THROUGH THE LEAVES

JANUARY 1928

THE GREAT WESTERN SUGAR CO.
EDITOR’S NOTES

Lifting by the Bootstraps

The sugar business of the United States has recently been trying to lift itself out of the ditch by its own bootstraps. It got into the ditch in this fashion:

Between 1914 and 1925 Cuba’s production of sugar increased 100 per cent. In the same period the production of sugar in the insular possessions of the United States increased 80 per cent. But the total consumption of sugar in this country during that time increased only 53 per cent.

For the last two years the manufacture of sugar in the United States has not been a particularly profitable business. Any one can confirm that statement by examining the financial statements today of the cane and the beet sugar companies. The basic explanation appears in the supply and demand situation of the commodity. There has been too much sugar on the market for a number of years.

This condition led to abuses in selling sugar—concessions in price, special deals and terms, heavy storage penalties, unbridled competition. Prices already low became lower net prices. The situation became so bad, in fact, that the industry has taken steps to purge itself of the worst evils.

These efforts comprise Cuba’s program to restrict production on the Island and to enlist other exporting nations in a more orderly marketing and a restricted production plan; formation of a National Association of Sugar Refiners in the United States; and organization of an American Sugar Institute.

The Association of Refiners purposes to eliminate the unfair practices in competition, to substitute openly known discounts based on quantity purchases; compile statistics on consumption and dis-
tributio n; and perhaps advertise to increase the use of sugar. The 
Institute would follow lines similar to like organizations in the steel, 
oil, textile, copper, leather, and other industries.

* * *

Where Beet Enters

While beet sugar production in the United States since 1914 
increased about 400,000 tons, annually, Cuba’s increase in exports 
to this country was 1,500,000 tons, and the increased shipments to 
the United States from its insular possessions were a million tons.

The restriction in production, if it must come, is up to the ter­
ritories which have made the biggest increases in production. And 
between them it seems mostly up to Cuba as long as Porto Rico and 
Hawaii enter duty free.

Just why Philippine sugars should be permitted easy 
and free access to our markets is a question that is des­
tined to receive more and more attention from American 
sugar interests.

If the lifting on bootstraps helps the sugar market, either in 
stabilizing prices or bringing them to a more profitable level, the 
beet sugar industry will be helped. But not much relief is in sight 
until the world supply and demand situation is greatly improved. 
European beet sugar production is on the increase. Almost every 
sugar country since the world war has been developing its sugar 
industry, to benefit national economy and national defense. 
Another year or two may pass before a healthy supply-and-demand 
balance arrives.

Meantime sugar buyers in recent months have displayed a lack 
of confidence in the market. No one could foretell the effects of 
the bootstrap measures.

* * *

In Great Western Territory

Beet growers in Great Western territory have enjoyed the 
highest price for raw materials in the country during the recent 
off years in the sugar business. They, in return, have given the 
company fairly long campaigns in its factories.

Only the economies of this large scale production plus 
other efficient policies have enabled the company to keep 
out of the red. But the return on investment has been 
lower than sound business practice justifies.

It would enlighten growers served by the Great Western to 
examine the financial condition of other beet sugar companies 
which have obtained their principal raw material at one dollar or 
more per ton less than the Great Western paid. This would ren­
der plainer how difficult has been the making of a profit in beet 
sugar manufacture during the last few seasons.
BEETS ON THE EVERETT SWEET CLOVER FIELD, AUGUST 8, 1927.

MODERN HOME OF MR LEE EVERETT
DURING our Scottsbluff-Gering beet tour, last September 7, a beet field belonging to Mr. Lee Everett was visited. At this particular stop a great deal of interest was shown by all members of the tour who heard the explanation and talks given by Mr. Everett and by the Sugar Company men. There were two fields, side by side, belonging to Mr. Everett. One was a field on which sweet clover had been used in rotation: alfalfa was in the rotation on the other field. The sweet clover field was handled in the following manner:

Forty acres of sweet clover were seeded in the spring of 1925, using barley as a nurse crop, drilling 1½ bushels of barley per acre. 85 bushels of barley per acre was threshed. After the barley was threshed on August 10, a bunch of cows were turned on the sweet clover field, averaging about 2½ head per acre, and it was pastured the rest of the summer until late in the fall. Cows were again turned on the sweet clover in the spring of 1926 at the same ratio of 2½ head per acre. The clover made a very rank growth during the season and had to be mowed twice. It was fall plowed. The result was a yield of 18.5 tons of beets per acre in 1927.

The adjoining field of forty acres which had used alfalfa in rotation was handled in the following manner. It was in alfalfa four years to and including 1925 and was planted to beets in 1926. In 1927 it was manured and again planted to beets. This field was in the best of tilth but the yield was only 17.5 tons as compared to 18.5 tons on the sweet clover land, notwithstanding the fact that the alfalfa field was in the best of condition for an excellent crop.

These fields were handled the same, well-farmed, and good work was done by the hand labor. Both fields were well irrigated. In fact there was no difference between the two so far as field operations were concerned.

Good crops bring prosperity and prosperity brings fine homes, as shown by the picture of Mr. Everett's new home.

Mr. Everett believes that sweet clover is cheap fertilizer and has proven his case. Inasmuch as the dairy business is becoming one of the leading factors of prosperity in the Valley, I believe that sweet clover fits in well with the regular program of crop rotation.
They Made the Extra Ton Per Acre

On nearly 14,000 acres of sugar beets in 1927 the Minatare, Nebraska, factory district growers brought in an average net yield per acre of more than 13 tons. This was a fraction of a ton larger than the average yield per acre for the entire Nebraska district.

The Minatare growers who had prize-winning beet labor last season averaged more than 14 tons per acre. Doubtless a number of elements entered into their getting that extra ton per acre; but efficient blocking and thinning played a big part.

This efficiency arises (1) in selection of the workers at spring recruiting time; (2) from supervision of their labor in the field by the grower; (3) their education in improved methods of tending the crop; and (4) in furnishing them some incentive for performing good work, such as bonus for high yield, prizes, good housing and living conditions.

The names of the Minatare growers in 1927 who enjoyed prize-winning beet labor are, by Fieldmen's districts:

**S. J. Tilden**
- George Fotinos
- Alex Meter
- Fred Rein
- John Huck, Schledewitz
- & Fred Fagler
- George Reib
- John Eskam, Jr.
- Conrad Gable
- Jacob P. Roth
- Dave Stricker, Jr.
- Jacob Brill

**Art Detlefsen**
- Arthur Bass
- Harry Crabill
- Henry Kaufman
- George Rickard
- Mel Nichols
- George Deines
- V. C. Redding
- John C. Long
- Frank Jones
- R. H. Hester

**James Jessup**
- Henry Treantos
- Leo M. Schumacher
- Henry Ziegler
- Claude Schumacher
- Henry Greenwald
- H. W. Drawbaugh
- Bill Fotinos
- Fred Steinbracker
- C. G. Nichols
- Carl H. Carlson
Three Tons More in Three Years
Southwestern Nebraska Growers Heed Higher Tonnage Campaign

By L. R. MONDT, Fieldman

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres</th>
<th>Average Tons per A.</th>
<th>Avg. Value per A. at $7 per Ton</th>
<th>District's Returns</th>
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<tr>
<td>1925</td>
<td>615</td>
<td>11.16</td>
<td>$78.12</td>
<td>$47,845.00</td>
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<tr>
<td>1926</td>
<td>943</td>
<td>12.56</td>
<td>87.92</td>
<td>82,950.00</td>
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<tr>
<td>1927</td>
<td>1312</td>
<td>14.45</td>
<td>101.15</td>
<td>132,790.00</td>
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</table>

Those figures tell their own story of improved beet-raising practices in the Republican and Frenchman river districts of southwestern Nebraska. An increased yield in 1927 of 3.29 tons per acre as compared with 1925!

How was the 14½ tons yield obtained last season? How may it be increased in 1928?

Growers realized in 1926, after the “another ton” campaign was heralded in the district, that with natural conditions in their favor—good climate, soil, and water supply—any increase was largely up to themselves.

The first response was more sweet clover in the beet rotation. In 1925 only 25 acres of sweet clover; over 160 acres in 1926; and more than 400 acres in 1927. There will be over 800 acres of sweet clover seeded in 1928.

Better thinning came in for its share of attention. With results that only indicate what still remains to be accomplished: in 1925, average stand, 51 per cent; in 1926, a drop, 48 per cent; but in 1927, a stand of 63 per cent.

Better cultivation came, too; more knife-edged bull tongues in the district in 1927. Why not the slogan for 1928: “ditchers on every drill and knife-edged bull tongues for every cultivator.”

The beets were thinned before they got too large. There was better use of irrigation water, timely application, light and more frequent applications. This district has suffered frequently from too much leaf-spot. It has reduced yields and has lowered sugar content.

The time has arrived to reduce the damage done by leaf-spot. In a local survey it appears that rotation prevents or reduces the evil. Beets on new alfalfa, clover or rich corn ground seemed to escape the worst leaf-spot last season.

With the lessons of the past to guide us, let farmers in the district also put out more manure; expand their cattle and sheep feeding; adopt the use of a land leveler generally; continue seeding 20 pounds of beet seed per acre; terminate leases January 1 or February 1, and with the fine co-operative spirit between all interested attain new heights in 1928.
Fieldmen Plan Grower's Rotation

By P. H. McMASTER

A DEFINITE crop rotation plan for every beet-growing farm has become almost a necessity if high beet yields are to be maintained. It is compulsory where the grower desires to increase his yield. With nematode on a large number of farms a definite system of crop rotation is needed to control this disease on farms already infested and to prevent its spread.

In certain parts of the Ovid factory district, definite systems of crop rotation have been followed for a number of years by a limited number of farmers. Until recently this has largely been confined to those operating their own farms. Tenanted farms, especially of non-resident landlords, have not received the same good rotation treatment as the owner-operated farms. However, since the discovery of nematode in the district, crop rotation is commanding the attention even of those who formerly considered rotation a fanciful theory.

A properly planned crop rotation system on any farm will increase its profitableness and will prevent damage inevitable following a continuous one-crop plan. The same rotation will not answer the purpose of all farms, but certainly a plan can be formulated for every farm.

Last winter at the request of different growers and landlords, the fieldmen undertook to map different farms and work out with the grower or landlord a suitable crop plan. W. I. Whitney, living three miles west of Sedgwick, made such a request of the fieldman in his district.

Mr. Whitney wanted to follow a four year rotation including sweet clover, utilizing the sweet clover the second year for sheep pasture. Upon mapping this farm, we found there was a total of approximately one hundred acres of the 160 suitable for beets. The balance is a bit too rolling for successful beet growing. Only the land suitable for beets was included in the four year sweet clover plan.

His landlord, a non-resident, did not approve the plan for two reasons; because it did not provide for as large
a yearly acreage of beets as wanted, and, the pasturing of sheep necessitated an expenditure for fencing, which he did not want to make.

This summer, a stop was made at the Whitney farm on our Annual Beet Tour. A large map was put up showing the field in 1926, before any cropping plan was started, and the crops on each field during the cycle of the rotation. This map gave the tourists a clear understanding of a four year sweet clover rotation.

By reference to the map, you will notice some slight re-arrangement of the fields was necessary, but as no fences were involved this was a minor detail. The land suitable for beets was divided into four fields of about twenty-five acres each. The rolling land in the southwest and northeast corners of the farm is to be seeded to alfalfa or a catch crop, as the operator desires.

Consideration was given to the pasturing of the sweet clover. All fields, except in the northwest corner, come out to the road. Access to the corral at the barn is very easily had without any permanent lane being necessary. Furthermore, the plan is worked out so that it is necessary to move only half of the pasture fence each year.

The landlord in this case could well afford to provide the necessary fencing and corrals for the tenant to carry out this rotation plan. Over a period of years the initial cost would be repaid many times by the increased yields of the beets alone. Also, an infestation of nematodes could probably be prevented.

### Rotation Plan
**W. I. Whitney Farm**

<table>
<thead>
<tr>
<th>Year</th>
<th>Field No. 1</th>
<th>Field No. 2</th>
<th>Field No. 3</th>
<th>Field No. 4</th>
<th>Field No. 5</th>
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<td>1926</td>
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<td>Beets</td>
<td>Beets</td>
<td>Beets</td>
<td>Alfalfa</td>
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<td>1927</td>
<td>Beets</td>
<td>Beets and Grain</td>
<td>Grain</td>
<td>Beets</td>
<td>Alfalfa</td>
<td>Corn</td>
</tr>
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<td>1928</td>
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<td>Clover Pasture</td>
<td>Beets</td>
<td>Grain and Clover</td>
<td>Alfalfa</td>
<td>Corn</td>
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<td>Beets</td>
<td>Clover Pasture</td>
<td>Alfalfa</td>
<td>Grain and Alfalfa</td>
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<tr>
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<td>Beets</td>
<td>Grain and Clover</td>
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<td>1932</td>
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<td>1934</td>
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<td>Grain and Clover</td>
<td>Beets</td>
<td>Grain and Alfalfa</td>
<td>Alfalfa</td>
</tr>
</tbody>
</table>
The End of the World . . .

Some prophesy another flood.
The pacifist fears that war will end the world.
A doctor may deem it likely to come from social diseases.
An astronomer senses the danger of astral collisions.
The farmer’s mind may turn to bugs.
Do bugs threaten the world’s end? Corn borer, boll weevil, webworms, chinch bugs, beetles, wasps, flies, cutworms, locusts, plant lice, moths, ticks, grubs, hoppers, caterpillars,—
And in the world of good sugar beet yields—nematodes.
Flood, erosion, war, disease, bugs, any one of these could end the world of man if man were not on his guard.
To put you on your guard, not to alarm or to frighten, the story of the sugar-beet nematode is presented in this issue.

...1928...
Anti-Nematode Year
Every owner or tenant of land infested with sugar beet nematode need be in no doubt for long concerning that fact. He may have been informed of the presence of the disease by the sugar company fieldman; or may recognize its existence by the appearance of the roots and a decrease in yield. If the same field has been continuously cropped to beets and nematode is established on adjacent farms the probability is that his ground is infested to some degree.

Light infestation may escape notice for a time. But if any field has a characteristic bare spot during the growing season, and this lack of yield is not otherwise explainable, examination for nematode should be made immediately. In this, fieldmen will assist any grower.

Heavy infestation with the sugar beet nematode is found only in fields which have produced many crops of sugar beets with little or no rotation. Your land, with heavy manuring, may appear capable of growing consistently heavy tonnage season after season. But after a few nematodes are introduced in a beet field, either through dump dirt, irrigation water, or in any other manner, repeated cropping.
to beets results in a terrific rate of increase in nematode colonies. It is, therefore, of utmost importance that a crop-rotation system be adapted for both infested and uninfested fields. On the latter, with no known or visible damage from nematode, sugar beets may be grown for not more than three years in succession in any rotation.

On infested fields the first need in planning the rotation is to consider the severity of the infestation, the possible crops other than sugar beets, and the general fertility of the soil.

For light infestation, with one or two patches per acre forming only a small percentage of the total, the rotation may keep beets off this land for only two years. Peas, beans, alfalfa or sweet clover, potatoes, tomatoes or other cultivated crops may be used. Small grains should be avoided. Precede the beets with a legume, if possible.

Moderately infested fields, with 10 to 20 per cent of the crop endangered, should have rotations keeping beets off the diseased areas for 2 to 3 years. Or throw the land into alfalfa for 3 or 4 years, after which a beet crop may be grown every third year. The other crops mentioned for the light attacks of nematode are available in moderately infested fields, too.

Severely infested fields are those in which one-fourth or more of the crop is destroyed.
Fig. 3.—Typical result of attempting a crop of beets on severely infested soil after one year of wheat. The infected areas are a total loss.

These require a rotation of not less than 3 and preferably 4 to 5 years. For this long rotation the most common crop used is alfalfa; but if desired the rotation may be made up of 1 or 2 years of small grain, followed by 2 or 3 years of potatoes, peas, beans, etc. Small grain should not immediately precede sugar beets. After the 4 to 5-year rotation reduces the infestation beets may be grown every third year.

Under any system of rotation careful watch must be kept, and if serious nematode injury appears the length of the interval from beet crop to beet crop must be increased.

Crops on Which Nematode Will Starve

Alfalfa—The nematode does not attack alfalfa. A thick stand is necessary, however, to reduce nematode infestation because weeds in the alfalfa may be fine host plants.

Sweet Clover—When a heavy crop of sweet clover is turned under the heat and gases of the decaying material kill large numbers of the nematodes. Sweet clover, not a host plant for nematode, fits in well for short rotations on slightly or moderately infested fields.

Potatoes, Beans, Peas—One crop of beans on slightly infested fields may be followed by beets. One or two bean crops at the end of a 3 or 4 year rotation is helpful on severely infested land. Peas, an excellent legume, fit into any rotation in sections where a mar-
ket awaits. With peas harvested early, the infested field may be fallowed the remainder of the year. But weeds should be kept down. Where the soil and market are favorable for potatoes, it makes an excellent crop with which to fight nematode. Manure can be spread with the potato crop, benefitting the following beet crop. The potatoes follow alfalfa and precede beets in the longer rotations.

Wheat, Barley, Oats, Corn, Onions, Tomatoes—None of these are out-and-out host plants for sugar-beet nematode, but the small grains are advisable only as nurse crops for alfalfa or sweet clover when fighting this disease. Onions and tomatoes are especially good preceding beets in the rotation. Corn is fair.

The following should never be planted on soil infested with the sugar beet nematode: cabbage, cauliflower, table beets, mangles, turnips, rutabagas, radishes.

Don't Tempt Fate

When a profitable crop of sugar beets is obtained on nematode-infested soil after a crop rotation, the grower will probably feel that another crop the following year should be nearly as successful. However, this is not true. A second crop invariably falls back to approximately the same yield as before the crop rotation. This is because the few nematodes remaining after the rotation have greatly increased in numbers on the first crop of beets, and the nematodes severely attack the second crop.—Gerald Thorne.

Fig. 4.—A 16-ton crop of beets following a 4-year alfalfa rotation. The stand and yield were apparently about normal, but a few nematodes were present on every beet by harvest time.
Growers, Meet Mr. Sugar-Beet Nematode!

How to Recognize an Enemy Which If Not Controlled May Cost You Many Hundreds of Dollars and Spoil Many a Season’s Hard Work

(Editor’s Note: Gerald Thorne is the author of the U. S. Department of Agriculture Farmers’ Bulletin No. 1514, on “Control of Sugar-Beet Nematode.” Every grower should send for one of these bulletins.)

YOU perhaps have never seen a sugar-beet nematode. You do not see electricity on a high-power line. But the electricity can kill. So does the nematode, when a field is severely infested, kill yield and sugar content.

The nematode can be seen with the naked eye. The form commonly seen in the field is the female—a small, milky-white, lemon-shaped body clinging to the beet root. Practically speaking, the female is a mass of from 100 to 600 nematode eggs.

From these eggs hatch small, slender worms or larvae which average one-sixtieth of an inch in length. They are equipped with a strong spearlike organ in the mouth, with which they make an entrance into the beet root. Here they feed on the plant juices and soon molt.

Up to the time of molting there is no visible difference in the sexes, but afterwards there is little similarity. The males remain long and slender, somewhat like the larvae, except that they are several times as large and have blunt, rounded tails. After maturity they break from the roots and go in search of the females.

After molting the females are flask-shaped. As their size increases they break through the root tissues and remain attached by their heads. At this stage they are fertilized by the males.

Fig. 1. Head of larva of the sugar-beet nematode, showing the spear with which it works its way into the beet root. (Magnified 1000 times.)
and soon develop into lemon-shaped bodies. A gelatinous fluid is excreted, which collects in a mass about the posterior end.

Into this mass many of the females deposit eggs, which soon hatch, the larvae finding their way into the soil or into the beet. The number of eggs varies from a few to upward of a hundred. And since several generations occur each season there are soon enormous numbers capable of attacking the beets.

As the season advances many of the females change in color from white to dark brown, becoming what is commonly known as the brown-cyst or preservation form. In this form the dead body of the female serves as a protecting sac for the eggs.

If sugar beets or other favorable host plants are grown the following year, most if not all of these eggs hatch. However, if no host plants are present, only a few of the larvae hatch, the remainder lying dormant in the eggs. This condition may prevail for several years.

The first evidence of nematode injury commonly noticed is the appearance of small areas which produce no beets or only a few undersized ones. Unless a considerable quantity of infested soil has been hauled into the field, it is usually two or three years after infestation before these areas are large enough to attract attention.
Each Grower His Nematode Doctor

It is possible to determine whether suspected areas are infested even if beets are not growing on the land; for example, in winter or when other crops are planted.

Take a small sample of the soil, preferably dry, from the suspected areas. Drop the soil into a glass of water.

If any considerable number of nematodes are present, some of the brown cysts will immediately rise to the surface, where they gather on the glass and appear as small, lemon-shaped, bright-brown bodies easily distinguished from the black weed seeds and other rubbish with which they may be associated. A magnifying lens may be of help.—Gerald Thorne.

On severely infested areas the beets wilt and wither away just after thinning, often only a few remaining. If the infestation is only slight or moderate, and if the moisture and cultural conditions are favorable for growth, the beets may not die but simply make less growth than normal beets. As the season advances these will be found to wilt much more readily on warm days.

If one of these infested beets be carefully dug up, it will be found small and stunted, with many more small roots than the normal beets have. In some instances the entire taproot is covered with these small roots, many of them being brown and dead. If nematodes are present, an examination will usually reveal the small, lemon-shaped, white bodies of the females clinging to the roots. Later in the season they often are found on the beet itself.

At this time it will probably be noticed that many of them are becoming brown—the development of the brown-cyst stage.

Value of Manures in Nematode Control

When nematodes are present in a field it is all the more imperative that the soil fertility be maintained. If beets do not make an immediate, thrifty growth from the beginning of the season, a comparatively small number of nematodes will so check growth that the yield may be seriously reduced.

However, if the young beets grow thriftily, they will not be injured perceptibly by the nematodes even though present in considerable numbers.

Barnyard and green manures give excellent results.—Gerald Thorne.
These visible forms of the nematode are not able to move at all, and the observer should not confuse them with the sugar-beet aphid, which is a true insect several times as large as the nematode and which can be seen to move about slowly.

Occasionally it is very difficult to find the nematodes on the beets even in severely infested fields. This condition usually prevails in fields that are very dry, the nematodes having died from lack of moisture. Careful examination of such fields will sometimes reveal some of the brown cysts attached to the roots, but it is usually necessary to make a soil test.

**Fig 3. Cyst form of the sugar-beet nematode which has been crushed in order to show the eggs and larvae. (Magnified 25 times.)**

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**Keep Every Copy of Through The Leaves**

You may want to refer to some ration for feeding livestock or to another grower's experience in fitting a seed-bed. Through The Leaves of each issue contains something worth re-reading at a time when you may need to refresh your memory on a detail of field practice or some other phase of farming. Keep each issue. If you miss a month ask the nearest Factory office to supply the issue.

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**The Question of Profits**

"It is true that while the volume of business has held up in the face of many adverse circumstances, the profits of business have made a less satisfactory showing. There is no question that the continuous decline of prices during the past two years has given business a difficult problem to meet, and business men have had to depend mainly upon large scale output and the most careful elimination of waste and inefficiency in production to keep out of the red."—The National City Bank of New York, December Bulletin.
Cultural Methods of Controlling Leaf-Spot
By C. O. TOWNSEND
Pathologist in Charge of Sugar-Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture

The most satisfactory and practicable methods known at present for reducing leaf-spot are deep fall plowing and crop rotation. Inasmuch as crop rotation is the "balance wheel" of good farming and must be practiced in order to obtain the most profitable results, regardless of the presence of leaf-spot, this disease and many other pests may be controlled and other advantages gained by crop rotation without extra expense and labor.

If the rotation system is wisely planned and carefully and thoroughly executed, better crops of all kinds will result and many pests, including this fungus, will be eliminated or at least reduced below the point of serious injury, provided the fungus is not returned to the field in the manure, on the seed, or in some other way.

The principles of disease control by means of crop rotation are based upon the fact that certain pests, like this fungus, can thrive only on certain kinds of plants. Therefore, when the crops are changed and the food supply thereby cut off, the pests must perish or be greatly reduced in number. It must be remembered that the most profitable crop rotation does not consist merely in changing the crops around from year to year regardless of the relation of the crops to each other, but that the central aim in all crop-rotation systems should be to have each field in better tilth, better physical condition, and reasonably free from pests at the end of each rotation cycle.

No hard and fast rotation system can be laid down for any community, but the most profitable system must be worked out for each farm and, indeed, for each field. There are certain general principles, however, that should be borne in mind in this connection in order to accomplish the most satisfactory results.
For soil improvement there should be at least one leguminous crop in each rotation cycle. To this class of plants belong the clovers, alfalfa, peas, beans, etc. There should be also a sufficient number of live stock, especially milk cows, on each farm to utilize the beet tops and roughage and to supply the desired quantity of stable manure, which, in addition to green crops plowed under, will furnish the necessary amount of humus to the soil.

The conditions resulting from this treatment, if the soil is properly handled, will make the succeeding crops more vigorous and capable of offsetting, in some measure at least, the effects of any pests that may appear. Again, the successive crops in any rotation should be so selected and arranged that no two upon which the same pest may thrive will be grown in succession.

The beet-leaf fungus Cercospora beticola has not been known to thrive upon the small grains, corn, clover, alfalfa, beans, and many other plants suitable for rotation with sugar beets. It is apparent, therefore, that crop rotation properly carried out offers a satisfactory means of eliminating, or at least of keeping in check, this pest, which, if allowed to gain headway, will turn an otherwise profitable crop of sugar beets into a serious loss to the grower.

The length of time that a field infested with leaf-spot should be in crops other than beets in order to insure the destruction of the leaf-spot fungus and spores appears to depend somewhat upon climatic conditions and upon the manner in which the soil is handled. One field that came under the writer’s observation was so badly infested with leaf-spot that the crop was not harvested. The field was then seeded to alfalfa. At the end of two years it was fall plowed to a depth of 12 to 14 inches and subsequently put into beets for two successive years. Very little leaf-spot appeared either the first or second year that the field was in beets, following the two years in alfalfa.

This and other examples indicate that, under some conditions at least, an interval of two years will reduce leaf-spot below the danger point. It is wise, therefore, in planning a rotation cycle to arrange for two or more years in other crops before returning to beets. Furthermore, it should be noted that the best all-around results are obtained when the rotation period covers three or more years.
Another method which under some conditions has given positive results in the control of beet leaf-spot is that of deep fall plowing. The writer has found by experience that deep fall plowing of beet land has marked effect in reducing the amount of leaf-spot in the succeeding crop.

For example, a field where leaf-spot was very injurious to the beet crop was plowed to the depth of 14 inches in November. It was again planted to beets the following year, with the result that very little leaf-spot appeared, while the shallow-plowed land in the same locality which was planted to beets showed a destructive amount of leaf-spot.

The plowing should be done with a mold-board plow, so that the surface soil, which contains the fungous spores, is turned under completely.

On general principles of good farming an occasional deep fall plowing is beneficial to certain soils. It is not recommended, however, as a general method of controlling leaf-spot, to the exclusion of crop rotation, and should be used for this purpose only in case it is absolutely necessary to follow infested beets with another crop of beets.

More About Sweet Clover

Early fall cutting of first year sweet clover greatly reduces the amount of material stored in the roots before winter sets in and thus lessens the soil improving or pasture value of the crop the following year.

First-year sweet clover, seeded with small grain in the spring, usually gets its full growth by the latter part of September but the roots are not fully developed by that time. If the clover is allowed to stand the roots will double in weight between that time and freezing weather. Also their nitrogen content increases.

It seems that during this last period of growth in the first season, sweet clover acts somewhat like a root crop. Its leaves manufacture material for storage in the roots, to be used the following spring for giving the plants an early start.

If a hay crop is removed early in the fall, or if the clover is heavily pastured, the roots fail to develop and then the crop is late in starting growth the second year; the yield is much smaller.

If clover is to be plowed under the second spring it will be lacking in total organic matter as well as in nitrogen if a hay crop is removed early in September.

There is no objection to cutting the first-year hay crop shortly before it is likely to be killed by frost. By that time in normal years the roots will have reached their full development. However, this won't be good hay with unfavorable weather following. So watch the root development in the fall and do not cut the crop for hay any earlier than necessary to get it cured.
The Tariff Question

(A Statement by the Secretary of The Mountain States Beet Growers Marketing Association.)

There has been recently among general farm organizations an attitude of indifference, if not open opposition, to the present protective tariff.

The danger is that this indifference may give occasion to those opposing the protective tariff to demand a general reduction in the tariff, and such reduction may include the present tariff on imported sugar so necessary to the continuation of the sugar beet industry.

It is needful to point out to the farm organizations that the sugar beet industry cannot be maintained in competition with Cuba (that is, without a protective tariff). The price of sugar, which ultimately fixes the price of beets, is made by the addition to the cost of raw sugar the duty of $1.76 per hundred weight.

Cuban raws can be delivered in New York at 3 cents. To this 3 cents the refiner must add $1.76. So he is making refined sugar out of raws costing him $4.76. This makes the price of refined sugar about $6 and the price of beets is fixed by this $6 sugar.

It would be unthinkable for the beet farmer to grow beets in competition with New York sugar made out of raws costing only 3 cents. The beet industry has the direct benefit of the tariff of $1.76.

The Beet Association must attempt to keep before the eyes of the general public the direct and necessary benefit of the sugar tariff.

**Duty paid raw sugars have been below $4.76 and refined below $6 New York basis for months.
Let's Run a Sugar Factory

(Continued from Previous Issue)

FILTRATION

In a single process beet sugar factory, that is, one with no provision for the recovery of sugar from final molasses, the juices and syrups are subjected to no less than six successive filtrations. After each operation on the juices, such as two carbonations and two sulphitations, comes a filtration. And the wash water and molasses thrown off at the centrifugal station are, wholly or partially, filtered separately before going back into the juice stream.

The mixture of juice and precipitate which is formed in the first carbonation is treated in the first presses. The mixture is pumped into the filter; the juice, passes out leaving the precipitate deposited on the cloth in the form of lime cake from which the sugar is removed by washing with water.

After leaving the first carbonation filters the juice is heated, and then treated with lime kiln gas at the second carbonation. The precipitate formed here is removed in the second presses, which are used exactly like the first.

At the third filter station several products are treated: thin juice and thick (evaporated) juices, high wash (sweet waters), and high green (molasses), and melted sugar syrups, and sometimes mixtures of all of these.

Beets of low purity or frozen beets complicate every stage of the process. Bad beets burden the house with an excessive amount of lime salts. These are certain combinations of lime and organic acids. If they escape the first filtrations and reach the evaporator station the salts form scale on the tubes, or interfere with sugar boiling and quality, but most of them go through into the molasses.

Originally beet sugar factories used bone-char as a filtering or purifying agent. But when the lime and sulphur treatments were fully developed and the chemistry of the beet juice was better understood bone-char filtration practically ceased in beet sugar mills. It is used now in a few refineries for removal of certain colloidal impurities which affect sugar color. But where the carbonation process is carefully conducted, with the latest improvements in mechanical filters, the bone-char filtration is unessential to production of the highest quality sugar direct from beet juice.

Filtration in the Steffen House and in the later development of molasses desugarizing at the Johnstown plant of the company present still further chemical and engineering problems.

In filtration at least four vital objects are sought by the mill operatives: low precipitate left in the juice; low sugar in discarded lime cake; smallest amount of wash water; as little labor and filter cloth as possible.

Various filters have been designed in efforts best to achieve these objectives. The most commonly used are the old-fashioned plate and frame presses. Danek, Sweetland, American, Dorr, Vallez, Genter, Borden, Oliver and Kelly are names of other filter equipment known to beet sugar factories, with the ultimate filter still to be achieved.

(Evaporation and Crystallization will be treated briefly in the next installment.)
If I Were Making Resolves for 1928...  

By JAMES JESSUP  
Fieldman, Nebraska District

You are face to face with the New Year's farming problems. A cropping program is to be arranged: mental note is made of last season's mistakes: one quite naturally determines to avoid past errors. While thinking of the farm work of 1928 would it not be a good thing for all growers to consider the following?

Resolved that before starting my farming operations I will lay out in advance a systematic plan of action.

I will see that all tools and implements are in perfect condition before spring work opens.

I will disk before plowing in all cases, even on alfalfa or stubble.

I will plow the land to a depth of at least ten inches.

I will spread the fertilizer and plow under immediately in order to avoid loss.

I will work the soil intensively in order to get a seed-bed as nearly perfect as possible.

At planting time I will hoe the row and not wait until it has had time to crust and blow. Further, I will, after every rain, cultivate just as soon as the land will permit.

I will cultivate in the beginning just as soon as I can see the rows and will blind cultivate if necessary or advisable.

I will watch my crop always and give it the very best of care throughout the growing season, because by so doing I know I will be well repaid for my efforts.

I will never hurry the beet workers beyond their normal capacity, and will aid them in every way possible to do for me a good grade of work.

I will not put in more acres than I can properly handle.

I will not plant any poor land to beets but will build up such soil by the use of other crops.

FOR THE LANDLORD

I will co-operate with my tenant in everything tending toward better farming, by furnishing good living quarters for both tenant and labor. I will do all I can to keep up the fertility of the soil so that it will be a paying proposition for all concerned.

I will not rent my farm to a poor farmer because by so doing the fertility and productivity of the land will decline rather than improve. By having a good farmer and following a systematic crop rotation, I can expect maximum results. A good farm always attracts the attention of a good farmer and there is not much chance to rent a rundown farm to other than a poor farmer.

I will follow good farming practices and the results will be well worth the effort.
Fort Collins District Soil Survey Conclusions

By A. T. SWEET

U. S. Department of Agriculture, Bureau of Chemistry and Soils

(Editor's Note: In this recent survey Mr. Sweet and assistants hiked over 1,000 miles and bored more than 4,000 sampling holes with soil augers. The Fort Collins territory is well-known as a fine farming country; nothing in this article is intended to detract from that fact. The survey was made by the Bureau of Chemistry and Soils co-operating with the Colorado Agricultural College. This report was read before the Colorado-Wyoming Academy of Science.)

Our soil survey work in the Fort Collins area furnished much interesting and valuable data. Considering the region as a whole, perhaps the most striking thing brought out is that the texture of the heavier soils is not so heavy as it seems under moist field conditions.

In other words, a soil which when slightly too wet is very sticky and gummy is found upon laboratory examination to have a high per cent of fine and very fine sand in its composition. A soil which, when examined in the field seems to be a heavy clay loam or a clay when analyzed in the laboratory is found to be, on account of the high per cent of sand, only a loam or possibly only a very fine sandy loam.

This condition is probably due (1) to the very high per cent of fine and very fine sand, which mixed with only a very small per cent of silt, clay and soil colloids gives a more sticky soil than if the sand in the mixture were coarser, (2) to the presence of very small amounts alkali which causes the breaking down or defloculation of the soil grains and (3) to the presence of comparatively large amounts of sticky soil colloids.

Soils of this region are supposed to be well supplied with the essential plant foods and I think this supposition is in general correct. Even the heaviest adobes are well supplied with plant food but these soils are not highly productive because they have a bad structure so that the necessary foods and moisture are not available.

The farmer cannot do very much to change the texture of a soil, that is, change the size of the particles of which it is made up, but he can do a great deal to change its structure, which is in many cases of even greater importance. Soil which is over irrigated, which is cultivated when too wet or which is trampled by live stock when wet changes in structure from loamy or friable to sticky and compact when wet, and to hard and cloddy when dry.

Soils such as the heavier of those of the Fort Collins region are especially susceptible to injury of this kind. They require especially careful handling for this reason. They may be compared to a very delicate, high powered machine, wonderfully efficient when in just the right adjustment but easily thrown out of adjustment, and when in this condition much less efficient.
Good soil structure can be maintained by (1) careful handling of irrigation water, especially avoiding over-irrigation; (2) by cultivation only when the soil is in good moisture condition (3) by rotation of crops in which deep rooted crops and leguminous crops have a place, (4) by the use of manures and the addition of organic matter in every way possible.

The second most important fact brought out by the soil survey is that although the soils of the greater part of this region have much the same surface appearance and to the casual observer seem to be nearly equally productive, there are rather wide variations. Some soils are not only much more productive than others but are also much easier to handle and have a wider crop adaptation than others.

This variation is in most instances due to subsoil rather than to surface soil conditions. Where the parent shale, sandstone or limestone is reached within four or five feet of the surface, subsoil, and in many places, surface soil, conditions are less favorable for crop growth than where the parent material lies at a greater depth. This is due largely to restriction of moisture and air movements in the subsoil and in places to the accumulation of alkali.

The most productive soils of the region surveyed are the terrace or bench soils along the Cache la Poudre, the Big Thompson and the Little Thompson; the wind blown soils which occupy a considerable area of upland both to the north and south of Fort Collins, and the better part of the soils in the lower stream valleys, or recent alluvial soils.

The third most important fact brought out in the survey is the rather large and increasing amount of land which needs drainage. My first impression of this region, gained from driving across it several times, was that comparatively small amounts of the land were being injured by seepage water. Later in the season, when the survey was taken up and the land gone over in detail, few large areas of seep land were found but there are a large number of small ones. These seem to be slowly increasing and are not only unproductive but on account of their appearance reduce the sale value of adjacent lands.

An examination of the subsoil of any of these seep areas shows a very high percentage of white crystalline material which is largely magnesium sulphate but which is also made up partly of gypsum, calcium carbonate, sodium chloride and some other salts. These areas, even when drained, are not very productive. Some of these areas cannot be easily drained, but others can and should be. It is even more important that drainage be provided wherever needed before the land goes to seep.
TURNING UNDER SWEET CLOVER IN SPRING FOR BEETS

PLOWING, PACKING, AND HARROWING SWEET CLOVER, AFTER BEET PLANTING. THIS FIELD WAS IRRIGATED UP.
Watering alfalfa or sweet clover early in the fall after turning under a green manure crop instead of harvesting the last hay cutting.

Preparation of Alfalfa or Sweet Clover Seed Beds

By H. C. GIESE

ON MOST soils it is preferable to plow under the last cutting of hay in the fall in order to secure as much benefit as possible of green manuring. I suggest that in fall plowing the ground be either disked or harrowed immediately after plowing. If practicable it would then be well to make use of water in order to pulverize the soil and to help in the disintegration of the green material. This method can be applied to both alfalfa and sweet clover. (See photograph No. 1.)

The practice now is to delay the fall plowing too long, thinking that the added growth will be valuable. Too late plowing almost always leads to trouble the next spring, sweet clover, especially, will sprout. Better to do the fall plowing before September 10 and irrigate it in the fall. If other work makes it impossible to plow before this date I would recommend waiting until spring before plowing under the legume.

When plowing in the spring it is necessary to wait until the sweet clover or alfalfa is 6-10 inches high. This generally is in the last of April. If the growth of sweet clover has removed practically all the moisture from the soil it might be advisable to irrigate the ground before plowing, especially in the heavier soils. (Photograph No. 2 shows a sweet clover field being turned under last May for beets.)

Photograph No. 3 was taken on the farm of James Work west of Fort Morgan and shows very clearly his successful way of preparing a seed bed following sweet clover. After plowing Mr. Work followed up with a Campbell packer which was heavily weighted down with concrete blocks. After packing the plowed ground twice with the Campbell Packer the ground was harrowed well. It was then planted, with the ditchers on the drill, after the ground had been floated and harrowed again. It was then furrowed out and the beets irrigated up, assuring an excellent germination stand.

Alfalfa can be handled in the same manner although it makes the planting a little late for beets. I prefer to fall plow whenever it is possible to do so.
A. B. C. of Fitting a Beet Seed Bed

By Asa C. Maxson

Plow in the fall when the nature of the soil and moisture conditions will permit. This produces a finely pulverized, well compacted seed-bed, insures a good and evenly distributed soil moisture, and reduces the tendency to crust after planting.

Use the harrow after the plow every half day if the soil pulverizes well; the disk if it is slightly cloddy; and the roller if large clods are turned up. This firms the seed-bed, closes the larger air spaces, thus preventing the drying out of the plowed soil and subsoil; breaks all large clods or forces them into the plowed soil where they can become moist and be more easily reduced.

If fall plowing cannot be done, plow as early in the spring as possible. Use the harrow, disk or roller as conditions outlined above may demand.

Harrow fall-plowed land as early in the spring as possible. This conserves moisture.

Level fall and spring-plowed land as early as possible. This gives more time for the dry soil left in depressions to become moistened. This in turn insure a more uniform germination and a better stand.

Harrow before leveling when soil moisture is close to the surface. This dries the surface, prevents the formation of a crust when the leveller cuts through moist ground, and makes better and easier leveling possible.

Harrow lightly after leveling and before planting. Run the harrow at right angles to the direction of the rows or the slope of the ground. This conserves moisture, prevents blowing, reduces runoff and washing during heavy rains, causes the soil to take in more moisture and helps to prevent crusting.
Beet tops are usually fed up during the fall and early winter before livestock are put on a very heavy grain feed. In many instances no grain is fed during the preliminary tops feeding period and the tops fed with hay are usually used up before the first of the year.

The first standard beet by-product ration for fattening cattle on full feed was made up of wet beet pulp and alfalfa hay. As early as 1903 the Colorado Agricultural Experiment Station conducted feeding experiments using this combination as a check. 900-lb. steers consumed daily 123 pounds of wet beet pulp and 12.5 pounds of alfalfa hay. They gained 1.4 pounds per head daily at a feed cost of $11.96 per cwt., based on present feed prices.

The addition of 6.4 pounds of corn chop increased the daily gain to 1.82 pounds but also increased the cost to $13.08 for each hundred pounds gain secured on pulp and hay and still proved more profitable. Such bulky rations were, of course, best adapted to the fattening of big cattle and not at all suited for yearlings or calves; but the fattening of yearlings and calves was not even considered as practical in those days.

A standard fattening ration for any section of the country means the ration which is readily available and which will put on maximum gains at the least cost. There is no doubt that the standard beet by-product ration for northern Colorado must contain wet beet pulp. Changing conditions, however, have altered the original combination of feeds used.

First—Early feeding operations indicated that cottonseed cake was practically essential in fattening rations when wet pulp was fed. Cottonseed cake increased gain, feed consumption and selling price and actually decreased the unit cost of gain.

From 1 to 2.5 pounds of cotton cake according to the size of cattle fed, has proven worth from two to two and one-half times the price of corn when fed with wet pulp.

So cottonseed cake has been rather permanently included in the standard beet by-product ration even though it narrows the nutritive ratio beyond standard requirements.

Second—With the use of cotton cake it was found possible and
practicable to feed beet molasses in the standard ration. So about the year, 1915, the standard beet by-product ration for a two-year-old steer consisted of:

- Wet beet pulp (full fed) .......... about 100 pounds
- Beet molasses .................................. 4 to 6 pounds
- Cotton Cake ..................................... 2 pounds
- Alfalfa ........................................... 10 pounds

With this combination it took 15,000 pounds of wet beet pulp, 600 pounds of molasses, 300 pounds of cotton cake, and 1500 pounds of hay to produce a 300-pound gain on a steer. Under favorable circumstances a gain of two pounds per head daily was made. The feed cost of 100 pounds gain with this combination was reduced to about $10.75. The addition of molasses and cake materially cheapened the former ration.

For those in position to secure the necessary amount of wet pulp and molasses this ration still offers itself as the most economical one available. But this leads us to the third condition.

Third—The standard ration shown above called for practically seven and one-half tons of wet pulp per steer or over 200 tons to fatten 27 head of steers. With an average allotment of from 75 to 125 tons of wet beet pulp the shortage of pulp available to the average feeder became a serious consideration.

Then the fourth condition presented itself in the form of a new process to obtain sugar from beet molasses with a possibility of almost the elimination of beet molasses from the feeding program. (Editor's Note: Restriction of molasses to feeders is not likely this year. In seasons of short campaigns at our plants a molasses shortage for feeding is likely.)

How can these two factors be met? There are a number of ways.

First—The growing demand for baby beef offers an opportunity for feeding a more limited amount of pulp in fattening rations for calves and yearlings. Where 75 tons of wet pulp would only fatten 7.5 aged steers the same amount has been used to fatten about 30 calves.

Second—A limited acreage of corn for silage will produce a carbohydrate roughage that saves both pulp and hay. Corn silage fed with wet pulp at the rate of a little over one-third silage and two-thirds wet beet pulp has made it possible further to stretch the 75 tons of wet pulp so that it will fatten 40 calves.

Some grain should be substituted where beet molasses was formerly fed. The substitution cannot be accomplished without a
slight increase in cost of gains produced. The value of corn chop is well known. From four to six pounds is usually sufficient.

Barley chop or rolled barley will usually give practically as good results as corn and should be used when available at less than corn prices.

A standard beet by-product ration for fattening cattle under present conditions consists, therefore, of wet beet pulp fed in proportion to the amount available and number of cattle it is desired to feed; a limited amount of grain, usually corn chop or barley chop; cottonseed cake, and alfalfa hay. Corn silage is added to this ration if the wet pulp supply is not sufficient without it.

The following rations may be used when a very limited supply of pulp is available:

**Standard Beet By-Product Rations for Fattening Cattle**

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<th>Yearlings</th>
<th>Twos</th>
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<td>Grain</td>
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<td>5</td>
<td>6</td>
</tr>
<tr>
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<tr>
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<tr>
<td><strong>NUMBER TWO</strong></td>
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<tr>
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</tr>
<tr>
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<td>9</td>
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</tr>
<tr>
<td>Grain</td>
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<td>5</td>
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<tr>
<td>Cotton Cake</td>
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<td>1.25</td>
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<tr>
<td>Alfalfa</td>
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**Prevent Losses of Stock in Corn Fields**

Corn stalks are dangerous as livestock feed because they are dead, decaying plants. The only sure way to prevent losses is to keep the live stock out of the stalk fields, a thing which farmers do not seem inclined to do. Loss of animals from well cured corn fodder or from silage is as uncommon as loss from good hay or ripe grain. This fact leads to the conclusion that the loss must usually be due to the decaying food in the stalk fields.

Careful livestock men use quite uniform methods. They recommend that no livestock be turned into corn fields while hungry, that there always be some other good feed available, that the animals be left in the field only a few hours at a time, that they be kept out entirely when the fields are wet, that they have plenty of water and salt, and that each field be tried first with a few of the least valuable animals on the place.
A Brief History of Colorado's Beet Sugar Beginnings

Part I

(Editor's Note: Acknowledgement is gratefully made to Colorado Agricultural College for Alvin T. Steinell's "History of Agriculture in Colorado" from which much of the data in this series is taken.)

ON AN April morning in 1865, close upon the end of the Civil War, a farmer in the Platte river bottoms seven miles southwest of Denver might have been seen planting seed. This was no ordinary crop. His small fields of wheat, oats, barley, and rye were showing green. Corn and potatoes were to go in at a later date.

The bearded figure in coarse, homespun garments was planting a new crop. He pushed a small hand drill down rows twenty inches apart. Occasionally he bent over the ground to uncover a few seeds and examine at what depth they were being deposited. The planting had to be done with care because he was intent on making an experiment which he believed was of great importance to Colorado's future.

Back in Europe whence this farmer had migrated to America he had known the crop. Even then it was the basis of a farming and manufacturing industry of some magnitude abroad. And in his newly adopted country he hoped to prove that the same crop offered like promise. He had discussed it with his neighbors at the winter meetings of a little farming club they had organized.

As he looked past his log cabin toward the mountains Peter Magnes thought of the torrent at the mouth of Platte canon. Water sufficient to irrigate thousands of acres of these fertile prairies! Peter Magnes paused in his planting to dream. He saw factories and new cities, founded on this new crop! Enough sugar to supply the nation!

He was planting sugar beet seed, the first in Colorado. From relatives in Illinois, who had obtained the seed in France, Peter Magnes had received enough to plant an acre or two.

And while this pioneer farmer was dreaming of a sugar empire, another
believer, farming along Clear Creek a few miles west of Peter Magnes, was likewise experimenting with the sweet beets. From his farm house L. K. Perrin had sold foodstuffs to miners in the gold rush up Clear Creek. The gold fever gripped him at times. It promised quick riches, and farming was bitter toil in those days.

But he would let younger men try their luck in the hills and gulches. For him was the soil and Perrins had been farmers for generations. Moreover, he believed that this new plant promised Colorado more wealth than all the gold and precious minerals its mountains so grudgingly surrendered.

When Peter Magnes and L. K. Perrin were thus testing Colorado for sugar beets the first wave of gold seekers had passed. The stolid Magnes was untouched by the rush for precious metals.

"If we had beet sugar factories in Colorado," he prophesied at that early date, "I imagine Colorado farmers would produce more gold than all the mines in the mountains."

Today that prophecy has been fulfilled. The yearly output of beet sugar in the state is many times the annual value of all its gold, silver and precious metals. The new wealth created each year by the sugar beet crop comes without depletion of the state’s resources; whereas, gold once mined decreases Colorado’s mineral resources.

When Magnes and Perrin were experimenting with sugar beets in the middle 60’s Colorado was not yet a state. It still had the territorial form of government. Five years later the first passenger train arrived in Denver, on June 23, 1870. Yet even then these long-visioned pioneers were laying the foundation for the greatest industrial agriculture in the West.

Editorial mention of the experiments of Magnes and Perrin appeared in a Denver newspaper November 23, 1866, as follows:

"The past seasons have demonstrated that the soil of Colorado has no superior for producing sugar beets. We are of the opinion that its manufacture here would prove a good paying investment, besides saving to the country a large amount of capital.
that now goes East for the purchase of this staple."

Destiny's hand seemed to write the sugar beet into Colorado's history. Long before the gold discoveries that resulted in the settlement of Colorado, and prior to Magnes and Perrin sugar beets were thought of as a possible crop here. In a petition filed January 8, 1841, by Gaudalupe Miranda and Carlos Beaubien praying Governor Manuel Armijo of the province of New Mexico for what in later years became known as the Maxwell Land Grant, one of the purposes for which the land was to be used was the growing of sugar beets. The Maxwell Grant extended into what later became Las Animas County, Colorado. The petition said:

"We ask that Your Excellency have the kindness to give us a piece of land, with the intention of improving it without damage to the Third Party (public), particularly for the purpose of cultivating the sugar beet, which we believe will grow well and abundantly."

Beaubien was a Frenchman and undoubtedly familiar with beet production in his native land.

Magnes and Perrin not only discussed the sugar beet tests with the editor and farmer neighbors but they must make tests of the sugar content of the crop. Ready at hand was Professor Jacob F. L. Schirmer, metallurgist and chemist, who conducted an assay office in Denver and later became superintendent of the Mint. He with others of a brilliant company of pioneer men of science who came to Colorado in search of gold instinctively felt greater possibilities in agriculture and turned their training to the account of the people. His sugar beet experience was obtained in Germany where the industry had reached a high stage of development.

Schirmer made the first laboratory examination of sugar beets in Colorado. Moreover, he knew something about factory problems in beet sugar manufacture and on December 8, 1869, in a published letter discussed: "Culture of sugar beets—manufacture of sugar, alcohol and potash in Colorado." In his closing paragraph Mr. Schirmer made a prophecy that has practically come true:

"In conclusion I will say that our climate and soil are well adapted for the culture of the beet and that it is my honest belief that no other country on the face of the globe has equal advantages if a proper system of irrigation is inaugurated. The construction of ditches is only a small item compared with the country of Louisiana. Our coal is equally as good and perhaps better for evaporating purposes than bituminous coal or anthracite. In short, there is nothing to hinder it to make Colorado the greatest sugar producing state in the world."

That Colorado has reached the distinction of leading the states of the Union in beet sugar is ample fulfillment. Colorado today produces more than one-third of all the beet sugar made in the United States.

(To Be Continued Next Month)
Soils of Old Stream Terraces Became Important Factor in Beet Development

Part 1

By A. T. SWEET

U. S. Department of Agriculture, Bureau of Chemistry and Soils

(Editor's Note: Adapted from paper read before the Colorado-Wyoming Academy of Science.)

Less than three quarters of a century ago eastern Colorado was a grass covered plain. Buffalo and Gramma grass predominated from the Kansas-Colorado line to the foothills of the Rockies.

Today large portions of it are densely populated, intensively farmed. Sugar beets and alfalfa; small grains and corn; livestock and milk, fruits, melons and seeds are her contributions to the markets of the world. Her agricultural importance is increasing year by year.

Man, boastfully thinks this has been wrought alone by his brain and brawn. In his enthusiasm of accomplishment he fails to see that Nature, possibly before he came upon the face of the earth, prepared his soil, planned his irrigation projects, and even located his town sites.

Formation of Stream Terraces

During the early part of recent geological times important changes were wrought in the mountains to the west of this region. On them precipitation was heavy. Snow, ice and water scoured their slopes; cut deep their canons and gorges; scooped out glades and valleys. Whole mountains of debris were carried downward.

Gigantic predecessors of the Arkansas, the Platte and the La Poudre were torrential streams of mighty volume. By them porphyry and rhyolite; quartz and granite; trap and limestone were torn from their beds; rounded and polished and carried for long distances out into the plains. Wide spread deltas and fans of sand, gravel and boulders grew deeper and broader. Materials eroded from the mountains were carried far beyond the present bounds of the state.

As stream gradient decreased and evaporation toward the plains probably increased these streams finally could build their deposits no higher. Then through them they began cutting channels and making valleys. These valleys at first were broad and shallow, and across them like giant snakes, the streams writhed forward and backward many times, each time leaving in their wake coarse material too heavy to be carried even by their swift currents. Along its sides where overflow was less frequent and the currents less swift deposits were made of fine sand silt and clay.

Thus, these entire valleys, except in the stream channels finally had a surface covering of fine material and a deep substratum
of sand, gravel and boulders, the same arrangement of material found in the flood plains of all streams of this region, and of streams in general.

These old valleys had a width of from one to three miles. In time, however, precipitation diminished. Runoff decreased. Narrow valleys became adequate and the streams cut them into the floor of the old, broad ones.

These new, deeper valleys were only one-fourth to one mile in width and the remainder of the old valleys became terraces high above overflow. These terraces, however, are not continuous nor of uniform height above the present stream flood plains, their height and position being determined, to a considerable extent, by the underlying rock formations. These, in this region, consist of eastward dipping beds of shales, sandstones and limestones of varying degrees of hardness.

After cutting through the sand and gravel outwash surface deposits, the streams were checked here and there, in their downward cutting, by the harder, more resistant beds. Above each of these a broad valley was formed which later became a broad terrace.

Through the resistant rock beds only narrow valleys were developed and no terraces or only very narrow ones remain. In this way the old valleys and resulting terraces developed as a series of steps down stream. Although varying widely in height above the present stream valleys the inner or stream sides of the terraces are in most places, sharp and well defined. In a few places there are two or more parallel terraces, those of more recent formation being as a rule narrow and lying at but a slight elevation above the flood plain.

On the outer side, the terrace limits are less well defined, the outer edge overlapping the lower part of the adjacent slopes. These slopes are in many places fairly steep and marked at the top by rounded, gravel-capped hills and slight ridges, remnants of the old gravelly outwash plain. These are especially marked along the edge of the uplands bordering the valley of the Arkansas.

Along the valleys of the Cache La Poudre, the South Platte and their tributaries they are also present, in places, but in other places the outer terrace boundary is marked only by a slight steeper slope and the more uneven surface of the adjacent uplands.

Irrigation

The first irrigation in eastern Colorado was in the lower valleys on small individual projects. As soon as men began to plan larger co-operative projects their attention was turned to the higher, level bench lands and terraces.
These offered especial inducements for irrigation. They were (1) Easily accessible to water carried from the streams by high line ditches. (2) They occur in comparatively large bodies adjacent to or included within the regions already settled. (3) They have a nearly level or gently sloping smooth surface, and (4) The soils were and still are highly productive.

The importance of old stream terraces both on account of their geographic position and their suitability for irrigation has long been appreciated. It is very doubtful, however, if the full importance of the soils of these terraces has ever been recognized. Recent soil survey work in the Arkansas Valley and in the Fort Collins and Loveland regions of northern Colorado indicate that not only are the old terrace soils the very heart of the best irrigated districts but so extensive and important are they that without them the present high state of development would not have been possible.

(Continued in Next Issue)

Mr. Fink Scores Again

By T. J. CUNNINGHAM

In 1926, Mr. Henry Fink, of Finch, Montana, had the high tonnage for this field district. Again in 1927 he carried off the honors with a 21½ ton average on eighty acres.

This crop of beets was raised in three fields. Let us follow Mr. Fink from field to field, first in his excellent seed-bed preparation, then the planting, cultivating and last but not least the irrigation of this profitable crop of beets.

The first field, 15 acres of fall plowing, was stubble ground and very foul with wild oats which all farmers know is a problem to combat. His way of getting rid of the oats is practical and worthy of mention. The ground was fall plowed 10 inches deep and well harrowed. In the spring, the oats having germinated, the ground was disked and harrowed with a three-section spike-tooth harrow, weighted, the teeth being set nearly straight. This ground was not seeded until May 9 and 10, and was redisked and harrowed just before seeding. The beets were planted in 22-inch rows, 2 inches deep, using 20 lbs. of seed per acre. Immediately after planting, the field was rolled with an American Land Roller. Mr. Fink says that if the ground bakes, he rolls it again, that he is not afraid to use the roller after planting. This wild oats field yielded 22 tons per acre.

The second field, 34 acres of beet ground, was not plowed but was cultivated 8 inches deep with a beet cultivator equipped with 13 spike teeth shovels. The ground was then harrowed three times
with a weighted harrow, followed by floating, planting and rolling as in the first field. The seed was planted April 11 to April 13, yielding 19 tons per acre.

The third field of 31 acres was well manured before plowing and was plowed 10 inches deep. There were three outfits preparing this seed-bed, two teams plowing and one continuously harrowing the plowed ground with a well weighted harrow. Floating, planting and rolling followed as in the other fields, the time of planting being April 25 to 27. This field yielded 24 tons per acre.

All these beets were cultivated twice before they were thinned. The labor started thinning the earliest beets May 30 and finished the last of the eighty acres June 30.

Mr. Fink started his first cultivation May 26 and his cultivator was in use every day from that time until July 30. The entire eighty acres were cultivated five times.

Mr. Fink is a firm believer in the frequent use of the harrow in preparing a seed-bed for beets, and he specializes on irrigation. All his beets were irrigated three times. He says:

“I do not believe in saving the irrigating shovels nor in being short on help to use them. When a head of water is turned on my beets, a man is with it constantly and if a man cannot be with each head of water during the night, the water is turned off, rather than take a chance of flooding some beets.”

The last irrigation was completed September 10 and the soil was left in excellent condition for harvest.

The 80 acres yielded 1720 tons of beets and returned $182.75 per acre at $8.50 per ton. The cash return from the beet tops was $8.60 per acre, making the total gross income $191.35 per acre.

“It Is As Silly.....”

Colorado sugar sold in distant markets cannot bring as much money back to Colorado beet growers as if it were sold here at home and the freight charges were saved. It is as silly for us to buy cane sugar as it is for us to patronize eastern mail-order houses and then wonder why our merchants don’t prosper.

It is fair to ask how many beet farmers who are begging Uncle Sam for farm relief are also using cane sugar on their tables, and how many of us town folks who are dependent upon the sugar industry for much of our prosperity are doing the same thing.—Edw. Foster, in The Weld County News.
Dollar-and-Cents Meaning of Higher Beet Yields

By N. R. McCREERY

Nearly 13 Million Dollar Increase for Farmers—Longer Campaigns and Bigger Pay-Rolls in Mills

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In the three years of the company's "another ton" campaigns, the growers have annually made an increase of 2 to 3 tons in the average yield per acre, compared with the previous 10-year average. Except for weather differences no other new outstanding element has been introduced into beet raising.

The increase in three years amounted to 1,702,316 tons. At prices paid, the growers received $12,768,432 for the increased tonnage.

The higher yields added an average of 16 days to the slicing campaigns of all our factories. The increased pay-roll was about $500,000 per year.

The increased farm yield of beets during the three-year period was of equal value to the grower to an advance of more than $1.25 per ton in the price paid if there had been no increase in yield over the previous 10-year average. Farmers and beet workers deserve great credit for putting into effect the better-farming practices which produced the higher yields.

For a New and Better 1928

Every grower wants to increase his average yield per acre. Better profits for the grower make for a sounder foundation for the industry.

The Company, too, is desirous of getting a better quality beet—higher sugar content, higher purity. Improved farming practices tend in that direction.

By continued effort on points already stressed in the higher tonnage campaigns, with early planting, rotation and more careful irrigation, we may anticipate even more satisfying results in years to come.

HIGHER YIELDS OF BETTER BEETS IN 1928
Raising Dollars in a Cheese Box—
Or, How the Gwesco Boys Set Out to Take the Edge Off Pandora's Reputation

By THOS. H. FERRIL

MYTHOLOGY differs as to whether Pandora's magic box contained all the blessings or the evils of the earth. Anyway she opened it and became famous.

Working for higher yields Great Western agriculturists compromised by showing both the evils and blessings in the same box.

Reviewing the agricultural highlights of 1927, let's chalk up the fact that thousands of farmers, through aid of a cheese box, were brought to new realization of one of the most obvious commonplaces in the business, namely, that sugar beets grow in the ground.

It is agreed that 1927 witnessed the most universal effort toward proper seed-bed preparation in the history of western beet culture. Back of this effort was faith in a cheese box.

P. H. McMaster, manager of the Ovid factory, must be credited with the original idea. In 1925 Mr. McMaster rigged up a cheese box, 4 by 4 by 12 inches. He installed a glass front and filled the box with earth.

Beet seeds germinated well against the glass. Good photographs were taken which formed the basis for illuminating discussions of underground conditions, printed in Through The Leaves.

Satisfactory results prompted further development of the idea for the
spring program of 1927. Under McMaster’s direction a number of boxes were built, 4 feet long and 12 inches square, with glass fronts. Two compartments in each box contrasted good and bad seed-bed preparation.

These boxes, planted with seed, were placed in store windows in various towns in Great Western territory. They created unusual interest among farmers. The seed-bed, once taken for granted, now became a wide new field for scientific investigation.

Mr. McMaster, C. V. Maddux, labor commissioner, and Asa Maxson of the Longmont experimental station, considered whether such boxes could stand the vibration of the beet demonstration trains. They tried it and it worked.

Credit for working out many of the mechanical details of the 1927 seed-bed cars is due M. S. Clement, fieldman, of Sterling, and James Blu-baugh, Longmont fieldman.

Supplemented by graphic motion pictures of underground conditions the seed-bed boxes laid a foundation in the minds of thousands of farmers which will be of increasing effect toward higher yields in the future.

It is quite probable that the 1928 educational program, if authorized on lines now under development, will reiterate the truths of the little cheese box.

Irrigated Soils Need More Organic Matter

By R. H. WALKER

Agronomy Department, Colorado Agricultural College

In the recent soil survey of the Fort Collins area, the fact was emphasized repeatedly that Colorado soils under irrigation need organic matter. For the proper management of most soils in this area, as well as in other irrigated regions of Colorado, it is recommended that regular additions of organic matter be made.

The physical effect of organic matter in the soil is to promote good tilth. Soils in good tilth are much easier to cultivate and do not turn up in great hard chunks at the time of plowing. The organic matter promotes granulation and mellowness in the soil. It also increases the water-holding capacity and aids in the percolation of rain water, and the proper development of plant roots. Likewise, the presence of organic matter in the soil encourages the activities of many desirable bacteria which aid in making the necessary plant foods available.

During a large part of the year the organic matter already present in the soil is being decomposed. Although this decreases the amount of organic matter in the soil, it is desirable, and emphasizes the fact that provision must be made for maintaining the supply. The practical way to do this is to turn under farm manure, crop residues and green manures.

Regular additions of these materials to the soil should be made. A good growth of a legume crop, such as alfalfa or sweet clover, should be plowed into the soil at least once during a crop rotation as well as all straw and other crop residues. Farm manure should also be applied to Colorado irrigated soils to maintain their necessary supply of organic matter.
My Experience with Blackleg Serums

By a Fort Lupton Beet Grower

BLACKLEG has been killing cattle at times for more than thirty years in Colorado. Some of the first efforts at preventing this disease were made by the U. S. Bureau of Animal Industry. They furnished cattle growers a dry powder vaccine free of charge and told us where to buy suitable utensils to prepare the vaccine and a proper hypodermic syringe to inject it. It was quite a job to sterilize the tools, then grind the vaccine in a mortar, filter it, dilute it with just the right amount of boiled water, use it and then sterilize everything afterward. It was awkward, too, because the mixed vaccine would not keep and if a few head were somehow missed, the whole process had to be gone over, just for them.

Private firms soon began to sell dry forms of vaccine that did not require diluting with water, that would keep awhile, and needed only a little tool to insert it under the animal's hide. But it was found that calves vaccinated before they are six months old lost their immunity before they reached the safe age.

Blackleg sometimes kills a calf about two and a half months old; hence I made it a practice to vaccinate every calf before it got that old. A second dose was usually given at the 6-months-old regular vaccination and often a third dose at the next regular half-yearly going over. I found in the course of many years on an annual calf crop of about twenty-five head that this greatly reduced the death loss, but in bad outbreaks, there would still some die.

Profiting by the results obtained by other cattle growers I then bought a western-made liquid germ free vaccine put up in rubber-stopped, sealed bottles that would keep awhile. I have used this on four separate bunches of about thirty-five head, six months apart, and so far have lost none. I still use the dry pills for the odd calves born in between times but use the liquid on them just the same whenever the half-yearly time comes.

Winter Protection of Fruit Trees

Mice and rabbits are responsible for the loss of thousands of trees each year. They can be kept away from young trees by ordinary screen wire around the trunk. Mice may be poisoned or kept from building nests at the base of the tree if the weeds and grass are kept down. Gophers should be caught as soon as they are discovered in the orchard as they sometimes cut off roots of good sized trees.

Plums and cherries are particularly subject to sunscald which kills the branches on the southwest side of the tree. Reflection of the sun from snow often causes this and may be prevented by whitewashing the trunks and main branches, by leaning a board against the tree, or tying cornstalks around it. If trees only a few years old lean to the north, tie the trees to a stake, after protecting the tree with burlap or an old inner tube.
Mendel and His Work

Its Value to the Investigator and Breeder

MENDEL must be credited with founding the modern science of heredity. In the year 1853 Mendel became teacher of natural science in the Brunn Realschule. Soon after this appointment, in the seclusion of the cloister garden he commenced a series of experiments with the common pea. The results of these experiments were published in the Proceedings of the Natural History Society of Brunn in 1865, and this paper remained in obscurity for a third of a century.

Mendel had observed the regularity with which the off-spring of certain hybrids produced the pure ancestral forms, and his experiments were undertaken with the object of gaining some clear evidence as to the manner in which definite and fixed varieties found within a species are related to one another, or, as Professor Thompson puts it, "He sought to discover the law of inheritance in hybrid varieties." What is known as Mendel's law is the result of his labour.

This might be said to be a law which relates to the inheritance of certain definite characteristics, a feature of which is that they are found to group themselves naturally into pairs of more or less antagonistic qualities. No two animals or plants are found exactly alike. This extra-ordinary individuality is due to the mingled natures of two separate parents. The parents produce offspring which may resemble one parent far more than the other. In subsequent generation, however, features which belong to the parents and which were invisible in the first offspring reappear.

What is the reason of this, and how is it brought about? What is the relationship of these definite fixed varieties which have been produced by the joint effort of the two sexes? All observant persons must have noticed that within a species there are definite and mixed varieties. In plants of the same species many differences are easily noticed. The flowers may be different colours, such as you find in the sweet pea. The seed pods may be different, such as the yellow butter bean and the green bean. The seeds may be white, black, brown or spotted. Ears of wheat may either be beardless or bearded. You have tall and dwarf growing plants.

Variation in like manner is found in the animal kingdom. In the human being you find marked differences. For instance, you have races differing in colour, white, black and yellow, tall and dwarf races, individuals with different-coloured eyes and hair, etc. With the lower animals the differences are again very marked. You find cattle with and without horns, with long horns and with
short, with humps and without, etc. You find sheep with short, fat tails, and others with thin, long tails. Sheep with short and long hair, with coarse wool and fine, with crinkled wool and with straight, etc.; and lastly poultry with their pea, rose, single, and without combs. Mendel noted all these facts and arranged his experiments in such a way as to exclude all confusing elements.

“Dominants” and “Recessives”

There are over 6,000 families belonging to the pea and bean tribe (Leguminosae), of which the common pea is a very important member. It possesses a remarkable number of strains, all of which are very definite and easily observed. The plant is a hardy annual. It is self-fertilizing, and as insects, with one or two exceptions, are unable to get to its pollen, it can only be cross-fertilized artificially. Owing to these facts and also because they are so easy to cultivate, and their relatively short period of growth, Mendel chose the common pea. He selected twenty-two different varieties of peas, all of which, he states, remained constant, without any exception, during the whole period of his experiments. Among the varieties selected for crossing you find peas differing in length of stem, and shape of leaves, size of pods; shape and size of seeds, colour of seed coats, etc. As an example of Mendel’s methods we can take his experiment with crossing a giant and dwarf variety of pea. Peas with stems 1 ft. 6 in. in length he artificially crossed with peas having stems 6 ft. long. This cross yielded seed which, when planted, produced without exception plants of a giant nature producing stems from 6 ft. to 7½ ft. in length.

On the strength of this result, Mendel called the giant character, dominant, and the dwarf, which disappears in the first generation, he called recessive. All the giant plants (“Dominants”) were allowed to mature, and the flowers were self-fertilized. The seed carefully collected and again planted the following year, and it was found that 75 per cent of the plants were giants (“Dominants”) and 25 per cent dwarfs (“Recessives”). An average ratio of 3 to 1. None of the plants were intermediate in height; they were either tall or short.

Recessives Breed True

Mendel then planted the seeds from the dwarfs (“Recessives”) as well as those of the giants (“Dominants”). These were kept separate and allowed to self-fertilize. The result led to a most important discovery. The seed of the short stem or dwarf (“Recessives”) produced only dwarf plants. They did not vary; they bred true to the parental form, and continued to do so in each succeeding generation. Thus the recessives, for all time, breed true.
In the case of the long stem or giant peas ("Dominants"), the results were very different. They did not breed true in like manner to the recessive. The seeds from these giant peas or dominants produced plants—some giants and some dwarfs—in the proportion of 25 per cent dwarfs ("Recessives") and 75 per cent giants ("Dominants"). The recessives, as before, bred true. The dominants again split up. One-third of the dominants gave seed which produced only tall plants, and thus were pure, and the remaining two-thirds gave seed from which came giants and dwarfs in the proportion of 3 to 1. The continuation of Mendel's experiments on these lines conclusively proved that the second generation consists of three kinds of plants—pure dominants 50 per cent and recessive which are always pure, 25 per cent.

Limitation of the Mendelian Formula

Experimental breeding has been extensively conducted by biologists during recent years. These investigations have thrown a considerable amount of light on the subject. They have confirmed Mendel's experiments, but at the same time have demonstrated the fact that although Mendel's discovery is of enormous value to breeders, it is asking too much to expect a cut-and-dried formula whereby breeders could produce a perfect specimen of the animal they desire. Like everything else, the Mendelian formula has its limitations. In breeding one is always running up against the unexpected problems waiting solution.

Ingenious theories are often offered as a solution to many difficult and complex problems. The only sound and acceptable solution is one which has received confirmation by experiment.

A Happy and Prosperous 1928

is our wish for all
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If I knew you and you knew me,
If both of us could clearly see
And with an inner sight divine
The meaning of your heart and mine,
I'm sure that we would differ less
And clasp our hands in friendliness;
Our thoughts would pleasantly agree,
If I knew you and you knew me.

—Nixon Waterman.
Farmers of foresight have always followed the wise rule of making the most of each favorable day in winter to do field work. Their spring work is thus advanced and they are in the best possible shape to meet any unexpected weather condition later.

It also is acknowledged that at any price the highest economical yields produce the most profit. Put yourself in position to make the best crop by preparing your land for the drill at the earliest practical date.

With sugar beets the yield of roots is helped, under average conditions, by reasonably early planting. Sugar content is aided more by favorable weather and prolonging the growth at the other end of the season.

In many years a warm, open spring affords the opportunity of planting beet seed in April under favorable moisture and temperature conditions in the soil. Only by early preparation of the land is the farmer able to take advantage of such a development.

Generally speaking, mistakes are made more often by planting beets too late than too early. Loss of available moisture in the ground, stored over winter, is one of the dangers of delayed field preparations. Thus, timely work may help germination of a good stand if early preparation conserves moisture.

Better seed beds result when sufficient time is taken to fit the land properly. Early start on the seed bed will help reduce the "peak load" of spring work and afford more time for careful fitting of the soil.
EDITOR'S NOTES

Diversification and Rotation

In the first issue of "Through The Leaves," fifteen years ago, appeared a $5 prize offer for the best article to be submitted on "The Proper Rotation of Farm Crops, as Practically Applied to our Section of the Country."

Seven years earlier the Company instituted a rotation plan on the Secor Farm. Practically from the inception of the business our agricultural department has urged rotation.

Diversification and rotation may have much in common. But the terms, properly understood, are not synonymous. Farming may be classed as of two types, specialized or diversified. Most good farming is rotated.

A farmer might diversify his crops without practicing rotation or manuring, and come to grief. He might diversify but unwisely if the crops clash with each other in demands upon his time and equipment. If his diversification leaves his fields subject to erosion by wind and water, and to loss of fertility, he is again unwise. Or if soil, markets and his own bent are not favorable to the crops in his diversified program he is bucking a losing game.

The cry for diversification comes generally after excessive acreage in a single crop is joined with falling prices for it. The sugar company has from the beginning advocated rotation which balances or adjusts the farmer's business to his soil, his equipment, his markets, continued high production and fertility, and freedom from soil and plant diseases.
Here and there farmers, for reasons best known to themselves but certainly not from any wish to sacrifice profits, have gone too heavily into beet raising to rotate their lands properly. Against this tendency the company has constantly urged upon growers the advantages of a cropping system, termed a rotation, that will protect them against the disadvantages of continuous single cropping.

The danger in popular waves of starched-collar advice to farmers is in going to extremes. A soundly planned rotation system, however, is a farmer's safety stop on that sort of thing. If he is farming intensively, as in highly specialized crops, rotation suggests providing or procuring high soil fertility. Rotation doesn't encourage diversification to the extent of putting an expensive crop upon poor land. It does encourage him to build up that land to higher productive capacity.

There comes to mind an organized movement for diversification in Great Western territory, opposed to beet-raising, in which the new substitute crop hardly paid for the seed foisted upon the farmers. As well, there have been failures at beet-growing in southern districts where most any other crop would have been a commercial success, if as in planning a practical rotation study had been made of soil, rainfall, markets, transportation, farmers, and other pertinents.

Rotation puts behind the wise adage of "not all eggs in one basket" the practical experience of successful farmers in any locality. To the extent that these diversify the less successful may safely aspire. Beyond that point the less successful face dangers confronting any one that experiments. The plain fact appears after nearly a generation of beet-growing in Great Western territory that many successful farmers carry on rotations including sugar beets.

In one outstanding aim the advocates of diversification and the sugar company have a common interest—the welfare of these beet-raising communities. And in a very substantial way not to be denied by any man's senses these communities have made tremendous strides since the introduction of the beet crop. It constitutes the most successful step in rotation and diversification that these districts have witnessed.
Rotation . . .
Manure . . . .

Their Part
In Higher
Beet Yields
Crop Rotation . . .

An orderly succession or sequence in which different crops follow each other according to a definite plan, flexible if necessary.

The best order is a sod or leguminous crop, followed by one or two row crops, followed by small grain.

This change of crops improves yields. Each succeeding crop in a proper rotation feeds at a different soil level, uses elements of fertility not exhausted by the previous crop, and leaves substances in the soil helpful rather than injurious to the following crop.

Manuring . . .

The use of barnyard manure, legumes, green growth and crop residues plowed under provide most of the organic matter or humus for soil building.

Each crop removes from the soil some of its fertility.

Like a bank account, soil is depleted if deposits of fertility are not made in it.

In general, crop rotation without manure has been found to be almost as effective in increasing yields as the use of fertilizer without rotation.

THE HIGHEST YIELDS ARE POSSIBLE WHEN MANURE AND ROTATION ARE CONJOINED OR PRACTICED TOGETHER

(1) Proper handling of soil and water, (2) manuring, and (3) rotation, about one-third each in importance, constitute the vital factors in crop production.
The Function of Fertilizers

1—Chiefly to furnish nitrogen, phosphoric acid, and potash, which may be termed the essential manurial elements. These three are removed in crops in greater amount than other elements of fertility.

2—A secondary function of manures, particularly yard manure and green growth turned under, is seen in two directions.

A—the vegetable matter improves the physical character of the soil;

B—the addition of vegetable matter to soils improves its water-holding powers. Both these secondary functions of manure increase the availability or effectiveness of the essential fertile elements.

Moreover, farmyard manures actually contain the bacteria so necessary for soil improvement. Green manures, as in the case of yard fertilizer, make the soil a more favorable medium for the growth and development of these bacteria.

It is a part of the modern farmer’s education to understand the handling of soils so as to favor the development of the bacteria which bring about the decay of organic matter in the soil, and which make the elements of fertility available to the plants.

This soil you are tilling is alive. It may be compared to your own body, as having circulatory, digestive, and respiratory systems.

Fertilizers feed it. Plowing exercises it. Cultivation induces proper breathing. Water and air aid its digestion and circulation. It may be poisoned or starved in the same sense that the human body may be improperly fed and poorly nourished.
Basic Principles of a Good Rotation

1. Sod or leguminous crops, intertilled or row crops and small grain are grown in the order named and in recurring succession on a given area of land.

2. The condition or characteristics of a particular soil, the local markets and types of farming determine in large measure what crops are best included in the rotation.

3. The growing of one kind of crop affects to a greater or less degree the growth of another crop which follows. Grow crops in the order that each may have a favorable effect on the following one.

Have clearly in mind the starting point in establishing a proper rotation the order of succession of crops:

A.—A grass or leguminous crop, like alfalfa or sweet clover, followed by

B.—A row or intertilled crop, like beets or corn.

C.—Follow row crops by a small-grain crop, like wheat or barley.

Such a system of farming makes possible:

Intensive cultivation of the land, its uninterrupted use without fallowing.

It permits farming with livestock. "No forage, no cattle; without cattle, no manure; and without manure, no crop," was an old Flemish proverb.

It provides a substitute for fallowing, a rest period for the land in that leguminous crops are alternated with those of an exhaustive nature.

It permits of clean cultivation, weed control, and tends to reduce danger of soil and plant diseases.

It has demonstrated its ability to maintain soil fertility. Compared with unrotated fields, the intertilled, small-grain and grass or leguminous rotation has increased yields. With manure added to rotation the highest productivity is attained.
It's Burning Money!

Not the fabled landscape of majestic mountains!

Only a burning straw pile in a beet-growing locality!

And elsewhere farmers hauling straw many miles for bedding in the feedlot; elsewhere fattening stock in a morass of mud; elsewhere valuable fertilizer going to waste for lack of straw!

It isn’t “just straw.” A ton of wheat straw is 10 pounds of nitrogen, 2 pounds of phosphorus, and 17 pounds of potassium.

It’s burning money!
Will You Make Your Own Comparisons?
Here Are the Figures: Are You Interested in Finding Out Which Rotations Made the Most Money?

We give below the bare facts on average yields in four different cropping systems in the experimental plots at the Scotts Bluff Field Station, headed by James A. Holden.

At this Station the most extensive work on irrigated crop rotations in the United States has been conducted. Mr. Holden has thus made an invaluable contribution to every irrigated farmer in the intermountain west.

The data given affords a basis of comparison between continuous cropping of four separate pieces of land to the same crop—alfalfa, potatoes, sugar beets, oats—and a 6-year rotation embracing alfalfa (3 years), potatoes, beets and oats.

A comparison also may be made between these two plans and a 7-year rotation embracing a second successive beet crop manured.

Still another contrast is furnished between these three plans and a 4-year rotation including sweet clover, as follows: oats with sweet clover, sweet clover pastured with sheep, and sugar beets (2 years, unmanured.)

Again, as in all general discussions of cropping sequences, it should be remembered that these yields were obtained under specific soil conditions, which might not be applicable to your farm. But there is a rotation that will fit your individual case, your own conditions. Your Fieldman gladly will co-operate with you to adapt the general and fundamental principles of a good rotation to your farm.

Average Yields per Acre

A—Continuous Cropping (14 Successive Crops)
- Alfalfa ........................................ 4.7 tons
- Potatoes ...................................... 100 bushels
- Beets .......................................... 8.9 tons
- Oats ........................................... 44 bushels

B—6-Year Rotation
- Alfalfa ........................................ 4.9 tons
- Potatoes ...................................... 322 bushels
- Beets .......................................... 18.1 tons
- Oats ........................................... 71 bushels

C—7-Year Rotation
- Alfalfa ........................................ 4.7 tons
- Potatoes ...................................... 297 bushels
- Beets .......................................... 17.1 tons
- Beets (manured) .............................. 18.7 tons
- Oats ........................................... 70 bushels

D—4-Year Rotation
- Beets (first year after pastured sweet clover) 19 tons
- Beets (second year after pastured sweet clover) 16.1 tons
- Oats ........................................... 55 bushels
**Value of Sweet Clover in the Rotation**

*By W. S. BRUMMETT, Fieldman, Nebraska District*

One of the outstanding demonstrations on last summer’s Mitchell-Lyman Beet Tour took place on the farm of Wm. Ledingham in the Mitchell Valley. The stop at this farm emphasized the importance of sweet clover in the rotation even where a large amount of manure was available for fertilizing.

Mr. Ledingham conducts extensive feeding operations on all of his farms. With the proper use of the manure obtained and rotation, his lands are always in a high state of productivity. This particular farm, however, is comparatively raw land, being under the new Gering-Ft. Laramie irrigation project and only having had water available for the past three years. Mr. Nelson, the tenant on this place last year, is one of our best farmers and a strong believer in the use of sweet clover.

The beet field, a half mile long, was divided into four plots. The first plot containing twenty acres was cropped to beets in 1925, 1926 and 1927, receiving a good application of barnyard manure each year. The seed bed was prepared by plowing to a depth of eight inches, harrowing twice, floating, rolling and harrow ing again. It was then planted on May 2nd and 3rd. The yield on this plot was 24 plus tons per acre.

Plots 2 and 3 contained sixteen and four acres, respectively. These also received a good coating of manure. On number 2 one year’s growth of sweet clover was plowed under while on plot 3 there was no clover. The preparation of the seed bed was the same on these two plots as on plot 1 excepting that the sweet clover was plowed twice, the first time to a depth of three inches and the second time.

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<tr>
<td>#2</td>
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<td>16+Tons per Acre</td>
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Plat of beet land on Wm. Ledingham farm for 1927; James Nelson, Tenant, Mitchell, Nebr.
to a depth of eight inches. The planting on plots 2 and 3 was done May 7th and 8th.

The yield on plot 2 was 20 tons per acre and on plot 3 was 16 tons per acre, or a difference of 4 tons per acre in favor of that land which had been in sweet clover one year.

Plot 4, containing 23 acres, had been in sweet clover one year. This plot received no manure. The sweet clover was plowed twice, as in plot 2, and the remaining steps in preparing the land were the same as on all other plots. The yield was 18 plus tons per acre on this plot, or two tons per acre more than on plot 3 where manure was applied but where sweet clover had not been grown. This latter yield in face of the fact that this land had been planted to beets May 14th and 15th or just one week later!

The entire field was cultivated six times. The early plantings, which included plots 1, 2 and 3, were irrigated four times. Plot 4 was irrigated 3 times.

Mr. Nelson believes that it is better to fall plow first year sweet clover in this locality and then irrigate it in order to assist the process of rotting the clover roots, unless one has a dairy herd or other stock for which he needs pasture. In the event the soil is adapted to potato growing it is more advisable to plow the sweet clover late in the spring, thus taking advantage of the green manure in the early growth of the clover the second spring.

Sugar Consumption Declined in 1927 Despite Low Prices

DEMORALIZATION of the sugar market in the United States in 1927 is shown in a 6 per cent loss from the preceding year in per capita consumption, according to latest estimates by Willett and Gray.

While markets were expanding for the majority of other commodities sugar consumption dropped to 100.95 pounds per capita as compared to 109.30 pounds in 1926.

This decrease of 6 per cent is sharply contrasted with an average yearly increase of more than 5 per cent over a period of 105 years.

Curtailment was not caused by high prices to the consumer. Relatively low prices prevailed in 1927. Unsettled conditions, due to overproduction throughout the world, contributed to a declining market.

Expressed in long tons of refined sugar continental United States consumed 5,297,050 tons in 1927 as compared to 5,671,335 tons in 1926, or a decrease of 374,285 tons.

Brief analysis of the sources of domestic consumption shows a slight decrease in imports from Cuba, losses in total sales of domestic beet sugar and large increases from the insular possessions of the United States.

Increasing amounts of duty-free sugar in 1927 came in from Hawaii, Porto Rico and particularly the Philippines. While domestic beet consumption in 1927 was dropping 92,453 tons from the 1926 figure, Philippine sugars consumed here showed a leap from 312,723 tons in 1926 to 434,542 tons in 1927.
Think Underground

What's in Your Soil-bank, Below the Surface?

You have lifted the hood of your automobile many times. You know the hidden, under-cover parts of your machine. Perhaps it represents an investment of fifteen hundred dollars.

But how much do you know of the "horsepower" for crop production of your thirty thousand dollar investment in the soil of your farm?

You have fixed notions about the best oil, the best gasoline, the best service shop for your car. And you doubtless aspire to have some day a machine of greater power, a bigger-yielding machine in pleasure and pride of ownership.

Rotation will provide your farm with a cropping system that will give you the best returns and bigger yields.

Think of what happens underground, of your crops demanding the best oil and gas. Think of their root systems, feeding at different depths underground, consuming varying amounts of nitrogen, phosphorus, potash, lime. Have you planned to return fertility and horsepower under the hood of your soil machine?

That's Rotation—Thinking Underground
Prize Baby Beef Fattened with Dried Pulp

Ground Barley Proven Excellent Feeding Grain by W. C. Harris, Winner of First and Second Prizes for Heifer Carlots at Denver Show

By J. R. MASON, Sterling

This reproduction hardly does justice to these W. C. Harris heifers which took highest honors in the Baby Beef Division at the National Western Stock Show.

The W. C. Harris Company of Sterling recently shipped 2 cars of "Baby Beeves" to the Denver Market, which were declared by many local people to be the finest lot of cattle ever fed in the vicinity of Sterling, Colorado. That they merited this praise was demonstrated by the fact that they won both First and Second prizes for carlots of heifers in the Baby Beef Division at the National Western Live Stock show. It proved that these were real cattle and had been fed and finished properly, a more noteworthy feat considering they were competing with many other lots which had been on feed much longer.

This lot consisted of 54 purebred Hereford heifers purchased from John Painter, noted Hereford breeder of Roggen, Colorado. They were put in the Sterling feed lots of the W. C. Harris Company on August 26, at an average weight of 530 pounds. During the first part of the feeding period the ration was:

- 5 lbs. ground barley.
- 5 lbs. dried molasses pulp.
- 2 lbs. cotton seed cake
- All alfalfa hay they would eat.

After a little over two weeks, 3 lbs. of alfalfa and molasses meal (25% molasses) was added to the ration. Shortly afterwards corn chop was added and the amount of ground barley was gradually reduced. Likewise, the amount of alfalfa-molasses meal was gradually increased and the dried molasses pulp reduced slightly.

At the close of the feeding period
these cattle were receiving the following ration:
7 lbs. corn chop.
8 lbs. dried molasses pulp.
2 lbs. cotton seed cake.
5 lbs. alfalfa-molasses meal (25% molasses).
All the alfalfa they would consume.
These cattle were fed in an open lot with no especial shelter or particular care, such as is usually accorded "show" cattle. Very satisfactory gains were made during the entire 140 day feeding period, as shown by the following:
Average wt. per head, entire lot, August 26, when put into lot: 530 pounds.
Average Wt. per head, Denver, when sold: 1st car, 900 pounds; 2nd car, 788 pounds.
This indicates a net daily gain (after shrink) of approximately 2.25 pounds per head per day for the entire 140 days feeding period.
These cattle were sold in the ring, the first prize car bringing 16½ cents per pound and the second prize car 15 cents per pound.

Several points are illustrated in the feeding of these cattle which are of particular interest to feeders in beet growing districts and all irrigated sections:
(1) With good quality feeders and properly balanced rations, very satisfactory gains and finish can be put on "baby beef" in a relatively short feeding period.
(2) Ground barley can be used very successfully in a fattening ration, being practically equivalent to corn. Mr. Harris states that in the past he has had a little trouble feeding ground barley to real young stock (calves) as it will sometimes irritate their throats probably due to the "beards" in the ground feed. However, he has never had any trouble with older stock and considers it a most valuable grain for feeding purposes.
(3) Dried molasses pulp and molasses are valuable supplements in a ration and when properly used give excellent results. These beet products are available over all parts of the beet raising territory and can profitably be hauled to outlying districts where the delivery of wet pulp is prohibitive.

When Manure Is Wasted....

The Maryland Experiment station allowed 80 tons of manure to be exposed to the weather for one year. This quantity was reduced, in that time, to 27 tons.

In a Canadian experiment 2 tons of barnyard manure were used, containing 1938 pounds of organic matter. It was exposed to the weather from April to August, four months. There was a decrease by fermentation and decay in the organic matter to 655 pounds. The nitrogen alone was reduced from 48.1 pounds to 27.7 pounds.

In a Cornell experiment, over a 6-months period, April to September, there was a loss in dry matter of 55 per cent, and in plant food value of 48 per cent.
E. P. Cromer—Master Farmer

Well-Known North Platte Valley Beet Grower Placed on Nebraska Honor Roll

By HERMAN JURGENS

The North Platte Valley had reason to be proud of one of its prominent farmers when Mr. E. P. Cromer, of Gering, was awarded a Master Farmer medal. This occurred in Lincoln on January 3, 1928, when ten Nebraska farmers were named Master Farmers at the annual presentation banquet sponsored by The Nebraska Farmer. The ten were chosen from 115 nominees because of the outstanding success they have made of their farming business, their home life and their community obligations.

Individually and as a group they are typical of the ideal farmer who, through many years of effort has blazed the trail of the pioneer, endured the hardships of early day agriculture, commanded the respect and admiration of his community, meanwhile proving himself a good farmer in the light of modern methods. In choosing Master Farmers each nominee was sent a questionnaire covering in detail every phase of his farming, his home and his community activities, with the request that it be filled out carefully and accurately. Fifty-six of these candidates were actually visited during the summer and fall of 1927 by a representative of the paper and a careful check made of their replies. Investigations were made through neighbors and business men of the qualifications of the candidates. All the data obtained were turned over to the judging committee, consisting of Professors Filley and Burr of the Nebraska College of Agriculture, and George Jackson, Secretary of the Nebraska State Board of Agriculture.

Mr. Cromer lives on a well improved farm one-half mile east of Gering. A definite system of crop rotation consisting of alfalfa, sweet clover, sugar beets, corn and grain, aided by feeding, has placed his farm in a high state of fertility. He is recognized as one of the most successful beet growers of the vicinity, his average for the past five years being 16.6 tons per acre while the average for the Gering factory for the same period was 13 tons.

He does all his farm work with ten pure-bred Percheron mares. He has about 25 registered Percherons—young and old—on his farm at all times. He has built up an excellent reputation as a horse breeder and has a ready market for his young stock, which he finds pays for the keep of his mares. In 1922, he exhibited 11 head of his herd at the Denver Stock Show, winning seven firsts and five seconds—more prizes than any other individual exhibitor. His stallion was first in his class and reserve champion of the show.

Mr. Cromer has also made a success of feeding cattle, having 100 head of baby beefes in his yard at present. Aside from increasing the fertility of his soil he finds this provides a better distribution of his labor during the entire year.

One of his successful side lines is an orchard of about five acres. This is one of the oldest orchards in this part of the state and from it in each of the past two years he has sold over 500 bushels of apples.

He has always given freely of his time and has been prominent in both church and community affairs, having been on the official board of the Gering Methodist church since it was formed about forty years ago, and for 27 of his 42 pioneer years he was a school teacher.

He has taken an active part in the development of irrigation and at present is president of the Gering Drainage District. He is a director of the Scotts Bluff County Fair Association and a member of the Gering Valley Co-operative Cheese Factory.
Mr. Cromer’s Speech at Master-Farmer Banquet
Pays Tribute to North Platte Valley Pioneers

“Instances are common where sugar beets have returned a net profit of $75 to $100 per acre in one year,” said Mr. Cromer.

Mr. Chairman, Ladies and Gentlemen: It is with heartfelt gratitude that we are permitted to share the honors of this occasion.

We wish to thank ex-Governor McKelvie and his Nebraska Farmer for the opportunity of listening to the words of commendation that are usually recited in a man’s obituary. We never knew a man so good, nor yet one so bad, who could not be made better by words of congratulation over the achievement of some worthy deed. The universal custom is to chide a man with his failures and withhold his virtues with which to comfort those who mourn his death. May this new departure become more prevalent.

We have the honor, ladies and gentlemen, to hail from Scotts Bluff County, out where the West is at its best. It was in February, 1886, that we settled in the extreme western portion of Nebraska. The whole panhandle of the state was at that time known as Cheyenne County and constituted a part of the “Great American Desert.”

We could have filed at that time on public domain in the central portion of the state, but coming as we did, from Illinois, and having a normal amount of red corpuscles in our blood, we were desirous of frontier experiences. So leaving the train at Sidney we mounted a stage coach carrying mail and passengers to the Black Hills of South Dakota. On reaching the North Platte river, we turned westward again, till we came within a few miles of Wyoming. Here we established our home, 80 miles northwest of Sidney, our nearest trading point.

We had been told that rainfall would follow the plow but our first few years’ experience was very discouraging. The dry seasons and hot winds so shrivelled our crops that we were obliged to augment our farming with other employment in order to sustain life. Some of us gathered the dry bones scattered over the prairies and hauled them to Sidney to trade for a grub stake. Others cut down red cedar trees growing in the hills skirting the valley, converting them into fence posts and hauled them to Sidney for the same purpose, but a far greater majority retraced their steps to the land from which they came.

Soon poverty, the prolific mother of inventions, whispered in our ears that if trenches were dug in which to divert the water from the river, it could be used instead of rainfall. The suggestion was tried and found most successful. Where water was applied the vegetation made a magical growth. All hands were turned toward excavating canals, but our greatest hardships were found in trying to finance these projects without money. We had none and eastern capital was at that time gunshy of this new undertaking, but finally, on the completion of the Pathfinder project, practically all of the irrigable land in Scotts Bluff County was placed under water.

We now have the most productive portion of the state, if not of the nation. Frequently a single crop of potatoes has yielded an income sufficient to pay three or four times the price of the land on which they were grown. Instances are common where sugar beets have returned a net profit of from $75.00 to $100.00 per acre in one year. We have seen land, abandoned as worthless, sell for $400.00 per acre for farming purposes alone. You can stand on the top of Scotts Bluff National Monument and count the smoke of six sugar factories. $7,000,000 were paid to the growers for this year’s crop alone.

We have harnessed the water power found in our irrigation projects for the manufacture of electricity, with which the wheels of our factories are turned and our cities lighted. The initial steps have been taken to light the whole valley with the current thus produced. We have labored constantly for over forty years to bring about this stupendous transformation and indeed very few are with us today who saw the beginning of this gigantic enterprise. Some fainted by the wayside but a greater number passed to their reward without seeing the results of their labors.

Thus we have accomplished two purposes: one, the making available 100,000 homes for energetic people and the other, the everlasting effacement from our geographies of that infernal misnomer—“Great American Desert,” insofar at least as Western Nebraska is concerned. I ask you, Ladies and gentlemen, if this job is not worthy of the hand of a Master Farmer.
Your Rotation Problem

Having clearly in mind these fundamental principles of crop sequence the farmer can adapt them to meet his individual circumstances.

What crops are best for him to use in a rotation must be determined by each farmer after taking into consideration these fundamentals, his soil, previous cropping, markets, financial condition, etc.

Fortunately for farmers in these irrigated districts where the Great Western Sugar Company operates, the various staple crops now grown may be used in planning a balanced rotation. For instance, alfalfa, sweet clover, corn, sugar beets, small grain, potatoes, beans, and various vegetable crops where canning factories offer outlets fit nicely into cropping systems which meet all the requirements of a good rotation.

The variety of farm products which have been successfully grown over the entire Great Western territory permits of a wide selection to meet peculiar soil conditions.

Rotations that would apply to adobe soils would not fit the lighter or "potato" soils. Or, sweet clover which has succeeded so well in some parts of the territory may not be favored as much as another legume in other localities. But alfalfa, beets, and small-grain may be grown on any of our soils, although a distinction may be necessary as to where potatoes and corn may be grown successfully.

There is a rotation plan to fit your farm. Your Fieldman is prepared to work it out with you. Start planning it now, for 1928. And stay with it for at least two cycles to give it a fair trial.
A Test of Manure's Value in Beet Yields
By J. S. RICE, Fieldman, Nebraska District

MR. F. O. SPURRIER'S farm is located one mile west of the Haig, Nebr., dump. He rents the greater part of his beet land to a Japanese farmer, Henry Tanaka.

Last spring Mr. Spurrier divided one beet field, giving the tenant the north side and keeping the south side for himself. All of the manure on the place went to the tenant. Mr. Spurrier decided to test the difference in the two patches between manuring and no manuring. The soil was the same.

Mr. Spurrier realizes he has a good beet tenant, so Mr. Spurrier followed in every way the example set by Mr. Tanaka, in preparation of seed bed, cultivation, irrigation and all field operations.

From the emergence date the tenant's field showed up much better and from that date until time of harvest the manured ground was far in advance of his own field.

One of our stops on the beet tour, September 7, 1927, was at this farm. Everyone could see the difference. The contrast was very distinct. Then estimates ranged from 3 to 5 tons in favor of the manured field.

The actual tonnage from each field was:

- Unmanured, 34.52 acres, 14.13 tons per acre.
- Manured, 82.63 acres, 17.40 tons per acre.

A difference of 3.27 tons per acre; enough to pay the hand labor!

In 1926 both of these fields had the same amount of fertilizer. The test showed what missing one year of manuring did to the next year's yield.

Mr. Spurrier's feed yards where even in off-years in the sheep feeding business a valuable fertilizer is produced for profitable beet yields.
Live Stock Feeding for a Beginner

VI—Making Cornfield Mutton

By E. J. MAYNARD

In Charge of Animal Investigations, Colorado Agricultural College

Cornfield lamb feeding appeals to the feeder for under favorable conditions it will produce quick heavy gains and at a low cost but every precaution must be taken to safeguard against excessive death losses. Supplemental forage, stock beets, bulky feed, such as wet pulp, and method of handling can protect against loss. It is a practice which will never be safe for everybody but which can be used to advantage where a system is devised and with good supervision.

Lambs are peculiar in their ability to take a certain amount of grain without trouble—and no more.

After years of feeding in the West, feeders are coming to realize that heavy grain feeding is responsible for most feedlot losses occurring after the first few weeks of feeding. These losses have been blamed on many things: moldy hay, lack of minerals, and other causes but indications all point toward too heavy grain feeding.

In dry lot feeding the average experienced feeder takes about six weeks to put lambs on a full grain feed of 1 to 1.5 pounds.

Lambs are brought up to a pound of grain very gradually, for once off feed they never respond to a full grain feed in a normal way. Even with such precautions digestive disturbances occur. The sudden change from mother’s milk and dry range grass to the richer feeds on the farm must be made with care.

Now, with these things in mind, what about cornfield feeding? At the outset we must recognize two different classes of sheep, natives raised on the farm and western sheep raised on the range. Our experience has shown that farm-raised lambs are much more safely handled in cornfields than range lambs.

The general recommendations in cornfield feeding are fairly simple. Lambs are turned into the cornfield about September first. They are fed alfalfa hay, sometimes oil meal. Rape or soybeans are often planted with the corn or in adjoining fields. Under ordinary conditions they are fattened off in a 60 to 90 day feeding period, making from 15 to 25 pounds gain and using from 1.75 to 2.25 bushels of corn per head. They eat little alfalfa, usually one-half to two-thirds pounds per day and ordinarily a 40 bushel yield of corn will carry about 20 lambs. Feed costs are usually about 15 per cent less than in dry lot. If it were not for death losses cornfield fattening would be very simple.
What usually happens is this: During the first few weeks the lambs find plenty of green feed, leaves and weeds and eat very little, if any corn. Then the corn is exposed to view. They get a taste for it and the problem is how to keep them from eating too much.

Will limiting the time on corn be effective? Observations have shown that in one hour many lambs will consume the equivalent of three ears of corn or during two one-hour periods in a day, from two to four pounds. Apparently limiting the time alone is not sufficient.

One way to control amount of corn eaten in pasturing corn is to fill the lambs up first each day with a variety of feeds before they are given access to the corn so that they will not be able to consume enough grain to hurt them.

A successful feeder in Colorado uses a certain system in cornfield feeding. Each morning his lambs are taken from the pen and herded slowly over alfalfa stubble, then through a field of piled beet tops, then through the cornfield and finally back to the alfalfa feeders in the pens. Each afternoon the same procedure is followed. The schedule is so regular that each day at the same hour the lambs may be found at about the same place.

This system which requires very little labor after the lambs become accustomed to it has been very effective in producing good gains and cutting down death losses. It has been successful in filling up of the lambs and limits the consumption of corn. Of course, a system in which one could pasture the lambs rather than herd them would be simpler yet.

It is sometimes recommended that a small portion of the cornfield be separated off with a temporary fence and pastured, then another portion and so on. This scheme should work well with constant supervision but the danger would lie in judging just when to change the lambs to a fresh field. This would be especially true where 1000 to 1500 lambs were handled.

At the Colorado Agricultural Experiment station we have done some work with stock beets or mangels in connection with cornfield feeding in an attempt to develop a pasturing rather than a herding scheme. We turned lambs onto a field of stock beets at seven o'clock each morning and then into the cornfield at 11 a.m. where they were left until 4:00 p.m. when they were put back into dry lot on alfalfa self-feeders.

One acre of corn and .2 acre of stock beets carried 40 lambs 81 days and produced 24 pounds gain as compared with 22 pounds gain in dry lot. The lambs were not well enough finished for market at the end of this field feeding test but were finished during a 30-day feed in dry lot.

The use of the pastured stock beets cheapened the cost of gain, increased the gain over dry lot and straight cornfield feeding and cut down the death loss. The cornfield and stock beet field lambs in last year's test made 52
cents per head profit while the straight cornfield lambs lost 49 cents per head.

We have found that type and breed had somewhat to do with success in cornfield lamb feeding where range lambs were used. We used different breeds representing the main classes of feeder lambs. They were grade Hamp­shires from Wyoming, Rambouillets from Utah, Corriedales from the U. S. Government Experiment Station at Dubois, Idaho, and Southerns (a light pelted grade Rambouillet) from New Mexico.

We found that the compact fleeced, hardy northern lambs such as the Rambouillets from Utah stood adverse weather conditions best and made the heaviest gains. The black faces and Corriedales gave practically as good results. We found the southerns, however, not at all suited for cornfield feeding.

The Southerns come off the ranges later in the fall, sometimes late in October and cornfield lambs should be started early in September. They are light pelted and not nearly as hardy as the other breeds and they show much lighter gains and heavier losses in the cornfield.

### Comparison of Grade Range Lambs of Different Breeds in the Cornfield

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<th>Northern</th>
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<tr>
<td>Rambouillet</td>
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<td>Hampshire</td>
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| Average gain | 22.7 | 21.9 | 20.6 | 14.7 |
| Daily gain   | .25  | .24  | .23  | .16  |
| Loss         | 2.   | 3.   | 3.   | 5.   |

More Members of the 20-Ton Club

By C. A. ROCKWELL, Fieldman

This is the time when farmers are figuring on the crops to be planted in the spring. For beets select land which will produce profitable yields, even though this may give you less acreage than you would like to plant. And start right now to build up the poorer fields for high-yielding beet crops.

In studying the performances of growers in my district who obtained 20 tons or more of beets per acre in 1927, I am struck with the fact that their ground had been prepared to produce these large tonnages, by rotation and manure. Of course, they used excellent cultural methods and their irrigation was done properly. But it takes good farming and good rich land to make 20-ton beet yields.

Here are the list of 20-ton club members in my district:

- F. F. and A. J. Fonay, 22.7 tons per acre on 21.51 acres.
- John Lauridson, 21.37 tons per acre on 15.48 acres.
- Joe Noe, 20.25 tons per acre on 5 acres.
- E. P. Crowell, 20.15 tons per acre on 10.37 acres.

And by virtue of the small fraction of a ton missing I am prompted to add C. O. Sanstad, 19.996 tons per acre on 22.22 acres.
Ted Gable, on the left, explaining to A. H. Heldt the Gable feeding operations and how his high yield was obtained.

Highest Yield in the Scottsbluff District

By A. H. HELDT

Agricultural Superintendent, Nebraska District

Mr. TED GABLE is managing the farming operations for himself and his father. He had the highest tonnage in the Scottsbluff factory district for 1927, his beets yielding 20.19 tons per acre on 18.09 acres.

This high tonnage was not produced by accident but by high grade farming throughout the season. The farm work is always well in hand, and each step is taken at the proper time. Beets are not planted until the seed bed is as nearly perfect as possible. Cultivation is thorough and frequent.

The hand labor is the best to be had. They are employed the year around and stay right on the farm. Mr. Gable pays his labor $1.00 per acre bonus for each ton over 12 tons. There is some inducement for the labor to be interested in the work and in the grower's success. This is just another example of where the attitude of the grower toward the labor contributes to the success of the crop.

The Gables are among the most successful feeders and farmers in the Valley. They raise a large number of lambs each year and feed a large number of cattle. Consequently they always have an ample supply of manure for their land.

Ted Gable, as he is known among us, is not a stranger to the Sugar Company family. He had charge of the sheep-feeding operations of the Company at one time. He is a good farmer, likes his work, and could not be lured away from it.
To The Man Who Does Not Feed Cattle or Sheep:

How Can You Increase Your Yields and Profits

THE WORK OF CROP PRODUCTION IN THESE SEMI-ARID DISTRICTS COMES UNDER FOUR MAIN HEADINGS:

1. Handling of the soil and the crops; i.e., seed bed preparation, cultivation, thinning, etc.
2. Rotation or succession of crops.
3. Use of fertilizers, such as barnyard manure, green growth and residues turned under.
4. Irrigation.

For the moment, however, attention is directed to rotation and fertilization; irrigation and soil handling will be dealt with at another time and place.

Thoughts of most beet growers have turned to barnyard manure when they considered increase of their crop yields. Manure will do it. But some farmers do not engage in feeding, produce insufficient fertilizer. About one-third of the beet land is manured annually; only 10 per cent in 1917.

U. S. Department of Agriculture experts are authority for the statement that:

- That in merely maintaining the producing power of the soil, rotation is 91 per cent as effective as the use of fertilizer.
- That measuring increases from maintenance yields, (average yields at beginning of tests), rotation alone has been found at times to equal or exceed the effects of fertilizers.

The man who does not feed cattle or sheep, or who for any reason does not produce sufficient barnyard fertilizer to cover his beet land, has another means of increasing his yields—rotation of crops.

Rotation is not a substitute for good seed bed preparation, cultivation, and irrigation. But it partly makes up for lack of manure; and even with plenty of manure, rotation increases the good effects of fertilization.

Continuous cropping of beets with manure may maintain high yields, but it tends to lower sugar content and to increase dangers of diseases.

Continuous cropping of beets without manure is altogether inadvisable.

Any farm having alfalfa or sweet clover is in position to start a beet rotation, turning under some green legume stuff before a row crop of corn or some other intertilled crop; (beets are generally better the second year out of alfalfa, and corn or potatoes should precede beets rather than follow beets); then following the beets with a small-grain crop nursing the legume.

Vegetable growers may fit their special crops into the rotation nicely, taking care, however, not to put cabbage or like host plants on nematode-beet land.

Rotation is simply a system of farming in which different crops follow each other in regular order, the aim being improved soil fertility and higher yields, control of insect pests, prevention of plant diseases. The plan calls for leguminous crops (alfalfa, sweet clover, beans, peas, etc.) followed by deep-rooted cultivated or row crops, (corn, potatoes, beets) followed by shallow-feeding crops like small-grain.

There is a certain increase in crop yields obtainable by manure; also an improvement in yield from rotation; and the largest benefit comes from joining both. But why not get the increase from rotation if you are not producing all the barnyard fertilizer that you may need.
Should We Diversify?

Paper read by Mr. H. D. Lute of Sarben, Nebraska, at the Sidney meeting of Nebraska Organized Agriculture.

THERE can be but one answer to this question if we are looking forward to a permanent and prosperous agriculture and to the building of real homes on the land.

It is not for me to say where, when, or how to diversify. Every farm is a problem in itself. Every farmer is a law unto himself in this matter. There are various types of farms. There are a variety of conditions. And then there are farmers and farmers. There is no set plan for diversification that will fit all needs or conditions. Each farmer must study his farm, his environment, his ability and to some extent his inclinations.

A one crop system without diversification is but soil mining and leads to suit-case farming. Years ago many of the farmers in the wheat growing section of eastern Oregon stayed on the land long enough to harvest and seed the crop and spent the rest of the time basking in the sunshine of southern California.

No Escaping One Crop Evils

Many farmers in Western Nebraska in years gone by were inclined to grow only wheat and live in town the rest of the time. I was discussing this matter with a Duel County farmer during the worst of the late depression when low prices and poor yields didn't leave the wheat farmer enough to pay the hail insurance. This man, together with an unmarried brother, had tractors, trucks, and cars, without live stock of any kind or any crop other than wheat. They camped on the farm long enough to harvest the crop and seed another and lived in a modern house in town the rest of the time.

I said: “What are you going to do, you can't grow wheat after wheat all of the time.”

He replied: “We will summer till.”

I said that would burn out the organic matter. He said: “We will cut the grain high with the header (that was before the day of the combine) and plow the stubble under.”

I said: “Yes, but the constant cropping to one crop will increase insect and disease pests.” His final comment was: “Oh yes, I know, but I am hoping the other fellow will diversify so that I can continue to grow wheat.”

Farm Residence of H. D. Lute at Sarben, Nebraska.

Then there is the town man who hires all of the work done and makes no pretense of building up a farm home. But the worst of all is the man who lives at some distance, in another part of the state, or maybe in some other state, who comes out to harvest and seed and leaves the country. He builds no home on the farm. He has no interest in community affairs. He looks only to immediate profits. He is a soil miner and a speculator.

Reasons Why

Diversified farming gives an all year round job. Even Henry Ford
with his iridescent dream of producing a crop with the labor of a month or two does not plan that the farmer shall be idle the rest of the time: he is to work in factories. The margins in agriculture are not wide enough to make profitable loafing on the job a third or half of the time.

Diversified farming distributes labor so that the farmer with his own labor and that of his family can handle a much larger proposition without hiring so much help.

Diversified farming divides the risk. Dry weather, a storm, rust or some calamity may hit the wheat crop and all is lost. With a variety of crops and live stock there is always the probability that some of it will come out all right. Even the low-priced cycles do not hit all at the same time; witness hog and cattle prices today.

One crop farming increases disease and insect pests, demonstrated by the alfalfa weevil, corn borer and the sugar beet nematode. In the upper North Platte Valley they used car loads of poisoned bait to kill off grasshoppers, whose rapid increase was no doubt due to the large acreage of alfalfa but the problem was not solved till the farmers or farmers’ wives took to diversifying by adding turkeys to the farm live stock.

Conservation of soil fertility is an ever-increasing problem. This means a variety of crops must be grown so that certain particular elements shall not be unduly depleted. It means also the growing of legumes, of a kind adapted to local conditions and best suited to fit into the general plan for that particular farm. It means keeping live stock, either dairying, growing stock on the place, or feeding out.

W. F. Taylor, in a little publication called “The Furrow,” said: “The farmer who tries to farm without live stock has a business on his hands that is entirely out of balance. He is without barnyard manure which furnishes plant food and improves the physical condition of his soils.

I can well remember when we had cattle and did but very little farming that it was a chore to get the manure disposed of and we had a pile as big as a barn back of the corrals. Now we feel that we must keep stock in order to have the manure for the crops, especially the sugar beet crop. Then, too, we feel that live stock furnishes the best market for feed grains and roughage and practically none of this is sold off the farm. In fact our cash crops are beets and livestock.

The Broad View

The farm is more than a work shop. It is a home. Agriculture is more than a mere job. It is a life. The farmers are builders and their reward lies in the knowledge of a task well done and a life well spent. But to leave a farm and a home for posterity there must have been a variety of field crops, including legumes. There must have been live stock to build the soil. There must have been poultry for pin money. There must have been trees and shrubs and flowers for artistic influence and benediction. There must have been children to furnish the incentive for building a home out in God’s open spaces.

So I repeat: There can be but one answer to the question: “Should We Diversify” if we are looking forward to a permanent and prosperous agriculture and to the building of real homes on the land.
Better Beet Labor Houses in Iliff, Colo., District

This Type Must Go!
Well, If No Sentiment Then Good Business

By GEORGE B. HOLMES, Fieldman

I might have a little sentiment about putting up my beet help in a shack, against the feedlot or hog pen, too close to a ditch, highway or railroad, dangerous to children. But I recognize that farming is a difficult business. The farmer may be facing increasing costs, may be fighting to obtain more money and higher yields.

So I am putting this beet labor treatment up to you strictly as a common sense business proposition.

In a majority of cases I observe a close connection between a good beet house, efficient labor, and a good beet yield. Sometimes farmers with good housing accommodations for their contract beet help get poor workers; and at times good workers are put up in slovenly “shacks.” But the misfits do not last: the natural thing generally happens, good labor on good farms with good housing facilities.

To the laborers, a poor shack means possible sickness, a heavy expense, loss of earnings. To the farmer sickness among the field workers means a shortage of help during the busy season, possibly a poorer yield. Or a poor shack means uncomfortable, dissatisfied workers, and this spirit shows in their care of the crop.

I have a feeling that as the beet business grows older in these irrigated districts, as the Americanization and the intelligence of the workers increases the old-fashioned beet shack must go! There will be agitation by the workers, perhaps; there will come among the farmers themselves a keener appreciation of the dollar-and-cents value of better treatment of the beet help.

The sugar company’s position in this matter is also a difficult one. It would not like to be forced into a stand of declining to give a beet contract to growers who lack suitable housing facilities for beet help. It does not like to lay a burden upon growers to build new improvements. The company’s attitude is merely one of presenting the facts to you: after all, it is up to the growers to decide what must be done to improve the housing for beet workers.

I am sure that growers appreciate what the company has done to set a reasonable example, in the construction of colonies of houses at various points. And the company, in turn, appreciates what so many individual farmers have done on their own initiative to put up decent living quarters for contract beet help.

Not a single case has yet come to my notice of a farmer dissatisfied with his investment in better housing for beet workers. Evidently it pays to build a modern beet-labor house.

A beet house sufficiently large to accommodate the people required to tend your acreage; lathed and plastered inside; shingle-roofed; warmly constructed and decently located will almost invariably draw good labor. That efficient labor will very likely come back year after year, or if permitted will remain in the house over winter, furnishing the farmer with winter and early spring labor, and assuring the farmer adequate beet help for the next season.

Satisfied labor is almost certain to do better beet work than dissatisfied labor: and good beet work is a big element in the program of getting more and better beets.
He Tested Irrigating Before and After Planting

By C. J. RODEWALD, Fieldman

In preparing spring plowed alfalfa or sweet clover ground for beets it is necessary, as a rule, to apply an irrigation, not only to pack or firm the seed bed, but also to insure a good germination stand. The question then arises—Should the irrigation be applied before or after planting.

The practice throughout the Ovid factory territory has been to irrigate, then plant; but because of continuous winds in the spring, the surface moisture is soon lost, resulting in poor stands of beets. Furthermore, the toxic condition or the heat produced by the decomposition of the green growth turned under results in a weakened condition of the young plants and further reduced stands where this method has been practiced.

To determine for himself which was the proper method of applying the irrigation, Mr. F. B. Bartow, on the Cleveland and Souder farm west of Ovid, decided to make a comparative test. For this test an alfalfa field was selected. A heavy growth of nine or ten inches was turned under; the entire field was cross-harrowed floated and harrowed, after which half of the field was planted.

Irrigation After Planting

Previous Crop—Alfalfa.
Plowed 9 inches May 18.
Harrowed—Double floated-Harrowed.
Planted—May 23.
Ditched for Irrigating Up.
Irrigated—May 25.
Double Harrowed to break crust.
Date Emergence—May 29.
Thinned, June 20—Per cent stand, 89.
Date of Harvest—October 26 to October 29.
Measured Acres—3.92
Tons Per Acre—13.17.

F. B. Bartow

Immediately after planting, both the planted and unplanted fields were ditched and irrigated on May 25. As soon as the surface soil was dry, the field was cross-harrowed. The other half of the field was planted May 30.

Both fields were cultivated and irrigated the same number of times during the growing season.

Although there were only seven days' difference in the date of planting and date of emergence on the two fields, the young plants on the field that was irrigated AFTER planting appeared to be stronger and made a much more rapid growth than on the other field, and were ready for thinning fifteen days earlier.

Irrigation Before Planting

Previous Crop—Alfalfa.
Plowed 9 inches, May 20.
Harrowed—Double floated-Harrowed.
Ditched for Irrigation before planting.
Irrigated—May 25.
Date Emergence—June 5.
Thinned, July 4—Per Cent Stand, 84.
Date of Harvest—October 29 to November 5.
Measured Acres—6.73.
Tons Per Acre—11.65.

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Why Only 8.4 Per Cent?

By J. G. ENGLISH, Fieldman

Longmont factory's territory in 1927 had the finest average tonnage in its history, close to 14 tons per acre on more than 20,000 acres.

Yet, only 87 of those growers—8.4 per cent of the farms on which beets were harvested—averaged 18 tons or better for the season.

Consider what this means! Select any cost you choose to name for the average cost of producing an acre of beets. Include return on capital (investment) or not, as you prefer, in the elements of cost.

And what a difference in profit between the 10-ton grower and the 18-ton grower! Mr. James Holden of the Scotts Bluff Experiment Station has used a comparison that might serve here. At $5 per ton for beets he is accustomed to illustrate the difference in value and profit of various yields by pointing out that IF it costs 10 tons at $5 to raise an acre of beets the 11-ton farmer has a profit of $5, the 18-ton grower a profit of $40—eight times as much.

Mr. Holden, of course, does not apply his illustration through all changes in beet prices, nor does his example take into account higher costs of higher yields, and other problems in individual cases. That is, if beets were $12 per ton it would not follow that the average cost per acre would be $120. Similarly, the 18-ton grower might be at greater expense, and have more valuable land, than the 10-ton grower. The illustration is merely an average one, made to point out a moral.

There was one grower in the Longmont district last season whose yield of 18.59 tons per acre on 27.95 acres was obtained on land handled as follows:

Wheat was planted in 1925 on 8-year-old alfalfa ground. The grain was badly hailed that season.

The land was fall-plowed and wheat was again seeded in the fall of 1925, bringing a harvest next summer of 55 bushels per acre.

In 1926 the ground was fall-plowed and beets were planted on April 5, 1927. Thinning was finished June 15, after a bad hail on June 4. The crop was cultivated six times, had four irrigations. From start to finish the beets had excellent care. The seed bed was in fine shape for planting. Thinning was given marked attention.

This was the crop of J. B. Lang and Sons.

Plant the full recommended rate of beet seed, 20 pounds per acre. Compared with lighter sowings, on the average, the heavier seeding increases per cent sugar, yield, and sugar per acre.
Showing the manner in which the disease spread through the field. Dead plants can be seen in the blank spaces.

The Results of Continuous Cropping—Disease

By JESSE FORBES, Fieldman

One of the best arguments for a systematic crop rotation on beet farms is that it will control plant pests (such as the nematodes) and also fungous diseases. A great deal of publicity has been given the nematodes in recent years, and most growers now realize the seriousness of this pest. Less information has been given the group of fungous diseases which attack beets and many growers do not appreciate how serious these can be in extreme cases.

The accompanying pictures taken during the past season show a field attacked by the Fungous Rhizoctonia which causes what is known as "Rhi­zoc Rot," a form of crown rot in beets. The farm on which these pictures were taken is located in the Sterling district about 3 miles west of the Ackerman dump. For years this farm has been rented, and has had several different tenants, all of whom grew large acreages of beets each year. Some parts of the farm have been in

Closeup of plant attacked by this disease. Note wilted leaves, also rot­ting crown at right-center of picture.
beets continuously for at least 10 years.

The field shown in the photographs has been in beets at least 10 years straight and has heretofore yielded average crops. In 1926 there were a few small spots that showed this fungous disease. However, the tenant did not think these were serious and in 1927 again planted the field to beets.

The cultural operations on the crop were good during the past season, and the stand left at thinning was very good. However, early in the summer the rot began to spread and by harvest time it had ruined large areas of the field.

It is a quite common belief among some growers, particularly those opposed to early and timely irrigations, that this and similar "rots" in beets are caused by early irrigation; i.e., by irrigating before the leaves shade the ground. The fact that this field was not irrigated at all until August 15, (when the pictures were taken) proves that early irrigation has nothing to do with this disease. The lack of crop rotation is the real cause.

This 160-acre farm has always produced too large an acreage of beets, some years producing up to 100 acres. I believe that not over one-fourth to one-third of the cultivated land should have been planted in beets heretofore, and am sure that this plan will have to be followed from now on if profitable yields are to be obtained.
Soils of Old Stream Terraces Important Factor in Beet Development

By A. T. SWEET
U. S. Department of Agriculture, Bureau of Chemistry and Soils

PART 2
Soil Formation

Soil is the product of certain factors reacting on soil material. Dust, dune sand or recently deposited alluvium is not soil in the technical sense but soil material. After the action for many years of heat and cold, moisture and drought, growth and decay of plants and addition of organic matter, chemical reactions, physical changes and bacterial activity it becomes stratified and forms soil. In its original form it may have been stratified but its stratification was one of the deposition, not of weathering.

One is as distinct from the other as is a completed building from a pile of cement, brick and sand. Tear it down and it cannot be rebuilt except by Nature working through a long period of time. The chemical elements can be replaced in their proper order but the soil structure cannot be duplicated and structure is an important factor in controlling moisture movement, aeration and root penetration.

Since all soils of eastern Colorado have been subject to about the same climatic conditions they have some general characteristics common to all of them. In comparing soils, however, virgin soils only or those which have not been under cultivation for several years, can be used as a standard. In shallow or uncompletely developed soils the influence of parent material predominates over the influence of climatic conditions. These must also be eliminated in noting the results of weathering.

Characteristics common to completely weathered sorts of this region are

1. A brown or dark brown layer, the surface inch or two of which is finely granular and slightly crusted, well filled with plant roots, worm hides and insect cavities. It ranges in thickness from about 9 to 13 inches and shows a well defined adobe structure, where exposed to drying and weathering, due to vertical and horizontal cleavages.

2. A layer of lighter brown color, heavier texture and having distributed through it numerous nearly white spots due to the accumulation of lime and other readily soluble salts, this layer extending to a depth of about 30 inches below the surface.

3. A deep layer of the same light brown color but without the spots of lime accumulation and distinctly lighter in texture.

The transition from soil material to soil takes place through the carrying downward of the finer silts and clays from near the surface into the layer below it by penetration of surface moisture. The more soluble salts are also taken into solution and carried downward to the zone of maximum moisture penetration where they
are reprecipitated. The upper layer is changed also by addition of organic matter, by aeration and complete oxidation.

A completely developed soil then is made up of three layers; (1) a dark colored surface layer from which material has been removed both physically and chemically; (2) a lighter colored heavier layer to which material has been added both physically and chemically and; (3) a layer which differs but little from the slightly weathered parent material.

Soils of Old Stream Terraces

Soils of old stream terraces have, as a rule, completely developed profiles because they have a nearly level surface, favorable for rapid soil formation; have remained in their present position for a considerable time; and are not subject to serious erosion by which the surface soil is removed as rapidly as it forms.

In addition they have a deep substratum of sand, gravel and boulders favorable for thorough under-drainage, high above the water table maintained in the adjacent valleys.

Soils of old stream terraces on account of their texture, which ranges from fine sandy loam to heavy loam or clay loam, and their good surface and under-drainage have a high moisture capacity.

They are able to take up large quantities of moisture and hold it, and to release it again when needed by growing crops. They are comparatively free from seep and alkali, and are easy to cultivate.

As a whole they are better suited for highly specialized crops than are the soils of the stream flood plains below them, the residual soils which lie above them or even the loess or wind-blown soils. Without them the highly specialized seed crops of the Arkansas Valley and the profitable sugar beet crops of Northern Colorado would not be possible. They occupy the center of the best irrigated districts and on them have been built many of the important towns of this region.

One Way to Hold the Boy on the Farm

By ALFRED R. WILLIAMS, Fieldman

Last spring Jacob Musselman, farming four miles northeast of Wheatland, Wyo., gave his son, Edward, 2.80 acres of the best land on the farm to plant to any crop he chose. Edward chose beets as the crop most likely to bring him the greatest returns for his labor.

The land was manured, then plowed May 2nd and immediately worked down into a good seed bed by harrowing and floating. Planting was done on May 4.

It was Edward’s intention to thin his own beets, but too much other farm work prevented this, and the hand work was done by his father’s Mexican beet labor. The thinned stand averaged about 80%. Edward cultivated his field five times and irrigated it twice. A heavy hail storm on August 15th damaged the tops severely, reducing the yield materially.

On October 1 the harvest commenced, and the yield was more than 15 tons per acre.
$9,413.78 Net on 156½ Acres of Beets
By T. D. STEPHENS, Fieldman, Nebraska District

The 1927 beet crop of Mr. W. F. King, tenant on land belonging to the Lincoln Land Company, near the Joyce beet receiving station, deserves special mention because of the large acreage involved and the good tonnage of beets obtained in spite of some unfavorable conditions over which he had no control.

Mr. King is farming some 380 acres of bottom land which might be classified as medium sandy loam. He raises 85 acres hay, 20 acres potatoes, 110 acres grain, 156.56 acres beets, and 8 acres of cucumbers for pickles.

The latter crop was put in on shares by Mr. King for the purpose of furnishing employment for his beet labor when they were not needed in the beet field.

The 156.56 acres of beets yielded a total of 2490.6 tons, or an average of 15.9 tons per acre, making a gross return of $19,920.52, less expenses amounting to $10,506.74, giving a net return of $9,413.78. The expenses include cost of seed, labor, rental and other incidental expenses including bonus money paid to beet labor, $1.95 per acre.

Eighty acres of the beet land was old spud ground and was not fertilized; twenty-six acres was raw land broken in 1925 and planted to spuds in 1926; and seventy-five acres of the beet land was fertilized to the extent of ten tons of manure per acre from cattle feeding operations carried on the previous winter.

The entire beet ground was plowed to a depth of nine inches, harrowed three times, floated, rolled, and planted to beets by May 15, the seeding being done to a depth of about one and one-half inches.

The crop was cultivated six times, including ditching, and received careful attention throughout the growing period as regards blocking, thinning, irrigating, weeding, etc. Ten acres of the beet ground was fifty per cent damaged due to standing rain water following an irrigation.

Mr. King vowed last spring to raise a banner crop of beets, and we understand that this year he expects to increase his beet acreage and hopes to increase the yield per acre. He believes in fertilization, proper preparation of the seed bed and kind treatment of labor including proper housing facilities and extra employment. He believes consideration shown the hand laborers is an important factor in securing a good stand of beets.

We often hear of large yields per acre on comparatively small acreages of beets. While the above operation did not show an abnormal yield per acre, still it was practically 3 tons per acre larger than the average for the district and on such an acreage is quite unusual.

Heavily fertilized land produces beets of lower per cent sugar content than unmanured land unless the beets on the manured fields have a long growing period, well-timed and early irrigations.
Manure . . . . Fertilizer

WHY?

Every farmer knows the value of manure. There may be some disagreement about when best to apply it to the land and how this may be done to most advantage. But of fertilizer's ability to increase crop yields no farmer is in doubt.

Then why talk about it, why continually urge its production and its conservation?

Because we sometimes lose sight of the fact that farming, in one sense, is the conversion of the soil's fertility into salable products.

You merely take from your land certain amounts of nitrates, phosphates, sulphates, and various other life-giving salts and market them in the form of crops. If you keep on doing this without restoring them to the soil your work is bound to return progressively less wages or profits.

We talk and write about manuring, despite a general appreciation of the value of fertilizers because when the fundamental principles underlying plant nutrition are better understood, you will be better able to use that knowledge for your profit.
Early Manuring and Planting in North Platte Valley Meant 4½ Tons More on this Farm in 1927

By JERRY MAXSON, Fieldman

ON ONE of Mr. A. N. Mathers’ farms, four miles southeast of Gering, the value of manure as a soil builder is rather plainly brought out. This place is farmed by Mr. George B. Tapster who has been on it ten years. In 1926 this farm raised the first beets, made possible by the incoming of the new Ft. Laramie canal and the Gering beet spur. Most of this land, however, is new and needs a good deal of building up. Realizing this, Mr. Tapster fed lambs on the place with very good results.

The first year Mr. Tapster raised fifty-four acres of beets, carrying out good farm practices and doing the best he could for his crops. He harvested 12 tons of beets per acre.

That fall he and Mr. Mathers fed three thousand lambs on the place. There was enough manure thoroughly to cover the beet land. In 1927 the tonnage rose to 15 tons per acre. Here was an increase of 3 tons per acre in one year.

Due to weather conditions several interesting facts were brought out as to time of application of manure, time of planting, etc.

It will be remembered that about the middle of April, 1927, all farm operations were brought to a close by a heavy snow storm. The first week in February, before the storm, Mr. Tapster started hauling manure. He applied about 12 tons per acre on a 12-acre patch and disked the manure in. Then the last week of February he plowed this patch about 9 inches deep and disked again, immediately following with a cross harrowing. I might say here that Mr. Tapster uses his disk set straight and weighted down to pack the soil firmly for the seed bed.

Following the disk ing and harrowing Mr. Tapster floated and cross floated, and as before, followed up with a cross harrowing. After these seed bed preparations, weather conditions prevented further work so that none of his other land was plowed early or manured early.

As soon as weather conditions permitted Mr. Tapster planted the 12-acre patch, April 28. The field was cultivated 7 times and irrigated 5 times, the first irrigation July 3.

Now, adjoining this patch, Mr. Tapster had an 11-acre field that was not manured and prepared until the first week in May. He manured, plowed, disked, leveled and planted as fast as he could. This field was cultivated and irrigated and cared for exactly as was the 12-acre patch, there being no difference in field

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operations except in point of time of preparation and planting. Both were manured.

The difference in tonnage, though, shows the marked value of the early manuring and planting, to the extent of $4\frac{1}{2}$ tons per acre. The 12-acre patch, prepared early, made an average yield of 18.50 tons per acre, while the 11-acre patch, prepared later, only made an average yield of 14 tons per acre. In both cases the value of the manure is brought out, too.

Mr. Tapster believes that, weather permitting, he will profit by applying manure as soon as he can in 1928 and disk it in, following with an early plowing.

Mr. Tapster raised 94 acres of beets in 1927 and manured everything except 14 acres. The 14 acres not manured made an average yield of about 11 tons per acre while his total average yield was 15 tons per acre. This again brings out the value of manure as an aid in building up raw land and increasing beet yields.

After completing this harvest Mr. Tapster and Mr. Mathers again put lambs on the place and expect to cover most of the beet land with manure for the 1928 crop.

I believe that many other farmers in the Gering Valley could profit by doing some feeding and getting manure on at least part of their beet land. If conditions are such that feeding is not advisable, use alfalfa and sweet clover to add strength to the raw soil.

They’re Members of the 20-Ton Club

By H. H. KNOOP, Fieldman

The following growers in my district in the Brighton territory grew 20 ton crops in 1927:

<table>
<thead>
<tr>
<th>Grower</th>
<th>Tonnage</th>
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<tbody>
<tr>
<td>L. M. Foley</td>
<td>20.86 tons</td>
</tr>
<tr>
<td>R. A. Letterly</td>
<td>20.16 tons</td>
</tr>
<tr>
<td>John Debevtz</td>
<td>20.23 tons</td>
</tr>
<tr>
<td>Tom Sakurai</td>
<td>22.22 tons</td>
</tr>
<tr>
<td>M. Tashiro</td>
<td>20.00 tons</td>
</tr>
<tr>
<td>R. J. Lessing</td>
<td>20.68 tons</td>
</tr>
<tr>
<td>P. J. Glazier</td>
<td>20.98 tons</td>
</tr>
</tbody>
</table>

All of these growers except one live in old beet territory, twenty ton crops in the older districts show what can be accomplished when good farm practices are followed.

Not all of these growers have a definite rotation plan, but they are gradually working to a system of rotation, and even better tonnage may then be expected. Fall plowing is done when possible. Barnyard manure played an important part in this good tonnage.

Twenty ton crops don’t just happen: they are the results of fertile soil, good seed bed preparation, timely planting, good stands, (made possible by proper preparation), good hand work, followed by the proper cultiva-

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A Conversation Not Too Imaginary
The Fieldman Meets Farmer George and Discusses Free Water and Early Irrigation

Farmer George: "Hello, Bill, where you been keeping yourself all winter? I have hardly seen you since I finished hauling beets. Haven't we had fine weather this winter?"

Fieldman Bill: "Yes, almost too good. We are short on moisture. The other day I examined the soil in several fields and I was awfully surprised to find it as dry as it is."

George: "We haven't had much moisture this winter, come to think of it. I'd hate to have another dry planting season like 1925."

Bill: "There is lots of water in the river and I understand most of the reservoirs are fairly well filled. Don't you think that the practice of irrigating hay land early in the spring, February and March, followed by some farmers would be a good thing for more farmers to do? I know some men that irrigate their alfalfa in February or March every year. I have seen whole fields almost solid sheets of ice. But these fellows always cut a little heavier hay crop than their neighbors.

"What appealed to me, especially, was the fact that they had a considerable part of their early irrigation out of the way and if it was necessary to irrigate up beets they didn't have all the other crops to irrigate. Furthermore, alfalfa can be irrigated with free water in February and March but if left until later and there is a shortage of water, it may be necessary to use reservoir water."

George: "You know I irrigated some alfalfa land early one year and come to think of it, it worked out pretty good. I wouldn't be surprised that it might be a good idea to start watering the alfalfa pretty soon."

Bill: "If I could get the water I sure would irrigate right away. If it continues dry I believe it would pay to go in and irrigate the land to be planted to beets before plowing. Of course, on some soils you wouldn't want to do this, but on most of them you can without any trouble.

"If we were to get a heavy snow now every one would be happy but when you talk about applying the same amount of water by irrigation some fellows seem to think you have gone crazy."

"One thing is sure, the farmer who makes use of the water when it is available usually grows a better crop than the fellow who waits until everything needs irrigation and has to let some crop suffer because he cannot get to them all in time, or later in the season runs short of water."

George: "Believe I will go and see the ditch boss about getting some water turned in earlier than usual. Sometimes you can't get them to turn the water in unless a certain number of feet are ordered out. Then again they don't always have the ditch cleaned out so they can turn it in if we order it."
WHEN after years of agitation and discussion the first beet sugar factory in the state was finally constructed at Grand Junction in 1899 it sliced 6656 tons of beets and produced 6600 sacks of sugar. The acreage harvested in that year was barely over one thousand. Total payments to farmers amounted to about $30,000.

Since 1899 the industry has grown many hundredfold. Between the early efforts of Magnes, Perrin and Schirmer and the launching of the first beet sugar factory in Colorado came romantic and dramatic efforts to establish the industry. There was talk as early as 1871 of bringing sugar machinery to the state. A committee was appointed to solicit funds to finance the proposition. Nothing came of this effort although public discussion continued. It appears from records that Mr. Magnes sent East for castings for a small mill and press. But this, too, appears to have been premature.

In 1872 a Bounty Bill was introduced in the territorial legislature offering a bonus or prize of $10,000 for the first corporation, person or persons "who shall erect a manufactory and refinery for the purpose of manufacturing sugar from beets at a cost of not less than $50,000, and with a capacity of producing two thousand pounds of sugar per day, and shall manufacture from beets grown within the limits of this territory at least two hundred barrels of good merchantable sugar." The measure was defeated by one vote.

Today there is hardly a plant in the state valued at less than a million dollars and the largest are capable of producing one million pounds of sugar every twenty-four hours during the beet slicing season. In annual taxes alone the industry returns to the people of the state nearly one hundred times the defeated bounty.

The first promotion company to be formed in Colorado for the purpose of building a beet sugar factory was launched in Denver on February 23, 1872. A subscription list for stock was started. Some of the names that appear on the list of incorporators are of interest to present day residents of the state. They were: Fred Z. Solomon, J. E. Bates, H. P. Bennett, M. N. Everitt, E. F. Hallack, W. G. Sprague, Geo. C. Schleier, Phil Trounstine, James Archer, Charles W. Perry, L. K. Perrin, H. G. Bond, Henry Crow, Jacob F. L. Schirmer and Peter Magnes.

The Colorado State Agricultural College was founded in 1879, and from its establishment at Fort Collins tests were conducted with various crops. These tests gave way in 1888 to research work by the Colorado Experiment Station established in that year in connection with the college.

Thereafter bulletins were issued regularly by the Agricultural Experiment station on sugar beet culture in Colorado. Farmers in the Arkansas Valley, in the San Luis Valley and on the Western Slope were acquainting themselves with the crop.

Finally a state sugar convention was held in Denver, March 26, 1892.
The Grand Junction Sugar Factory, first in Colorado, as it looked on completion in 1899.

At this convention a county organization was advised for encouragement of beet raising. C. H. Jennings of the Lehi, Utah, factory was among the speakers, also Peter Magnes who had been active now for over thirty years in urging sugar beet growing in Colorado.

Independent of these efforts on the Eastern Slope residents of Grand Junction were pushing for their own factory. The visits of Western Slope citizens to nearby factories in Utah and an exhaustive report on the Grand Island, Nebraska, factory by Mrs. C. E. Mitchell, wife of a Grand Junction druggist, encouraged the Western Slope to action. In 1897 the city was visited by "Tama Jim" Wilson, U. S. Secretary of Agriculture, who was enthusiastic on the subject of beet raising.

About this time Charles M. Cox, a promoter, became interested particularly in view of an offer made by the commissioners of Mesa county of a bonus of one per cent on the capital invested in a sugar beet factory in that county provided the cost of same should not be less than $350,000. This offer was afterwards increased to three per cent. Mr. Cox obtained the necessary pledges of beet acreage and interested capital in the project of factory construction.

On the eighth day of February, 1899, contracts for the Grand Junction factory were let by the Colorado Sugar Manufacturing Company of Grand Junction to E. H. Dyer & Company of Cleveland, Ohio. Incorporators of this original operating company loom large in the industrial and agricultural history of the state: John F. Campion, J. R. McKinnie, Charles Boettcher, Charles M. Cox, Charles E. Mitchell, and George W. Trimbell. On the Board of Directors, among others was J. J. Brown.
Into the 20-Ton Club by Rotation and Feeding

By ELMER ANDERSON, Fieldman

The following article is written to show what can be done on a farm in nine years if farmed in the proper manner. In 1919 Mr. Emanuel Weibert moved on this farm of 160 acres, located one-half mile north of Gill. At that time 100 acres was in sod, and the balance had been farmed two or three years to grain and beans, with no alfalfa.

When the slogan of "another ton per acre" was started, Mr. Weibert entered into the race wholeheartedly. He first instituted a program of feeding and rotation. The present plan of rotation is alfalfa three or four years, followed by potatoes, followed by two years of beets, manuring the ground for the second crop of beets, then to grain or beans. If beans are planted they are generally followed by a third crop of beets.

Secondly, he practices early planting and close supervision of the beet thinning. Mr. Weibert does all of the cultivation himself. He watches the crops very closely so that his irrigations are timely; he irrigates often and lightly.

The following table gives his acreage and yield the last five years:

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<tr>
<th>Year</th>
<th>Acres</th>
<th>Tons per Acre</th>
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<tbody>
<tr>
<td>1923</td>
<td>19.4</td>
<td>14.31</td>
</tr>
<tr>
<td>1924</td>
<td>42.4</td>
<td>12.31</td>
</tr>
<tr>
<td>*1925</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>35.4</td>
<td>17.69</td>
</tr>
<tr>
<td>1927</td>
<td>41.8</td>
<td>20.36</td>
</tr>
</tbody>
</table>

*No beets; lost on account of drought.

Mr. Weibert also practices utmost economy in harvesting his crop. He does not rush his harvesting; does all of his own hauling and does not get panicky over a storm, nor excited when some of the neighbors are finished. Last fall he and his son hauled the crop of 851 tons and they are well satisfied with its returns. He says he is planning to reach 25 tons per acre.

This 1928 Beet Seed Bed

By A. DETLEFSEN, Fieldman, Nebraska District

On heavy soils discing at the right time in the early spring is very essential to break up the top layer of soil and help eliminate air pockets caused by large clods and trash being turned under when the plowing is done.

Light soils can be handled in a satisfactory manner by using a sharp tooth harrow, well weighted down, and harrowing the land diagonally in opposite directions. Treatment of this nature will aid materially in placing this type of soil in good condition for plowing.

A good job of plowing is the next step and should be commenced as soon as soil and other conditions permit. Many farmers make the mistake of plowing the ground too wet. When in this condition it will not work down to a satisfactory seed bed. Plowing should be followed by thorough harrowing with a long tooth harrow, at least twice a day. I prefer weighting down the harrow and setting the teeth straight because in that way the clods will be pulverized more completely. This is important because plants cannot thrive in lumpy, poorly prepared soil.
The number of harrowings to be recommended depends on weather conditions but the ground should be sufficiently harrowed so as to pulverize the soil, and personally I consider the harrow one of the most important tools to be found on any beet growing farm.

To insure proper germination of seed and uniform distribution of water the field must be smooth and free from depressions. This can be accomplished by floating which will also help crush small clods that were left by the harrow. The float should be run once diagonally and once at right angles to the coming planting, and followed by a roller. Then follow with a small harrow ahead of the drill.

A seed bed well prepared is the foundation of a good crop.

Beet Yield on Fall and Spring Plowing Compared

By C. P. WIELAND, Fieldman, Nebraska District

Situated one mile west of Scottsbluff is the farm owned by Peter Koller. It is located near the North Platte river and for the most part is composed of that heavy alkali soil on which it is rather difficult to secure a stand of any crop. In 1925 eight acres were planted to beets for the third consecutive time. The results were just fair. A poor stand was mainly responsible for a yield of 11 tons per acre. In the spring of 1926 the land was double-disked and barley was seeded. The yield was about 75 bushels per acre.

During this time the land adjoining this piece was continuously cropped to beets, and each year fertilizer was applied rather liberally. In the fall of 1926, after much speculation and deliberation on the part of the farmer whether to plow or not to plow, the stubble land in the fall, he finally concluded to plow. The remainder of the acreage planted to beets was spring plowed. Beets were planted on both fall and spring plowing the same day.

On the Scottsbluff-Gering beet tour, September 7, 1927, this field was viewed by many farmers with interest. The difference was very noticeable, even to the last row of fall plowing and the first row of spring plowing. The fall plowing had almost a perfect germination stand resulting in an excellent thinned stand; much earlier, thriftier and better in every way. This could not be said of the spring plowing which showed a thinner stand and a poorer quality of beets.

The fall plowing yielded 16.6 tons and the spring plowing 13.3—a difference of 3.3 tons in favor of the fall plowing.

The action of frost and sunlight on fall-plowed land helps to put it in a condition which will permit the making of a better seed bed, an earlier planting, as well as securing a better germination stand. Personally I am in favor of fall plowing on much of this heavy soil. Evidently the impression that the beet tourists got at this particular stop caused several adjoining farmers to fall plow for their first time about one-third of their entire spring acreage.
Beets Tried on Nematode Field After 5 Years Out of Beets

By W. E. Outcalt, Fieldman

Sugar beet nematodes were first discovered in the Sterling district in 1922 on a farm near Merino. This farm had grown beets for a number of years, almost continuously on some fields. The land, however, had been well manured each year and up to the time the infestation was discovered had produced satisfactory yields, above the average for the locality. When discovered the nematode infestation had gained considerable headway and in places was very heavy.

After 1922 these infested fields were planted to other crops and no beets were raised on these fields until 1927. Two crops of corn and two crops of barley were grown on this land during the interval. Both corn and barley are resistant crops; i.e., they are not attacked by nor are they hosts of the sugar beet nematode. Consequently, this procedure was in accordance with recommendations for holding the nematode in check.

Two fields on this farm were planted to beets in 1927. These were given good care throughout the season and yielded an average of 11.84 tons per acre, which was .22 tons above the average for this dump. Considering that the growing season was not particularly favorable, this yield was quite satisfactory.

Throughout the season these beets had a good appearance. There were no bare spots in the field and little outward indications that the field was infested with nematode. However, a careful examination prior to harvest showed unmistakably that there were large numbers of nematode still remaining in these fields. While no "visible" damage could be seen on the beet crop this year, the number of nematodes in the soil was undoubtedly increased to the point where no further beet crops can be grown until the ground is again rotated to other crops.

The experience on this farm illustrates facts which have been proven repeatedly in other districts, namely:

1. That a 4-year rotation on badly infested land will reduce the nematodes in the soil so that a satisfactory crop of beets can be raised.

2. That this rotation will not completely rid the soil of nematodes. Consequently, after 1 crop of beets, resistant crop must again be raised.

3. That a systematic rotation should be started immediately on both infested and non-infested lands. In fact, it is imperative on non-infested lands.

Early irrigation improves both yield and per cent sugar in beets following alfalfa. As between two and four irrigations the larger number of irrigations, based on a survey of a score of fields last season, made an average yield nearly 4 tons per acre higher than the lesser irrigated fields.
HIGHEST YIELD GROWERS
IN OVID FACTORY DISTRICT

DOMINIE SANTERO
MEGEATH

ALEX LAMCREHT
JULESBURG

H. SKOGlund
BIG SPRINGS

PETER STRAUCH
KIMBALL

PHILLIP SCHREINER
HITT

FRANK STOCKHAM
SEDGWICK

CHRIST SCHMIDTLIEJ, JR.
DORSEY

J. M. ANDERSON
ADRIAN
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THROUGH
THE
LEAVES

FEEDING ON BEET TOPS

MARCH
1928

THE GREAT WESTERN SUGAR CO.
Higher Yields of Better Beets

By Asa C. Maxson

The formula for producing the well balanced crop that both grower and sugar company desire is:

Prepare seed beds early and thoroughly.

Plant early. Plant plenty of seed.

Cultivate thoroughly and as often as conditions require.

Block and thin early. Leave a 12 to 14-inch stand. Leave the big beet.

Irrigate to firm the seed bed if necessary. Irrigate up if necessary.

Irrigate as often as beets need water, regardless of size of beets or weather conditions. Irrigate lightly when beets are small.

Use lighter applications more frequently. Irrigate at least every two weeks during July and August unless heavy rains occur.

Force the growth during the early part of the season as much as possible especially on heavily manured land and alfalfa or sweet clover land.

Apply fertilizer where it will do least harm and most good.

Rotate properly.

Harvest the earliest beets first and late beets as late as conditions will permit.
A Statement on the Beet Contract

During the recent conferences on the 1928 beet contract, notwithstanding substantial progress toward a closer relationship between the co-operative associations and the sugar company and despite sincere efforts to reach an agreement, differences of opinion developed over the beet price. The company therefore feels that farmers and the public at large are entitled to a statement of its position.

Conditions in Sugar Industry

It is regrettable that conditions do not justify the company’s continuing the high minimum guarantee made in 1926 and 1927. Sugar from the 1928 beet crop will not be produced until next autumn and the bulk of the crop will not be sold until the year 1929. To forecast the market accurately during that distant period is obviously impossible, particularly since the situation is complicated by artificial restriction policies surrounding sugar production in foreign countries.

In the last two seasons Great Western growers enjoyed the highest guaranteed minimum payment for beets in the United States. Expectations of sugar content and beet price on which the guarantee was based did not materialize. As a result the company’s earnings have fallen below what is necessary to attract and keep capital in the business, to provide for expansion, and to continue the high character of service the company desires to provide. Maintenance of a sound financial condition and an adequate rate of income over a period of years are essential to payment of an attractive price to the farmer.

By reason of the high guaranteed payment of the last two seasons and an unusually low level of sugar prices the sliding scale embodied in the 1926 and 1927 contracts has not up to the present justified payments in excess of the $8.00 guarantee. When that scale was formulated in 1924 it provided for a division of the proceeds based upon the company’s operating results for the previous ten-year period. In adopting the scale the company then stated that later improvements in technical performance would be shared with

* $8.50 for the Billings-Lovell Districts.
growers. In the intervening four campaigns factory efficiency has been improved and this is reflected in the new sliding scale now offered.

The 1928 Beet Contract

The sliding scale has been increased in the 1928 beet contract, and the bonus for volume of sugar production has been retained. At sugar content and price levels likely to apply, the new scale is 33 to 58 cents per ton higher than the 1927 scale. Under no conditions will the contract pay less than \*$7.00\* and it embodies participating features for the growers better than ever before offered.

Based on the company's present extraction the new sliding scale gives the full equivalent of the "50-50" demand so often made in previous negotiations. With the bonus for volume the contract pays more than half of the sugar value, ranging up to fifty-four per cent. The production of a volume of beets sufficient to insure the application of the bonus is a factor which is very largely in the control of the growers themselves, and is easily attainable. Production in each of the three districts in the past two seasons has exceeded the quantity stipulated for the application of the full fifty cents per ton bonus.

To say that this contract will not pay more than the \*$7.00\* guarantee is to assume the most pessimistic view of the four controlling factors—harvested acreage, yield per acre, sugar content and price. While there is uncertainty as to any single one of these factors it is difficult to believe that they will all result unfavorably.

Better Understanding Reached on Some Issues

Reduction of the initial payment removed the necessity of a clause relating to lowering of the sugar tariff, and this provision was eliminated for 1928.

The report of a joint committee of the conference which prepared instructions for taking tare will be followed by the company. Appointment of check taremen to represent the growers has always been agreeable to the company as evidenced by provision therefor in past contracts. We feel that the employment of such taremen will remove many causes of misunderstanding.

Sentiment in the conferences was markedly in favor of restricting piling of beets until after October 15, to increase sugar content and tonnage and to reduce the large mutual loss of sugar occasioned by too rapid a rate of delivery in the harvest.

The company feels confident that with a little study of the new contract the growers will realize its unusual attractiveness, and that a large acreage will be grown. During the conference the company offered its most favorable terms, and any contract which provides for a higher basis of payment cannot be accepted.

\*$7.50 for the Billings-Lovell Districts.
A Well-Prepared Seed Bed.

Is Your Spring Work Early and Right?

By P. B. SMITH, Fort Morgan, Colo.

Some things bear repetition without becoming tiresome, and the matter of seed bed preparation is one of them.

Probably one of the most important, if not the most important thing concerning the proper handling of a seed bed is to be certain that it is well packed. By proper packing is not meant merely surface packing the soil but rather the firming to the full depth of plowing and the elimination of air pockets to this depth.

Three operations at one time on the same field—hauling manure, plowing, and harrowing.
Photo No. 1 shows a well prepared seed bed, properly packed with sufficient clods harrowed to the surface to prevent any ordinary danger of blowing. This seed bed is in ideal condition for planting beets. Most soils can be put in practically as good condition if handled at the right time and in the right way.

**Hauling Manure**

Without doubt, if the ground is not too wet, hauling direct from the feed yard and spreading it immediately on the ground ahead of the plow is the cheapest and safest method. In piling manure in the field sometime ahead of the plow, a great deal of its fertilizing value is lost. The odor commonly associated with manure piles comes from ammonia gas. This ammonia contains nitrogen which is the most valuable constituent in fertilizers and the chief element supplied by legumes, such as alfalfa and sweet clover. In a great many cases manure cannot be hauled and spread directly from the yard, but very often this does not hold true.

As soon as possible after spreading manure it should be turned under (see Photo No. 2). A common practice, which is an excellent one, is harrowing the plowed ground the same day it is plowed. A sharp toothed harrow makes a good packer but in Morgan county farmers are favoring the use of a weighted Campbell Packer or of a disc set straight immediately after the plow in order to firm the ground deep down under the surface.

They then follow up with the harrow (as shown in No. 3). If
the ground needs floating it can be done at this time and the soil can then be reharrowed, before planting. On especially light sandy soil probably the best time to float and level is previous to plowing. By following this scheme the seed bed can be left in rougher shape to prevent blowing than would be possible if the floating were done after plowing.

A few simple details such as discing before plowing and harrowing daily make possible an excellent seed bed and assure a good start for a good germination stand.

## Corn Sugar Trying to Force Its Way Into Sweet Society

The Corn Sugar Bill has again made its appearance in United States Congress. Once before it was defeated as an attempt to weaken the pure food laws of the country. It has re-entered the lists with the backing of corn belt interests, principally manufacturers of dextrose, (the principal ingredient of corn sugar.) Little reliance is placed on the theory that passage of the bill would afford any material relief to farmers who raise corn, although this is the argument advanced to catch the popular fancy.

The bill proposes to put corn sugar on a parity with beet and cane sugars when used in confectionery, frozen products, products of the bakery, meats or meat products. Ordinary sugar made from the cane or sugar beet need not be declared on a food label because everyone understands that sucrose is the agent used for sweetening purposes unless otherwise specified.

The absence of a declaration that the food product contained corn sugar would be equivalent to deception of consumers. The presence of corn sugar in a food product as a sweetening agent must now be stated on the label thereof. The bill proposes to make this no longer necessary.

Opponents of the bill claim that the effect of such a law would be the virtual abandonment of a basic principle of the pure food law, wholesale adulteration of food products with corn sugar, deception of consumers, possible injury to public health, all for the sake of the enrichment of a few manufacturers of corn sugar.

The present National Food and Drugs Act does not prohibit the use of corn sugar in foods which enter inter-state commerce. The present law does not restrict the manufacture or sale of corn sugar in any way; neither does it restrict its use as a sweetening or preserving agent of food products. It requires only that the presence of corn sugar in foods be declared on the label.

Dextrose or corn sugar is well known to be inferior to beet or cane sugar for ordinary household uses. It is not as sweet as ordinary sugar and in the manufacture of various food stuffs in the home dextrose has failed to gain the approval of the average housewife.
Early Preparation
Planting
Thinning
High Yields

A rudimentary principle of high beet yields is to plant as early as soil temperatures and preparation of a good seed bed permit.

The earliest practical preparation of their ground will put growers in a position to profit from early planting.

Normally March produces many days favorable for farm field work. Cloddy fields may now be rolled. The V-marks in old beet fields may be leveled. Early plowing where the soil is not too wet is advisable. On frozen ground manure may be hauled, to be spread just ahead of the disk and plow. Stubble land not disked last fall may be helped by early working.

Comparisons of beet yields in 1927 again establish the value of early planting—by which is meant April 5 to April 25, or as early as local conditions and experience make seeding advisable.

A survey of 67 farms, with 1,354 acres of beets, in a district which enjoyed normal spring weather last season developed the following:

<table>
<thead>
<tr>
<th>Average Yield Tons</th>
<th>Beets Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Finished Planting</td>
<td>Before April 10</td>
</tr>
<tr>
<td></td>
<td>April 10 to 24</td>
</tr>
<tr>
<td></td>
<td>After April 24</td>
</tr>
</tbody>
</table>

These farms, in the main, were above average in fertility and ability of growers. Similar surveys in previous years indicate like trends, the large areas embraced serving to equalize individual differences in fertility and cultural methods.

Early preparation of seed beds and early planting naturally lead to timely thinning and irrigation, also contributing to high yields.

The runner slow to start seldom finishes ahead.
Proof of Profit in Early Plowing for Beets

By H. S. VARNER, Loveland, Colorado

In the Loveland territory our records show that fall plowing, when properly done, and taken care of in the spring, produces from one to three—and even up to five—tons of beets more per acre than the average spring plowing. However, it is too late to fall plow for the 1928 crop, but we can approach it by plowing early in the spring.

Usually we find that the early plowing, even though done when the soil is a trifle too wet, will be put in pretty good shape by the little freezes that we have at night. The soil will mellow up and a firm, well-compacted seed bed can be secured. Whereas, on the late spring plowing, particularly if the soil is wet, the seed bed is cloddy and loose, filled with air pockets.

Last year in my district there were fifty growers who had an average yield better than 15 tons per acre, some yields ranging from 18 to 20 tons. In the same district there were ten growers whose yield was below 10 tons. Of the 15-ton class, 40% of the acreage was fall plowed and 60% was spring plowed. But, in every instance, the spring plowing was done early and a good seed bed was secured, which permitted early planting.

On the other hand, in the 10-ton class, nine out of the ten growers plowed late in the spring. The one grower's low yield was due to poor fertility of the soil. But the other nine can attribute their low tonnage almost entirely to the late spring plowing, because their ground was wet and no matter how much they harrowed and worked their fields they couldn't get away from the cloddy, open seed beds. The soil was put in a puddled condition and remained in poor condition all season.

In the neighborhood with these low yields we had the other growers with the same soil, same fertility, same cultivations, irrigations, etc., but harvesting from 15 to 20 tons per acre. Why? Because they plowed early and secured a seed bed that was suitable for beets.

"Measured by long periods of time it would seem to be impossible to maintain our soils without a liberal proportion of live stock and barnyard manure procured in some way for use on every farm.

"The farmers of America can buy enough nitrogen, phosphate and potash to get a soil analysis sufficient to produce a crop, but it will not be available for the crop unless there is sufficient moisture stored up by the humus in the soil."—A. E. Chamberlain.
Early Irrigation for Beet Land
By M. S. Clement, Sterling, Colorado

Why not plan to irrigate your beet field early this spring before planting time? This practice is tried by a few growers every year and the results are very gratifying.

The field can be plowed and roughly worked down, but it is not necessary to bring it to the condition of a finished seed bed. The irrigation will finish and firm the seed bed much better than any machine can. After the irrigation a little work on the surface will make an ideal condition for planting.

Most fields when plowed in the spring appear to have plenty of moisture—the furrows turning over moist and sometimes even wet. This condition is often deceptive and misleads the grower into believing that he has sufficient moisture to start and carry the crop through thinning.

This top soil moisture is of little value unless it is well-supplemented by a surplus of moisture in the sub-soil. The spring winds and sun soon deplete the top soil moisture and unless there is an abundance of moisture continually coming up from below, there will be considerable damage done to the small beets at this important stage in their lives.

The results of insufficient moisture are well known, such as poor germination, or none at all; loss of a good stand; slow growth, and heavy losses at thinning time. The results are often such that an early planted field in reality becomes a late field of beets.

Under most ditches there is an abundance of free water available early in the spring. Most of this water passes down the river and is lost to the Colorado farmer. By using the free water early in the spring on beet land, this water can be turned into a profit instead of a loss.

This practice would also make easier the water situation later on in the season, when the water supply is limited. Most of the ditches with river rights are either in shape or could be put in shape to run water a month earlier than they do, provided that there was a sufficient demand from the farmers for early water.

Plan to give your beet land an early irrigation this season.

Professor George Stewart of the Utah Agricultural College Experiment Station says: “If there are three weeks during which a farm operation may be done, the first week is considerably better than the second, and the second is much superior to the third.”
How Twenty Ton Yields Are Maintained

By W. C. McCARTY, Fieldman, Morrill, Nebraska

WOULDN'T YOU BE PROUD OF THIS RECORD?

<table>
<thead>
<tr>
<th>J. D. Bright</th>
<th>W. H. Bright</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Season</strong></td>
<td><strong>Acres</strong></td>
</tr>
<tr>
<td>1919</td>
<td>24.17</td>
</tr>
<tr>
<td>1920</td>
<td>29.79</td>
</tr>
<tr>
<td>1922</td>
<td>26.44</td>
</tr>
<tr>
<td>1924</td>
<td>20.60</td>
</tr>
<tr>
<td>Avg.</td>
<td>26.20</td>
</tr>
</tbody>
</table>

Averages of the Last 5 Years: 25.49, 21.794, 27.31, 20.645

Through nine years of good growing conditions and bad, early springs and late springs, web worms and leaf spot—

Through hails, frosts, and other setbacks—

Wouldn’t you be proud of an average yield of twenty tons per acre on from twenty to thirty acres of beets?

That is the achievement of J. D. Bright and W. H. Bright, growers for the Mitchell factory, who have adjoining farms of eighty acres each. Their land is good sandy loam. They follow a fixed rotation. They feed sheep or cattle every year—sometimes sheep and cattle.

Here are some of the other highlights of their farming practices:

Rotation of alfalfa, potatoes, beets two years, and small grain seeded to the alfalfa.

Thorough disking before and after fertilizing.

Plowing to a good depth all land to be planted to beets or potatoes.

Harrowing from three to five times.

Leveling, rolling, and more harrowing if necessary.

Always a good seed bed and plantings early and carefully done, never on land that is wet.

Careful cultivations when needed.

Supervision of hand labor; satisfied hand labor with good houses.

Deep irrigation ditches; re-ditching when necessary, water applied regardless of the calendar but whenever the beets need it.

Careful handling of beets at harvest time with the lowest possible shrink.
How to Start a Beet Crop on the Road to Higher Yields and Better Quality

BY ASA C. MAXSON

The critical period in the growth of a young sugar beet is from the time the seed begins to germinate until the first true leaves appear. During this time the nature of the seed bed has more influence than at any other.

A poorly prepared seed bed, one that is loose, cloddy or dry, retards the growth of the young beet. This weakens the seedling, makes it more easily attacked by parasites and disease and in general prevents the rapid normal development which marks the sturdy healthy young beet.

The old adage “The horse is made the first winter,” meaning that the care of the colt makes the horse, is just as true of a sugar beet. The seed bed makes the beet.

Seeding less than 18 or 20 pounds is very apt to result in poor stands, low yields and sugar per cent.

Studies made in growers' fields during 1916 and 1917 show that 20 pounds of seed produced 300 pounds of beets and 0.2 of 1 per cent sugar more than 14 pounds of seed produced. This increase in yield and returns was due to the better average stand secured when 20 pounds of seed were planted.

Delayed blocking and thinning interferes with the development of the plants left, removes moisture from the soil that the thinned stand should have, removes some plant food that the beets in the thinned stand may need to make the greatest tonnage, and increases the shock sustained by the beets left when the surplus beets are removed.

After the proper time for blocking and thinning, surplus beets become weeds. Their prompt removal is just as essential as the removal of lambs quarter, Russian thistles or pig weed.

Beets planted the same day and treated just alike with the exception of the blocking and thinning, were thinned at intervals of 6 days. They produced as follows:

<table>
<thead>
<tr>
<th>Blocked and Thinned</th>
<th>Yield T. per A.</th>
<th>% Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 16</td>
<td>16.17</td>
<td>18.95</td>
</tr>
<tr>
<td>June 22</td>
<td>15.58</td>
<td>18.81</td>
</tr>
<tr>
<td>June 28</td>
<td>14.79</td>
<td>18.53</td>
</tr>
</tbody>
</table>

Aim to leave a 12 to 14-inch stand wherever possible.

Wide stands increase the size of the individual beets. This is associated with a lowering of per cent sugar and if the spacing is wider than the optimum the yield is reduced also. For example, beets spaced 11 to 12 inches in 20-inch rows produced 15.30 tons per acre and 15.29 per cent sugar; beets spaced 15 to 16 inches produced 13.48 tons and 14.76 per cent sugar; and beets spaced 22-23 inches produced 11.87 tons per acre and 14.09 per cent sugar.
EXPERIMENTS in Pasturing Sweet Clover is the title of Bulletin 211, by Professor J. H. Shepperd of North Dakota Agricultural College, at Fargo. Farmers interested in the subject will profit by sending for this interesting and entertainingly-written pamphlet.

His conclusions are summarized here:

Earlier observations and the testimony of other men pointed to the belief that cattle would not eat sweet clover plants. Cattle must be starved somewhat for a few days to induce them to graze sweet clover. They began eating it fairly well after three days time with no other forage available.

Cattle crave other forage, possibly for variety, until the sweet clover reaches the blossoming stage of growth.

Bloating did not occur during the experiment. Out of 20 Northwest farm managers, 9 reported slight trouble from bloating. Their report covers observations, equivalent to 6,000 head of cattle for one season. Their evidence indicates that reasonable precaution against bloat should be taken.

Cattle grazing sweet clover ate the coarse heavy stems of blossoming sweet clover in preference to the leafy new growth. They also seemed to lose their insatiable desire for other forage when grazing blossoming and seed forming sweet clover plants.

In the 1921 trial, sweet clover produced high class beef. Three steers pastured 110 days on sweet clover made an average daily gain of 1.98 pounds per head.

In the 1923 trial, four steers pastured on sweet clover 95 days made an average daily gain of 1.86 pounds per day while two brome grass steers made 1.54 pounds gain per day. The 1921 steers grazed 8½ hours per day, loafed 3½ to 4½ hours, ruminated (chewed the cud) from 5½ to 8½ hours and slept from 3½ to 5½ hours in 24 hours.

Measuring the trampling effect of a horse and rider during 45 days of trampling is a calculated approach to standard pasture trampling. Loss from trampling sweet clover was a little less than one-third (30 per cent) of the growth of dry matter. The loss from similarly trampling brome grass was two-fifths or 44 per cent.

Taking the dry matter secured from five clippings during the season as the basic figure we found:

Four clippings yielded an increase of 39.3 per cent.
Two clippings yielded an increase of 82.4 per cent.
One clipping, following 55 days' growth gave an increase of 249.3 per cent.
One clipping, following 78 days growth gave an increase of 276.3 per cent.

Sweet clover and brome grass were grazed at the rate of two steers per acre. The sweet clover carried the load; the brome grass was overstocked at least twenty-five per cent.

Honey bees increase the yield of sweet clover seed over one hundred per cent and by that means probably improve its pasture value. Scout bees locate suitable honey sources and transmit the information to the swarm by means of a "bienen ballet" or bee dance.
VII. Standard Beet By-Product Rations for Fattening Live Stock (Lambs)

By E. J. MAYNARD

In Charge of Animal Investigations, Colorado Agricultural College

In fattening lambs, beet tops are pastured in the field or hauled and fed in dry lot. Alfalfa hay has been the principal supplementary feed used. This combination has been justified where tops and hay were comparatively low in price and where additional growth was desired on lambs.

With the present tendency toward the production of larger feeder lambs, a better balanced beet top ration is often needed to produce the quick finish desired with the least amount of accompanying growth. The addition of grain such as corn or barley to a beet top-alfalfa ration usually increases gain and reduces the cost of gain.

The wet beet pulp, grain and alfalfa combination seems to be the present standard beet by-product ration for fattening lambs in northern Colorado. The succulence added by the wet pulp increases gains and simplifies the fattening operation by eliminating digestive disturbances and some death loss.

An average of six feeding trials at the Colorado Agricultural Experiment Station shows that a daily ration of 1 pound of grain, 3.7 pounds of wet pulp and 1.9 pounds of alfalfa produced slightly heavier gains than a ration of 1 pound of corn and 2.3 pounds of alfalfa hay.

Wet pulp reduced the hay consumption materially in these trials. The final results showed that each ton of wet beet pulp fed replaced 115 lbs. of shelled corn and 358 lbs. of alfalfa or at existing prices each ton of wet pulp showed a feed replacement value of $3.52.
Where wet beet pulp is available, it can be used to good advantage in fattening lambs. Pulp-fed lambs are eagerly bought at market, the grain feed of course being necessary to produce good finish and dressing per cent.

Beet molasses when available may be used to advantage to increase gains and decrease costs of gain in fattening lambs. It is usually fed at the rate of three-tenths of a pound per head along with grain and alfalfa. Because of its palatability, it has shown a higher actual feeding value than the nutrients it contains might warrant.

In a three year comparison at the Colorado Agricultural Experiment Station, it was found that each ton of beet molasses fed to lambs replaced 1183 pounds of corn and 2044 pounds of alfalfa. The beet molasses actually showed 93.2%, the feeding value of corn, or at present prices, had a feed replacement value of $27.97 per ton.

It is easy to see why molasses is such a desirable ingredient in commercial feed mixtures. Comparisons of beet and cane molasses indicate practically equal feed values. Beet molasses is usually handled in coal hods and is poured along the grain troughs before the grain is spread. Then the lambs with each mouthful of grain get only a small amount of molasses. It is best to start with one-tenth of a pound working up to one-fourth of a pound in about 15 to 20 days, and reaching a maximum feed of one-half pound of molasses in from 30 to 40 days.

Lambs can stand a fairly heavy feed of molasses if it is not introduced too suddenly into the ration.

**DRIED MOLASSES BEET PULP** has shown a much higher feeding value than the nutrients it contains might warrant.
value when fed along with grain or ensilage, than it seems to have when fed as the only carbohydrate feed. When fed alone it showed only 75% the feeding value of corn while fed with corn, it showed 96.5% the value of corn.

A four year comparison of rations at the Colorado Agricultural Experiment Station showed that when dried molasses pulp was mixed, equal parts with corn, each ton of dried molasses pulp fed replaced 1774 pounds of corn and 549 pounds of alfalfa or at present prices had a feed replacement value of $29.35 per ton.

Dried molasses pulp has seemed very effective in stopping digestive troubles when lambs have gone “off feed” as a result of too heavy a grain ration. It gives best results mixed equal parts by weight with corn.

SUGAR BEET BY-PRODUCTS in lamb fattening rations help to cheapen production costs in northern Colorado and provide a means whereby the Colorado lamb feeder may successfully compete with cornbelt feeders in cost of gain produced.

The Proof of Early Planting

In a survey of 2150 acres of beets, fifty per cent of which were planted by April 30 and all of which were planted by May 15, yields from the early plantings averaged 16.7 tons per acre, compared with 13.6 tons from the later plantings. Here was a difference of 3.1 tons per acre merely caused by an average difference of two to three weeks in planting.
Preachments nor laws make landowners better farmers. Resort in the final analysis must be made to the good judgment and the selfish interest of the landlord. In that spirit we address

**You, Mr. Landlord:**

Crop shares form the prevailing basis of farm rents in these beet-growing districts. It is the type of tenantry in which the landlord has a direct interest and responsibility in the farm management. The larger the crop the greater the landlord's return.

When yields decline renter and owner become dissatisfied. And if other things remain the same the rent and the price of the land decline. The tenant accuses the landlord of having infertile land; the landlord censures the tenant for poor farming.

The **highest long-time average returns come to tenants and owners who follow a definite cropping rotation that will maintain or increase yields.** When both sides exploit the soil for the **highest present return regardless of the future effect on crop yields, they are heading for trouble.**

Who are the most successful farm land owners in your neighborhood? Aren't they closely supervising their tenants; establishing a definite rotation plan on the farms; seeing that planting, cultivation, and irrigation are performed timely; striving to feed some stock and produce some fertilizer every season; watchful that improvements on the place are kept in good repair.

**The eye of the master is good for the land**
Seven Tons Per Acre Difference in Yield Due to Difference in Landlords

The feed lots on a farm where partnership feeding of livestock between the landowner and tenant is a yearly practice. The average annual yield of beets on this farm for the last four years has been 16.49 tons per acre on an average 59 acres harvested each year.

Buildings on a soil-impoverished farm where little rotation is practiced and no livestock feeding is done. The average beet yield on this farm for the last four years was only 9.16 tons per acre on an average of 72 acres harvested yearly.
A Landlord-Tenant Feeding Partnership

By LYMAN ANDREWS

On the opposite page pictures are shown of improvements on two tenant-operated farms in beet growing territory. Both landlords are residents of the district. Absenteeism does not enter into the difference in the appearance of the farms.

The eighty-acre farm which has the feedlot and modern, well-maintained improvements is owned by John B. Cook. The average gross return per acre of beet land on Mr. Cook's farm in the last four years has been $106.37. On the other farm, of 160 acres, the yearly gross return from beets has been $67.25 per acre for corresponding seasons. The eighty acre farm maintains a seventy-five per cent acreage in beets; the other less than fifty per cent. This high ratio of beets has been possible only as the result of the manure production.

For the excellent yields of beets on the Cook place the tenant during this four year period, Wm. Schwartzkopf, deserves a share of the credit. At the present time a new tenant is in charge, M. O. Andrews, and Mr. Cook's partnership arrangement for feeding may interest other farmers.

The landowner furnishes the capital for the sheep or cattle, and pays for the feed. The tenant furnishes the labor. In effect, Mr. Cook pays the renter for the tenant's share of the beet tops, alfalfa hay, and grain, at current prices, in addition to purchasing all necessary additional feed such as cotton cake, wet or dry pulp. The tenant must haul all beet tops, alfalfa hay and the wet or dry pulp to the feedlot and feed them.

The profit, if any, after deducting the initial cost of the livestock, the interest and feed bills, is divided equally between the landowner and the tenant.

All fertilizer from the feeding operation is hauled by the tenant and applied to the land.

Sweet Clover Plowed at the Wrong Time

By HOWARD RIENKS, Kersey, Colo.

In the latter part of November and early December, 1926, a field of sweet clover was plowed under. It was a good job of plowing, but at the wrong time. By the latter part of March, 1927, the field showed promise of an excellent crop of sweet clover. The grower then procured an alfalfa renovator and worked the surface of the field until no growing clover was in evidence and planted beets. However, the clover again came up, making it impossible to cultivate or thin beets.

The field was then plowed, harrowed, floated, harrowed and replanted. These operations were completed about May 15. The seed bed was very cloddy and contained many clover roots. The result was a very uneven stand, averaging 57 beets per hundred feet. The harvest was 14.26 tons per acre.

The cost of the extra work done on this field might be figured but the cost to the grower in loss of tonnage is merely a guess. Figured on basis of tonnage produced on 57% stand, a 90% stand would have yielded over 21 tons per acre, or $56.00 per acre lost through plowing sweet clover at the wrong time. It should have been plowed in late August or early September.
Renter and Owner Co-operated for Better Farming

By ELMER ANDERSON, Eaton, Colorado

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres</th>
<th>Avg. Yld. Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>25</td>
<td>8.66 tons</td>
</tr>
<tr>
<td>1921</td>
<td>30</td>
<td>13.7 tons</td>
</tr>
<tr>
<td>1922</td>
<td>29</td>
<td>6 tons</td>
</tr>
<tr>
<td>1923</td>
<td>29</td>
<td>13½ tons</td>
</tr>
<tr>
<td>1924</td>
<td>38</td>
<td>9.68 tons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres</th>
<th>Avg. Yld. Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>7½</td>
<td>16.23 tons</td>
</tr>
<tr>
<td>1926</td>
<td>31</td>
<td>13.68 tons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Hailed August 8)</td>
</tr>
<tr>
<td>1927</td>
<td>33½</td>
<td>17½ tons</td>
</tr>
</tbody>
</table>

Until three years ago there had been no feeding operations on this farm. Now the wet pulp is shipped from the Fort Collins factory and si­loed on the farm.

The silo was built by the tenant, Mr. Chris Poulson; the material was furnished by the landowner, Mr. H. H. Croll of Greeley. The owner is not interested financially in the feed­ing operations, but believing that re­turns from crops will be bettered by the manure produced he was glad to provide facilities for feeding.
The landlord also built a good cow barn on the farm. Dairying is also being conducted on this place, 20 head of Holsteins making up the present herd. The milk checks are averaging $150 monthly. Mr. Poulson has operated the farm in the last three years.

He has 93 head of cattle on feed this winter. After pasturing them on beet tops for a month following their arrival in November, Mr. Poulson put the cattle into the feedlot, and their ration at the time this was written consisted of:

- 4 tons of pulp.
- 150 pounds of Purina Steet Fatina.
- 500 pounds alfalfa.
- 400 pounds ground corn.

The corn is fed with the first load of pulp in the morning. Fatina is fed with the second load of pulp at noon. A tank of molasses and a heater, to which molasses the cattle have free access, are included in the equipment.

Nine cars of wet pulp were shipped from Fort Collins and hauled to the farm silo. It is built in a side hill which was hollowed out for the pit. Floors and sides consist of 2-inch planks. Posts, 10 feet apart, are creosoted. The silo is 36 feet long, 24 feet wide, and 7 feet deep. The nine cars, containing 468 tons of pulp, well filled the silo.

Spring Plowing and Seed Bed Preparation

By R. M. BARR, Longmont, Colorado

If the weather remains open through March, do not lose a day in land preparation. Experience proves that late work means poor crops. Have as near 100 per cent of your land prepared and ready for crop seeding before April 1st as possible.

I hope the growers realize the actual meaning of this in dollars and cents, for if they do a real effort to accomplish the preparation of their land this month will result.

To spring plow stubble land that has not been touched in any way since harvest, disk and harrow it before plowing. The stubble will be mixed with the soil so that there will be no air-pockets to interfere with the rooting of the new crop. If you have manure to spread, spread and disk it before plowing, and follow your plowing with the harrow every day.

Use a long toothed harrow for this purpose and run it as straight as possible as the deeper you run it the more you compact the soil underneath. With a 2 inch or 3 inch mulch on the surface you hold moisture with least evaporation.

By delaying plowing to April in the average season you run into April rains, and then our heavy soils cannot be properly plowed or prepared. It may be that some day improperly prepared land will not be accepted for beet culture, as it is a source of trouble throughout entire season to all concerned.

If for any reason you have to plow in April, do not plow wet land or your troubles will begin. Should it be necessary on account of climatic conditions to plow rather wet, do not seed it to beets before your fieldman inspects the seed bed.
Up Each Year

Main Factors in Increasing Yields

By E. S. WILLIS, Loveland, Colo.

It is not uncommon to hear of unusually good yields of beets on many farms each year throughout the Great Western territory, but it is always of interest to hear of men who have increased their yields each year and how.

Three very good farmers in the Loveland territory—Con Lebsack, Jr., on one of George Lee’s farms; N. H. Early, on his own place, and C. C. Hendershott on his place—have made real strides in both increasing and keeping up a good average tonnage for the past few years. In the following figures note that the high yields were obtained on fairly large acreage.

**CON LEBSACK, Jr.—**

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres Harvested</th>
<th>Tons per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>38.50</td>
<td>18.69</td>
</tr>
<tr>
<td>1927</td>
<td>46.50</td>
<td>19.83</td>
</tr>
</tbody>
</table>

**N. H. EARLY—**

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres Harvested</th>
<th>Tons per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>46.24</td>
<td>11.00</td>
</tr>
<tr>
<td>1925</td>
<td>Dry Year</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>70.00</td>
<td>18.27</td>
</tr>
<tr>
<td>1927</td>
<td>37.33</td>
<td>18.62</td>
</tr>
</tbody>
</table>

**C. C. HENDERSHOTT—**

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres Harvested</th>
<th>Tons per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>76.59</td>
<td>14.21</td>
</tr>
<tr>
<td>1925</td>
<td>Dry Year</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>61.34</td>
<td>16.16</td>
</tr>
<tr>
<td>1927</td>
<td>52.43</td>
<td>18.01</td>
</tr>
</tbody>
</table>

There are several things to be considered in raising a beet crop, among which “strength of soil” and preparation of seed bed are important. Their fall plowed and manured percentages of beet ground show that they realize the importance of a good seed bed:
CON LEBSACK, Jr.—

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres Fall Plowed</th>
<th>Acres Manured</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>59%</td>
<td>100%</td>
</tr>
<tr>
<td>1927</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

N. H. EARLY—

<table>
<thead>
<tr>
<th>Year</th>
<th>Manure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>None</td>
<td>Dry Year</td>
</tr>
<tr>
<td>1925</td>
<td></td>
<td>Dry Year</td>
</tr>
<tr>
<td>1926</td>
<td>64.2%</td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

C. C. HENDERSHOTT—

<table>
<thead>
<tr>
<th>Year</th>
<th>Manure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>58.2%</td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td></td>
<td>Dry Year</td>
</tr>
<tr>
<td>1926</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>89%</td>
<td></td>
</tr>
</tbody>
</table>

All three men feed sheep and cattle on their places.

I also credit them with managerial ability as they give their seed beds good preparation, thorough and timely cultivations, thorough and timely irrigations, and supervise the beet work done by their laborers.

The Root Rot of Alfalfa

By DR. L. W. DURRELL, Colorado Agricultural College

During the last few years alfalfa has been subject to dying out in many fields in the state. The disease causing this injury was discovered in Iowa in 1923, says Dr. Durrell of the Colorado Agricultural College and since has been found in most of the alfalfa growing states.

The dying of the alfalfa plant is the result of a plugging up of the water tubes in the roots by a yellow brown gum. The disease is not to be confused with the common rotting of the crown found in old plants.

The water ducts are partly stopped up by this gum; the plants wilt and do not manufacture and store enough food to start a strong growth the following year. In a few seasons this performance results in death of the plant.

Alfalfa plants are seldom attacked by the disease before they are three years old. A cut through the diseased roots after that time reveals a ring or rings of yellow or brown, showing where the brown gum has been deposited in the water tubes of the roots. The diseased plants occur in small patches, or singly, and after several years the continued injury may practically destroy a field.

The government workers in the Department of Agriculture claim that a bacterium is responsible for the plugging of the roots. However, it has been found by others that a similar stoppage of the roots can be produced by soil salts.

There seems to be a definite relation of the disease to water as badly diseased spots occur where water has stood or where night runs have been made.

No cure or treatment has as yet been found though there is some hope of resistant varieties not subject to the disease.
This Test Proved Fall-Plowing of Sweet Clover Gave Higher Beet Yield in Following Year

By J. S. Rice, Fieldman, Nebraska District

We hear discussions on the proper time to plow sweet clover. Some favor spring, when the clover is about 8 inches high; others plow in the fall.

H. R. Schmunk, who owns a farm in the Mitchell Valley, had a 29-acre field in sweet clover. Last fall he plowed half of this field and the remainder he plowed in the spring. Both fall-plowed and spring-plowed ground were worked the same, harrowed twice, rolled, floated and planted within two days of each other.

Beets on the fall-plowed land were a better stand and came up much quicker than on the spring-plowed land.

Fall plowing eliminated the cut worms. The worms were working pretty badly on the spring-plowed ground, decreasing the stand materially. Replanting was necessary on about 5 acres. All through the summer, the fall-plowed portion of the field was by far the best in appearance.

In harvesting, there was three tons difference in favor of the fall-plowed land. It went 18 tons and the spring-plowed 15 tons.

Mr. Schmunk's farm is a new farm under the South Government ditch. It has been under irrigation for three years. His beet crop averaged 15.78 tons per acre on 81.76 acres.

Feed yards of Henry Schmunk where fertilizer is produced to increase yields, in addition to the use of sweet clover in the rotation.
Partners with the Soil

To Landlords and Tenants:

You are bent on making the most money out of your farms. Land speculation aside your success depends upon crop yields, other factors being equal or uncontrollable.

On what depend crop yields? Primarily upon soil fertility. There are three main causes of unproductive soils:

1—those of a physical nature—poor tilth, poor supply of organic matter, poor regulation of water supply.

2—some chemical lack or condition—a deficiency in potassium, nitrogen, or phosphorus; alkali, acidity or sourness.

3—biological causes—disease, absence of useful bacteria.

By rotation and manuring these conditions may be met, your soil's productive powers may be improved. Four thousand years of farming in China prove it. The valleys adjacent to Athens are producing larger yields today than in the time of Socrates. In Europe soils which have been producing crops for two thousand years are now more productive.

The soil is your silent partner. It wants only intelligent handling to bring you greater returns.

Its bounty is in your hands. The way a soil is handled, the way the crops are arranged, the way the soil is fed to maintain fertility determines its bounty.

God made the soil. Be worthy of such a partner.
WHICH OF THESE TWO FARM LAYOUTS HAS THE BETTER LANDLORD?

AS THE LANDLORD IS SO IS THE TENANT, IN THE LONG RUN.
Absenteeism—
Land Speculation—
Tenant Turnover—

THORNS IN THE SIDE OF ROTATION

Latest figures available show that in 1925 tenants were 38.6 per cent of the total number of farm operators in the United States.

In these beet-growing districts the percentage of tenants is much greater, about two-thirds of the beet acreage being farmed by renters.

Over nine-tenths of the rented farms in the United States are owned by landlords who live in the county or in adjoining counties. Surveys made in the west, however, show as many as one-third of the rented farms owned by absentees, men residing out of the county in which their lands are located.

If such owners are represented locally by energetic, competent agents, the situation with respect to establishing a profitable rotation on the farm is not a serious one. The real difficulty appears on a farm owned for speculative purposes by a non-resident unfamiliar with the proven profitable farming methods in the locality.

Merely from ordinary observation aren't you convinced that the most valuable landlords in a community are men who regard their land as an investment, not as a speculation. They do not make short-time leases primarily with the idea of selling the land. Their tenants, if satisfactory, have a reasonable assurance of permanency.

Perhaps the situation carries its own correctives. At present prices of land, tenants and owners are compelled to look more and more to good farm management for fair returns. If the absentee landlord and annual change of tenant combination is satisfactory to owner and renter the rest of us haven't much cause to concern ourselves over their condition. And if not satisfactory the first to seek a cure should be the landlord.

Where farms are being conducted by owner-speculators and new tenants each season, with income insufficient to warrant outlays for improvements on the landlord's part and paying the tenant day laborer's wages or less, the result is well known to neighboring farmers. The place is "run down." The soil is robbed. Frequently some neighbor who knows what the farm could do if properly handled buys it at a bargain from the speculator-owner after he has tired of waiting for a land boom.

Beet-growing districts are developing a number of outstanding successes among good farmers who have acquired many parcels of land, who devote most of their time to managing these properties, feeding cattle and sheep, and who take pride in the high yields of all crops grown in the rotation.

A FARM IS JUST AS BIG AS ITS FERTILITY.
—Eugene Davenport.
What Produces High Yields?
By E. Ward, Jr.

During the 1927 beet harvest, the average weight of beets was again determined, which enables us to calculate the stand on each beet contract. In one Colorado factory district, by grouping all contracts into classes according to per cent stand and obtaining the average yield in each stand-class we find:

<table>
<thead>
<tr>
<th>Per Cent Stand</th>
<th>Yield in Tons per A.</th>
<th>Weight of Beets in Ozs.</th>
<th>Range of Yield Tons per A.</th>
<th>Range of Weight of Beets in Ozs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 to 39</td>
<td>7.97</td>
<td>27.3</td>
<td>3.12 to 11.03</td>
<td>10.7 to 37.7</td>
</tr>
<tr>
<td>40 to 49</td>
<td>10.22</td>
<td>27.5</td>
<td>5.25 to 14.99</td>
<td>14.1 to 40.3</td>
</tr>
<tr>
<td>50 to 59</td>
<td>12.16</td>
<td>27.2</td>
<td>6.45 to 17.05</td>
<td>14.5 to 38.2</td>
</tr>
<tr>
<td>60 to 69</td>
<td>13.50</td>
<td>25.7</td>
<td>8.62 to 18.40</td>
<td>16.4 to 35.0</td>
</tr>
<tr>
<td>70 to 79</td>
<td>14.74</td>
<td>24.5</td>
<td>9.77 to 19.55</td>
<td>16.3 to 32.5</td>
</tr>
<tr>
<td>80 to 89</td>
<td>15.35</td>
<td>22.5</td>
<td>11.81 to 19.03</td>
<td>17.3 to 27.8</td>
</tr>
<tr>
<td>90 to 99</td>
<td>17.59</td>
<td>22.9</td>
<td>13.40 to 20.78</td>
<td>17.5 to 27.1</td>
</tr>
<tr>
<td>100 or more</td>
<td>18.51</td>
<td>22.7</td>
<td>14.24 to 21.53</td>
<td>17.5 to 26.4</td>
</tr>
</tbody>
</table>

*Per cent stand is number of beets per 100 feet of row.

To explain the table let us look at the results in the “60 to 69 Per Cent Stand” class. We find that the average yield of all contracts showing from 60 to 69 per cent stand was 13.50 tons per acre and that the average beet weighed 25.7 ounces, or 1.6 pounds. However, the actual yields in this class ranged from a minimum of 8.62 tons per acre to a maximum of 18.40 tons per acre, due to the fact that the weights of the beets ranged from 16.4 ounces to 35 ounces.

The value of a good stand is self evident, but a study of the above table showing the ranges of yields and weights of beets in each stand class brings out clearly the importance of the soil fertility factor in producing high yields.

Given an excellent unthinned stand to work on, your beet help can leave you a good thinned stand; but a high yield is not assured unless the soil has sufficient plant food in it to produce large average beets.

Soil fertility conserved by crop rotation and manuring, together with proper cultural methods and sufficient irrigation water, if combined with good stands, produces the high yields.
SUGGESTIONS

The next few pages contain specific rotation programs for some of the factory districts in Great Western territory.

It is impossible to prescribe general cropping schemes applicable to each individual farm.
The problem of a crop rotation has to be worked out for almost every individual case if the needs of the farm, the tenant, and the landlord are to be suited.

These rotations, however, have been found practical in a large number of cases in each district.

If you are not satisfied with your present cropping system or if your sequence has been haphazard in previous years, consult your Fieldman and your Agricultural Superintendent. They are desirous of helping each grower with his individual problems.
5-Year and 7-Year Rotations for Brighton District

By C. F. JOHNSON, Brighton, Colorado

We do not have farmers that follow the rotations exactly as given below but many come as close to these as they can. Often when seeding alfalfa some farmers may fail to get a stand and thus the specific rotation may be interrupted for a time. Or a farmer may be inclined to grow for a season too large an acreage of a particular crop that he expects to bring a high price. However, the rotations outlined work nicely into the cropping systems in the Brighton territory, as a general rule.

7-Year Rotation

<table>
<thead>
<tr>
<th>Year</th>
<th>Field No. 1</th>
<th>Field No. 2</th>
<th>Field No. 3</th>
<th>Field No. 4</th>
<th>Field No. 5</th>
<th>Field No. 6</th>
<th>Field No. 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927</td>
<td>Alfalfa</td>
<td>Alfalfa</td>
<td>Alfalfa</td>
<td>Grain or Garden Truck</td>
<td>Beets</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
</tr>
<tr>
<td>1928</td>
<td>Alfalfa</td>
<td>Alfalfa</td>
<td>Grain or Garden Truck</td>
<td>Beets</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>Alfalfa</td>
<td>Grain or Garden Truck</td>
<td>Beets</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>Grain or Garden Truck</td>
<td>Beets</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>Beets</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932</td>
<td>Manure Beets</td>
<td>Grain and Alfalfa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1933</td>
<td>Grain and Alfalfa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(In the spaces marked “Grain or Garden Truck,” can be substituted the following: Corn, Beans or Potatoes.)

5-Year Rotation

<table>
<thead>
<tr>
<th>Year</th>
<th>Field No. 1</th>
<th>Field No. 2</th>
<th>Field No. 3</th>
<th>Field No. 4</th>
<th>Field No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927</td>
<td>Grain and Sweet Clover</td>
<td>Beets</td>
<td>Manured Garden Truck Beets</td>
<td>Manured Beets</td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>Sweet Clover Pasture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>Beets Garden Truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>Garden Truck Manured Beets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>Manured Beets Grain and Sweet Clover Pasture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(In the space marked “Garden Truck” can be substituted the following: Any kind of grain, potatoes or beans.)

If there is nematode on your farm your beet rotation is a special problem. The rotation fitted for uninfested soil will NOT serve the field which has the sugar-beet nematode. Beets should not be grown on such land more often than once in four years.
Suit the Rotation to the Farm and the Farmer

By A. H. HELDT, Scottsbluff, Nebraska

I propose below two rotations, both practical for most sections in the North Platte Valley of western Nebraska. But it is difficult, if not altogether inadvisable, to accept any cut-and-dried rotation plan constructed on general principles and apply it to a specific farm. One must consider the lay of the land, soil conditions, farmer's ability and inclinations, etc. Weather conditions sometimes upset a farmer's plans, and other crops must be substituted for a season or two.

Number 1—Sweet Clover Rotation:
- Barley seeded to sweet clover.
- Sweet clover pastured the second year and fall plowed.
- Corn or Potatoes.
- Beets 2 years (manured the second season).

Number 2—Potato Rotation:
- Barley seeded with alfalfa.
- Alfalfa three years.
- Potatoes.
- Beets 2 years (manured second year).

When a farmer has enough dairy cows, sweet clover should be rotated to provide pasture for the cows. Some farmers are not dairymen but like to raise potatoes. They should include potatoes and alfalfa, but not sweet clover. Rotation Number 1 is a good combination with dairy cows, the corn also furnishing silage. Some farmers may prefer to add alfalfa to that rotation. Beets should follow corn. Never follow beets with corn. Potatoes are a gamble. The dairy cattle and beets combination is especially practical for this valley.

Three Good Rotations for Windsor District

By E. C. WALTER, Windsor, Colorado

(Basis 160 acres cultivated land)

6 YEARS
- Small-grain and alfalfa.
- Alfalfa 3 years.
- Potatoes.
- Beets.

8 YEARS
- (Beans might be added in a seventh year, in the above rotation or beets, manured).

6 YEARS
- Grain seeded with alfalfa.
- Alfalfa 2 years.
- Beets.
- Grain, stubble manured and land fall-plowed.
- Beets, then returning to grain and alfalfa.

Rotations that bring beets into the cycle oftener than once in four years are not suited to farms infested with the sugar-beet nematode. The rotations cited in these pages for normal undiseased soils are not to be confused with rotations required for nematode ground.
Avoiding Hit-and-Miss Cropping by Rotations in the Bayard-Minatare Districts

By A. M. GINN

In the Bayard and Minatare districts of Nebraska's North Platte Valley potatoes are not grown to any great extent. But the quality and nature of the soil are such that there is no real reason why potatoes should not prove practical.

Up to recent years little corn was grown in this section. But the farmers are beginning to realize that corn is a suitable crop hereabouts, particularly with a gradual increase in the number of hogs raised. It seems feasible to consider including both corn and potatoes in a well-balanced cropping system in this territory, depending upon the soil and the wishes of each individual farmer.

In two rotations I will suggest one includes sweet clover. Its merit for rebuilding soils is unquestioned. However, it has been my observation that there are difficulties to be encountered in handling sweet clover for only one season. The most beneficial use of sweet clover is realized where it is pastured the second year and fall-plowed prior to the planting of a cultivated crop. Some beet raisers are not equipped to handle sweet clover in this manner because they have not sufficient livestock to justify the use of valuable land for pasture. And in trying to get a satisfactory stand of beets on one-year sweet clover they encounter discouraging results in some seasons. In general, therefore, I am disposed to favor a rotation including alfalfa rather than sweet clover for those who are not prepared to pasture sweet clover.

Rotation 1
Alfalfa with barley as a nurse crop.
Alfalfa in two or three years, preferably three.
Potatoes or corn.
Beets without manure.
Beets manured.

Rotation 2
Sweet clover with barley as a nurse crop.
Sweet clover pastured and fall-plowed in second season.
Potatoes or corn.
Beets without manure.
Beets manured.

Logan County in Need of Rotation

By J. R. MASON, Sterling, Colorado

There is little systematic rotation in this territory. With this in mind the agricultural department suggests two rotations which would be satisfactory for a large part of our district, but not necessarily for each farm.
Number 1—Seven Years:
Alfalfa 3 years.
Potatoes or small-grain, depending upon whether the soil is adapted to potatoes and whether the grower cares for this crop.
Beets 2 years (manured the second year).
Barley seeded to alfalfa.

Number 2—Four Years:
Barley seeded to sweet clover.
Sweet clover pastured or for seed.
Beets 2 years (manured the second year).
SYSTEMATIC cropping is gaining in favor with farmers of the Big Horn Basin. The principal products grown are alfalfa, sweet clover, beets, beans, potatoes and small grain. Potatoes are grown extensively only in the Powell district. Wheat is most favored around Powell, while barley is the choice elsewhere.

In general two outstanding rotations are being practiced by successful farmers. One is a short four-year plan including sweet clover; the other, a 7-year rotation with alfalfa.

7-Year Rotation:
Alfalfa 3 years.
Beans or potatoes 1 year.
Beets 2 years (manured second year).
Grain with alfalfa.

4-Year Rotation:
Grain with sweet clover 1 year.
Sweet clover pastured or for hay, and plowed under in the fall, 1 year.
Beets 2 years.

M. P. McLaughlin of Powell, who has sheep on his farm the year round, has increased his beet yield 5 tons per acre by plowing sweet clover pasture in the fall for beets the following year.

G. Kagi of Powell has eliminated alfalfa entirely from his cropping system. He grows grain with sweet clover one year, cuts a crop of hay the following season, and plows under a heavy growth of clover that fall. He follows with potatoes, then with beets. His beet yields are uniformly high.

J. H. Montgomery of Manderson has systematically rotated alfalfa, beets, beans, and barley on his 480-acre farm for years. From 137 acres of beets last season he averaged 17.32 tons per acre, proof that his rotation succeeds. Mr. Montgomery supplements his cropping system with farm-feeding each year.

Edgar Swallow, operating two farms in the Powell district, is using both the long and the short rotation in connection with his farm flock of sheep and his lamb-feeding operations. His yields are steadily increasing.

Morgan County Rotations

By H. C. GIESE, Brush and Ft. Morgan, Colo.

4-Year, Including Sweet Clover:
Sweet clover (spring-plowed in second year).
Potatoes.
Beets 2 years (manured the second year).

7-Year, Including Alfalfa:
Alfalfa 3 years.
Beets.
Grain.
Beets, on stubble manured.
Grain, seeded to alfalfa.
Six Different Rotations Suitable to Varying Conditions in Greeley District

By C. E. EVANS, Greeley, Colorado

Number 1—Three Years:
Barley seeded to sweet clover, and clover plowed under after early irrigation.
Beets.
Beans.

Number 2—Four Years:
Barley seeded to sweet clover.
Pasture the clover in the second year.
Early potatoes.
Beets.

Number 3—Six Years:
Barley seeded to alfalfa.
Alfalfa 2 years.
Alfalfa manured and planted to potatoes.
Potato ground spring-toothed and planted to beets.
Beets, manured.

Number 4—Six Years:
Alfalfa 2 years.
Early potatoes.
Wheat, (planted previous fall).
Stubble manured, beets.
Barley seeded to alfalfa in the sixth year.

Number 5—Six Years:
Alfalfa 2 years.
Alfalfa manured and planted to potatoes.
Beets.
Corn.
Beets.

Number 6—Seven Years:
Barley seeded to alfalfa.
Alfalfa 2 years.
Alfalfa manured and planted to potatoes.
Potato ground spring-toothed and planted to beets.
Manured and fall-plowed (if time and type of soil permit), and planted to beets.
Pinto Beans.

Cropping Plans for Mitchell District

By C. S. CAMPBELL, Mitchell, Nebraska

5 Years:
Small grain with sweet clover.
(Plow clover under in second fall).
Potatoes or Corn.
Beets 2 years (manured second year).
Some dairy cows or lambs and other stock to pasture the clover in the second year would be advisable in such a rotation.

7 Years:
Small grain with alfalfa.
Alfalfa 3 years.
Potatoes.
Beets 2 years (manured second year).

He Planted April 19

L. P. Lawson, a grower near Bridger, Montana, harvested twenty-four tons per acre of sugar beets, from an eight-acre patch in 1923. This land was broken out of alfalfa in the spring of 1922 and planted to wheat and potatoes. After they were harvested the ground was fall irrigated and fall plowed. Beets were planted on April 19, 1923. Mr. Lawson applied the first irrigation on June 21.
Varied Rotation Problems in Longmont District

By R. M. BARR, Longmont, Colorado

EVERY rotation has to fit the peculiar needs of the farmer, his soil, markets, water supply, finances, and if a rented farm the wishes of the landlord and tenant. Besides, in our district the use of alfalfa is more generally advocated than of sweet clover because fall irrigation water is pretty scarce in this locality and few of our farmers are in a position to pasture the sweet clover in the second year of its growth. Moreover, few farmers want to plow alfalfa oftener than every three or four years.

For men in this situation we advise a 7-year rather than a shorter rotation:

Alfalfa 3 years, followed by small grain. Or corn could follow the alfalfa, to keep the rotation more nearly in line with primary rotation principles of following the legume with a row or cultivated crop, and following the row crop with a small-grain. Or if the soil is suitable potatoes could follow the alfalfa, and after the corn or potatoes could come beets for 2 years, with manure on the second beet crop. Alfalfa with a nurse crop of grain would follow the beets, the alfalfa being retained three more years to commence the cycle anew.

Alfalfa after 3 or 4 years on our heavy soils dies out to a certain extent, and with reduction in hay it becomes advisable to plow up the alfalfa.

There are, however, a few early ditches with small acreages under them which are favored with fall irrigation water. Under these sweet clover might be introduced into the rotation with advantage.

In such cases a nurse grain should be planted with the clover. When the grain is harvested the irrigation water should be applied to the sweet clover and a green growth plowed under late in August or early in September. Or it may be left over winter and plowed in May for a late cultivated crop in the second year.

We have not had sufficient experience with sweet clover to advise such a 2-year rotation. It might put so much nitrogen in our soils as to prove detrimental both to tonnage and sugar content of beets. Preferably, while we are learning from experience locally what sweet clover will do, those who want to try a short rotation might better make it 3 years, following the grain-clover crop with September plowing of the irrigated clover (one year) with two row or cultivated crops. If beets two years in succession, manure would be advisable on the second beet crop if high yield is wanted, although the sugar content might suffer.

We have a 2-year rotation with peas and beets which is a good producer of both. The peas are grown for the canning factory in a 2-month period. The land is then plowed for late summer fallow, resting the land and producing a splendid beet crop in the second season. Alfalfa is wisely introduced into this rotation every six or eight years because the continuous 2-year rotation is not calculated to keep the soil in a highly fertile condition for much longer than three cycles without the introduction of alfalfa.

The planning of a rotation for a farm is a highly individualized problem. We have been able to co-operate with a number of our farmers in working out definite rotations fitted to their conditions, and we are desirous of extending this service to the growers we serve.
Potato Rotation Possible in New Lyman District

By N. C. VANDEMOER, Lyman, Nebraska

There is but one crop rotation which we can recommend for this district for the reason that the district being new, practically none of our farmers have established crop rotations long enough to demonstrate advantages. We will, however, offer the following as a seven-year crop rotation which we believe can profitably be followed by some growers in this territory. It is based on an eighty-acre farm.

Ten acres to be broken every year for beets and ten acres to be reseeded to alfalfa with a barley nurse crop. Sugar beets, twenty acres, alfalfa fifty acres, potatoes ten acres, making four years in alfalfa, one year in potatoes, and two years in sugar beets.

We believe it better to break alfalfa ground and crop it to potatoes than to put the beets into newly-broken alfalfa ground. The numerous and deep cultivations of potatoes make the best seed bed. From experiments and actual practice of this territory, we find that many of our largest beet yields are made with practically the above crop rotation.

Four Rotations for Fort Lupton Territory

By S. R. ROBERTS, Fort Lupton, Colorado

In the past there has been little done hereabouts in the line of systematic rotation. The common practice has been to break up alfalfa, grow beets and garden crops for a varying number of years, and seed back to alfalfa.

I am suggesting three different rotations, of which I personally think the seven-year cropping plan is ideal for this locality.

Rotation 1—Three Years:
Barley seeded to sweet clover.
Irrigate clover in the spring, plow, and plant to beans, corn or garden truck.
Beets in the third year.

Rotation 2—Five Years:
Grain seeded with sweet clover.
Beans or corn.
Beets.
Beets, manured.
Garden crops.

Rotation 3—Seven Years:
Alfalfa seeded with grain.
Alfalfa three years.
Potatoes, corn or garden truck.
Beets 2 years, (manured second year).

A Good Eaton District Rotation

By PHIL DALE, Eaton, Colorado

Eight Years

Grain seeded to alfalfa.
Alfalfa three years.
Potatoes.

Beets.
Beans.
Beets, (manured).
HIGHER RETURNS WITH ROTATION

Increase of Nematode and Simple Comparisons of Cropping Systems Point to Need of Rotation

Higher yields of better beets is a major interest of the Great Western Sugar Company's field forces. To that end Fieldmen are ready to give personal attention to the rotation and fertility program of individual farm owners or tenants on local beet-raising farms.

Day-by-day decisions with respect to plowing, planting, cultivation, irrigation, offer temporary problems. Quite as important is the background of the farm's cropping system or sequence—its rotation—over a period of years.

When the farmer has decided to grow a crop the price of which is fixed either by contract or in a future market, his return is mostly influenced by its yield. Ages of practical experience point to improved returns from cropping systems which take account of soil fertility and the effect of different plants upon succeeding crop requirements, diseases, and tilth.

The fact that out of a total of 10,743 fields examined last year more than six per cent were infested with the sugar-beet nematode indicates the need of attention to rotation.

A test comparing beets grown continuously without manure, grown continuously with manure, and a simple rotation of grain and beets-manured-every-other-year developed in ten seasons a difference markedly in favor of rotation.

This perforce is of a general nature: your local Fieldman and Agricultural Superintendent are in a position to work out for your individual farm a suitable rotation.
Fit the Rotation to the Farm and Farmer
Suggested Rotations for the Fort Collins District of Colorado

By D. J. ROACH and H. H. GRIFFIN

A ROTATION scheme at best is only a guide and must be altered by each individual farmer to meet his needs and conditions. The territory served by the Fort Collins factory has at least four distinct soil types that must be taken into consideration. Schemes applicable to our adobe soils would not fit a soil favorable for potatoes.

The essential thing for the farmer to understand is the fundamental principles underlying rotation. Understanding these he can readily adapt a rotation to meet his conditions.

A rotation is a system of cropping in which crops of different kind follow each other in regular order over a fixed period of time on definite areas of the farm for specific purposes, among which are control of insects, prevention of diseases, use of crops of different feeding habits, and to improve soil fertility. It should include a grass or legume (like alfalfa or sweet clover) followed by a cultivated or row crop (like beets or potatoes) followed by a small-grain crop like wheat or barley.

Because of climatic conditions which may produce a dry seed bed and because of lack of early irrigation water for preparation of seed beds, it is not considered advisable as a general rule to recommend planting of beets directly following alfalfa. The use of sweet clover in this territory is not general, although it can be fitted into desired short rotations.

In a new farming district or where feeding is limited by insufficient capital or for any other reason, a 4-year rotation may be worked out like the one below. It will furnish considerable forage and pasture, permitting production of some fertilizer either by pasturing the sweet clover or cutting it for hay the first year. By hauling in the beet tops and feeding them and by cutting the fodder and corn much additional roughage may be secured which can be supplemented by the grain.

4-Year Rotation with Sweet Clover

Grain seeded with sweet clover.
Sweet clover pastured the second year or cut for hay.
Corn or beets.
Beets.

This short rotation may be employed on a portion of the farm if a man has a good producing acreage of alfalfa which he does not wish to disturb. It is hardly permissible to lay out a rotation for less than six years where alfalfa is employed. In the rotation plan given below you will note that alfalfa occupies the land for three years, which is really shorter than advisable in some cases. It will not add sufficient fertility in less time and the expense and risk of reseeding is too great if attempted oftener.

Better results with alfalfa can be secured if alfalfa is sown alone and occupies the land and the farmer's attention exclusively. If this is done on beet land the preparation and cost are reduced. However, if desired, grain can be seeded with the alfalfa particularly on beet land free of wild oats and weeds. The grain should be taken off for hay if it seems to threaten the growth of the young alfalfa or saps too much of the soil's water content. If a grain crop is desired, necessitating leaving the grain until
mature, plant about three-fourths as much seed as for a full grain crop. This gives the young alfalfa better growing conditions and insures a good stand.

6-Year Rotation (Where Corn or Potatoes Are Not Raised.)
Alfalfa three years.
Grain.
Beets 2 years.

This situation in which the farmer does not have potato land and does not raise corn presents a problem common to portions of the Fort Collins territory. The grain should follow beets according to basic rotation principles; but if individual needs are considered and the farmer is unable to get a good beet crop on alfalfa land and unable to raise corn or potatoes, he does the next best thing as above outlined.

If he has potato soil or wants to raise corn his rotation will be better as follows:

7-Year Rotation (with Corn or Potatoes)
Grain seeded with alfalfa, or alfalfa alone.
Alfalfa 3 years.
Corn or potatoes.
Beets 2 years (manured second year).

If no potatoes can be grown successfully but if corn and small grain are feasible this 7-year rotation also is a practical one, grain or corn fitting into the place of corn or potatoes.

Hailed Beets Measured to Prove Growth of Roots While New Leaves Being Made

By R. G. RODEWALD, Fieldman

On July 13, 1927, the Eaton district suffered from a severe hail storm. After such a storm arguments naturally arose over their recovery whether or not the roots make any growth while the plants are growing new tops.

To arrive at the following data, four beets were selected in a badly hailed field. Two of them were large beets and two smaller. The hail completely defoliated these beets.

Each week these four beets were measured with a steel tape to get the circumference in inches. These measurements were taken for twelve consecutive weeks, up to harvest time.

You will note in the table below that while they were growing new tops the roots made about as much growth as at any time during the season; also that the beet crop recovers about as quickly as any farm crop.

Good cultivation was practiced in this particular field, a very necessary practice to speed recovery after such a disastrous hail. The table below shows the steady increase in circumference, week after week:

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<th>8-2</th>
<th>8-9</th>
<th>8-16</th>
<th>8-23</th>
<th>8-30</th>
<th>9-6</th>
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Proper Use of Fertilizer

BY ASA C. MAXSON

Here we refer to barnyard manure and green manures. The spreading of manure is a cost against the crop. The smaller this expense is per ton of beets the greater the profit from the manure. Applications of from 8 to 10 loads per acre are much more profitable than larger ones. The continuous use of manure raises the yield of beets up to a certain point after which no increase is possible. With yearly manuring the sugar per cent declines rapidly until it reaches a point where the value of the crop is materially decreased for sugar production.

After manure had been applied to a field for 10 consecutive years and beets grown every year, the per cent sugar was 15.70. On an adjoining field beets were grown every year also but no manure was applied. The per cent sugar in the beets from this latter field was 17.4.

During the 10 years, the manured field varied from 11.34% in 1913 to 16.27 in 1915. The season of 1913 was very dry while 1915 was the wettest year and naturally cooler than 1913. Thus, it is seen that the ill effects of excessive manuring are increased by dry seasons and almost removed by wet ones.

Naturally, then, we turn to irrigation as a means of overcoming these ill effects. The proper use of water on heavily manured soils will offset the effect of the manure and increase both yield and per cent sugar.

The greatest value of manure is secured when it is applied to the poorest fields such as fields that have grown grain for many years, sandy fields and light, doby soils. Manure on potato land, old beet land or alfalfa land before breaking it out, gives lower values in crop increases per ton of manure applied.

It is not advisable to apply manure to alfalfa or sweet clover land intended for sugar beets or potatoes. The only exceptions are certain peculiar soils which are lacking in some element and which produce diseased beet crops. Manure on such soils reduces the disease and does much to insure profitable beet crops where beets follow alfalfa. Such soils are helped by the proper use of commercial fertilizers.
In rotations including alfalfa, manure should be applied at intervals as far removed from alfalfa or sweet clover as possible. This not only increases the value of the manure but produces a better balance between yield and per cent sugar in the beet crop.

Heavy manuring causes grain to lodge, retards the ripening of corn and causes disease in potatoes, all of which lead to reduced returns from these crops. Distributing the use of alfalfa or sweet clover and barnyard manure throughout the course of a rotation, increases the value of the manure and reduces any ill effects resulting from heavy applications.

Proper Rotation

A rotation in which alfalfa, corn, beets and wheat were grown in the order named, produced 16.19 tons of beets per acre containing 14.47 per cent sugar for the years 1915 to 1920 inclusive, while beets alternating with grain (stubble manured) produced 17.63 tons per acre and 15.79 per cent sugar. (The last named rotation would not be practical on nematode infested land.)

Manure every year produced 17.95 tons per acre and 14.45 per cent sugar. Beets were grown every year also. When beets alternated with wheat and manure was applied every other year (to the stubble) the yield was 18.18 tons per acre and 15.25 per cent sugar.

Manure every other year with rotation produced more beets and a higher per cent sugar than manure every year and no rotation.

Requirements for Successful Farm Tenantry

By LYNN ROBERTSON

1—Fair-minded landowner and tenant.
2—A desire on the part of each party to co-operate and serve the other.
3—A method of rental that encourages a profitable system of farming.
4—A lease that provides for a fair division of income between landowner and tenant.
5—Adequate improvements furnished by the landowner to permit efficient farming and comfortable living.
6—Farming skill and intelligence on the part of the tenant.
7—Good business relations between landowner and tenant.
Give Beets an Early Start for High Tonnage and Good Sugar Content

By ASA C. MAXSON

HEAVILY manured beets and beets following alfalfa and sweet clover have a tendency to grow late in the fall, especially after the early growth has been retarded by poor seed bed, late planting or delayed irrigation. This always produces a crop low in per cent sugar, even though the yield is high.

In order to overcome this tendency the grower should plant early on a well-prepared seed bed. This should be followed by thorough and timely cultivations, early blocking and thinning leaving a good stand, early but timely irrigation, and delayed harvest.

A good seed bed insures a healthy seedling, a rapid growth and a good stand. Early planting helps to make a long growing period and gives the crop the advantage of the best part of the season for growth and an opportunity to utilize the fertility of the soil.

Thorough and timely cultivating keeps down weeds thus preventing them from using the water and plant food that should go to the beet crop. The beets removed in blocking and thinning have the same effect as weeds so long as they are allowed to grow. Removing them early prevents them from interfering with the growth of those to be left and lessens the shock resulting from their removal.

A good stand increases both yield and per cent sugar.

Early irrigation if timely maintains a normal growth which is very essential if best results are to be secured. Delaying harvest gives the crop opportunity to ripen (become rich in sugar) because the cool nights and bright days, usually common during the fall, favor sugar storage.

In addition to the above, fall plowing of alfalfa or sweet clover should be practiced where soil types and the condition of the soil will permit. This early plowing affords opportunity for the alfalfa or sweet clover to become partly decomposed, at least, before the beet crop is planted. This early decomposition liberates some of the plant food the alfalfa and sweet clover contain and make it available to the beets as soon as they begin to draw nourishment from the soil. This stimulates early growth which is very essential if a high per cent sugar is to be secured.

The slower the decomposition of the alfalfa and sweet clover the later the plant food becomes available to the beets, the later their growth and the lower the per cent sugar.
Rotations in which alfalfa and sweet clover occur produce lower sugar per cents than those where these crops are not used. The nearer the beet crop is to the legumes in the rotation the lower the per cent sugar. Two rotations including alfalfa produced beet crops containing 12.63 and 13.19 per cent sugar, while a rotation of grain and beets (manure applied to the stubble) produced a crop with 15.0 per cent sugar. The yield of the latter was also 1 ton per acre higher than for the rotations with alfalfa. The first crop after alfalfa was 17.21 tons and 12.51 per cent sugar while the second crop after alfalfa was 16.66 tons and 14 per cent sugar.

The cause of the effect of certain rotations upon per cent sugar is the same as that of heavy manuring. The increased soil fertility and accumulation of nitrogen in the soil are responsible. The means of overcoming this are the same also:

**Early seed bed preparation, early planting, early blocking and thinning, a good stand, thorough and timely cultivation, early but timely irrigation, and delayed harvest.**

Beets grown on poor soil are low in yield and, when growing conditions are at all favorable, relatively high in per cent sugar. The remedy for such cases is obvious. Increase the fertility by rotation and the use of fertilizer. Then follow the same procedure outlined above in handling heavily-manured soil and beets following alfalfa or sweet clover.

### Lamb Feeders' Day at Fort Collins

The answer to many practical feedlot problems will be given Friday, March 9, at Colorado Agricultural College when results are made public of tests with eleven lots of twenty-five lambs each.

Barley for fattening lambs is the outstanding subject of inquiry in this year’s experiments. An added feature is a comparison of forty pound lambs and sixty pound lambs. The College invites all lamb feeders.

### He Planted April 5

Mr. Geo. Ostermiller averaged twenty tons of beets per acre on forty-four acres in 1923. In the previous season twenty-nine acres of this land was in wheat. It was manured, fall plowed, and then worked down in which condition it went through the winter. In the spring of 1923 the land was harrowed lengthwise and crosswise, double disked, harrowed again, floated lengthwise and crosswise, rolled and then harrowed lightly just before planting. The other fifteen acres, which were in beets in 1922, were fertilized and spring plowed. Planting commenced on April 5.
HENRY BURBACH who raised this crop of beets, lives on one of W. D. Baxter's farms, 13 miles from the Everett dump. Mr. Burbach has been on this farm a number of years. Mr. Baxter owns two adjoining farms in this locality and insists on maintaining and building up the fertility of his farms. Feeding is done on both of these farms.

Out of the 134½ acres of beets which Mr. Burbach raised last year, 39 acres were broken from alfalfa. The rest was old beet land. The alfalfa was crowned in the fall to a depth of three inches. In the spring the old beet land was given a thick spread of manure. The alfalfa land was harrowed twice and then plowed to an average of about 12 inches deep. The usual procedure was followed to get a good seed bed.

With a good seed bed, a good germination stand was obtained. The beets were cultivated three times before thinning. Thinning was started as early as possible. Mr. Burbach's own family thinned 45 acres and the balance of the contract was thinned by the family of E. Rico, a Mexican. This Mexican family was one of the prize winners last year. Numerous counts showed that he left 90 to 95 beets per hundred feet of row. Mr. Burbach's own family did as well. In a majority of cases they left the largest beet in the bunch. Mr. Burbach supervised the work. Good management was in evidence throughout the growing of this crop.
Cattle Made Good Profit on Sweet Clover

By W. S. HENDERSON, Fort Morgan, Colorado

Lawrence E. Larson fed out 29 steers this fall that were started on first year sweet clover the last of August when it was 15 to 18 inches in height. The Biennial White was the variety used and it was seeded at the rate of 11 pounds to the acre. The steers were fed daily in addition to the clover:

- 5 lbs. Ground Barley.
- 3 lbs. Dried Molasses Pulp.
- 1 lb. Cotton Cake.

They were on the clover a total of 35 days and were furnish with all the green forage they could eat. They were then placed in the feedlot where they were fed for 80 days, being marketed the last of December.

The cattle were bought at $9.25 per cwt. and weighed an average of 920 pounds when put on the sweet clover. They were sold in the feed lot when they averaged 1200 pounds, at $12.50. Mr. Larson had a net profit of $1053.10, or $36.31 a head.

According to Mr. Larson’s figures the items of the feed bill for the 29 head were somewhat as follows:

- Barley .................................. $300.00
- Dried Pulp ................................ 185.00
- Cotton Cake ................................ 100.00
- Ear Corn .................................. 75.00
- Fatena Feed ................................ 8.00
- Sweet Clover Pasture ...................... 45.00
- Interest ................................... 71.00
- Hay ......................................... 40.00

$829.00

On a basis of these figures the gain was put on at a cost of 10.2 cents a pound, a very economical gain. Daily average gain per head was 2.43 pounds.

Mr. Larson plans to pasture the sweet clover next summer and then to plow it next fall. This is a splendid way to handle the sweet clover as it produces a luxuriant and ample forage at the same time increasing the soil fertility.

Beet Yields and Manuring

Fifteen farms tributary to the same beet receiving station with practically identical soil and water conditions were divided, for purposes of comparison, into three classes.

Class 1 consisted of five farms on which sheep feeding had been carried on consistently for ten years or more. The average yield of beets on these five farms for nine years was 15.8 tons per acre.

Class 2 consisted of farms on which sheep feeding had been carried on for five or six years. On this group the average beet yield was 13.8 tons per acre.

In Class 3 were five farms on which no manure was produced aside from feeding work stock and a very few milk cows. These farms averaged 11.6 tons of beets per acre.

In Class 2 the farms increased their average yield of beets two tons per acre during the five years they practiced sheep feeding, compared with their previous average tonnage.
Developing a Dairy Herd

By HARRY BARTON

S. BARTON & SONS began breeding purebred Holsteins about eight years ago with a few good foundation cows and an excellent young bull. The herd now numbers about 75.

Since buying the foundation cows no outside females have been added to the herd but special care has been taken in the selection of our herd sires. They have been chosen from the most popular lines of breeding and in every case are from high yearly record dams of large size and good type.

Our last sire was a son of Marathon Bess Burke from a daughter of S. P. O. M. 37. His seven nearest dams averaged over 1000 pounds of butter in a year. His nearest dams averaged a ton in weight. Our present herd sire is a son of Triune Ormsby Piebe 49, the 1313 pound son of K. P. O. P., from a beautiful 1000 pound cow. His first calves will soon arrive.

We now have thirteen baby calves sired by Triune Ormsby Piebe 49, whose nine nearest dams averaged 1153 pounds of butter from 24,837.5 pounds of milk in a year.

Our herd of thirty cows in the Cow Testing Association last year made an average of 405 pounds of butter fat from 11,500 pound of milk. Our high cow, Alice Pontiac Mercedes, was the high cow in the association with 637.44 pounds of butter fat from 17,470 pounds of milk.

Our North Platte Valley Cow Testing Association was the highest one in the State. The highest herd in the Cow Testing Association in Nebraska for the past year was comprised of six cows giving an average of 461 pounds of butter fat. Our six high cows gave an average of 542 pounds of butter fat from 15,000 pounds of milk. These six cows, figuring their milk at current cheese factory prices, gave an annual net profit of $166.60 per cow.

During the past eight years we have sold in the neighborhood of 100 bulls to farmers and dairymen of the North Platte Valley.

Beets have been grown on our farm for a longer period of time than have the Holsteins but we have found, since starting our dairy herd, that beets and dairy cows together form a good combination. All of the barnyard manure that has been used on this farm for the past several years came from the keeping of our dairy herd.
We have been growing from 75 to 80 acres of beets each year for many years. We have found that the Holstein cow has helped to solve the problem of maintaining the high state of fertility necessary for securing a profitable yield of beets. However, we must not overlook our other partner, sweet clover. We plant sweet clover with all of our small grain and in most cases we pasture the cattle on it the second year, following which it is plowed and planted again to beets. Necessarily our motto is “Holsteins and Sweet Clover for More Tons Per Acre.”

GET HORSES IN GOOD CONDITION

Coarse alfalfa or clover hay that cattle will not eat makes good horse feed and should be given at least once a day to the idle work horses at this time of year. This feed will help supply the food materials needed to keep the horses in good condition and to build up their reserve strength for the coming year. If the horses are in good shape, no grain need be fed until about six weeks before spring work begins. Then a handful of linseed oil meal should be added to each feed of grain to help loosen up the heavy coat of hair and make the horse shed early. Sickness is more likely to occur if the horse carries his winter coat of hair into the spring work season, sweats too much, and his coat remains wet most of the night.

Ten to twelve pounds of grain daily is plenty until heavy spring work begins when the amount should be gradually increased to from one pound to one and a fourth pounds of grain per hundred pounds each horse weight. For example, a 1500-pound horse at heavy work should be getting 15 to 19 pounds of good grain per day. Oats and ear corn are the best grain feeds for mature horses.
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THROUGH THE LEAVES

Crust Is the Worst Enemy of Beets in the Germination Stage

APRIL, 1928

THE GREAT WESTERN SUGAR CO.
TO JUSTIFY OUR PRIDE
We Should Keep Up the Good Work

Note the leap in tonnage coincident with the launching in 1925 of the program for "Another Ton Per Acre."

Early planting will help to maintain the record of improved yields in Great Western territory. In 1928 strive for higher yields of better beets.
EDITOR’S NOTES

Farm More of Your Farm

Of 11,000 contracts in Great Western territory last season 5,020 harvested stands which averaged 55 per cent or lower. There were only 126 fields with an average stand of 90 to 99 beets every hundred feet of row. In a few fields the spacing was closer than the recommended rule, 12 inches.

Large numbers of growers apparently are unaware that they are trying to get a whole crop from half the beet field. Too great a plant mortality is taking place between planting and harvest. It may be poor seed beds, lack of moisture for germination, poor hand work, indifferent cultivation or irrigation. Whatever the cause the facts show an average spacing of 18 to 20 inches instead of the desired 12 to 14 inches.

There has been considerable discussion of a 25-cent difference in the sliding scale beet price. On a 14-ton crop that difference would mean $3.50 per acre. Between 18 inch and 12 inch spacing the average yield differs at least 3 tons per acre, or $21.

But progress is being made. In 1925 the average per cent stand was 56; in 1926, 58.5; and last season, 60.2. Where average yields per acre were lower in 1927 despite closer average stands the explanation mainly appears in the difference in growing seasons. Over a 10-year period beginning in 1926 with the closer spacing strongly emphasized, compared with the previous decade when the importance of the 12 to 14 inch stand was not so generally appreciated, the average yields per acre should show a marked gain.

No farmer would think of skipping every other foot of soil in plowing, cultivating, irrigating, harvesting. Practically, however,
that is the effect of numerous skips in the rows of growing beet plants. The half stand is getting just as much attention, entailing about the same expense as the full stand, but is giving the farmer only half the return.

Study the per cent stand data and observe how while the average weight per root declines as the stand grows closer, the greater number of plants in the closer spacings more than offset the decrease in weight per beet.

<table>
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<th>Stand 1927 Crop—Total Great Western Territory</th>
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<td>% Stand Class</td>
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<tr>
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<tr>
<td>0-19</td>
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<td>20-29</td>
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<tr>
<td>30-39</td>
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<td>40-49</td>
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<td>50-59</td>
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<td>60-69</td>
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<td>70-79</td>
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<td>80-89</td>
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<tr>
<td>90-99</td>
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<tr>
<td>100+</td>
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<tr>
<td>Average</td>
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These figures cover all kinds of soils, different types of farmers, varying weather conditions. Too close spacing on highly fertilized fields may be inadvisable. But unless careful study indicates that wider spacing is required in special cases, space beets from 12 to 14 inches on the average. Make up for unavoidable skips by closer spacing of the neighboring beets.

Farm more of your farm in 1928.

Of Special Interest to Beet Raisers

Mr. Asa C. Maxson, in charge of the Great Western Experimental Farm, discusses in this issue timely thinning and mechanical blocking. The practical presentation of the equipment and use of the ordinary cultivator for mechanical blocking should prove of particular interest to beet growers.
What Is a Good Seed Bed For Sugar Beets?

Primarily it is a soil that has been deeply loosened and reduced to a friable condition, free from clods and air pockets.—Dr. O. W. Willcox

A year ago the beet demonstration trains presented most graphically certain desirable practices in fitting a beet seed bed.

Pictures of those exhibits are reproduced on the next few pages. Study the proper and the wrong methods of getting ground ready for beet seed.

Seldom can poor preparation of the seed bed be overcome by later work. Have it right to start with.

If manure or crop residues are to be plowed under precede the plow with a double disking. Disk or scarify the surface before any spring plowing. Where live stock have been pastured on ground to be planted to beets, double disk before plowing.

The harrow should follow the plow closely, except perhaps on sandy soils or on land given to blowing. Teeth slanted forward will bring clods to the surface: a Campbell packer or harrow with teeth set straight or a disking will help firm the seed bed.

A good seed bed is the first essential to a 100% germination stand. Some beet crops each season make half or three-fourths of a crop because not a good enough stand is obtained in the first place.
Handling Light Sandy Soils

By O. F. STELK, Fieldman, Nebraska District

EACH year brings much loss of beets on our light sandy soils in the Nebraska district, due to poor stand from germination. This is caused by soils drying out before the roots have gotten down into the moist subsoil, also from reduced stand on account of wind. Time could be spent to good advantage in better seed bed preparation and carefully guarding the crops against winds both before and after planting.

Seed bed preparation on our light sandy soils should begin just as soon as sufficient frost is out of the ground to permit harrowing and disk ing. Fertilizer may be spread and disked in at this time. If the sandy ground is sufficiently uneven to require floating, then the floating should be done before plowing and not afterwards. When floating very far ahead of the plow, the float should be followed by a harrow to prevent blowing.

Sandy soil may be plowed fairly wet to a good advantage. After plowing sandy soil, it should be allowed to dry long enough so the top soil becomes dry and cloddy before harrowing, but care should be taken that it is not left too long so that the subsoil dries out. When sufficiently dry, the ground should be well harrowed to secure the much desired firm and compact seed bed. If the desired seed bed is not secured by harrowing two or three times, a subsoil packer may be used and then more harrowing. Neither float nor roller should be used on the very light soils as it tends to break the little clods that are so essential in holding the soil on windy days.

Planting the rows at right angles with the direction from which most of the hard winds blow is a great help in protecting the beets from the wind. A crust should never be allowed to form on the beet field. A light harrow should be used to prevent crust forming. Often times cultivating before the beets are up may be done to good advantage in keeping the soil from blowing. Cultivating the ground to get the surface as rough as possible after the beets are up is a great help in protecting the small beets against the wind. If duck feet and bull tongues will not roughen the surface enough to protect the plants, disks may be used to good advantage by placing them in such position that the dirt is thrown together as high as possible between the rows.

When this is thrown together as suggested, before the soil becomes too dry and shifty, there is no reason why the soil cannot be held against the blowing winds unless the adjoining fields are so greatly neglected as to be a menace to the beet field. A certain field of 20 acres in the Bayard district was entirely destroyed last year by a neglected corn field just across the fence, belonging to a man who was not the owner of the beet field and evidently didn't care if the beet grower's crop had all blown out as he made no effort to roughen his ground after the crop had been destroyed. Let us all be more careful during the coming season, especially on the light sandy soils.
Difference Between Early and Late Yields

A difference of 6 tons per acre in the yield of sugar beets, between good seed beds and poor seed beds, is reported by the company’s experimental farm.

In five tests conducted during three years, timely planting exceeded late seeding by 5 tons per acre.

Other things being equal, seasonable or early planting on a good seed bed is favored by early preparation of the land.

You know what the beet contract is for 1928. If you plan to grow the crop your yield and final cash returns will be helped by the earliest possible preparation of a good seed bed.

Early planting and delayed harvest combine to lengthen the growing period, tending to increase sugar percentage. This is particularly desirable with beets on manured, alfalfa, or sweet clover ground.

The fertilizer stimulates plant growth, prolongs growth late into the season, and delays maturity. Late planting or delayed irrigation results in a green beet at harvest.

Delay in preparation of beet land or in planting beet seed may cost you your soil moisture and result in poor germination.

Some districts irrigate up all beet seed. But where irrigation for germination is not the common practice the spring moisture may be conserved by early fitting of beet ground and the expense of an irrigation may be saved.

Have your beet ground ready for planting by April 10, if weather conditions are favorable. When weeds such as lamb's quarter and Russian thistle are appearing in open fields, conditions for planting of beet seed are about optimum.
Many of our best beet growers have their seed beds nearly ready now. That is, the land was manured and fall plowed and has now been thoroughly harrowed, providing a fine mulch that will bring the moisture up to the surface. All these farmers have to do when ready to plant is to level and harrow ahead of the planter. However, there are many whose land was not fall plowed, and whose seed beds are not even started.

A man came into the office in February and said he had a field of stubble land that had considerable wild oats in the grain last year. This field is intended for beets. He wanted advice, whether he should plow it deeply as soon as the frost was out and work it up so as to plant early, or if some other treatment was necessary.

We advised him thoroughly to disk the field so as to insure a sprouting of the wild oats; then to leave it until he had the rest of his beets planted to give the wild oats time to get up; then to plow the land and work it into a good seed bed and plant his beets as quickly as possible.

All stubble land should be thoroughly disked before plowing as was demonstrated on the beet train last spring. Otherwise one cannot get the seed bed packed and free from lumps, with air spaces underneath the surface.

Mr. Nuckolls of the Department of Agriculture relates some excellent results obtained in Utah by spring top dressing with well-rotted manure. That is, if a man fall-plowed his land without fertilizer, to spread some well-rotted manure on the surface in the spring, disk it in, float and lightly harrow the ground, and then plant. This places the plant food close to the surface where the small plants can reach it, resulting in a quick early growth.

Spring manuring that is not pretty well rotted is not desirable, unless you have moisture enough either from rainfall or irrigation to soak up the manure and thus effect decomposition before or shortly after the crop is planted, preferably before.

Always remember that a good seed bed is one that will retain and conduct moisture, that it is the bigger half of the battle in raising a good crop and well repays extra care.

Use Ditchers on Beet Drills

Be prepared to run water and irrigate up the seed if it becomes necessary.

Ditchers on the beet drill help reduce wind damage, aid in blind and early cultivation to break crust.
There is no more deadly enemy of a good stand of beets than crust.

Yet under average conditions the work of preventing a crust is so easily and quickly done—if performed at the right time—that no grower can afford to take a chance with it.

The light "crust-breaking" harrow is especially adapted to use on most fields threatened with crust. A large acreage can be covered with this tool in a day. The disk and on heavy soils an ordinary harrow cope with crust under certain conditions.

Crust and surface sand shifted by the wind reduce many good stands. Harrowing or cultivation lessens wind damage.

Each Great Western factory will help growers acquire a light wooden harrow for crust prevention.
“Free” Beet Labor from Early Thinning

By ASA C. MAXSON

(Editor's Note: This article and the one which follows should be read as a unit.)

EVERY year tonnage is lost because the beets are allowed to become too large before the blocking and thinning is done. This delay constitutes what in this article is called late thinning.

Late thinning may be due to various causes. 1—Weather conditions may be such that the blocking and thinning cannot be done at the proper time. 2—A laborer may have contracted more acres than he can work in proper time. In such cases a portion of the crop must suffer from late thinning unless additional labor is available. 3—Labor may become dissatisfied and quit before the blocking and thinning is completed. Unless other labor is put on the field immediately late blocking and thinning, and a loss in tonnage, result. 4—A grower may neglect to arrange for his labor trusting to some other grower’s labor to do his work later. This always results in late blocking and thinning.

Very little late blocking and thinning is the direct result of a lack of knowledge of the proper time to do this work on the part of the grower. No matter what the cause of the delay may be, the results are the same. The extent of the loss can be judged from the results of carefully conducted tests.

Beets blocked and thinned when they were 16 days old produced 15.59 tons per acre. Beets in the same field allowed to stand unthinned until they were 44 days old, produced 13.24 tons per acre. The delay of 28 days reduced the yield 2.35 tons per acre. At last year’s beet price this was a loss of $18.80. This is more than 75% of the contract labor price for an acre.

Since late blocking and thinning is apt to be necessary in some fields every year we are naturally interested in any means of reducing the loss which it causes. This loss is due to the crowding of the young beets in the row and the rapid loss of moisture and plant food from the soil surrounding the beets. The presence of weeds in the row increases the damage caused by late blocking and thinning. All this stunts the young beets and retards their early development. No matter how favorable conditions may be later, the beets never outgrow the damage done by delayed blocking and thinning.

Since the loss is due to crowding and the loss of moisture and plant food, anything that reduces the crowding should reduce the loss. Several years study show that this can be done by blocking the beets first and then doubling over the field and thinning the bunched beets. It has also been demonstrated that the earlier this
blocking is done and the longer the time elapsing between the blocking and the thinning, the greater the benefit of the early blocking.

Beets blocked June 13th and thinned June 20th produced 1660 pounds of beets per acre more than beets blocked and thinned June 20. Beets blocked June 13th and thinned July 18th produced 3700 pounds of beets more per acre than beets blocked and thinned July 18th.

If we assume that because of a labor shortage beets could not be blocked and thinned until July 18th, 1.85 tons per acre would be gained by blocking the beets June 13th and thinning them July 18th. At last year's beet price this increase would be worth $14.85.

When the blocking and thinning was delayed 28 days the loss was $18.80. This was a loss of $4.70 per week. In the case just cited the delay was 35 days (from June 13th to July 18th). At $4.70 per week the total loss would be $23.50. This is not large enough because the loss becomes greater as the delay becomes greater. Therefore, our figures are conservative. The early blocking produced more than the late blocking and thinning. Therefore, the $23.50 loss was reduced to $8.65 by the early blocking.

Mechanical Blocking Feasible in Emergency

By ASA C. MAXSON

(Editor's Note: This article and the one which precedes it should be read as a unit.)

If the greatest benefits from early blocking are to be secured, some rapid means of doing the work must be devised. Naturally this brings us to a consideration of mechanical blocking. Several years study show that this is possible if a sufficiently good germination stand is secured.

It is very evident that if a grower is to take advantage of the mechanical means of overcoming loss due to late blocking and thinning brought about by any of the causes already enumerated, he must have a good germination stand. This can only be secured by having a good seed bed and planting sufficient seed. Twenty pounds per acre is none too much.

This mechanical blocking can be done with a four-row beet cultivator equipped with 7 eight-inch duck feet. If properly adjusted, the wheels of a cultivator are 80 inches apart. When the
duck feet are properly placed for mechanical blocking, there will be one directly behind each wheel and one in the center of the bar directly back of the tongue. The other 4 will be placed 2 on each side of the center one. When uniformly spaced there will be 4 inches between each pair of duck feet.

When a cultivator thus equipped is run at right angles to the row, the beets in 8 inches of every foot of row are cut out and those in 4 inches left. With a perfect germination stand this will produce a perfect 12 inch stand of thinned beets. As the germination stand falls below 100% the thinned stand is reduced as already shown.

In addition to the duck feet, the cultivator must be equipped with a marker such as is used on a beet drill. This must be set so that at each succeeding trip across the field, the marker will come exactly where the center duck foot should travel. This will require a marker 84 inches long if it is fastened to the center of the cultivator. This will bring the outside duck foot on each return trip just 4 inches from where it traveled previously leaving a 4-inch block between rounds each time.

That the method of blocking is practical has been definitely proven. Where 20 pounds of seed was sown, mechanical blocking produced 21.58 tons per acre and all-hand-work 22.65 tons. The germination stand was not sufficiently good to produce a 100% mechanically blocked stand.

It has also been demonstrated that the labor can thin from one-half to one-third more acres mechanically blocked in the same time than they can when they both block and thin. The better the condition of the soil, the cleaner the field and the better the beets have been cultivated, the faster labor can thin mechanically blocked beets.

This means that the grower can decrease the loss due to enforced delay in blocking and thinning by doing this work mechanically when the germination stand is sufficiently good; that this loss can be further reduced because the labor can thin these mechanically blocked beets in at least two-thirds the time required to block and thin a like acreage; or that the same number of laborers can work from one-half to double the acreage if the beets are mechanically blocked.

You’ll never work out a rotation for your farm by merely reading the printed page. It can give you the principles. But the place to work out a rotation is in and on your land.
Early Beet Seed-Bed Preparation May Prevent Delays Costly to Yields

IDEAL soil moisture conditions for spring farm work are reported from practically all districts. The recent snow in Colorado and Nebraska helped to retrieve subnormal winter precipitation.

It has been observed frequently in past seasons that when the early spring moisture is conserved by early seed-bed preparation and is used to germinate a stand of beets, yields are generally higher on such fields than if the moisture is lost and further rains are awaited.

Early and thorough preparation of the land is a most important factor in securing a good crop of beets. Some seasons a large percentage of the ground is prepared in late April with the seed not germinated until May unless the field is irrigated. The ground may just as well be fitted earlier, weather and soil conditions being favorable, and plantings be made in the fore part of April with improved chances of germination and a close stand.

If ground can be prepared early it can be planted at any desired time and advantage be had from any favorable spring moisture. But if the moisture falls on unprepared ground a further delay in planting ensues.

A last-minute rush to prepare land, with plowing and drilling seed on wet ground, results in poor seed beds, poor germination, and poor yields.

The beet contract for 1928 is known. If you are going to have a beet crop this year why not make the largest possible tonnage at the contract price by the earliest practical seed-bed preparation and planting.

Large Bean Acreage Might Depress Prices

By GILBERT GUSLER
(In the "Western Farm Life" for March 15, 1928)

THE 1927 crop of about 16,872,000 bushels of dry edible beans is apparently fully equal to domestic demand. If the same acreage is planted in 1928 as in 1927 the average yield would give about 17,800,000 bushels. An increase over that figure would probably result in a further reduction in prices, even allowing for normal increase in consumption.

The production of Great Northerns in 1927 was the largest on record. A further heavy increase in production in 1928 would be likely to result in considerably lower prices. The Pinto has increased from a production of less than a million bushels in 1920 to more than 2½ million bushels in 1927. The consideration that an excessive acreage might easily depress the price should suggest to growers that an expansion of the acreage of these beans this year should be held within moderate limits.
Right and Wrong Adjustments of Beet Drills


Cut Number 6 and 7: Kind of trouble—shoe tension spring. Source of trouble—tension spring cotter key lost. Result of wrong adjustment—planting too shallow. Remedy—replace cotter key and adjust to proper tension of spring.
Cut Number 2: Kind of trouble—tongue position, seed not planted deep enough. Source of trouble—tongue too high. Result of wrong adjustment: drill rides entirely on press wheels and seed is not planted deep enough. Remedy—lower tongue to proper position.

Cut Number 3: Kind of trouble—improper press wheel setting, with uneven depth of planting. Source of trouble—No. 2 and No. 4 press wheels are set too high. Result of wrong adjustment: two deeply planted rows and two shallow rows (2 and 4 plant too deep). Remedy—see that all press wheels are set uniformly.
Cut Number 4 and 5: Kind of trouble—wrong shoe tension spring adjustment. Source of trouble—tension spring too loose (right hand shoe). Result of wrong adjustment—planting too shallow. Remedy—adjust tension on all springs to be the same.
Preventing for 20 Tons in 1928

By LEE H. ALDEN, Hudson, Colorado

In the spring of 1927 Mr. Fred Wiegel moved on to a farm in the Henrylynn District. This place had been dry-farmed in the past and had no alfalfa or sweet clover crops on it. As Mr. Wiegel was an experienced beet grower and wished to get the ground in condition to grow a good tonnage as soon as possible, he planted about sixty acres to sweet clover. One field of about twenty acres he manured and planted to beets. By good farming he produced 17 tons to the acre.

This year on this same field he is following a program intended to produce twenty tons to the acre. During the winter he hauled 207 truck loads of sheep manure a distance of two and one-half miles and put into large piles over the field. This made about three hundred spreader loads or about fifteen loads to the acre. After spreading the ground will be disked, plowed, harrowed, then irrigated if moisture is lacking, redisked, harrowed, leveled, harrowed and planted.

Seed will be planted as soon after April first as weather conditions permit. By following this start with good farming throughout the summer and with a normal weather year he should go over his goal of twenty tons per acre.
LEAVE THE BIG BEET IN THINNING——AND WHY

By Asa C. Maxson

When perfect selection of large seedlings at thinning time is approached very material increases in yield may be secured with no significant decrease in per cent sugar. For example:

Average of 3-Years Trials (1918, '19, and '20)

LARGE SEEDLINGS

22.46 tons  13.76% sugar  6180 lbs. Sugar per A.

SMALL SEEDLINGS

11.75 tons  14.59% sugar  3428 lbs. Sugar per A.

In thinning beets on a commercial scale it is practically impossible to do a perfect job of always leaving the "big beet." But by careful instruction and supervision the hand workers can be induced to do the best possible job of plant selection, giving substantial increase in the final yield.
The Ditcher Prevents Wind Damage

Comment by a Number of Sugar Factory Agriculturists Who Recall the High Winds of Last May 8 and 9

IT IS a well established principle that a roughened surface or field will reduce injury to plants from wind action.

A notable example of the value of using ditchers on the beet drill was furnished in the Wheatland district last year. After the severe storm of May 8 and 9 fields which were planted with ditchers on the drills had 15 to 20 per cent more beet plants which survived the storm than fields planted without ditchers.

This was particularly true in those fields in which the rows ran north and south. In them we found that the row immediately adjacent or on the east side of the row which had been ditched showed more of the protective effect of the slight ridging than did the other row in which no ditcher had run.

An Exception to the Rule

A roughened surface reduces the action of wind upon soils, and where soils are given to blowing any method that roughens the surface is desirable. The use of ditchers on any soils of this nature or upon land that has been plowed in the fall is to be commended.

However, there are instances where their use is not desirable. That is on clay soils plowed in the spring and on which there is no danger of the soil shifting. In making the ditches more or less clods are apt to be thrown to the surface on such ground. In cultivating very small plants these clods, as well as the ditcher ridge of dirt, interfere more or less in cultivating by throwing the dirt on the small plants. Furthermore, when a crust forms and cross-harrowing is attempted the dirt is pulled more or less on to the planted portion and increases the depth of soil over the seeds.

If blind cultivation becomes necessary early in the life of the crop ditchers on the drill are a decided advantage.—H. H. Griffin, Fort Collins.

* * *

Aids in Many Ways

It is a great aid on any kind of soil if the marks of the ditchers remain, because teams will follow these marks and thus the operator will be able to give more attention to his cultivator and will cut out fewer plants.

In the sandy lands the use of ditchers on the drill protects the young beet plants from cross field winds. And should the wind come down the rows there is less danger of damage, too.

Should the beet fields need ditching for irrigating up a stand, the use of ditcher tools on the drill aids this, even on heavy soils.—R. M. Barr, Longmont.

* * *

In general we feel that the use of ditchers prevents much damage from wind storms.—J. R. Mason, Sterling.

* * *

It is the general opinion of the agricultural staff that beets planted with the ditching tools on the planter withstand high winds better than unditched plantings. Of course, it is no positive guarantee against loss from blowing, particularly if the wind comes down the rows.—H. C. Giese, Fort Morgan.

* * *

The use of ditchers on beet drills is the universal practice in the North
Ditchers Mostly Beneficial

On those fields where the beet planter ditchers are used the young plants never suffer from the wind as do those where the ditchers are not used. Occasionally the wind will blow directly down the row and the plants may be damaged, but this is largely unavoidable. For the most part it is a great benefit to the young beets if ditchers are put on the drill.—E. C. Walter, Windsor.

After our heavy wind storm last spring the fields where ditchers were used on the drill did not seem to suffer quite as badly as those where the beets had been planted without the use of ditchers.—C. E. Evans, Greeley.

He Doubled His Dairy Herd Profits

RED BURHOP says, in "Hoard's Dairyman," that he bought twelve grade Guernsey cows and a pure bred bull in December 1915. For seven years he did the best he knew but made no outstanding success.

In April 1922 he joined a cow testing association. Very shortly Mr. Burhop learned that three cows were not paying for their feed. They were sent to the butcher.

At the end of the first year of testing he made an important discovery: from month to month there was a wide variation in the feed cost of a pound of butter fat. The lowest priced butter fat during the year was produced on pasture when no grain was fed and the cost increased each month during the summer.

"I concluded," said Mr. Burhop, "that during the first month on pasture the cows were drawing from the reserve stored up during the heavy winter feeding period, and as they became thinner they naturally produced less. I then fed a grain ration during the entire summer pasture period which kept up both production and physical condition of the herd.

"Because the herd came into the barn in the fall in good condition less grain was required during the winter. There was an average increase in butter fat with little or no increase in cost per cow.

"The average production in my first year of test work of thirteen cows was 277 pounds of butter fat, and the average return over feed cost per cow was $85. In the fifth year with the same number of cows the average production was 414.4 pounds of butter fat, and the return over feed cost was $177 per cow. I had increased the feed cost one third but the net returns per cow were more than double."

"By studying the test book I learned which of my cows are the most profitable. From these cows my heifer calves are raised."

About half the manure plus rotation produces nearly as large a yield of beets as manure every year and no rotation.
Depth of Planting

By CHARLES F. MANN, Fieldman, Billings

It is practically agreed that the per cent of stand largely governs the tonnage of beets to be harvested per acre. It has been demonstrated that leaving the big healthy plant at thinning time also has an important bearing on the yield. With a normal rate of seeding, the per cent stand and the number of big beets at thinning time can in a large measure be traced back to the depth of planting.

In Montana most of the seed is germinated by spring rains. A rain or an irrigation after planting is necessary to have a uniform germination of the seed. Therefore, the seed should be planted at a depth which will allow the plant to reach the surface soon after the moisture is applied. From 1 inch to 1½ inches is the most profitable depth to plant.

Late plantings can be planted deeper as the ground is warmer and the seedling will grow farther in the same length of time than early planting in cooler soil. The idea is to plant the seed at a depth that its vitality is not lost between the opening of the seed ball and the plant's emergence.

The loss of this vitality reduces the stand as a great many plants in a weakened condition do not reach the surface. They are unable to push their way through a light crust or a compact soil caused by a heavy rain.

Even the beets which finally emerge are in such a weakened condition that they are very susceptible to black root which annually reduces our stands. The flea beetles enjoy preying on these weakened beets and consequently a great many beets are unable to withstand their ravages. Cold weather, heavy rains and winds also take their toll of these weakened beets.

A beet that has an unduly long growing period under the surface comes up a weakened plant and stunted plant and will never make a big beet. A stand of stunted beets cannot make a bounteous yield. The big beet at thinning time is a beet which has not been stunted and consequently is the big beet at harvest time.

The Long and Short of It

Speaking of growers with big yields the Billings district enters pictures of the highest, the heaviest, and the lowest in point of physical size. Mr. Elmer Talmadge of Joliet is 6 feet 8 inches in height although he claims to be only 5 feet 20 inches. Mr. James Mullowney is 6 feet toward heaven and weighs 335 pounds. Mr. E. D. Pettipiece says he has no height but admits 115 pounds.
Profitable High School Beet Project
By ARTHUR QUELLE

THE vocational agricultural department of the Garden County High School requires that a project be carried out by each student during the summer months. The student must turn in a report as to the profit or loss on his crop.

I selected beets for my project because I thought there would be more money in them than with any other crop. So I got my father to rent a small piece of land next to our beet renter's field. I had to hire the land plowed and put into shape to raise beets because I was still in school. It was May 19 before I could get the beets planted owing to the difficulty in getting a planter and hiring some one to plant them.

When the time for thinning and blocking came I had an excellent stand to work on. I left the beets twelve inches apart or as nearly that as possible.

I had a little trouble in getting them irrigated as there was one high spot in the field that I could not get water on. I got over the rest of the field twice. And I believe if I could have irrigated them once more I would have increased the yield.

The field of 1.84 acres raised twenty-nine tons of beets. They were not very large but there was a good stand over nearly all of the field. The total value of the crop amounted to $232.00, and the cost of labor $40.30. My own labor amounted to $29.00. The rent on the land amounted to $46.40, one-fifth of the crop.

After these expenses were deducted I was left a profit of $116.30, or a total earning, including my labor of $145.30. This was considerably better than the profits realized from other projects with different crops. But I consider the experience and knowledge gained from these projects to be one of the most important parts whether or not the project has been a success from a financial standpoint.

Boys who live on a farm, and even those who live in town where it is possible to rent beet land will find it well worth their time and trouble to put in a few acres of beets, not only for the profit which will come in mighty handy but for the experience.

Long leases will not prevent shifting of tenants so effectually as will a change in the attitude of the landlord and the tenant toward a more stable agriculture. So long as landlords and tenants exploit the soil for the highest present returns regardless of the future effect on crop yields, a long tenure is impossible. It is far better to recognize the rights of the soil, regard the farm as a home and permanent investment and use a lease calling for a year-to-year tenure which leads to permanency if satisfactory to both parties at the end of each crop year. The intent and not the letter of the contract governs the length of tenure.
Mexicans Meeting Demand for General Farm Workers

By E. S. WILLIS, Loveland, Colorado

MORE Mexicans are hired to do general work on the farm every year. That is noticeable to anyone who has been living in or passing through the beet territory for the last five years or more. It proves that they can do general farm work. It is to the advantage of growers and Mexicans that they do it. They remain longer in the district; their broader understanding of English enables them better to receive orders from the grower, and their better understanding of prevailing farm methods enables them better to execute those orders.

Special advantage to the farmer follows the hiring of beet workers to do general farm work during the winter or between beet work periods. It makes the beet labor more permanent, less migratory. That means more experienced labor, more contented labor—higher quality of thinning and topping—higher tonnage.

Contrast this picture with beet work alone. The labor has employment only for from 70 to 80 days of the year—Spanish-speaking beet workers driving manure spreader, plowing, piling beet tops, hauling beets by motor truck, and shoveling beets in reloading a pile—only a few of the ways in which the contract hand laborers may be helped to increase their wage earnings.
the seven months' period they live in the territory with the result that they move away after harvest, most often necessitating hiring inexperienced labor to take their place the next season. It takes the new labor a week or two at least to get into the "swing" of thinning. During that time they work slowly, and the result is delayed thinning, resulting in lower yields.

The German Russians who worked all the acreage before the advent of the Mexican worker, and who still work a large part of the acreage each year, were not then and are not now migratory. They, generally speaking, came here to stay, and did not move away after each harvest period. They did such work as was available for them between seasons, and got along well.

It has been a slower process with the Mexican but necessity can permit of no admission that the Spanish-speaking workers present an unsolvable problem. The growers, generally speaking, have been less inclined with the Mexican than with the German-Russian to afford opportunities for extra work, to encourage remaining over in the beet-growing territory from season to season.

But with the closing of the immigration doors the Spanish-speaking peoples offer the only important source of beet labor. They have been farmers for centuries, in southwestern United States and in their native land. Properly treated they are friendly, faithful, honest workers. With certain kinds of farm work failing to attract so-called American labor, if the work must be done and the Mexican is willing to do it at reasonable wages ordinary common sense points to the advisability of trying our best to get on with him.

Northwest Colorado

Whether sugar beets can profitably be grown in northwestern Colorado is being studied through tests started in Moffat, Routt, Grand and Jackson counties in 1927. Sugar beets have been grown by individuals there, in garden patches, off and on for several years. But no systematic effort was attempted until last year when the Moffat Tunnel League undertook supervised tests.

Twenty one-quarter-acre plats were tried by local farmers. Definite information has been compiled on date seeded, percentage of stand, yields, percentage of sugar, type of soil, etc. Yields varied from almost nothing to 17 tons per acre under the most favorable conditions. Sugar content ranged from 14 to 16 per cent.

Those tests are not intended to foster or encourage sugar-beet production at this time, but will determine what sugar beets might do as a possible crop in the region. R. W. Schaefer, district extension agent for the Colorado Agricultural College, supervised the details of the tests. Further trials will be conducted with local farmers again this year.

Tryimg Sugar Beets

Where beets must follow alfalfa, irrigation should be done to insure the proper moisture conditions at planting time and during the early growth of the crop.
Dairy Cattle and Beets Go Hand-in-Hand

By HERMAN JURGENS, Gering, Nebraska

The 160-acre farm where Mr. O. W. Moore resides, one mile south of Gering, was the first farm in the Valley to be irrigated, about 30 years ago. At that time it produced splendid crops, and continued to do so for five or six years. Then gradually the land began to seep, bringing heavy alkali deposits to the surface. The west eighty soon became a swamp, unfit for farming and of little use as pasture. It remained so until the drain ditch was put through in 1924. Gradually the east eighty became more and more seepy until only about twenty acres of it were producing as they should.

In order to cope with this discouraging situation, Mr. Moore decided to take up dairying. The dairy cows, he reasoned, would provide an income while the herd was growing in value, besides furnishing the necessary barnyard manure which would enrich the soil by counteracting the alkali deposits. In the fall of 1919 he purchased a number of grade Holsteins. These he milked for about two years, but his interest in purebreds had already been kindled and he became dissatisfied with the production of his grades, and offered them for sale.

In the fall of 1921 he visited the purebred Holstein herd of the McKay Bros. of Caddoa, Colorado, breeders of purebred Holsteins for 35 years, and producers of Tillie Alcartra, the world champion milk producer. Here he selected ten head which formed the foundation stock of his present herd.

Mr. Moore’s herd is headed by Marathon Bess Burke VIII, a son of Marathon Bess Burke, the famous Erickson herd sire. His dam and sire’s three nearest dams averaged 34.69 lbs. of butter in 7 days, and 1152 lbs. of butter in 365 days. His dam (with records of 31 and 1,000 lbs.) is by a son of Colantha Johanna Champion, whose dam, Colantha the 4ths Johanna, was the first 1200 lb. and the first 35 lb. cow. His sire combines the blood of the 1164 lb. and 42 lb. Minnesota Champion Bess Burke Ormsby, daughter of the wonderful long-distance sire, “Sir Piet,” with that of the noted sire of show ring winners, King Pietertje Ormsby Piebe.

In the fall of 1927 Mr. Moore purchased Sir Bess Ormsby Fobes 78th, at the Hollyhock dispersal sale at Oconomowoc, Wisconsin. His sire, Sir Bess Ormsby Fobes, sired the grand champion at the Nation Dairy Show
in 1926. He is from the great foundation cow, Wisconsin Fobes, the only 1100 lb. cow having three 1000 lb. daughters; he is by Sir Pietertje Ormsby Mercedes 37th, the sire of the United States butter champion, Daisy Aggie Ormsby 3rd, the world champion for four lactation periods, where two records were made in heifer form.

Mr. Moore's herd of 22 cows was the highest in the North Platte Valley Cow Testing Association for 1927, and second highest in the entire state of Nebraska, having an average of 453.28 lbs. of butterfat, and 13,738.8 lbs. of milk.

His high cow, Omaha Rag Apple Secundus, commonly known as "Old Rags," made 142 lbs. of butter in 30 days. Another, Blossom Pietertje Segis Posch, averaged for the first four months 92 lbs. of butterfat, and in ten months 602 lbs. of butterfat from 17,580 lbs. of milk, with a net profit of $205.15 in the ten months, which was the highest net profit of any cow in the North Platte Valley Cow Testing Association for the year.

Mr. Moore is a firm believer in the value of sweet clover both as a pasture for dairy cows and as a soil builder and fertilizer; he now has in over 60 acres and will plant 30 or 40 acres more this spring. In his particular problem of winning back swamp encrusted soil to cultivation he says that the sweet clover roots mellow up the soil and cause it to disintegrate and rot more freely, thus aiding cultivation very materially.

Mr. Moore has been raising beets for many years, averaging from 35 to 40 acres each year. Last year, on ground that has been seepy for 15 or 20 years, and has been drained only about three years he had a field of 15 acres that averaged 15 tons, some spots in the field producing from 18 to 20 tons. This success he attributes to drainage, barn-yard manure and sweet clover.

Of course he realizes that it will take several years of work, cultivation and fertilization to get this land back to normal production, but he hopes to increase his beet tonnage each year by the use of manure, sweet clover and proper crop rotation, with grain, sweet clover, alfalfa and beets. The beet tops and beet pulp furnish an excellent dairy ration together with alfalfa and grain, and Mr. Moore believes that dairy cattle and beets go hand-in-hand.
Roots of Beet Plants—How They Function

By W. H. SNELSON

(Printed through the courtesy of the Commissioner of Irrigation, Department of the Interior, Canada)

The function of the root system is to gather from the soil the water, nitrogen and other food materials it contains and deliver them to the above-ground parts of the plant where they are converted into sugars, starches and other compounds for use in building up the cells of the plant as a whole and for its daily maintenance. The root secures these necessary food materials with the least expenditure of energy possible.

The root will not develop into or towards a region containing no food or water but will expend its energy in growing towards and developing in the soil zone richest in the materials required. Jean and Weaver concluded from their root development studies that in every case where roots come in contact with a soil layer or zone rich in available food materials they not only developed much more abundantly and branched more profusely than in zones of low soil fertility but this rich zone apparently retarded normal penetration into adjacent soil zones of lower fertility.

In 1927 the writer, in excavating a sugar beet root near Raymond, Alberta, found a root behavior in accordance with this conclusion of Jean and Weaver. At a depth of 3½ feet the tap root penetrated a badger hole which had been filled in, presumably by the animal itself, with soil from near the surface, containing considerably more organic matter and darker in color than the surrounding subsoil. In the soil immediately above this burrow the tap root had developed single lateral roots ⅛ to 1¼ inches in length and spaced about ⅛ inch apart.

After entering the rich, loose soil of the burrow the branching was very profuse. The root system seemed to have run riot in the presence of such an abundance of easily extracted food materials, sending its branches into all parts of the burrow soil and branching again and again until the soil was a network of roots. The tap root did not appear below the burrow soil.

How Roots Secure Food and Water

The absorption of water through the root hairs is the only means that a plant possesses of obtaining the various essential food materials which are derived from the soil, for it is only when these necessary constituents are dissolved that they can find entrance into plants.

Soon after the appearance of the primary root from a seed, secondary roots spring from it and from these, new roots arise,
so that the soil becomes penetrated in all directions by fine rootlets, near the ends of which numbers of root hairs are developed. As the rootlets push their way through the small crevices of the soil the root hairs grow into close contact with the small particles of soil and with the films of water surrounding the latter.

These tiny root hairs are really long, hollow tubes through the walls of which the food-laden soil-water is drawn by the force of osmotic pressure. They may be seen near the tips of growing rootlets with a magnifying glass. They grow, perform their work and die, as the root progresses through the soil. It is only through these root hairs and the youngest part of the root in their immediate neighborhood that absorption of water occurs.

As the rootlet ages and the root hairs die off, it becomes covered with a corklike layer. During the past season the writer observed that within one week after a heavy rain tiny, hair-like rootlets had grown out into the cultivated furrow slice at least six inches or at the rate of about one inch in length per day. Later on, as the furrow slice became too dry, these roots died off, only to be replaced by another similar system after rains had again moistened the soil.

What the Root Requires in Order to Grow

To grow, the root must first have energy or motive power. This energy is secured from the sugars and starches that have been manufactured by the green leaves with sunlight and the carbon-dioxide of the air and carried down where it is needed by the rootlet to produce new tissue and cells for growth. Having received this raw food material the rootlet must convert it into energy and to do this, oxygen is required. This element is secured from the air contained in the tiny, open spaces between the soil grains. The plant as a whole must have water, for without water the leaves could not grow and produce the food materials required by the root. Therefore, the root must have access to water at all times.

A certain degree of warmth is needed in the soil at all times. It has been shown that in order to grow the root needs food, air, water and warmth. Therefore, any farming practice such as cultivation, irrigation, or timely cultural work that affects the supply of these necessary growth constituents will affect the growth of the root.

Both per cent sugar and yield of beets may be increased by having some crop grown immediately after the alfalfa and between it and the first beet crop.
Conditions Affecting the Supply of Growth Factors of the Sugar Beet—Food, Air and Water

By W. H. SNELSON

The Food Supply

The amount of available plant food in the soil largely determines the amount of crop produced per acre. It is dependent upon the amount of organic matter introduced into the soil from manuring or as a result of crop rotations, and made available to the plant through nitrification and other food-liberating agencies. Sugar beets grown at the Brooks Irrigation Experiment Station yielded at the rate of twenty tons per acre where grown on soil that had been enriched by the growing of alfalfa or sweet clover and but ten tons per acre where grown on land of poor fertility or such as had been in grain crops for several years with no leguminous crop in the rotation.

Roots must have energy to grow. They obtain it from the leaves. The plant as a whole must have food to grow and produce leaves. Hence the food supply is one of the four great essentials for root development. First, the raw food materials must be placed in the soil. Second, moisture, air and warmth must be present for this food to become available to the plant.

The Air Supply

Air is essential to the conversion of the raw materials furnished the roots into energy for the growth of the root cells and for the use of the bacteria that convert the organic matter into available plant food. Roots will not grow normally when this air supply is restricted. Baking or puddling will exclude air from the pore spaces of the soil and a similar effect is caused by an excess of moisture.

Conditions have been found most favorable for growth when the soil pore spaces contain about half air and half water. Heavy soils are more productive with an air content in the pore space of thirty-five to fifty per cent; light soils with an air content of fifty to seventy per cent. The air supply of the soil must be maintained by keeping a proper amount of water in the soil and by thorough cultivation.

The Moisture Supply

Water is needed by the plant to maintain the turgidity of its growing cells. Whenever the water supply is insufficient to do this the cells become flaccid and the plant wilts. Water dissolves the various foods present in the plant and conveys them to the different organs of the plant needing nourishment. It brings into solution the plant foods present in the soil and conveys them through the roots to other parts of the plant where they are utilized. It is transpired into the air through the leaves to keep the
The Optimum Water Content

When the moisture content is above the optimum per cent the excess of water not only lowers the soil temperature but cuts down the air supply. When it is appreciably less than the optimum per cent the moisture films are held so closely to the soil grains and with such force that the root hairs cannot secure water in sufficient quantities to maintain normal growth.

When the soil is too wet the development of the plant as a whole is retarded because the roots cannot grow as they should for lack of air and warmth. When the soil is too dry root development is retarded because the plant as a whole cannot get enough water.

The amount of water obtained by the plant from any soil zone or layer is in direct relation to the development of actively absorbing rootlets in that zone, as the movement of water by capillarity from one soil zone to replenish that abstracted from another zone is too slow to supply the needs of the rootlets. To secure an abundant supply the roots must grow to the water.

Having gained from the foregoing text a knowledge of the work the root system of the sugar beet has to be in the building up of the plant as a whole, of the sources of food supply and energy to the root, and of the conditions most favorable to root development, one can better understand and evaluate data to be published next month on the development of the roots of sugar beets under varying conditions of soil, climate, soil fertility, and quality of soil water.

It is the physical condition of the soil, its permeability to roots, its power of absorbing and radiating heat, and its power of absorbing and retaining moisture, that is of more importance than its, strictly speaking, chemical composition. This is a sentence, I need hardly say, that every agriculturist should learn by heart and keep constantly before his attention.—Sir John Lawes.

A Seedbed Specialty

Disk ground before plowing. This is particularly important if the soil has been packed by stock running on it during the winter.

It is not necessary to disk if the top soil is mellow. But if in doubt, play safe and disk thoroughly.—A. H. Heldt.
Better Houses—Better Labor

By J. JESSUP, Minatare, Nebraska

HUMANITARIAN considerations aside, there is one big reason why farmers should consider providing better living quarters for their beet help where present accommodations are admittedly inadequate: that is the profit to be made from such an investment.

It is a simple matter to advise a grower to spend money to build a good labor house: it is another matter to get the money for such an investment and to earn a return on it. If I did not conscientiously believe the investment in a good labor house to be a profit-maker for the grower, I would not be urging it. My belief is based on numerous proofs that such improvements have paid beet farmers.

The accompanying pictures show two of the new beet labor houses built in the Baxter district last year. One is of stucco, a good material for this type of construction, and the other is a fair frame house. These farmers had no trouble obtaining good labor. Their workers were happier for the comfortable living quarters, and this was expressed in better hand work performed for the grower.

Although there has been a deal of stress put on the matter of better housing conditions for beet labor I do not believe there is any danger of this being overdone. In our own living customs we have in recent years shown a marked improvement. Our desire for comforts and luxuries is keener, and in one way or another folks have found ways and means of realizing these better ways of living. It is only natural that the beet workers should feel the same impulse to obtain better things. Just as our higher living standards have made us more efficient so the betterment of living conditions among the beet help will make them better workers.
IN THIS day and age we are hesitant to condemn new practices and methods of feeding because of the many discoveries which are still being made in nutritional fields and because we realize that there is still much to be learned.

The problem in this instance resolves itself into the question: Are additional minerals necessary or beneficial in beet by-product rations? Because there has been no experimental feeding work conducted along this line with beet by-product rations we are forced to draw on work done at other agricultural experiment stations and to reason from a theoretical standpoint. It is, of course, understood that minerals are essential in live stock rations.

The best authorities have come to the conclusion, however, that there are only five mineral elements ever likely to be lacking in ordinary farm rations. These are:

- Sodium
- Chlorin
- Iodin
- Calcium
- Phosphorus.

Sodium and chlorin are supplied in common salt which should always be available for farm stock.

In certain sections of the United States particularly in the Northwest and in the Great Lakes district a lack of iodin has been noted in farm rations. Wherever iodin is lacking, however, a pathological condition occurs to indicate the deficiency. Hairless pigs, or lack of development of horns and hoofs at birth, are an indication of iodin deficiency as are the development of goiters in live stock. There has been no indication of iodin deficiency in beet growing areas of Colorado. This leaves calcium and phosphorus for consideration.

Alfalfa hay is rich in available calcium. It has been truly termed the backbone of the feeding industry and it has a two-fold mission as the foundation of our fattening rations. It furnishes a liberal supply of both protein and calcium. Other calcium-rich feeds are clover, tankage, and dried milk products.

When cattle chew bones and sticks in our feed lots it is usually an indication that they need phosphorus. This mineral element is especially plentiful in cottonseed cake. The addition of cottonseed meal or cake to most beet by-product rations is usually good practice.

Other feeds rich in phosphorus are wheat bran, linseed meal, tankage, and dried milk products. The different grains contain a fair amount of this element also. Apparently most beet by-product fattening rations contain a plentiful supply of essential minerals.

In some sections of the country the addition of a simple mineral mixture containing calcium, phosphorus and a very small amount of iodin has in-
creased gains on steers and shown an added profit when used with a standard ration. A study of the ration fed however, shows an apparent need for at least one mineral element.

**Daily Ration Fed**

Shelled corn .......... 16 lbs.  
Linseed meal .......... 2.5 lbs.  
Corn silage .......... 30 lbs.  
Clover hay .......... 1 lb.  

Such a ration on account of the small amount of legume hay fed would be deficient in calcium and a simple mineral mixture could be expected to show beneficial results.

Beef growers have a simple mineral mixture available should they care to use it. Lime cake, a refuse of the sugar factories, is practically all calcium carbonate and a good source of available calcium while bone black, a by-product of the manufacture of sugar from molasses at Johnstown, Colorado, is a heavy carrier of available phosphorus.

Ordinary complex commercial mineral mixtures are sometimes called "shot gun" mixtures. One product widely advertised consists of:

- Calcium phosphate
- Sodium chloride (common salt)
- Potassium iodide
- Magnesium sulphate (Epsom salts)
- Sodium sulphate (Glauber salts)
- Ferrous sulphate (copperas)
- Sulphur.

The name "shot gun" mixture comes apparently from the idea that a combination of minerals are given the animal with the hope that essential ones may accomplish more good than the harm done by unnecessary ones.

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**On Restoring Limit to Sugar Imports from the Philippines**

Sugar growers and manufacturers of the United States are strongly endorsing the resolution introduced by Congressman Timberlake of Colorado to restore a limitation on the amount of duty-free sugar that may enter our ports from the Philippine Islands. He would permit not more than 500,000 tons per annum to come in duty-free.

Statements by Philippine Commissioners Gabaldon and Guevara March 6, calculated to convince Congress that the domestic industry is not threatened by a rising flood of duty-free Philippine sugar have been vigorously refuted. " Entirely misleading," W. L. Petrikin said, "is the statement of the commissioners that 'from 1923 to 1926 the annual average export was 396,969 tons.'" Such an average, citing the year 1926 which marked the one interruption in a steady expansion from 1918 to 1927, he pointed out, gave no idea of the mushroom growth of the Philippine industry.

"The commissioners neglected to state," he said, "that between 1923 and 1926 Philippine exports to the United States increased 60 per cent, and that between 1918 and 1927 exports have leaped from 60,587 tons to 473,674 tons, representing an amazing increase of more than 680 per cent."
"Over-expansion in tropical countries has confronted the domestic industry with the gravest crisis in years. Domestic beet sugar companies have recently found it difficult to make both ends meet. High profits are reported in the Philippines.

"With cheap labor and only 12 per cent of the islands under cultivation of any kind, further continuation of unlimited duty-free imports may ultimately wipe out an income to our continental sugar farmers of $100,000,000 annually and a larger investment in factories."

The present policy, Mr. Petrikin said, may result in sacrificing the domestic industry in favor of building up a remote supply 7,000 miles across the Pacific.

Mr. Timberlake holds that fixing a limitation at 500,000 tons per annum on duty-free imports from the Philippines would be in excess of last year's importations, therefore, would not deprive the Philippine producers of their free American market to the extent to which they have hitherto enjoyed it.

It is held that unchecked Philippine sugar imports, produced under tropical labor conditions with which the American farmer cannot compete, have increased so alarmingly in recent years that only immediate action by Congress can forestall grave consequences to the domestic industry.

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On Irrigating Beets—Young and Old

By ASA C. MAXSON

The four principal factors in plant growth are: (1) Temperature; (2) light; (3) plant food; (4) water. In the beet growing sections temperature and light are never deficient excepting for very short periods when unseasonable weather retards plant growth. Plant food may or may not be deficient depending upon the soil type and the way it has been handled.

In the arid and semi-arid districts natural water supplies are always deficient for the production of normal crops. Therefore, irrigation which is a supplement to natural rainfall, becomes very important in crop production. Even though sufficient irrigation water is always available, maximum crops will not be produced unless the water is applied in the right way, in proper quantities, and at the right time.

Delaying irrigation after the moisture in the soil has reached a point where the crop begins to suffer, even though no indication of suffering is seen above ground, retards the growth of the crop. This retardation is in effect the same as shortening the growing period. It has very much the same effect as late planting in that it prevents the crop from growing during the normal growing period and forces it to grow late in the season if the soil is
fertile and the weather permits. This always reduces sugar per cent and tonnage.

**Proper Use of Irrigation Water**

Before we go further let us define the proper use of irrigation water as we understand it. Our definition is: *Irrigating at the proper time; applying the proper amount at each application, and applying it in the proper way.*

**THE PROPER TIME TO IRRIGATE IS ANY TIME THE CROP NEEDS WATER. THIS NEED MAY ARISE AS SOON AS THE SEED IS PLANTED. IRRIGATING UP IN CASES WHERE THERE IS NOT ENOUGH MOISTURE TO GERMINATE THE SEED, HAS THE SAME EFFECT AS EARLY PLANTING.*

Irrigating immediately after planting when the moisture in the field is irregular results in a better stand and beets of uniform age and size. The yield and per cent sugar will be higher than where the beets were not irrigated up.

Withholding water from any crop slows down its growth. The growth of crops is actually slowed down before any visible effects of lack of moisture become apparent.

Young sugar beets will suffer from lack of moisture when the subsoil is still quite wet because their roots have not reached any great depth. For this reason small beets may require irrigating at any time after they appear above ground.

If water is not applied regardless of the size of the beets whenever the need arises, the yield will be reduced and the sugar per cent is very apt to be lowered also. The best results are secured when beets are irrigated whenever they require water regardless of date, size of beet or weather conditions.

In 1912 one field of beets was irrigated 3 times and another every time the crop showed that the soil moisture was becoming exhausted. The field irrigated 3 times produced 16.30 tons and 16.10 per cent sugar. The other produced 17.56 tons and 16.1 per cent sugar. The normal, continuous growth produced an increase of 1.26 tons per acre without any loss in per cent sugar.

The only way to produce a profit-winning beet crop is to feed it (give it water) as frequently as it demands it regardless of the age or size of the beets.

"Good management and crop rotation are the gold dust twins to clean up debts and brighten farm life."—Asa C. Maxson.
The Potato Outlook

Statement by the Bureau of Agricultural Economics, U. S. Department of Agriculture, in “The Agricultural Situation” of March 1, 1928.

LARGER stocks of potatoes were carried through the winter compared with last year and have moved out at lower prices for the most part. This is especially true in the West. Eastern growers have had an encouraging year, if one may judge by their expressed intention to increase the potato acreage by around 10 per cent this spring. Such increase, if accompanied by fairly good yields, would be apt to mean very ample supplies next fall.

Growers in 10 early-shipping States apparently plan to increase their combined acreage about 5 per cent over last season and may have a total of 254,000 acres. This would be the heaviest planting in five years. Marked increases are noted in Alabama, the Carolinas, and Virginia, also in southern California. Florida shows little change. Decreases in the lower Rio Grande Valley of Texas are nearly offset by gains in other parts of the State. Louisiana expects to plant fewer acres of early potatoes than in any year since 1925.

Light arrivals of new potatoes were selling somewhat lower than last season. With supplies of old stock about 15 per cent heavier and prices a little lower than in 1927, it is doubtful whether the general market position this spring will be quite as strong as a year ago. On the other hand, there has been an upward tendency during recent weeks, amounting sometimes to 10 cents or 15 cents per 100 pounds of old potatoes, and holders may be favored by a fairly early clean-up of good quality stock. Heavy losses are reported in storage, particularly, in the West, and large quantities of low-grade potatoes are being used for feeding purposes.

The situation in Maine has strengthened to such an extent that shipping-point prices there are a bit higher than last year. Growers in Idaho and Colorado had a rather discouraging season, but a 25-cent advance in mid-February lent cheer to the situation. Several of the important eastern and northern States report fewer merchantable potatoes than they had a year ago; if their remaining supplies are exhausted earlier than usual the demand for western stock may increase in an unexpected degree.

Though the price level this season has been considerably below that of 1926-27, growers east of Nebraska evidently have made some money, enough at least to encourage heavier planting in 1928. The intended increases in Northeastern and North Central States average fully 10 per cent above the 1927 acreage. There is likely to be some decrease in the West, as acreage and production in that region during recent years have been gaining more rapidly than is profitable.

They Planted April 20

Messrs. Dickerson & Hull farming near Fort Morgan, Colorado, in 1923, averaged 19.24 tons of beets per acre on 61.77 acres. About nineteen acres were plowed out of alfalfa. A like acreage was in beets the previous year but in alfalfa the year preceding that. The remaining twenty-four acres was old beet ground which was heavily manured before plowing. They planted about April 20.
A Few of Longmont's High Ton Growers in 1927

DONALD MARKHAM

U.W. EADES

BYRON L. SMITH

CLYDE BLACKWELL

GUST R. ANDERSON
They Aim to Repeat in 1928

By R. M. BARR
Agricultural Superintendent, Longmont, Colorado

Each had more than 20 acres of beets last season, and each produced in excess of 19 tons per acre:

Axel Anderson, Walker Dump
Gust R. Anderson, Puritan
M. A. Otis, Morey Dump
U. W. Eades, Gowanda
Byron A. Smith, Hygiene

Robert Markham, Walker Dump
Clyde Blackwell, Jessum Dump
Donald Markham, Mead Dump
C. A. Bixler, Whiterock Dump
W. D. Nelson, Idaho Dump

In the Longmont district last year we had 156 growers who produced from 17 to 24 tons per acre. One 115 acre contract averaged 17.82 tons per acre.

We also had 210 contracts which went from 15 to 17 tons per acre. These two groups represented more than one-third of the Longmont factory’s total acreage.

On this percentage the bulk of the land was fall-plowed and was planted early. Where the soil is suitable for fall work the increase in beet yields attributable to this practice makes it worth while for the farmer to have the fall-plowing done by hired help if he cannot find the time to do it himself.

Several severe hails in different parts of the district last year are responsible for the non-appearance in the above list of the names of many well-known growers. But they, as well as the high yielders of 1927, are determined to show in the high tonnage brackets for 1928.

Beet Tops Prove Cheap Cow Feed

D. V. McIlwain Successfully Feeds Tops to 14 Cows Which Bring Him $103.02 in Two Weeks

The question of the feed of dairy cattle has been discussed pro and con for some time, some dairymen claiming one feed to be the best and others claiming another feed to produce better results. D. V. McIlwain, one of the leading farmers and dairymen of the community, produces figures which show that beet tops can be fed to dairy cattle to good advantage and a fair profit realized.

Mr. McIlwain is now milking fourteen head of cows, ten head are fresh cows and the other four head are classified as strippers. His milk check from the co-operative cheese company, covering deliveries for two weeks time, amounted to $103.02, in addition to the milk, cream and butter used in his home.

To produce this amount of revenue he fed beet tops, unground oats and oat straw. He figures that at the present price of beet tops this feed cost him around six dollars, the fifteen bushels of oats less than that amount, and the oats straw which is fed every day is valued at a very low
figure. So it can easily be figured out that the feed cost for the two weeks period was less than fifteen dollars.

He also states it is a mistaken idea of many persons that beet tops will dry up the milk flow, or that they are hard on the teeth of the milk cows on account of the particles of gravel that get mixed up with them. According to his experience beet tops do not dry up the milk flow, neither are they injurious to the cattle's teeth, as he has a cow eighteen years old which has been fed tops during the greater portion of her life.

The feeding of beet tops to dairy cattle also sells the tops at a high figure. Mr. McIlwain figures that he will receive over $550 for the beet tops off twenty acres of beets, by feeding them to his dairy herd.

Another item which should not be overlooked is the fertilizer from a herd of dairy cattle. Mr. McIlwain states that his herd of fourteen head produced better than 250 loads of fertilizer in one year's time, which will go a long way towards building up the fertility of his farm. A similar herd on every place in the Valley would soon get all the farmers on a paying basis and the general prosperity of the Valley would be much greater.—From the Minatare Free Press.

Obtaining a Five Ton Per Acre Alfalfa Yield

HERE and there through the irrigated regions of the inter-mountain West reports have come in recent years of alfalfa diseases and lowered alfalfa yields. Therefore the methods of a farmer who has increased his average alfalfa yield two tons per acre should be of interest to other irrigated farmers.

J. A. Carnahan has had charge of the operations on the C. A. Mason farm near Balzac receiving station in Morgan County, Colorado, for the last eight years. The farm is operated largely for the purpose of feeding lambs. Alfalfa has been one of its major crops. Naturally a high alfalfa yield is particularly desirable in the feeding operations.

Seed Bed Preparation

In preparing land for seeding of alfalfa, twenty loads of sheep manure to the acre is applied in the fall. This is fall-plowed and fall-irrigated. In the early spring this ground is thoroughly worked down and planted to barley and alfalfa. 42 pounds of barley is seeded with 12 pounds of alfalfa, per acre. The barley is irrigated twice during the growing season and after it has been cut and harvested, the young alfalfa is irrigated immediately.

Rotation

It has been the practice to leave the alfalfa seeded down for five or six years and then the alfalfa is broken out and the land put to some cultivated crop, such as corn or beets for two years in succession and then reseeded back to alfalfa.

Care of Alfalfa

It has been the practice to manure all alfalfa ground each year as far as it is possible to do so. Twelve loads of manure are applied to the acre in early spring. The alfalfa is irrigated early in the spring and a few days before each cutting, and is also fall irrigated when the water is available.
Yield

Barley used as a nurse crop usually yields around 100 bushels per acre. The yield of alfalfa hay for the 1926 season was 5 tons per acre, while in 1927 it was a little less than the 5 ton average, because of heavy hail damage and some winter killing of old alfalfa.

13 Per Cent and Pay for Management by Good Farming Methods

By I. G. KINGHORN

WATCHING costs, following a good crop rotation, and feeding live stock to maintain soil fertility and to keep him busy during the winter months, has enabled T. J. Nix, an Eaton district farmer, to realize 13 per cent on his investment the past two years. He made money throughout the post-war depression period.

Mr. Nix studies his business from every angle through accurate farm records kept in cooperation with the Colorado agricultural college, and eliminates enterprises that do not show a profit in favor of those that do. He is a great believer in live stock along with crop production. He keeps some sheep, 40 to 50 hogs, 125 chickens, 4 milk cows and 15 head of horses on his 220-acre farm. During the winter months he feeds either cattle or sheep, depending upon which promise to be the most profitable.

Besides finding live stock an excellent market for home-grown feeds, Mr. Nix has found that he can maintain his soil fertility by returning the manure to the land every year. He generally puts manure on fields he expects to plow for row crops; for instance, his sugar beets.

The selection of crops, which are grown in a rotation, shows that he has alternated sod crops, row crops and small grain. This gives a rotation with maximum advantage in maintaining fertility. Last year he raised alfalfa, spring wheat, pinto beans, sugar beets, potatoes, oats and barley. Pinto beans were a very light crop in many parts of Colorado due to unfavorable weather conditions. Had Mr. Nix depended entirely on that crop, he would have lost heavily.

But a bad year for beans did not seem to hurt his sugar beets, barley, potatoes or spring wheat. A better than average yield was received from each of these crops.

The records kept by Mr. Nix and checked by the agricultural college show that he made 11.7 per cent on his investment in 1926 and 14.3 per cent in 1927. He made that much after paying himself $100 a month for his own labor, paying his taxes, interest on feeder loans and all expenses of operation. And he has done it by feeding his own feeds to live stock, keeping cost accounts, and through the practice of a good crop rotation.
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THROUGH

THE

LEAVES

BOY SCOUTS THINNING BEETS

MAY, 1928

THE GREAT WESTERN SUGAR CO.
Profits Engraved in Stone

Tourists in the fertile agricultural regions of France are impressed by the triumphal arch erected in 1853 in the old town of Valenciennes. Sculptured in stone you see the heads of Napoleon I and Napoleon III, and under the heads are inscriptions, relating not to glory in war but to:

Sugar Manufacture

Napoleon I, Who Created It
Before the manufacture of beet sugar the arrondissement of Valenciennes produced 695,750 bushels of wheat and fattened 700 cattle.

Napoleon III, Who Protected It
Since the manufacture of beet sugar was introduced the arrondissement of Valenciennes produces 1,157,750 bushels of wheat and fattens 11,500 oxen.

In this way does picturesque Valenciennes credit to the beet sugar industry an increase of 66 per cent in wheat production and 1,542 per cent in oxen. It is curious to note that sugar output is taken for granted, simply mentioned as the basis for sound agricultural economy. The German who said, "In Europe we have to grow the sugar beet," summarized an accepted agricultural principle.

To credit the intermountain sugar beet with simply the revenue from 3,000 pounds of sugar per acre is only a beginning. Add the benefit of producing 200 to 300 pounds of meat per acre, the maintenance of soil fertility and the stimulation of other crops and you still have left much untold.

The railroad, the coal mine, the industrial payroll and the welfare of the community at large all derive benefit from the humble beet.
EDITOR’S NOTES

WHAT would the sheep feeders think of consumers who go on strike against lamb and mutton because the feeders didn’t return to consumers half of the feeding profits?

Banks in farming districts have had rough sledding in recent years. Now that they are again profitable will the bankers be pleased to give back to depositors half of the bank profits? Particularly because the depositors urge that under such a plan the banks will make more profit than ever before!

When will merchants sell goods on a basis of returning to their customers in reduced prices one-half of the store’s profits?

In all agriculture where is there a crop marketed to guarantee the average farmer cost of production (and a profit for the more efficient farmers) plus 50 per cent of the moneys left after farmer and manufacturer each receive their primary costs?

Under existing conditions in practically all lines of business profit is the margin of efficiency. Two companies may own their raw material at the same price but one makes more profit than the other by reason of lower costs or more efficient processing.

Of two farmers receiving the same price for beets one makes a greater profit because of his economies or his greater yields—the extra profit of efficiency.

It may be good business for a manufacturer or a farmer to give away some of this profit to increase volume or yields, further
to reduce costs. By the bonus for yields over 12 tons per acre the farmer hopes to get better work out of his contract beet labor, an extra ton or two. But does he pay the labor exactly half of the additional profit?

To attempt to force a definite percentage limitation on rewards of efficiency is to ignore the primary principles of competitive business, to discourage economies and thwart progress.

The Great Western, for example, was recently contemplating erection of one or more Steffen houses in order better to balance beet slicing capacity and the working of molasses. Their construction would naturally tend toward higher extraction, although Steffen sugar is more costly than the product of a straight run of beets.

We might be able to estimate a reasonable earning on the proposed investment in new Steffen houses if all or most of the expected return on the extra sugar was available for the company. But to reduce that earning by 50 per cent might make the investment a very unwise one and it would never be authorized.

The tenant on a poor farm is less able to pay a high cash or share rental than the tenant on a fertile place. After renter and landlord on the poor ground by co-operation develop the farm into higher productivity the land brings a higher rental and both tenant and owner are better off. In the same fashion, a well maintained, progressive and profitable sugar factory in the long run will pay higher prices for beets than a rundown, unprofitable plant, and will be more of an asset to the farmers and the community.

There are vastly greater values to be saved for all interested in the beet sugar industry than from fighting over the beet contract—needed co-operation toward increasing the sugar content of the crop, preventing the terrific loss of sugar in beets stored during the harvest; helping the sale of Great Western sugar in nearby territories thus bettering the beet price; increasing the yield of beets per acre, and maintaining the protective tariff and a labor supply.
MAY and June are cultivating and thinning months in the beet fields. Busy months for the hand labor and for the grower! And the way each do their work decides the tonnage in the fall. There should be thorough co-operation at this time.

Labor cannot do good work unless good cultivation precedes and follows the hand work and of course good cultivation will not give the best results unless the hand work is properly done. The efficient grower will supervise and direct often in order to insure good hand work, but supervision alone will not obtain good hand work. Cultivation also plays a large part in getting good hand work done.

In certain soils an examination will show that a crust or cake has formed below the surface, although the surface is apparently in good condition, and where this is the case deep cultivation must be given before the beets will begin to grow as this sub-crust must be broken up to give the roots a chance. This below-surface crust cannot be detected without close examination but when beets are not doing well and have a poor color this will often be found to be the trouble. When this crust is broken up by deep cultivation and a good surface mulch is maintained, hand labor will be able to do good work.

Space correctly, leave the big beet and the plants left will grow. A good stand is often left by the labor but is materially decreased by poor or careless cultivation. Cultivate thoroughly and give the labor and the beets a fair chance and the tonnage will take care of itself.

**Thinning Supervision More Necessary Than Usual**

Blocking and thinning is the one important step in beet raising that the grower is frequently obliged to leave to others. If he could do it himself, knowing the importance of leaving a closely spaced stand of selected plants, the farmer would do a thorough job. When he must engage others to do it, the farmer's job of supervision must be just as thoroughly performed.
Late Planting

By ASA C. MAXSON

ANYTHING that shortens the growing season reduces the yield of sugar beets. The growing season may be shortened in several ways. (1) By late planting. (2) By early harvesting. (3) By doing anything or leaving anything undone that results in a slowing down of growth. In effect the last is the same as shortening the growing season since any growth that could have been made but was prevented represents time lost.

The growth of a sugar beet is divided into two periods: (1) The period during which tonnage is produced relatively faster than sugar is stored. (2) The period during which sugar is stored relatively faster than tonnage is increased. The first period occupies the time from planting to about the first of September in the average beet crop. The second period occupies the time between September 1 and harvest. The first may be termed the period of growth and the second the ripening period.

From the standpoint of tonnage or per cent sugar these periods are not equal in effect. Shortening the period of growth has much more effect upon the tonnage than upon the per cent sugar. Shortening the ripening period reduces the per cent sugar proportionately more than it does tonnage.

Late planting shortens the period of growth. Therefore, it is much more injurious to the yield than early harvesting. When late planting cannot be avoided all possible means of reducing the effect of late planting should be employed. The means available are: (1) Hastening germination of the seed. (2) Forcing early growth as much as possible.

A finely pulverized and well compacted seed bed hastens germination. In the case natural moisture in the soil is not sufficient to germinate the seed immediately, irrigation after planting will hasten the germination.

The early growth of the beet crop is dependent upon: (1) Temperatures; (2) Available moisture in the soil; (3) Condition of the seed bed. (4) Presence of weeds.

The temperature of the air cannot be influenced by the grower; the temperature of the soil can be to a certain extent. Damp soil is cooler than dry soil when air temperatures and intensity of sunlight are equal. Not infrequently cool damp weather prevails about the time the beets are coming up. This is not as apt to retard growth in late planted beets as in the early planted ones.

When the weather is abnormally damp and cool, harrowing the

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soil loosens the surface, dries it and warms it up. Cultivating has the same effect.

If sufficient moisture is not available in the soil irrigate regardless of the size of the beets or the time of season.

A young sugar beet cannot grow normally in a loose open seed bed. The loss of stand is very heavy in the case of late planting on such seed beds. While a well-prepared seed bed is important at all times it is much more important when planting must be late than at any other time.

Weeds use the moisture and plant food that the young beets should have. The more weeds allowed to grow the greater the interference with the normal growth of the beet crop. Keep down all weeds from the very start. Beets allowed to grow in the row after the proper time for thinning act as weeds. Block and thin early.

A Farmer's Views on Brands

Written by a Colorado Beet Grower Who Is a Frequent Contributor to Through The Leaves.

Both horses and cattle are a little more valuable than they were a year ago. For this reason they are more likely to be stolen.

Colorado has a long list of laws dealing with live stock. It is larceny to brand another person's animal, or to drive an animal away from its range. In case of dispute a lawfully recorded brand on an animal is prima facie evidence as to its ownership.

When the state records a brand to anyone, a record is kept and if an animal with that brand gets lost and is taken up, notice is sent to the brand office and they notify the owner. If an animal is found with no brand or a brand not recorded the animal is advertised and then if no one claims it, it is sold and the state takes care of the money.

When animals are bought the bill of sale should specify the brand. In case no brand is mentioned the owner should look the animal over and if a brand is found the hair can be clipped off it and then a careful copy of it made and kept in a safe place.

When a person has a dozen head of stock it is often a good plan to take out a registered brand. If the particular brand wanted is not to be had, the folks at the office are often able to suggest something else.

In a general way the long bars of letters to be branded on horses should be at least two and one-half inches long and on cattle three inches. The color of the burnt spot shows just about whether it is done right or not. Where a person does not know about branding an experienced person should be got to do it.
SOMETHING TO SHOOT AT
AIM FOR THE BULL’S EYE
What Will Your Stand Be This Year?

By E. WARD, Jr.

IT IS hardly necessary to remind the beet grower that his yield of beets depends on (1) stand, and (2) average weight of the beets.

A study of the results obtained by the growers themselves has shown, year after year, that on the average field a 12 to 14-inch spacing, that is from 86 to 100 beets in every 100 feet of row, will produce the greatest tonnage. For instance, in 1927:

- Growers having from 70 to 79 per cent stands averaged 14.61 tons per acre.
- Growers having from 80 to 89 per cent stands averaged 15.70 tons per acre.
- Growers having from 90 to 99 per cent stands averaged 16.71 tons per acre.
- Growers having 100 per cent stands averaged 18.01 tons per acre.

The average grower in Great Western territory last season raised 13.05 tons of beets per acre; the average weight of the individual beets was 26.6 ounces and at harvest time there were only 60 beets in every 100 feet of row; 40 beets were missing.

What would these 40 missing beets have been worth per acre? With a 100 per cent stand the yield would probably have been at least 18 tons; 18 tons minus 13 tons is 5 tons, which at $8.00 per ton were worth $40.00 per acre—practically clear profit except for the additional cost of hauling and some labor bonus.

Better stands have been talked pretty consistently for the past 3 or 4 years and some progress can be noted. A comparison of the average stands for the past three years shows:

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If this slow rate of improvement keeps up, we can calculate that in 1947 the average stand will be 100 per cent. But why take 20 years? Thinning operations will soon be started on this year’s crop, and now is the time to plan on improving stands.

From a practical viewpoint we know that it is not possible to leave a 100 per cent thinned stand from the average germinated stand. But closer supervision of the labor will pay big returns, if the labor will leave all possible beets to help fill out gaps; 10 extra beets in each hundred feet of row, weighing 1½ pounds at harvest, will produce nearly 2 extra tons of beets per acre.
Influence of Soil Fertility and Texture on Beet Root Development

By W. H. SNELSON

(Printed through the courtesy of the Commissioner of Immigration, Department of the Interior, Canada.)

1. The development of the beet plant is dependent upon the available plant food in the soil.

2. The function of the root system is to obtain this food with the least expenditure of energy possible.

These two fundamental truths are emphasized in the accompanying pictures which show the development of the beet plant as a whole on a light, sandy soil of poor fertility and on silt soil of very high fertility.

On July 27 the beets on the poor soil had a root length of 20 inches and a diameter of beet top of 1 to 1½ inches while the beets on the rich soil had a root length of 32 to 38 inches and a top diameter of 1½ to 2½ inches. Both fields were planted May first.

Photographs were made of the beets on these same fields two months later and showed that the beets on the poor soil had attained a top diameter of 2 to 3½ inches while those on the

Same beets at different stages of growth, in soil of low fertility. Compare root development with beets in other picture which were irrigated as were these but grew in soil of higher fertility. Difference in yield, 7.8 tons per acre.
Contrast these beets with roots in other picture accompanying this article. The beets in the picture above are growing in rich soil. The two roots are of the same beet, at different ages.

Rich soil had top diameters of 3 to 5 inches. The infertile plot yielded at the rate of 9.7 tons per acre. The fertile plot yielded at the rate of 17.5 tons per acre. Here was a difference due to soil fertility of 7.8 tons per acre.

The soil moisture content of each of these plots was maintained at the optimum by irrigation as required.

Where the soil was rich the roots could obtain sufficient food for the normal growth of the entire beet plant; where the soil was poor they could not do so.

The photographs taken on September 27 (larger root in each picture) furnish an excellent illustration of the second truth as noted above. The function of the root is to secure food and water with as little loss in plant food and energy as possible, because food and energy so expended is at the expense of the beet itself.

On the fertile plot there was not only an abundant supply of food, and
moisture near the surface, due to the alfalfa residue plowed under, but there was also plenty of food and moisture lower down in the soil from the rotting alfalfa roots, so that the beets did not have to travel very far or send out very many long or very heavy tendrils to secure their supplies. Conditions for this beet were just about right. Note its symmetry, the branches feeding in the furrow slice, and the few branches of moderate size necessary to secure supplies lower down.

Now note what has happened in the poor soil. In this case, crop after crop of grain has been removed with never a leguminous crop or a manuring of any kind to build up the soil's store of organic matter. The plant here has sent several long, slender roots down through the soil in search of food, down to depths of 50 to 60 inches. Instead of one tap root going straight down as in the fertile soil, this plant apparently took stock of the food supply situation after it had got down a foot or so and decided that the prospects of one root gathering sufficient food in such a poor soil were not very good. It, therefore, decided to sub-divide and send down several roots and thus cover more territory.

Due to lack of organic matter, the furrow slice on the infertile soil dried out quickly and baked. This was unfavorable to root development in the furrow slice.

Summing up: Where food is plentiful it is secured with less energy than where scarce. The energy thus conserved is built into the beet.

**Failure to Secure Alfalfa Stand**

**YOUNG alfalfa needs a firm, moist seed bed that has been as carefully prepared as for sugar beets, according to Alvin Kezer, agronomist of the Colorado Experiment Station. For that reason the crop often is started more readily on land that has been previously in a cultivated crop that has left the soil in a good physical condition. Some failures to secure stands of alfalfa may be due to the lack of organic matter in the soil which is sometimes evident on heavy soils that “run together.” Irrigation waters that carry silt increase the tendency for the soil to “run together” or bake.**

Alfalfa makes the best growth when planted fairly early in the season and not over one-inch deep on heavy soils. The seed must come in contact with moisture before it will germinate which sometimes makes it necessary to furrow and irrigate the newly seeded ground. A nurse-crop is particularly valuable where the soil tends either to crust or blow, Professor Kezer points out. From one-half to two-thirds of a stand of the nurse crop is sufficient.

Barley has proved the best nurse-crop all over Colorado, particularly the variety known as Colessa. Kanota, a short-stemmed oat, has proved very satisfactory in the Arkansas Valley.

After the ground has been planted the alfalfa, rather than the nurse crop, should be favored in the matter of irrigation. The small grain will usually take care of itself as long as the young alfalfa is in good condition. The alfalfa should be irrigated as soon after the nurse crop is harvested as possible.
Co-operation Between Landowner and Tenant

By J. J. JESSUP, Fieldman

The territory south of Minatare is known as Creighton Valley. Some of the highest yielding farms in the North Platte Valley are located there. Several of these high producing farms are owned by R. E. Moore.

The average yield on four of Mr. Moore’s farms for the past seven years has been over 17 tons per acre. The Moore farms are kept in a highly productive state by good farm practices, the liberal use of fertilizer from his feed yards and complete cooperation between landlord and tenant. Of course he has no trouble in getting good tenants for these farms. Throughout the eight years of feeding cattle and sheep and growing beets on these farms, Mr. Moore says he has found this combination to be the most profitable.

Four of the tenants on Mr. Moore’s farms in the past eight years have been able to save enough to purchase farms for themselves. It took three of these men only four years to lay up an amount sufficient to buy a farm, and the other only five years.

No doubt tenants in other parts of the beet raising territory have done equally as well but the remarkable feature is that so many of Mr. Moore’s tenants have been able to reach their goal of owning their own farm.

Mr. Moore feeds pressed pulp, dry pulp, cotton cake, beet tops and alfalfa to his cattle; barley, cotton cake and alfalfa to his sheep. The past winter Mr. Moore fed 5000 sheep and 4000 cattle.
A year ago Mr. Hoerler ran afoul some unavoidable delays in beet planting. The picture shows how he made up for lost time—four operations at one time, spreading manure, plowing, harrowing, and planting.

A Farming Success Against Odds
By EMIL HOERLER

I HAVE been a tenant on the O. M. Robinson farm near DeGraw station, Nebraska district, for six years, and although this land is rather low, heavy, wet soil I have been able to obtain a very good tonnage of beets each year by the liberal use of barnyard fertilizer. In 1927 due to the very wet late spring, I was not able to get into my fields until the early part of May when I started the spreader and plow at the same time and, in fact, did all the work of preparing the soil in one operation as indicated by the accompanying picture which shows in the order given, spreading fertilizer, plowing, harrowing and seeding all at the same time. I finished planting 48 acres during the last few days of May, and obtained an average of 14.71 tons which I consider very good in view of the lateness of the season, and without any irrigation on this field because it subs enough to provide the necessary moisture.

My method of farming for beets includes heavy application of manure following which the land is plowed deep; immediately following the plow comes the harrow, and the harrowing is continued until the land is in satisfactory condition for planting, following which the beet seed is planted without using a float. This particular soil is too heavy to float well.

I have not been able properly to rotate crops on this place as it is too wet and heavy, and alfalfa does not do so well. However, I feed cattle and have a dairy herd which produces sufficient fertilizer to manure 40 to 50 acres each year, and in this way produces very good yields of beets. I raise alfalfa on higher ground to provide the necessary feed for my livestock.

I have followed this method of farming for the past six years and have been successful enough to encourage me to buy 160 acres of land of my own this year.
IX. Prepared Feeds—Commercial Concentrates

By E. J. MAYNARD
In Charge of Animal Investigations, Colorado Agricultural College

A COMBINATION of feeds usually gives more efficient results than any one feed. Live stock as well as humans respond to variety in the ration. As an illustration the man who feeds wet pulp, molasses, cotton cake, barley and alfalfa produces heavier and more economical gains than the man who feeds hay and grain alone.

Good feeders try to make use of any and all available feeds to furnish this variety and to increase the palatability of the ration as well. Cull potatoes, beet tops, pea vine silage, beet molasses, wet beet pulp, corn silage, dried beet pulp—these and many other feeds are used to add variety and palatability to fattening rations in Colorado. It is not necessary that large amounts of these feeds be available. No feed, excepting possibly wet beet pulp, is as efficient when fed in large quantity as when a moderate amount is used.

Prepared feeds generally have two factors in their favor. (1) Being made up of a mixture of feeds they are more efficient than any single feed. (2) Almost invariably they contain some feed which adds palatability to a ration.

These prepared feeds may be simple or very complex. They may contain only molasses and cut alfalfa or they may contain a mixture such as corn, barley, dried pulp, mill screenings, oat hulls, molasses, linseed meal, cottonseed meal, straw and alfalfa meal, with possibly salt and charcoal added. Their formula may be changed over night and usually is quite elastic to allow for the purchasing of the most reasonably priced ingredients. Usually there is some filler in these mixtures, sometimes oat hulls or mill screenings which are not readily recognized.

Many prepared feeds make good, palatable supplements to ordinary grain and alfalfa rations, but the most common criticism of prepared feeds as a class is that they are too costly for the nutrients they supply compared with ordinary farm feeds. This is especially true, I believe, in northern Colorado where so many palatable and succulent feeds are usually available at low prices.

A comparison of the analysis of a typical fattening and finishing feed (recommended as a supplement to corn and alfalfa) with corn and cottonseed cake will serve to bring out this point.

<table>
<thead>
<tr>
<th>Prepared Cotton Feed</th>
<th>Cake</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>11.0%</td>
<td>44.1%</td>
</tr>
<tr>
<td>Fat</td>
<td>3.0%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Fiber</td>
<td>7.5%</td>
<td>8.1%</td>
</tr>
<tr>
<td>N. F. E.</td>
<td>58.0%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>60.0%</td>
<td>45.0%</td>
</tr>
</tbody>
</table>

The table indicates that, provided variety and palatability are available, corn furnishes a cheaper source of carbohydrate and cottonseed cake furnishes a cheaper source of protein than the ordinary prepared feeds.
Value and Methods of Feeding Beet Tops

By B. W. FAIRBANKS
Associate Professor, Animal Husbandry, Colorado A. C.

THE Western Slope Lamb Feeding Demonstration at Delta, Colorado, conducted co-operatively by the Colorado Extension Service and the Colorado Agricultural Experiment Station, consisted of ten lots of 50 lambs each. Some new rations were tested, dealing with the feeding value and various methods of feeding beet tops. Sugar-beet tops are protein-bearing or growth-producing.

They are usually purchased on the basis of tops per ton of beets produced. In reporting the tops required for 100 pounds of gain, in the tables presented, the tops have been figured on tons of beets produced. This seems to be a more practical method of figuring than on the basis of dry matter which is from 10 to 15 per cent of the net weight of the beets produced.

How Should Beet Tops Be Fed to Lambs?

Feeders well know that there are two methods commonly employed. Some turn the lambs into the field to pasture the beet tops while others haul the beet tops to the lambs and feed them on the hay. A comparison of these two methods was made and the results are given in Table No. 1. These results are the average of two years’ work.

A study of Table 1 reveals that the method of feeding has practically no influence upon the rate of gains. In the average daily feed fed and the feed requirements for 100 pounds of gains, it is seen that when lambs are pastured on beet tops they consume more tops and less hay. This fact is of considerable importance, particularly during seasons of high priced hay.

The heavier consumption of beet tops in the pastured lot also reduced the corn requirements for 100 lbs. of gain. All of these factors tend to explain why gain was put on for $1.20 less a hundred in the pastured lot than in the lot receiving beet tops hauled in. By pasturing the beet tops a greater feeding

The pen of lambs which received corn, wet beet pulp, and hay.
value was obtained from the beet tops, than when they were hauled in. In addition, the pastured lots produced lambs of higher finish.

Table No. 1
PASTURED vs. HAULED IN BEET TOPS
Average of 2 Years.

<table>
<thead>
<tr>
<th>Ration fed</th>
<th>Corn</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa hay self-fed</td>
<td>Beet tops hauled</td>
<td>Beet tops pastured</td>
</tr>
<tr>
<td>Av. Daily gain *</td>
<td>0.27</td>
<td>0.28</td>
</tr>
<tr>
<td>Daily feed fed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>0.88</td>
<td>0.84</td>
</tr>
<tr>
<td>Tops (from ton of beets)</td>
<td>0.006</td>
<td>0.008</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>1.52</td>
<td>1.01</td>
</tr>
<tr>
<td>Feed required 100 lbs. gain:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>335.7</td>
<td>302.9</td>
</tr>
<tr>
<td>Tops (from ton of beets)</td>
<td>2.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>574.8</td>
<td>362.7</td>
</tr>
<tr>
<td>Feed cost of 100 lbs. gain</td>
<td>$9.11</td>
<td>$7.91</td>
</tr>
</tbody>
</table>

*Based on market weights.

Feed Costs:
- Corn $1.50 per cwt.
- Tops $0.50 per ton of beets.
- Alfalfa $10.00 per ton.

It should be emphasized that a feeder takes a weather hazard when he pastures lambs in the field. In a year of heavy and frequent snows the value of pasturing tops is greatly reduced. Many beet tops will be trampled into the mud and decay, while there will be some loss of nutrients through washing.

Professor Fairbanks (left) and C. J. Jack looking over the corn-beet tops-alfalfa lot while the lambs were being fed grain in the grain pens.
and weathering. Under such conditions a more efficient utilization of the tops will be had by hauling them to the lambs.

Some prominent feeders have reported that when they pastured beet tops they suffered some losses. One man attributed his loss to scouring, while another stated that the beet tops produced a condition which he termed "water belly" in the wether lambs. During the first year's work one lamb was lost from the pastured lot, and upon post mortem the cause of death was given as necrotic hemorrhagic septecemia. Two lambs were lost this last year from alfalfa bloat.

What is the value of adding beet tops to a corn and alfalfa hay ration? This question is answered in Table No. 2 which is the average of two year's work.

Table No. 2
BEET TOPS ADDED TO A CORN-ALFALFA HAY RATION
(Average 2 Years)

<table>
<thead>
<tr>
<th>Ration Fed</th>
<th>Corn</th>
<th>Beet Tops Hauled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa self-fed.</td>
<td>0.24</td>
<td>0.27</td>
</tr>
<tr>
<td>Av. Daily gain *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily feed fed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>0.98</td>
<td>0.88</td>
</tr>
<tr>
<td>Tops (from ton of beets)</td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>2.12</td>
<td>1.52</td>
</tr>
<tr>
<td>Feed required 100 lbs. gain:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>387.2</td>
<td>335.7</td>
</tr>
<tr>
<td>Tops (from ton of beets)</td>
<td></td>
<td>2.4</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>882.7</td>
<td>574.8</td>
</tr>
<tr>
<td>Feed cost of 100 lbs. gain:</td>
<td>$10.22</td>
<td>$9.11</td>
</tr>
<tr>
<td>* Based on market weights:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>$1.50 per cwt.</td>
<td></td>
</tr>
<tr>
<td>Tops</td>
<td>$0.50 per ton yield of beets.</td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td>$10.00 per ton.</td>
<td></td>
</tr>
</tbody>
</table>

The beet tops improved the gain to a slight degree, but the main value of the addition seems to be in reducing the amount of corn and alfalfa hay required for the production of 100 pounds of gain. From the data presented it is readily computed that the tops from one ton of beets replaced 21.5 pounds of corn and 128.3 pounds of alfalfa hay in the production of 100 pounds of gain. At present feed prices, the tops from one ton of beets have a feed replacement value of 86 cents. When beet tops are purchased at 50 cents per ton of beets yielded, it is seen that their feed replacement value in a corn and alfalfa ration exceeds its purchase price by a generous margin. The lambs receiving corn, beet tops and hay have had a superior finish and have been appraised at a higher figure when sold on the central markets.
Go After the Crust

Farmers make various devices to meet special surface conditions dangerous to young stands of beets
This Is the Famous Scottsbluff Light Wooden Harrow for Breaking Crust on a Planted Beet Field
This simple home-made crust breaker consists of a 2”x8” plank sixteen or eighteen feet long, through which 40-penny spikes are driven in two rows at intervals of 4 inches apart. Two 2”x2” planks ten feet long serve to keep the harrow level.

Fort Morgan district farmers used such a crust breaker last season with excellent success. Two 2”x8” planks, width of the cultivator, were fastened together. A number of 40-penny spikes were driven at an angle through the planks, tearing up the crust around the beets and mulching row centers. The disks and a single knife-edged bull tongue in the center of the row completed a good job of cultivation and crust breaking.
Beet-Grower Invents Crust Breaker

Notice the crust-breaking attachments on this beet cultivator. These have been patented by Cody Powers, inventor, of Windsor, Colorado, from whom further information can be obtained.

In 1927, writes Cody Powers of Windsor, Colorado, I made a test on a 24-acre field of beets. I measured off six acres in one plot, 12 acres in another, and six acres in a third patch.

In one six I harrowed to break a crust; in the other six I rolled the field; and on the 12-acre piece I used my crust breaker.

On the harrowed ground I got 85 tons, 230 pounds; on the rolled piece I harvested 70 tons and 750 pounds; and on the patch treated for crust with my newly-invented attachment I got 208 tons and 600 pounds.

Handling Alkali Soils

Plowing under organic matter, early seed bed preparation and delayed planting are practices that will bring about larger yields on alkali soils where alkali accumulation is a problem and drainage impossible.

Sweet clover, which is quite tolerant to alkali, can be planted on such soils and turned under for organic matter, says Alvin Kezer, agronomist at the Colorado experiment station. A green-manure crop will counteract the effects of alkali to some extent. Among other alkali-tolerant crops are sugar beets, cane, millet and barley. Sugar beets are one of the most profitable cultivated crops that can be grown under alkali conditions, says the station.

Drainage, of course, is the first step in reclaiming soils where alkali accumulations are due to a high water table. Where the water table is some distance down, the alkali concentration at the surface may be lessened by “washing off” the soil in the spring by a run of irrigation water. Early and deep seed bed preparation is recommended while late planting will allow the alkali to work down into the soil. Frequent cultivations tend to concentrate the alkalis under the surface rather than at the surface.
There Are Crust Breakers ... and Crust Breakers

By HERMAN JURGENS, Fieldman

This crust breaker was made and used by Jacob Stricker, near Gering, Nebraska.

The teeth are of \( \frac{3}{4} \) inch iron, pointed and spaced irregularly, driven through a 2x6 and projecting three inches. These 2x6 are fastened on a round block at either end. The crust breaker consists of two sections, each 16 inches in diameter and 50 inches long.

For moving from field to field, or on the road, wheels are mounted on the projecting axles.

This machine was used on a heavy gumbo soil and a fairly good stand was obtained in spots where, in previous years, the plants had been killed by the crust.

Growers delayed in planting, for any reason, are urged to consider the advisability of avoiding putting seed in hastily-fitted ground. Get ground ready without delay. Plant only on seed beds which because of their excellence and prospects of early germination will prevent further delay or damage to a good yield.
To Do Away with Dirt—A Sore Point in Beet Harvest

When new beet wagon boxes are to be constructed or old boxes repaired growers should arrange to equip them with the pipe hinge shown in this drawing. Any blacksmith can make this type of hinged sideboard by following the drawing. Company factory offices will furnish growers with a copy of this plan on request.

The old-style hinge allows most of the dirt to work down between the sideboard and the wagon-floor when beets are shoveled into piles. Adoption of this type of hinge will reduce difficulties over dirt tare at beet piles. The time may not be far distant when this beet bed may be required at every dump.
Note Carefully the Rations and Comparative Profits.
Lamb Feeders' Day, Scotts Bluff Experiment Farm

By S. K. WARRICK, Scottsbluff

The annual Lamb Feeders' Day was held at our Experiment Farm on April 5. There were about 200 feeders present. At this meeting the result of three years' experimental feeding was given out. These experiments were carried on under the able management of James A. Holden. In these tests there were 13 lots of lambs, consisting of 25 lambs each, and they were fed 120 days each season.

Three principal comparisons were studied:

Corn was compared with corn and cotton seed cake, when fed with alfalfa hay.

Corn, barley, molasses dry pulp and plain dry pulp were compared when fed with cotton seed cake and alfalfa hay, also with cotton seed cake, corn silage and alfalfa hay.

Beet tops and corn silage were compared when fed with corn, with barley, with molasses dry pulp, and with plain dry pulp.

By referring to the accompanying photographs you will notice that the highest cost per hundred pound gain, was where a corn ration was used, and the lowest cost per hundred pound gain, was a plain dry pulp ration with supplements. Lambs fed corn were given the highest appraised value; and those fed plain dry pulp the lowest appraised value.

Beet tops and corn silage proved to be profitable feed, with beet tops ranking higher than corn silage. The cost of feed per hundred pounds gain, was decreased by the use of beet tops or corn silage, and the selling price was increased.

No charge for labor is included in any of these calculations.

After the feeding experiments had been explained by Mr. Holden, and the
Dried Beet Pulp Showed Up Well.
results announced, the matter of buying feeder lambs from the producer's standpoint and from the feeder's standpoint was discussed. Some of the high points brought out in this discussion were:

(a) That Colorado and Nebraska feeders feed about 2,500,000 lambs annually, and that these lambs represent an investment on the original purchase and freight, of about $20,000,000.

(b) That the North Platte Valley in Nebraska and Wyoming, feeds about 300,000 lambs annually, and should increase their feeding operations to 500,000 lambs annually, which would only give one lamb to each acre of irrigated land.

(c) That the two most profitable animals handled in the North Platte Valley are sheep and milch cows.

(d) That speculators fix the price of feeder lambs on the range annually before they are born.

(e) That the price of fat lambs on the Omaha market from January 1, 1923, to April 1, 1928, averaged $13.65.

(f) That the cure of speculation in feeder lambs is with lamb feeders by refusing to purchase lambs at prices inflated by speculation.

(g) That the interests of producers and feeders of lambs are mutual, and that the professional speculator is not needed in the industry.

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Does Replanting Pay?

By H. S. VARNER

Our severe storm of May 8 last year caused a great deal of replant. Many stands of beets were absolutely lost, but I am of the opinion that we were a little hasty in replanting. Three of my growers left a part of their fields and in all three cases the thin stand of the original planting yielded better than the replant. The following yields were obtained:

<table>
<thead>
<tr>
<th>T. Harvested per A.</th>
<th>Original</th>
<th>Replant</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. W. Keirnes........</td>
<td>16.97</td>
<td>15.69</td>
</tr>
<tr>
<td>A. H. DeFrance, Jr.</td>
<td>18.80</td>
<td>13.09</td>
</tr>
<tr>
<td>Chas. Rix................</td>
<td>17.43</td>
<td>15.59</td>
</tr>
</tbody>
</table>

Of course, we realize that we have had some replant beets that were better than the original planting, but this does not happen very often. Whenever there is a doubt about replanting it is a pretty good idea to give the original planting the benefit of the doubt and let it stand.

After a storm such as we had last year, it is best to wait a few days before deciding on a replant. Immediately after a storm the beets look pretty sick and it is hard to arrive at a good decision. After three or four days the beets have come out of it and the field looks much better.

I recall off-hand the yields obtained by three men who wanted to replant the next day after the May 8 storm but we asked them to wait a few days. After waiting the beets looked better so these men decided not to replant. Their yields were 14.16 tons per acre; 15.86 tons per acre, and 18.30 tons per acre, respectively. I am sure these men would not have benefited themselves by a replant.
THE spacing of the beets in the row is one factor and the spacing of the rows is another. A 12-inch stand in 22-inch rows has 23523 beets per acre. This is the equivalent of a stand of approximately 13.5 inches.

The number of beets per acre controls the yield more than the actual spacing. Therefore, when we say a 12 to 14-inch stand, we mean from 26136 to 22402 beets per acre.

Close spacing produces small beets and high per cent sugar. Of course, small and high as used here are only relative.

**EXAMPLE**

Beets spaced 11 inches............15.30 Tons; 15.29% Sugar  
Beets spaced 13.5 inches............15.24 Tons; 14.65% Sugar  
Beets in 20-inch rows:  
14-inch spacing .................12.63 Tons; 16.02% Sugar  
Beets in 22-inch rows:  
14-inch spacing .................12.09 Tons; 16.00% Sugar  
Beets in 20-inch rows:  
16-inch spacing .................15.3  Tons; 14.61% Sugar  
Beets in 22-inch rows:  
15-inch spacing .................15.4  Tons; 14.50% Sugar
In the case of the 14-inch spacing in the 20 and 22-inch rows, the number of beets per acre was reduced by the 22-inch spacing between rows. The 16-inch stand in 20-inch rows and the 15-inch stand in 22-inch rows produced approximately the same number of beets per acre. The effect of widening the rows can be offset by having the beets closer in the row.

When increasing the width of the stand reaches a point where the yield is reduced because of too few beets per acre, both yield and per cent sugar are decreased.

**EXAMPLE**

<table>
<thead>
<tr>
<th>Beets Spaced</th>
<th>Tons per Acre</th>
<th>% Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-16 inches</td>
<td>13.48</td>
<td>14.76</td>
</tr>
<tr>
<td>22-23 inches</td>
<td>11.87</td>
<td>14.09</td>
</tr>
</tbody>
</table>

The 15 to 16-inch stand should not be taken as optimum. It is used here simply as an example.

**Remedy.** The remedy is obvious. Leave a 12 to 14-inch stand whenever possible.

### Too Close Spacing of Beets

Too close spacing of beets results in such keen competition in the soil and above it that normal development cannot take place. The result on normally fertile soils and those lacking in fertility is small beets relatively high in sugar per cent.

**EXAMPLE**

1915—Beets Spaced 7 to 8 Inches
17.95 Tons; 17.45% Sugar; 6264 lbs. Sugar P. A.

1915—Beets Spaced 16-17 Inches
20.60 Tons; 16.78% Sugar; 6912 lbs. Sugar P. A.

Unfortunately, no 12 to 14-inch spacing was studied in 1915. Had this spacing been included, there is every reason to believe that the yield and per cent both would have been higher than that of the 16 to 17-inch spacing. The value of the comparison would not have been changed, however.

It is possible that close spacing on heavily fertilized soils, especially when such soils are rich in nitrogen, may produce beets low in both yield and per cent sugar. That too close spacing on highly fertilized soils produces an abnormally high per cent of tops, is a well established fact.

**Remedy.** Unless careful investigation indicates that wider spacing is required in special cases, space beets from 12 to 14 inches in 20-inch rows. Where wider rows are used, space proportionately closer.
Early Blocking and Thinning

By Asa C. Maxson

Beets allowed to grow in the row after the proper age for blocking and thinning has been reached, are weeds in effect. They rob those to be left of moisture and plant food and interfere with their growth just as weeds do. Removing such beets at the proper time results in higher yields and per cent sugar.

Example

Average of Trials 1923, '24 and '25

<table>
<thead>
<tr>
<th></th>
<th>Tons</th>
<th>Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocked and thinned early</td>
<td>14.66</td>
<td>16.18%</td>
</tr>
<tr>
<td>Blocked and thinned 14 days later</td>
<td>13.45</td>
<td>15.79%</td>
</tr>
</tbody>
</table>

The ill effects of delayed thinning are increased by the presence of many weeds in the row. Early blocking and thinning is more important in weedy fields than in clean ones and where the germination stand is heavy than where it is light.

In case of hail or other damaging storms, early blocked beets may not produce as well as those blocked just after the storm. The reason is the killing of some beets in the early blocked and thinned portion of the field. Such conditions are the exception and should not be considered an excuse for delay.

The loss due to enforced late blocking and thinning can be partially overcome by blocking in advance of the thinners. The longer the time elapsing between the blocking and thinning, the greater the benefit when compared with late blocking and thinning.
Leave the Big Beet

Large seedlings grow faster and produce larger beets than small ones when the difference in size is not due to differences in the date of emergence or to accident.

When germination is irregular so that some plants emerge several days later than others, the seedling that is inherently large may be relatively smaller than one that is inherently small because the latter came up first. This condition makes it impossible to make a perfect selection of large seedlings at thinning time.

An uneven germination stand may have the same effect as irregular emergence because of uneven crowding in the row.

When perfect selection of large seedlings is approached, very material increases in yield may be secured with no significant decrease in per cent sugar.

EXAMPLE

Average of 1918, '19 and '20 Trials

<table>
<thead>
<tr>
<th>Type</th>
<th>Yield</th>
<th>Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Seedlings</td>
<td>22.46 Tons</td>
<td>13.76%</td>
</tr>
<tr>
<td>Small Seedlings</td>
<td>11.75 Tons</td>
<td>14.59%</td>
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</tbody>
</table>
The Living Soil

How It Breathes—Effect of Cultivation—Danger of Drowning Plants

Most people look upon soil as being homogenous and more or less solid. Actually it is neither. Soils are made up principally of two ingredients. Firstly, we have the mineral part, which occurs in small particles of irregular size and shape. These particles are largest in gravelly and sandy soils, and smallest in silts and clay soils. They are not in contact with neighboring particles over the whole of their surface areas, but spaces occur between them.

Many of these spaces are occupied by the second main soil constituent—humus. Humus consists of decaying vegetable and animal matter, such as farmyard manure, leaves, etc., but in spite of this the soil still has a large amount of pore space. The mineral particles are surrounded by very thin films of soil water, consisting of a solution of the various elements present in the soil, together with any dissolved fertilizers, etc. The spaces between the particles are occupied by the soil atmosphere.

The Nature of the Atmosphere

The most important gaseous constituents of this atmosphere are oxygen and carbon dioxide (also known as carbonic acid gas). If the soil were merely a mineral substance, the soil atmosphere would closely resemble the air above it. But the soil is not solely mineral: the soil is alive. It teems with all sorts of organisms, both animal and vegetable, and what these farms lack in size they make up in numbers. Protozoa, fungi and bacteria carry out their unseen work, and in doing so they greatly change the nature of the soil “air.”

The Process of Respiration

One of the most characteristic things about all living organisms, both animal and vegetable, is their dependence upon respiration or breathing to keep them alive. In respiration the organism gets hold of oxygen and exchanges for it an approximately equal amount of carbon dioxide. Thus in the soil we may expect to find a somewhat higher proportion of this latter gas than we do in the ordinary atmosphere. This is not altogether a bad state of affairs. It seems that quite a quantity of this carbon dioxide may dissolve in the soil water to form a very weak solution of carbonic acid. This has the power of dissolving substance to a rather greater extent than the ordinary soil water, and it consequently makes available food which otherwise might remain locked up.

How the Plant May Be Suffocated

Now the roots of plants breathe or respire in much the same way as the aerial parts. That is, they require air, and they require also that the products of their respiration be carried away before they become actually harmful. Suppose now that the water table rises and the roots are deprived of their oxygen. The plant becomes unthrifty and may actually perish from suffocation. It may appear absurd to say that the plant has been suffocated, but in effect that is what has happened. The plant has been drowned, although not completely submerged. Obviously a crop which cannot breathe properly is not in a position to make the fullest use of ma-
nures supplied to it, and these are to a very large extent wasted.

The Effect of Stirring the Land
Moreover, the foregoing facts explain, partially, why tillage operations have a good effect upon crops. Stirring the land with harrows and cultivators loosens soil which has gone down hard and solid under the influence of rain and roller, and allows the air to penetrate freely. Not only does the plant benefit directly from this operation in having oxygen once more bathing its roots, but it benefits also indirectly in this manner. The soil contains large numbers of bacteria which are capable of taking the nitrogen from the air and manufacturing it into nitrates, which eventually become available to the plant. Stirring the soil encourages this operation, which may result in the gratuitous addition to the soil per acre of as much nitrogen as is contained in a hundredweight of nitrate of soda. A water-logged, untilled soil does not share the benefits of this bacterial activity.

Sugar Company’s Earnings Low in 1927

THE Great Western Sugar Company and its subsidiaries showed a net income of $3,530,567.75 for the fiscal year ended February 29, 1928, in the annual report made public today. This fell short by 42 per cent of meeting current dividends.

Summarizing the largest sugar production in the company’s history in the face of depressed world prices, the consolidated balance sheet also reflects heavy borrowings and larger than normal sugar stocks on hand.

Sugar and by-products on hand are listed at $38,958,519.85. Notes payable amount to $20,700,000 in the 1928 report, more than twice as large as in the previous statement.

On net assets of $64,077,623.79, earnings in the year under review returned approximately 5½ per cent.

W. L. Petrikin, president, said in a statement to stockholders: “Despite continued governmental restriction of sugar production in Cuba, world production has increased, and as a consequence the trend of prices was downward during the last half of our fiscal year.

“Because of this continued weakness in the market, the anticipated volume of sales was not realized, and stocks of new crop sugars now on hand are larger than normal.”

Production of granulated sugar during the past campaign, exclusive of the output of the Johnstown refinery, was 10,258,735 bags of 100 pounds each, from a crop grown on 301,264 acres, both acreage and production exceeding those of any previous year.

“The marketing of so large a crop,” Mr. Petrikin said, “has made it necessary to extend somewhat the territory in which our sugar has heretofore been offered, but our present program contemplates the distribution of all unsold stocks before the 1928 crop becomes available.

“The trend of prices for the past few weeks encourages the belief that returns from the unmarketed balance of last season’s production will be favorable.”
Mr. Swanson maintains high yields on large beet acreages by a combination of feeding and rotation.

Good Farming, Feeding—Fine Farms
By S. J. RICE, Fieldman

Fred Lofgren and G. A. Swanson are prominent farmers in Mitchell Valley, Nebraska district. A view of Mr. Swanson's beet yield record for the past three years is convincing:

1925 .......... 56.57 Acres 22.94 Tons
1926 .......... 80.18 Acres 14.73 Tons
1927 .......... 123.96 Acres 18.38 Tons

Mr. Swanson feeds sheep extensively. This year he fed 4300 head. It helps to keep his farm in a high state of fertility.

Mr. Lofgren previously farmed near Haig but sold out and went to Chicago for two years. Returning last fall he bought one of the best quarter sections in the Valley. This farm has a very fine set of improvements. The large two-story house shown in the picture is for beet labor. Mr. Lofgren fed 1200 lambs on his farm this winter.

Watch the Spacing of Beets

Experience has shown that beets are generally spaced wider than desired. If you ask for a 12-inch spacing you probably will get an average stand slightly wider than you order. The grower who requests a 14-inch stand generally finds that the average left is nearer 16 inches. Either ask for a closer spacing than you actually want or supervise your contract labor closely to obtain as nearly as feasible the exact spacing you order.
One of these rare June days the sugar beet webworm may pay you a visit—millions of the pests, in fact.

If you have a sprayer go over it carefully now. Your nearest sugar factory has a stock of sprayer repair parts: get what you need.

Being ready is the biggest item in meeting an attack of webworms. They can easily do $30 damage per acre: but 30 cents worth of time and attention to the sprayer can prevent it; plus a little Paris Green at the zero hour.
This is primarily for people who want to enjoy farming as well as make money out of it. I realize that people farm to make a living; and all our animal husbandry teaching, experimental, and extension work is directed to that end. But I get tired, once in a while, of directing people towards dollars that are here today and gone by winter. So when spring comes I am glad that I can offer one farm crop that when once put in, will return an income year after year, and at the same time give real pleasure every time the owner walks out over it.

There used to be in Colorado, a widespread idea that pastures would not pay on irrigated land, suited to special crops such as beets, cantaloupes, celery and fruit. But we know that on the islands of Jersey and Guernsey, cattle are being pastured upon land having a rental value of $30 or more per acre. Also we know that in spite of England's dense population, large areas are kept in permanent pastures. So twenty years ago I began studying English experience with grasses.

In the early years of the work I used all of the well known grasses found to have been of value in the northwestern and central parts of the United States; and from England I imported other grasses and plants that had proven themselves there. Among these were chicory, burnett, yarrow and trefoil.

The object was to find a mixture of plants that would form a good sod, yield heavily, root deeply and not only resist drouth but improve the soil; and that would give a variety of grazing which would secure maximum gains on cattle. The earlier mixtures of seed which we made up, always contained a large number of varieties; but gradually many were eliminated as of minor usefulness, and our final efforts were towards a mixture that would contain the following:

First—A deep rooted, heavy yielding grass.

Second—A grass that spreads from a root stock, as blue grass does, so that a close sod may be formed.

Third—Another shallower rooted grass that feeds from the top layers of soil, while the deep rooted grasses are securing their nutriment from the lower layers.
Making Beef and Butter-fat on Irrigated Pasture.

Fourth—A legume, which helps balance the ration, and also forms nitrogen that will be available for the grasses and so increase their yield.

Fifth—It was later found necessary to add a cheap short life grass to act as a filler and produce ground cover, while the deeper rooted grasses are becoming established.

Plants such as these are necessary for any pasture grass mixture; and after several years of work we found the ones that seemed to do best under widely varying conditions in Colorado.

Orchard grass is the deep rooted clump grass.

Western brome grass is the sod former.

Meadow fescue is the finer shallow rooted grass.

Yellow blossom sweet clover is the legume, and is practically non-bloating.

Timothy is used as the filler because it is cheap, and has many seeds per pound. In the Arkansas Valley, English Rye grass is used in place of timothy.

Pastures composed of these grasses are in use in every agricultural county of Colorado where irrigation is practiced. And we are no longer dependent upon experimental results alone for a knowledge of the carrying capacity of such pastures. Dr. DeWitt put in one of the early trial mixtures about 1910, and by 1920 so many of the pastures were being used, that calls for the formula began to come from all parts of the state.

On the Western Slope at Montrose there are pastures carrying three to four head per acre for the grazing season. At Fort Collins, higher and cooler, two head per acre are carried. In the Platte Valley near Sterling, two and one-half head are carried.

In the lower Arkansas Valley where we found it unusually difficult to get a stand, three head per acre are carried. In Fremont County near Canon City, three to four head are carried. Near Pueblo, we have one of the best records—five head per acre for seven months.

Carrying capacity of this pasture is directly comparable to the alfalfa
yield in a given locality. Where alfalfa yields two and a half to three tons per acre, this grass mixture will maintain one and a half to two head of cattle for the grazing season.

The formula for the pasture may be obtained from your county agricultural agent or from the Animal Husbandry Department of the Colorado Agricultural college, Fort Collins.

I am sure there is no greater joy, when handling live stock, than in watching them spread out over a rich pasture and put on bloom. And if you will figure the carrying capacity per acre against what can be done with crops grown upon the land, you will convince yourself that the income from pasture land is adequate, and secured with much less labor than from other crops.

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The Mythical "Average Farmer"

The difficulty of devising a general pattern of farm relief which will fit all farms and all farmers is indicated in a report on "average farm labor income" compiled from federal and state surveys by the Agricultural Service of the Chamber of Commerce of the United States.

The figures would lead to the conclusion that the "average" farmer does not exist. Annual farm labor returns, as indicated by surveys made in 17 states during the past six years, have ranged from a loss of $5,852 to an income for labor and management of $19,925. Individual farm labor incomes of a group of Virginia farmers, for example, ranged from $1,365 to a loss of $800. In Ohio the range was from $3,908 to $136.

The range in costs of producing hogs among 21 Iowa producers varied from $7.20 to $17.66 per 100 pounds. The low-cost producer received $1.54 per bushel for corn fed and the high-cost producer received 51 cents.

Butter fat costs for a section in the Middle West ranged from 24 cents to $1.67 per pound. State averages of corn production costs ranged from 49 cents per bushel in Indiana to $1.95 in Texas. Cotton production costs varied from 10 cents per pound to 57 cents.

The efficient farmer, the comparisons indicate, will reap a profit where the inefficient reaps a loss.

To produce that well balanced beet crop which is most profitable to the grower and sugar company alike, strive for:

1. Good Seed Bed.
2. Heavy Seeding.
3. Early Blocking and Thinning.
5. Proper use of Fertilizers.
6. Proper Rotation.
7. Proper Use of Irrigation Water.
8. Delayed Harvest.
I have been observing the hows and wherefores of irrigation ever since I could toddle about the farm, and have tried to note the best and easiest methods used. I have been interested in the fact that the V-marks left in the beet harvest cause trouble during the flooding of grain, following the beets. This is especially bad when a heavy crop of foliage has been on the field.

The land seemed to be perfectly level when the grain was sown but when the irrigation started, the water sought out the old V-tracks, and made necessary a great deal of paddling. The V became a catch basin for beet crowns, leaves, clods and other trash. This trash settled during the rains and irrigations and caused low places, which were very annoying.

I decided to eliminate this difficulty this year if possible. I constructed a V-leveler, which the accompanying photograph will depict more clearly than I can explain in writing. I have used this leveler with very satisfactory results. The dirt removed by the V is replaced, leaving no depression to be filled with trash.

I can level a twenty acre field with one team in a day. This work can be done either before the tops have been piled after harvest or during a mild winter or spring after the tops have been removed. This leveler is inexpensive and easily made. I believe that it will soon be extensively used.

The correct length of the leveler is about twelve feet, and it should be wide enough to reach to the outside of the ridges. 2x8 lumber is best for making the leveler but 2x6 or 2x10 material may be used with good results.
The Proper Amount of Irrigation Water

By ASA C. MAXSON

The proper amount of water refers to each application and the whole season. The proper amount at any time must be determined by the soil and age of the plant.

Never apply enough to leach shallow or porous soils or to water-logging heavy soils. When either of these is done the growth of the crop is interrupted and the yield and per cent sugar are reduced.

The smaller the beets the lighter the application should be. There is nothing gained by filling the soil with water several feet below the young beet roots. There may be a loss since the soluble plant food will be carried below the roots by the water. This will temporarily retard the crop's growth. This always lowers production in proportion to the extent to which the growth is retarded.

As beets grow older they use more water and exhaust the soil's supply faster. The greatest amount is used during August, the next greatest demand is during July. While it is very essential to irrigate before July 1st and after August 31, nearly every year arrangements should be made to have water available during July and August if maximum production is to be secured.

This does not mean that water should be withheld earlier. Quite to the contrary. If water is withheld during the early part of the season much of the value of that applied during July and August is lost.

Withholding water during the early part of the season always means a late growth and a low yield and per cent sugar unless natural supplies early in the season were sufficient for the requirements of the crop. This is rarely the case, however. In all probability from 12 to 16 acre inches of water during the season will produce a maximum yield. This should be applied in relatively light applications at frequent intervals. Under normal conditions beets require water every two weeks during July and August.

Proper Way to Apply Water

It may seem unnecessary to most of you to say anything about the proper way of applying water in a district where irrigation has been practiced for over half a century. Observations each year convince one that there is much to be learned, however.

Beets should not be flooded. However, do not hesitate to irrigate because some flooding must take place. A flooded field will produce more than one that is dried out. Run small heads on steep fields and increase the time of the set. Run large heads on flat fields and shorten the time it runs in each set.

Take care of your waste water. An acre drowned out at the lower end of your field is an unnecessary loss. On shallow soil make short runs by putting in cross ditches. Runs of 500 to 600 feet are better on all soils than longer ones. Long runs over-irrigate a part of the field and reduce production.
School for Beet-Working Children

By A. C. COHAGAN
Superintendent, Public Schools, Windsor, Colorado

HERE are in Weld county about two thousand children of school age who work in the fields during beet harvest. Windsor school district has more children affected by the raising of beets than any other district in the county. This being the case much thought has been given to working out a plan by means of which parents may have the assistance of their children in making a living and at the same time meet the requirements of the law in school attendance.

When the writer was placed in charge of the Windsor schools ten years ago it was quite evident that compulsory school attendance must be overlooked or some plan adopted which would enable the children to assist in making a living and also meet the requirements of the school law.

About seven weeks are required to harvest a crop of beets. Consequently, for pupils who must work or who desire to work during beet harvest a school is opened in July, seven weeks prior to the usual opening in September. It is a matter of choice with the pupils whether they enter school in July or in September, but it is necessary that a choice be made as the compulsory school attendance law is enforced. Those who enter school in September are not allowed any time away for work.

For several years the plan was not accepted in the community without criticism. But we feel that now the effort put forth to meet the conditions is fully appreciated and that the plan thus far has been very successful in this community. With some modifications to meet local conditions, we see no reason why this plan may not be operated successfully in other communities.

Results of this plan may be summarized as follows:

The average school attendance in days for those who work in the beet harvest has increased from 51 in 1925 to 168 in 1927. The enrollment in the school opening in July has varied from 210 in 1918 to 501 in 1924.

In 1918-1919 there were no pupils in the beet worker school above the fourth grade. Neither parents nor pupils considered school as being worth while. There was a continuous demand on the part of the parents that the "kids" be allowed to stay out and work.

The attitude of both parents and children toward the school has undergone a complete change. Very few requests are now made for the assistance of pupils during school hours. As a rule now the children do not want to leave school until they have completed the Eighth Grade. And at the present time we have many of these boys and girls doing High School work.

If the first business of farming is to take fertility from the soil, is it not the second business of farming to replace the fertility thus removed.
When Beets Call to the Back Country

And You Buck Snow and Quicksand Slush to Get a Labor Contract

When an automobile bucks New Mexico's mud and high water that would worry the pinto cayuse of Billy-The-Kid, there must be, as the Grape Nuts ads say—A REASON! Read the sign in the spare tire: Recruiting beet labor for Great Western territory! That's the reason.

It's spring when those smiling Latin faces step off the train to be told about the big beet and the 12-inch spacing but the work really begins with the agent back in the snowy days when the arroyos and ranges are dissolving into floods, quicksand, liquid dobe treacherous as lava rivers.

At Taos, for example, lives Company Agent J. A. Des Georges. Follow Agent Des Georges a few days in the back country as he sounds the call of the beetlands. Recruiting Officers Maddux, Morris, Des Georges, agree more people would come, if they knew, from the Tierra Amarilla and Parkview districts, 30 miles behind Chama, yes, if they knew. So Agent Des Georges decides to let them know ... fills the car with gas ... looks at the tires ... starts ... up Chama River for Abiqui, El Rito, Ojo Caliente, Cebolla ... all in the mountains. Chama Agent A. G. Daggett, snowbucker, flood-rider, goes along ... sounding the call of the beetlands.

They enter the mountains. Snow's too deep to make Tierra Amarilla, Parkview ... can't get to railroad at Chama ... retrace steps to Durango via Gallup ... advertising all the way, sounding the call of the beetlands ... work three days with agent in San Juan and La Plata River valleys ...

still wondering about how to beat that deep snow.

Talks it over with Morris, up from the South, and leaves Durango again March 12 ... bucking mud to Aztec. Ever hear of Aztec? How is the road to Blanco? Not so good. Arrive there anyway. How cross La Plata River, swollen, muddy? Frank Pilon, Pilot Pilon, piles car on crude boat and Agent Des Georges crosses La Plata.

Adios to Pilot Pilon. We enter the lonely Canon Largo, bump, bump ... high centers ... wonder if we're tearing out the crank case ... wonder what a coyote thinks about ... time to do some more shoveling ... shovel ... shovel ... gas getting low. Here comes an old man ... first human I've seen. How far to Cuba? He says: "Twenty miles to Haynes ... mas o menas" ... always more or less. Five hours to mythical town of Old Haynes ... 20 miles mas o menas! Put on chains ... chains at Haynes, good rhyme ... start for Gallina ... slippery mountain roads.

Cold ... colder ... dark ... darker ... stuck in the mud to the hubs ... hauled out four hours later ... tired ... hungry ... lock car ... seek shelter from stormy night.

There's a light ... dogs begin to bark ... draw my gun ... fight them off ... nobody in house answers ... maybe I can sleep in barn ... cold, wet, hungry ... finally women come out ... give me shelter for night.

Next morning car won't start ... covered with snow ... check gas line, ignition ... about ten bells a kind hombre with a team of ponies pulls me to Gallina where nobody knows how to fix a car ... maybe the forest
To make his house-to-house canvass for beet labor (which is really moun-
tain-to-mountain and flood-to-flood) Agent Des Georges of Taos, extreme left, must cross swollen rivers on water-logged ferries and be mired in the mud for hours.

ranger two miles up the road knows ... try him ... giddap ponies.

Forest ranger busy ... offers to help ... four of us work hours ... car dead as King Tut ... I'm getting nervous ... maybe I can't keep appointment with Bodie Morris en route to Las Vegas ... maybe I better hire a horse ... maybe I better call the garage at Cuba ... wherever that is. So I call Cuba and forget the horse to Espanola.

Then the sun comes out ... I tinker with the needle valve ... the blame thing kicks over, sputters, roars. Hot Dawg! Adios! When that guy from the Cuba garage shows up, tell him to send the bill to me at Taos! Later I get it ... twenty-five bucks ... he got stuck twice and had to fork over a ten-spot to be hauled out. Lucky he didn't show up before I started ... me with only eight bucks.

So that's the way it goes with Agent Des Georges, combing the far lands with the call of the beetlands ... lots of other agents just like him ... all over the Southwest ... that looks just about the way it did when Columbus landed ... and the roads are just as bad or worse.

All in the day's work maybe ... the labor's glad to come ... but somebody's got to tell 'em ... somebody's got to buck the mud, snow, slithery dobe, thundering arroyos ... lots of He-Man drama back of that smiling Latin face ... stepping off the train to be told ... about the big beet ... and the 12-inch spacing.
Mr. Berquest finds dairying fits in nicely with beet raising. This is a portion of his dairy herd.

The writer came to Scotts Bluff County in 1916 and took up a homestead 1¼ miles north and ¾ mile east of the Baxter beet dump. The land, just a rolling piece under the Government ditch, was not what would be called a very promising outlook.

I floundered around for a few years before I heard of the Government Experiment Farm in Scotts Bluff County. I made a trip up there and right then I first began to learn how to farm. Mr. Holden explained to me the value of rotation and how to apply the various kinds of rotation.

I went home and started farming according to the information and knowledge gained by that visit to the Experiment Farm. That was four years ago, since which time I have made a regular practice of going to the farm each year. There is always something new to learn, and I find that I can profit by following the practices which experiments have proven to be correct.

I have a good dairy herd. I seed some land to sweet clover every year. I plant 20 to 40 acres of potatoes every year, 30 to 40 acres of beets and 5 to 10 acres of corn for ensilage. I feed some barley, beet pulp and beet tops to my dairy stock. I plow 15 to 20 acres of sweet clover every year for beets and manure 10 to 15 acres. I figure that rotation is making me a profit; also I find the dairy herd is making me money.

I never farmed until I came to Scotts Bluff County and without the aid which I received from the Experiment Farm I probably would have
been still doing my farming as I did the first few years.

I feel that the farmers of this Valley should be very thankful that we have an Experiment Farm so close at hand where we can obtain, without cost, valuable information which every farmer, if he will make use of it, will find very helpful. I have no hesitancy in saying that I feel the Experiment Farm and the information and advice from Mr. Holden are responsible for my farming success today.

My farm is profitable now, whereas before I had begun farming on a scientific basis I was getting nowhere. The publication "Through the Leaves" has also helped me a great deal and the "Big Beet Special" brought information and advice which I have found very helpful.

The home of F. E. Berquest who built up his profitable farm in the North Platte Valley with beets, dairy cows and scientific farming.

The Recipe for Master Farmers

(As given by Carl Williams, editor of the Oklahoma Farmer-Stockman, after investigating the careers of men who have achieved greatest distinction among farmers of his state.)

They began at the bottom, of course. They didn't start with big teams, rich soil, high quality live stock and big farms. But they did their best with what they had right from the start, and each year they got ahead a little until finally they climbed into the class of Master Farmers.

From the very beginning of their farm histories these Master Farmers raised their own food and feed. They stayed in one place. They raised live stock and diversified their crops. They built up the soil by the use of manure, straw and legumes. They practiced crop rotation. They used the best teams and tools they could afford, and they gave both teams and tools good care.

As they got ahead, they bought bigger teams and bigger tools so that they could do more work in a day. They worked out farm systems which gave them work to do throughout the entire year. They finally got live stock of high producing quality, as they learned that a few good animals are more profitable than many poor ones.

Finally, with the profits from small farms, they got for themselves larger ones, so that they could operate their big teams and big tools on more land.

Know that with a farm, as with a man, however productive it may be, if it has the spending habit, not much will be left over.—Cato, about 100 B. C.
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Higher beet yields and sugar percentage are more easily to be realized, and in bigger portions, from better thinning and timely irrigation than from any other two practices within the grower's control. At the start of thinning and with irrigation just ahead this issue of Through The Leaves deals fully with these two vital steps. Right now you are laying the foundation for your harvest. The tonnage you dig can be no larger than that foundation.
19% In Sugar Beets
PRODUCED

65% of Farm Crop Values

Government reports show that in 1927 on the Pathfinder, the Gering and Ft. Laramie, and the Northport Irrigation Districts in western Nebraska sugar beets were grown on 19.14 per cent of the total irrigated acres.

Beets furnished 62.32 per cent of the total farm value of all the crops grown that year on these three portions of the project.

Two-thirds of the farm wealth from one-fifth of the farm land.
Editor's Notes

The company's contracted beet acreage for 1928 has passed the 250,000 mark. In a year featured by perhaps the bitterest opposition from co-operative association leaders in the company's history the plantings have been quite satisfactory and operation of all plants is assured.

Nebraska has the largest contracted acreage ever written there, the total on May 15 being 72,586. The Colorado district, with 150,000 acres, suffered a reduction of 40,000 acres from last year's plantings, the land going into other crops when the outcome of association opposition appeared uncertain. Members of the Mountain States Beet Growers Marketing Association have planted nearly 50,000 acres of sugar beets on the conditional contract announced by the company.

The Billings-Lovell territory has contracted nearly 29,000 acres, Lovell enjoying the largest acreage in its history.

A curious announcement was made on May 15 by J. D. Pancake, secretary of this association: "We have not attempted to restrain our members from growing beets." An unprejudiced observer would be hard-pressed to find where the association leaders were lending any encouragement to beet-growing. But Mr. Pancake's statement came too late in the season to offset the exactly opposite impression many members held of the association's attitude.

Following the decision of Judge J. W. Woodrough in federal court, holding the Nebraska association's contract invalid, Frank Thomas, president of that organization, announced that its members were "at liberty to contract as you see fit for 1928." That, too, was belated assurance, members in the meantime having rebuked the activities against beet-raising led by Mr. Thomas, rolling up the largest acreage ever signed in the Nebraska district.

On May 15 only a small percentage of the acreage contracted remained to be planted. Two hundred and forty thousand acres received a series of splendid rains which set in about the middle of May. Stands in the Colorado district are generally reported to be the most promising ever seen at this stage of the growing season. The rains in Nebraska and Billings territories assured good germination of beet seed. Lovell always irrigates up.

Thinning has commenced in Colorado. The supply of labor for the hand work is ample. In the Windsor
and Eaton factory districts, where reduction in acreage was most marked about 2,000 field workers mostly resident in the territory have found employment elsewhere.

The acreage contracted falls into two classes with respect to the blocking and thinning operation, the early contracts coming on for spacing ahead of the acreage later signed with the rider attached. By shifting of workers between these groups of fields it is hoped to handle the large acreage to be thinned early before the plants get too big for best tonnage.

The company's agricultural department in every district is putting forth all possible effort to coin the fine preliminary prospect into one of the best average yields on record. Timely blocking and thinning is the first step in this program. Should the recent rains result in unexpectedly rapid growth of the young plants before blocking is possible on many fields, the agricultural department is contemplating urging mechanical blocking. Where such a course is followed the thinning is performed at a later date.

An early irrigation program is also under consideration. Mr. Maxson reports that in Colorado the precipitation from October 1, 1927, to April 30, 1928, was several inches below normal. Even the mid-May rains did not make up the deficiency. Before they fell it would have required the heaviest May precipitation in 17 years to supply the lack.

The rule seems to be that when the precipitation from October 1st to June 20 is below 12 inches early first irrigation gives the highest sugar per acre. At the Longmont experiment farm, however, precipitation from October to April 30 last was only 4½ inches. With one exception this is the lowest in 17 years. Even with the heaviest May rainfall on record added to 4½ inches the total would make less than 9 inches, indicating that if the optimum results are to be realized the deficiency must be supplied by irrigation earlier in June than is ordinarily attempted.

### EARLY THINNING PROVED!

<table>
<thead>
<tr>
<th>Thinning Completed by</th>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 15</td>
<td>15.05</td>
<td>12.90</td>
<td>14.81</td>
<td>19.25</td>
</tr>
<tr>
<td>June 1</td>
<td>13.05</td>
<td>13.26</td>
<td>15.45</td>
<td>17.35</td>
</tr>
<tr>
<td>June 15</td>
<td>13.37</td>
<td>13.31</td>
<td>14.32</td>
<td>15.52</td>
</tr>
<tr>
<td>July 1</td>
<td>12.48</td>
<td>12.38</td>
<td>13.38</td>
<td>13.15</td>
</tr>
<tr>
<td>After July 1</td>
<td>10.94</td>
<td>10.41</td>
<td>11.88</td>
<td>10.45</td>
</tr>
</tbody>
</table>

These facts are taken from Fieldmen's records in the Colorado District of The Great Western Sugar Company and cover hundreds of thousands of acres of sugar beets.
GOOD STANDS INDICATE HIGH YIELDS

Early Thinning Following Prompt Planting Promises Better Profits

Fieldmen report stands of beets superior to anything they have ever known. These are the early planted fields, but where growers were delayed in planting, rainfall or early irrigation should give later sowings excellent opportunity to make good stands.

The greatest average beet yield in the history of western sugar production was made on acreage planted early and THINNED EARLY. That was Nebraska’s experience in 1925. The April and the May plantings, with favorable moisture in Colorado and Nebraska this spring, should average over 13 tons per acre—and possibly over 14—with careful and timely attention to every field practice from now on.

More acreage, higher yields, mean a better chance for the company to make the sugar volume desired to pay a bonus under the 1928 beet contract. It may mean 50 cents per ton more for every beet farmer.

Every incentive, therefore, favors giving the stand of beets exceptional care. It will continue to be the most profitable crop, the safest, which the farmers can grow on a large scale.
Your Stand of Beets

40 Beets Missing in Every 100 Feet of Row Last Year

Results obtained by the growers themselves, year after year, have shown that spacing beets 12 to 14 inches in the rows—that is leaving 86 to 100 beets per hundred feet of thinned stand—will produce the largest tonnage. In 1927, for example:

Growers having from 70 to 79% stands averaged 14.61 tons per acre.
80 to 89% stands averaged 15.7 tons per acre.
90 to 99% stands averaged 16.71 tons per acre.
100% stands averaged 18.01 tons per acre.

The average acre in Great Western territory last season yielded 13.05 tons per acre; the average weight of the individual beets was 26.6 ounces. AND AT HARVEST TIME THERE WERE ONLY 60 BEETS IN EVERY 100 FEET OF ROW. Forty beets were missing.

These 40 missing beets in every hundred feet of row were worth $40 per acre! The difference between the yield of a 60 per cent stand and 100 per cent stand was 5 tons!

Much commotion surrounds a difference of 25 to 50 cents per ton in the contract price of beets. On the average crop this represents a few dollars per acre. Many times as much revenue is available from leaving a closer stand of beets.
A Fieldman will do everything in his power to increase the grower’s tonnage. But the Fieldman has a hundred or more beet fields to look after, while the farmer has one. The Fieldman is rustling up labor, “shooting troubles” of various kinds, called here and there for emergencies.

If better thinning is the most promising element in getting higher yields the job of supervising the hand-labor to get first-class thinning work is a matter the good grower will trust only to himself.

It is noticeable that the farmers who supervise their beet help closely and get 20-ton crops have a system about it. First, they get into the beet field at least twice daily during blocking and thinning. Second, these farmers actually measure and count the stand being left by the workers. Third, by fair treatment of the hand labor these farmers gain the co-operation of the workers to do a good job while the grower is not around.
Improvement in the spacing and selection of plants during beet thinning offers perhaps the biggest single possibility of increasing the yield at harvest.

Experimental plots and commercial tests have increased yields 5 tons or more per acre by 12-inch spacing as compared with 20 inches. In other tests where the only variation in treatment was plant selection, leaving the big beet in the blocked bunch gave an increase of 5 tons or more as compared with "average thinning" which disregarded sizes.

Despite campaigns of previous years for 12-inch spacing, the average last season was 18 to 20 inches. If the indicated improvement in yields from closer spacing were cut in half—\(2\frac{1}{2}\) tons per acre—its value would still be within a few dollars of the entire hand labor cost on the crop.

Benefits from leaving in the thinned stand the big, thrifty plants are additive. If the promise of this practice were divided by two another marked increase in yield would be gained.

12-inch stand, closer spacing and early thinning are now foremost in the program of growers who work for higher yields. Cultivation and thinning where the beets have four leaves should be commenced immediately, soil conditions permitting.

The big beets are as easily left as the weaker ones: press this point on your hand workers. Enlist their cooperation by considerate treatment.

Your beet check is as big as the foundation you lay in the blocking and thinning.
Make Good Stands Mean Higher Yields

Germination stands generally are very heavy this year. The wet weather, however, gives foul growth a chance to become well-established in the rows as well as between the rows.

Unless more than normal speed is made in blocking and thinning this season there will be much more congestion in the rows of beets than is usual or advisable. The extra beets in the unthinned stand as well as the extra weeds hold back growth and tonnage of the roots you finally will harvest.

If the beets make a rapid growth as the result of rains and hand-laborers fall behind the desirability of mechanical blocking should receive careful consideration of growers. Should this wet weather continue a rare condition will confront growers and it may call for unusual treatment. Before attempting mechanical blocking, however, consult your Fieldman.

Early thinning involves early cultivation, a step which now takes on special value from the fact that weed growth is also advanced.

Good germination stands are of first importance in good final yields. With assurance of a fine start for 1928 do not lose ground to delayed blocking and thinning or cultivation.
Hand Workers to Receive Prizes for Better Thinning

Interest of contract beet workers is again being aroused in higher yields per acre. Growers and Fieldmen, by personal solicitation of every group of hand laborers, will in 1928 strive again for better blocking and thinning, leaving the “big beet,” timely weeding, and all-around improved hand work on the crop.

Prizes for thinning will this season loom large in the vision of beet contractors. Fifteen per cent of the workers are eligible for prizes, a larger number than in any previous year’s better thinning campaign.

The higher yields bring their own rewards to grower and beet tenders. The contest for prizes merely appeals to the instinct of every normal person to excel. Gold buttons awarded last year to the best laborers are in evidence in 1928, workers taking pride in displaying this emblem of superiority. Again the best thinners will receive gold buttons and prize certificates, to the number of about 15 in each Fieldman’s district. “Repeaters,” who have taken honors in two seasons, will receive special buttons making known that fact.

Complete information and instructions are being given to beet contractors. Leaflets in English and Spanish, emphasizing the 12-inch spacing and leaving the big beet, are being distributed.

That 6,880 families of beet tenders earned bonuses in 1927, is the rather surprising encouragement given in the first leaflet for the hand workers. Nearly a thousand received premiums of $80 or more.

The possibilities, however, have barely been scratched. Harvested stands
still range around 60 beets per hundred feet of row on the average. ONLY TEN EXTRA BEETS IN EACH 100 FEET OF ROW, weighing 1½ pounds each at harvest, WOULD MORE THAN PAY THE FARMER'S ENTIRE THINNING BILL.

Workers are being told that winners will be selected on the following points: 1—What were the conditions in the field at thinning time. 2—How well was the work done. "It is more creditable," says the leaflet, "to do excellent work under difficult conditions than under perfect conditions. Every year some of the prizes have been awarded to workers who did first class work on hard or weedy fields.

"To earn a bonus and also win a prize, do your thinning as well as possible with respect to the following:

"A—Space the beets 12 inches apart, unless your farmer orders otherwise.

"B—On each end of vacant places or gaps in the stand leave two beets about six inches apart.

"C—Leave the BIG BEET in the bunch after blocking."

EARLY THINNING AND LATE

The Facts Prove Early Thinning Gives Higher Yields.

1914—Beets blocked and thinned when 16 days old produced 1596 pounds of beets and 167 pounds sugar more per acre than beets blocked and thinned when 31 days old. (Delay of 2 weeks cost nearly 1 ton in yield.)

1923—Beets blocked and thinned when 25 days old produced 845 pounds beets and 51 pounds sugar more per acre than beets blocked and thinned at 32 days old. (Delay of one week reduced yield per acre nearly one ton.)

1924—A delay of 14 days reduced the yield 2744 pounds of beets and 645 pounds sugar per acre; and in another experiment this year a delay of 26 days reduced the yield 7187 pounds of beets and 1543 pounds of sugar per acre. (Delay of two weeks reduced the yield nearly 1½ tons per acre; delay of 3 weeks and five days cost more than 3½ tons per acre.)

Cultivate Immediately After Thinning

Cultivation a day or two after thinning is important. It pushes the dirt up to the plants, clears away traces of tramping, aerates the soil, and aids in quick recovery of the young seedlings from the punishment of the thinning job. Some farmers cultivate their beets weekly until the foliage covers the rows.
Lamb Fattening Experiment at Fort Collins

By E. J. MAYNARD

Lamb feeders listening to Dr. C. A. Lory at the annual lamb feeders day, Colorado Agricultural Experiment Station, Fort Collins.

The importance of systematic feeding experiments and the lessons they teach is shown by the ever increasing attendance at Feeders' days at the Agricultural College. This year over 400 lamb feeders from different parts of Colorado gathered at the Agricultural Experiment Station at Fort Collins to hear results of the current feeding work and to study the lambs on experiment. Objects of the experiment this year were:

1. To compare shelled corn and home grown Trebi and Coast (California Feed) barley for fattening lambs.
2. To compare whole barley and steam-rolled barley.
3. To determine the value of cottonseed meal fed with barley and alfalfa.
4. To compare cut-corn-fodder and corn silage.
5. To determine the feeding value of pressed beet pulp.
6. To compare gains and cost of gain on light and medium weight lambs.
7. To compare different methods of feeding alfalfa hay.

Increased yields from improved strains of barley have revived interest in barley as a fattening feed for lambs. Results of early feeding tests by Morton (Colorado Experiment Station Bulletin 187) based on present prices of grain and alfalfa show that while a two-rowed Scotch brewing barley was.
practically equal to corn, a six-rowed feeding barley (California Feed) showed 16 per cent lower value than corn when fed with alfalfa hay. Trebi, an improved strain, and Coast (California Feed) were compared to corn in the present test.

An average of feed prices for the past six years shows corn (recleaned No. 3 yellow) costing $30.00 per ton and alfalfa hay $13.00 per ton. The following comparisons of corn and barley are based on these prices.

In a direct feeding comparison a ton of shelled corn was equal to 2204 pounds of Trebi barley and 874 pounds of alfalfa, or with corn at $30.00 per ton and alfalfa as stated, the Trebi barley was worth $25.01 per ton fed with alfalfa alone, or 83.4 per cent the value of corn. Coast (California Feed) barley proved just 10 per cent less valuable than Trebi barley in this test. The barley fed in the test was uncleaned to correspond with general farm conditions.

When whole barley was compared with steam-rolled barley practically the same returns were secured. With whole Trebi barley worth 83.4 per cent the value of corn, the steam-rolled barley was worth only 84.4 per cent corn value or only 30 cents per ton more.

General feeding experiments over the country indicate that sheep or lambs with good teeth can grind their own grain. This test apparently confirmed the general rule and although some barley may pass undigested when a heavy feed is used, the rolling or grinding of barley did not prove to be profitable in the fattening ration.

Cottonseed meal fed with barley and alfalfa increased the average gain per lamb 5.4 pounds but it also increased the unit gain cost and did not pay in that particular ration.

Where plenty of alfalfa hay is used with grain alone the ration is narrow enough without the use of cotton cake. The principal value of cotton cake lies in its use in rations where a bulky carbo-hydrate limits the amount of protein roughage consumed. Cotton cake can be expected to show good results fed along with (1) grain, corn silage or corn fodder, and alfalfa or with (2) grain, wet beet pulp, and alfalfa. Corn silage and cut corn fodder, although they are not as efficient as wet beet pulp on present cost bases, have proven valuable feeds in Northern Colorado fattening rations. They are especially valuable in cutting down the amount of alfalfa hay used in fattening lambs. In this test corn silage showed 34.9 per cent the feeding value of cut corn fodder pound
for pound or with silage at $6.00 per ton the cut corn fodder was worth $17.67 per ton. An average of three years' work, however, shows corn silage worth 38 per cent the feeding value of cut dried corn fodder.

Two fattening rations were outstanding in the experiment: the barley, wet beet pulp, cottonseed meal and alfalfa ration and a self-fed ration composed of barley, cottonseed meal and alfalfa, ground and mixed with beet molasses.

Lambs in these two lots were finished and went to market three weeks sooner than the rest. The wet beet pulp ration produced the cheapest gains of any lot in the experiment. The ground feeds mixed with beet molasses and fed in a self-feeder produced the same quick gain as the pressed beet pulp ration, but the cost of grinding and mixing feed made the self-fed ration more costly.

A comparison of gains and cost of gains on light and medium weight lambs was made. At the time the lambs were secured for the test 25 light-weight “cully” lambs were sorted from the 1300 available and were fed in a separate lot during the experiment. Although these lambs did not make as heavy gains as the medium weight lambs their gains were actually more economical than the gains on medium weight lambs costing only 89 per cent as much. The good results secured with these light lambs indicate the value of sorting and sizing up lambs. Had they been fed with the heavier lambs they, undoubtedly, would not have shown such good results.

Narrow panels used for hay feeding showed up to better advantage than hay self-feeders this year although the reverse was true last year.

The outstanding indications of the test are briefly as follows:

Although, barley is not equal to corn in feeding value when fed with hay alone it closely approaches a corn value when there is a variety of feeds used in a well-balanced fattening ration.

Improved strains of barley actually have a higher feeding value than common barley.

It does not pay to roll barley for fattening lambs.

Cottonseed meal can be used to advantage in fattening rations containing bulky carbohydrate feeds.

Cut corn fodder has given slightly better results than corn silage.

Wet beet pulp is the most economical feed if available for the lamb fattening ration.

Light weight lambs make more economical gains than medium weight lambs when fed separately.

Favorable growing conditions brought about by favorable temperatures and distribution of rainfall COUPLED WITH early planting and a longer growing period; late damaging frosts; AND WELL-TIMED AND EARLY IRRIGATIONS will do much to produce a higher per cent sugar on heavily fertilized land.—Asa C. Maxson.
Four Beet Demonstration Trains Conducted in 1928 by Sugar Companies

By C. V. MADDUX

The slogan of four beet trains run in various factory districts this spring, for the first time, was “Stand and Tonnage,” meaning, of course, that better tonnage will follow a closer stand at thinning time.

The trains were run in Ohio, in Michigan, in the Arkansas Valley of Colorado, San Luis Valley of Colorado and in the Grand Junction-Delta district of Colorado. More than 18,000 persons visited these trains, gratifying attendance at each stop.

Various sugar companies operating in Michigan collaborated with the Michigan Central railroad and the State College in the train tour they started March 5 and ended March 17. In Ohio, the tour was made over the New York Central Lines with the co-
Wherever better beet growing is discussed emphasis is placed on better seed beds.

operation of Ohio State University and local sugar companies. In the Arkansas Valley, the train was run with the sugar companies, the Colorado Agricultural College and the Santa Fe Railroad co-operating. The Denver & Rio Grande Western Railroad Company, with the aid of Colorado Agricultural College and interested sugar manufacturers, conducted the tours in San Luis Valley and on the Western Slope.

A demonstration feature common to all these trains dealt with closer spacing and selection of the big beet. In each instance, other approved farm practices of peculiar local value were included, such as Soil Drainage, Feeding of Live Stock, Crop Rotation and Fertilization.

The beet trains were composed of one exhibit car (in one instance, two exhibit cars), lecture car and one

Highlights of beet culture included "break crusts," "100 beets to 100 feet," "save strong plants," "cultivate properly," "plant early," "fewer weeds, more beets," etc.
business car for accommodation of the demonstration personnel.

Two significant slogans were used on the Ohio tour—"A beet where a beet ought to be" and "Save the Sturdy Seedlings," which being interpreted into our language means "Space beets 12 to 14 inches apart" and "Leave the Big Beet." That thought was stressed in all the tours as one of the most important methods for increasing yield per acre without materially increasing the cost of production.

As a means of getting labor to space beets closer and leave the big beet, in Michigan this year, a bonus feature was introduced into the labor contract. IT PROVIDES FOR PAYING THE LABOR 75c PER TON IN EXCESS OF A YIELD OF NINE TONS PER ACRE. That plan for contracting with labor was advocated by speakers on the train to create a sense of proprietorship on the part of the beet labor, to stimulate their personal interest in increasing yields. Under a flat rate labor contract, the interest of the worker is centered too much in the amount of acreage he tends and too little on production per acre.

Varying Numbers of Irrigations

By ASA C. MAXSON

Two, three and five irrigations were applied in 1912 with the following results:

<table>
<thead>
<tr>
<th>Date Irrigated</th>
<th>% Sugar</th>
<th>Yield per A.</th>
<th>Sugar per A.</th>
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<tbody>
<tr>
<td>7-22, 8-12</td>
<td>16.10</td>
<td>16.31</td>
<td>5250</td>
</tr>
<tr>
<td>8-12, 9-16</td>
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<td>5070</td>
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<td>6-27, 7-22, 8-12</td>
<td>16.29</td>
<td>17.10</td>
<td>5570</td>
</tr>
<tr>
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<td>16.24</td>
<td>18.33</td>
<td>5952</td>
</tr>
</tbody>
</table>

Where two irrigations were applied, the earlier applications produced the highest per cent sugar and sugar per acre.

Three irrigations exceeded two regardless of the date of application, in per cent sugar, yield and sugar per acre.

Five exceeded two and approximately equalled three in per cent sugar and exceeded all others in yield and sugar per acre.

This shows that the yield and sugar per acre can be materially increased without any appreciable reduction in sugar per cent by giving the crop plenty of water properly applied. Shortage of water tends to produce relatively low sugar per cents.

GIVE BEETS TIMELY IRRIGATION. STUDY THE NEEDS OF THE PLANTS AND NOT THE CALENDAR.
There Was a Time—

Beet growers used to begin irrigation about Aug. 1.

The average date of the first irrigation in our districts is now about July 10. When July 4th comes around thoughts turn to irrigation.

But the drift is sharply toward earlier irrigation. In the Lovell district all beets are irrigated up, a normal condition due to lack of rainfall for germination. Now irrigation for germination is common in the Logan, Sedgwick and Morgan county beet growing areas of Colorado. It has not yet been attempted on any large scale in Nebraska.

In these semi-arid districts man built irrigation systems to supplement natural rainfall, to put water on crops when they needed it. If they need it before or after planting for germination—if they need it in June—that is the time to apply the water.

On our experiment farm at Longmont they begin summer irrigation of sugar beets by June 20 or 25 if the natural precipitation is below normal. They consistently produce yields several tons higher and a per cent or two greater in sugar content than the average for the locality.

There was a time when these expensive irrigation systems remained idle at the very stages of crop growth crying for water. That mistake is no longer made by farmers who realize that the best crops are obtained by keeping the plants growing steadily and thriftily throughout the season.
Withholding Water to Lengthen Beet Roots---

PROVEN BY TESTS TO BE A MISTAKE

"Contrary to popular opinion, the length of beets is not increased by delaying the time of applying the first irrigation."

So stated Prof. F. S. Harris after he had concluded the first 5-years' tests at the Utah Agricultural College experiment.

With the aid of Prof. D. W. Pittman, Mr. Harris then commenced another series of experiments in the irrigation of sugar beets, ended in 1921. Again they reached the conclusion:

"The length of the beets showed very little variation with the different treatments except that on the dry plat they are just a little shorter than the others. This bears out the results of the previous tests in showing that allowing the beets to suffer for water early in the season will NOT increase the length of the beets."

Those irrigation treatments which produced the largest yield of beets also produced the largest sized individual beets by weight.

Weekly or alternate weekly small (2-inch or 3-inch) irrigations gave the largest yields of beets. Irrigations, of course, should be adapted to natural precipitation.
Don't Let Rain Fool You

By Asa C. Maxson

Until the rains of Mid-May fell the precipitation in the Colorado district from October 1, 1927, to April 30, 1928 was the lowest in 17 years, with one exception.

The Nebraska district was even drier on the whole, until the rains of May 13 came. Montana had heavy snowfall during the winter but seed beds were very dry, except where irrigated, until the May rains.

If we get a precipitation during May in Colorado equal to the heaviest May rainfall in the past 17 years, we will still be several inches short of normal when regular irrigations of sugar beets usually are started.

Moreover, 1928, so far has been rather above normal in temperatures and wind, causing an abnormal evaporation of moisture from the beet fields.

*Every indication, therefore, points to the probable need of starting regular irrigations in 1928 earlier than usual.*

The best beet crops on the Longmont Experiment Farm have been produced when irrigation was applied to take account of any deficient or surplus precipitation from October to June. If short, irrigation was begun before June 20. If the rainfall was normal the regular irrigations started about June 20, and if the season was very wet irrigations were postponed accordingly.

*But the moisture situation in the soil—and not the calendar—is the thing to watch. Irrigate when the beets need water regardless of the calendar.*
Why We Irrigate

By F. C. JEAN

Professor of Biology, State Teachers College, Greeley

There is no single factor that determines so completely the measure of success in farming as does the water supply. Animals soon reach the age when they can use solid food. Plants never do. Every bit of nourishment plants take comes dissolved in water.

58% of the weight of sugar made by sugar beets is composed of elements which the plant gets from water. The beet plant combines the carbon dioxide of the air with water to make sugar.

The leaf is cooled by the loss or evaporation of water, this transpiration setting up a flowing stream through the water tubes of the plant and in this manner carrying up quantities of mineral matter from the soil to the leaves where it is used. For every pound of thoroughly dried top or root produced, several hundred pounds of water are taken out of the soil.

Because of this lavish use of water by plants the successful beet grower must constantly so till his soil and shape his irrigation practices as to accomplish two things:

1—He must keep the plant well supplied with moisture AT THE ROOTS through all stages of growth, and

2—Avoid unnecessarily extravagant use of irrigation water.
WHEN
TO IRRIGATE

By F. C. JEAN
Professor of Biology, State Teachers College, Greeley

There is nothing in plant science to warrant the popular belief held by many that the plants must be starved for water supply to drive the roots deeper into the sub-soil and thus grow larger, heavier-yielding beets.

Whenever beets are wilting during a large part of the day, the pores in the leaves are practically closed. Carbon dioxide from the air is not passing into the leaves rapidly enough; sugar is not being made to any great extent, and the plant is loafing on the job.

To permit a condition like this to continue very long may permanently arrest the rate of plant development, reduce the sugar content and materially cut the grower’s profit on the crop.

One should not water by the calendar, by the moon or by the sign of the Zodiac. Only one sure rule can be laid down and that is WHENEVER THE BEETS NEED WATER GET IT ON THEM.

Unless the summer rains fall in very unusual amounts at a single time and in such a manner as to be soaked up by the soil, little or no consideration should be given them in connection with irrigation practices.

When the soil in the upper layers has become quite dry, the roots in that region have lost their root hairs, the skin on them has become thickened, and this portion of the root system has been deprived very largely of its power to absorb moisture. If this part of the root ever works again effectively it must push out fresh, new branches and develop new root hairs. Meantime the plant has lost time and tonnage.
Summarizing Beet Irrigation

By Asa C. Maxson

In order to produce the best type of beet-crop irrigation, your practice should be based on the moisture supply in the soil. Take into account the rainfall from the preceding October to about June 1st. If deficient, start regular irrigations earlier than is your custom.

The best beet crop—in tonnage, per cent sugar, and sugar per acre—is secured by the application of adequate supplies of water, by timing irrigations to make the most uniform water distribution possible during the growing season.

Normally beet crops do not receive enough water for best results or the distribution is not properly controlled. If you have the water apply it as the crop shows need of it—or rather just before that need becomes too apparent—regardless of the size of the plants.

Frequent showers sometimes mislead growers. The plants look refreshed after rains. The leaves are turgid—stand up well—because the heavy moisture-laden air keeps them so. But you want to harvest roots. What are the roots doing in the meantime?

Last year in some of our districts we had many showers during the irrigation season and growers were inclined to put off watering the beet crop. As a result the roots part of the time were trying to find food in soil with a moisture content too low for best tonnage. The plant food must be dissolved for the small root hairs: ordinary showers do not penetrate to the feeding level of the tap root and smaller side roots in the lower portion of the plowed ground and below.
The territories furnishing beets to the Great Western Sugar company are all deficient in rainfall. It is quite natural, then, that precipitation should exert more or less influence upon the quality and quantity of the sugar beet crop.

The annual precipitation as recorded for the calendar year has no direct relation to sugar per cent or yield of beets as can be seen by the following:

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Inches</th>
<th>% Sugar</th>
<th>Yield Per Acre</th>
<th>Lbs. Sugar Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1915</td>
<td>22.96</td>
<td>17.74</td>
<td>14.47</td>
<td>5134</td>
</tr>
<tr>
<td>1913</td>
<td>17.37</td>
<td>14.23</td>
<td>12.90</td>
<td>3671</td>
</tr>
<tr>
<td>1912</td>
<td>17.08</td>
<td>15.10</td>
<td>13.21</td>
<td>3989</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>15.69</td>
<td>13.52</td>
<td>4264</td>
</tr>
<tr>
<td>1914</td>
<td>16.25</td>
<td>16.24</td>
<td>16.69</td>
<td>5421</td>
</tr>
<tr>
<td>1916</td>
<td>13.60</td>
<td>15.07</td>
<td>14.79</td>
<td>4430</td>
</tr>
<tr>
<td>1917</td>
<td>12.40</td>
<td>17.08</td>
<td>12.36</td>
<td>4214</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.13</td>
<td>14.61</td>
<td>4688</td>
</tr>
</tbody>
</table>

It can hardly be conceived that any of the six years given above were wet enough to be injurious to the beet crop. These figures suggest a study of seasonal distribution. The moisture falling during several months of each year affects the crop of the following year. This suggests a crop year as the basis of study.

For this study the crop year is taken to be from Oct. 1 to Sept. 30 the following year. The years 1912 to 1917, inclusive, are grouped according to the precipitation during this period in the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Ins. Prec. for Crop Year</th>
<th>% Sugar</th>
<th>Yield Per Acre</th>
<th>Lbs. Sugar Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1915</td>
<td>22.89</td>
<td>17.74</td>
<td>14.47</td>
<td>5134</td>
</tr>
<tr>
<td>1914</td>
<td>19.47</td>
<td>16.24</td>
<td>16.69</td>
<td>5421</td>
</tr>
<tr>
<td>1912</td>
<td>16.11</td>
<td>15.10</td>
<td>13.21</td>
<td>3989</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.36</td>
<td>14.79</td>
<td>4848</td>
</tr>
<tr>
<td>1917</td>
<td>19.29</td>
<td>17.08</td>
<td>12.36</td>
<td>4214</td>
</tr>
<tr>
<td>1913</td>
<td>13.61</td>
<td>14.23</td>
<td>12.90</td>
<td>3671</td>
</tr>
<tr>
<td>1916</td>
<td>11.82</td>
<td>15.07</td>
<td>14.79</td>
<td>4430</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>15.46</td>
<td>13.35</td>
<td>4050</td>
</tr>
</tbody>
</table>

The wet years produce the highest average per cent sugar, yield of beets and sugar per acre.

Since irrigation as usually practiced is regulated more by the calendar than by the actual needs of the crop, the amount of precipitation from Oct. 1 to the date of the first irrigation the year following may be considered of considerable importance in determin-
ing the type of crop produced. This is especially true, since the average crop is much more apt to suffer from lack of water before the first irrigation is applied than afterwards.

The following table shows the importance of the precipitation during what may be termed the storage and pre-irrigation periods.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Precip.</th>
<th>Yield Lbs. Sugar</th>
<th>Sugar Per Acre</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oct. 1 to 1st Irri.</td>
<td>% Sugar</td>
<td>Per Acre</td>
<td>Per Acre</td>
</tr>
<tr>
<td>1914</td>
<td>18.36</td>
<td>16.24</td>
<td>16.69</td>
<td>5421</td>
</tr>
<tr>
<td>1915</td>
<td>14.39</td>
<td>17.74</td>
<td>14.47</td>
<td>5134</td>
</tr>
<tr>
<td>1917</td>
<td>13.07</td>
<td>17.08</td>
<td>12.36</td>
<td>4214</td>
</tr>
<tr>
<td>Average</td>
<td>15.27</td>
<td>17.02</td>
<td>14.51</td>
<td>4923</td>
</tr>
<tr>
<td>1912</td>
<td>10.58</td>
<td>15.10</td>
<td>13.21</td>
<td>3989</td>
</tr>
<tr>
<td>1916</td>
<td>8.61</td>
<td>15.07</td>
<td>14.79</td>
<td>4430</td>
</tr>
<tr>
<td>1913</td>
<td>8.16</td>
<td>14.23</td>
<td>12.90</td>
<td>3671</td>
</tr>
<tr>
<td>Average</td>
<td>9.12</td>
<td>14.80</td>
<td>13.63</td>
<td>4030</td>
</tr>
</tbody>
</table>

Here we have the most pronounced effect of a seasonal factor yet encountered. These figures suggest a connection between early precipitation and the date upon which a crop will require its first irrigation.

As a possible indicator of the water requirements of the beet crop, the distribution of the rainfall during the growing season is included. The growing season is considered to begin on the planting date and to end at harvest. This period naturally divides into two parts. (1) the period of rapid growth which is from planting to Aug. 30th, (2) Sept. 1st to harvest or ripening period. In making the following table, the precipitation is measured from one week in advance of the actual planting date since such rains if at all heavy have an effect upon the germination and early growth of the seedling.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Precip.</th>
<th>Yield Lbs. Sugar</th>
<th>Sugar Per Acre</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planting to Aug. 31</td>
<td>% Sugar</td>
<td>Per Acre</td>
<td>Per Acre</td>
</tr>
<tr>
<td>1914</td>
<td>10.95</td>
<td>16.24</td>
<td>16.69</td>
<td>5421</td>
</tr>
<tr>
<td>1915</td>
<td>10.90</td>
<td>17.74</td>
<td>14.47</td>
<td>5134</td>
</tr>
<tr>
<td>1912</td>
<td>7.71</td>
<td>15.10</td>
<td>13.21</td>
<td>3989</td>
</tr>
<tr>
<td>Average</td>
<td>9.85</td>
<td>16.36</td>
<td>14.79</td>
<td>4848</td>
</tr>
<tr>
<td>1916</td>
<td>6.93</td>
<td>15.07</td>
<td>14.79</td>
<td>4430</td>
</tr>
<tr>
<td>1917</td>
<td>6.11</td>
<td>17.08</td>
<td>12.36</td>
<td>4214</td>
</tr>
<tr>
<td>1913</td>
<td>5.20</td>
<td>14.23</td>
<td>12.90</td>
<td>3671</td>
</tr>
<tr>
<td>Average</td>
<td>5.65</td>
<td>15.46</td>
<td>13.35</td>
<td>4050</td>
</tr>
</tbody>
</table>

The greater the rainfall during the months of heavy growth the higher the per cent sugar, heavier the yield of beets and the greater the pounds of sugar per acre. (And in the absence of rain why not irrigate to get the same effect?)
We will now attempt to determine how the precipitation from Sept. 1st to harvest affects the crop.

<table>
<thead>
<tr>
<th>Year</th>
<th>Precip. from Sept. 1 to Harv.</th>
<th>% Sugar</th>
<th>Yield Per Acre</th>
<th>Lbs. Sugar Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1916</td>
<td>5.63</td>
<td>15.07</td>
<td>14.79</td>
<td>4430</td>
</tr>
<tr>
<td>1915</td>
<td>4.64</td>
<td>17.74</td>
<td>14.47</td>
<td>5134</td>
</tr>
<tr>
<td>1912</td>
<td>3.51</td>
<td>15.10</td>
<td>13.21</td>
<td>3989</td>
</tr>
<tr>
<td>Average</td>
<td>4.59</td>
<td>15.97</td>
<td>14.15</td>
<td>4518</td>
</tr>
<tr>
<td>1913</td>
<td>2.87</td>
<td>14.23</td>
<td>12.90</td>
<td>3671</td>
</tr>
<tr>
<td>1917</td>
<td>1.56</td>
<td>17.08</td>
<td>12.36</td>
<td>4214</td>
</tr>
<tr>
<td>1914</td>
<td>1.28</td>
<td>16.24</td>
<td>13.69</td>
<td>5421</td>
</tr>
<tr>
<td>Average</td>
<td>1.89</td>
<td>15.85</td>
<td>13.98</td>
<td>4435</td>
</tr>
</tbody>
</table>

The effect of precipitation in this period upon sugar per cent is slight. On the other hand the wet falls appear to favor higher yields and sugar per acre.

From all the foregoing it is plain that a plentiful and continuous moisture supply from planting until harvest produces the most valuable beet crop.

### Basic Rule of Irrigation

To produce a prize-winning calf or pig, farmers know the animal must be kept growing steadily from the day of its birth.

If a beet plant is to do its best, it must be kept in a thrifty, growing condition constantly throughout the growing season. The only way this can be done in these semi-arid sections is to irrigate beets when moisture is needed.

### Prevent Misunderstandings With Your Beet Labor

Nearly all cases of trouble between beet farmers and beet laborers can be traced to misunderstandings. Before using beet help for other work have a definite understanding concerning wages, preferably a written agreement. Also give your contract beet workers definite directions regarding obtaining fuel; about the hauling of groceries, etc.
Beet Root Development and Depth of Irrigation

By W. H. SNELSON

(Printed through the courtesy of the Commissioner of Immigration, Department of the Interior, Canada)

SANDY soils will retain (that is, hold water up in the soil against the pull of gravity) from ½ to 1 acre-inch of water per foot in depth of soil, depending on the soil texture, the coarse sands holding the smaller amount.

Loam soils will hold from 1½ to 2½ acre-inches of water per foot in depth of soil. Fine silt or silt-loam soils will hold from 2½ to 3½ acre-inches and heavy clays from 3 to 5 inches per foot in depth of soil.

Under good irrigation practice it is unprofitable to allow the plant completely to exhaust the available moisture supply of the root zone before applying the next irrigation; so that under average conditions we find that the irrigated soil retains from ½ to 1½ acre-inches of water per foot in depth of soil from irrigation.

Average amount of water that can be Depth of Age of Age of root-occupied zone, retained in the root-occupied zone from Depth of root-occupied zone. an irrigation. In Inches.

\begin{tabular}{|c|c|c|c|}
\hline
Age of & Depth of & Sand & Loam & Silt \\
Beets & root-occupied zone. & ½ & 1 & 2 \\
\hline
1 month & 0.5 & ½ & 1 & 2 \\
2 months & 1.0 & 1½ & 3 & 4½ \\
3 months & 3.0 & 2 & 4 & 6 \\
4 months & 4.0 & 2½ & 5 & 7½ \\
5 months & 5.0 & & & \\
\hline
\end{tabular}

For sandy soils a 3 or 4-inch irrigation would always be more than enough to apply. A 2-inch irrigation would be much more economical in the early stages of growth.

For loam soils the correct depth per irrigation will vary from a 3-inch irrigation in the early part of the season to a 5-inch irrigation in August and September, depending on rainfall and applying only enough water at one irrigation to saturate the root zone thoroughly.

For silt soils. The silt and silt-loam soil will retain up to a 7-inch irrigation late in the season but it will be found much more profitable to apply this amount in two 3½-inch irrigations than in one application of 7 inches depth.

Only light irrigation should be applied to sugar beets in the early part of the season, especially on lands underlaid with an impervious stratum or poorly drained.

Conclusions

1. Development of plant dependent upon supply of food, moisture, air and warmth:

The development of the plant as a whole depends upon the development of the root system. The development of the root system is dependent upon the supply of air, plant-food, moisture and warmth. The supply of these constituents in the soil may be regulated by crop rotation, manuring, irrigation and drainage.

2. Correct moisture content must be maintained:
The soil, especially the surface zone containing the bulk of the plant food, must be maintained at the proper moisture content throughout the growing season so that roots can develop therein and extract food.

3. Light irrigations should be applied to supplement rainfall:

When the rainfall is not sufficient to maintain the soil at the proper moisture content the deficiency should be supplied by no more than that required to raise the moisture content of the root-occupied zone up to the optimum moisture content. This will necessitate the application of light irrigations, especially in the early part of the growing season.

Better results will be attained by the application of a given amount of water in frequent light rather than few heavy irrigations. The reason is obvious because so large a proportion of the water applied in a heavy irrigation is lost to the plant by percolation below the root-occupied zone. This percolation removes plant foods. With light irrigations applied frequently, the fertile soil zone near the surface is more nearly maintained at the optimum moisture content.

Feeds for Profit and Fertility

By JAMES JESSUP, Fieldman

Mr. Redding Has a Compact, Well-Beded Feed Lot.

VIRGIL C. REDDING of the Nebraska district received a fair profit this year on the feeding of both sheep and cattle. In addition he had fertilizer with which to make his farm produce larger crops. In his feed yard he used plenty of bedding, with the result that fertility was not lost.

He fed his sheep wet pulp, barley and alfalfa and finished them on beet tops, corn, cotton cake and alfalfa. The 2300 lambs made an average gain of about 30 pounds per head. His 60 cattle showed a good gain on wet pulp, beet tops, corn, cotton cake and alfalfa.

Mr. Redding is a firm believer in feeding every year to keep up the fertility of his three farms, including his home place, a very fine farm. Mr. Redding uses a rotation of alfalfa, potatoes and beets, with plenty of fertilizer.
Co-operatives Demand Philippine Tariff

Representatives of Nearly a Million Farmers Warn Congress of Danger to American Agriculture from Duty-Free Imports of Competitive Products

NEARLY a million American farmers are on record demanding protection of domestic agriculture against duty-free imports from the Philippine Islands.

The Philippine menace was emphasized in demands for immediate upward revision of tariffs on farm products placed before Congress by delegates from agricultural co-operative associations representing 981,000 farmers, holding their first national conference on tariff problems in Washington May 7 and 8.

Endorsing the principle of a protective tariff on farm products, the conference called for emergency legislation on many commodities including "products from the Philippine islands that come into direct or indirect competition with products produced on the farms of the United States."

This action gives added support to the resolution introduced recently by Congressman Charles B. Timberlake of Colorado calling for a restoration of a limitation of sugar imports, duty free, from the Philippines. Not in excess of 500,000 tons of sugar per annum would be permitted to enter the United States duty free under the Timberlake measure.

The farm conference resolution summarizes the problem as follows: "At this time we call the attention of the Congress to the fact that the farmers of the United States are suffering severely because no tariff duties are placed upon products grown and imported from the Philippine islands. We are convinced that the time has come to speak just as frankly about our relations with the Philippine islands."

"For years the Federal Government has been pouring millions of dollars into the development of these islands and allowing products from these islands to come into this country duty free, notwithstanding the fact that the Philippines are not a part of the territory of the United States. We therefore demand that a tariff be levied upon products imported from the Philippine islands."

The resolution was signed by members of the Legislative Committee of the First National Conference on Agricultural Tariffs including J. T. Montgomery, chairman, manager of the Central Co-operative (Live Stock) Association, South St. Paul, Minn.; Charles W. Holman, secretary, of the National Co-operative Milk Producers' Federation, Washington, D. C.; J. D. Miller, president, the National Co-operative Milk Producers' Federation, Susquehanna, Pa.; J. R. Worsham, representing the Peanut Growers' Association, Norfolk, Va.; J. W. Shorthill, secretary, the Farmers' National Grain Dealers' Association, Omaha, Neb.; and Harry R. Lewis, president, the National Poultry Council, East Greenwich, R. I.
Mr. Maxson has reviewed the literature on this subject and in this text also combines a recent study of the disease in the McCook District.

I find no reference to soil fertility in connection with a predisposition to leafspot and but very brief reference to the effect of fertilizer upon leafspot occurrence. In general it is stated that excessive fertilization with nitrate of soda produces a condition favoring leafspot infection.

Stift states that heavy applications of lime produce much leafspot. This was followed by applications of nitrate of soda and unfertilized in the order named in degree of infection. Ammonium sulphate seemed to reduce leafspot. Our own observations lead to the conclusion that lack of fertility and excessive nitrates in the soil such as occur in the Arkansas valley, favor leafspot.

Any cultural practice that interferes with the normal development of the beet, especially if it retards growth or weakens the beet, is apt to result in an increase of leafspot. On the other hand fertile soil, especially where rotation is practiced, appears to retard leafspot and to quite an extent, prevent infestation.

Early planting, especially on unfertile ground, favors leafspot. The infestation takes place after the soil has become exhausted to a point where the beet's growth is slowed down. Naturally late planting on such soils exhausts the soil later, thus delaying infestation. In such cases the beet may not reach a point in its development where it is easily attacked until after conditions favorable for the disease are past. In such a case no disease or very little would appear.

With the aid of Mr. Mondt at McCook, Nebraska, I have made a study of
Fig. 2—A diseased leaf of a sugar-beet plant, showing the relative size, shape, and distribution of spots produced by the leaf-spot fungus. (About one-third natural size.)

Fig. 3—A sugar beet leaf which has been entirely killed by leaf-spot. (About one-third natural size.)

leafspot the last two seasons. The results of this study are interesting at least. In this study the coefficient of association is used as a measure of the effect of a practice upon leafspot. A coefficient of 1 means that there is no relation between the factor studied and the occurrence of leafspot. When the factor is greater than 1 the factor favors leafspot and when below 1 it acts against the development of the disease. The factors studied are as follows:
You will note that the early dates have higher coefficients than the later ones. Planting previous to April 15th is quite favorable to leafspot and planting after May 15th appears to prevent it to considerable extent. This does not mean that the early planting would not be the best from the standpoint of yield and sugar per acre.

These results show the effect of rotation with alfalfa and the exhaustion of soils by the common practice of wheating land heavily in the McCook territory and the worse effect of continuous beet growing.

This work cannot be taken as conclusive. However, it points toward certain practices to avoid where leafspot is prevalent. In general the small grains and beets appear to favor leafspot in McCook. The legumes and corn act in the opposite way. The effect of irrigation practices varies and is probably in some way associated with periods of natural precipitation and prevailing temperatures.

### Delaying Harvest

A reasonable delay in the date of harvest will improve the yield and percent sugar. This is especially true when beets follow alfalfa or sweet clover; in the case of manured beets; and in cases where the first irrigation was delayed beyond the proper time.

**EXAMPLE**

**Average of 1923-'24-'25-'26 and '27**

<table>
<thead>
<tr>
<th>Age at Harvest</th>
<th>140 days 21.55 Tons; 14.22% Sugar; 6191 lbs. S. P. A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at Harvest</td>
<td>175 days 22.59 Tons; 16.22% Sugar; 7346 lbs. S. P. A.</td>
</tr>
</tbody>
</table>

Lengthening the growing period by early planting increases yield proportionately more than sugar per cent. Delaying planting increases sugar per cent proportionately more than yield. Maximum yield and per cent sugar result from reasonably early planting and reasonably delayed harvest.
New Steffen Houses

Delayed by Contract Situation, Ovid and Minatare Pushing Work for Coming Campaign

WITH sufficient beet acreage contracted to assure another bumper crop, the Great Western Sugar company has started construction of two new Steffen houses in connection with the factories at Ovid, Colo., and Minatare, Neb.

The new Steffen houses hung in the balance during beet contract negotiations, although the probability that they would be built, consequently increasing the company's average extraction, had considerable bearing on increasing the sliding scale in favor of the grower.

Need for added Steffen capacity had been apparent since the building of the new factories at Ovid, Minatare and Lyman brought the Great Western total to 20 mills, exclusive of Johnstown. Formerly all workable molasses from the company's factories could be handled in 100 days or less in the 8 Steffen houses located at Loveland, Longmont, Sterling, Fort Collins, Fort Morgan, Scottsbluff, Gering and Billings. Not only did new factories crowd Steffen equipment, but also increased slicing capacity in the old ones, stimulated by the pennant plan, had a marked effect.

Moreover, total tonnage in Great Western territory increased, extending campaigns to such lengths that it was not expedient to operate Steffen factories after the non-Steffen mills had shut down. Storage capacity for non-Steffenized molasses has been taxed for the past two years.

The Ovid and Minatare Steffen houses are to be smaller than the older types, being designed for 60 tons of molasses per day, although they may be pushed up to 70 or 75 tons. The effect of a large Steffen house is to increase the amount of sugar pouring into the sugar end of the mill with the result that slicing must be slowed down. With the belief that concentration of Steffen products retards crystallization, slowing down the beet process, the capacity of the new plants has been set at a low daily average in hope that the present high slicing rate can be maintained. The addition of this equipment, not needed except in the case of comparatively long campaigns, reflects the company's confidence that large beet crops will continue.

More advanced in design than any now operating, the new houses have various labor-saving devices. Pumping has been minimized by the fact that molasses, water and lime come together at the top of the house and move by gravity to successive stations. Cooling, to check sugar losses caused by generation of heat when lime is mixed with the molasses solution, is effected by a continuous cooler, developed in our research laboratory, to supplant the intermittent batch coolers used elsewhere.

12-inch spacing at the start of thinning is easily stretched into 16 inches as the work progresses and interest in close spacing lags. The thinners should be reminded frequently what 12-inch intervals look like.
Nebraska's Biggest Farm Feeding Company
Based on Beet By-Products

By J. M. BEATTIE, Bayard, Nebraska

The main feeding grounds on the Ferguson-Wright-Bigler-Safford extensive site, with the mill in the lower panel.

THIS community is fortunate in having the largest single live stock feeding enterprise in western Nebraska, owned by W. H. Ferguson of Lincoln, C. M. Wright of Scottsbluff, M. L. Bigler of Bayard and Charles H. Safford of Scottsbluff, with Mr. M. L. Bigler in personal charge of operations in Morrill County. This company conducts live stock feeding on a very extensive scale, the principal feeding unit being located on the W. H. Ferguson farm of 520 acres adjoining the corporate limits of the City of Bayard.

The feed yards at this plant are nicely located on well-drained, sloping land with southern exposure, equipped with modern and efficient means for the proper handling of live stock on a large scale. In conjunction with these yards is an electrically operated elevator and grinding plant where the feed used on the farm is mixed. The plant, of course, includes scale and scale house for weighing of feed bought and consumed; also a steam boiler storage tank for the handling of molasses from the local beet sugar plant, molasses being
On the sloping hillside along the highway, also showing some of the improvements on the farm.

an important part of the ration.

Other equipment in addition to the pens for cattle and sheep, include such items as self-feeders, brood houses for hogs, sheds, dipping vat, dehorning chute, and electrically operated water system. All such equipment is thoroughly modern. Feeding operations are carried on throughout the entire year, new feeders being put into the yards to replace the fat cattle or sheep as marketed. The feed is placed before the live stock in self-feeders, except beet tops and loose hay. Usually, however, hay is ground as are other feeds such as corn and barley. Wagon boxes especially built for the purpose haul the mixed ground feed from the elevator to the self-feeders which are kept supplied so that the stock have feed before them at all times.

In a business of this size it is, of course, to be expected that a great deal of experimental work is done from time to time to determine the value and benefits to be derived from various rations and methods of feeding. As a result of experiments which have been carried out along this line the following program has been found to furnish the best results with cattle.

First, on arrival feeders are given all the loose hay and beet tops they will clean up; the tops in season. The stock is kept on this ration usually for about 60 days, depending to some extent on the amount of beet tops available. Young steers are usually held on this ration as long as possible in order to develop growth. Heifers, however, are as a rule crowded with the idea of finishing as soon as possible.

Second, ground alfalfa hay mixed with molasses is added for a period of 60 to 70 days. A comparatively small amount of molasses is put on the hay at the start, but later up to 4 to 5 pounds of molasses per head.

Third, dried molasses beet pulp is added to the mixture. The beet pulp containing a certain percentage of molasses, the amount of molasses applied at the mixing plant is correspondingly reduced. This ration is fed usually about 30 days.

Fourth, ground grain is then added in an amount sufficient to replace
one-half of the dried beet pulp and after about 20 days on this ration the stock is consuming about 30 to 35 pounds of this mixed feed per 1000 pound steer per day.

Fifth, after 30 days of the preceding ration cotton cake is added to the mixture and the cattle are kept on this until they have been fed a total of from 140 to 180 days, depending upon the quality of the stock, the progress they have made, weather conditions, and the fat cattle market.

Prior to the fall of 1927 the feeding operations of Ferguson, Wright, Bigler and Safford were confined to cattle, but last fall 15,000 head of lambs were placed on feed. The lambs made a very rapid gain on ground feed, being ready for market in about 60 days. It was found that sheep would consume an average of about one-half pound of the ground mixture at the start with a gradual increase to about two pounds.

The operations of these men have proven beneficial to the farmers of the community through the market afforded for their surplus alfalfa, corn, barley, etc. In one season the company purchased locally 32,000 bushels of corn which, because of excessive moisture content, could not have been shipped to any outside market; 18,000 bushels of barley and 1500 tons of alfalfa hay. Prevailing market prices are paid.

Approximately 1000 acres of land were fertilized in the spring of 1927 from fertilizer resulting from these feeding operations. It is estimated that there will be sufficient fertilizer this spring to cover 1500 acres or more. The tenants on lands controlled by the company are required to fertilize all land to be planted to beets. No expense devolves upon the tenant other than the labor cost to apply the fertilizer. In some cases neighboring growers trade the company beet tops for fertilizer. If any surplus fertilizer is available it is sold for use on neighboring lands. There is beneficial use of all fertilizer produced at the plant.
The Nebraska Association's Case
Decision of United States Judge J. W. Woodrough

Growers should be familiar with the two court decisions in the beet contract controversy this year.

Judge J. W. Woodrough in the United States District Court at Omaha on May 14, dismissed the complaint filed by the Co-operative Beet Growers Association of Nebraska and held the membership contract between farmers and that association "illegal and void, in violation of the Nebraska statutes." The contract failed to provide members a means of withdrawal from the association, as required by the Nebraska law.

To the complaint that the company was persuading members to resign from the association the United States judge replied:

"The allegations in the bill to the effect that they are persuading them in a peaceable way to avail themselves of a legal right, to avail themselves of their right of election to withdraw from the association, discloses no actionable wrong for which a court of equity could grant relief."

In his oral comments, Judge Woodrough further stated: "To merely go to them and say you have the right now to withdraw, you have the right to serve notice of intention to withdraw, so long as they go no further than to peaceably persuade the members of the association in that way by revealing to them and discussing with them their legal rights, no court of equity ought to prevent that or ought to take any steps to prevent that."

The federal court's decree held that the "bill of complaint failed to state any matter of equity entitling the plaintiff (association) to the relief prayed for or to any other equitable relief whatsoever, and that the facts in said bill of complaint alleged are insufficient to constitute a cause of action against the defendant (company)."

"That said bill of complaint fails to state any fact or facts showing that the Great Western Sugar Company did commit or threaten any illegal or unlawful act in the premises."

You want good thinning done not only when you are watching the work but principally when you are not around. This helpfulness on the part of the beet tenders is usually best assured by fair treatment.
The Colorado Association's Case
Decision of District Judge L. C. Stephenson

This case was brought by Charles T. Monroe, a member, plaintiff, against the Mountain States Beet Growers Marketing Association, defendant.

Judge Stephenson on April 26, acting for the district court of Logan county, Colorado, handed down a decree finding the association's "acts and threatened acts" with respect to Mr. Monroe's 1928 beet crop, "in attempting to restrain and prevent the plaintiff from planting, growing, harvesting, and selling, or contracting to plant, grow, harvest and sell, a crop of sugar beets upon his land, or to impose a penalty or damage upon the plaintiff or upon any purchaser of said crop or upon any person contracting with said plaintiff with respect to such crop, are, and each of them is:

"In restraint of trade.
"Constituting a restriction upon production.
"Contrary to public policy.
"In violation of common law and of the Constitution of the United States.
"And of the Constitution and laws of the State of Colorado.
"Illegal and wholly void."

The decree further ordered "that the plaintiff is hereby wholly released and discharged from any obligation under that certain contract entered into by him with said defendant under date of September 15, 1923, and that said contract, so far as relates to the growing or marketing of a sugar beet crop during the year 1928, be and it is hereby cancelled, annulled and for naught held."

The court made permanent an injunction:

"Enjoining and restraining the association from in any manner enforcing or attempting to enforce the terms and provisions of said contract.

"And from in any manner intimidating, threatening, hindering or interfering with said plaintiff in the planting, cultivation, growing, production or marketing of sugar beets during the year 1928.
"Or in entering on his own behalf into any contract or contracts therefor.

"And from in any manner enforcing, or attempting to enforce any penalty, claim, or demand against the plaintiff by reason of entering into such contract.

"And from enforcing any penalty, claim, or demand against any purchaser of such beets by reason of such purchase or by reason of entering into or inducing any contract with the plaintiff therefore."
The Wind an Important Factor in Soil Formation in Northern Colorado

By A. T. SWEET
Bureau of Chemistry and Soils, United States Department of Agriculture

RECENT soil survey work in eastern and northern Colorado has called attention to the importance of old stream terraces. In the Fort Collins region, for example, broad stretches of nearly level, well-drained, highly-productive soils on such terraces border the valleys of the Poudre, Big Thompson and Little Thompson Rivers. Fort Collins, Loveland and Berthoud each is situated where it is because long ago these streams smoothed the surface and left it favorable for deep soil development.

Other extensively developed and productive soils of this region have, however, an entirely different and quite as interesting an origin.

All farmers appreciate the work of the wind. When it blows, wet soils dry out. Dry soils are swept from place to place. Exposed points become bare. Drifts of soil material accumulate along the fences and at the roadsides.

This is most pronounced in the dry lands but at times and under certain conditions occurs on all cultivated fields. There is no soil in this region which has not been influenced to some extent by the wind.

Soil developed entirely from wind blown material or loess, as it is called, has been found, however, to cover considerable areas in the Fort Collins region. This soil has much the general appearance of soil developed directly from the shale, and is made up largely from shale material. That it has been carried and deposited by the wind makes an important difference in the character of soil formed.

The Fort Collins District Lakes
The foothills to the west of Fort Collins consist of thin rock beds sharply tilted by the uplift of the mountains. Faulting and erosion have left long chains of hills with a north and south trend. The east slope,

Fig. 1. This deposit of wind blown soil material, in many places more than four feet deep, accumulated along a barb wire fence at the side of a field of heavy soil, dry farmed for only eighteen years.
formed by the top layer of the tilted beds, is long and smooth. The west slope, the edge of the beds, is steep and rocky. Farther east, in the region under cultivation, the same tilting occurred, but here the rock beds are softer and both slopes are now covered by soil.

Along the west side of each ridge, where the winds sweep with the most force, in the area under cultivation is a poorly defined drainage way. Chains of shallow lakes are connected by small crooked streams. Since irrigation began many of the lakes have been enlarged for reservoirs. There are other lakes both large and small but nearly all have this general north and south trend.

These lakes, to a large extent, are believed to be the work of the wind. Water in ages past probably, collected in shallow basins and during the winter seasons froze and thawed many times, breaking the shale on the basin floor into fine powder. By the hot summer winds this was dried, swept out and spread over the adjacent uplands. This process was repeated from year to year and in time large basins were scooped out and the uplands covered to a considerable depth with the wind blown soil materials.

Mr. R. D. George, State Geologist of Colorado, in referring to these lakes says, "It is highly probable that more than half of the basins are due to the work of the wind."

Differences in Soils

Since the loess material consists almost entirely of powdered shale with a small admixture of material from sandstone, it may well be asked how this soil differs from that which has weathered directly from the shale beds. Let us look into the changes that have taken place since the loess was deposited.

A shower of rain falling on an exposed bed of shale sinks to a depth of less than an inch. The same shower falling on a deposit of loess, because it is more open and porous, sinks to a depth of several inches, perhaps to a depth of a foot or more. Other showers carry the moisture deeper. Sinking downward it dissolves the lime and some of the other readily soluble materials carrying them deep into the subsoil. It also carries down-
ward some of the finer silts and clays.

Shale and Wind-Blown Soils

Conditions soon become favorable for the growing of plants. From their decay organic matter is added. Soil bacteria become active. In time a soil is formed with three distinct layers. The upper one is dark-brown and extends to a depth of about ten inches. The second one is lighter-brown, heavier in texture, from the silt and clay carried downward, and has light gray spots of lime accumulation. This layer extends to a depth of about 30 inches. The third layer is also light-brown, nearly free from lime spots and is loose and friable. Where exposed in roadside cuts and ditch banks it has a peculiar columnar structure, one of the characteristics of wind-blown soils.

Such a soil takes up and holds moisture well, has good under-drainage and permits of good aeration of the subsoil. It is fairly easy to cultivate, is free from alkali in harmful amounts and is productive.

Soils developing directly from shale, on the other hand, weather very slowly and in the Fort Collins region have not yet weathered deeply. They have the dark surface layer and a subsoil layer in which there has been some accumulation of lime but the deep subsoil, instead of being open and porous, is a tight plastic clay or a partly disintegrated shale. Considerable areas of this soil are heavy and refractory, are difficult to handle, contain alfalfa in harmful amounts and are not very productive.

In this region the soils of loessal origin are closely associated with those which have developed from the shale or from closely related beds of sandstone, but as a rule they occupy the higher parts of the upland areas whereas the soils of shale origin are developed most extensively in the valleys, on the steeper slopes, and in small basin-like depressions.

A line southward from Waverly through Fort Collins, Loveland and Campion to Berthoud approximately separates that part of the uplands in which the loess soils predominate from that part which consists largely of shale soils. The loess soils are to the east of this line, the shale soils between the line and the foothills to the west.
Inoculation of Red Clover Seed

By WALTER G. SACKETT

Bacteriologist, Colorado Agricultural College

The growing of red clover seed in the Arkansas Valley and on the Western Slope has been so successful in recent years that the acreage in the state will probably be increased very appreciably this season.

One of the first requirements for growing any crop profitably is a satisfactory stand. The preparation of the seed bed, the fertility of the soil, the selection of good seed and the presence of plant diseases and insect pests the preceding year are all factors which will affect the stand.

Another point which should be considered when legumes are to be planted, especially red clover, is the inoculation of the seed with nodule forming bacteria.

Colorado soils have been found to be lacking, almost wholly, in any natural inoculation for clovers, and this must be supplied by commercial cultures. In view of this, no one should either hesitate to inoculate his clover seed because he regards this practice as a passing fad, or allow the relatively small expense of the cultures to deter him from using them. The inoculation of legumes is neither a whim of the day nor an extravagant theory, but it is based upon sound field experience and common sense; furthermore, the expense of the cultures is not prohibitive. Material for inoculating thirty pounds of seed costs about sixty cents, and larger amounts can be purchased at a correspondingly lower rate.

The wisdom of this practice, particularly when seeding land to red clover for the first time and where the proper bacteria are absent, has been recognized by successful farmers for years. The explanation may be somewhat as follows:

The critical period in the life of every plant is from the time its seed sprouts until it becomes established in the soil. Any protection against adverse soil, moisture, or climatic conditions that can be given it during the first few months of its existence will be paid for many times by the improved stand and by the increased yield per acre at harvest time.

This is exactly what inoculation accomplishes by providing the young, tender plant with root nodules and through them with an additional supply of available nitrogen at a time when it needs it most. Moreover, there is probably no other single factor, unless it is moisture, which is more responsible for a perfect stand of red clover and the survival of the plants over winter, all things being equal, than the added stimulus supplied through inoculation.
MORE OVID GROWERS WITH HIGHEST YIELDS

LESTER McCONNELL SARBEN

R.W. NICHOLAS TOBIN

J. N. FRENCH JULESBURG

ANDY BAKER MARCOTT

B.A. ANDERSON FACTORY

JOHN F. FRESE RED LION

JAMES R. WHITE O'FALLONS

DAVID KENNEDY SUTHERLAND
All farmers who grow beets realize that the crop must be thinned properly. Few beet growers, however, are in a position to know just what difference late thinning makes in the yield. Late thinning means the beets were thinned at an age later than was best for their future development.

If beets are allowed to remain unthinned too long, the weed crop grows faster than the beet crop and damage is done to the beets by the weeds robbing them of moisture and nourishment. The result is a stunted plant left when the thinning is finally done. Also when unthinned, the beet plants which should have been hoed out, act as robbers and cause stunting of the plants that are to be left. An object lesson from late thinning is shown herewith.

The beets in the large pile in the picture were thinned when the plants were from 20 to 30 days old. The germination was somewhat uneven because of the crop being irrigated up.

The beets in the small pile were thinned 28 days later than those in the large pile. The relative yields are worth serious consideration.

Each pile contains all the beets from 100 feet of row.
HOW DELAY IN THINNING LOWERS YOUR BEET CHECK

Careful tests prove that after beets are up 16 days, delay in thinning lowers the yield at harvest time. The loss ranges from one-half ton for a week's delay to several tons per acre in aggravated cases.

When the plants are small—about the four-leaf stage—thinning can be performed with much more speed than when the plants are large.

If the start of thinning is delayed the last half of the field to be thinned suffers a heavy loss in tonnage. There the plants have grown altogether too large for the best results in blocking and thinning.

Because recent rains have brought a rapid growth of the young plants—and of weeds as well—growers may be taken unawares unless their minds are fixed upon thinning earlier than usual. Frequent showers have made a timely start of the work impossible on many fields.

Wherever for any reason a good germination stand has grown too fast for the best results if blocked and thinned in the usual leisurely manner, growers should consider the advisability of mechanical blocking; the thinning in such cases to be completed as soon afterward as feasible.

With duckfeet or knives, or a combination of the two, the ordinary 4-row cultivator can be fitted up to cut out 8 inches and leave 4-inch blocks to be thinned later. Your Fieldman can help rig up the cultivator.

With average spacing between rows seven duck-feet are required, one directly behind the tongue and the others spaced with shanks 12 inches apart. The rig should have a marker, the center duck-foot to follow that line. The 8-inch duck-feet or the knives should run just deep enough to scour, taking care not to cover plants. Crusts must be broken before mechanical blocking is attempted.
If the doctor’s prescription called for sugar, the pharmacist would use familiar table sugar.

Each of the ten million bags of sugar produced in 1927 by The Great Western Sugar Company might properly be labeled “C P” — meaning chemically pure.

In the twenty-one Great Western factories the purity of sugar is established by delicate electrical instruments, chemical reactions, and color tests.

The finished crystal is better than 99.9 per cent sucrose — amazing purity, fully satisfying the “C P” standard. Sugar, literally made of air and water, is probably the purest of all foods.

It is unnecessary to label the finished sugar “C P” — chemically pure. Over a quarter of a century the two letters G-W have assumed equivalent meaning.
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WHEREAFTER BEETS DO THEIR BEST

JULY, 1928

THE GREAT WESTERN SUGAR CO.
The Horror of Hail

Nothing so beautiful on the land as growing crops of grain, potatoes, beans, beets, and the husbandman proud of the coming harvest.

But gnawing at his heart is the fear of hail. Every storm cloud is watched; every sudden change in the weather brings forebodings.

What fear of loss of his job is to the city worker so is the horror of hail to the farmer because the crops are the results of his job, his hard work.

When hail comes the sympathy of every neighbor goes out to the unlucky ones. So many of these inscrutable hazards in farming, in all walks of life.
Editor's Notes

ELIMINATION of hand-shoveling of beets has received careful study in Great Western ranks for a number of years. A test machine is under construction and no less than the farmers the company hopes that eventually a practical device will be perfected.

In several districts experiments are being made with commercial fertilizer. Preliminary results have been gratifying. Further study and experimentation will be necessary before the use of commercial fertilizer can be recommended to growers with positive assurance that increases in yields and sugar content more than repay the cost of the chemicals. But, again, when the work has been perfected farmers will receive its benefits.

Operating men are considering ways and means of preventing the dramatic loss of sugar during the beet harvest, suffered now in the necessity of piling large tonnages to await shipment until after direct car deliveries at the receiving stations are sliced. An improvement is anticipated in the Colorado and Nebraska districts this fall through the extension to October 15 of the non-piling date. Should these plans prove successful the industry as a whole will enjoy huge benefits. Perhaps not all of the millions of dollars annually lost in sugar shrinkage is saveable. Any material portion of it saved by economical measures is, however, infinitely to be preferred to the present waste.

Tests of beet seed varieties to improve the strains used in
Great Western territory and give the maximum yield of sugar per acre are being continued. The benefits of mechanical blocking when beets are in danger of getting too large at thinning time, of earlier and better irrigation, and of a variety of other field practices are receiving careful consideration. Work previously done by the company's agricultural department—and proven, too, on many a commercial beet field in Great Western territory—is being copied in beet-raising districts throughout the world.

In the quiet secluded rooms of a big research laboratory Great Western chemists are seeking methods of increasing extraction, improving quality of the finished product, finding ways of bettering the factory process. The men at the mills and the management, also keenly alive to the needs and problems of the industry, are constantly contributing suggestions and criticisms that eventually register advances.

On the very practical problem of selling sugar, facing the difficulty of marketing a tremendous output, results have been obtained that a few years ago were only blooming hopes. By advertising and intensive effort a very considerable increase in the total number of bags of sugar sold in the better-netting territories has been attained. Too much still has to find an outlet farther east, at heavy freight penalties; and the average net price being the important factor in payment for beets any improvement in this connection is worthy of the cooperation and attention of all elements affected by the sugar industry in Great Western territory.

These and similar many-sided activities continue day after day, year after year. They receive less attention from the public and enlist less comment than a temporary flare-up over the beet contract. In the aggregate they are as vital to the industry, to its permanence and soundness, as the making of a fair contract. Indeed, reasonable views on the beet price no longer involve any differences comparable to the values to be gained for the whole industry by improvements in these other directions.
Common Faults Applying the First Irrigation

By R. G. RODEWALD, Fieldman, Eaton, Colo.

The application of the first irrigation is one of the most important steps in growing a good crop of sugar beets. Upon its proper application depends to a marked degree whether or not the crop will make the maximum yield. Once a crop is not started right it takes hard work to adjust the wrong, and in many cases it cannot be corrected during the remainder of the season. Personally, I believe that the first irrigation is the most important of all the irrigations; more skill in applying it and more good judgment as to the time to apply it are required than for any other.

The first common fault in applying the first irrigation is the right time to begin. There is no set date because conditions vary too much from year to year. The grower will have to use his judgment regarding the time to apply it, taking into consideration his own particular field and the condition of his soil and crop.

It has been a general practice in years gone by to put off the first irrigation too long, with the view of obtaining a longer beet. It has been repeatedly proven not to do so.

Experiments show that the early irrigation produces the maximum tonnage, commencing about the latter part of June or the first few days in July. The time to begin to water is when the plant needs it.

If the young plants wilt very badly and remain wilted during the morning, you may be sure that the plant needs water and is not growing.

As a rule late planted beets are the first beets that suffer for water. They do not have the root system of the early planted beet and suffer most in hot weather.

The next and most common fault is the amount of water used. Generally there is a tendency to use too much water rather than too little. Both are detrimental for the best results. Too much water is detrimental because of the effects of leaching, puddling, and water-logging the soil. Leaching depletes not only the soluble plant foods, which the crop uses to obtain the maximum yields, but also draws on the fertility of the soil, so that it will put the soluble plant foods in the lower strata of the soil out of reach for the beet crop and also following crops.

If a soil is water-logged, the air is excluded. Without air the plant cannot grow and function properly. The air being excluded from the soil, millions of the soil microorganisms are killed. Alive they are beneficial in helping to
put plant food in a soluble form so that the plant can assimilate it.

On sandy soil the first irrigation should be much heavier than on heavy soils. If the irrigation is too light the crop is apt to suffer before the second irrigation is applied.

Other common faults in applying the first irrigation are the methods used in applying the water, in getting ready to run water, and the cultivation after irrigation. Water must be distributed evenly throughout the field if the best results are obtained. For the first irrigation it takes considerable skill to accomplish this, in order to get a good even job without flooding.

Before getting ready to irrigate it is very essential that the beets be ditched properly. The best kind of a ditch is a deep, narrow ditch rather than a wide shallow ditch.

In a great many fields it is impossible to get a deep narrow ditch due to faulty cultivation, when the ground is hard. This condition can be avoided by not using too many tools on the cultivator the first cultivation. It is far better to have only knives for the first cultivation and then following up with only the duck feet in the center to loosen up the ground thoroughly.

If the middles of the rows are loose, good ditches can be made. Poor ditches result in an uneven distribution of water and cause more or less flooding. Beets should never be flooded any more than necessary, as flooding will cause the ground to become puddled, excluding the air from the soil and causing it to bake.

The next question is the best lengths for running water. In many instances, when using long furrows, the upper part of the field receives too much water if the water is run until the lower end of the field is properly saturated. When one end of the field is ready to cultivate the other end will be crusted and hard, having lost a good part of the moisture. The length of the furrows must be determined with regard to the character of the soil and the slope. It is better to have several cross laterals, than to bring about the above conditions.

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The tightest kind of a written lease, duly signed, acknowledged and recorded, becomes but a "scrap of paper"—useful only in terminating the rental relationship—unless the tenant and landlord choose to be honest and even go out of their way to accommodate each other.—Lynn Robertson.
Two fields on the same section of land, and what a whale of a difference two months in planting time makes! No. 1, the large beets, shows the results of fall plowing, a well-prepared seed bed and planting on March 31. No. 2 was seeded at the end of May, on spring plowing. In the heavy soils of the Longmont district fall plowing is a necessity even if the farmer has to hire it done.

A large acreage of barley will be harvested in July. The stubble ground should be plowed as soon as the crop is taken off.

Follow the plow with discs set almost straight, not enough to turn over the soil but sufficient to push stubble and manure down to the plow sole.
The Last Cultivation

Laying By the Beet Crop
Free of Robber-Weeds

There is still room in beet fields of advanced growth for a final shallow cultivation before the leaves completely cover the ground. In later and backward fields there may be time for two cultivations. Until the cultivator and horses break the leaves and injure the plants the stirring and mulching of the soil, particularly following showers and the first irrigation, is beneficial to the crop.

Danger of injury to the foliage and to the upper feeder-roots emphasizes the care needed in the final beet cultivations. Bull-tongues should not be set too close to the rows, nor go down deep. Some of the biggest-tonnage beet raisers take pride in keeping the cultivator going almost constantly until the crop is "laid-by." They are just as particular to have the hand-weeding done promptly. Despite frequent showers in some districts this season beet fields have been kept unusually free of weeds. Where for any reason the crop is backward there is all the more occasion for clean fields and a well-cultivated surface mulch.

When the beet field can no longer be cultivated irrigation remains the only controllable factor to make the best possible tonnage. Emphasis has been placed on irrigation this year earlier than usual because even in rainy seasons the application of irrigation water is too long delayed on the whole.

Severe wilting in the day time and failure to revive during the night are danger signs. Watch your beets and irrigate them when they begin to show signs of wanting water.
Baby Beef Most Profitable in Experiment

Both cattle growers and feeders are due for a long and fairly profitable inning according to opinions of speakers at the ninth annual cattle feeders' day at Colorado Agricultural College. Speakers as well as the results of this year's experiments seemed agreed that the lighter beef is most desirable from the standpoint of the feeder, grower and consumer.

Professor H. J. Gramlich, head of the animal husbandry department at Nebraska University cautioned both feeders and growers to work for a steady and conservative level of prices to prevent any slumping of the market with its certain bad effects on the industry.

"Stay by baby beef," was Gramlich's plea to the cattlemen, after he had summarized experiments at his institution which proved the lighter stuff more profitable as well as more desirable from every standpoint. "A calf will put on the same gains with 60 pounds of feed as will a big steer with 100 pounds. Not only that, the investment is just about half as much," he continued. "After the first 90 days a big steer will only gain about a pound a day, even though he will gain three or three and a half pounds for the first 90 days, while a calf will continue to gain and increase the proportion of gain throughout a long feeding period."

To the growers Gramlich urged the feeding and marketing of surplus heifers before they are two years old, preferably a year old, when they will weigh from 600 to 800 pounds. Big heifer calves are bound to produce wasty carcasses while the younger ones produce well-covered carcasses that will ship long distances, a point that is coming to be more and more

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important since three-fourths of our beef supply is used in the East.

**Feeding Roots**

Prof. George E. Morton, head of the animal husbandry department, discussed the feeding of root crops, stating that the college has found half-sugar beets the most satisfactory and most suitable in every way for stock feeding. The half-sugar beets seem to be just about half way between the sugars and mangels in every respect—dry matter, susceptibility to freezing, and yield—and if the feeder wishes to feed root crops they are the most practical. From the standpoint of siloing, corn is, however, far more preferable than the roots.

Five pens of steers and one pen of open heifers, ten head to the lot, were used in this year’s experiments. Although the heifers did not gain as much as the steers, and although the cost per 100 lbs. of gain was higher with the heifers, they were appraised by the Denver cattle buyers at the same price as the steers and, since their initial cost was $1.50 per cwt. less, they showed a greater net return by $2.00 per head when fed the same ration as the steers.

Professor E. J. Maynard, in charge of animal investigations, said that three years’ work has demonstrated that barley will give practically the same gains as corn when fed in a properly balanced ration. Cottonseed and linseed cake have also shown about equal results when fed properly and the cottonseed has been on the average $18.00 per ton cheaper. Therefore cottonseed is far more economical.

**Corn Silage**

Corn silage has proved more satisfactory, year in and year out, than cut corn fodder. However, Colorado farmers get even better results with their fodder than do farmers farther east.

Since crop conditions in northern
Colorado at present point to a shortage in alfalfa hay and beet pulp, Mr. Maynard recommended the use of more supplementary feeds than ever. He pointed out that the use of corn silage cut nearly in half the amount of pulp and hay necessary to a good gain and finish. It also cut the cost of gain but the valuation was slightly lower so the net profits were about the same.

Siloed beet pulp proved preferable to pressed pulp in cheapness of gains although the pressed pulp gave greater gains. Siloed pulp showed a feeding value of $4.07 per ton, compared with a cost at the feedlots of $2.17 per ton, while pressed beet pulp showed a value of $4.74 against a cost of $3.51 per ton. The pressed beet pulp showed a loss of 43 per cent siloed at the college.

Irrigated Lands Eventually Need Natural or Artificial Drainage

ALMOST every Colorado valley that enjoys the benefits of irrigation has land that is in need of drainage, recent soil surveys and observations show.

Excess water should be drained from the soil even though the condition is not yet serious enough to prevent the growth of crops, according to R. H. Walker, Assistant Professor of Agronomy at Colorado Agricultural College. Where irrigation is practiced on bench lands the excess water seeps through the subsoil and comes out on the lower lying lands where, in some instances, it causes a great deal of damage to crops. Where natural drainage conditions are poor, the water-table gradually has raised since irrigation began until it is so high that plant roots have but few inches in which to feed. A rising water-table in Colorado usually carries alkali salts to the surface with the result that many acres of valuable land have been ruined by alkali.

Where alkali has accumulated on the surface of the soil it can be removed in most cases by thorough drainage, Walker points out. After sufficient tile has been laid the land can be flooded to remove the excess alkali salts. This is about the only effective means to reclaim alkali land. It is a sure method for preventing the rise of alkali in land that is subject to seepage.

When soil is thoroughly drained the plant roots are able to grow deeper and secure a large part of their food from the subsoil. A well-drained soil makes conditions right for the growth of the millions of micro-organisms that play an essential part in preparing food for crop plants.

When a soil is water-logged the air is prevented from passing into it where it is needed for the respiration of these organisms. Wet soils are too cold for the best growth of plants and prevent the decomposition of organic matter and the formation of humus. This keeps such a soil in a poor physical condition and in poor tilth.
On Running a Grain Binder

By a Fort Lupton Grower

The worst thing to damage a binder is probably lack of oil on the bearings. It is well to give the binder a good oiling twice a day. The main wheel bearings sometimes get packed tight with dirt and have to be picked out. The fast running parts should be frequently oiled.

If the team goes slowly or the ground is too wet or powdery dry, or the grain green, it is hard to make good bundles. The remedy is to use a whip or cut a small swath or drive the binder with an engine.

Sometimes the main drive chain will stretch and ride the cogs. A new chain may work properly.

If the twine has worn grooves in the guides between the can and the needle, a gas welder can fill up the grooves. In an emergency the binder may still work if the twine tension is taken off, the little grooves supplying plenty of tension. In most cases the binder works better with the tension rather light.

If the needle sticks up a little, the grain can not come down so the packers can place it properly. In this case the spring holding the needle shaft gear is probably out of order.

Sometimes the faces of the clicks or dogs controlling the tying devices are worn round or the spring is weak and the binder will kick off a good bundle and several little ones. A new dog or a spring may stop that.

At least one pair of the binder gears are timed together and if a person does not know the exact spot they mesh, they should be clearly scratched with a cold chisel when taken apart.

The work of the knotter is done so quickly that the eye does not follow its movements. A large harvester company furnishes a little folder giving pictures of different missed knots on bundles. By comparing the knots with the picture a remedy can be applied. If one has no chart and suspects that the trouble is at a certain worn place, let one person turn the binder over by hand while another holds a piece of wire or thin iron to compensate for the wear.

Very slight roughness or rust on the duckbill will cause the knotter to miss. Keep the knotter covered with axle grease. In an emergency clean a rusty one with emery cloth or a fine file.

Going with a jar over an irrigating ditch will sometimes spring the binder frame so the canvas will not go through the guides. The next move is either to spring back the frame or hacksaw off the protruding bolt head. Sometimes the whole binder will chuck. If the cause is not readily seen, remove the long drive chain behind and try to turn over each sprocket separately. Then examine closely that part that won't turn.

Occasionally a long spider-legged spring that holds the butts of the bundles parallel will silently snap off and be lost. Then the butts will slide down and choke the deck. Get another spring from somebody's old wrecked binder.
The Age and Sex Factor in Beef Production

By H. J. GRAMLICH

Professor Department Animal Husbandry, University of Nebraska, College of Agriculture.

(Address at Colorado Cattle Feeders Day, Fort Collins)

The beef cattle industry has been subjected to many conditions during recent years which have resulted in revolutionizing the business. Probably as big a single factor as we have had to contend with is that representing the change in the demands of the consuming public. This change is one which has become very marked and its effect is far reaching.

Prof. H. J. Gramlich

It is difficult to analyze the causes of this change. Possibly the automobile has been as great a single factor as any in causing people in our cities and towns to order meat differently than they used to. Modern methods of living whereby tremendous numbers of families located in small apartments are living on a luncheon basis have resulted in a large demand for small steaks and chops which can be made ready with comparatively little cooking.

As a result, today we find the most popular beef to be that of the lightweight carcass, produced in the main by a steer or heifer that has been fattened and sent to market at an age of from one to one and one-half years. From such carcasses small, relatively economical cuts can be obtained, although the cut from a large, prime steer may have more flavor and even today is the more desired article with a few people.

Housewives who do not buy steaks and chops buy cooked meats, many of which are made up of ground beef and pork. This call for prepared meat has resulted in an abnormal demand for cutter cows, canner steers, bologna bulls, and other animals normally saleable at a nominal price compared to the price of corn-fed or grass-fat steers. As a result of this condition we have seen during recent months a peculiar market in that buyers have persistently paid abnormally high prices for butcher stock of all kinds.

Beef is essentially a fresh meat product. Purveyors of beef follow the policy of keeping it moving. Whether it shows a loss or a profit, the packer always follows the policy of prompt distribution of practically all classes of beef which are sold in the carcass. As a result, beef is usually on the retailer's block within a week from the time of slaughter.

The packer gauges his purchases and the prices which he pays by the reception which the branch house manager receives from the
If the retailer buys light carcasses and comes back for more, the packer's buyer is pretty apt to try to buy more of that kind of cattle. Such a condition has existed during recent years in practically all of the distributing centers of the United States, the only possible exception being a limited area in the New England territory tributary to Boston where many retailers are still clamoring for heavy carcasses.

There is an old saying to the effect that it is relatively easy to create a supply when there is a demand for the same, but on the other hand very difficult to create a demand for a product of which there is a large supply. This, in a way, illustrates what we are confronted with today in the beef producing business.

In other words, purveyors of meat tell us that they have an almost unsatisfiable demand for light cuts of beef such as are produced by yearling cattle. Furthermore, packers tell us that they have a relatively large supply of heavy cattle coming to our major markets and, as a result, these produce a considerable quantity of heavy beef carcasses for which there is only a very limited demand and much effort is necessary in disposing of these. It is this condition which explains the fact that large steers have seen such slow sale upon our markets recently.

**Effect of Age Upon Gains of Steers**

Coupled with the fact that our American beef consuming people have to all outward appearances stamped their O K upon light beef in such a manner that we are inclined to think that this is a permanent demand, it would be well to bear in mind the fact that during six years' experimental work conducted at the University of Nebraska, young cattle have consistently proven to be by far the most economical convertors of farm grown grain, hay, and grass into finished beef. In other words, from the standpoint of the corn-belt feeder, young cattle are the most efficient and because of this represent a safer proposition from the standpoint of the farmer who desires to convert his farm raised products into beef.

These experiments at the University of Nebraska have shown that the big steer gains very rapidly for a short feeding period of 60 to 90 days. In the future most of the large cattle that are fed will doubtless be handled about this length of time. Unfortunately, we frequently have a bad market at about the time cattle have been on feed this length of time and the men who own them are forced to hold over longer periods.

Young cattle have consistently shown greater gains AFTER having been on feed 90 days than before. In other words, the feeder who produces young cattle can hold them through periods
of depressed markets and, if necessary, feed as much as eight or nine months and still obtain quite satisfactory increases in weight. This is due to the fact that young cattle have obtained only part of their growth and their increased weight is due to both growth and fattening.

Feeding Heifers of Various Ages

The feeding of young cattle has another marked advantage in the case of the heifer. Experimental work which we have conducted during the past several years tends to show that heifer calves placed in the feed lot at weaning time and marketed the following spring sell practically on a par with steers of the same age and breeding. These same heifers if held until one or two years older before going to the feed lots produce carcasses that are rather too heavy and wasty to suit much of the trade and, consequently, sell at a discount as compared with the price the lighter heifers bring. Furthermore, these older heifers do not gain as rapidly as the heifer calves under feed lot conditions.

In June, 1926, we marketed from the University of Nebraska groups of experimental heifers that were three years of age, two years of age, and one year of age at the time they were sold. The oldest heifers brought $89.09 per head, the heifers one year younger or just two years of age brought $73.56, while the heifers one year of age brought $66.06. Thus we see that the heifers two years of age when sold brought only $7.50 per head more than those that were twelve months old, while the heifers that were three years old brought only $15.53 per head more than those two years of age. From this it can be seen that older heifers did not bring enough additional return to justify carrying them over.

The problem of the disposition of surplus heifers was one of the big problems confronting the beef industry for several years. Normally, three-fourths of all heifers go to market young.

Heifer vs. Steer Calves

Experimental work at the University of Nebraska has shown consistently that heifer calves will gain almost as rapidly as steer calves and that they will actually finish to a merchantable degree more quickly than will steers. The heifer does not continue to grow to the same extent that a steer does. Considering the fact that these little animals make such merchantable carcasses and sell without discrimination, it would seem that the policy whereby practically all of the surplus heifers which are not needed for breeding purposes could reach the market centers weighing from 600 to 800 pounds would not only result in the producers netting more for the female cattle which they raise, but likewise would get these cattle out of the way at a lighter weight. This condition should react
favorably on the price of steers, inasmuch as the tonnage would in this way be materially reduced. Heifers really are competitors of steers in that they tend to hold steer values down when they are marketed extensively.

Summarizing the above it would seem that one might draw the following deductions:

1. The demands of the consuming public are very persistent in favoring the lighter cuts of beef and hence younger beef animals receive the call.

2. This demand for light cuts of beef is probably of a permanent nature, due to changing conditions in methods of living and traveling, as well as economic conditions.

3. In addition to the popularity of light cattle with consumers, the relatively greater efficiency of these animals in the feed lot causes them to be in growing popularity with feeders. These two factors present a very strong case for young cattle.

4. Heifers when put on the market young produce much more desirable beef than when sent later and consequently it would seem that the majority of surplus heifers should reach market at less than two years of age and preferably when twelve months old, weighing around 600 to 800 pounds.

5. With the change which has taken place in the demands of the consumer, there can be no doubt that the ranchman who is able to adapt his business to one of calf production will fare well in the future. If he is producing calves of quality, he will realize a good market for them to be used in baby beef production. He will experience much less discrimination against heifers than has been experienced in the past and he probably will net more from them than will the person who holds them over until they have practically reached maturity and become so large as to be severely discriminated against.

On very few farms is there enough live stock manure produced to maintain the organic matter of the soils on all fields. Green manuring should then be practiced to supplement the live stock manuring. Green manuring is the plowing under of green crops for soil improvement. Alfalfa and sweet clover are the most valuable since they add not only organic matter but also nitrogen to the soil.—Lou Sweet.
Any Doubt on Early Planting?

By Chas. E. Evans

Field numbered 1 was planted March 26. It was cultivated and thinned early and by July completely covered the rows. The picture was taken on June 20. Field 2 was planted May 3. It is making excellent growth but is far behind the earlier planting and with equal stand will not make equal tonnage.
Beet Spacing and Yield

By S. B. NUCKOLS
Associate Agronomist, Office of Sugar Plants, United States Department of Agriculture

As blocking and thinning in Great Western territory was coming to a close new evidence arrived that the closer the spacing, the greater is the yield of beets per acre. In Great Western districts this rule is modified by experience showing no gain in yield from spacing closer than 12 inches. But wider spacing tends to reduce the yield.

CLOSELY spaced sugar beets produced better yields than those spaced 12 inches or more in experiments conducted in the Salt Lake valley of Utah during the year 1926, when the crop was very seriously injured by curly-top disease. The rows were 20 inches apart.

Similar experiment conducted in 1925, a year in which there was no curly-top injury, indicated that closer than 12-inch spacing did not give a profitable increase in the yield. More than 12-inch spacing reduced the yields in 1926, but the decline in the yield as the number of beets decreased was not as rapid in 1925 as in 1926.

These data are accumulated from 25 acres of a number of agronomic experiments conducted in five widely separated fields representative of commercial fields of the area. These fields were divided into small plots, each of which was carefully harvested and the actual number of beets grown and the yield of each plot recorded.

Table 1. Yield Per Acre and Average Size of Beet as Influenced by Stand

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<tr>
<td>4,000 to 8,000</td>
<td>44.80</td>
<td>9.96</td>
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<tr>
<td>8,001 to 12,000</td>
<td>29.87</td>
<td>14.86</td>
<td>2.33</td>
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<tr>
<td>13,001 to 18,000</td>
<td>20.23</td>
<td>18.89</td>
<td>2.44</td>
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<tr>
<td>18,001 to 23,000</td>
<td>15.30</td>
<td>22.06</td>
<td>2.15</td>
</tr>
<tr>
<td>23,001 to 28,000</td>
<td>12.80</td>
<td>23.92</td>
<td>1.88</td>
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<tr>
<td>28,001 to 33,000</td>
<td>10.28</td>
<td>24.10</td>
<td>1.58</td>
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1926

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<tr>
<td>3,000 to 8,000</td>
<td>48.25</td>
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<td>29.87</td>
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<td>33,001 to 38,000</td>
<td>8.83</td>
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The significant difference in the results for these two years is the variation in the size of the beet as the stand is increased. In 1925 there is a steady decrease in the size of the beets as they are grown closer; while in 1926, under curly-top conditions, the size of the beet did not decrease as it did in 1925, when not injured by curly-top. A summary of the data is presented in the accompanying table.—From “The Sugar Cossette.”
Barley for Fattening Beef Cattle
Results of Minnesota Experiments

THAT cattle can be fattened satisfactorily on ground barley in a mixed, balanced ration, was the conclusion of a feeding trial recently completed at University Farm, St. Paul. Sixty grade Hereford yearling steers comprised the test lots, divided into six of ten head each.

The following rations were fed the respective lots:

Lot I—Ground barley full fed, linseed meal 2 lbs. per head daily, alfalfa hay, and corn silage full fed.
Lot II—Whole barley full fed, linseed meal 2 lbs. per head daily, alfalfa hay and corn silage full fed.
Lot III—Shelled corn full fed, linseed meal 2 lbs. per head daily, alfalfa hay and corn silage full fed.
Lot IV—Ground barley full fed first 84 days, then shelled corn full fed 91 days. Linseed meal 2 lbs. per head daily, alfalfa hay and corn silage full fed.
Lot V—Ground shelled corn, linseed meal 2 lbs. per head daily, ground corn fodder mixed together and full fed first 56 days, then ground corn fodder replaced with ground alfalfa hay 119 days.
Lot VI—Whole shelled corn, linseed meal 2 lbs. per head daily, whole corn fodder fed in amounts approximately equal to amounts of ground feeds fed to Lot V first 56 days, then whole corn fodder replaced with whole alfalfa hay 119 days.

All feeds were fed to all lots twice daily in feed bunks and mangers inside a shed. Four weeks' time was used to bring the cattle up to a full feed of grain. Grain was fed first, the linseed meal being mixed with it. Then silage and hay were fed from forty minutes to one hour after the grain had been fed.

After the cattle were on full feed, the amount of grain was limited as nearly as possible to what they would clean up in forty minutes' to one hour's time, until the last thirty-five days of the trial, when grain was fed somewhat more heavily and silage and hay reduced a little. During the last thirty-five days, the grain would not be cleaned up until time for the next feeding. Water, salt, and animal feed bonemeal were kept before the cattle at all times.

Number 3 yellow corn and feed barley were fed. The alfalfa hay was standard and Number 2, about an equal amount of each. The corn fodder was of good quality containing a moderately high percentage of ears. The corn silage was of good quality made from fodder containing a fair yield of corn.

The following conclusions were drawn from this trial:

1. A ration of shelled corn, full fed, linseed meal two pounds per head daily, alfalfa hay full fed, and corn silage full fed, is a highly satisfactory ration for fattening yearling steers. To secure greatest profits from this ration, at least one feeder pig should be provided to each two steers.

2. Ground barley proved quite satisfactory as a grain for fattening yearling steers when full fed along with two pounds of linseed meal per head daily, alfalfa hay full fed and corn silage full fed, but failed to produce quite as large daily gains or as large a profit as when shelled corn was fed. It is doubtful if it pays to
provide pigs to follow cattle being fattened on ground barley.

3. Whole barley proved quite unsatisfactory as the grain for fattening yearling cattle. Barley must be ground to be fed profitably.

4. There is no advantage to be gained by feeding ground barley during the first half of the feeding period and shelled corn during the last half as compared to feeding shelled corn throughout the feeding period.

5. There was no appreciable advantage in grinding and mixing shelled corn and dry roughage for fattening yearling steers. The steers fed the whole feeds proved more profitable than those fed the ground mixed feeds by $4.48 per head.

Lot 3, which was fed a ration of shelled corn, linseed meal, alfalfa hay and corn silage, had an advantage over Lot 1, fed ground barley, linseed meal, alfalfa hay and corn silage from practically every standpoint. The steers in Lot 3 gained faster, made cheaper gains, sold at a higher price per pound and returned a considerably larger profit than those of Lot 1.

Because of the bulk, light weight and low palatability of the ground barley, it limits consumption itself. In all probability, the way to get the cheapest gains from ground barley is to full feed it, while the way to get the cheapest gains from shelled corn is to limit it to 85 per cent of a full feed or approximately 1.6 pounds of shelled corn per 100 pounds live weight of cattle per day.

Lot 2, the steers receiving whole barley, ate a trifle more grain by weight per day and a little more silage than the steers fed shelled corn and quite a little more grain by weight and a little more silage than the steers getting ground barley. What apparently happened was that they simply swallowed a large part of the barley whole without breaking the kernels at all and it passed through their digestive tracts without being digested. This resulted in a low daily gain, a high feed cost per 100 pounds gain, a poor finish, lower selling price per pound and a small loss per head instead of a profit.

There were no apparent advantages of feeding barley during the first part of the feeding period and corn during the latter part, unless a farmer has a partial supply of each grain on hand, in which case, he had best feed the barley first and the corn toward the finish of the feeding period. Cattle usually do not do well on ground barley toward the end of a long feeding period.

It was found that the feed cost was a little higher for Lot 5 which received the mixture of ground grain.

"We may be wasteful and careless of everything else; but the land belongs to the ages—it is ours for the brief period which marks the passing generation. We are the trustees holding this land a sacred trust for generations yet unborn; and the happiness, the comfort—yes, the very existence of our children's children and the millions who will follow, is dependent upon the conscientious, far-seeing wisdom with which we discharge this solemn trust."—William C. Brown.
How I Handled My Beet Workers

By CLIFFORD SELTZER, Brighton Grower

WHEN the time comes to start thinning beets, I see that each beet worker is supplied with a hoe that suits him, something that is just right to turn out first class work, and always tell them that they can have new hoes and plenty of files when needed. I want them to feel that they can have plenty of the best tools to work with and usually make it my business to know at all times that the hoes are in good shape, so they can do good work.

The workers are advised daily as to the kind of spacing desired and the importance of saving the bigger beet. The cultivating is carefully and thoroughly done.

When a man is real careful in doing his own work, the beet worker is generally inclined to take a greater interest in the thinning and spacing. In other words, do not expect anybody to put more into your business than you yourself are willing to put in.

My beets, this year, were thinned in the manner above and in time to make a real first class job. I had no hesitation in telling the beet labor that the work was just right.

It seems decidedly wrong and altogether a mistake to try to belittle the Mexicans or to be overbearing or unfair in your dealings with them. We are depending upon them for the faithful performance of their important duties, and we certainly should be courteous to them.

After fifty acres of my contract had been thinned in good shape this year, I told my people that they did splendid work and that it was just what was expected of them. So I went to town and bought two gallons of ice cream and treated them to ice cream and cake, which was not too much to do for a bunch of people who took such an interest in my welfare.

We arranged for credit at a store where they were treated right. We sell eggs to them at the same price that the storekeeper pays us; also milk at the price that the creamery pays, and so on down the line.

We have no desire to dog them around. We have found them to be honest and generally willing to do us a favor, such as feeding the stock and doing the milking when we were obliged to be away at chore time.

The Mexicans, or Spanish Americans, train their children to work and generally make good citizens of them.
Importance of Irrigation

1—The development of the plant as a whole depends upon the development of the root system. The development of the root system is dependent upon the supply of air, plant food, moisture and warmth. The supply of these constituents in the soil may be regulated by crop rotation, manuring, irrigation and drainage.

2—The soil, especially the upper zone containing the bulk of the plant's food, must be maintained at the proper moisture content throughout the growing season so that the roots can develop therein and extract food.

3—When the rainfall is not sufficient to maintain the soil at the proper moisture content the deficiency should be supplied by no more than that required to raise the moisture content of the root-occupied zone up to the optimum moisture content. This will necessitate the application of light irrigations, especially in the early part of the growing season.

4—The reason is obvious because so large a proportion of the water applied in a heavy irrigation is lost to the plant by percolation below the root-occupied zone. This percolation removes plant foods. With light irrigations applied frequently, the fertile soil zone near the surface is more nearly maintained at the optimum moisture content.
THE normal annual precipitation over the territory served by the Lovell factory in Wyoming is about 6 inches. A considerable portion of the total rainfall ordinarily occurs during the months of May and June, and quite often these rains are sufficient to germinate beet seed. Nevertheless, experience has shown the only safe course is to irrigate for germination and to do it IMMEDIATELY after planting without waiting for rains which may or may not come. This irrigation practice is general in this territory, and although soil types vary all the way from light sandy to heavy clay and there is also considerable variation in topography, splendid germination stands are the rule throughout the territory and within the reach of every grower every year.

Stands of beets obtained this spring have again been good, in general, but due to very unusual weather conditions, the stands on about 20% of the planted acreage are much below what should be the case. The problem here as elsewhere is the avoidance of ironclad rules in farm practice so that any situation which may arise due to weather conditions or any other cause may be met promptly in the best way possible. The uncertainties in obtaining good stands of beets as well as satisfactory yields can to a large extent be eliminated next year by profiting by this year's experiences.

This year the work of spring plowing was very greatly speeded up by the enormously increased use of tractors. This would have been a splendid thing except for the fact that the work had to be done during a short period of time more or less irrespective of the condition of the soil, with the result that some fields were plowed too wet, and numerous others too dry. In both cases, it was impossible to avoid cloddy and poorly prepared seed beds.

Spring plowing has been the RULE in this territory for years, but increasing numbers of successful beet growers are finding each year from experience that fall plowing of most of our soils pays big. An exception may be noted in very light sandy or heavily alkaline soils. The plowing of alfalfa lands can very profitably be done in August or September by plowing under the third cutting. Also with the greatly increased numbers of tractors, a large acreage this fall can be plowed after the completion of beet harvest before the ground freezes.

The depth of planting has again in a number of cases seriously affected germination stands. Early planted fields that are to be irrigated up should be planted SHALLOW—not more than 1 inch deep. The ground is cold, the irrigation water is cold and at best germination is slow early in the spring. Beets planted 2 to 3
inches deep, as sometimes occurs, almost invariably show poor stands, and especially is deep planting disastrous when planting is done early as it should be.

Following planting and irrigation for germination this spring, came a period of the hottest and driest weather of record in this territory, the mean temperature for May being 8.5° higher than for the same month in 1927. The hot weather, accompanied by negligible precipitation and almost daily winds caused exceedingly high evaporation of moisture from the soil.

Ordinarily the first regular irrigation of beets is not necessary until after thinning has been completed or around the first of July. This year, however, many fields were dry before the first cultivation was given, and many growers very wisely irrigated before thinning began. Some well-mulched fields retained moisture so that irrigation before thinning was not needed, but numerous others have had growth seriously retarded from lack of sufficient moisture available to the young plants. Again is demonstrated the necessity for adopting rules to meet conditions as they arise. The well-established practices of the most successful beet growers have many points of uniformity, but one of the reasons for the success of these men is their ability accurately to analyze a situation and act accordingly, irrespective of custom or precedent.

They have learned that beets can be successfully irrigated for germination on any kind of soil, and that uninterrupted growth must be maintained after germination by properly applied irrigation at ANY TIME DURING THE GROWING SEASON whenever additional moisture may be needed. They also appreciate the value of frequent light irrigations during the early stages of growth with the heavier irrigations applied later in the season.

CULTIVATION AND IRRIGATION

The Gold Dust Twins of Higher Beet Yields

A weedless, clean beet field now will promote a clean field at harvest time and clean low-tare beets. Make your labor live up to their contract.
BEETS in the Nebraska district are in splendid condition and give promise of a record crop if careful attention is given through the month of July to irrigation and cultivation.

Cultivating should be frequent and thorough up to the first irrigation. When tops begin to spread cultivate shallow near the beet. Set the bull-tongues near the beet and very shallow with the center bull-tongue deeper. Very deep cultivating close to the beet, or what is known here as tearing up in preparation for ditching is a poor practice as it destroys the feeder roots which, by this time, are thrown out on all sides of the beet.

We have received a number of fine rains which have been very beneficial and have pushed the crop along rapidly, but perhaps have created a false impression of a great amount of moisture stored in the soil. This, in fact, is not the case as the winter months were very dry, only 5.86 inches of moisture being received from October 1 to June 1 as compared to 9½ inches received during the same period in 1925 when the high tonnage was harvested.

This moisture now in the soil is being rapidly consumed by the fast growing plants and when the dry, hot weather sets in they will receive a setback which will certainly affect the tonnage if not irrigated in time to enable them to continue their growth.

The first irrigation should be given just as soon as needed regardless of the calendar but should not be a heavy application. There is an abundance of water in the North Platte Valley for all crops and growers knowing that they do not need to save are apt to use too much water. Frequent, light irrigations are much better than a few very heavy ones. It would be somewhat the same thing to give your horses a copious drink and expect them to get along without another until the next week because it is less trouble to water them that way.

The beets should be reditched just as soon as dry enough after the first irrigation. This is very important for if the soil bakes it checks plant growth. This crust is certain to form if the beets are not large enough to shade the ground.

After beginning to irrigate, irrigate often enough to keep the soil moist and the beets growing. This will give the best tonnage and sugar content. Cultivate and irrigate through July and your beet crop will be on the right side of the ledger.
Despite Rains Loveland Finished Thinning Earlier Than Usual—Bumper Crop Ahead

By H. SCILLEY

THE last month has been a trying one. Frequent rains kept labor out of the fields for ten days. The moisture stimulated the beet growth so that the regular families were not able to thin them fast enough and everyone was calling for additional help. We used floating gangs, school boys, extra families, and all available labor of any kind. Most of the beets were thinned on time and are making a splendid growth.

One thing is noticeable, now the rush is over: people who treat their beet labor well and try to make them comfortable, have little trouble in holding them and getting the necessary extra labor. Others who are, to put it mildly, inconsiderate have trouble with regular help. Extras hear of it and refuse to go there. "A soft answer turneth away wrath." Smiles and pleasant words are not expensive, but they are a distinct asset in handling beet labor.

The question of supervision by the farmers was emphasized in recent years and we made some progress this spring. But there is yet room for improvement. Supervision applies to the work of second hoeing just as much as to the blocking and thinning. With a good thinned stand it behooves us to see that it is not cut out in the hoeing.

Many of the farmers still allow the beets to be blocked too far apart. Some furnish the labor with 10-inch hoes and get about 60% to 70% of a stand. All our experiments, as well as field results, show that this is a mistake and results in loss of tonnage.

Beets respond to a proper amount of moisture in the soil as is shown by the rapid growth for the last month, notwithstanding the cool weather. Now, that they are well rooted, it is essential that the moisture supply be kept in the soil in order to maintain this continuous growth throughout the season. We have prospects for one of the best-yielding crops in many years, if timely irrigations are kept up.

Do not apply too much water at any one time, but supply it lightly often enough, and cultivate after applying in order to make a mulch to hold it. We have the stand and we have the water; let us make a bumper crop by early and frequent irrigations.

There has been an abundance of webworm moth in the fields. A parasite which lives on the webworm egg has kept the pest in check. We had this condition last year and eggs did not hatch, but we should keep a careful lookout for worms. Farmers who have sprayers of their own should put them in working condition without delay. Those who do not own sprayers can hire from the factory.
Irrigation and Nematode Survey to the Fore in Brush and Fort Morgan Districts

By H. C. GIESE

FROM October 1, 1927, to June 15, 1928, our total rainfall in this district was 5.88 inches. From October 1, 1926, to June 15, 1927, the rainfall was 8.07 inches. In other words we had 2 inches less rainfall to store water in the soil than we had a year ago. Unless we get very heavy rains in the near future, it is going to mean that the beets will have to be irrigated earlier than they were a year ago, in order to make up this lack of moisture in the soil.

Experience of practical farmers in this district proved that especially in the first irrigation of beets, we should not apply too much water. Give the beets a light irrigation and make the runs short, so that the soil is not water-logged.

The number of irrigations will depend upon the condition of your field, and no two fields can be treated alike. We suggest that you irrigate your beets the first time before they show signs of suffering for water and then keep applying the water so as to keep the beets in a healthy and growing condition up to harvest time, keeping in mind that light and frequent irrigations produce better results than heavy irrigations applied less frequently.

As long as the beets will permit, go in as soon after irrigating as possible and form a mulch so as to hold the water in the soil.

The price for bunching and thinning is $9.00 per acre. The price for hoeing is $2.00 per acre. Of this $1.00 may be held back until the completion of the contract. You do not owe your beet help any money, if they are working clear through on the contract, until the hoeing has been done. You then owe them $10.00 per acre. Keep in mind that the fieldman cannot measure every field in his district as soon as you would like to have it done. Settle up as close as you can with your labor, as they need their money to pay their bills. Tell them you will make final settlement as soon as the fieldman can get the measuring done.

We are going to make a survey of fields this year to find out which are affected with nematode. Any aid you can give the fieldman along this line will be greatly appreciated. A patch of nematode infested beets appears somewhat like a gravel spot or dry spot in the field. If you have any of these spots, call your fieldman and he will try to determine what is wrong.
Prospects are very good for a beet crop in the Ovid factory district. The stands, as a general rule, are the best we have had in a number of years. The excellent stands are attributable to two factors: the growers planted more seed per acre than normal. The seed was small and more seed balls were distributed, giving us more plants per foot of row than heretofore.

Secondly, irrigation applied to the beet land either before or after planting has, in most cases, been very satisfactory and the germination stands very good.

In that part of the district where water was available, under the Julesburg irrigation district, eighty per cent of the beets were irrigated either before or after planting. In other parts of the district where the water was not available in all cases, the percentage irrigated up is smaller. The results from the irrigation for stand were highly satisfactory in most cases.

A few growers had finished irrigating just previous to a heavy rain of June second. The ground remained so wet for several days that it was impossible to harrow the dirt off of the beets that had been thrown there by the ditchers, with a result that the beets were so deep that they would not come through. There are only a few growers who had such experiences.

On the whole, the irrigation either before or after planting has been very satisfactory.

Advance Labor Arrangements Figure in Thinning Problems of Lyman District

By N. C. Vandemoer

The agricultural conditions in the Lyman territory have been unusually satisfactory and have resulted in a very good stand of beets. The germination of practically all fields at the same time resulted in some fields being blocked and thinned after the beets were a little larger than advisable.

Earlier in the season there was ample labor available in Nebraska, but some growers, being unwilling to receive their labor early, advised us that they would obtain their own labor. Later these growers requested that labor be furnished them, and as there was no surplus of labor available it was necessary to ship them in. The blocking and thinning has also been delayed somewhat by numerous rains.

Sixty-five per cent of the blocking and thinning was completed in this territory by June 18 and with normal conditions from now on we should see an unusually large crop harvested this fall.
Billings Had Dry Spring; Early Irrigated Fields Hold Forth Best Promise

By R. B. PETRIKIN

THERE never has been a time in my experience in the beet business when the advantage of early planting has been so thoroughly proven. All early planted beets are far better than the later plantings in the Billings district. The farmers who delayed drilling and did not irrigate the seed have had a hard time getting a stand and in many cases have had complete failure.

In 1927 we had a large percentage of our beets planted with ditchers on the drills but we did not need to use the ditchers to irrigate the seed. It was a wet season. But this year they did not use the ditchers. It was a dry spring, with the result that a great many fields had to be flooded, always a poor practice.

In some of the later planted fields there was moisture enough to sprout some of the seed but not enough to keep the plant growing. A poor stand resulted even when irrigated after the real damage had been done.

I would advise in all cases where there is any doubt of sufficient moisture at time of planting, to irrigate immediately.

The answer here seems to be: fall-plowed ground, early planting, and never without the ditchers on the drill. The success of the crop after thinning will depend on keeping the ground properly wet and well cultivated.

Windsor Has Bright Prospect in All Crops

By JOHN COMER

THE general condition of the beet crop is above normal. Excellent germination stands were secured, which have resulted in better thinned stands than usual. Blocking and thinning is completed. The second hoeing is well under way. Most fields are in very good condition, having been well cultivated and otherwise cared for. Most of the small grain and alfalfa have been irrigated.

If the excellent start the beet crop has is to be maintained, be ready to irrigate before your beet crop shows signs of suffering from lack of water. Irrigating before the crop shows signs of suffering is much better than waiting until wilting begins.

Due to the heavy loss of old alfalfa, the amount of new alfalfa seeded is above normal in this district. Much of the old alfalfa land has been planted to potatoes. This land should be in fine condition for other crops in 1929.

The present indications are that all crops will be very good.
Smaller Hoes for Hoeing Beets Urged in Fort Collins District

By JOHN COMER

The beet crop in the Fort Collins district is generally quite satisfactory. The weather was a little too cool during June for maximum crop growth, but with warm weather we anticipate that the crop will be fully up to or above normal on July first.

With thinning completed by June 23, cultivation of the crop is receiving most consideration at this time. In weedy fields, the knives must still be used; on the earlier planted fields which have been cleaned out early, bull tongues and duck feet are doing the best work. When the plants have attained such a size that they are not easily covered in cultivating, and the soil is not too wet, is the time for deep cultivation. In order that proper ditching may be done, no hard sole should be allowed to form.

We are urging our growers to watch their beet fields carefully as to the moisture condition of the soil, so that irrigation may be started before the crop shows need of water. On the larger contracts, especially, it is advisable to begin irrigation a little early, even before the crop shows any wilting, in order that it may be completed before any of the field has suffered.

The hoeing, in our opinion, is one of the most important operations in connection with the care of the crop. Many excellent stands are damaged beyond measure by careless hoeing, and lack of supervision of the labor. We have advised our growers to provide their labor with a smaller hoe for the hoeing, and have had good results. Too many beets are lost during the hoeing by the use of wide hoes.

On account of the cool weather and continued rains, the grain crops have stooled remarkably well and barring damage from the elements, should develop into one of the best crops ever produced in this district.

Corn and barley planted on the fields plowed out of alfalfa this spring, are making a rapid growth owing to the firm, moist condition of the soil caused by the frequent rains.

ALFALFA HAY SUBSTITUTES

Millet, planted after a small-grain crop, is another suggestion for emergency feed. Oats or barley may be planted after the harvest of the grain crop. Either will make some hay or a large amount of fall pasture which will replace considerable hay. Temporary pastures of fall rye seeded in corn at the last cultivation will provide a fall or early-spring pasture and, to some extent, reduce the amount of other feed necessary to carry stock over winter.
Eaton's Diversified Crops Coming Fine

The season thus far has been very favorable for all vegetation. Sugar beets are all thinned and an exceptionally good thinned stand has been left.

Labor has been plentiful and as a rule very good labor was available. Beets never looked better at this time of the season. Some fields are hoed; many fields are in need of cultivation, but due to frequent rains and other farm work pressing, the growers in some cases have neglected the cultivations.

More growers than usual are using the 10-inch duck-feet alone on the cultivators this year and are doing a first class job of weed killing and loosening of the soil between the beet rows, thus preparing the land for a good ditch.

Small grain looks very promising. A large acreage of potatoes has been planted and many fields are up with good stands.

Pinto and seed beans have been planted quite generally throughout the district, but on account of frequent rains and cool days and cold nights, this crop has not thrived as well as others.

Young alfalfa seeding was a success this season and most farmers report good stands. The old alfalfa winter-killed badly this past winter; consequently the hay crop will be below normal.

With the good start that all crops now have and favorable growing conditions the remainder of the season, coupled with plenty of irrigation water available, 1928 should be a very satisfactory year of yields for the farmer, provided we escape hail.

Control of Weeds Is Cultivation's Biggest Benefit

Control of weeds before they take the water and plant food out of the soil is the one distinct advantage of cultivation, according to Alvin Kezer, agronomist at Colorado Agricultural College, when asked "Why cultivate?"

"Shallow cultivations of three to four inches with a small-shovel cultivator will generally do the most good," Professor Kezer says. "When the ground is stirred deeply too much loose dirt is turned up to dry and often the roots of the plants are disturbed. Weeds are most effectively controlled by cultivation while they are still small or just after they have sprouted. At the very latest they should be killed before given an opportunity to go to seed. Otherwise they will be more plentiful than ever next year.

"Cultivation assists materially in the control of moisture, but principally through keeping the weeds from getting it. Where the soil has been crusted by a hard-beating rain, cultivation will break the crust and restore the soil tilth. When stirred the soil is left in a condition to catch and retain the maximum amount of moisture."
Weather conditions during the first two weeks of June were not especially favorable on account of frequent rains and low temperatures. During that period Minatare factory received 1.74 inches of moisture and Bayard 1.71 inches. These storms supplied moisture at a time when it was much needed, but caused material delay in thinning. However, blocking and thinning was pushed when conditions permitted and the development of the crop is considerably in advance of this time last year.

With thinning out of the way, the most important consideration to claim our attention in the near future is the matter of irrigation. Many growers are likely to be misled by the rather unusual amount of precipitation during the past two or three weeks. This moisture, while extremely beneficial, has only served to improve moisture conditions in the top soil, and a few days of hot weather will cause a rapid drying out because the subsoil is dry. A study of precipitation records extending over a period of years indicates very conclusively that our best yields follow heavy precipitation during the period of October to June preceding.

From October 1, 1927 to June 1, 1928, the precipitation was only about half that received in 1922, 1925 and 1927, which were our highest average yield years. It is highly essential that we be prepared to irrigate early and often if maximum results are to obtained.

Enough Feed Wasted on Farm to Supply Pork Consumed

There is enough feed wasted on most farms to supply the pork consumed on that farm. Pork production, logically a part of diversified agriculture, may be carried on profitably with a small amount of capital invested in foundation stock, labor and equipment, according to "Principles of Pork Production," a new extension bulletin published by Colorado Agricultural college.

After observing the experiences of many, the authors believe that the Colorado farmer who has decided to establish himself permanently in the pork-production business has a greater chance of success if he will start with a small herd and grow into the business. With an initial purchase of three to five sows, a farmer can quickly build up his herd to any size desired. He has obtained his experience, moreover, with a small investment.

The new bulletin, written by B. W. Fairbanks and A. C. Allen, tells the types of sows to buy, how to care for them at farrowing time, care of pigs at weaning time, suggests rations for growing and fattening pigs, and gives hints on swine sanitation.
Timely Planting and Thinning Put Longmont District Ahead

By R. M. BARR

For the most part the Longmont district got a good early start this year, and on the early fields the stand of beets is not only excellent but far advanced for this time of the season. Particularly those beets planted on fall-plowed ground are big, the foliage covering the ground and the roots making good growth, too.

There was considerable grain planted in the territory and it is looking fine. In this vicinity the beet-grain rotation is not uncommon. But for best results grain ground should be fall-plowed if beets are to be planted thereon next season. If the grain is taken off as early as possible and the ground is plowed and disced, the farmer can get the added benefit of six or more months of fallowing. It isn’t enough merely to plow: the ground, if heavy, should be worked down right after plowing.

This year the weather permitted much plowing in February and March, a condition that does not happen every season. For certain results fall-plowing is preferable. I do not know of any single practice on heavy ground that will do more to contribute to better beet yields.

Farmers in the Longmont district are to be congratulated on the fine cooperation they have been giving in recent years toward early planting and early thinning. They have led the Colorado district in these respects and the improved yields attest the wisdom of the practice.

A Word on Blackroot from Mitchell

By C. S. CAMPBELL

Six separate rains ranging in the amount of precipitation from .09 inches to .67 inches and totaling 1.97 inches fell in the first two weeks of June. These rains provided the top soil with ample moisture, but very little of this moisture penetrated to a depth where it can be stored for future plant use with small evaporation. Therefore, in order to keep the crop progressing properly it is advisable to give the beets a light irrigation at once, being careful to make short runs with the water in order to avoid having water stand on some of the plants too long and also to avoid washing the soil from the roots.

A small amount of black root showed up. This disappeared very shortly, however. Another year growers who seem to feel that they should roll their beet fields after every rain in order to keep the crust from forming should remember that this practice results in a much too firmly packed seed bed. It is much better after these gentle, soaking rains to use a light harrow which will adequately take care of the crust problem and will at the same time
leave the soil in such a condition that black root will not be so apt to become a menace.

The outlook this year is very promising. A larger percentage of the beets was thinned on June 15 than for some time. Last year our Spring was quite backward. Two years ago we got off to a wonderful start, but before June 15 hail storms had done considerable damage to the crops. Should we have any hail storms later in the season, especially one of those hard, driving storms accompanied by some wind, steps should be taken as soon as possible to get into the fields to cultivate.

It is very gratifying to note the care with which some of the growers prepare to give battle to the web worms. It might be well, however, to caution growers not to get too panicky at the first sign of worms. There is a proper time to do your spraying when the worms are hatched out and before they are large enough to do damage. Watch your field and spray at the proper time; it will save you time and money. If in doubt, ask your fieldman to come out.

**Lovell to Make Nematode Survey; Irrigation Overcame Dry Spring**

*By H. S. Looper*

WITH 57% of the beets thinned on June 15 as compared with 40% a year ago, it is probable that thinning will be fully completed by July 1st as will a great part of the hoeing. Thus for consideration during July we have irrigation and cultivation, webworms and nematodes.

Because of a combination of many factors such as warm windy weather in May, and a lack of even a normal amount of rainfall during the early growth of the beets, it has been necessary to watch the beets closely to prevent drying out. Many beet fields have already had three and sometimes four applications of water. This has brought about a condition, which if continued during July, will benefit the crop to a great extent; that is, frequent light irrigations followed by deep cultivations. In this way a sufficient amount of moisture is maintained in the soil so that the beets will never suffer from being dry.

So far there have been no nematodes discovered in the Lovell territory. In this we have been particularly fortunate but we should not be led into any false sense of security believing that we never will have any sugar beet nematodes. This pest has already cost beet growers in other districts many millions of dollars and can be controlled only by segregation and rotation.

For this reason a survey of beet fields in the Lovell territory will be made during July and August to determine whether or not any nematodes are present. Growers noticing any spot where the beets do not make the growth that is being made by surrounding beets should bring it to the attention of the fieldman.
Government Barge Lines Lower Beet Profits
Subsidized Carriers Permit Foreign Sugar to Enter Favorable Territory Cheaper Than Domestic Producers Can Ship by Rail

The complex problem of marketing sugar at a profit today is seriously aggravated by government ownership and operation of barge lines on the Mississippi. Because of low water rates, foreign sugar can enter favorable territory of the domestic producer at a lower price than he can meet under natural competition. Under the barge subsidy the government, in effect, is giving preference to the very foreign producers against whom tariffs are levied for the protection of the domestic industry.

Continuation of this unnatural water competition would diminish The Great Western Sugar Company's returns approximately 10 cents per bag, aggregating over a million dollars on such an output as the Company's 1927-28 production, it is estimated.

Following appropriation by the House of $10,000,000 in May for further expansion of the barge service, domestic sugar producers entered vigorous protest against final passage of the bill by presenting their case before the Senate committee on Commerce. The severity of the hardship on the domestic industry was summarized by an eastern beet sugar manufacturer in the following statement to the committee:

"The Mississippi and Warrior River Barge Line, operated and subsidized by Government funds has added many thousands of dollars to the loss of this company during the past three years. "Our working capital is exhausted and this disruption of all our freight structure appears to us as one of the most unjust direct taxes ever placed against a branch of American industry.

"In supporting this program Congress violates every principle of our national philosophy which denies the government the right to engage in private enterprise as against the activities of our private citizens. We most strenuously protest against further subsidy of the Federal barge line and urgently request these activities be left to private enterprise."

According to the report of the Inland Waterways Commission the government has already invested over $17,000,000 on the Mississippi barge lines. If this service were privately operated a reasonable capital charge would have to enter calculations, but it was stated at the Senate hearings, no such charge is made by the corporation in its annual statements of revenues and operating expenses. The government corporation also escapes taxes and other fixed charges paid by private enterprises.

Since their inception the Warrior and Upper Mississippi divisions have suffered heavy operating losses, it was brought out, while the Lower Mississippi division showed an annual loss up to 1924. Since 1924 reports show an operating profit on that division, but it is held that if a capital charge, taxes, and other fixed charges such as are used in private business were taken into consideration, even the Lower Mississippi division would show consistent annual losses.

Harry Austin, secretary of the United States Beet Sugar Association, summing up the case of the domestic
producer before the committee, declared:

"We submit that in view of the showing made by this barge line service and of the unfair advantages afforded foreign sugar in competing with the sugar produced on American soil, it is unwise, unjust and uneconomic to further subsidize this enterprise by the additional appropriation of $10,000,000 of Government funds, and in fact we believe it is high time that the Government withdrew from competing with private enterprise and either abandon the service or turn it over to the latter."

Eastern cane refiners have also entered their protests together with various seaboard Chambers of Commerce. Just prior to the adjournment of Congress Senator Shipstead of Minnesota offered an amendment providing that the Mississippi and Warrior systems each be transferred intact to private capital.

Sweet Clover May Be Used to Supplement Alfalfa for Hay

Farmers who planted sweet clover for a green manure crop last spring may find it profitable this year to use it as a supplemental legume hay to replace alfalfa that has been killed out due to root-rot or winter-killing.

Sweet clover properly cured is as palatable as alfalfa and practically equal to it in feeding value. Altho the second-year growth will make the largest tonnage, it is apt to be stemmy and poorer in quality than first-year sweet clover unless cut at the proper stage, states Waldo Kidder, extension agronomist, of Colorado Agricultural College.

For hay, sweet clover should be cut before it blooms, usually when it is one-fourth to one-half in bud, Kidder advises. It will be approximately 24 to 30 inches high at this time. As second-growth sweet clover comes from the buds on the stem, the crop should be mowed high enough to leave stems with buds on them. The height of the stubble will depend on the variety and the stand but ordinarily 3 to 5 inches of stem are sufficient.

Yellow sweet clover can be cut closer to the ground than white, and a thick stand closer than a thin one. When cut under these conditions, sweet clover will make from 1 to 1½ tons of hay to the acre for each cutting.

Sweet clover is more difficult to cure than alfalfa. As soon as possible after it is cut, the hay should be bunched and allowed to cure in the shock, or windrow if a side-delivery rake is used. Sweet clover should be stacked as soon as cured, the best results being obtained when it is stacked a trifle "sappy."
When Rains Stop

Showers Are Not Often Equal to Irrigations; the Beet Crop in Practically Every Locality Is Ready For Irrigation

June was an unusually wet month this season in most of the Great Western beet raising territory. The Nebraska district, for example, had showers almost daily. Portions of the Colorado area received as much as six inches precipitation.

And yet in a territory which received more than three inches of moisture in June soil tests at the month's end showed a marked deficiency of moisture in the lower root strata.

If July is as hot as normally the beet crop will draw heavily upon soil moisture. Hot winds may make further heavy draughts. The growing foliage evaporates increasing amounts of moisture. More and more beet fields are already showing signs of needing water.

Anticipate the irrigation needs of your beets: do not wait to prepare to irrigate until after the crop begins to suffer.

It seems strange that farmers who never let their grain wilt, who irrigate their potatoes and their alfalfa, should let the beets suffer before applying water.

Cool weather in June and frequent showers kept the beets looking fairly fresh but in many fields the crop was making no marked advance. With hot weather the plants will begin to spread out rapidly and if moisture is added the roots will go down, making for tonnage.

The first irrigation should be fairly light. Have the water runs short. Thereafter light, frequent applications of water should give the best results.
The Season's Mistakes in the Billings District

By CHARLES F. MANN

MONTANA normally has sufficient moisture during April and May to bring up a stand of beets but this season has been an exception. During April and May of this year a total of 1.39 inches of moisture fell which is 3.37 inches below normal.

The showers which composed this precipitation were not only inadequate for the seed germination but caused the growers to delay irrigation.

The old proverb that all signs fail in dry weather was surely true in Montana this year. Finally when most growers realized that there was a possibility that they might not get sufficient moisture to germinate the seed then irrigation started. By this time all their farm must be watered as the alfalfa was dry, their grain either had to be irrigated up or was badly in need of moisture and their bean ground had to be irrigated before preparing it for seeding.

This irrigation problem on the entire farm and the fact that the growers did not generally use ditchers on their beet drills caused the growers considerable delay in getting water to their beet fields.

Ditching after planting to irrigate up beets is unsatisfactory. It only throws too much dirt, covers the seed deeper and kills some of the small beets which are up. It does not put the ditch in the center of the space between the rows. Those growers who had ditchers on their beet drills could follow the marks and with the six by six blocks on their cultivator had very good ditches. Due to the smoothness of the sides of the blocked ditches it was necessary to run the water a little longer but they got the seed wet without flooding the field.

Too many growers in this territory feel that it should not be necessary for them to irrigate their beets up and make this irrigating up job as hard as possible. Others just let the water soak up the ditch without wetting the seed. Why should we irrigate unless we intend to get moisture to the seed as that is the object of the irrigation.

Another mistake that some growers made in this district this year was that they did not cultivate quickly enough after irrigating. The beet row ridges dried out before the little roots were down to growing moisture and in some cases it was necessary to re-water before thinning.

A shower on some fields was sufficient to germinate the seed but not enough to keep the plants growing. By the time these
growers realized that the little beets needed water and could get it to them, a great many plants had died. Such delays not only reduce the stands but each day lost shortens the growing period of the beet crop.

From this year's experiences we have learned the following lessons:

1. Put ditchers on your beet drill.
2. Make 6"x6" blocks for the cultivator.
3. Plant seed about 1½ inches deep regardless of moisture condition of seed bed.
4. If seed is dry irrigate as soon as water is in the canals.
5. If shower germinates seed but not sufficient to keep plants growing, irrigate before they suffer or die.
6. Cultivate as soon as possible after irrigating to stop evaporation.

Let bygones be bygones except for the lessons we have learned and the experiences we have gained. Keep your crop growing from now until harvest time.

Cultivate with the knife-edged bull tongues behind the thinners unless the field is weedy and then use the knives with one bull tongue in the center. Unless you destroy too many leaves, cultivate with knife-edged bull tongues and reditch after your next irrigation.

Although you irrigated your beets up and got a few showers do not make yourself think that you can delay future irrigations. Water your beets before they are suffering and do not wait until the leaves are wilted flat on the ground.

To my knowledge the camel is the only animal which does not require a small amount of water at regular intervals and the sugar beet is not the camel of the farm crops.
Ropiness in Milk and Its Cause

To Relieve this Condition Destroy the Germs Which Cause Ropiness

ROPINESS in milk is not uncommon during summer and sometimes causes farmers considerable trouble and loss. It is nothing to be particularly alarmed about when properly understood.

It is caused by certain bacteria but the ropy milk is not harmful nor is its food value unfavorably affected. Only because its appearance is out of the ordinary, and unacceptable to consumers, is the farmer naturally aroused by the experience. In bad cases the milk becomes almost slimy, sticky threads from an inch to a foot long, appearing in the milk.

Pasteurized milk seldom is ropy because heating to 140 degrees F. and holding it at that temperature for 30 minutes kills the ropy bacteria.

The bacteria that cause the ordinary type of ropiness normally live in stagnant water pools. The first thing to do in the case of ropy milk is to drain or close off to the stock any stagnant pool to which they have been going.

The bacteria adhere to the cow's body and udder and fall into the pail at milking time. Only some of the cows may become carriers of the germs but the bacteria multiply rapidly and the milk utensils become infected. The germs may maintain themselves in the water of the milk cooling tank or in the utensils (if not thoroughly scalded and exposed to the sun) and thus ropiness may persist for some time after stagnant pools have been disposed of.

Everything that has been used in connection with ropy milk, including strainers, dippers, brushes, etc., should receive a thorough disinfecting and cleansing.

Do not confuse ropy milk with stringy milk which is caused by an abnormal condition of the udder, such as garget. This latter is an inflamed condition of the cow's udder, and milk from such a cow usually contains masses of stringy, coagulated matter. Ropy milk, on the other hand, comes from a perfectly healthy and normal udder. Ropy bacteria enter the milk after it is drawn. Ropiness seldom develops in any milk until it is from 7 to 8 hours old and has been kept at a temperature of around 50 degrees F. The farmer may not know that his milk is ropy for it may leave his place in an apparently normal condition. Milk dealers, in such cases, may encounter the difficulty, particularly if the milk is not soon pasteurized.

Easier to Produce Clean Milk Than to Clean It Afterwards

TO PRODUCE clean milk in the first place is far better than attempting to clean it later, dairymen are reminded as warm weather comes on to make their task increasingly difficult. Bacteria will multiply every 20 to 30 minutes under favorable temperature conditions, which will mean millions in 24 hours. Low-bacteria-count milk indicates clean milk.

Clean milk starts with the cow herself, says W. C. Harvey, chemist for the Colorado Dairy Commission. It is fully as important to curry and groom a cow as it is a horse, but it
should be done about an hour before milking time to give the material from her body a chance to settle out of the air. Then wipe the udder and teats with a damp cloth just before milking.

Sodium hypo-chlorate, commonly known as B-K, is sometimes put in the cleansing water. It materially reduces the bacterial count. Another precaution that Harvey recommends is the use of small-top pails where one-half to two-thirds of the top is covered. This prevents a large amount of dirt, manure and body dust from falling into the pail.

All utensils with which milk comes in contact either should be sterilized with steam or scalded with hot water. Sterilizing will kill the bacteria that grow and multiply in the milk that remains in the seams of these utensils, while scalding will materially reduce them.

Prompt cooling retards the growth and multiplication of bacteria. Lack of cooling, Harvey says, is the greatest cause for high bacterial counts in milk and cream.

Summer Care of Pullets Influences Egg Production

Their care and management during the summer largely determines the egg-production to be expected from pullets through the winter months.

To force the growth of pullets by the continuous use of a heavy protein diet is poor practice, says O. C. Ufford, extension poultry specialist at Colorado Agricultural College. They should develop gradually so as to have body vigor for the long and continuous period of heavy egg production.

The normal growing period for breeds of the Leghorn type is from five to six months when properly managed and fed. Plymouth Rocks, Wyandottes and Rhode Island Reds require from one to two months longer for normal growth.

A good plan of management is to hatch early and start feeding a growing mash when the chicks are three and four weeks old, and continue it until they are three and four months old. Mr. Ufford recommends a mash as follows: Cornmeal, 35 pounds; bran, 25 pounds; shorts, 25 pounds; meat meal, 10 pounds, and bone meal 5 pounds. When the pullet’s comb begins to turn a bright red is good indication to cut down on animal food. After this, a slower growth of the egg organs is desired. It can be secured by elimination of the milk and the meat meal in the mash.

For one to two months prior to the time it is desired to bring the pullets into production, Ufford recommends a ration as follows: Corn meal, 35 pounds; ground wheat 50 pounds; ground barley or oats, 10 pounds and bone meal, 5 pounds. With such a ration they will put on body weight and fat. They will go into winter egg production with greater vigor and vitality as a result.
Ten Grain Binder If's

If the binder has rusted during the year, especially the knotter and knife, it is a good idea to squirt some kerosene over it a few days before it is to be used. The kerosene should be wiped off and all parts should be well oiled before the machine is used. Ten Binder If's given below will help a farmer adjust his machine and put his finger on the trouble as soon as it occurs during the harvesting season.

1. If the machine travels with a jerky motion, the main drive drain is too loose or it may be dry. Try a little oil on it.

2. If the slats rip off the canvas, the elevators are not square.

3. If the knotter hook is rusty and rough, it will not work properly. Polish it with a fine emery paper.

4. If the binder attachment is not timed properly, it certainly will not work. Some binders are timed in as many as five places.

5. If the knotter hook does not turn far enough to close the fingers on the twine, no knot will be tied. Look at the knotter pinion. If it is worn, replace it with a new one.

6. If the twine slips through the cord holder, the twine will be pulled out before the knot is tied. Adjust the cord holder spring. It should take 40 pounds to pull the twine from the disk.

7. If the disk does not move far enough, the knotter hook grasps only one cord, hence a loose end band.

8. If the needle is bent or out of shape, there will be a loose end band. The needle is malleable iron and may be hammered back to shape.

9. If the twine is pulled from the hook before the knot is tied, try the knife, it may be dull.

10. If you wish to change the size of bundles do it with the bundle sizer spring, not the tension or compress spring.
Beet Raising Publicity

Another Program in Which Great Western Districts Lead

For eight years weekly farming suggestions have been published as advertisements by the Great Western Sugar Company throughout its beet-growing territory.

Served with demonstration trains, beet tours, monthly magazine, Fieldmen, special notices in emergencies, and this good farming publicity, growers in Great Western territory, as a group, are the best informed beet raisers in the United States.

No other beet sugar manufacturer in the world has carried on activity comparable with this in size, frequency and duration.

Desirable cultural practices, together with natural riches in soil and water supply, relative freedom from crop diseases, development of rotation and feeding, and favorable prices paid for beets, primarily explain the better condition of agriculture and general business in this territory compared with most other beet-raising localities.

The weekly good farming "ads" have sought to present only proven field methods. Our agricultural department, observing many farms and types of farming, is in a position to select the most successful. At our experiment farm still further improvements are studied and tested. A statistical department in the Company conducts large-scale studies of methods on commercial beet farms, further seeking proofs to ways of better yields.
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A Portion of the Lee Everett Dairy Herd Near Scottsbluff on Sweet Clover Pasture

AUGUST, 1928

THE GREAT WESTERN SUGAR CO.
A Fatal Mistake

By C. E. Evans
Manager, Greeley and Eaton Factories

Last summer, especially during August, we had frequent rains. The sugar beets always appeared to have plenty of moisture.

However, when they were harvested, the crop turned out with rather a low tonnage. Farmers said they had over-estimated the rainfall.

Had farmers irrigated more frequently last season, the yield would have been better. But the same farmers are making the same mistake this year.

We are having frequent showers, sometimes near cloudbursts. But these storms are not to be compared with a proper irrigation.

The rains sort of seal up the land and the water runs to the low places in the field. Many portions of the fields receive an insufficient wetting in the lower layers of the soil where the beet tap root and smaller roots are feeding.

Don’t be fooled by these rains. Irrigate.
Editor’s Notes

The Company’s Interest in Your Crop

"1. The Grower agrees to prepare the land for, plant, block, thin, cultivate, irrigate, harvest, and deliver during the season in compliance with the directions of the Company.......acres of sugar beets on the following described land."

Thus reads the beet contract. Fieldmen and agriculturists of the company throughout the season counsel with growers on their crop problems. Cards occasionally are sent by mail calling attention to emergencies. Newspapers carry advertising directed toward higher yields of better beets. Tours, special trains, company experiment farms, demonstrations on commercial beet farms—all manifest an uncommon interest in the grower’s conduct of what may seem at first blush to be his own business.

The great majority understand why from the start of the beet sugar industry the factories have come closer to the farmer than have the purchasers of any other crop he grows. But occasionally individuals and organizations misunderstand or misinterpret the company’s agricultural program.

Politically the farmer may be getting too much advice. But narrow indeed is the person who would discourage extension of carefully planned and soundly based programs to increase the number of quality potatoes per hill, spuds free of hollow-heart, beets of a higher sugar content and larger tonnage per acre, disease resistant varieties of plants, and cultural practices which make farming more profitable.

The sugar company, paying the highest possible price for a ton of beets, wants roots from which it can extract economically the largest possible number of pounds of sugar. Hence our interest in date of planting, in good seed beds, careful cultivation, early and frequent irrigation, prolonged harvest—any and all practices which
tend toward beets of high sugar content, purity and slicing quality.

If the beets are fibrous, slice up like excelsior, slow down the mills, and contain too high a ratio of non-sugars which prevent an equal amount of sugar from crystallizing out in the process, the company quite naturally is directly interested in correcting such conditions. The enlightened grower is glad to co-operate in such a program because the financial success of the company measures its ability to pay for beets, too. And, in general, the things that help make beets of desirable quality for milling improve the farmer's yield per acre.

What the educational program means to the grower may be gauged by a single circumstance. In the last few years, mainly as a result of the growers adopting better field methods developed and brought to them by the company, the average yield has been raised one to two tons per acre. The farmers themselves deserve the credit for this accomplishment. Two tons per acre means $14. On 300,000 acres the increase represents more than four millions of dollars for the farmers annually.

To many substantial farmers political action of various forms to boost farm prices has less appeal than adoption of field practices which give them equal or larger benefits through increased yields and lower per unit costs. Certainly no intelligent farmer would oppose or criticise proper agricultural extension effort regardless of his attitude on co-operative marketing, collective bargaining or legislative relief.

The Case of Irrigation

That much remains to be accomplished in joint action by growers and company toward growing beets of better sugar content is illustrated in the present season's irrigation experience. It has been evident for years that irrigation has been too long delayed. Fields properly watered have gone several tons higher and produced beets of higher sugar content than neighboring contracts which suffered for early water and were not constantly maintained in maximum growing condition.

Over most of our territory this season showers have been frequent, and some unusually heavy rains have fallen. It was feared that growers would attach too much importance to this moisture and efforts to obtain early irrigation were redoubled. In one factory district, with 15,000 acres contracted, only 2,000 acres had been watered by July 15. Conservative estimates place at a ton per acre the average loss in yield due to this delay in starting irrigations.

The company's interest in your crop is a selfish one. It is on a par with your own interest. Your crop is worth most to you when, the price having been fixed, you obtain the highest possible yield. To the urge for more tonnage the company is putting an emphasis on quality—sugar content and purity—which runs hand in hand with the highest tonnage. Our company and growers by agricultural education and co-operation have made Great Western territory the highest average beet yield districts in the United States. It's the sort of team work that is worth carrying on.
Seventeen Years Dairying

By L. A. EVERETT
Scottsbluff, Nebraska

IN THE fall of 1910 we bought a small dairy, consisting of dairy equipment, a milk route, a herd of 22 cows and a pure bred Holstein bull. Dairying appealed to me for two reasons: first, it was bringing an income of $10 a day, which was helpful in keeping down the running expenses of the farm; second, it utilized all of our beet tops for which there was no sale and the alfalfa hay which, at that time, was not worth more than $5.00 per ton in the stack.

This was the start of the "Hillsview Dairy," which we named because of the beautiful view which we have of the Scotts Bluff hills, directly across the river from our dairy.

Our original dairy barn was built for 22 cows and had a milk room which soon proved too small. Since our herd and business increased rapidly it was necessary to build a barn for 50 cows, a larger milk house and add more equipment. At this time we purchased a milking machine which I think was the second one installed in Scotts Bluff county.

It seemed impossible to hire single men for the dairy work, so we found it necessary to build several tenant houses in order to employ married help.

The first few years we were always buying more cows, but during the last ten years we have bought very few cows. From the increase of our original herd we have raised all the cows we need, beside starting three other dairies. Many people have wondered how we could run a retail milk route and at the same time raise all of the calves. We do this by selling a certain amount of our produce in the form of sweet cream, so we always have plenty of skimmed milk.
for the calves in addition to the requirements of the milk route. I think it best to feed a certain amount of whole milk to a calf for the first month, even though it is worth 10 cents a quart.

I have not been as particular as I might have been about buying good cows. We never have had a pure bred cow on the place. We have always had the best pure bred bulls for our herd.

I kept no records of what the cows produced in the first few years of our dairying. I do know that there were times when the herd did not average more than a gallon and half a day per cow. Now our production for the herd seldom drops below an average of three gallons of milk per day per cow.

From the start of my dairying I have always taken a good dairy paper which gave me ideas of value. Since its organization in this county I have always belonged to the Cow Testing Association and have found that it helped pick out boarder cows and makes us appreciate more the value of paying cows.

We have a large silo which I usually fill partly with corn and then beet tops. We like the beet top silage fine. The crowns of the beets come out of the silo in just as good shape as they go in.

We have no permanent pasture here at the dairy. Two years ago we started the plan of pasturing our cows on sweet clover. At that time we had 30 acres of sweet clover pasture which was a big help. This year we are pasturing our herd on 23 acres of sweet clover. In my cropping plan I intend to have from 20 to 25 acres of sweet clover pasture each year. This pasture is planted to beets the following year.

I have found that one thing which makes more difference in milk production than any other feed is whether we have well cured alfalfa or just hay.

We keep and feed out as two-year-olds all of our Holstein steers. Last year 43 head of Holstein steers averaging 1200 lbs. brought $10.25 per hundred as against $11.75 per hundred for our beef steers which were shipped at the same time.

The dairying industry has been a successful venture for us.

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**Disc Grain Fields**

Except where the grain nursed alfalfa or sweet clover, grain fields may be disc ed immediately after shocking even if driving around the shocks is inconvenient. This leaves the fields in much better shape for plowing.

If a field was put to grain in 1928 instead of beets and you plan to grow beets on the land in 1929 do not allow the grain stubble to grow up in weeds. Fall plow the heavy land early; disk ing of the lighter soils, mixing the stubble with the top soil, will help conserve moisture and improve conditions for early spring plowing.
Pasture Your First Year
Sweet Clover This Fall

By G. O. Reed, Fort Morgan

Good stands of sweet clover are the common thing this year and offer an excellent pasture after the grain is removed. Hogs, lambs, dairy cows, and beef cattle have been fed with success on sweet clover pasture.

This summer, due largely to the rapid growth made by the sweet clover, a great many cases of bloating of cattle have been reported on sweet clover. Ordinarily sweet clover does not cause bloat, and if a supplemental feed is fed it is not so likely to. No sure preventative for bloat seems to have been found, although a bit or gag tied in the mouth helps.

Hogs can be fattened very cheaply on sweet clover pasture with a grain supplementary feed in addition. One to two pounds of corn or barley for each 100 pounds live weight is usually found to produce a profitable gain. The first year's growth of sweet clover is best suited for pigs, as it is less coarse and woody.

By getting lambs and beef cattle shipped in earlier in the fall a very cheap gain can be put on with the first year's growth of clover before they are turned into the feed lot. This hastens the time they can be finished out. Using hay to fill the animals before placing on the pasture will lessen the tendency to bloat.
Plow Sweet Clover at the Right Time

By P. B. SMITH, Fort Morgan, Colo.

It is important in handling sweet clover to plow it under at the proper time. Ten days in the fall make a big difference in the way plants are killed. Many good examples of plowing too late in the fall were in evidence this year. In most cases they were rather costly, increasing the hand labor and decreasing the thinned stands.

It requires only a glance at Photo No. 1 to see the ground that was plowed at the proper time. The right side of the picture was plowed, starting the last part of August and completed in the first week of September. The ground where the sweet clover came up so badly was plowed after beet harvest had commenced and was finished the last week in September. Practically all of the clover came up again in the spring while practically no sweet clover came up on the part of the field that was turned under at the proper time. This picture was taken on the Adam Schreiner, Jr., farm near Fort Morgan.

A close-up view of a spot on the left portion of the field shown in picture one. The sweet clover has to be pulled out or cultivated out, reducing the stand of beets.

At right the sweet clover was plowed correctly for beets; at the left the sweet clover was turned under too late.
Not counting the extra work required in pulling the sweet clover out a very serious effect on the thinned stand almost always results.

Photo No. 2 was taken just as the young beets were pushing through the soil. The sweet clover had already gotten a good start. By the time the beets were large enough to thin, the pulling of the sweet clover roots took out a lot of beets that might otherwise have been left. In most cases this amounts to from 10 to 30 per cent decrease in stand, depending on the kind of work done. This certainly cuts down the fertilizing benefit derived from planting the sweet clover.

Plow the sweet clover not later than the first week in August and then fall irrigate in order completely to kill and rot the immense amount of organic material.

Tractor power is helpful in turning under a heavy crop of sweet clover as green manure.

There is practically as much nitrogenous fertilizer in the sweet clover in the fall as there is in the spring and if beets are to follow the sweet clover, plow in the fall. A tractor is better than a team because it packs the ground down better. (Photo No. 3)

Fort Collins Crop Conditions

By JOHN COMER

The condition of the beet crop is fine at the present time. First irrigation has been completed and by the first of August, most of the crop will have received its second irrigation. We are urging the second irrigation on those fields that have not yet received it. Growers should watch the moisture condition of the soil, as the maximum tonnage can never be realized if beets are allowed to get dry between irrigations.

Grain harvest is now starting and in a short time will be general. Grain of all kinds promises a yield above normal.

The hot weather of the last two weeks has been very beneficial to the corn crop and it has made a very rapid growth. It now promises a splendid outturn.

Second cutting of alfalfa has also made a very rapid growth and will soon require cutting.

In general conditions in the Fort Collins district are excellent on all crops and we are expecting a bumper harvest this year.

The water supply is above normal with plenty of water to finish all crops.
Some Simple Soil Chemistry

By THOMAS L. MARTIN
Agronomist, Brigham Young University

The soils in the western half of the United States have been formed where rainfall has been quite deficient and the physical agencies have predominated, resulting in soils rather coarse in texture. The rainfall has been so small that it has not been able to leach out the soluble plant foods. These soils are low in humus and nitrogen but fairly high in other plant foods. As evidence that they are quite high one notices how readily a soil becomes alkaline when much irrigation water is applied.

It is perhaps safe to say that some of our soils lack a little soluble phosphorus and perhaps, too, a little potash and when some is applied in the form of commercial fertilizers the crops make a favorable response. One must remember, however, that a soil may be rich in the elements and yet respond favorably to the application of some soluble material.

Our soils are high in these elements and will remain high for many years to come and when they respond favorably to the application of commercial phosphorus and potash it merely indicates that they are low only in the soluble kinds.

The unavailable or insoluble elements may be liberated to plants by the addition of organic matter in the form of green manures and barnyard manures.

What Shall We Do to Increase Fertility?

Our soils lack humus, nitrogen, and carbon dioxide. These can be supplied in various types, namely: green manures, barnyard manures, and nitrogen fertilizers with a humus base. The decomposition of these materials in the soil will liberate large quantities of carbon dioxide gas and various organic acids, all of which will make the insoluble phosphorus and potash available to plants. It is my suggestion that we handle our problem of soil fertility in the western states on the basis of the application of the materials and allow the by-products of their decomposition to liberate the plant foods already in the soil.

Nitrogen Fixation

There are in the soils many bacteria which take the nitrogen from the air and make it available to plants. These bacteria are called nitrogen fixers. The iron in the soil helps these bacteria, and in the presence of certain organic compounds found in manures it will stimulate these nitrogen fixers to work more vigorously.

Green manures and stable manures are the sources of these organic compounds and they with the iron already in the soil help
the bacteria to fix much nitrogen. We have evidence that straw incorporated with the soil is even better than green and barnyard manures for this particular activity.

**Manure furnishes energy for bacteria; it improves the handling qualities of the soil; it loosens the clays and adds body to the sands.**

On heavy soils the carbon dioxide gas that is liberated makes these heavy soils porous. Manure cements the sands and produces protective effects on the clays. It aids the drying, freezing and swelling processes in the soil. These, too, aid in decomposition and encourage the accumulation of the gases and nitrates. The gases produce pressure which causes a further extension of the spaces between the soil particles, thus puffing the soil like the rising of bread, improving the tilth.

In one experiment when sodium nitrate, a commercial fertilizer, was applied, there were found six and one-half million of bacteria per gram of soil. When a phosphorus, potash and nitrogen fertilizer was applied there were eleven and one-half million per gram of soil. **But when stable manure was applied to the same soil there were found twenty-three and one-half million bacteria.**

**Carbon Dioxide Gas**

This is a substance which in a practical way has not received much attention from farmers. When we force breath from our mouths it is found heavily charged with carbon dioxide gas. It is bad for our health but mighty valuable for the soil.

We often think that all one needs to make plants grow is to apply a certain amount of essential plant foods. Carbon dioxide is not thought of. Yet this gas is as essential as any plant food.

Sugar beets were grown on one occasion with all the plant foods needed and in an ordinary atmosphere of six-tenths of one per cent carbon dioxide. The yield was 8 tons per acre. When this carbon dioxide content was increased to 1 per cent the yield was raised to 16 tons per acre. And as the gas was increased so did the beet yield increase.

The organic matter, green manures, and farm manures furnish that gas. Dr. Headden of the Colorado Experiment Station intimates that one of the great benefits derived from growing sweet clover and alfalfa is because of the greater quantities of carbon dioxide produced in the soil than when grain crops are growing.

**If barnyard manures are not available then do something to get green manures into the soil.**
New Forage Crops in Eaton District
Sorghum Cane and Cow Peas Found to Be Satisfactory Substitutes for Alfalfa in Lamb Feeding

Livestock feeders are seeking new and better forage crops. In the Eaton (Colorado) district—a feeding center with good land farmed by a high average type of men—the alfalfa failure put many in the mind to try new forage crops. Cow peas, sudan grass, and various kinds of sorghums and millets have the call.

A short beet acreage with resultant reduction in tops and pulp contributed this year to the increase of these crops although for a number of years some leading beet growers have been experimenting with them.

Cow Peas

On the W. J. Moore place 2 miles west and 2 south of Eaton, Mr. Moore has a fine crop of cow peas. He drills about a bushel of seed to the acre and 10 pounds of alfalfa seed with the cow peas, as with grain. Rows are 7 inches apart. The planting is done as early in the spring as possible, this year about March 1. The land was in beets last season, and required little fitting for the hay. It was spring-toothed, floated and planted. His rule is to prepare the seed bed as for grain.

The cow peas were irrigated once. It was ready for cutting in mid-July. The crop makes 3 tons per acre in a favorable year and when so heavy is rather hard to cut. The mower clogs but a revolving device to turn and divide the swath is obtainable that lightens the chore. The best cutting stage is when the pods are partly filled and not too hard. Another guide for cutting is to wait for the first blossoms to fill out.

The cow pea hay is stacked like alfalfa.

Fed with beet tops to lambs the cow peas require no grain. In fact, experienced feeders advise against any
other grain when the peas are in the ration. It makes a good feed for dairy cows and steers, or the peas threshed and soaked are good for hogs.

Ralph Eaton at his former home place has a good crop of cow peas this year and expects to give the feed a thorough trial this winter.

Two and one-half miles due east of Eaton, W. D. Kay, former sugar company Fieldman and well known farmer, has a 17-acre patch of black amber sorghum which in mid-July looked good for a remarkable yield. Mr. Kay has grown this crop five seasons and is entirely satisfied with its results in the fattening of lambs.

This piece of land was in beets last year. This spring he renovated the surface rather deeply three times and planted 20 to 30 pounds of sorghum seed per acre in rows 26 inches apart, using a beet drill. The seed is better for a treatment of formaldehyde or blue vitriol, preferably the latter.

The crop goes 18 tons of green fodder to the acre and in curing shrinks about half in weight. It is cut with the ordinary corn binder, left on the ground four or five days, and then shocked up. Mr. Kay finds it advisable to cure in the bundles or the stuff will heat.

He expects his 17 acres of cane to take the place of 100 tons of alfalfa hay.

The sorghum must be fed with a little cotton cake or other high protein feed. For two years Mr. Kay ran the cane through a cutting machine but he found this unnecessary: the lambs relish it without cutting.

This crop was planted on May 25, and the cane can be drilled as late as July. The yield declines somewhat with delay in planting after May or early June. It was to be irrigated twice this season and due to the rains required a larger than usual number of cultivations.

Such a green growth draws heavily on the land but Mr. Kay restores fertility with manure. He has fed cane successfully to steers.
Beet Irrigations Go On

Period of Heaviest Use of Water by Growing Crops Is Here

Emphasis on irrigation of sugar beets, which has been featured earlier and more frequently this year than in former seasons, was deemed advisable because of past experience. On the whole beet irrigations have been too long delayed, both in starting of runs and in regularity of applications.

The scientific farmer (and he is the practical, successful farmer, too) knows that sufficient available soil moisture present at all times during the growing season is of prime importance in yields.

1—because crops by weight are largely water, and

2—water is the essential medium in the soil to dissolve the food elements and convey them to the plant.

It requires 200 to 600 tons of water for every ton of crop dry substance.

With irrigation started on practically every beet field by this date the next thing in making the best possible crop is regular applications, light runs at frequent intervals, to keep the supply of soil moisture at the desired point for maximum tonnage.

High yields and high sugar content are common in years of ample rainfall and irrigation water. Most districts got some fine rains this season but with hot, dry weather prevailing now the effect of these rains is not to be over-estimated.

Beets on alfalfa, sweet clover, and heavily manured ground are likely to demand more than average moisture for best tonnage and sugar content. Whereas in a few localities ditches are being sectionized and a scarcity of irrigation water looms do not postpone too long application of water on beets when it becomes available.
Fifteen Years of Poultry Experiments
Practical Conclusions at Purdue University

OUTSTANDING among the experiment stations of the country in the matter of poultry feeding, has been the Purdue university station at Lafayette, Indiana. For more than fifteen years, experimental work in poultry feeding has been conducted there, and out of this effort a number of valuable facts have been developed. Some of the principal ones are:

That both growing chicks and mature hens should have an animal protein of some sort in their ration.

That a mash must be kept before the growing stock and hens at all times.

That any mash mixture must depend upon the grain fed, that is, it should possess ingredients which will balance with the grain mixture.

That baby chicks may be raised efficiently on an all-mash mixture, saving labor and assuring the proper feeds at all times for growing stock.

That an all-mash ration for hens is satisfactory but not desirable unless it produces enough better results in the egg basket to pay for the additional cost of grinding all feeds. Because of grinding and mixing costs, an all-mash ration for hens has not been found economical.

That codliver oil will help provide for baby chicks the necessary factor known as vitamin D, but that extreme care should be exercised in using only the best codliver oil.

That the sun’s rays are the best and cheapest source of this vitamin, and should be used unless extremely bad weather prevents getting the chicks out where they can get these rays during their first three weeks.

That successful poultry husbandry not only includes good feeding, but also good breeding and good housing and management throughout the year. Feed will not solve all problems for any producer.

The standard Purdue laying ration, evolved after these years of experimental work, and which has been adopted by thousands of farmers, consists of either of two mash mixtures and a grain mixture which may be varied somewhat according to price of different grains.

Mash No. 1 consists of bran, 150 pounds; middlings, 150 pounds; and meatscrap, 100 pounds. Along with it may be fed a grain mixture consisting of yellow corn, 300 pounds; wheat, 300 pounds; and oats, 150 pounds.

The No. 2 mash mixture consists of 100 pounds each of bran, middlings, ground yellow corn and meatscrap. The grain mixture is the same as for ration No. 1.

Where three gallons of milk a day per 100 birds is available, no water should be given and the meatscrap or tankage is left out of the mash. Hens also have been found to do better when green feeds are provided. Alfalfa, clover or soybean hay, and germinated oats have been found to give good results when other green feeds were not available. Grain may be fed in litter, about one-third of the feed in the morning and the rest in the evening, giving all they will clean up satisfactorily at night. During the past year all of the Purdue grain has been fed at night with satisfactory results.
Rainfall and Manuring
Result of German Experiments

An important contribution to the question of the residual values of manures has been recently made by Professor Gerlach, of Berlin, in a paper read to the German Agricultural Society. In this paper the subject was treated more particularly from the point of view of the effect of rainfall on manurial residues. The experiments were carried out over many years, on four different kinds of soil differently manured.

In general, it must be accepted that the larger the rainfall the larger the drainage, and hence the loss of nitrogen, potash and lime. There is less loss on heavy than on light soils, on manured than on unmanured soils, on soils bearing a crop than on bare soils, and with even distribution of rainfall than with distribution in "downpours."

The Residual Effect

As regards the residual effect of different classes of manures, that of farmyard manure may last a number of years and give appreciable increases in the yield of following crops. The extent of the residual effect depends on the amount and composition of the manure, the soil and the rainfall. The larger the rainfall for the first crop, the larger the quantity of nutrients removed by the crop from the manure, the larger the loss by drainage, and hence the smaller the residual effect. The larger the rainfall in the period between the two crops, while the soil is bare, and the longer this period, the larger are the losses to the drainage.

Green Manuring

As regards green manuring, Beseler, from green manuring with lupins, seradella and other leguminosae, obtained increased crops of rye (grain per acre) of 5 cwt. in the first year, 4 cwt. in the second year, and 3.7 cwt. in the third year, in one experiment; and, in a second experiment, 11.7 cwt. in the first year and 2.5 cwt. in the second year. In long periods, before the following crop is taken, and with heavy rainfall, large quantities of the constituents of green manure are washed out of the soil, so that it is important to plough in green manure for the coming year as late as possible in winter.

Phosphates Are Retained

The residual effect of artificial manures is smallest with nitrogen. With customary nitrogenous manuring, a weak residual effect is obtained only if the summer is dry and if the second crop follows early in autumn; otherwise there is no residual effect. Phosphates are retained in the soil and are not washed away in the drainage, so that what is not used by one crop is at the disposal of following crops. Potash salts, on the other hand, may be washed out, and losses may be quite large; their residual effect is the smaller, the greater the rainfall, the poorer the soil, the smaller the manuring, the greater the growth through rainfall of the first crop, and the longer and wetter the period between the harvesting of the first crop and the growth of the second.
Losses of Lime

Next to nitrogen, lime is the most easily soluble fertilizer. The soil water dissolves it so easily, and in course of time, the top soil becomes much poorer in lime than the subsoil. Losses of lime are more considerable in years with heavy rainfall and on uncropped fields, and are increased with large applications of potash salts.

In these German experiments, in spite of over-average manuring in the 11 years involved, more nitrogen, potash and lime were removed from the soil in crops and drainage than were given in manuring (the phosphates in the soil were, however, increased). The difference in nitrogen would be largely made up through rainfall nitrogen and the activity of bacteria, but the losses of potash and lime presented a serious problem.

Pulp Aids Feeder to Compete with Corn Belt

Price of By-Product Balances Freight Charges to Mississippi Valley

The significance of beet pulp as a means to placing the intermountain feeder on a par with the Mississippi Valley competitor using a corn basis was explained by Cecil Doherty in a recent address before The Beet Sugar Technical Society on “The Processing, Distributing and Utilization of Beet Pulp.”

Without cheap by-products of the beet sugar industry, feeding in territory served by The Great Western Sugar company probably would have been unable to reach its present proportions, Mr. Doherty said.

Roughly estimated the price of wet pulp balances the freight penalties on feeding in local territories as compared with the Mississippi Valley.

He explained that the difference in the price of corn in Colorado and the corn belt applied to the quantity consumed by a heavy steer amounts to about $9 for a full feeding season.

“Allowing a little extra freight on the animals, we can see that the Colorado feeder needs to feed a steer for $10 less than the cost of a corn ration to compete in the primary markets.

“Now if we take the average price of pulp at the feed lot at $2.05 per ton, we find this feed $1.30 a ton cheaper than its replacement value in a corn and hay ration.

“On the basis of 7½ tons pulp per steer fed 150 days the saving is $10 a head,” or the equivalent of the freight charge.

Tracing the history of beet pulp Mr. Doherty said: “The first method for the disposal of the pulp by-product of beet sugar factories, so far as I know, was conveying to a convenient river. I have seen it so handled as recently as 1912, but not in Great Western territory.”

FINISH THE FALL PLOWING BY PACKING THE GROUND WITH DISC SET STRAIGHT
The House That Beet Labor Built

By J. L. Williams

This is the adobe house that the beet labor built on the farm of Mr. Lew Forrest, west of Brush, Colorado.

The unplastered adobe bricks are shown in the first picture, the finished, neat-appearing home in the lower photograph.

It is a low-cost building and can be put up by the beet workers on the farm in their spare time. The Spanish-speaking people know how to construct such a house. When finished it is infinitely better than the tarpapered shacks one still occasionally encounters in our beet-growing districts.

The best experienced beet labor is attracted by this type of accommodations on the farm. It has paid many farmers to put up such living quarters for their beet help.
Relative Merits of Barley and Oats for Fattening Baby Beef Cattle

IN THE baby beef feeding trial that was reported by O. M. Kiser, animal husbandman at the Northwest Experiment Station, Crookston, Minn., 30 high grade Hereford calves had been fed for 224 days from November 1, 1927, to June 12, 1928, on the following rations:

Lot 1. Seven calves received a grain ration of ground barley, linseed oilmeal, alfalfa hay and corn silage.

Lot 2. Eight calves received a grain ration of ground barley, \( \frac{2}{3} \) by weight, ground oats \( \frac{1}{3} \), linseed oilmeal, alfalfa hay and corn silage.

Lot 3. Seven calves received a grain ration of \( \frac{1}{3} \) ground barley, \( \frac{2}{3} \) ground oats, linseed oilmeal, alfalfa hay and corn silage.

Lot 4. Eight calves received a grain ration of ground oats, linseed oilmeal, alfalfa hay and corn silage.

The object of the trial was to determine the comparative merits of barley and oats as grains for fattening baby beef calves. The results of the trial can best be learned by a study of the table of results accompanying this article.

By a comparison of the figures for lots I and IV it will be seen that ground barley alone proved to be much superior to ground oats as a feed for fattening beef calves, when fed with alfalfa hay, corn silage and \( \frac{1}{2} \) pounds of linseed oilmeal per head daily.

Barley seemed to be more palatable as the calves receiving barley consumed somewhat more grain throughout the trial, than those fed oats. Though there was no marked difference in the feed required to produce 100 pounds gain, the barley fed group made more rapid gains, carried a much higher finish at the close of the trial, were valued at \$1 per hundredweight over the oat fed lot, and returned a decidedly larger profit.

Replacing barley with oats—Lots 1, 2 and 3: In this trial the addition of ground oats to a ration of ground barley, alfalfa hay, corn silage and linseed oilmeal did not prove desirable. Each increase in the proportion of oats to barley increased the grain requirement, reduced the rate of gain, lowered the degree of finish and final selling price, with a corresponding decrease in margin of profits over feed costs. Calves in Lot 1 consumed not only more grain but more hay and silage than in the oat fed groups. Calves in Lot 1, receiving barley alone, were valued at \$13.75 per hundredweight; Lot 2, two-thirds barley and one-third oats, \$13.50; Lot 3, one-third barley and two-thirds oats, \$13.20; and Lot 4, oats alone, \$12.75 per hundredweight.

CONCLUSIONS

1. In this baby beef feeding trial ground barley alone proved to be more efficient than ground oats alone or a mixture of oats and barley.
2. Barley produced a more desirable market finish than oats.
3. Profits were reduced by the addition of oats to a ration of ground barley, linseed oilmeal, alfalfa hay and corn silage.

Returns per bushel of grain fed: If the returns above feed costs are applied entirely to the grain fed, the returns for each bushel of barley and oats would have been as follows: Lot 1, barley \$1.07 per...
bushel; Lot 2, barley $1.01 per bushel, oats 67.5c; Lot 3, barley 88.8c per bushel, oats 59.2c; Lot 4, oats 57.9c per bushel.

It is noticeable that as the proportion of oats was increased, the returns per bushel of barley and oats fed was decreased.

Fattening Baby Beef Calves for Market

Nov. 1, 1927—June 12, 1928—224 Days

Eight calves per lot in lots 2 and 4; seven calves in lots 1 and 3. Figures on single average calf basis (pounds and dollars). All lots fed alfalfa, corn silage and linseed meal.

<table>
<thead>
<tr>
<th>LOT NO.</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Barley</td>
<td>Oats</td>
<td>Barley</td>
<td>Oats</td>
</tr>
<tr>
<td>Initial weights</td>
<td>395.23</td>
<td>378.95</td>
<td>380.23</td>
<td>379.03</td>
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<tr>
<td>Final weights</td>
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<td>862.49</td>
<td>838.80</td>
<td>848.33</td>
</tr>
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<td>Total gain</td>
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<td>483.54</td>
<td>465.57</td>
<td>469.29</td>
</tr>
<tr>
<td>Average daily gain</td>
<td>2.24</td>
<td>2.15</td>
<td>2.05</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Average daily feed:

Ground barley | 10.72 | 3.50 | 6.08 | 10.24 |
Ground oats | 1.45 | 1.45 | 1.45 | 1.45 |
Linseed meal | 7.92 | 7.09 | 7.80 | 7.20 |
Alfalfa hay | 2.47 | 2.11 | 2.37 | 2.13 |

Feed per 100 lbs. gain:

Ground barley | 478.35 | 324.51 | 170.46 |
Ground oats | 64.04 | 162.21 | 340.87 | 488.90 |
Linseed meal | 353.57 | 328.48 | 381.21 | 343.78 |
Corn silage | 110.50 | 97.89 | 115.82 | 101.93 |
Alfalfa hay | 10.60 | 10.64 | 11.37 | 10.82 |

Initial value per cwt. | $11.60 | $11.60 | $11.60 | $11.60 |
Initial value per head | 45.84 | 43.96 | 44.10 | 43.96 |
Total cost of feed | 53.25 | 51.64 | 52.13 | 50.77 |
Final cost per head | 99.09 | 95.64 | 96.23 | 94.73 |

Selling price So. St. Paul, cwt. | $13.75 | $13.50 | $13.20 | $12.75 |
Selling price, Crookston, cwt. | 13.00 | 12.75 | 12.45 | 12.00 |
Value per head, Crookston | 116.68 | 109.97 | 104.43 | 101.80 |

Margin per head over feed cost | $17.59 | $14.87 | $8.20 | $7.07 |

Feed prices charged: Barley, 72c per bushel; oats 48c per bushel; linseed meal, $50 per ton; corn silage, $5 per ton; alfalfa hay, $10 per ton. Charge for grinding grain, 8c per cwt.

Alfalfa ground intended for beets next year should be double plowed this fall and worked down. This is better than crowning now and second plowing next spring.
A GARDEN OF WEEDS

Contract Hand Workers Saved This Crop

Occasionally you see a beet field like this—but more and more rarely since the pull of weeds on beet yields has been properly appreciated.

This picture was taken early in July. The beets had been thinned, the hoeing had been delayed. And the longer weeding was put off the worse became the garden of weeds.

Contract hand labor for a slight increase in the rate of pay fought mosquitoes, deer flies, and heat: the farmer's crop was saved. It was a discouraging prospect for the workers. The farmer was fair and generous: his considerate treatment of the laborers won their hearty co-operation.
Summer Neglect of Cows Cuts Profit

By KIRK FOX

In "The Dairy Farmer"

“NEGLECT in feeding and caring for their cows in summer piles up heavy losses every year for Illinois farmers,” says C. S. Rhode, dairy specialist at the University of Illinois.

On good pasture Jerseys and Guernseys in proper working condition do not justify grain feeding when they are producing under 20 pounds of milk daily. Weaver and Oderkirk at the Iowa state college recommend one pound of grain for each five pounds of milk. Above 40 pounds production calls for a still heavier rate of feeding.

Holsteins need grain on pasture when they are producing 30 pounds or more of milk daily. After reaching 40 or 50 pounds, feed them one pound of grain for each 7 pounds of milk. When pastures are short and dry, the amount of grain must be increased.

The Iowa agricultural experiment station recommends a mixture of 5 parts by weight of corn, 5 of oats and 1 of a high protein concentrate. This concentrate may very well be cottonseed meal and gluten products. Barley may replace the corn and bran may be used rather than oats. It is found, however, that bran is more valuable when fed in the winter. Pasture grass provides a balanced ration. Oats alone furnish a well-balanced concentrate but a simple mixture is more satisfactory and is not usually expensive.

Summer feeding, besides immediate profits, prepares a cow for heavy production during the winter months. “The cow that is dry and will freshen in the fall is in a position to receive the worst setback from dry pasture,” finds A. J. Cramer at the University of Wisconsin. His observations are based on 167 cow testing associations having a membership of some 4,000 farmers of Wisconsin.

Cramer advises feeding a grain mixture to all high-producing cows even on the best of pasture. He believes that all cows should get silage and some grain after pastures get short.

A summer grain mixture recommended for the milking herd consists of 200 pounds of ground barley, corn or hominy, 100 pounds of wheat bran, and 100 pounds of linseed oilmeal, cottonseed meal or gluten feed. One pound of this should be fed for each four or five pounds of milk produced. For the dry cow the testing official advises equal parts by weight of ground oats, ground barley or corn, wheat bran, and a high protein feed. From three to eight pounds daily should be fed, depending on the condition of the cow.

“The average cow suffers more from underfeeding during the summer than during the winter,” says O. E. Reed of the Michigan agricultural college. He finds underfeeding to be the primary reason for the summer decline in milk flow.

“Heavy producing cows should receive some grain regardless of how good the pasture might be, because they cannot eat enough grass to obtain the nutrients they require,” states Reed. He strongly advocates more attention to pastures, especially the use of temporary crops such as sweet clover and alfalfa.
Beets Following Alfalfa
By R. M. BARR, Longmont, Colo.

QUITE a large per cent of our beets are seeded each season on previous alfalfa land. This rich ground, if properly handled, should produce a maximum crop, but due to various methods now used much of this land is only producing fair and some of it poor crops. We will describe some of the methods of plowing and preparing this land.

1. The poorest proposition we have is double plowing in spring; i.e. shallow crowning followed by a deep plowing. By this method we can only expect from one-half to two-thirds of what this rich land should produce. Any land that has not been stirred for a number of years will not produce a good crop of beets by spring plowing. Save the cost of the crowning; plow it once and put in some other crop, say small grain, potatoes, or corn from which you will get good results. As quickly after those crops are harvested fall plow deeply, and your beets second year from alfalfa will make a bumper crop.

2. Some farmers crown alfalfa in fall and replow deeply in spring. This is better than No. 1, but unless replowed in February or early March, it is impossible to get a proper tilth seed bed for beets, and you are again disappointed with results. This solid land needs fall plowing for aeration, and it is only by early fall plowing that it can be physically fitted for a beet crop.

3. Some of this land is crowned after 3rd cutting is harvested and 10 or 12 days later replowed deeply with much better results than Nos. 1 and 2 as the ground through winter’s exposure is in a much better physical condition to grow a beet crop. But still not a maximum crop.

4. The best method to use for a maximum crop is August plowing and turning under of the 3rd crop of alfalfa. Entirely too much value is placed on this as a hay crop, as it is a soft watery feed with little dry matter or substance to it. It does not average one-half ton per acre, and will return 3 or 4 times its fall value in the following beet crop if turned under, besides increasing yields for several years after.

We have 40 acres of beets close to Longmont handled by this No. 4 method. The 3rd crop was irrigated and plowed deep in August. The disc was run almost straight over each day’s plowing, thus packing the alfalfa down on the plow sole, and forming a submulch over it, causing it to heat and rot thoroughly. In February it was again disced and harrowed and prepared in March, and seeded in last week of March.

The soil tilth was excellent and a perfect stand of beets was the result. The alfalfa and roots were entirely mixed with soil and so
well rotted that this alfalfa land cultivated like old land, with nothing to bother knives or duckfeet. The prospect for heavy tonnage on this field is flattering.

Our greatest trouble comes in cultivating beets on alfalfa land under our present methods of plowing it. With those methods we have a continuous death rate of plants throughout the season, and especially just after thinning. There are few of those fields that do not lose from 5 to 8% of the stand between thinning and harvest; and tonnage is invariably disappointing.

This season alfalfa land handled under the first three methods shows up much better than in our average season. It does not show the plant death rate we generally have and will make better tonnage than usual. This results from the greater rainfall and higher humidity in May and June than in our average seasons. So do not use this crop as a criterion.

Turn under your 3rd crop of alfalfa in August and prepare the land as stated above. The land needs the humus and phosphorus to produce, and the gain in tonnage of all crops by this method for several years after doing it will justify the burying of a third crop of alfalfa.

**Windsor District Crop Conditions**

*By B. I. Becker*

As this article is written (July 19) all beets in the Windsor district have been given their first irrigation and most of them their second. The crop has responded excellently and is in good growing condition.

Grain is ready to harvest; the second cutting of alfalfa is ready to cut, and other crops need attention. But wide awake farmers are not allowing these other chores to interfere with the irrigation of beets.

With the thick stands of beets obtained this year and the hot weather the beet crop is drawing very heavily on the moisture content of the soil now and it needs to be replenished before it gets so low as to set the crop back.

Beets will do their best if not allowed to suffer for lack of moisture but are kept growing at all times. It is not hard to keep a wagon rolling if it is not allowed to stop, neither is it hard to get a good yield if you do not allow the beets to suffer for lack of water and nourishment.

Beets need plenty of moisture and sunshine. The sunshine is here in abundance and it’s up to us to apply the moisture.
Fall Plowing of Stubble

By J. G. ENGLISH, Longmont, Colo.

Fall plowing is a necessity in our beet districts, especially with the heavy soils. The average beet tonnage from fall plowing has always shown a higher yield over spring plowing in the Longmont district, this difference in tonnage being as high as four tons per acre. This alone is reason enough for fall plowing.

There are many other arguments in favor of fall plowing over spring plowing. One of the most important of these is the spreading of the work over a longer period; that is, much spring work is eliminated by plowing the land in the fall. Also a wet or dry season often delays the spring work. Fall work can be done at a time when most of the crops are laid by because there is a slack time between threshing and beet harvest.

The question may arise is any time in the fall all right to fall plow? Is there any advantage from plowing early or later in the fall? The answer is fall plow if possible. There is a decided advantage in early fall plowing. If manure is to be spread before plowing, a much greater benefit will be derived from the manure where the land has been plowed early, as it will give the manure a much longer disintegration period.

Plowing in the latter part of July and in the month of August is better than September and October plowing for the above mentioned reasons. Early fall plowing might easily be called summer fallowing. We all know the advantage of summer fallowing.

At the present time the grain is being cut, and there will be a good many fields in the shock for a month or more before the grain can be threshed, unless the grain is stacked before threshing. A few years ago it was the general practice to stack the grain. If this were the practice at the present time, the hauling of manure and fall plowing could be commenced much earlier and the cleaning of the field would not have to wait for the shock threshing.

But as preparatory work for fall plowing is necessary, much of this work can be done even with the grain still on the field in the shock. There are a few farmers in this district who follow this practice, which in my opinion is a very good one. The ground in between the shock rows is double disced. If manure is to be applied, the manure can be hauled out direct from the feed lots and spread before discing.

This will also eliminate the double handling of the manure, which adds an extra cost to the fertilizing. Then as soon as the grain is threshed, the remainder of the ground covered by grain...
shocks can soon be fertilized and disced, preparing the whole field
for plowing.

If there is an abundance of irrigation water and the land is dry,
irrigate before plowing. Land should never be left as plowed. A
disc after every day’s plowing run nearly straight can be used.
This will help pack and pulverize the soil and force the stubble
and manure to the bottom of the plow furrow and start the disinte­
gration of your fertilizer much sooner than where the soil is left
as plowed.

**Disking Stubble for Alfalfa**

A FEW years ago it would have
been considered rank heresy to
advocate seeding alfalfa in disked
stubble ground, but this practice is
now being followed with marked suc­
cess in several counties in Iowa. In
a year like this, when much alfalfa
and still more clover winterkilled,
seeding alfalfa in disked stubble
should prove a great help in getting a
larger acreage seeded.

Alfalfa, as well as all other leg­
umes, delights in a seed bed that is
firm below and mellow on top. This
condition is best obtained by double
disking the stubble ground about
three times and then harrowing. The
job must be well done, of course, and,
in some cases, still more disk ing may
be required in order to thoroughly
subdue the weeds. When handled in
this way a minimum amount of mois­
ture is lost through evaporation,
while the soil below the surface re­
 mains in ideal condition for capil­
 lary action.

The trouble with plowing, unless it
can be done very early, is the prac­
tical impossibility of afterwards get­
ting the ground worked down suffi­
ciently to make a good connection be­
tween the bottom of the furrow and
the stubble side of the furrow slice.
The turned stubble, especially when
heavy, tends to hold up the furrow
slice which then rapidly dries out.
When the alfalfa is sown the seed
may sprout, but when the tiny roots
reach the stubble layer they find hol­
dow dry spaces and the result is fre­
quently death to the young plants.

On the other hand, when the stub­
ble field is thoroughly disked and not
plowed there are no open spaces in
the soil and the stubble acts as an
excellent mulch not only at seeding
time, but also throughout the fall.

One might think that weeds would
bother more than if the ground were
first plowed, but such does not appear
to be the case. In fact it seems to
help keep the weeds down as it gives
the oats or other grain a much bet­
ter chance to sprout and come up with
the alfalfa and thus crowd out some
of the weeds. The oats, of course,
disappear as soon as frost comes and
to some extent act as winter protec­
tion for the alfalfa. While this meth­
od may appear somewhat slovenly, it
gives results and results are what we
are after.

Try to get the alfalfa seeded by
the 10th of August. While Septem­
ber 1 may not be too late, it is well to
remember that early seeding is much
safer and better.—The Iowa Home­
stead.
DURING the current year of 1928 the association and the Sugar Company have not been able to agree upon the terms of a contract for marketing of the 1928 crop to be produced by the members of the association. The plaintiff in this action, Monroe, a member of the association, when planting time arrived, which is about April 10, having ascertained that no such contract had been made or secured, or would be tendered, asked to be released by the association for the year 1928 from the obligations of the association contract resting upon him, so that he might be free to enter into a contract himself with the purchaser for the sale of his beets; but the association refused to release him.

Thereupon he brought this action, which, in form, is in the nature of a suit in equity to enjoin the defendant association from enforcing against him the terms and provisions of their contract, and to compel the defendant to refrain from all attempts to enforce against him the penalties therein provided, and to release him from its obligations for this year.

Defendant's answer alleges that for months previous to the beginning of the month of April, 1928, it had been negotiating with the Sugar Company in attempts to secure a fair and satisfactory price for beets to be grown during the year 1928 on the plaintiff's lands, and the lands of its other members; that the Sugar Company, during the negotiations, has only submitted to it one form of contract; that this form was not at a fair and profitable price satisfactory in its judgment, and its refusal to accept such contract was duly approved by a majority of its members; that, although such negotiations with the Sugar Company for a contract have continued for months, up to the time of filing of the answer they have not resulted in providing any market for beets to be grown in 1928 by the plaintiff, which would, in its judgment, justify marketing of them. In a replication plaintiff denied affirmative matter of the answer.

Upon issues thus joined there was a trial to the court without a jury. An application for a preliminary injunction was made. The court, at the close of the hearing upon this application, granted the temporary writ whereupon, by agreement of the parties, the evidence taken upon the preliminary hearing was to be considered by the court upon the final hearing and at the final hearing additional testimony was taken.

The court made findings of fact and entered a decree in favor of the plaintiff, which, in substance, released and discharged him from his obligations under the 1928 contract relating to the growing or marketing of the sugar
beet crop during that year, and enjoined the threatened acts of the defendant to restrain and prevent plaintiff from planting, growing or harvesting or selling, or contracting to that end, a crop of sugar beets in 1928, and restrained the association from imposing any of the penalties prescribed by the contract.

The court specifically found, among other things, that the defendant association is unable to perform the terms of its contract with the plaintiff and that its refusal, either to market plaintiff's crop or to release him from the contract and permit him on his own behalf to market his crop, is arbitrary, unreasonable, willful and without just grounds or excuse, is not the exercise of any discretion vested in the defendant, but constitutes a breach of its contract with, and a wrongful oppression of, the plaintiff.

The court also found that the contract was in restraint of trade and, as construed by the defendant, would operate to restrict or decrease production in order to enhance price, and that plaintiff was also released from the contract for a failure and refusal by the association to obtain for the growers a marketing contract by planting time.

For our own convenience we state the respective contentions of the parties in the order they were advanced at the trial below, and as repeated here.

1. Plaintiff says the contract between these parties, as do many similar contracts with other members, provides for, and was intended to accomplish, a positive, not a mere incidental, restriction upon production of sugar beets.

2. The association through such restriction is attempting to fix and control the price of an agricultural product.

3. With the arrival of planting time each season, which is from the 10th to 15th of April, the duty of the defendant is either to find a market, or, if unable to do so, to release its members to enable them individually to contract for themselves.

4. Defendant's refusal, in the circumstances that existed, to accept the marketing contract tendered by the Sugar Company is illegal, arbitrary and unlawful, and likewise released the plaintiff from its obligations under his contract with the defendant.

The defendant's contentions are that though the plaintiff thus
subdivides his points the real and only question, except the alleged breach of its contract with the grower, is:

Whether the marketing contract involved is authorized by the co-operative marketing act, and that its disposition disposed of the entire controversy in its favor.

Both parties, however, desire an expression of opinion by us on each and all of these propositions and upon all the findings of fact and of law of the trial court. Interesting and important as these questions are to the parties and helpful as our answers might be to them, we think we should not comply with the request in its entirety, even though the District Court in its rulings on evidence and in its findings and decree expresses its opinion on all of them.

A determination of the first three of plaintiff's propositions would require us to investigate and pass upon grave and far reaching questions of constitutional law, both federal and state, and as to those arising under the federal constitution our decision would not be final but subject to review by the ultimate authority.

It is the general rule and practice both in the federal and state courts not to pass upon constitutional questions unless it is essential to the disposition of the pending cause. Decision of neither of these three propositions is necessary at this time because an affirmation of the decree may well be made on the fourth ground, which disposes of the entire case.

The parties are pressing for a hearing before final adjournment, which will be taken on the day of announcement of our decision. Considering the vast interests involved and the importance of the decision to those engaged in a great industry, that they may have our views before the season of harvesting beets in the autumn begins, we are complying with their request. Within the limited time at our disposal, we think we should not depart from the established practice of reviewing courts, in passing upon important constitutional questions, even though the parties desire it, if the decision of the controversy can be based, as it may be here, upon other and substantial grounds.

We come now to a consideration of the 4th proposition upon which the District Court probably chiefly relied in making its findings and decree. In resting our affirmation thereon, the arbitrary and unlawful act of the defendant association in failing or refusing to make a marketing contract and coupling with its offer to make one for 1928 that was acceptable to it, the condition hereinafter referred to, we are assuming with the defendant, as we may and as already decided by us in other cases, that our co-operative mar-
keting act of 1923 in its main features is a proper exercise of legis­

lative power, and, without so deciding, that this co-operative mar­

keting contract is authorized thereunder.

The contract of sale tendered by the Sugar Company to the defendant association, when first presented, was rejected by the defendant as not satisfactory. This rejection was within the scope of the defendant's discretionary power, and if such power was not arbitrarily exercised, it might reject the contract notwithstanding the plaintiff and other growers may have approved of it. The trial Court specifically so found. The contract between these parties provides that in case of such rejection the association, as selling agent of the grower, shall not be subjected to damages for such failure. The contract, however, is entirely silent as to what the rights of the grower are with respect to a sale by himself. In this case, notwithstanding the fact that the association made sev­

eral subsequent efforts to secure a marketing contract that it deemed satisfactory, it was unable to do so and notified the plain­

tif of its failure.

Thereafter the defendant made a counter proposal to the Sugar Company in which it stated that the tendered contract previously disapproved by it was now acceptable in all its terms, and that it would accept and approve the same, if the Sugar Company would at the same time, enter into another marketing contract with it for the purchase of beets of its growers for the three subsequent years of 1929, 1930 and 1931, on terms proposed, or to be proposed, by it.

The Sugar Company refused to enter into a contract for the purchase of beets beyond the current year, upon the ground, among others, as we understand, that the price of sugar manufactured from the beets depends in a measure upon the world market for sugar. The plaintiff then brought this action to obtain his release from his obligations under the contract with the association, and the district court granted relief, as stated. The trial court rightly ruled that these several contracts should be construed together. So doing we find that by the contract between the plaintiff grower and the association, either party thereto may on or after the year 1924, terminate the same at the end of any year by giving written notice to the other on or before November 1st.

The plaintiff (and for aught we know all other grow­

ers) might desire before November 1, 1928, thus to ter­

minate his contract with the association and if so would have no interest whatever in any marketing contract be­

yond the time of his withdrawal. His contract rights may not be made to depend upon, or be effected by, a proposed
contract which the association wished to make for three years after the grower had terminated it.

The finding of the trial court that, in the light of the surrounding facts, such conduct and behavior on the part of the defendant was arbitrary and willful, without just ground or excuse, and not the exercise of any discretion vested in the defendant, and constitute a breach of its contract with the plaintiff and the wrongful oppression of him, is abundantly sustained by the evidence which we have recounted. It is too plain for further discussion.

So far as concerns their respective duties, the relation of this co-operative marketing association to its members is not materially different from that which exists between the directors of a corporation, organized for profit under our general corporation statute, and its stockholders. This relation is that of a trustee to his beneficiary, or as here, between a principal and his agent. Equity exacts of a trustee, or one acting in that capacity, the utmost good faith to those whom he represents, and by whom he is selected as trustee to protect and advance their interests. When the defendant association declared its approval of the tendered marketing contract as to all of its terms, and offered to sanction the same if the Sugar Company would make another contract with it for three additional years on the defendant's own terms, and the Sugar Company refused to do so, and the association still refused to release the plaintiff from his obligations under the contract, or permit him to market his own crops, this was a manifest abuse of the legal discretion which it had, and plaintiff was released from his obligations for the year 1928. The findings and decree of the trial court were unquestionably right and the decree is accordingly affirmed.

More Than Weather to Winterkilling

Alfalfa and sweet clover killed badly through the north central states during the past winter, writes Wilber J. Fraser in "Hoard's Dairyman."

The chief cause he found, "is that the plants are not allowed sufficient growth to give them an opportunity to store up nutriment in their roots before freezing weather." Listing the reasons why the plants are starved and stunted Mr. Fraser wrote:

1—Cutting any crop of alfalfa too early or cutting the last crop too late, or pasturing too much in the fall. Pasturing sweet clover too early in the first fall.

2—Land that is acid, not thoroughly inoculated, or improperly drained.

3—Soil that is unbalanced in fertility, such as that lacking in phosphorus or containing too much nitrogen.

4—Kind of seed not adapted to locality.
Get The Weed!

By A. Johnson, Fort Morgan, Colorado

Mow, plow, or disc under weeds along fence rows before their seeds are scattered. Burning weeds after they are dry and ripe is not very satisfactory as a great many weed seeds have already scattered and the burning generally injures the fence posts. Discing under or plowing under weeds is the most satisfactory way to handle them if it can be done. A clean farm ordinarily means fewer harboring places for insect pests. Get the weeds before it is too late.
Feedlot Rations for Fattening Calves

By E. J. MAYNARD
Of the Colorado Experiment Station, Fort Collins

The Value of Wet Beet Pulp; Comparing Wet and Pressed Pulp; Value of Adding Corn Silage to Beet Ration; Fattening Value of Tops; Comparing Cost of Gains on Steer and Open-Heifer Calves on Same Ration.

GRADE Hereford calves averaging 376 pounds in weight were used in this test.

These calves were sorted into five pens of 10 steers each and one pen of 10 heifers. The greatest uniformity possible was maintained between the different lots of cattle by balancing all known factors involved.

The steers averaged 379 pounds in weight and the heifers only 365 pounds at the beginning of the experiment. This difference in weight between steers and heifers born at the same time in the spring may ordinarily be expected in the fall of the year.

Rations Fed

Lot 1 (steers) Siloed beet pulp, barley, cotton cake, alfalfa.
Lot 2 (heifers) Siloed beet pulp, barley, cotton cake, alfalfa.
Lot 3 (steers) Siloed beet pulp, corn silage, barley, cotton cake, alfalfa.
Lot 4 (steers) Sugar-beet tops, barley, cotton cake, alfalfa.
Lot 5 (steers) Barley, cotton cake, alfalfa.
Lot 6 (steers) Pressed beet pulp, barley, cotton cake, alfalfa.

Typical fat steer calf. Born May 3, 1927. Weight in feedlot November 22, 1927, 391.7 pounds; weight at Denver, May 28, 1928, after 187 days on feed, 790 pounds, gain 398.3 pounds or 2.12 pounds per day. Chilled weight of carcass 482.2 pounds. Dressing percentage, 61.04 pounds.
Feeds Used and Methods of Feeding

*Ground Trebi Barley.* 11.5 per cent moisture. 46.5 pounds per bushel (whole) was grown locally. A full feed for the calves was 11 pounds daily for lot 5 and 8 pounds daily for the other lots.

*Siloed beet pulp* was hauled from the Fort Collins sugar factory and stored in a small wooden silo adjacent to the feedlots. Each load of from 3 to 4 tons lasted from 6 to 8 days. The average moisture content during the feeding period was 87.5 per cent. The range in moisture content was from 90 per cent to 85.9 per cent. The siloed pulp has been charged at the factory price of $1.10 plus a 50-cent handling charge per ton. There was a 26.4 per cent loss between factory weights and feeding weights from the silo, which increases the price to $2.17 per ton weighed to the cattle.

*Pressed beet pulp* was shipped from the Loveland factory but for the purpose of comparison it was charged at the factory price of $1.50 plus a 50-cent handling charge per ton. Of 242 tons siloed at the college there were only 137.84 tons available and weighed to livestock as feed. In other words, there was an actual loss through fermentation and other causes of 43.04 per cent. The pressed pulp fed had an average moisture content through the feeding period of 86.79 per cent. The range in moisture content through the feeding season ran from 88.8 per cent to 84.1 per cent. There was considerable drainage noticeable from the pulp stored in the silo during the feeding period. On this basis of the cost of pressed pulp delivered to the cattle, it is charged at $3.51 per ton.

*Sugar-beet tops* were piled in small piles and fed from 2.25 acres of beets that averaged 13.25 tons per acre. The tops averaged 65.1 per cent moisture when hauled and weighed 6.54 tons per acre. The average moisture content as fed was 45.4 per cent. The tops were charged at 50 cents per ton of beets produced or $6.63 per acre. The cattle actually consumed 6.05 tons of tops costing $2.47 per ton.

*Corn silage* fed had an average moisture content of 72.5 per cent. It was of good quality with well-manured grain. It was charged at $7.00 per ton.

*Cottonseed cake,* 43.9 per cent pro-

**SUMMARY**

1. a. Wet beet pulp materially reduced feed costs on beef calves fattened on standard beet by-product rations.

b. Siloed beet pulp proved more economical, all costs considered, than pressed beet pulp fed in this test.

2. Corn silage fed with wet beet pulp reduced the amount of pulp necessary to fatten a calf by 42.6 per cent. The addition of corn silage proved practical where only a limited amount of pulp was available.

3. Sugar beet tops produced too narrow a ration for maximum gain or selling price when fed with barley, cotton cake and alfalfa.

4. Steer calves outgained heifer calves 44.9 pounds or 13.8 per cent in 187 days on feed and at a feed cost of 80 cents or 8.7 per cent less per cwt. gain.
tein, was of good quality and ran 7.2 per cent moisture. The maximum feed allowed was 1.25 pounds daily in all lots.

Alfalfa hay was of good quality.

Hay was fed from the first and second cuttings only.

Salt—All lots were self-fed block salt.

Discussion

The Feeding Value of Siloed Beet Pulp—Wet beet pulp siloed at the factory under present conditions is available in only limited quantities to the average beet grower. An average allotment of only 75 to 125 tons makes it necessary to feed smaller amounts in the fattening ration than formerly. Each ton of wet beet pulp hauled from the silo and fed in this test replaced 164.4 pounds of ground barley, 1.7 pounds of cotton cake and 289.8 pounds of alfalfa hay.

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>Ration Fed</td>
<td>Siloed Beet Pulp</td>
<td>Siloed Beet Pulp</td>
<td>Siloed Beet Pulp</td>
<td>Pressed Beet Pulp</td>
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<td></td>
<td>Barney</td>
<td>Barney</td>
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<tr>
<td>Alfalfa Hay</td>
<td>Self-fed in All Lots</td>
<td>Cake</td>
<td>Cake</td>
<td>Cake</td>
<td>Cake</td>
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<tr>
<td>Feedlot weight at start</td>
<td>378.9</td>
<td>364.8</td>
<td>375.2</td>
<td>375.8</td>
<td>382.2</td>
<td>381.3</td>
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<tr>
<td>Market weight at Denver</td>
<td>750.0</td>
<td>691.0</td>
<td>723.0</td>
<td>655.9</td>
<td>744.0</td>
<td>751.1</td>
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<td>Shipping shrinkage per cent</td>
<td>3.43</td>
<td>2.81</td>
<td>3.21</td>
<td>3.32</td>
<td>3.17</td>
<td>4.05</td>
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<td>Gain at market</td>
<td>371.1</td>
<td>326.2</td>
<td>347.8</td>
<td>309.2</td>
<td>362.2</td>
<td>369.8</td>
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<td>Daily gain market weight</td>
<td>1.98</td>
<td>1.74</td>
<td>1.86</td>
<td>1.66</td>
<td>1.94</td>
<td>1.98</td>
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<tr>
<td>Daily feed fed (pounds)</td>
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<td></td>
<td></td>
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<tr>
<td>Ground barley</td>
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<td>5.1</td>
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<td>28.0</td>
<td>22.6</td>
<td>16.0</td>
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<td>Pressed beet pulp</td>
<td></td>
<td>6.1</td>
<td></td>
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<tr>
<td>Corn silage</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Sugar-beet tops</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
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<tr>
<td>Cottonseed cake</td>
<td>5.8</td>
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<td>4.7</td>
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<td></td>
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<tr>
<td>Feed required per 100 pounds gain (at market):</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Ground barley</td>
<td>261.9</td>
<td>287.4</td>
<td>269.5</td>
<td>305.3</td>
<td>367.9</td>
<td>253.0</td>
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<td>1411.1*</td>
<td>1298.7</td>
<td>860.8</td>
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<td>1113.80*</td>
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<td>Corn silage</td>
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<tr>
<td>Sugar-beet tops</td>
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</tr>
<tr>
<td>Cottonseed cake</td>
<td>68.7</td>
<td>61.2</td>
<td>57.3</td>
<td>64.4</td>
<td>54.9</td>
<td>53.7</td>
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<td>Alfalfa hay</td>
<td>290.9</td>
<td>325.9</td>
<td>253.6</td>
<td>428.9</td>
<td>495.4</td>
<td>388.4</td>
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<tr>
<td>Feed cost per 100 lbs. gain at market:</td>
<td>8.41*</td>
<td>9.21</td>
<td>9.06</td>
<td>9.32</td>
<td>9.98</td>
<td>9.35*</td>
</tr>
<tr>
<td>Cost of feeds used:</td>
<td></td>
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<tr>
<td>Ground barley</td>
<td>$30.00 per ton</td>
<td>Sugar-beet tops</td>
<td>2.47 per ton</td>
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<td>Siloed beet pulp</td>
<td>2.17 per ton</td>
<td>Cottonseed cake</td>
<td>46.00 per ton</td>
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<td>3.51 per ton</td>
<td>Alfalfa</td>
<td>13.00 per ton</td>
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<td>Corn silage</td>
<td>7.00 per ton</td>
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(Editor's Note: On commercial feeding farms using pressed pulp about 40 per cent of the pulp hauled is fed direct to the cattle. Forty per cent shrink on 60 per cent of the pulp, the amount stored, would make 24 per cent shrink on the whole. With 24 per cent shrink the cost of gain in the pressed pulp ration would have been lowered to about 8.86 per cwt., and figuring all wet pulp directly fed to the cattle with no shrink that cost figure would have been lowered to 8.01 per cwt.)

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At present feed prices the wet beet pulp hauled from the factory silo and stored for a short time until fed at the college and costing $2.17 per ton, had a feed replacement value of $4.39 per ton.

Pressed Beet Pulp—Presses have been installed at some sugar factories to press the free moisture from the wet beet pulp. This process is claimed to reduce moisture content of pulp from 95 per cent to 85 per cent. There should be no drainage from the pulp containing only 85 per cent moisture. Beet growers must haul or ship this pressed beet pulp when they deliver their beets in the fall and must silo it at their feedlots until it is fed. In this test 242 tons of pressed beet pulp from the Loveland factory, stored above ground in a wire enclosure 20 feet wide, showed a 43.04 per cent loss in weight between pulp stored and pulp available for feed.

The Feeding Value of Pressed Beet Pulp—Each ton of pressed beet pulp siloed at the college and fed in this test replaced 206.0 pounds of ground barley, 2.2 pounds of cotton cake and 228.0 pounds of alfalfa hay. At present

FINANCIAL STATEMENT BASED ON AVERAGE FEED PRICES AND SALE OF CALVES

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<tbody>
<tr>
<td>Number of Calves in Lot</td>
<td>9a</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>9b</td>
<td>9c</td>
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<tr>
<th>Ration Fed</th>
<th>Siloed Beet Pulp</th>
<th>Siloed Beet Pulp</th>
<th>Siloed Beet Pulp</th>
<th>Siloed Beet Pulp</th>
<th>Pressed Beet Pulp</th>
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</thead>
<tbody>
<tr>
<td>Alfalfa Hay Self-fed in All Lots</td>
<td>C. S. Cake</td>
<td>C. S. Cake</td>
<td>C. S. Cake</td>
<td>C. S. Cake</td>
<td>C. S. Cake</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Steers</th>
<th>$11.00 per cwt.</th>
<th>Heifers</th>
<th>$9.50 per cwt.</th>
<th>Feed cost per calf</th>
<th>Estimated fixed costs including interest, equipment and labor*</th>
<th>Shipping and selling expense</th>
<th>Total cost at market (Denver) pounds</th>
<th>Selling weight (Denver) pounds</th>
<th>Result of market sale:**</th>
<th>Selling price per cwt.</th>
<th>Gross receipts per cwt.</th>
<th>Profit per calf</th>
<th>Dressing percentage (based on 1.8 per cent shrinkage in cooler)</th>
<th>Selling price per cwt. needed to break even</th>
<th>Margin over purchase price per cwt. needed to break even</th>
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<tbody>
<tr>
<td>Cost per calf at feedlot:</td>
<td>41.68</td>
<td>34.66</td>
<td>41.27</td>
<td>41.34</td>
<td>42.04</td>
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<tr>
<td>Feed cost per calf</td>
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<td>31.51</td>
<td>28.81</td>
<td>36.15</td>
<td>34.58</td>
<td></td>
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</tr>
<tr>
<td>Estimated fixed costs including interest, equipment and labor*</td>
<td>7.28</td>
<td>6.99</td>
<td>7.28</td>
<td>7.19</td>
<td>7.48</td>
<td>7.41</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shipping and selling expense</td>
<td>2.36</td>
<td>2.36</td>
<td>2.47</td>
<td>2.34</td>
<td>2.53</td>
<td>2.56</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total cost at market (Denver) pounds</td>
<td>82.73</td>
<td>74.65</td>
<td>82.53</td>
<td>79.68</td>
<td>88.19</td>
<td>86.49</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Selling weight (Denver) pounds</td>
<td>750.00</td>
<td>691.00</td>
<td>723.00</td>
<td>655.00</td>
<td>744.00</td>
<td>751.10</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Result of market sale:**</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Number of calves at $13.40 cwt.</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of calves at $13.85 cwt.</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Number of calves at $12.50 cwt.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Selling price per cwt.</td>
<td>13.30</td>
<td>13.35</td>
<td>13.33</td>
<td>13.21</td>
<td>13.40</td>
<td>13.40</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Gross receipts per cwt.</td>
<td>92.75</td>
<td>92.26</td>
<td>96.38</td>
<td>99.49</td>
<td>99.70</td>
<td>100.65</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Profit per calf</td>
<td>17.02</td>
<td>13.29</td>
<td>13.55</td>
<td>16.81</td>
<td>11.51</td>
<td>14.16</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Dressing percentage (based on 1.8 per cent shrinkage in cooler)</td>
<td>58.6</td>
<td>61.0</td>
<td>61.2</td>
<td>58.1</td>
<td>58.7</td>
<td>60.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling price per cwt. needed to break even</td>
<td>11.03</td>
<td>11.72</td>
<td>11.41</td>
<td>11.58</td>
<td>11.85</td>
<td>11.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margin over purchase price per cwt. needed to break even</td>
<td>.03</td>
<td>.22</td>
<td>.41</td>
<td>.63</td>
<td>.85</td>
<td>.52</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

* Developed from studies of Economics Department, C. A. C.
** Steer calves were sold together at market with 4 culls out. Heifers were sold separately.
  a 1 steer died 12-16-27, cause: ecdiiosis
  b 1 steer died 1-3-28, cause: alfalfa blight
  c 1 steer died 4-20-28, cause: enteritis

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feed prices the pressed beet pulp, estimated as costing $3.51 per ton, had a feed replacement value of $4.62 per ton.

_Siloed Beet Pulp vs. Pressed Beet Pulp_—In both cases wet beet pulp proved an economical feed. Each ton of siloed beet pulp fed showed a feed replacement value of $2.22 per ton more than it cost, while each ton of pressed beet pulp fed showed a feed replacement value of only $1.11 per ton more than it cost delivered to the cattle.

_The Value of Adding Corn Silage to a Standard Beet By-Product Ration_—Corn silage is not as cheap or efficient a feed at present prices as wet beet pulp. The chief value of corn silage lies in its ability to reduce the wet pulp requirement for fattening cattle and thereby to increase the number of cattle it is possible to finish on a limited allotment of wet beet pulp. Seventy-five tons of siloed beet pulp fed in a standard beet by-product ration with ground barley, cotton cake and alfalfa hay, according to this test, will finish out only 29 calves; (the 28 head of cattle fed on this ration requiring, according to this test, 75 tons of wet beet pulp, 13.6 tons of barley, 2.9 tons of cotton cake and 15.7 tons of alfalfa hay) while the same amount of siloed beet pulp with the addition of 28.7 tons of corn silage, 9.9 tons of barley, 2.1 tons of cotton cake, and 6.4 tons of alfalfa will finish 50 calves.

Because the wet beet pulp is only available in limited quantities the true value of corn silage for cheapening fattening costs is seen in a comparison of Lot 3 fed the wet beet pulp and silage combination and Lot 5 the straight grain-
fed pen. This comparison shows a decided lowering of the feed cost of gain with the use of only a limited amount of wet beet pulp.

The Fattening Value of Sugar-Beet Tops—Although the tops fed with a basal ration containing both cotton cake and alfalfa produced too narrow a ration for optimum gain or selling price the feeding value of the tops was high. Tops fed in the experiment showed a feed replacement value of $5.71 per ton of beet tops fed, or $1.16 for the tops from each ton of beets produced.

Comparing Gains and Cost of Gains on Steer and Open-Heifer Calves Fed the Same Ration—Results of this and previous tests indicate that steers make quicker, cheaper and consequently heavier gains than heifers in the same length of time. The heifers put on a quicker finish and are usually ready for market sooner than the steers, but the steers outgain them, putting on more growth though less finish.

Comparison of Feedlot Gains from Start on Steer and Open-Heifer Calves

<table>
<thead>
<tr>
<th>Number of Days on Feed</th>
<th>Steer Calves (Lot 1)</th>
<th>Heifer Calves (Lot 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Gain Lbs.</td>
<td>Average Daily Gain</td>
</tr>
<tr>
<td>30</td>
<td>43.9</td>
<td>1.46</td>
</tr>
<tr>
<td>60</td>
<td>99.4</td>
<td>1.66</td>
</tr>
<tr>
<td>90</td>
<td>168.9</td>
<td>1.88</td>
</tr>
<tr>
<td>120</td>
<td>250.0</td>
<td>2.08</td>
</tr>
<tr>
<td>150</td>
<td>310.0</td>
<td>2.07</td>
</tr>
<tr>
<td>181</td>
<td>387.8</td>
<td>2.14</td>
</tr>
</tbody>
</table>

On the basis of final market weights, the steers put on 44.9 pounds or 13.8 per cent more gain than the heifers at a feed cost of 80 cents less per hundred pounds gain. With the steer calves at $11.00 per cwt., the heifer calves purchased at $9.82 per cwt. would have given the same results.

Beets Abroad

In considering the possibilities of the beet crop one is at first apt to look upon it with a view to direct profits only, but it has many other points of vantage. If farmers, are, in many cases, prepared to take a root crop (turnips) at a direct loss on paper why expect a fortune out of beets? In many places it has been found that where beets are grown the standard of farming has improved. In England and on the continent, in fact every place where they have been grown seriously, a big increase in yield has been noted in the succeeding crops on the farm. This is not due to any particular virtue of the crop itself. It is owing to the fact that to grow beets successfully the land must be well cultivated and manured liberally. If a crop will pay for this liberal treatment it takes a very important place in the rotation and ought to be grown as far as possible.—The Farmers' Gazette, Dublin.
CUTTING THE COST OF PRODUCTION

By J. C. HOGENSON
Extension Agronomist, Utah Agricultural College

Every time you leave 100 beets to each 100 feet of row you decrease your cost of production.

Every time you leave the biggest and best beet in the hill in thinning you lower your crop costs.

Every time you irrigate at the proper stage and in the proper amount you reduce your cost of production.

Every time you cultivate properly, you bring down your costs.

Every time you apply manures or turn under crop residues in good season and handled right you cut your costs.

Every time you fit a seed bed that will give the young plants a chance to "ketch" and germinate a good stand you have decreased your cost of production.

Your profits are represented by the difference between cost and selling price. The cost of growing beets is practically the same almost regardless of yield. Lower your costs and you increase your profits. Most of the factors in lowering costs are within the farmer's control.
Effect of Sweet Clover Demonstrated

By L. R. MONDT, Fieldman
McCook-Culbertson District

The accompanying pictures snapped July 12 are of a 1928 winter wheat field on the F. F. Meininger farm north of Culbertson, Nebraska.

In 1927 this field was in wheat with all but one drill width planted to white biennial sweet clover. The clover was plowed under in August when over three feet in height and the field was then irrigated. The strip where there was no clover was handled the same as the clover land.

Picture No. 1 shows Carl Fahrenbruch, left, neighboring farm-
er, and Ed. Rothermel, Culbertson Realtor, standing in the sweet clover wheat. They estimated it would make from 35 to 40 bushels per acre.

Picture No. 2 shows the same men standing in the non-sweet clover patch which they estimated would make from 15 to 20 bushels per acre.

In 1925 not over a dozen acres of sweet clover were planted in the Republican valley. Today there are over 700 acres working for the growers, pasturing their live stock and building up the fertility of their land so they can make more wheat, beets and dollars.

From the interest shown in the district, there will be over 1,000 acres of sweet clover planted in the irrigated section of southwest Nebraska in 1929.

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Limiting Factors in the Feeding and Management of Milch Cows

By R. BOUTFLOUR

(From Paper Read at World Dairy Congress)

During the last decade much attention has been given by agriculturists and scientists to the systematic rationing of milch cows. The result of this is that definite standards of feeding for the maintenance of the cow, and for the production of milk, have been laid down and adopted with success.

The object of this paper is to deal with the four most serious limiting factors and their effects upon the cow and her consequent yield of milk.

These factors may be enumerated as follows:

1. The lack of control of the indigestible fibre.
2. The lack of control of the total amount of food fed.
3. The neglect of the preparation of the cow for her lactation period.
4. The over-stocking of the udder.

The Lack of Control of the Indigestible Fibre

Large quantities of crude fibre—an indigestible food—can have a very depressing effect upon the yield of a heavy milking cow. This is due to the fact that, although the material is indigestible, the attempt at digestion is made with the result that a large amount of energy is used in this attempt.

The energy should have been utilized in the digestion of the non-fibrous food, and, as a consequence, less of this food is utilized.

This factor should be realized and is most important in the feeding of a heavy yielding cow, where the amount and quality of the food to be fed is
considerable. With cows yielding more than 70 lbs. of milk per day, it is necessary to control the amount of crude fibre fed within the limits of 3 to 4 lbs. per day.

The feeding of such fibrous foods as cotton cakes and inferior fodders, both long and cut up for chaff, is to be deprecated. This is an example of the factor explained above and these foods should on no account be fed to dairy cows giving high yields of milk.

**The Lack of Control of the Total Amount of Food Fed**

Co-related to the above factor is the lack of control of the total bulk of the ration. This is the most serious limiting factor now operating in the management of milch cows, especially in the case of cows giving high yields of milk.

A cow can only efficiently deal with a limited quantity of food per day, but if the opportunity presents itself, she will consume 30 per cent more food than this quantity. If this is permitted, the attempt is made to digest this greater quantity, energy is wasted, and less food is digested than if a smaller quantity were fed.

To illustrate more fully the above statement, the following has been found to be the case. The average cow, weighing about 11 cwt. live weight, can only deal efficiently with a total dry matter of about 30 lbs., but if given the opportunity she will consume 40 lbs. If she is given 30 lbs. of dry matter she will efficiently deal with this quantity, but if she is given 40 lbs. she will deal with, of this quantity, far less than 30 lbs.

All high-yielding cows should therefore have their total daily ration controlled. If it is assumed that hay alone is used for maintenance and 3½ lbs. of concentrates (supplying 2½ lbs. of starch equivalent, including .6 lbs. of protein equivalent) are used per gallon of milk for production, the amounts to be fed to cows of varying yields should be as follows:

<table>
<thead>
<tr>
<th>Dry Matter</th>
<th>Hay Concentrates Matter</th>
<th>Gallons</th>
<th>Lbs.</th>
<th>Lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>16</td>
<td>17½</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>9</td>
<td>24½</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>6</td>
<td>28</td>
</tr>
</tbody>
</table>

It will be noticed that as the concentrates are increased the hay fodder is reduced to make room for the concentrates. The maintenance ration is reduced but there is no need to supplement this, as the production ration cannot wholly be used for production, and in consequence the more of this that is fed the more maintenance ration is supplemented and less is required as fodder for maintenance.

If a high yielding cow is fed with a ration, the bulk of which is controlled, and hay is given ad lib., it will be found that she will quickly drop her output by as much as two gallons of milk per day. This being so, it is not surprising that in herds, where the bulk is not controlled the cows never attain a yield within two gallons per cow per day of what they might have done.

The seriousness of this must be obvious when it is realized that the majority of cows are fed with a constant maintenance ration often having the very high dry matter figure of about 24 lbs. When these cows are fed for two gallons, i.e., with an addition of
7 lbs. of concentrates, they are at their efficient limit; when they are receiving concentrates for more than two gallons the stomach is overloaded. The five-gallon cow would be getting nearly 40 lbs. of dry matter; this cow is then expending a large amount of energy on food which will eventually be converted into solid excreta, and less energy is available for the conversion of food into milk.

That the overloading of the stomachs of cows is common is very obvious if herds are visited at night. Cows will be found lying down and grunting. This grunting indicates that the cows are suffering from indigestion—a trouble which is never associated with efficiency in milk production.

The benefit that is derived from roots used in large quantities is not so much from their food value, but rather from their laxative effect in assisting the cow to eliminate the food which cannot be digested, be it either the indigestible food or the excess quantity of food with which she has been fed. If the bulk and crude fibre are controlled, the roots can be dispensed with, provided the cow is given sufficient water.

Undue stress should not be laid upon the palatability of foods as there is a distinct relationship between this palatability and the amount consumed. When food is fed ad lib. there is a great possibility of indigestion due to the overloading of the stomach. This would not happen if the food were not so palatable.

Neglect of Preparation of Cow for Lactation Period

Next to lack of bulk control the lack of preparation of the cow for her lactation period is the most serious limiting factor in the management of milk cows. This process is known colloquially as “steaming up” or “fitting.”

Cows approaching calving are, as a rule, indifferently managed, and, as a result, after calving, give only moderate yields, whereas, had they been properly prepared, higher yields would have been obtained.

The recommendations are that the cow should be dry for six weeks, and that during this time she should receive, in addition to her maintenance ration, a balanced ration for production as follows:

- 6 weeks before calving, 3 lbs.
- 5 weeks before calving, 4 lbs.
- 4 weeks before calving, 5 lbs.
- 3 weeks before calving, 6 lbs.

In the last fortnight before calving a sufficient quantity should be given to thoroughly prime the cow. This quantity will vary from 9 lbs. to 14 lbs. During the last fortnight care must be taken that the type of food used should be naturally laxative. It should not contain English beans or any form of cotton seed cake. The former food has a tendency to lead to the retention of the afterbirth, and the latter to affect the health of the calf.

The object of this preparation is not to get the cow fat—this process should be carried out on a fat cow—
but to get the cow into a real stage of fitness at the time of calving.

The day before the cow is expected to calve she should be drenched with the following mixture:

\[
\frac{3}{4} \text{ lb. Glauber's salts.}
\]

A tablespoon of ground ginger, and

3 pints of tepid water.

This drench should be repeated after calving.

After calving, high yields should be anticipated, the amount of concentrates being gradually lifted so that at the end of the week she is being fed for one gallon more milk than she is giving. For example, if at this time she is giving five gallons, feed for six; when she is giving six gallons, feed for seven; but as you increase the concentrates the other foods must be reduced by a similar amount.

In this way a cow should be led to her maximum yield, which she should not, as a rule, reach until the eighth week after calving, and at this eighth week she should be giving one gallon more at least than she was giving at the end of the second week. If this is not happening there is one of the limiting factors at work preventing this happening.

Many people are afraid to "steam up" a cow as they are of the opinion that it is the cause of milk fever. Nothing is further from the truth, for if a cow is properly prepared it is in the best state to resist the trouble. On the other hand, no cow is more susceptible to milk fever than the half-prepared cow.

The Over-Stocking of the Udder

The overstocking of the udder at any time will always result in the diminution of the milk yield. From the moment that the udder is stocked re-absorption takes place, and a lowering of the yield of milk will follow. To demonstrate this: a cow giving three gallons of milk per day may be taken. If she is not milked she is completely dried off within four or five days. A cow giving high yields which is only milked twice per day, can be in that stocked condition before every milking. A consequent re-absorption takes place, and it will be necessary to milk these cows more frequently. Three times milking per day is therefore recommended.

If three times milking cannot be resorted to then it will be policy not to take cows to a higher yield than six gallons per day.

It should be pointed out, also that a cow can have a stocked udder before calving, and therefore if a cow, during the "steaming up" process, comes to her milk before calving she should be milked. This milking should be continued regularly in the same manner as if she had calved.

To summarize:

Prepare the cow for her lactation period.

Milk the cow as soon as she comes to her milk.

Feed a balanced production ration according to the yield of the cow.

Feed a controlled maintenance ration so that the total bulk does not exceed the amount of food the animal can deal with efficiently.

Control the amount of indigestible crude fibre fed to high yielding cows.

Have an adequate supply of water.

For high yields three times milking is necessary.
Live Stock Feeding Industry Increasing in Northeastern Colorado

By E. WARD, Jr.

NORTHERN Colorado's leadership in sheep and cattle feeding is being challenged by another Great Western beet-raisining territory—northeastern Colorado comprising the districts around Fort Morgan, Brush, Sterling and Ovid sugar factories.

To the magic names of "feeders" in northern Colorado-Farr, Evans, Webster—the northeastern territories are adding a Harris, Dillon, Roediger, Hanks, and names of like operators on a large scale.

Some day, too, the story will be told of the growth of feeding in the North Platte Valley where the Fergusons, Sands, Biglers, Staffords, Halleys are making history in a similar development there.

Growth of the feed lot stock fattening industry means more, however, than the upbuilding of a few fortunes. The number of "small" feeders is increasing. Every beet grower may take the pulp made of his own tonnage. Gradually more and more farmers who handle only a carload or two of steers or a few cars of sheep are getting into the game. It means a wider distribution and use of the beet by-products, widespread benefits from the resultant fertilizer, higher crop yields.

Northeastern Colorado's rise in the live stock fattening industry joined with beet by-products appears in the surveys made during recent years by fieldmen of the sugar company, reporting the approximate number of cattle and sheep on feed in their districts each winter. The table below was compiled from the fieldmen's reports.

### Sheep and Cattle on Feed

<table>
<thead>
<tr>
<th>Feeding Season</th>
<th>No. of Head in Northern Colorado</th>
<th>Cattle As % of</th>
<th>Sheep As % of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cattle</td>
<td>Number Nor. Colo.</td>
<td>Number Nor. Colo.</td>
</tr>
<tr>
<td>1924-25</td>
<td>54,000</td>
<td>29,000</td>
<td>23%</td>
</tr>
<tr>
<td>1925-26</td>
<td>38,182</td>
<td>37,759</td>
<td>99%</td>
</tr>
<tr>
<td>1926-27</td>
<td>72,122</td>
<td>56,170</td>
<td>78%</td>
</tr>
<tr>
<td>1927-28</td>
<td>67,631</td>
<td>58,043</td>
<td>86%</td>
</tr>
</tbody>
</table>

* Estimated.

While conclusions based on only four years' statistics may be inaccurate, due to fluctuations in crop conditions and prices of live stock, one cannot but be impressed with the growth of the feeding industry in northeastern Colorado, when the number of head fed is figured as per cent of the number fed in northern Colorado. The increase in cattle feeding in northeastern Colorado is particularly striking, while statistics and observation show a decided growth in sheep feeding also.

Eight or nine years ago the Sugar Company had to feed wet pulp at its northeastern Colorado factories in order to dispose of it. Gradually Company
feeding operations were discontinued. The demand for pulp by local beet
growers is increasing rapidly each year. With the growth in feeding there
has come an increase in the farm values of beet tops, alfalfa hay, and straw.
Five or six years ago straw stacks over two years old were quite common
sights in the irrigated sections of Morgan county. Such sights are rare now.
Straw for bedding is hauled nine or ten miles from the dry lands, to bed cattle
fed in the beet growing section.

Before the use of trucks for hauling beets and wet pulp became general
feeding by beet growers was mostly confined to the immediate vicinity of the
factories. The increased use of trucks and the greater interest in feeding
has forced the Company to pro-rate the pulp.

A few years ago it was very common to see heavy steers on feeds of hay
and wet pulp, sometimes supplemented by cotton cake and molasses, the pulp
fed per head per day often being as high as from 100 to 120 pounds. The de­
creased allotment of pulp per feeder has forced cutting down the wet pulp ra­
tion, and increased the corn or barley ration, with cotton cake as a supple­
ment. This trend in reduction of wet pulp fed per head has increased the
value of the wet pulp in the ration. Barley is in enlarged demand and now
quite generally in northeastern Colorado is used as a nurse crop for alfalfa.

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Early Plowing for Winter Wheat

There is a distinct advantage in plowing sod or stubble land intended
for winter wheat early or as soon after harvest as possible. When the
stubble ground is hard and dry it is an excellent plan to go over it with a
disk to break up the crust on top before plowing. This will aid in the
conservation of moisture. Furthermore, when the soil is loose on top
at the time of plowing, a better contact between the bottom of the fur­
row and the top of the furrow slice will be secured. In other words this sort of treatment re-establishes cap­
illarity more promptly, so that the moisture can flow freely from the
subsoil up into the furrow slice.

For three years the Ohio Experiment Station obtained an average
yield of 37 bushels of wheat per acre on land that was plowed on August 1.
Adjacent fields that were plowed two, four and six weeks later yielded 1.7,
3.6 and 3 bushels less per acre respectively. Early plowed ground should
be disked from time to time after heavy rains not only to break up any
crust that may have formed on top, but also to kill weeds. On some soils
a roller used shortly before seeding will prove helpful in securing a uni­
form stand.

---

Hard Pan On the Surface

You well know how hard the stubble fields become after the grain
harvest. The surface soon dries out and bakes so that plowing can
scarcely be done. Rains, if you are lucky, may soften the crust. But to
make sure double disc after the binder.
How Much Have We Learned Since 1903?

Hans Mendelson calls attention to a pamphlet printed in 1903 by C. S. Faurot, then agricultural superintendent of the Longmont Factory.

"Beets should be planted as early in the spring as possible. Experience has shown that the early-planted beets produce a larger yield and higher sugar content. Beet seed can be planted with safety in Colorado as early as the first week of April when the soil and climatic conditions are favorable.

"As it is very important that a good stand be secured I suggest that should the ground be dry when the seed bed is prepared it be given a light irrigation either before or after planting.

"Let me caution the grower against the false idea that if the young beet is allowed to suffer for moisture it will seek the moisture below. Never let the young beet suffer for water. When a young beet has once been checked in its growth to any marked degree it becomes a stunted, puny plant and will never mature you a good crop."
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The Great Western Sugar Co., Longmont, Colo.
In This Issue---“Phosphate Fertilization” by Asa C. Maxson

SEPTEMBER, 1928

THE GREAT WESTERN SUGAR CO.
Beet Crop
Fundamentally Sound

1—Sugar beets afford the farmer a means of obtaining a larger total annual income. The crop requires a large expenditure of man and horse labor, and at a time when they would otherwise be idle where merely grain and alfalfa are raised.

2—A cultivated row crop in rotation is a necessity for the maintenance of the soil’s productivity. Potatoes and some special crops serve this purpose in limited areas but the sugar beet thrives on all normal soils.

3—The sugar beet is a cash crop with a ready and certain market.

4—More than other crops the sugar beet displays greater resistance to alkali, hail and insects, and is, therefore, a safer crop.

5—Transforming of available water into salable crops demands in addition to grain and alfalfa a crop able to use late and stored water to advantage. The sugar beet transforms more water into more cash than any other crop.

6—The by-products of the sugar beet—tops, pulp and molasses—add just what is needed to fatten animals on the existing supply of alfalfa. The low-cost by-products have created a fairly profitable feeding system furnishing also the manure for maintaining and increasing soil productivity.
Editor's Notes

BEFORE another issue of Through The Leaves appears the harvest will be underway. At best the delivery season is a trying time for growers, receiving station crews, drivers, and the agricultural forces of the company. Aware of the burden of digging and hauling a bulky crop over a period of from four to six weeks every effort has been made to provide equipment and to arrange a program that will occasion the least delay and avoid misunderstandings.

Fresh, healthy beets, reasonably clean, suffer serious losses of sugar in the storage piles. The loss is in proportion to the length of time the beets are piled, but ranges on the average from 6 to 10 per cent of all the sugar in the beets.

The cost of this loss is almost wholly sustained by the company. Its occurrence being a limitation on the price that can be paid for beets, growers are directly interested with the company in holding this loss to a minimum.

The loss is rapidly increased when unusual quantities of dirt and trash are delivered with the beets and when irregular piles permit snow to accumulate in low spots. Hence the emphasis on keeping dirt out of loads, as far as possible, and the need of making piles regular in shape and height.

Dirt Tare

It is impossible to deliver a crop of beets without some dirt, leaves, and poorly topped crowns getting into the loads. This foreign stuff is not only without value to the factory but is actually harmful during storage in the piles and to the factory process.

Since all of the beets cannot be cleaned and weighed afterward we must try to determine the percentage of dirt, leaves, and crowns by taking samples and figuring the percentage of tare. The principal misunderstandings in past seasons have been over tares taken at the piles rather than on loads direct into cars, and over top tares.

The beets shoveled into piles are now screened only through a fork. Dirt
left in the wagon is relatively light; hence the forked samples tare correspondingly high. Even with the care shown in taking these samples the combined pile tare and loose dirt in the wagon fail to account for all of the dirt. Thorough and extensive tests prove beyond doubt that the company annually pays for thousands of tons of dirt at the contract beet price.

It is only natural that a high tare should irritate a grower. Most farmers try to deliver their crops in as clean a condition as possible. They do not want to sell dirt to the company nor crowns that are worse than useless. The few individuals who try to "put something over" make it unpleasant for the others.

**Top Tare**

That part of the beet known as the crown is distinctly different in composition from the rest of the root. There is no sharp line of division between the two.

In the root proper most of the sugar is stored, with a small percentage of impurities. In the crown most of the impurities (valuable mineral salts from the soil) are found, with a small quantity of sugar. Because of these impurities in the crown very little sugar can be extracted and this only at high expense. Hence the factory does not want any crown material delivered with the beets.

The beet contract provides that crowns shall be cut off and left in the field where they have value as stock food and fertilizer. In the rush of harvest, and with occasional careless laborers, the desired method of topping is not always followed. Taking top tare is only for the purpose of correcting faulty work in the field.

The factory prefers to get beets carefully topped and not subject to any tare for high crowns. Extensive experiments have proven beyond doubt that crowns have no value for sugar manufacture even if delivered to the mill without cost. The factory does not want them at any price, much less at the rate paid for beets. On the other hand, the tops have a real food value on the farm and return valuable mineral salts to the soil when fed to sheep and cattle or plowed under.

Much that has been said here of dirt and crowns applies as well to frozen beets. The regulations governing their delivery are ultimately for the benefit of growers as well as company.

Instructions for taking tare will be posted at each "dump." Growers are as always welcome to observe the taking of their tares. The dump crews will be selected with care. They will be the most competent the company can hire. It is inevitable that at times cordial relationships must depend upon a mutual patience and tact. With this spirit active from all concerned tare alike fair to grower and company should result and relieve the harvest strain.
Association Not to Restrict Beet Acreage in 1929

Record Crop Next Year Likely If Co-operative Program Under Discussion by Growers and Company Is Carried Out

A LARGE crop for 1929, possibly greater than the 10½ million bag production of The Great Western Sugar Company in 1927, seems probable in consequence of action by directors of the Mountain States Beet Growers’ Marketing Association August 24, when the board voted not to restrict members from growing beets in 1929.

J. D. Pancake, secretary of the Association, was quoted in the press as saying “the agreement was unanimous. It should mean a much larger planting and larger crop next year.”

W. D. Lippitt, General Manager of The Great Western Sugar Company, stated “If the Association will follow out the constructive program which is now being considered by some of its leaders, it will be of inestimable value to every beet grower, the Company and the industry as a whole. The way is cleared for the solution of many problems common to all parties.”

Not to restrict members from growing beets next year and decision not to enforce the 50-cent penalty clause on this year’s crop, were announced by the Association. Informal discussions had been held earlier in the month, between Association heads and Company officials.

Many problems incident to the production and marketing of the maximum crop attainable have been discussed. What the contract price per ton will be, or whether the contract will be negotiated for more than one year, has not been announced.

Heads of both parties, however, have discussed a co-operative program involving adequate tariff protection, developing and protecting logical markets against foreign sugar produced under cheap labor conditions, effort in behalf of legislation limiting the amount of Philippine sugar which can enter this country free of duty, and other problems affecting the industry as a whole.

Director William A. Carlson of Greeley declared that the Association would devote its energies “to protect the home market for the American producer,” as one phase of the plan.

Realization of such a program would be of tremendous value to all concerned.

Already the action of the Association seems to clear the way for early planting next year, satisfactory local credit conditions, early labor contracts, and one of the biggest crops in the history of the intermountain industry.
Pancake Advances Co-operative Program

*Urges Constructive Program Uniting Growers and Company in Movement to Solve Serious Problems Confronting Industry*

The beet sugar industry at this time "is confronted with a great many problems that call for the earnest consideration and co-operative effort" by both farmer and manufacturer, according to J. D. Pancake, secretary of The Mountain States Beet Growers' Marketing Association.

Recently interviewed in Loveland, Mr. Pancake pointed to the fact that over 20 per cent of the beet sugar factories in the United States were idle last year, that European beet farmers enjoy higher tariff protection than is levied against Cuba on behalf of the American farmer, and described the additional menace to the domestic industry of the rising flood of cheaply produced Philippine sugar now entering our ports free of duty.

"These things are critical for the beet growers," said Mr. Pancake, "and the Beet Association in conjunction with the Sugar Company is to put on a program of co-operation, looking to the preservation of the industry."

The secretary's remarks, occasioned by announcement by the beet association that its members would be free to contract individually with The Great Western Sugar Company in 1929, were printed in full in the Loveland Reporter-Herald as follows:

*May Contract Individually*

"The Board will not restrict members from growing beets in 1929, but leaves the matter to individual growers to determine for themselves when the contract is put out by the Sugar Company. And the members of the Association may freely sell their 1928 crop when it is ready to go on the market. Fourteen of the sixteen directors were present at the meeting recently held in Greeley and this action was taken unanimously.

"In the past years the directors held conferences with the Sugar Company officials preparatory to making a satisfactory contract, both parties earnestly endeavoring to construct such a contract. These conferences will of course continue by mutual consent and with the idea uppermost of securing an agreement that will be for the best interests of all concerned.

"At this time the industry is confronted with a great many problems that call for earnest consideration and co-operative effort. The Sugar Companies of the world are producing surpluses which are prevented from entering other markets by reason of much higher tariffs than are imposed in the United States. In fact, most countries other than England and the United States produce their own sugar, most of them having surpluses for shipment.

"England now has a tariff duty of $2.21, or 44 cents higher than the duty against Cuban sugar in the United States, and all
other countries consider the United States their most hopeful market.

"If these other countries can continue to unload their surplus sugar in the United States it means the loss of the market to our beet growers and eventually the wrecking of this great enterprise that has been built up in our beet growing areas.

Many Factories Idle

"Twenty-three factories out of a total of 105 in the United States never turned a wheel last year, and if the loss of the market continues more will undoubtedly be added to this number remaining idle.

"The Philippine Islands, with almost unlimited land, cheap labor and low standards of living have doubled their production of sugar in the last few years, and are selling their whole production in the United States without any tariff and with only a 22c freight rate. This production now amounts to over 600,000 tons.

"These things are critical for the beet growers. And the Beet Association in conjunction with the Sugar Company is to put on a program of co-operation, looking to the preservation of the industry, and it is with this in view that the Association and Company officials will endeavor to work out a contract and program for the betterment of the industry both as it concerns the grower and the company. We are very hopeful that out of this co-operation will come some lasting benefits and feel sure that it will result in satisfactory agreements for all concerned."

"While realizing the seriousness of the situation that confronts the industry as a whole," the Reporter-Herald said, "Mr. Pancake is very hopeful that by the spirit of co-operation with which it is being approached the very best results can be obtained. It is up to the growers and the Sugar Company to stand solidly together and we feel, as does Mr. Pancake, that if this is done this great industry can be strengthened for the fight that unquestionably confronts it."

HOW THE ENGLISH SEE IT

"Potato growers are beginning to realize that the growing of sugar beets has a stabilizing influence on the potato market. As is well known, good prices for potatoes are only obtainable in a bad year, so that by putting down a proportion of beet the potato market is kept at a more stable level."
Beet leaves showing symptoms of phosphorus deficiency. A deep green base, shading into yellowish-reddish discoloration is characteristic. Deep dark brown, even black spots, of irregular shape, usually appearing first on the edges, but sometimes in the middle of the leaf, indicate greater lack of phosphorus. Position of the leaves is described in the text.
How Phosphates Increase Yields

Over 400 Per Cent Return on Investment in Fertilizer Realized on One Field; Wheat Yield After Beets Increased 15 Bushels Per Acre

By ASA C. MAXSON
In Charge of Longmont Experimental Station

IT IS generally believed that the soils of the plains east of the Rocky Mountains are sufficiently rich in mineral plant foods for many years to come. This belief has been strengthened by reported fertilizer trials which appeared to show that the addition of commercial fertilizers does not increase crop production.

At this time a statement to the effect that we have many soils so deficient in available phosphorus that certain crops cannot be profitably grown on them need not create any alarm since the deficiency can be overcome by applying phosphate fertilizers at a handsome profit.

Nitrogen, phosphorus and potassium are the three most important plant food elements in the soil and the ones most commonly depleted to a point where their renewal by the use of commercial fertilizers becomes necessary.

Nitrogen can be added by the growing of legumes such as alfalfa or sweet clover and plowing these down. Phosphorus cannot be added by any system of cropping or green manuring.

The rocks and soil forming the earth’s crust contain about 0.11 per cent of phosphorus and 2.46 per cent of potash. Therefore, the natural supplies of phosphorus are much smaller than those of potash. The soils of the great plains contain from .08 to .40 per cent of phosphorus and from .2 to 1 per cent potash.

Phosphorus Depleted Before Potash

Many crops remove greater quantities of phosphorus than potash from the soil so it is evident that phosphorus will become deficient before potash. Since, as has already been stated, nitrogen can be added by growing legumes, it is very apparent that phosphorus will in all likelihood be the first element to become depleted in our soils.

Phosphorus is one of the elements absolutely necessary to plant growth. The vital parts of plants are rich in this element. Seeds and grains are relatively rich in phosphorus and contain much larger quantities than the leaves and stems of plants. The germs of seeds are especially rich in phosphorus. Therefore, it seems probable that this plant food is essential to the production of good seed and thrifty seedlings.

Phosphorus stimulates root growth especially the development of the fine feeder roots. This gives the plant greater water-absorbing and feeding power and produces a rapid early development of the crop. Phosphorus deficiency is more injurious in dry seasons than wet ones because of the effect that it has on root development.

Phosphorus Increases Beet Tonnage

The ripening of small grains is hastened by phosphorus. This would tend to reduce rust losses. Phosphorus produces an especially vigorous sugar beet seedling and early growth. The tonnage is increased without any loss in per cent sugar and the lowering of per cent sugar caused by heavy manuring is overcome by its use. Phosphorus also has a very marked effect
upon beets following alfalfa and sweet clover by overcoming the ill effects frequently observed when beets are grown after these crops.

The amount of phosphorus removed from the soil varies with the crop. The requirements of several of our principal crops are given below:

- Wheat .......... 50 bu. 26.6 lbs.
- Oats ............ 80 bu. 16.8 lbs.
- Barley .......... 65 bu. 27.6 lbs.
- Corn ............ 35 bu. 12.5 lbs.
- Sugar Beets .... 15 tons 23.0 lbs.
- Potatoes ........ 300 bu. 21.6 lbs.

These figures do not include the straw, corn stover, beet tops or potato vines.

It is very evident that the removal of the crops named removes considerable quantities of phosphorus from the soil.

The ordinary chemical analysis of the soil shows the total amount of the various elements in the soil but does not give any adequate idea of its availability to plants. There are two methods by which the need of any particular plant food can be learned. Field trials in which the various elements of plant food are applied to the soil, if carefully planned and carried out, give reliable information as to the soil's need. This method requires considerable time and requires a knowledge of experimental methods.

One of the best laboratory methods is known as the Neubauer method. It consists of growing rye in carefully

Striking contrast of beet growth on the Turner farm near Longmont. The beets on the left show the effect of fertilization by superphosphate (46 per cent mixture) applied at the ratio of 100 pounds to the acre. The beets on the right show lack of phosphate, all other conditions being similar.
prepared soil samples and under controlled conditions. The test is so arranged that the rye will take up all of the available phosphorus and potash in the soil in about two weeks.

At the end of this time a chemical analysis of the rye, including all roots, is made and the amounts of phosphorus and potash it contains determined. By conducting field tests the relation between the amounts of these elements taken up by the rye and the amounts of commercial fertilizer that must be applied to any particular soil has been determined and standards for the various crops established. In this way the results of the Neubauer tests can be translated into fertilizer requirements for any soil.

**Alfalfa and Clover Reduce Phosphorus**

During the past winter a large number of Neubauer tests were made by the Experiment Station of The Great Western Sugar Company. Some very interesting facts in connection with the effects of cropping and manuring upon the available phosphorus were brought to light.

It appears that alfalfa and sweet clover reduce the available phosphorus. The relative amounts of available plant food are given in what is called the Neubauer value. The lower the value the smaller and the higher the value the greater the amount of available plant food.

The soil of alfalfa fields had a Neubauer value for phosphorus of 1.9. This is very low. Grain and corn land had a value of 1.97, also very low. Manure increases the availability of phosphorus. This is clearly demonstrated by the Neubauer values of alfalfa and grain land that had been manured. Alfalfa land manured had a value of 2.57 for phosphorus while the value for grain ground manured was 5.71.

Ninety-nine manured fields had an average value of 5.18 for phosphorus while 86 unmanured fields had a value of 4.37. Not all of the differences in the values of manured and unmanured land are due to increased availability because some phosphorus is added with the manure. The important point is that manure helps to maintain the available supply of phosphorus.

That the yield of beets is associated with the Neubauer values for phosphorus is clearly shown by the following:

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<th>Tons Per Acre</th>
<th>Neubauer Value</th>
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<td>15 or more</td>
<td>5.41</td>
</tr>
<tr>
<td>12 to 14.9</td>
<td>4.91</td>
</tr>
<tr>
<td>Below 12</td>
<td>4.28</td>
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Our studies have not yet been extensive enough to determine any definite relation between soil types and phosphorus deficiency. At Wheatland, Wyoming, coarse soils containing much grit and gravel and underlaid with gravel at a depth of three or more feet, appear to be the most deficient.

These soils contain considerable lime which occurs in strata at varying depths from the surface. In northern Colorado, soils overlaying shale appear to be most deficient. Certain wind deposited soils in western Nebraska appear to be naturally deficient in phosphorus. The first crops on these soils after they are broken out of sod have responded to applications of phosphate fertilizer.

The sugar beet is very sensitive to phosphate deficiency. Beets grown on such lands may be identified by the following description:
"When speaking of lack of phosphorus there is taken for granted a real or at least a conditional surplus of other nutrients. Since excess of nitrogen always causes the green color of the plants to turn to a deeper green, the first sign of lack of phosphorus is this dark green color appearing in the leaves.

"If there is only a slight lack of phosphorus, the dark green color may under certain conditions be the only indication of this lack. In most cases, however, a yellowish-reddish discoloring sets in which is difficult to describe in its various gradations, but it always has a greenish base. The sugar per cent of the beets in such cases decreases little or not at all. The relation of roots to tops remains the same, when the lack of phosphorus is not entirely too great, the same as in case of complete fertilization.

"Greater lack of phosphorus appears in another way. In such cases the dark green leaves take such a position that the petioles lie on the ground as horizontal as possible, but at the beginning of the blade the leaves turn and point upwards so that the tips are in a vertical or nearly vertical position. Such a type of leaf position, however, is not always an indication of lack of phosphorus but may be a peculiarity of an individual beet.

"Greater lack of phosphorus, regardless if the abnormal leaf position described occurs or not, is also characterized by the appearance of deep dark brown or even completely black spots on the leaves. These spots which are of an irregular shape appear first at or close to the edges of the leaves but in some cases they may appear in the middle of the leaf surface. From these spots the leaves begin to die off with a deep dark brown or black color without any yellow color appearing.

"When such pronounced indications of lack of phosphorus appear, the root and top are held back in growth, the sugar % of the beet is lowered although as a rule only slightly. The total amount of sugar obtained, however, is decreased due to the de-

In 1927 beets produced a normal yield on soil treated with phosphates as compared with a yield of about 2 tons per acre on adjacent untreated soil. These 1927 beets were followed this year by wheat on both soils. The above picture, taken May 29, shows the astonishing difference in early growth. The final difference at harvest was equivalent to practically 15 bushels per acre.
crease in yield. The number of leaves developed decreases with greater lack of phosphorus."

**Superphosphate Cheapest**

If a soil is naturally deficient in phosphorus or has become so through improper handling it can only be brought back to a productive condition by the addition of some form of phosphorus.

There are several forms of phosphorus-bearing fertilizers among which raw phosphate rock, bone meal, bone black, Thomas meal, and superphosphate are the most commonly used. Raw phosphate rock becomes very slowly available when applied to a soil, therefore, is not suited to cases where quick results are required. Bone meal and bone black are usually more expensive than superphosphate, therefore, less profitable than the cheaper superphosphates. Thomas meal is a smelter by-product more commonly used in Europe than in this country. Superphosphate is a phosphate rock or other phosphate bearing material treated with sulphuric acid. The cheapest and therefore the most profitable form to use in the great plains area is a superphosphate made by treating phosphate rock with acid.

Phosphate fertilizers may be applied before seeding, with the seed or after seeding. The best results are secured when the fertilizer is drilled into the seed bed before planting. This makes it available to the seedling as soon as it begins to draw its nourishment from the soil and stimulates the development already mentioned and which is so desirable. Certain brands are so strong that they cannot be safely sown with the seed in any quantity as they injure the germination of the seed.

Sowing fertilizer after planting is only advisable when it cannot be sown before or in case a lack of phosphate becomes apparent only after the crop has started. The rate to be applied will depend upon the strength of the fertilizer and the requirements of the soil.

During the past two or three years very striking results have been secured by an application of superphosphate both in increasing yield and in preventing disease.

A field that was producing 12.25 tons per acre without treatment, produced 16.15 tons when 200 pounds of 20 per cent superphosphate was applied before seeding. A part of the field was given an ordinary coat of manure and another portion manure and 200 pounds of phosphate fertilizer. The manure and phosphate produced 1500 pounds more beets than the manure alone.

In the case of the fertilizer without manure the profit to the grower was $26.72 per acre when allowance was made for the cost of the fertilizer, applying it and hauling the increased tonnage. This was over 400 per cent on the investment.

In 1927 a diseased condition appeared in a field during June. An application of phosphate between the rows on June 22 stopped the disease and produced a normal growth of the crop from that time on. The untreated portion produced about two tons per acre. The grain crop following this beet crop still showed the effect of the fertilizer. On May 31 the wheat on the treated portion was much larger than on the untreated as the accompanying cut shows.

The results of the harvest on this wheat field were surprising. Equal areas were studied, one which had
been treated in 1927 and one which had not. The yields were as follows:

- Untreated: 43.7 Bu. per acre
- Treated: 58.6 Bu. per acre

The kernels from the treated portion of the field were noticeably larger and better developed than those from the untreated portion.

**Combined Grain—Dangers and Prevention**

Precautions Must Be Taken in Threshing, Cleaning and Storing

The appearance of combines for small grain harvesting has brought new problems to the farmer desirous of getting the most good out of this invention. If, as claimed, the machines save from 10 to 25 cents per bushel in expense of harvesting, it is vital that the advantage not be lost in damage and loss of grain from the following causes:

1. Harvesting before the grain is ripe.
2. Cutting grain that contains excess moisture.
3. Occurrence of green weed seeds in the threshed grain.
4. Storing damp grain in bins.
5. Storing grain that contains green weed seeds.

Since the grain is threshed as it is cut with a combine, there is no chance for it to dry out in the shock as is the case when cut with a binder. It is important, therefore, that the grain be ripe.

R. H. Black and E. G. Boerner, specialists in grain investigations for the U. S. Department of Agriculture did considerable investigating as the basis of the following conclusions:

It is best to delay harvesting with a combine until the wheat is mature and dry. Spring wheat in the field in the central Northwest absorbs moisture at night and is seldom dry enough to harvest before 11 o'clock or noon. Always delay harvesting after a rain until the grain is dry. Wheat that contains more than 14 per cent moisture cannot be considered as dry.

Immature, or damp, or weedy wheat cannot be stored with safety. Weed seeds in even fairly dry threshed wheat may cause spoilage in storage.

Properly constructed ventilators, open to the outside air and placed close together in a bin, will keep clean grain which contains only a slight excess of moisture from going out of condition in storage, but may not prevent spoilage if the grain is immature or damp or if the grain contains green weed seeds.

In the spring wheat area any wheat which contains more than 14 per cent moisture must be carefully watched while it is in storage.

Rely on ventilated bins only for wheat that is ripe, fairly dry, clean and sound. If only one of these essentials is lacking the wheat may spoil even in ventilated bins. The higher the moisture content of the grain the greater will be the danger of spoiling while it is in storage.

Some farmers using the combine have found a way of meeting these problems. A windrower attachment may be obtained to be used with the combine. The windrower cuts the grain high and lays it in a windrow on the stubble in the middle of the swath. When the grain has been cured a combine with a pick-up attachment is used to gather and thresh it.
The Webworm, Too, Teaches Early Planting and Thinning

By C. S. Campbell

A good beet farmer, willing to swap experiences with fellow growers, L. E. Clemments, of Morrill, Nebr., permitted the taking of these two pictures in his beet field. Number 1 was taken about 20 feet to the right of Number 2 picture.

The damage done by the webworms in Number 1 is plainly visible. This portion of the field was thinned later than the other shown on the left of the man standing in Number 2. The early-thinned rows were hardly damaged by the worms.

Webworm moths seem to lay their eggs where the foliage is heaviest, where the future eating is likely to be best. The un-thinned beets offered the best feeding ground for the worms.

If the entire field had been thinned early the moths would have laid their eggs around the edge of the field, in the weeds, and spraying could have been done there with very little damage to the beets.
Colorado Proves It Can Grow Corn

Morgan County Grower Realizing Big Yield on Field Following Beets in 1927

By C. M. SNODGRASS

Twelve feet high and a hundred stalks of corn to a hundred feet of row—with a good looking beet field in the foreground.

MORGAN county is proud of her various crops and the corn crop this year can well make farmers of the Corn Belt take their hats off to this irrigated section.

I have been asked to tell something of the manner in which I handled my corn this year with the thought that the information might be of use to some of the “Through the Leaves” readers.

I have a field of about 19 acres of corn that was plowed about the first of March. This field was in beets in 1927. I plowed it as deep as I do for beets and harrowed and packed the ground in the same manner as for beets. I finished planting on May 5th and used an average of 9 pounds of seed to the acre.

I bought certified Minnesota No. 13 seed corn and would suggest that it is a wise plan to buy certified seed as you are certain you are planting seed of good germination and a true-to-type corn. This strain of corn has a very small cob with long ears well filled to the tip. (See Photo.)

I generally irrigate the first time
when the corn is starting to shoot and then again about three weeks later. I believe in cultivation and at the proper time.

Several persons have looked at the corn and estimate the yield at from 75 to 80 bushels. The corn stands about 12 feet high and will average around one stalk to the foot. I would think that for feeding it would make 7 or 8 tons of stover and ears taken together when cut.

Will Feed Lambs

The corn will be cut and run through an ensilage cutter and thence into a hammer grinder. The bur grinder probably would not need the ensilage cutter to chop the corn up, but with the hammer grinder it is almost a necessity if a lot of corn is to be ground.

We have 4,500 lambs contracted and about 2,000 head will be fed the ground corn and perhaps some cattle will be fed out on the ground corn. The lambs will be started on a light grain ration of either corn or barley and then the fatter lambs picked out and put on the ground fodder ration. From what I can learn from other feeders the ground corn fodder ration has proven quite economical for lambs. The ground corn is self-fed in connection with grain fed in troughs.

Vitamin E in Cow Breeding

Dairy Science Association Gives New Pointers for the Dairymen

The skeptics and probers of the dairy industry met recently in the annual conference of the American Dairy Science Association. They drew the curtain aside on what the lay farmer may be doing and thinking a few years hence.

From the New Jersey Agricultural Experiment Station came results of six rations fed different groups of heifer calves, with superiority in maintaining normal height and growth going to the following mixture:

- 100 pounds yellow corn meal,
- 150 pounds ground oats,
- 50 pounds wheat bran,
- 50 pounds linseed oil meal,
- 50 pounds soluble blood flour, and
- 3 per cent minerals.

These calves were weaned from milk at 30 days of age.

Vitamin E was found to be a vital factor in breeding. If the ration is short in this vitamin it is likely that breeding difficulties will be common in the herd, University of Nebraska agricultural teachers stated.

Feeds rich in vitamin E include whole wheat, ground wheat bran, and sprouted oats. Ground oatmeal contains a small amount and alfalfa leaves and yellow corn are only moderately rich in this vitamin.

An explanation was given for the occasional appearance of an appetite for hair and wood in a calf herd. Men from the Michigan State College told of experiments which showed the necessity of a ration containing coarse feed in the form of ground corn cobs, oat hulls, hay or grass to prevent the depraved appetite for wood and hair.

"Man cannot live by bread alone," and cattle cannot live by grain alone.

Within any breed the larger cow is the better producer and more profitable animal, according to U. S. Department of Agriculture surveys.
Another Month of Irrigation to Boost the Beet Check

With harvest beginning October 1, a month remains of the irrigation period, on most fields. This affords time to apply certain fundamental principles in the crop's use of water.

1. For every pound of dry substance the beet uses 397 pounds water.

2. An average 15-ton beet crop uses 15½ inches water.

3. Out of 397 pounds water entering the beet roots 392½ are evaporated through the leaves; 2 pounds are consumed in the foliage and 2½ pounds in the beet itself.

4. This water is essential to carry nitrogen, potash and phosphorus which feed the plant through the roots. Sufficient moisture to keep the plant from wilting is essential so that the leaves may properly perform their function of "breathing" by which carbon dioxide enters into the sugar-making process.

In the same neighborhood, with farms and field methods otherwise alike, growers who understand these facts of irrigation still show differences in applying them. Some irrigate more frequently than others, with amount of water per irrigation also varying.

Under normal rainfall conditions tests have indicated material advantage in frequent light runs. Utah experiments showed:

- 2-inch irrigation WEEKLY produced..............19.8 tons
- 4-inch irrigation alternate weeks.............18.9 tons
- Three 5-inch irrigations 2 weeks apart.......17.7 tons
- Three 5-inch irrigations 4 weeks apart.......17.3 tons

Trials at our Longmont Experiment Farm showed the following variations in yield from differences in the number of irrigations:

- 2 irrigations ........................................16.3 tons
- 3 irrigations .......................................17.1 tons
- 5 irrigations .......................................18.3 tons

There is more tonnage, a larger beet check, to be made by close attention to the beet crop for the next month.
“Why” of Irrigation Dominates Beet Tours
Advancement of Program Enthusiastically Received by Growers Attending Annual Inspection Meetings

The “WHY” of early and frequent irrigation stood foremost in the addresses and fields examined during the recent beet tours. With the opening of the tours in the Colorado district of The Great Western Sugar Company, N. R. McCreery, District Manager, reported greater enthusiasm than in any previous year.

As a result of the year's program irrigation began a week to ten days earlier than usual, and fields studied on the tours gave every indication of increased tonnage. This was considered excellent progress with view to the fact that excess precipitation in June caused some growers to lean toward the erroneous position that rainfall is a substitute for irrigation.

How early irrigation brings about earlier maturity and lengthens the ripening period was stressed in addresses by Asa Maxson, in charge of the Company’s Longmont experimental station, Hugh Scilley, Manager of the Loveland factory and Mr. McCreery. As in the past, addresses were given at noon following motor tours of inspection during the morning in the various factory districts.

The “WHY” of irrigation as explained by Mr. Maxson told of the method of feeding plants by the dissolving of the elements of plant food in the soil to make it available for the use of the beet. The quantity of water necessary to be taken up through the roots of the beet for each 1 lb. of dry substance of final product was shown to be 397 lbs., this water being drawn through the roots and evaporated through the leaves.

The function of the leaves in drawing carbon dioxide from the air into the plant was also explained. When leaves are allowed to wilt, they do not draw the carbon dioxide, and by reason of the lack of moisture in the soil for dissolving the plant food, there is no growth taking place. The beet stores up its energy during the day and makes its growth at night. If the leaves wilt down during the day, when the storing up process should be taking place, then at night there is no food available for growth. It is necessary that sufficient moisture be in the soil to dissolve the plant food and keep the leaves in a strong, vigorous condition at all times, if growth is to occur.

It was also explained that frequent and lighter irrigations keep the soil nearer to a proper moisture content than is possible with heavy irrigations at longer intervals. The heavy irrigation means that there is more moisture at one part of the period than is necessary, which is somewhat detrimental to the plant, and towards the end of the period prior to the application of water there is lack of moisture.

Many fields in some of the districts visited have been irrigated as much as five times this season. In the Eaton district, which is noted for its large tonnage production, the more frequent irrigations are practiced much more generally than in any of the other factory territories.

Carloads of Competition

Twenty freight trains were required to transport machinery of a new sugar plant costing $2,000,000, to its site in the Philippines recently.—N. Y. Telegraph.
Delay in Planting May Cost This Grower 5 Tons Per Acre

Release Forced by Court Decision Came Too Late for Best Yields This Year

Planted by April 26

What a whale of a difference three weeks in the planting dates of these two crops made in the probable yield!

Five tons per acre, neighbors estimate.

Only an irrigation ditch divides the two fields. The contrast in their appearance is mainly due to the difference in planting time. On Number 1 field planting was completed by April 26. Number 2 field was planted by May 16.

Number 1 grower was in a position to plant his beets when he pleased. Number 2 grower waited until after a federal court decision released him.

The difference in planting dates caused a succession of differences in the subsequent field work. Thinning was commenced on Number 1 field May 25 and on Number 2 field about June 10. The first irrigation on Number 1 field was started July 12 and completed July 19, whereas on July 25 the Number 2 field had not yet been irrigated. In fact, second hoeing had just been completed.

Planted on May 16. Both Pictures Were Taken Last June 27.
Rotation Becoming Community Custom

Acreage of Successive Years in Beets Shows Sharp Decline in Colorado

How sound cultural practices, rewarding the farmer over a period of years, soon become deep-rooted customs is illustrated nowhere better than in the increasing tendency to rotate crops intelligently in territory served by The Great Western Sugar Company.

In northern and eastern Colorado rotation is general. The fellow who plants beets after beets in successive years is becoming the exception. Profiting by the experience of others, even new growers are aware that it's better to accept rotation as a profit-making principle long before it is necessary to adopt rotation as a defense against pests and losses.

That the beet crop and all crops are most profitable when grown in a clearly planned cropping system, is brought out in a recent survey of the Company's Colorado district. Note the diminishing acreage of beets that follow beets.

<table>
<thead>
<tr>
<th>Year in Beets</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>81,696</td>
</tr>
<tr>
<td>2nd</td>
<td>39,245</td>
</tr>
<tr>
<td>3rd</td>
<td>19,606</td>
</tr>
<tr>
<td>4th</td>
<td>6,780</td>
</tr>
<tr>
<td>5th and more</td>
<td>7,158</td>
</tr>
</tbody>
</table>

It is gratifying to note that, while some growers are forced to rotation by nematode infestation, a far greater number rotate their crops because it is simply common sense—a good farm practice that means increased yields of all crops.

Rotation is constructive agriculture. Scientific rotation marks one of the great lines of distinction between the shiftless farmer who is just getting by and the aggressive grower whose place is a pride to himself and his community.

Planting time is not the time to figure out a cropping plan. That's the way it used to be in the old "horseback" farming days, when the farmer and his help would go out some morning in the spring and say: "Well, what do you say we put in some wheat there, and some corn there, etc?"

Volumes of data are today available on rotation. This information cannot be applied indiscriminately. Each farm needs its own interpretation. The fieldman, with a complete crop history of every beet farm in Great Western territory, is in a position to consult with the grower on cropping plans. No hit-and-miss, last minute planning widens the margin of profit.

Next year's cropping plan should be considered now; fall work should be done wherever suitable.
Area: -3%
Value: -18%

On three and one-third per cent of the cultivated area devoted to principal crops in Colorado during 1927 the sugar beet crop produced nearly 18 per cent of the total farm crop values.

The U. S. Department of Agriculture's Colorado cooperative crop reporting service makes this fact known in its annual review of agricultural statistics.

Of a total crop value of $132,316,000 sugar beets and tops returned farmers $23,405,000. This came from 218,000 irrigated acres in beets out of a total of 6,621,000 acres cropped lands, dry and irrigated. The Great Western Sugar Company’s payment for beets grown in Colorado last year was $19,765,016, or practically 90 per cent of the aggregate beet payment in the state.

Forty-five per cent of Weld county’s total farm crop values came from sugar beets although this crop was grown on only little more than 12 per cent of the land.

From fifteen and one-half per cent of Larimer county’s cropped area, the portion in sugar beets, the crop returned forty-one per cent of the total value of farm products.

In Morgan county forty-seven per cent was the beet’s contribution from 12 per cent of the cultivated land. Other leading beet-raising counties showed similar proportions.
Making Money on a Poor Stand

How Selective Spacing by a Four-Time Prize-Winning Thinner Increased One Grower's Stand from 67 Per Cent to 92 Per Cent

By M. S. CLEMENT

Selective spacing, which is just another way of saying "making the most of a poor stand" has increased the yield by more than three tons per acre on this field of W. W. Brown's over what might have been harvested after routine, unintelligent thinning.

REGARDLESS of how thoroughly the seed bed is prepared, or how carefully the beets are planted, or how favorable are the germination conditions, there are by thinning time many beet fields which have poor stands for the beet labor to work on. This unsatisfactory condition may be brought about by hail, crust, wind, cutworms or a number of circumstances. Nevertheless the field with the poor stand of unthinned beets is with us every year.

It has been realized more and more of late that the disadvantage of many of these poor stands can for the most part be overcome by a more careful and a more selective type of spacing by the beet labor.

The accompanying picture shows an example of this kind of work. This field had a poor stand for the labor to work on. If the spacing had been done automatically with the idea of leaving a beet every 12 or 14 inches, an 18 inch stand, or 67 beets per hundred feet of row would have been left.

But by careful selective spacing there was actually
left as is shown in the picture 92 beets per hundred feet of row; or figuring on the basis of 20 in. rows, 6,500 more beets per acre. If the average weight of the beet was one pound, which is a conservative figure, the selective thinning has increased the yield on this field 6,500 lbs. or 3½ tons per acre.

The large spaces which occur at intervals between the beets in the row, which are shown in the picture, as well as in the neighboring rows, give the beets which have been left close together ample space for expansion and normal growth.

This picture was taken in one of W. W. Brown's beet fields at Sterling, Colorado. The work was done by Pedro Landin and his family who have been awarded their fourth consecutive prize for high grade beet work.

This type of spacing has been advocated and practiced for a number of years by Mr. Brown in fields which have had a poor stand. That Mr. Brown's average beet yield for the past five years is one of the highest in eastern Colorado is some evidence as to the wisdom and practicability of selective spacing.

Wait Till September 10 to Plant Winter Wheat

Wheat farmers are being urged not to plant their winter wheat too soon this fall, in order to avoid the ravages of foot rot which was so prevalent last year. This is a hot weather disease and if the seed is planted during the warm days of late August and early September the chances are very favorable for the development of the spores with further disastrous results.

"Plant wheat from September 10 on," says Alvin Kezer, professor of agronomy at the Colorado agricultural college, "and the danger from foot rot will be very slight under normal conditions."

What Is a Rich or Poor Soil?

In the soil the plant foods are in an available and unavailable condition. They can diffuse into the plant or they cannot enter the plant. A soil may contain all the essential elements of plant growth but if they are not in a condition ready to be taken up by the plant roots in the needed amount the result is about the same as if the fertility was not in the soil. The unavailable or insoluble elements may be liberated to plants by the addition of organic matter in the form of green manures and barnyard manures, plant roots, stubble and leaves.
A ROUND VIEW
of America's Beet Sugar Industry

By Harry A. Austin

The domestic beet sugar industry furnishes a remunerative, cash-paying crop to approximately 100,000 American farmers, the minimum unit price of which is guaranteed before the seed is planted. Above and beyond this, the farmer shares in the net proceeds from the sale of the sugar manufactured from his beets.

The industry gives employment to nearly 75,000 farm laborers during the growing and harvesting season. It employs about 35,000 technicians, mechanics and agriculturists in and about the factories.

It annually distributes to American farmers from $40,000,000 to $60,000,000 for beets. It produces over seven million tons of beets grown on approximately 800,000 acres.

It produces a farm crop from American soil valued at over $120,000,000, the proceeds from sale of which are all distributed to American farmers, American labor, and American industry.

It pays annually to the railroads for freight from $20,000,000 to $25,000,000. It pays annually in salaries and wages over $20,000,000. About $20,000,000 are annually expended for supplies, such as machinery, coal, coke, lime-rock, bags, chemicals, etc., all products of American industry.

Aside from these benefits, the domestic beet sugar industry might be likened to an accident insurance policy. We never fully appreciate the value of such a policy until an emergency occurs, and then its benefits stand out in bold relief. So with the domestic sugar industry. When plenty of sugar is available and the price is low, little thought is given to the economic value of the industry by the public.

But when emergencies arise, as in 1911, 1917, 1920, and at other times, the value of producing on American soil at least a sufficient quantity of this necessary food commodity to stabilize the price and protect the consumer from extortion by foreigners, becomes instantly apparent.
Yields of Beets Following Alfalfa in the Colorado District, 1927

By the Statistical Department, Great Western Sugar Company

In all discussions of crop rotations suitable for the beet growing farms in the territories served by the company, the matter of the proper place for the leguminous crop to take in the rotation has been a rather difficult question. The basic rotation is alfalfa (or sweet clover), beets and small grain. Theoretically the rotation of crops in the order named is good but in many cases very poor results are obtained from beets after the alfalfa or sweet clover. However, as there are a number of growers every year who raise high yielding beet crops on such fields, it was thought that a study of tillage practices followed by growers who raise beets after alfalfa or sweet clover might show what practices produce the good results.

During the 1927 season detailed records were kept by the Colorado fieldmen of all beet fields planted after alfalfa where it was possible to obtain accurate yield figures. The results of the study of these records are shown in this report.

Beets After Alfalfa

589 fields of beets following alfalfa, totaling 8432 acres, were included in this investigation. The average yield was 13.85, which was ⅓ ton per acre higher than the average yield for the whole Colorado district.

A study of the recapitulation of the results shown in the following tables, brings out the fact that fall preparation of alfalfa ground produced the best beet yields, and, as was to be expected, permitted of earlier planting, a factor that also worked to produce higher yields.

Spring crowned, spring plowed alfalfa ground yielded better than alfalfa ground that was not crowned but was plowed once in the spring.

Further study of each class of alfalfa ground again brought out the extreme importance of planting early to obtain high yields after alfalfa. Beets after alfalfa planted before May 1st outyielded beets after alfalfa planted after May 1st, from 1.5 to 2.0 tons per acre.

The practice of plowing under a considerable growth of alfalfa in the spring preparatory to planting beets is, in general, not safe in a normal year, as there is a great probability of such beets being very low in sugar content. Experiments have shown that an excess of green manure has a tendency to depress the amount of available

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nitrogen in a soil for six or eight weeks after the time the green manure is plowed under.

With late planted beets this means that if the beets are not kept growing rapidly until such time as the heavy supply of nitrogen becomes available, the application of a late first irrigation will stimulate excessive top growth during the time when the beets should be storing the maximum amount of sugar.

### Beets After Alfalfa—Colorado District 1927

<table>
<thead>
<tr>
<th>Method of Handling</th>
<th>No. of Fields</th>
<th>Total Acreage</th>
<th>Average Yield</th>
<th>Average Date of Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Crowned-Fall Plowed</td>
<td>8</td>
<td>107.96</td>
<td>17.13</td>
<td>April 17</td>
</tr>
<tr>
<td>Fall Crowned-Spring Plowed</td>
<td>98</td>
<td>1571.64</td>
<td>14.68</td>
<td>April 29</td>
</tr>
<tr>
<td>Not Crowned-Fall Plowed</td>
<td>31</td>
<td>473.99</td>
<td>14.11</td>
<td>April 11</td>
</tr>
<tr>
<td>Spring Crowned-Spring Plowed</td>
<td>149</td>
<td>2363.82</td>
<td>14.10</td>
<td>May 4</td>
</tr>
<tr>
<td>Not Crowned-Spring Plowed</td>
<td>303</td>
<td>3914.54</td>
<td>13.25</td>
<td>May 3</td>
</tr>
<tr>
<td><strong>Total and Average</strong></td>
<td><strong>589</strong></td>
<td><strong>8431.95</strong></td>
<td><strong>13.85</strong></td>
<td><strong>May 1</strong></td>
</tr>
</tbody>
</table>

**FALL CROWNED-SPRING PLOWED**

- Planted Before May 1: 57, 876.04, 15.56
- Planted after May 1: 41, 695.60, 13.58
- Tillage rated as good: 81, 1321.64, 15.04
- Tillage rated as fair: 13, 207.03, 13.21
- Tillage rated as poor: 4, 42.97, 10.79

**SPRING CROWNED-SPRING PLOWED**

- Planted Before May 1: 63, 845.36, 15.03
- Planted after May 1: 86, 1518.46, 13.58
- Tillage rated as good: 110, 1649.85, 15.31
- Tillage rated as fair: 24, 467.61, 11.54
- Tillage rated as poor: 11, 205.16, 10.86
- Character of Tillage not specified: 4, 41.20, 10.65

**NOT CROWNED-SPRING PLOWED**

- Planted Before May 1: 148, 1792.08, 14.28
- Planted after May 1: 155, 2122.46, 12.39
- Tillage rated as good: 195, 2572.80, 14.22
- Tillage rated as fair: 82, 985.98, 11.82
- Tillage rated as poor: 21, 310.76, 9.75
- Character of Tillage not specified: 5, 45.00, 13.95

On account of the high yields of beets after alfalfa in the Prospect Valley Territory we show here the results of a special study that has been made:

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Beets After Alfalfa—Prospect Valley 1927

<table>
<thead>
<tr>
<th>Station</th>
<th>No. Acres</th>
<th>Average Yield</th>
<th>No. Fields</th>
<th>Avg. Acreage per Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roy</td>
<td>131.2</td>
<td>17.47</td>
<td>7</td>
<td>18.8</td>
</tr>
<tr>
<td>Hudson</td>
<td>131.1</td>
<td>16.81</td>
<td>10</td>
<td>13.1</td>
</tr>
<tr>
<td>Keensburg</td>
<td>177.1</td>
<td>16.20</td>
<td>6</td>
<td>29.5</td>
</tr>
<tr>
<td>Krauss</td>
<td>135.7</td>
<td>16.54</td>
<td>7</td>
<td>19.4</td>
</tr>
<tr>
<td>Sheehan</td>
<td>181.5</td>
<td>15.84</td>
<td>13</td>
<td>14.0</td>
</tr>
<tr>
<td>Sloan</td>
<td>289.6</td>
<td>17.64</td>
<td>10</td>
<td>29.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1046.2</strong></td>
<td><strong>16.82</strong></td>
<td><strong>53</strong></td>
<td><strong>19.7</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method of Handling</th>
<th>No. Fields</th>
<th>Total Acreage</th>
<th>Avg. Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Crowned-Fall Plowed</td>
<td>1</td>
<td>13.2</td>
<td>21.63</td>
</tr>
<tr>
<td>Fall Crowned-Spring Plowed</td>
<td>16</td>
<td>355.8</td>
<td>17.72</td>
</tr>
<tr>
<td>Spring Crowned-Spring Plowed</td>
<td>16</td>
<td>275.5</td>
<td>17.18</td>
</tr>
<tr>
<td>Not Crowned-Spring Plowed</td>
<td>20</td>
<td>401.7</td>
<td>15.60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53</strong></td>
<td><strong>1046.2</strong></td>
<td><strong>16.82</strong></td>
</tr>
</tbody>
</table>

It will be noted that the results in the Prospect Valley were consistent with the results in the whole Colorado District in that they show the advantage of fall work. Here, also, the beets following alfalfa plowed once in the spring were the lowest yielding.

Soft Corn Tested for Cattle Feeding

THE Agricultural College of Illinois tested soft corn for cattle feeding. A frosted crop in 1924 made the best trial although the experiments began in 1916. In those years cattle were fed in several ways on soft corn. Some was fed as shocked corn, some as standing corn pastured in the field, and some of the ears taken from the stalks were made into ear-corn silage.

In all but one of the experiments the cattle were well fed on preserved soft corn and made satisfactory gains. The best combined gains on cattle and hogs together per acre of soft corn showed the following rank:
1. Ear corn silage.
2. Shocked corn.
3. Corn left in the field and husked as needed.
4. Standing corn pastured in the field.

"Cattling down" the standing corn in a soft corn season resulted in much waste that did not seem to be recovered well by the hogs following the steers.

Gains on soft corn rations were not as rapid as on sound, mature corn, but considering the efficiency with which the dry matter in the corn was utilized, they were just as economical. However, it must not be forgotten that upon examination in the packing house the quality of beef from sound corn steers was superior to that from soft corn steers. The firmness and the marbling in the meat were better from sound corn than from soft corn, but the palatability and the chemical content of the meat were no different.
Early Planting—Early Irrigation
Compared With
Late Planting—Late Irrigation

By THEO. STEVENS, Sterling, Colorado

In the territory north of Sterling and adjacent to the Minto dump, there are two fields of beets being grown side by side. Only a road separates them. In character of the soil and the slope of the land these fields are the same. Both previously have been handled in practically the same manner. One field was in grain last year, heavily manured and plowed in the spring. The other was in grain two years ago, beets in 1927, heavily manured and plowed this spring.

On the 6th of August when this picture was taken, these fields looked much alike from the road. However, upon closer examination it was found that there was a remarkable difference in the size of the beets in the two fields. This striking difference in size is the result of a month's difference in the time of planting.

The field to the left of the road was irrigated early in April and planted on the 10th of April. The other was planted on the 12th of May and not irrigated. The early beets were thinned by the 20th of May and the late beets were not finished until June 20.

A sample of six consecutive beets in a representative row was taken from each field. The six beets on the left of picture were taken from the late-planted field, and the six beets at the right were taken from the early planting.

The average weight of the early beets without tops was 18 2-3 ounces and that of the late beets 5 5-6 ounces, or over 3 times as much weight in the early planted beets. The weight of the tops taken from the big beets was twice that of the late planted ones. Several counts of stands were taken in each field and it was found that there was also a big difference there. The average stand of beets in the early planted field was 83% while the other was 72%.
The small beets besides showing the effects of delayed planting also suffered from lack of timely regular summer irrigation. The larger beets came from a field which was twice irrigated in July whereas the other field was first irrigated in August.

So many growers still have the mistaken idea that beets should not be irrigated when small. This mistake carries over into late-planted fields, irrigations generally being delayed on the late plantings whereas they above any other class should be irrigated early in order to make up, in part, for the loss in tonnage due to their late start.

Production of High-Grade Alfalfa

PURITY, a high percentage of leaves, clinging foliage, green color, and pliable stems are the essential characters of high-grade alfalfa. The experience of Federal hay inspectors is that the most common causes of low-grade alfalfa are meadows with thin stands, foreign material in the form of partly decayed raking, weather damage, over-ripeness at time of cutting, overdrying, baling undercured hay, stacking distinctly undercured hay, and baling during very hot, dry, or windy weather.

In most instances alfalfa intended for market should be cut when one-tenth to one-fourth in bloom, or when new growth starts from the crowns irrespective of the bloom. There will be little, if any, increase of tonnage gained by allowing the crop to stand longer. At this stage of maturity the leaves usually constitute anywhere from 45 per cent to 55 per cent of the total weight of the plants, and the stems have not become objectionably hard and woody. The grade of U. S. No. 1 alfalfa can be attained in practically all alfalfa districts of the United States when crops are cut at this stage of maturity, providing the hay is properly cured and baled and not subjected to much damage from the elements.

Essential points in preserving leafiness and color and preventing overdrying are (1) to facilitate rapid evaporation of a large part of the moisture in the newly mown hay by exposing it to the sun and wind in the swath where the rate of evaporation is faster than in the windrow, bunch, or cock, and (2) to perform the operations of raking and windrowing while the hay is tough and the leaves are not easily shattered.

The side delivery rake is specially adapted to making windrows of wilted and tough alfalfa that will aerate and cure uniformly with the minimum loss of leaves and color. Average crops of alfalfa hay wilted in the swath will cure almost as quickly in side-delivery rake windrows as though fully cured in the swath and the grade of the hay is much superior. The side-delivery rake is an essential machine in the production of high-grade alfalfa.

Some of the highest grade alfalfa comes from districts where the hay is put up in large stacks with sleds and a derrick and then allowed to sweat prior to baling.—New Reclamation Era.
TAKE CARE OF YOUR BEET TOPS

By John Comer
Agricultural Superintendent, Fort Collins and Windsor

Owing to the scarcity of hay this fall it behooves every grower to care for his beet tops in the best possible manner. Their feeding value depends on it. Experiments at government stations show that one acre of properly cured tops is equal to one ton or more of alfalfa hay.

The best method to cure them is to let them stay in the windrow until thoroughly dry.

If the tops are to be pastured in the field they may be bunched with a fork into small piles after they are well-cured in the windrow.

If it is desired to haul the tops into the feed yard for later use, this can be done by stacking with alternate layers of straw or hay. This not only preserves the tops but also makes the straw or hay of better feeding value.

Tops stacked in this way will let a grower with a limited amount of pulp carry his stock through a longer feeding period and until finished, as the tops fit in very well with either pulp or silage.

1. Plan to care for your beet tops.
2. Let them dry in the windrow.
3. Cure the tops as carefully as possible.
4. Do not haul and pile green tops in the feed yard.
5. Stacking with straw or hay will keep them for later feeding.
Conservation of Manure
By H. S. VARNER, Loveland, Colorado

No doubt you may think that our growers are doing about all they can toward manure conservation but our figures on the numbers of live stock fed and the acres manured show that there is a waste of manure somewhere. Also from the study of the composition of manure and the fermentation of manure, one can readily see that a great waste occurs unless the handling is done carefully. How can we best handle manure under Colorado conditions, so as to have the least waste?

Some writers favor hauling the fresh manure directly to the field. Dr. Headdon claims that under our conditions the fresh manure does not rot and produces what is designated as "burning," by which is meant that the manured land dries out quickly and the crop suffers.

A German authority, Stutzer, has the following to say regarding this subject: "Fresh manure, especially where straw or similar material has been used for bedding, contains a great deal of carbonaceous material, such as starch, cellulose, and the like, which is decomposed by many kinds of bacteria. It happens that those bacteria that destroy nitrates require an abundance of food of this kind. Nitrate-destroying bacteria are abundant in the soil. It is therefore highly important that before manure is applied to the soil it should be properly fermented in order that before nitrate formation in it becomes active the carbohydrates, cellulose, etc. should be fermented out of it.

Both experiment and farm experience have shown that the best results with manure are obtained by keeping it under cover and well tramped and sufficiently moist to permit bacterial activity in it for a few months before spreading it on the fields. Where it is necessary to put fresh unfermented manure on the land, the best plan is to spread it on in the fall and then disc it in or plow it in shallow in order to mix some soil with it, so that the carbohydrates and cellulose may be largely broken down before active nitrate formation begins with warm weather in the spring."

Under our feed lot conditions, it is best to leave the manure untouched until one is ready to haul it to the field. Aerating the manure causes losses in plant food. Keep the manure packed and, if possible, moist. If it is necessary to clean out the feed lot before the manure can be spread on the field, then put it in large piles, well compacted and make the top hollow so it will catch and hold whatever moisture may fall.

Most authorities claim that the liquid manure contains approximately 50 per cent of the value of the whole manure. One simple way of conserving at least a portion of this liquid manure would be to use more straw for bedding. Straw will absorb from 2 to 3 times its weight of water and the straw itself contains elements of fertility. Some farmers use their straw efficiently, but feeder after feeder has not enough straw in his corrals to provide a good bed for his cattle.

Locating the corral properly is another method of saving manure. Oftentimes a corral is placed on a side hill in order to have
good drainage. This is fine from the standpoint of having a dry corral, but from the standpoint of producing and conserving more manure, it would be better to have a flat corral and then use plenty of bedding to keep the animals clean. If it is absolutely necessary to have the corral on a side hill then some loss can be overcome by building a wall on the lower side or by throwing up a dike of dirt to hold back the liquid manure. In the low spot plenty of straw should be used to absorb all the liquid manure.

The Time Is Here.....

Need of More Humus in Our Soils a Pressing Problem

E VERY farmer looks with favor upon dark colored soils. They are usually fertile soils and when well drained are productive. A dark soil is one rich in organic matter or humus, the latter being organic matter after it has reached a certain stage of decay and is ready to give up some of its soluble plant food to growing crops.

Soils that are comparatively rich in humus are also retentive of moisture. They do not dry out so quickly as those deficient in this constituent. They are also mellow, so to speak, and easily pulverized. Many of our soils are very deficient in humus and should be treated accordingly.

Barnyard manure is a splendid fertilizer, partly because of its content of organic matter. The trouble is that too little of it is produced on the average farm to keep the soil in a high state of cultivation. For this reason an effort should be made to add organic matter to our soils. While there are farms here and there that do not suffer for lack of organic matter, farms on which all crops are fed to live stock in large quantities of purchased grain in addition, they are few and far between.

The best crops to turn under for increasing the organic matter of the soil are legumes, such as the common clovers, sweet clover, soybeans, etc. They not only furnish organic matter but also large quantities of nitrogen, the most expensive element of plant food we have.

The need of legume crops for soil building purposes has been emphasized for scores of years in this country, yet they have been used comparatively little in many of our states. This is not because our farmers are ignorant of the value of legumes, but rather because their need has not been greatly felt in these states till the last 15 or 20 years and it takes a long time to inaugurate new practices.

The time is here, however, when neglect in growing legumes on a very much larger scale than has been the case in the past, must be remedied if we are to maintain the production not only of crops, but also of live stock on a profitable basis.—The Wisconsin Farmer.
A Little Known Reason For Crop Rotation

Once-living materials, such as plants, roots, manure, crop residues, and green growth, when returned to the soil furnish its so-called organic matter or humus. Fertile elements in organic matter made available by decay, by the action of bacteria, etc., in the soil, and in a soil solution that can be taken up through the plant root hairs play a vastly important role in crop yields.

But—organic matter is lost through cultivation. The microscopic forms of bacteria and other organisms in the soil, which break down soil fertility and make it available to plant roots, are more active where the land is cultivated, aerated, and put in fine tilth.

Rotation is necessary to put this cultivated land back into sod or grass crops. A period of no cultivation tends to restore the humus in the soil. Thus in part, for example, do the roots of alfalfa and sweet clover restore humus to the soil. Turning under green growth has a like effect; also manuring.

For years the agricultural department of the sugar company has discouraged one-crop farming, constant "beeting" of the same field. The company has urged rotation.

To disregard the laws of chemistry in extracting sugar would mean failure in our factories. A disregard of the principles of science will ultimately spell low yields and failure in farming.
Thinning Prize Awards for 1928

By C. V. Maddux
Labor Commissioner, Great Western Sugar Company

Gold buttons and prize certificates were awarded during August to selected beet labor in all Great Western factory districts. Excellence in thinning was the main basis for awarding the prizes. That, of course, includes stand, how closely the labor came to carrying out the grower's instruction for spacing, and leaving the "big beet" in the blocked bunch.

Those points are tonnage producers, as all growers well know. That is the chief purpose of the sugar company's prize system for beet workers. It is just one part of the larger plan for getting "Another Ton Per Acre." Grower, labor and company profit by the increase in production, if made at not too great a cost.

Fifteen per cent of the entire body of contract beet workers were given prizes this year, 1140 winners all told. It was often difficult to pick the winners because so many other workers merit consideration.

To labor who have won one or more prizes in other seasons a "repeater" button, slightly larger in size and more ornate in design than the regulation button, was awarded this year for the first time. This is the fourth year of the labor prize system. Fifteen workers won their fourth consecutive prize this season. Many of them worked, during that period, under different fieldmen but the quality of their thinning was so outstanding that they repeated their victory.

Growers naturally prefer to hire prize labor, and especially the repeaters. Extra care at thinning is sure to increase the yield.

The awards were made at special meetings, either a dinner or a picnic. Growers, bankers and business men who attended heartily endorsed the project. At the largest meeting, Scottsbluff, addresses were made by the following guests of the occasion: Congressman Simmons, William Barbour, district representative in the State Legislature; A. Suffa, an officer in the First Trust Company of Lincoln, Nebraska; and three local growers whose labor won prizes, Messrs. C. A. Carroll of Lyman, J. R.
Russell of Mitchell and David Schlothouer of Gering.

Everywhere was the labor proud of the honor conferred. Several volunteered to express their appreciation by words, but all showed it in their countenances. Frequently, they mentioned that they never knew of another company to give recognition in this manner to field or other workers. Naturally their reaction to the prize system is of prime importance in the success of the plan.

Sweet Clover Pasture for Dairy Cows Approved by High Authority

"The pasture that will free the dairyman from much labor in the busiest season and supply abundant feed for his cows during the whole summer has been found in sweet clover," says Wilber J. Fraser, professor of Dairy Farming at the University of Illinois, writing in "The Dairy Farmer."

"The best variety is white biennial because it grows larger and roots deeper and furnishes more feed over a longer pasture season than the other varieties."

Sweet clover is not only a fine pasture crop but a soil builder at the same time. Many farmers practice the excellent plan of sowing sweet clover in all the small grain each spring, which gives a good acreage for pasture in the fall. Any not needed for pasture may be cut for hay in the fall or plowed under the next spring to enrich the soil.

Sweet clover should not be made into hay the second year, according to some authorities, because it makes coarse, stemmy hay and if not cured properly sometimes causes a disease which is fatal to cattle.

If cows are turned onto sweet clover pasture when the plants are young and tender, there is no difficulty about getting them to eat it after the first two or three days. Some cows have produced as high as 50 pounds of milk per day and a few as high as 60 pounds on sweet clover pasture alone without grain. But, of course, when cows produce more than 25 or 30 pounds of milk per day some grain should be fed.

It is important that the cows have a full feed of the regular ration to which they are accustomed before they are first turned onto sweet clover pasture. They should not be turned on until the clover is free from dew, and when they are once on sweet clover pasture, they should be kept on continuously night and day. This precaution in addition to keeping some dry straw or hay in the pasture and an abundance of water convenient so they can drink frequently will nearly always prevent bloat, and these same precautions will prevent sweet clover from tainting the milk.

THE GROCERY BOY TO HIS LADY FAIR

This thrilling love letter was found in a basket of beans: "Dearest Sweet Pea: Do you carrot all for me? My heart beets for you with your radish hair and your turnip nose; you are the apple of my eye. Give me a date. If we cantaloupe, lettuce marry. I know we would be a happy pear."—Hoard's Dairyman.
Rotation Effects

Certain general principles underlie crop rotations and result in a number of direct benefits to the farmer. These have been listed by Van Slike in "Fertilizers and Crops" as follows:

1—Rotation changes location of feeding range of plants.
2—Changes the demand for individual plant food constituents.
3—Makes most advantageous use of remains of preceding crop.
4—Provides economical supplies of nitrogen.
5—Maintains supply of organic matter in soil.
6—Keeps soil in good physical condition.
7—Provides advantageous means of utilizing both farm manure and commercial plant food.
8—Keeps the soil advantageously occupied with crops most of the time.
9—Prevents or reduces injury caused by poisonous substances in soils.
10—Aids in controlling injuries done by insects, weeds and fungi.
11—Prevents mixing of varieties, thus keeping the seed pure.
12—Often saves labor.
13—Systematizes farming.
If You Want Higher Yields Next Year

By JOHN COMER

Agricultural Superintendent, Fort Collins and Windsor Factories

EVERYBODY who is farming has one common interest. That is the securing of higher yields, not only on beets but on every crop that is grown. To this end, may we offer a few suggestions?

Preliminary work done this fall will have a big influence on the yield secured next year. A good many fields in grain this year will be planned for beets, corn or other cultivated crops next year. If you have any manure on hand, there is no better time in the year to apply this manure than immediately after the grain harvest.

After applying the manure, disc the field enough times so that you secure a real mulch on the surface. Let this lie long enough to sprout all shattered grain or weed seed and if moisture conditions are right, fall plow and work the field down until practically ready to plant.

It is particularly important that fall-plowed ground be well packed in the fall.

If no manure is available, by all means disc the field anyway so as to secure the mulch on the surface. This discing is beneficial in several ways. There is probably nothing that sets a beet crop back and stunts the growth of the beets in the spring more than a foul field. Weeds, volunteer grain and wild oats sap the moisture, rob the soil of plant food, stunt the beets and make it impossible for the hand labor to do a good job.

Discing in the fall will cover all this seed and if sufficient moisture is in the soil, cause it to sprout. If there is not enough moisture at time of discing, the first shower will sprout this seed. This should give a clean field the next spring.

Not only will the discing help towards a clean field, but mulching the surface as soon as possible will help save what moisture there is in the soil and fix the ground in shape to get the full benefit of what moisture may fall. This is a great help towards getting the right conditions for fall plowing and if the field is not plowed until spring, will give a much better seed bed. If there is any delay in getting the grain off the field, the ground can sometimes be disced between the shocks. In any event the discing should not be delayed.

Fall plowing is beneficial on the majority of the soils in the Fort Collins district, providing moisture conditions are right at the time of plowing and if the ground is worked down immediately after plowing so as to hold the moisture. If the soil is dry and it turns over cloddy, it might prove anything but beneficial. A field plowed cloddy in the fall is very apt to give a dry cloddy seed bed in the spring unless we have a wet winter.
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The Great Western Sugar Co., Longmont, Colo.
THROUGH THE LEAVES

OCTOBER, 1928

THE GREAT WESTERN SUGAR CO.
WE ARE engaged in and are a part of a tremendously interesting and important business, one that I consider sound as measured by any economic or social standard. When I speak of the sugar business I mean the whole process from the planting of the seed to the delivery of the finished food.

It is one of basic production, and when it makes a profit that profit is created and not taken from somebody else. We are doing a fundamental, necessary thing—furnishing food to the human race.

If the industry prospers, the community in which it is established, and the nation where it exists also prosper. That is not true of all kinds of so-called business activity.

The sugar business has many departments separate and distinct in certain respects and yet closely interrelated and interdependent in others. The intensity of competition makes necessary a thoroughgoing harmony among these various departments or branches to insure survival in the struggle. Wise leadership and intelligent teamwork are required.

I believe that a purely materialistic aim does not insure the prosperous development of an industry or business. Speaking for this company, I believe that our ideals are sound and because they are we are going to make achievements and profits as a by-product, if you please, of those sound ideals.

—Excerpts from address by W. D. Lippitt, general manager, to the Windsor Factory organization, September 20, 1928.
Editor’s Notes

Some Wisconsin farmers have been probing their corn silage costs. Twenty-seven with an average yield of 4.16 tons of silage per acre produced that silage at $6.50 per ton. But thirty other farms with an average yield of 7.57 tons per acre made it at $4.50 per ton.

It cost $7 an acre more to grow the good yields but the cost per ton was lessened by over 30 per cent. Cost per unit is almost always higher with low yields.

Someone else comes forward with figures to prove that there is a larger percentage of failures among business men than among farmers. And with the same result—those less capable of managing a farm or a business go to working for others who by reducing costs are able to withstand competition.

Whereupon it may be reasonable to ask: will not the farmers who know or develop methods and management systems that pay, eventually draw the income now going to those who are doomed by inefficiency to be crowded out of farming? If the number of people who live on farms is steadily becoming a smaller percentage of our population, why with increased production per farmer won’t fewer farmers still gain the income now going to the larger percentage?

One writer makes bold to say: "that condition is taking place and has been taking place for years. It is making of the up-to-date farmers and particularly the dairymen the most enlightened and most prosperous class of citizens in the country. Our concern is that the ones who stay on the farms shall be good enough business men to eliminate expensive methods of production. They will be those who are sufficiently alert to adopt modern conveniences and power equipment as these are developed. That is why a constantly lower percentage of our population can feed the country. Competition will force out the one who cannot master his job and leave a clear field of prosperity for those who can."

Indiana and Iowa have been investigating corn costs. Several counties in Iowa, with 93 farmers co-operating, found average costs of 60 cents per bushel, the low county being 42 cents and the high $1.01. Indiana’s figures,
covering 195 farms, showed an average of 37.4 cents, ranging from 51.3 cents for yields of 51 bushels per acre down to 25.7 cents where yields averaged 95 bushels.

In both surveys the most important factor affecting cost was yield per acre. The important thing, too, is building up soil fertility to secure maximum yields.

There are times, of course, when even the most efficient farmers face a loss on some crop or other because it is selling at a low price. The potato crop furnishes such an example in beet growing districts this fall. If there is a market at any price, however, the low cost producer loses less under such adverse price conditions, or may make a small profit when the majority are suffering financial setback.

Wheat has not been a particularly attractive proposition in some of the beet-raising districts this season, according to numerous farmers. Some have stored their grain hoping for an upward turn in the market.

It is the sincere wish of everyone with the welfare of the beet growers at heart that potatoes and grain may yet improve sufficiently in price to let farmers out free of loss.

Where in addition to low prices on these crops the farmers had no sugar beets this year a most unfortunate condition is reported in many individual cases.

If crop rotation (diversification) aids in improved fertility and yields, and if the high-yield grower is generally the low-cost producer there is only one conclusion to be reached: it pays to rotate. There are still too many growers of sugar beets whose yields season after season are below the tonnage their lands are capable of raising if more attention were paid to rotation.

To which might be added another promising course: more dairy cows where a profitable market exists for their output and more feeding for manure production and profit. The man with some good milkers bought right and with a normal beet acreage is in shape to weather the setback from spuds and wheat.

Finish the Job

By ASA C. MAXSON

The beneficial effects of fall plowing are often missing because the plow is not followed by the harrow, disk or roller as conditions may require. Don't spoil a good job of fall plowing by not doing a little more work to finish the job. The theory that fall plowing should be left rough to catch and hold moisture is all right if moisture comes. But after a dry winter the seed bed is apt to be filled with clods and poor germination of seed will result.
Colorado Association Launches Constructive Program
To Increase Sugar Sales in High-Net Areas

At the Weld County and the Morgan County Fairs this year the Mountain States Beet Growers Marketing Association put on with the co-operation of the Sugar Company a display urging the use of beet sugar.

A poster stated: "The average freight charge on sugar last year was $1.40 per ton of beets. A good part of this would be paid farmers if more beet sugar were sold in our own local trade territory; 6,000,000 bags of foreign sugar were sold in our territory in 1927.

"Tell your friends to use beet sugar."

This Association has already given its members freedom to raise beets in 1929.
Causes and Cures of Alfalfa Winter-Killing and Bacterial Wilt

By F. R. Jones and J. L. Weimer

Bacterial wilt and winter injury appear to cause a large part of the early dying out of alfalfa fields in many alfalfa-growing regions of the United States.

Bacterial wilt is caused by parasitic bacteria, which enter through wounds in the root and crown, causing a plugging of the water-carrying vessels, and bring about the death of the plant.

Winter injury results in the killing of buds and of parts of the root and crown of the alfalfa plant during the winter.

Winter injury causes wounds through which the bacteria producing wilt may easily enter if it is present in a field. Thus fields are often destroyed by bacterial wilt after they have been injured during an unfavorable winter.

From what has been learned thus far of the life history of the bacteria producing wilt, it appears that of the several possible methods that may aid in the control of the wilt disease the most important is probably the prevention of the conveyance of the bacteria by water from old diseased plants to young fields, especially in the spring when many plants have wounds through which infection may take place readily.

Care should also be taken to avoid carrying the bacteria to new fields in fragments of stems of diseased plants with uncleaned seed or with manure.

If the disease is present in a field, its distribution by the knives of the mower can probably be avoided to some extent by mowing when the plants are free from surface moisture.

Hardy varieties of alfalfa are often injured sufficiently during the winter to make infection with bacterial wilt possible, even though the injury by itself may cause little permanent harm to the stand. Therefore the use of hardy varieties does not always prevent, though it may reduce, loss from this disease.
Winter Injury and Bacterial Wilt of Alfalfa

An Inquiry Into the Causes of Some Recent Alarming Disturbances in Hay Fields, With Suggestions for Control.

Throughout portions of the beet-growing territory a disease in alfalfa is causing widespread concern. What is it? farmers want to know. How can we cope with it?

The difficulty is not a new one. Alfalfa has been prone to disease almost from its introduction in American agriculture. But the more recent outbreak has commonly been called “winter kill,” while a few have distinguished between ordinary winter killing and a somewhat more intricate cause named “bacterial wilt.”

Probably the leading authorities on these two diseases are F. R. Jones and J. L. Weimer, pathologists in the federal government’s Bureau of Plant Industry. The Department of Agriculture published last July circular No. 39 by these two specialists. From this bulletin the following is very largely taken.

Bacterial wilt and winter injury are of widely different origin and character. Bacterial wilt is caused by parasitic bacteria, which enter the plant through wounds and multiply in the water-carrying vessels and in some of the soft tissues of the upper part of the root and crown until the plant is killed.

In winter injury, on the other hand, young shoots developed in the fall ready for growth in early spring are killed or injured, and the taproot itself may be damaged so that the life of the plant depends largely upon its ability to heal the wounds completely and rapidly. Inasmuch as it is often of the utmost importance to distinguish between these two types of injury, the chief characteristics of each are given.

Bacterial Wilt

Although bacterial wilt is primarily a disease of the underground part of the plant, shortly before the plant dies the disease produces characteristic evidence of its presence in the stems and leaves. Occasionally plants wilt during hot weather of the spring or summer and die immediately, somewhat in the manner of plants whose roots have been severed by gophers.

More frequently the plants do not wilt, but usually show before they die a characteristic dwarfed condition. (Fig. 1, A.) The stems are more or less shortened and may appear to be increased in number; the foliage is usually pale green or yellow; the leaves are frequently very small and their edges often become brown in hot weather; and after each succeeding cutting the new stems produced are usually much shorter until the plant dies altogether. This yellowing and dwarfing of the foliage are quite unlike those caused by any other disease of the alfalfa plant, and when they are present the disease is recognized easily.
Fig. 1.—Bacterial wilt of alfalfa. A, comparison of a diseased with a healthy alfalfa plant. Four-year-old plants. The diseased plant at the left shows the dwarfed stems and pale leaves characteristic of the disease when the plant is nearly dead. B, enlarged cross section of a 3-year-old alfalfa root in which the disease has been developing during the third year of its growth. The dark color in the outermost circle of wood close beneath the thick bark shows the region in which the bacteria have invaded the root. This dark color in the photograph was yellow or brown in the freshly cut root. The position, as well as the character of this discoloration, is very different from that occurring in winter injury shown in Figure 2. C, cross section of a healthy root of same age as the diseased root shown in B.
and in consequence buds developed after this injury come from a higher position on the crown.

The most conspicuous and perhaps the most serious injuries that result from the action of frost are found in the upper part of the taproot. Two regions of the root are usually damaged or killed more easily than the rest. These are located at the center and in the bark. Injury at the center of the root is shown by a shrinking of the wood and the opening of cracks along which blackening and decay follow sooner or later. (Fig. 2, E.). A hollow root results. Injury in the bark may cause rapid decay of the outer bark of older plants, or a gradual browning and peeling of the outer bark of younger ones. (Fig. 2, B and C).

A thin inconspicuous layer of new bark is always produced beneath the old to protect the root, but this often cracks when the plants grow vigorously, thus exposing the inside of the root to decay. In addition to the browning or blackening at the center of the wood and in the bark, a discoloration of a few fibers or rarely a wide band of wood close beneath the bark (fig. 2, D) is found.

Comparison of Bacterial Wilt and Winter Injury

Injury in the root or crown may be distributed uniformly around the root, or may be located chiefly on one side, causing deformities of various kinds as the plant grows. In a previous circular some of the diseased conditions of alfalfa plants resulting from winter injury have been described as collar rot, and heart rot, both of which appear to be consequences of winter injury.

In the foliage, bacterial wilt produces in the late stages of its development a conspicuous yellowing and dwarfing that distinguishes it from all other diseases. Winter injury does not at any time produce any characteristic appearance of the foliage whereby it may be recognized. It may result in the weakening and ultimate death of many of the plants, thereby causing the stand to become thin. Severely winter-injured plants may wilt and die in the spring like those infected by bacterial wilt. In such cases the root must be removed from the soil and examined before the cause of the trouble can be determined.

In the root, the discolorations produced by winter injury and wilt are different in character and in location. Bacterial wilt discolors the outer portion of the woody cylinder of the root. At first this discoloration appears as pale-yellow streaks seen when the bark is stripped from the wood. Later the entire outside of the wood is yellowed. Occasionally this yellow region is overlaid with white
Fig. 2.—Winter injury of alfalfa. A, the crown of an uninjured alfalfa plant as it appeared at the end of its fourth summer. B, crown of an injured plant found growing in the same field with that shown in A. The injury took place during the preceding winter. Note that the injury is so severe that no buds have developed from the lower part of the crown to furnish vigorous shoots for the following spring growth. C, upper part of the root of an alfalfa plant, severely injured during its first winter, as it appeared at the end of its second summer. The root is hollow and, like that shown in B, lacks fall buds at the base of the crown. D, cross section of an alfalfa root injured by cold during its second winter. Injury is chiefly in the bark. The black spots located in a circle in the outer part of the wood are also due to winter injury. E, alfalfa root similar to that shown in D injured both in the wood at the center and in the bark. A hollow root results from this type of injury.
wood, but the discoloration remains in definite circles. Winter injury produces discoloration at the center of the wood and in the bark. Sometimes in the outer wood it produces discoloration like that of wilt, but this does not extend far down the root from the crown and is darker in color and often appears in narrow streaks.

**Relation Between Bacterial Wilt and Winter Injury**

Likewise, winter-injured roots usually show some roughening or splitting of the bark, which is never seen in plants affected by bacterial wilt alone. Thus, by examination of the taproot it is possible to distinguish the character of the injury at all stages of development even when both kinds of injury occur in the same plant.

Some of the most destructive outbreaks of bacterial wilt observed thus far have occurred in fields where the plants have suffered severe winter injury. The reason for the rapid destruction of stands of alfalfa by wilt following winter injury appears to be that the bacteria find winter-injury wounds favorable points of entrance. Such wounds are often abundant; they occur in the spring when the bacteria are washed in greatest numbers from old diseased plants, and they occur in the part of the root situated near the surface of the soil where frequent rains may keep the wounded tissue wet and in favorable condition for infection. After entering the plants the bacteria may develop so slowly during the current season that few plants show conspicuous foliage symptoms of disease until the following summer. This apparent relation between winter injury and bacterial wilt is stated here because it must be taken into account in devising measures whereby the bacterial disease may be controlled.

It must be remembered, however, that, although these wounds following winter injury furnish a convenient, and perhaps the most frequent point of entrance for the bacteria that produce wilt, openings produced by other agencies such as insects, mowing machines and cultivation may also allow the bacteria to enter the plant; and hence the bacterial disease may spread to some extent in the absence of winter injury.

**Control of Bacterial Wilt**

Although alfalfa fields do not ordinarily suffer much from bacterial wilt during the first year or two, as high as 75 per cent of diseased plants have been seen in 1-year-old stands. The disease usually begins to appear in scattered spots in the fields during the second summer and continues to spread, so that frequently by the end of the third to the fifth year the stand is no longer worth maintaining in sections of the country where the disease is very prevalent.
Inasmuch as the life history of the bacteria causing the wilt disease of alfalfa is not completely known, it is not possible to indicate control measures that will completely exclude or eradicate bacterial wilt from alfalfa fields. However, from such knowledge as has been gained from observation of the spread of the disease in infested localities, it appears that the adoption of certain farm practices will reduce the damage it is causing. The source of the bacteria causing disease appears to be chiefly diseased plants living in the field. Even before a plant shows conspicuous evidence of disease, the bacteria may be distributed in almost all parts of its roots and foliage, though not, so far as has been discovered, in its seed. Thus the bacteria may be carried from diseased to healthy plants in a field by the knives of the mower.

Distribution in this manner may be reduced by mowing the field when the plants are free from dew or rain. The bacteria may be carried alive in dry fragments of stems for many months. Therefore these disease-carrying stems should not be carried to new fields either mixed with uncleaned seed or mixed as unrotted refuse from alfalfa hay with manure.

The most destructive outbreaks of bacterial wilt that have

These alfalfa plants, taken out of a field in northern Colorado in September, showed evidences both of winter injury and the bacterial wilt. The crown rot started by winter killing (either due to close clipping the third cutting, pasturing by sheep, or use of a southern seed) is quite noticeable in the plant at the right. The bacterial wilt was found in the characteristic shape of the foliage and in the discolorations in a cross section of the root.
been observed in fields during the second, the third, or even the fourth summer have usually occurred in fields so situated that the bacteria washed from diseased plants in an old field could be conveyed to them by water flowing along the surface of the ground or by temporary flooding. Apparently loss of young stands can frequently be avoided by placing them where surface water cannot convey the parasitic bacteria to them. Therefore, to avoid early destruction of young stands in an infested district the following measures are suggested:

New seedings of alfalfa should not be made in fields that receive surface drainage or flooding from land on which diseased plants are located.

New seedings should not be made on fields until all plants that have survived from a former diseased stand have been killed out.

In localities where the protection of new seedings from those that contain disease is impracticable, or where the disease is severe and persistently enters young stands in spite of such protection as can be given, it may be necessary to resort to the eradication of old infested stands before new plantings can be made with profit.

Control of Winter Injury

Winter injury appears at present to be essentially a milder phase of the climatic injury to alfalfa that in more extreme form results in winterkilling. Its control must therefore be sought in the use of hardy and adapted varieties and in farm practices that have locally demonstrated their efficiency in averting winterkilling. While under some conditions the use of hardy varieties may permit many plants to escape disease, this result does not always follow, especially when sources of infection are abundant.

Europe Still Seeking Practical Beet Harvester

Experiments have been going on for a number of years in European beet-raising countries with machines designed to eliminate hand work on the topping and lifting of the beet, and the removal of the earth adhering to the roots. A survey of machines produced in all countries was made by a Dutch committee several years ago but the committee was unable to recommend any machinery. Experiments have continued since that investigation. The German Ministry of Agriculture has interested itself in the problem on a rather ambitious scale.

A number of topping machines have been evolved and are now manufactured. But it seems that no existing machine will perform successfully in every soil under varying weather conditions, and apparently there is room for a good deal of modification in existing designs. Progress is not unexpected, however.
RULES AND CONDITIONS

Governing Hand Work in the Beet Harvest

The contract between grower and hand labor says:

“All beets left in the field over night must be protected properly from frost by the contractor by covering the piles with beet tops, the tops to be removed by the grower before beets are loaded.”

The beet contract between grower and company reads:

“4. The Grower further agrees....that he will protect the beets from sun or frost after removal from the ground. The company has the option of rejecting any diseased, frozen or damaged beets.”

Rotting, souring and spoilage of beets follow quickly on the heels of alternate freezing and thawing of the roots.

It is one of the worst causes of the terrific loss of sugar in piled beets and during the slicing season.

Whether or not a frost is predicted any rows of pulled beets permitted to remain in the grower’s field (or wagons) over night should be protected from frost. Your cooperation will be greatly appreciated and will lead to a more harmonious and economical harvest.
A beet field of 15.8 acres furnished a remarkable exhibit to the neighbors of A. R. Street, east of Evans, Colorado, this season. Half of the field was plowed last fall, the balance this spring.

Mr. Street and others noted a marked difference in the appearance of the two portions of the beet field from the day the beets came up.

The field is a unit; both fall and spring plowed patches received identical treatment. They were planted within a day of each other; were handled the same throughout the season. The only difference was in the time of plowing.

On September 19 eight beets from ten feet of average rows were pulled from each portion of this field. The picture shows the difference in average size of the roots.

All season the beets on the fall-plowed half of the field had been showing a better growth. The two sets of beets were weighed separately.

The beets pulled from the fall-plowed portion weighed 18½ pounds. The beets from the spring-plowing weighed 9 pounds.
Straw Fair Roughage for Cattle, Sheep and Horses

The abundance of straw in northern Colorado this year offers a partial solution for the alfalfa-shortage problem, for although straw does not supply protein or growth-producing materials found in alfalfa, it can often be used as a satisfactory roughage for cattle, sheep or horses. This is the suggestion of E. J. Maynard of the Colorado experiment station and agricultural college.

Dry roughage is one of the essential feeds for both cattle and sheep; in fact it is necessary in the normal digestive processes of all ruminants. Straw is very high in woody fibre or cellulose, a carbohydrate that requires much energy for its digestion. It is very low in crude protein and fat and also low in calcium or lime.

The straw from a grain crop that has lodged on account of hail, rain or wind is more valuable than straw from a matured crop, while straw from a spring grain crop is more nutritious than straw from fall-sown grain.

Straw has been used successfully as the only dry roughage for cattle fattened on grain, corn silage and cottoncake. Of course, more cottoncake was necessary than where alfalfa was fed. It is usually safer and more satisfactory to include a limited amount of alfalfa or other legume hay if it is available.

Lambs do not do as well as cattle where the roughage is made up of straw alone. Straw should not be fed as the only roughage to sheep. Feeding approximately equal parts of straw and alfalfa will give good results and save considerable hay. It is sometimes customary to feed straw at one feeding and alfalfa at the next.

Straw from a bearded barley may cause trouble with either cattle or sheep. The awns often cause sores on the sheep's gums, and they may also cause lump jaw in cattle.

Straw is sometimes chopped for feeding. There is no advantage in reducing it below one to one and one-half inches in length for cattle. Experiments show that shorter lengths or even reducing it to powder do not increase its feeding value.

Straw is very well adapted for use with beet by-products. It makes a good carrier for molasses, especially when it is cut. Alternate layers of straw used in stacking beet tops increase the amount of roughage available. By absorbing the juice from the tops both are believed to become more nutritious to the animal.

Oat straw is generally more valuable than barley straw and barley straw is better than wheat straw.

Although straw in any considerable amount is not suitable in the ration of horses doing heavy work, horses on light work or none at all may be wintered largely on bright straw.

Large amounts of straw are not advisable in the dairy-cow ration although some may be fed to advantage, especially oat straw. It is a good plan to place straw in the mangers for dairy cows where they can pick it over before it is eventually used for their bedding.
When Alfalfa Is Short!

Suggestions to Feeders

By E. J. MAYNARD

Colorado Agricultural College

ALFALFA prices are soaring and some men will not feed this year on that account. Alfalfa hay has been bound up with the development of the feeding industry in Colorado. Now that this legume hay is scarce many feeders will use a small amount or even do without it. There is a probability that this alfalfa shortage may continue for the next few years.

What Can Feeders Use in Place of Alfalfa?

It is true that alfalfa furnishes a cheap source of available protein or growth producing material; that it is high in calcium or lime, essential to the proper development of the body; and that it also contains an abundance of vitamin A. However, in many instances the fattening rations for both cattle and sheep in Colorado have contained more alfalfa than was actually necessary to furnish the proper amount of nutrients needed.

Cattle and sheep need plenty of bulk in their rations. This has been supplied by alfalfa because it was so easily available. Now we must look about for some other source of bulk, feeding only enough alfalfa to satisfy the nutritive demands of the animal.

Instead of feeding 10, 12 or 15 pounds of alfalfa per head daily to steers they may be limited to 3 or 4 pounds, their ration being properly balanced by the addition of a pound or two of cottonseed or linseed oil cake or meal.

Eastern results demonstrate that in extreme cases good results may be secured fattening steers when no legume hay at all is fed. Experiments at Indiana where oat straw and cottonseed meal were used in place of legume hay with ensilage and corn for fattening steers showed excellent results. Even though the steers ate only 1.5 pounds of oat straw per head they made as large gains and at a lower cost than those fed the legume hay.

Sheep ordinarily fed 2 to 2½ pounds of legume hay will do practically as well on ½ to 1 pound daily, if some other bulky feed is used and the protein built up with a concentrate like cottonseed meal.

If alfalfa hay is limited, however, the roughage or bulk in the ration must be made up from some other source. Beet tops, corn fodder or silage, corn and cob meal, wet beet pulp, cull potatoes, bean straw, oat straw or even wheat straw, all or any of these offer opportunity in the building of satisfactory fattening rations.
Beet tops are a protein or growth producing feed, a direct substitute for alfalfa. It is no time to pasture them in the field. They can be conserved by piling with layers of straw, making a compost heap along one side of the feeding pens.

The other roughages are all carbonaceous in character but will serve to satisfy the bulk requirements and furnish varying amounts of nutrients in addition. Wet beet pulp is a recognized hay saver but is often limited in quantity due to the strong demand for the available supply. Corn silage is becoming more familiar to Colorado feeders. If it is not put up until the kernels are well dented, it will prove a good fattening feed to supplement the supply of wet pulp. Silage has proved slightly more valuable than the dried cut fodder but both make good additions to the rations.

Cull potatoes for both cattle and sheep are best fed raw, chopped if possible. Lambs consume bean straw in large quantities. This filler has practically no protein value for them and should be accompanied by cottonseed or linseed meal.

Oat straw is considered most valuable of the straws. Wheat straw is least valuable, but barley straw from a bearded barley is dangerous to feed as it is apt to cause sore gums in sheep and actinomycosis or lump jaw in cattle.

Where Contented Beet Help Make High Yields

This beet labor house is on the farm of Peter Janssen in the Mitchell, Nebraska, factory district. Mr. Janssen put up this house for the exclusive use of the contract workers who annually take care of the large beet acreage on the farm.

The family group who this season enjoyed these fine accommodations is that of George Blehm. They won a prize for beet thinning in 1928.

The house is served with electricity. The basement is plastered. Drainage and surroundings were considered in the location of the house, the comfort and well-being of the beet tenders not being forgotten by Mr. Janssen.

Hailed Beets May Be Harvested Later

Beets that were badly hailed during the growing season are still growing at this writing. They should be allowed to remain in the ground as long as feasible to get the benefit of increases in sugar content and tonnage.
Bringing Profits Out of Weeds and Debts by Crop Rotation

By L. R. MONDT, Fieldman, Gertson, McCook District

Imagine 160 acres—the entire farm—in corn. Picture a fine crop of weeds, little corn, on the 160 acres.

And it is a good farm! Simply mishandled.

The non-resident owner, C. F. Gund, selects new local representatives—Messrs. Lehman and Swanson. They believe that the place can be developed into a good producer. No more severe test of crop rotation can be conceived than what followed.

The farmer selected for the job had been getting 7 to 9 ton crops of beets on another place. He was put on this weed patch because the new agents and the local Great Western Fieldman believed that with co-operation from the landlord and with a crop rotation system the grower could make big tonnage.

It was in 1925 that the entire farm went into corn. In the spring of 1926 Mr. Philip Rutz, the new tenant, moved on to the place. The rotation decided upon was alfalfa, barley, corn and beets, with every acre that was not seeded to alfalfa put into sweet clover.

New machinery was obtained for Mr. Rutz in 1927. He had been using an old one-way plow, poor beet cultivator, walking puller, etc.

For beets in 1927, some of the best land was selected. He got 14 tons per acre. Barley went 35 bushels, corn 40 bushels.

On 20 acres where a good stand of clover was obtained in 1927 beets were planted in 1928. Part of it was fall-plowed, the balance spring-plowed. It is a 16-ton beet crop this year.

Higher quality corn and barley seed is being used. Corn is kept clean. More sweet clover is being seeded. Now the landlord is making a return on his investment, the tenant is making a profit.
THEY'RE FALL PLOWING IN STERLING DISTRICT

JAS. DE SOTO — PLOWING UNDER 3RD CUTTING ALFALFA.

RETTILIO BETTINI — TURNING UNDER 2ND YEAR CLOVER.

HENRY WAGNER — FALL PLOWING GRAIN STUBBLE.

MIKE YOUNGER — FALL MANURING AND PLOWING GRAIN STUBBLE.
How the Company Is Advertising to Retail Grocers in the Colorado Sales Territory

Twenty-Five Million---

Yes, twenty-five million dollars in cash will be paid to intermountain farmers this fall by The Great Western Sugar Company for beets.

Soon $8\frac{1}{2}$ million bags of G-W will be ready for the market. Where will this market be?

Every pound of this sugar sold near the point of production places the Company in a position to pay the farmer more for his beets.

The farmer is a buyer. Cash in his hand means increased turnover for everybody doing business in his community and state.

The great beet sugar industry of the West is prosperity insurance. Don't let the policy lapse.

The Great Western Sugar Company
An Accidental Discovery of the Fertility Value in Straw

The rows of thick growth in the picture are thrifty beets, where the straw was spread and burned. The bare spots received no straw and lack of phosphate in the soil resulted in diseased beets.

He had heard that straw had some manurial value and decided to spread the straw stack on this year's beet field. This Wheatland grower loaded the straw on to a rack and started across the field, pushing the straw off sideways. Under the wagon little or no straw fell.

But he could not find time to plow under the roughage. So he burned it. In the usual manner he prepared the beet seed bed.

The soil evidently lacked phosphoric acid. Where the ashes of the straw was mixed with the soil came up healthy, thrifty beets. In the balance of the field the roots succumbed to black heart.

All summer the field showed a corduroy appearance, alternately a few rows of big beet tops and barren strips. It looked like he had beets in windrows. Wheat straw contains 4.4 pounds of phosphoric acid per ton of straw.
Lost—1,150,000 Bags of Sugar

The Dramatic Loss of Sugar in the Beet Harvest Challenges Attention of Growers

By D. J. ROACH

IN ANOTHER article in this publication, "The Late Growth of Beets," the writer made the following statement: "The whole beet sugar industry is and has been facing serious economic problems. The only way that it can continue to be in a reasonable state of prosperity is to take advantage of every means of increased production and savings."

I believe that a realization of the truth of the above statement is most essential to both grower and sugar company. At the present time sugar prices are low when compared with other products and the prospects are that they will continue low for some time to come.

With such a condition facing us our only hope of prosperity for the industry is in low cost production both in the field and factory.

Our company for a quarter of a century has realized the necessity of low cost of manufacture and fortunately we have been able to accomplish enough in this line largely to overcome some of the very substantial increases in the cost of labor, material, taxes, etc. So that today although the hourly rate of our labor has more than doubled, and the unit cost of material has almost doubled since 1913, our cost for these items per bag of sugar is not materially higher than it was before the war.

In fact, it is only because of these reductions in the cost of manufacture that our company was able in the face of present low sugar prices to offer the grower such a favorable contract as that of 1928.

During this 25 years, the capacities of our factories have been immensely increased, large economies in labor and material have been effected, and the sugar losses in the factory proper have been reduced.

In all this time, however, the loss in sugar in the piles and in transit from receiving stations has remained about constant and little progress has been made. This is what is known as the storage loss.

As a matter of interest let us see what becomes of the sugar in a ton of beets delivered by the farmer. Following is a statement of the situation in the year 1926-27, the last year during which beets were tested for sugar.

Note that the sugar lost in storage of beets is more than twice
as large as the factory losses, and even greater than these plus the sugar in molasses.

<table>
<thead>
<tr>
<th>Pounds Sugar</th>
<th>Per Cent Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>per Ton</td>
<td>in Beets</td>
</tr>
<tr>
<td>Beets Bought</td>
<td>Bought</td>
</tr>
<tr>
<td>Sugar in beets as delivered</td>
<td>298.8</td>
</tr>
<tr>
<td>Sugar lost in battery</td>
<td>5.3</td>
</tr>
<tr>
<td>Sugar lost in Lime Cake</td>
<td>1.4</td>
</tr>
<tr>
<td>Sugar lost in Steffen Waste Water</td>
<td>1.2</td>
</tr>
<tr>
<td>Sugar lost in unknown losses</td>
<td>3.1</td>
</tr>
<tr>
<td>Sugar lost in total factory or manufacturing losses</td>
<td>11.0</td>
</tr>
<tr>
<td>Sugar in Molasses</td>
<td>18.0</td>
</tr>
<tr>
<td>Sugar actually extracted</td>
<td>240.0</td>
</tr>
<tr>
<td>Sugar lost in Storage of Beets</td>
<td>29.8</td>
</tr>
</tbody>
</table>

**Total** | 298.8 | 100.0 |

**Per Cent Sugar in Beets as Delivered** | 14.94 |
**Per Cent Sugar in Beets as sliced** | 14.45 |

**Difference** | .49 |

**Shrinkage in sugar (sugar shrink)** | 10.00 |

Exactly ten per cent of the sugar in the beets delivered or almost thirty pounds of sugar for every ton of beets delivered was lost between the time the beets were delivered to us by the farmer and when we got them into the factory.

If all this storage loss could be prevented, the proceeds from the sale of sugar would be increased by $1.65 a ton of beets with sugar selling at $5.50 a bag. It is the combined result of losses due to shrinkage in weight and lowering the sugar content. Of this total loss, under the terms of the 1928 beet contract, the beet price per ton is lower by only 24 cents a ton and $1.41 a ton is absorbed by the company. Because such a loss has always occurred it is taken account of in drafting the price schedule of the contract. Should a material reduction in this loss occur in future years by cooperation of growers the possibility appears of that saving being taken account of in future price schedules, in like manner to the increasing of the scale in 1928 to give effect to improved factory extraction since 1924.

During this campaign 3,875,578 tons of beets were bought or the total sugar loss in storage was equal to over 1,150,000 bags of
sugar. I am not going to attempt to evaluate this loss in money since anyone who is interested can multiply it by the selling price of sugar but the figure is large enough to challenge the attention of every part of our great industry.

A typical beet pile where the co-operation of growers is needed to aid in reducing heavy sugar losses—1, by reducing the time of storage; 2, by delivering beets free of dirt and trash; 3, by prevention of freezing and of piling frozen beets with good roots.

Now what is the remedy? We know the loss exists but how can it be lowered.

1—By reducing the time that the crop is stored. The beet when stored is a living plant, it continues to breathe and in this breathing consumes sugar. The fewer days it is stored the less sugar will be consumed. The change of the piling date (in Colorado and Nebraska) from October 9 to October 16, will help in this matter, providing we do not nullify this change by unduly speeding the harvest after October 15.

2—By delivering and receiving the beets as free from dirt and trash as possible. The breathing loss is in
proportion to the temperature of the beets; the higher the temperature, the higher the loss. Dirt and leaves in a pile prevent air circulation and cause a temperature increase with a consequent greater sugar loss during storage.

3—By so protecting the beets from frost that frozen beets are not delivered at the piles. A frozen beet when piled soon thaws and then begins to rot. This rotting not only affects the beet but it spreads until there is maybe a ton of rotten beets in that spot and thus the merry work of sugar loss goes on. Care in this regard is most important.

The beet sugar industry is a big and important one but it rests on a narrow margin between profit and loss. Every hole must be plugged and may this little discussion cause some thought toward ways and means of plugging “The Storage Loss” hole.

**Improved Leveler for Irrigated Farms**

A NUMBER of years ago a beet grower in the Julesburg district invented an automatic land leveler for use on land to be irrigated. Mr. Eversman, the inventor, has sold the patent to a Denver manufacturing company bearing his name, retaining royalty rights for himself.

Inasmuch as “Through The Leaves” made mention of this machine and a number of farmers purchased the tool, it may be of interest to them and others to learn that the present manufacturer is ready to make adjustments on any of the early machines that may have proved unsatisfactory. The Eversman Manufacturing Company is now marketing an improved model on a satisfaction or money refunded basis.

For the machine its makers claim that it automatically takes the dirt from the high spots in a field and distributes the dirt evenly over the low places. With six head of horses or a small tractor, from 20 to 30 acres per day can be leveled and put in excellent condition for seed bed and irrigation.
WEBWORMS STILL AN ANNUAL THREAT

Districts which escaped a webworm outbreak this year may take a valuable lesson from one locality where approximately 30,000 acres were attacked at the height of the growing season.

Where an Ounce of Paris Green in Time Would Have Been Worth a Ton of Hindsight.

The worms in many fields appeared to attack with the most virulence in the center or in patches. With the foliage covering the rows farmers were puzzled whether to spray and batter down the leaves in so doing or to risk the possibility that the outbreak would not do much damage.

Practically all growers threatened with serious loss finally sprayed but in numerous instances the relief came too late.

It still remains the safer policy to spray at the first sign of an outbreak of the sugar beet webworm.
Burning Up Profits

There are localities where straw is worth any farmer’s cash, as bedding for the feed lot. One never sees a burning straw stack in the Nebraska district served by the Great Western.

And there are hills from which one can see at this time of the year a series of stack fires and smoke clouds.

One ton of wheat straw contains 10 pounds of nitrogen, 4.4 pounds phosphoric acid, and 12.6 pounds of potash. An average acre of irrigated grain produces about 4 tons of straw.

It figures out, based on the value of superphosphate in increased beet yields on lands deficient in this element, $9 per acre as the value of the straw for the phosphoric acid alone.
The Late Growth of Beets

By D. J. ROACH

This year at the Fort Collins factory, each beet field was sampled during the week of September 3 and again during the week of September 17. This gave us some idea of both the growth and the sugar content increase of the beets during the two week period from September 3 to September 17, and the table below shows this information:

<table>
<thead>
<tr>
<th>Sept. 3</th>
<th>Sept. 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Cent Sugar</td>
<td>14.1</td>
</tr>
<tr>
<td>Average weight of each beet</td>
<td>20.3 ounces</td>
</tr>
<tr>
<td>Increase in Sugar Content</td>
<td></td>
</tr>
<tr>
<td>Increase in size of Beets</td>
<td></td>
</tr>
</tbody>
</table>

The increase both in sugar content and in weight showed how important is this late growth.

For example, assuming a stand of seventy beets in one hundred feet of row, the yield on September 3 would have been 11.6 tons per acre, while after September 17, or two weeks later, the yield would be 13.6 tons or exactly 2 tons more. These fields had gained at the rate of one ton per acre per week.

At the same time the sugar content had increased 1.0 per cent and the beets were worth, under our sliding scale contract, fifty cents per ton more on September 17 than on September 3. In other words, the value of the crop to the grower had increased $21.40 per acre.

I realized that this period from September 3 to September 17 was earlier than we ever harvested and I thought it might be worth while to consider the increase in the sugar content and in the growth of beets during a later period, say from September 26 to November 1. We did have this information in regard to the increase in sugar content, at our Fort Collins factory, but did not have such information for the growth or increase in weight. I was, however, able to find in the files, a report on some extensive experimental work on the increase in growth which was carried on in 1923.

In what follows I am going to use both sets of information. The first table shows the average increase in the sugar content at the Fort Collins factory for the years 1924, 1926 and 1927, (1925 is not included because the campaign did not begin until after October 10).
Here we see that the average increase in the sugar content of the beets between October 2 and November 6 was 1.59% and that the value per ton of beets to the grower increased eighty-one cents.

The next table is taken from the experimental tests made in 1923 and shows both the increase in weight or tonnage and also the increase in the sugar content for that year:

<table>
<thead>
<tr>
<th>Date</th>
<th>Av.Wt.Oz. per Beet</th>
<th>Per Cent Sugar</th>
<th>Calculated Tonnage</th>
<th>Per Ton</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 26</td>
<td>29.6</td>
<td>13.93</td>
<td>13.0</td>
<td>$7.00</td>
<td>$91.00</td>
</tr>
<tr>
<td>October 3</td>
<td>30.4</td>
<td>14.40</td>
<td>13.34</td>
<td>7.18</td>
<td>95.78</td>
</tr>
<tr>
<td>October 10</td>
<td>30.9</td>
<td>14.82</td>
<td>13.56</td>
<td>7.39</td>
<td>100.20</td>
</tr>
<tr>
<td>October 17</td>
<td>32.5</td>
<td>15.14</td>
<td>14.27</td>
<td>7.55</td>
<td>107.74</td>
</tr>
<tr>
<td>October 24</td>
<td>33.1</td>
<td>15.24</td>
<td>14.66</td>
<td>7.60</td>
<td>111.42</td>
</tr>
<tr>
<td>October 31</td>
<td>35.2</td>
<td>15.43</td>
<td>15.45</td>
<td>7.70</td>
<td>118.96</td>
</tr>
</tbody>
</table>

These experiments show an average increase PER WEEK of one-half ton per acre in weight, and of .30 per cent in the sugar content and the crop was growing rapidly during the last week of October. Combining this increase in weight and the increase in price per ton because of the higher sugar content we show a total increase in return per acre of $27.96 or an average per week of $5.99. The above is of course based on experimental results but the experiments were so extensive that I feel they can be given careful consideration.

Last year one of our growers began harvesting a large field about October 1, and it took him four weeks to complete the harvest of the whole field. He kept a record of the acreage and the tonnage harvested each week and found that the yield per acre increased almost at the rate of one ton per acre per week. This is almost twice the increase shown in the above quoted experiments.
All this shows that year in and year out our growing season is none too long and we can get the best possible return out of the beet crop only by delaying the harvest of some of our beets as long as possible in order that we may get a maximum growth and sugar content. This is one of the reasons for the change in the piling date (in Colorado and Nebraska) from October 8 to October 15.

Let us take an example and see how this plan could work out for an individual farmer. Suppose on October 8 a grower had forty acres of beets and had such an outfit that he could deliver ten acres per week. In one case we will consider he started piling on October 8 and in the other case he delivered on restricted delivery from October 8 to October 15 and began piling on October 15.

### Case 1 (Began Piling October 8)

<table>
<thead>
<tr>
<th>Week</th>
<th>Acres</th>
<th>Tons per</th>
<th>Total</th>
<th>Sugar</th>
<th>Price per</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 8 to 15</td>
<td>10</td>
<td>13.5</td>
<td>135</td>
<td>15.00</td>
<td>$7.48</td>
<td>$1009.80</td>
</tr>
<tr>
<td>Oct. 15 to 22</td>
<td>10</td>
<td>14.0</td>
<td>140</td>
<td>15.50</td>
<td>7.73</td>
<td>1082.20</td>
</tr>
<tr>
<td>Oct. 22 to 29</td>
<td>10</td>
<td>14.5</td>
<td>145</td>
<td>16.00</td>
<td>7.98</td>
<td>1157.10</td>
</tr>
<tr>
<td>Oct. 29 to Nov. 5</td>
<td>10</td>
<td>15.0</td>
<td>150</td>
<td>16.50</td>
<td>8.24</td>
<td>1236.00</td>
</tr>
</tbody>
</table>

**Total**

|          | 40    | 570       |       |       |           |       |

The gain to this forty acre grower in total returns by delaying the piling date from October 8 to October 15 would calculate to be $158.34. This is caused by changing the delivery of seven acres from the week of October 8 to the period of November 5 to November 10. By this change there was on the seven acres an increase in yield of 1.5 tons per acre and of 1.5 per cent in the sugar content.

The change in the piling date of from October 8 to October 15 should result in an increased return both to the grower and to the company or in other words it should mean more to the whole industry. The increase in return to the forty acre grower in the above example was $158.34 or the equivalent of twenty-eight cents per
ton on his whole crop and an increase of $72.30 or twelve cents per ton in value to the company, less manufacturing costs.

The above savings can only be fully realized providing the grower does not deliver any faster after October 15 than he would have after October 8, if the old piling date of October 8 had been maintained. If, however, beets are delivered faster after October 15 than was customary after October 8, part of the above saving will be lost both to the grower and the company.

The whole beet sugar industry is and has been facing serious economic problems. The only way that it can continue to be in a reasonable state of prosperity is to take advantage of every possible means of increased production and savings. The use of October 15 instead of October 8 as the piling date, and the holding down to a normal rate of delivery after October 15 is one of the means of increased production that is within our grasp.

Beets Showed Large Increase in Weight and Sugar Content During September

By E. WARD, Jr.

During the week ended September 8 in the Colorado District field samples were taken from approximately 3600 of the riper beet fields. Each sample was comprised of all the beets in 10 feet of average row. Two weeks later the same fields were sampled. A comparison of the two samplings shows:

<table>
<thead>
<tr>
<th>Week Ending</th>
<th>Sept. 8</th>
<th>Sept. 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Cent Sugar</td>
<td>13.50</td>
<td>14.62</td>
</tr>
<tr>
<td>Avg. weight of Beets in Ounces</td>
<td>22.5</td>
<td>24.6</td>
</tr>
</tbody>
</table>

In spite of the fact that the samples represented the riper fields, there was a gain of 8.3% in sugar content and 9.3% in weight.

Beets that might have yielded 12 tons per acre if harvested during the week ending September 8, would have yielded 13 tons per acre two weeks later.

At this time last year (Sept. 22) beets were being harvested. This year every beet in the Colorado district will have a full week longer fall growth period than last year. If a killing frost holds off until the latter part of October, the later piling date will also give the beets a longer growing season than last year.

In other words, all indications point to a very satisfactory yield.
A New Crop in Morgan County

By J. Y. Henderson

In the spring of 1927 Mr. James Bolinger who lives southeast of Brush decided to try mammoth red clover as a hay and seed crop. He planted a field of approximately 50 acres to barley and seeded 10 pounds of mammoth red clover seed with it using the barley as a nurse crop.

After the barley, which made 84 bushels per acre, was harvested in 1927 the ground was irrigated and then pastured and a considerable amount of feed was secured off the field that fall.

This year the first crop, cut for hay, yielded approximately 2 tons per acre, which at the present market price is worth about $12.00 per ton.

The second cutting was saved for seed. The threshing on this was done in September with a yield of 318 bushels of clover seed. Part of the straw has been rethreshed, yielding 32 bushels of seed, and the balance will be rethreshed in the near future.

The total yield of 350 bushels at the present market price of $20.00 per bushel brings the value of the seed crop to approximately $140 per acre. To this we may add the value of the first crop of hay or $24.00 per acre.

In addition there will be the fall pasturage on this field, worth perhaps $2.00 per acre. This brings the total gross value to $166.00 per acre for this crop this year in addition to the pasture he received from it in the fall of 1927.

Mr. Bolinger is planning on feeding the threshed straw to live stock by mixing it with beet molasses. Also the fertility of this field has been increased considerably.

On the face of it it looks as if red clover might be a valuable asset to his farm rotation plan.
On a Beet Tour

By LYMAN ANDREWS

ALL factories of the Nebraska district held their seventh annual beet tour on August 31. The subjects stressed were early irrigation, crop rotation, phosphate fertilization, sweet clover handling, nematode and webworm infestations and controls.

On the Scottsbluff-Gering tour at the farm of John Furukawa near Gering the result of early irrigation was demonstrated with beets taken from ten feet of row from each of three separate plots that had been given the first irrigation at different dates. Those irrigated for the first time on July 2 promised a yield of 2.06 tons per acre more than those first irrigated July 31. All plots had been irrigated regularly at intervals of ten to twelve days following the first irrigation.

At the Dave Schlotthauer farm the result of crop rotation and maintaining soil fertility was clearly demonstrated by comparing two fields of beets which insofar as this year's farm practice and hand labor were concerned had been handled alike. The difference in estimated yield between the two was seven tons per acre in favor of a field which had been regularly rotated with sweet clover and well fertilized, as compared to the one which had been continuously cropped to beets.

From this point the caravan of nearly fifty cars drove through the new territory, known as the Gering and Cedar Valleys, where now 5,500 acres of sugar beets are growing on land that three years ago was unirrigated. The development, caused by irrigation, and the beet crop was marvelous to behold and served to remind the members of the tour of the wonderful possibilities of this and other similar districts in the North Platte Valley.

Coming out of the Gering Valley the tour dropped over into one of the oldest farm sections, known as Mitchell Valley, where the effect of phosphate fertilizer was observed on the beet field of William Michie. One hundred pounds of this commercial fertilizer was furnished by the Sugar Company last spring for an acre's experiment. The result of this chemical spread prior to planting, was evident in the increased size of the tops and the beet roots, as compared to the adjacent unfertilized rows. This particular soil was apparently deficient in available phosphate.

On the farm owned by Mr. Charles Raymond it was demonstrated that a field on which sweet clover was plowed under prior to September 15 gave little trouble from spring growth, resulting in a better stand and prospective yield of beets than a portion plowed after September 15 when the sweet clover plants had gone into the dormant state.

The last stop before reaching the experiment farm for lunch was devoted to a very convincing example of the damage caused to an unsprayed beet field by webworms, as compared to one just across the road which at the time of the webworm outbreak was as badly infested but was sprayed before any material damage had been done. After viewing the barren prospects of the unsprayed field all members of the tour were convinced that four pounds of Paris Green, timely
applied, would have saved not less than three tons of beets per acre where the infestation was as severe as this one.

Following the noon lunch, members of the tour listened attentively to an interesting explanation by Hugh Sciley on the water requirements of sugar beets. He pointed out that water, in addition to being the most important limiting factor of plant growth, served as a solvent and conveyor of plant foods.

James A. Holden, Superintendent of the Scotts Bluff experiment farm, by means of a tour of his experimental crop rotation plots and by a carefully prepared chart showing the results of these cropping systems, demonstrated the results of proper and improper methods of crop rotation. The beneficial effects of alfalfa and sweet clover, while not classed as profitable crops in themselves, increase the yields on the succeeding beet, potato and grain crops as effectively as barnyard fertilizer. This, he pointed out, was attained without the risk of financial loss sometimes accompanying live stock feeding. Continuous cropping, on the other hand, steadily decreased the yield as well as the quality of the product, despite the fact that these plots required and received exactly the same labor and expense of growing the crop as did the profitable properly rotated units.

The top row of beets, representing an average ten feet taken from the field irrigated for the first time on July 2, would have yielded on August 31 15.21 tons per acre as against 14.74 tons per acre for the part of the field irrigated July 10, represented by the beets in the middle row, and 13.15 tons per acre on those beets irrigated July 31, shown in the bottom row.
A Plain Statement on the Sugar Tariff Issue in the Presidential Campaign

By HARRY A. AUSTIN
Secretary-Treasurer, United States Beet Sugar Association

DURING the Presidential campaign of 1912, the Democrats, under the leadership of Woodrow Wilson declared, as they did in the platform adopted at Houston this year, that no drastic action would be taken modifying the tariff act, and that nothing would be done to disturb business. The farmers were also made to understand that their products would be adequately protected against competition from the products of foreign countries produced under the conditions of low wages and standard of living prevailing in those countries.

Mr. Wilson was elected President and the Democrats secured control of both Houses of Congress. One of the first acts of that Congress was the passage of the Underwood tariff bill. Contrary to their campaign pledges, the Democrats proceeded to put buckwheat and buckwheat flour, corn and cornmeal, eggs, fruits and berries, hides, meats, milk and cream, nuts, oil cake, potatoes, rye and rye flour, sago, soy beans, swine, cattle and sheep, wheat and wheat flour, wool and wool wastes, on the free list.

Under the Underwood bill, the duty on sugar was reduced 25%, and it further provided that on May 1, 1916, sugar should automatically go on the free list.

Upon the passage of the Underwood bill, 17 of the then 78 beet sugar factories were compelled to shut down, and from that time until the outbreak of the world war in August, 1914, the domestic beet sugar industry was absolutely demoralized.

The outbreak of the world war, however, which "bottled" up millions of tons of sugar in continental Europe, forced the world price of sugar up to such an extent that it nullified the effect of the tariff reduction on sugar provided in the Underwood bill. But the domestic beet sugar industry still had to face the fact that the bill placed sugar automatically on the free list on May 1, 1916. However, the democratic tariff bill and the exigencies of war had so reduced our customs revenues that the Government expenditures were exceeding the revenues by millions of dollars a month. In order not to incur a further loss of some 75 million dollars from sugar duties, the democratic Congress was compelled to repeal the free sugar clause just before it became effective, and the domestic sugar industry was saved from annihilation.

The tariff plank of the Democratic party adopted at Houston pledges the party to an upward revision of the tariff rates on farm products, but Governor Smith in his speech of acceptance went a
step farther and said that the Underwood tariff bill was the embodiment of the Democratic tariff policy. American farmers, including the hundreds of thousands of sugar beet growers, will not be deceived by the high-sounding phrases of the Democratic tariff plank when they remember that Governor Smith publicly stated that if elected and the Democrats gain control of Congress, a tariff bill similar to the Underwood bill will be enacted.

Today Cuban sugar, produced under cheap conditions of living and wages, is selling at a little over two cents per pound (cost and freight at New York), or one cent per pound less than it costs the American farmer to produce sugar in his beets, before the process of manufacture has begun. During the past year, under Government restriction, Cuba produced 4,000,000 tons of sugar. It has been announced that all restriction on production will now be removed and that Cuba will probably produce next year at least a million and a half tons more than this year.

This enormous increased production, which, due to a 20% preferential in our tariff rates granted to Cuba, will seek a market in the United States, further depressing the price, and unless adequate tariff protection is granted, the hundreds of thousands of American farmers now engaged in sugar beet culture will be compelled to abandon the 800,000 acres now devoted to that crop and plant the lands to other crops, of which there is already a great surplus.

The United States and Great Britain are the only two important countries of the world which import sugar to any great extent. Great Britain, with its proverbial free-trade proclivities, has a tariff rate on sugar much higher than that of the United States, and in addition she grants a very substantial bounty on beet sugar produced in the British Isles. There are twenty other countries which have a higher rate of duty on sugar than that prevailing in the United States. These high rates of duty are placed on imported sugar in order to protect the home sugar industry from competition with cheaply produced foreign sugar, to build up a great home sugar industry and to make those nations self-sustaining so far as this necessary food commodity is concerned.

If Governor Smith is elected and carries with him a Democratic Congress, and the present tariff on sugar is abolished as it was in the Underwood tariff act, or even should it be lowered to any extent, the domestic beet sugar industry will be annihilated, the $250,000,000 now invested in beet sugar factories, machinery, etc., will be entirely wiped out, thousands of American laborers employed in the 100-odd beet sugar factories will be idle, and 800,000 acres of land now devoted to sugar beet culture will be thrown into other crops with which the market is now surfeited.
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The Great Western Sugar Co., Longmont, Colo.
THROUGH THE LEAVES

TO THE FEED LOT

NOVEMBER, 1928

THE GREAT WESTERN SUGAR CO.
A HIGHER SUGAR TARIFF?

Yes, Says the Mountain States Beet Growers Marketing Association

For these reasons:

1—There is no country in the world producing sugar to any extent with as low a tariff as the United States.

2—Cuba's excessive production will hang like a cloud threatening the markets of the United States; a serious menace to the domestic sugar producer unless a higher sugar duty is levied against Cuba.

3—The domestic sugar producer is facing ever increasing production costs. These are conditions beyond his control, here to stay. They must be met if he is to continue to produce beet sugar. A tariff that once expressed a fair rate to the domestic producer is totally inadequate protection at the present time.

4—The present inadequate tariff favoring the foreign producer is causing American capital to make investments in foreign sugar enterprises rather than in our own country.

5—A serious crisis exists when beet sugar producers are making sugar at present day costs and selling it at pre-war prices. This may seem in favor of the consumer, but it is an unsound economic condition injurious to those engaged in sugar beet culture; and ultimately works to the disadvantage of both producer and consumer. The consumer's guarantee of a continuation of cheap sugar is the preservation of a domestic sugar supply.
ONE of the tariff desires of the domestic beet sugar industry is the limitation of free sugar imports from the Philippines. Not to exceed 500,000 tons of Philippine raw sugars should enter the United States free of duty. This is liberal toward the Philippines when all the facts are considered.

A curious accident of history is responsible for the present unlimited sugar market provided for the Islands in the United States. Just prior to the passage of the Underwood Law in 1913 only 300,000 gross tons of sugar were admissible from the Philippines free of duty. Any amounts beyond this limit were to be taxed. The Tariff Act of 1913 was designed to remove the sugar duties completely after May 1, 1916.

Had it been seriously contemplated in 1913 to retain any duty on sugar the unlimited free admission of Philippine sugars would probably never have been granted. The war came and the Underwood duty was retained.

Ever since the Spanish-American war the Philippine Islands have enjoyed tariff favors from the United States. From 1898 to 1909 Philippine sugar got a remission of twenty-five per cent. In the Tariff Act of 1909 Philippine sugars up to 300,000 gross tons were admitted free of duty. The cultivated cane sugar area in the Philippines rose from 205,000 acres in 1910 to 435,000 acres in 1913. Sugar sent to the United States in 1911 was more than three times the volume of 1909.

Since the unlimited free admission of Philippine sugars into the United States provided for in the Tariff Act of 1913 the area of cane cultivated has steadily climbed. Also sugar exportations to the United States have increased.

There can be little doubt that the sugar industry of the Philippine Islands is due for a further vast expansion if an unlimited market in the United States is assured. Under like conditions Ha-
waii and Porto Rico enjoyed a similar growth. With a tariff preference here Cuba developed into the leading sugar producing country in the world. Reports from Manila tell of new centrals going up and others projected.

The sugar resources of Porto Rico, Hawaii and Cuba were developed by American capital and its next most attractive field for investment under present tariff conditions would be the Philippines. Only the uncertainty of the far Eastern political situation, the demand of Filipinos for independence, and a certain dubiousness concerning the Islands' tariff position in the United States have prevented large funds from going into the Philippine sugar industry before this.

Protection for domestic beet sugar from unlimited expansion of the low cost Philippine industry is only one plank in the tariff platform of the Domestic Sugar Producers Association with which the United States beet sugar manufacturers are allied. Relief from two-cent raw sugar at New York involves more than the Philippine limitation. But it is at just such a time of low sugar prices that the free importation of Philippine sugars presses the thorns most heavily on domestic beet sugar producers. After all, Cuba's threat is alleviated in part by the 1.76c duty per pound. It need be higher. But there is no duty, no limit to the flood of Philippine sugars.

You don't hear much complaint from the producers in the Philippines about low sugar prices compared with the pleas for relief emanating from American beet sugar companies and growers. When a Cuban producer must take 2 cents a pound for his raws at New York the Philippine producer gets 3.76, the Cuban cost-and-freight price at New York plus the rate of duty against Cuba. The United States consumer of sugar is handing the Filipino a bounty of 1.76 cents per pound. It is a much larger percentage of his cost of producing that raw sugar than the ratio of the tariff to the cost of sugar in the beets bought by the average American manufacturer. On any tariff principle of equalizing costs the Filipino is getting the better of the deal compared with the beet grower.

As suggested by a former president of the Colorado farm bureau, it may ultimately come to a show down on the question: who is more entitled to consideration from the tariff-making powers of our country, the American beet grower and manufacturer or the Filipino farmer and central owner. The United States Tariff Commission has already ruled "the Philippine Islands could not be considered a part of the United States." When the decision is made for a higher tariff will the people who pay the duty feel worse for having put out of business some high-cost Philippine producers rather than Americans?
Foreword on Rotation

The increased number of fields found infested with the beet nematode again points to the necessity of all growers rotating crops on all fields. Regulations covering disposal of nematode dirt and delivery of nematode beets are unequal to coping with the situation. Only rotation can meet the emergency.

The advisability of farmers putting beets on the same land not more than two or three years in succession is strongly urged. Nematode fields, of course, should be rotated with non-host crops for four or five seasons before growing one more beet crop and then only one.

Corn, bean, potato, and old alfalfa ground handled properly offer openings for switching from old to new beet fields. Manure disked under and plowed this fall will have a chance to rot well by next spring. The desired moisture condition should obtain, however.

It is not too early to make plans for a rotation including beets. The other crop preceding the coming beet planting may have left the land in a condition requiring some early attention for the best results from beets. An open fall season may enable many growers to prepare new soil for beets, to manure some new beet land and give the ground “beeted to death” a much needed rest.
The Germans Say We Are Backward in Crop Rotation

Because:

1—Many farmers, both owners and tenants, are unfamiliar with crop rotation principles.

2—Some farmers exploit the soil for all it is worth; because beets bring in more money than other crops the tendency is to grow beets year after year on the same land until it is exhausted or diseased.

3—One-year contracts between grower and company, one-year leases between landlord and tenant discourage consistent farming or crop rotation planning over a period of years.

A German commission which visited the United States in the fall of 1927 made that report.

It noted the absence of a general appreciation of the benefits of rotation in sugar beet farming despite the immense effort of sugar companies and governmental agencies to spread a knowledge of rational beet culture.

Well!

Well?
Factors That Influence Profits on Irrigated Farms—A Review

What makes for profits, for losses in farming? To the extent that accurate information and a study of about 25 farms in one locality will answer such an important question Bulletin 318 of Colorado Agricultural College is a valuable contribution. Messrs. L. A. Moorhouse, R. T. Burdick, and J. B. Hutson, are authors of the Bulletin here reviewed.

Isn't this pretty strong talk for crop rotation:

"It is the opinion of many who are well acquainted with this area that in the long run a farmer will be ahead if he grows a rather uniform acreage of such crops as alfalfa, feed grains, and crops for which there are contract prices that do not vary greatly from year to year such as sugar beets, seed beans or canning factory peas, and limit the changes to the more speculative crops such as potatoes and cabbage."

This is the observation of three economists at Colorado Agricultural College in a study of "Factors That Influence Profits on Irrigated Farms." About 25 farms, located chiefly in Weld county, were studied during the years 1922, 1923, 1924 and 1925, as the basis of Bulletin 318 on the title quoted.

There is one 336-acre farm in the study which returned on investment, in addition to $1,272 each year for operator's labor, nearly 17 per cent in 1923; 18 1/2 per cent in 1924; and 26.4 per cent in 1925. It just about broke even in 1922.

Covering the entire group of farms the financial returns were: deducting the cash expenses, reasonable charges for depreciation on buildings and equipment, and the value of all family labor except that of the operator, at farm-wage rates, from the cash receipts, the average amounts left as the yearly income on the different farms ranged from minus $659 to $12,187.

Most Profit from Proven Crops and Feeding

Deducting the value of the operators' labor at regular farm-wage rates, the returns from the total investment ranged from a minus 3.8 per cent to 16.1 per cent. That is, during the 4-year period one farm showed an average yearly loss of 3.8 per cent on the investment while another farm showed an average yearly profit of
16.1 per cent. The other farms showed returns fairly well distributed between these two limits.

About $340 additional was the average annual value assigned for the family living furnished by the farms, nearly one per cent additional on the average return on the investment.

"On the most profitable farms," say the authors, "well-balanced systems were followed. The systems were built around staple enterprises adapted to the area. Crops and live stock were selected that fitted together and contributed to each other. The man-hour and horse-work needs were distributed throughout the year. The non-marketable products such as straw, beet tops, and pasture were utilized to good advantage. Good practices were followed. These things made for economical production." Another way of saying rotation, feeding, and good management.

During three of the four years feeders made larger returns than non-feeders. Based on this four-year record, the feeders made 5.9 per cent return and non-feeders 2.1 per cent.

"This would justify emphasis on feeding as an important cause of increased profitableness on some farms," observe the economists, "but there is nothing in the details to justify one in forgetting the other features of good farm organization and giving all the credit to feeding for the profits secured. It is the combination of a proper amount of feeding with cash crops that gives diversification and ensures a good return on the investment."

**Efficiency Varied**

One farm in the production of sugar beets used two and a fraction hours of man-labor and about five and one-third hours of horse work for each ton of beets obtainable, whereas another farm used $3\frac{1}{2}$ hours of man labor and $6\frac{1}{2}$ hours of horse work. That was approximately the spread between high-income farms and the low-income beet group, although the difference in efficiency was greater between the lowest and the highest individual beet farm.

Generally more man labor and often more horse work per acre was used on the farms with the lower returns than on the farms with the larger returns.

Causes for variations in returns are cited: selection of crops and live stock, cost and utilization of man and horse work, yields and cropping methods, feeding practices, knowledge of values in
buying and selling, adjustments from season to season in cropping plans due to price changes, size of farm, and managerial ability of farm operator.

**Major Enterprises**

The following emerges, however: "on the basis of normal yields, prices and production requirements, there are crops and classes of live stock for which the irrigated districts of northern Colorado are particularly well adapted.

"The returns from the land, man labor, horse work, and other resources devoted to these enterprises usually are larger than the returns from similar resources expended upon other enterprises.

"The area studied is well adapted to the production of alfalfa, sugar beets and potatoes. With the exception of potatoes these crops are adapted to the entire northern Colorado irrigated area. On many farms lamb and cattle feeding provides the best means of disposing of the alfalfa. Generally the most profitable systems of farming are built around these enterprises. Any farmer in the area should consider carefully the advantages of these enterprises for his farm as compared with enterprises that will displace one or more of them."

For diversification the authors suggest minor enterprises, other crops to provide a balanced system of farming. A nurse crop is needed for the alfalfa and a grain for the sheep, cattle and work stock; a few cows to provide milk, cream and butter for the family and to use feed and pasturage otherwise not utilized fully; hogs and poultry—all of which fill out the need for more man hours of labor during the year and likely, too, to make important direct contributions to income.

**Fall Plowing Dry Ground Inadvisable**

"In irrigated regions any fall plowing done with soils moist is a distinct gain, but plowing the soils when dry and cloddy is of very little advantage and costs outrageously," says Professor A. Kezer, Agronomist at the experiment station of Colorado Agricultural College.

"This has been a dry fall and lands generally were too dry to plow before rains in mid-October, without using an excessive amount of power. Long experience has shown that it seldom pays to fall plow when the soil is dry. If the soil is moist it nearly always pays under irrigation except for very sandy lands."
If Fall Cultivation Still Possible There Are Reasons Why It Will Pay

"HITCH the plow to the reaper" is a pithy saying which implies that early plowing of stubble, except on light and sandy soils, should commence as soon as possible after corn and grain have been cut.

On heavy land earlier this fall it was too dry for plowing. But two good general rains fell in October and in most Great Western districts it has been possible up to this writing to accomplish considerable fall plowing.

The texture, or state of tilth of the soil, as every farmer knows, is a very important matter. It is just as necessary for plant growth as the supply of plant food which the soil contains. The mineral resources of the soil must be freely and fully at the plant's disposal.

"At one time," as Joseph Hanly remarks in "Mixed Farming," "it was widely believed that cultivation rather than manuring formed the foundation of successful crop growing. It is now realized that the one goes hand in hand with the other; in fact, that heavy manuring, without judicious tillage, is usually more symptomatic of bad farming than good cultivation with little manuring."

Before latent plant food can be utilized by the living plant it must be changed from its crude state by the process of nature. This change is encouraged and fostered by cultivation. The plough and the harrow assist in bringing the tiny soil particles into contact with the air, sun, snow, frost and other natural influences, so that the raw material is converted into soluble plant food and the mechanical condition of the soil is improved in a way that can be obtained by no other means.

All this has been pointed out to farmers very often before and it is well known from their own observation and practice. Autumn cultivation has become a seasonal operation on many farms but there are still cases where the breaking of the stubble on lands set by for roots or potatoes continues to be associated with spring rather than autumn months. This must be looked upon as a relic of pre-reaper days when fall cultivation taxed the labor resources of the farmer less severely than the gathering of the harvest.

When the harvest is over there is often a lull in farm work which contrasts strongly with the pressing demands of April days. This is the farmer's opportunity, and his wisdom in taking full advantage will be evident in the spring. At that busy season with his land more than half ready, he is in a much safer position and more independent of weather conditions, for it requires but little cultivation to get his soil into good sowing condition.

Deep plowing is both easy and safe in autumn, and a deep soil is necessary for a successful root crop. Sub-soil turned up at that season is rendered harmless by exposure to the winter weather.
This Farm Pays for Itself

By J. Jessup

In 1923 soil so poor the beet crop yields 9 tons per acre.

In 1924 sugar company refuses to issue beet contract or supply seed for this land because soil is so poor and has been handled so sadly.

In 1925 John Newirth buys the farm: it is south and west of Melbeta, Nebraska.

Good farming—helped by wonderful growing season—produces 18 tons per acre. Mr. Newirth looked carefully after the beet crop at all stages of growth.

Fifteen tons average in 1926; 16½ tons in 1927; and in 1928 over 15 tons.

Each year Mr. Newirth has been able to make headway against the purchase price of the farm, besides improving the house, feed yards and general appearance of the place.

Some farmers have not been slipping behind these last few years despite the slowness with which the government is coming to their aid.
GET STRAIGHT ON PHOSPHATES

The article in September's "Leaves" by Asa C. Maxson on "How phosphates increase yields," created a mild sensation.

No wonder! A beet field producing 12 tons per acre without phosphate treatment jumped to 16 tons! Wheat yields rose 15 bushels per acre!

But Mr. Maxson did not offer phosphates as a cure-all. Other practices necessary to keep land in good condition for crop growth must still be followed.

A sound rotation of crops, farm manures, legumes, the cow, the sow, the hen, early planting and irrigation—GOOD FARMING—are still fundamental to soil fertility

As in eastern tests where grains phosphated showed earlier maturity, improved quality, and better weights, we may be on the verge of important discoveries in the use of this fertilizer in some beet localities.

But it is an addition, not a substitute. The "old reliables" of high yields are as essential as ever.
Burning the Candle at Both Ends

Prior to the October rains beets were broken off by the puller because the ground was so dry. This was unavoidable in some localities where irrigation water was short: where this picture was taken the farmer admitted he had plenty of water but did not irrigate timely before digging started.

Throughout the harvest some laborers topped the beets too deeply.

Little things, these, but instances were noted where the yield was reduced at least 10 per cent.
Lambs Gain Fast on Barley Mixed with Other Feed

BARLEY is a good feed for fattening lambs, and with the present spread in price between barley and corn it can be used to produce cheap and efficient gains on lambs. This is the announcement of E. J. Maynard, associate animal husbandman of the Colorado agricultural college.

"A ration of barley and alfalfa hay, however, does not give as good results as when some other feeds are included," Maynard adds.

"Cut corn fodder, wet beet pulp, corn silage and beet molasses were supplementary feeds which showed up to good advantage with barley and alfalfa in a recent fattening test at the Colorado experiment station."

In the experiment the increase in gains secured by feeding lambs the different supplementary feeds, especially beet by-products along with alfalfa and barley, were particularly noticeable.

The addition of a pound daily of ground, dried corn fodder reduced the alfalfa consumption 50 per cent and at the same time increased the gain per lamb 20 per cent.

Five and one-half pounds of wet beet pulp per day, fed with barley and alfalfa, produced a 40.2 pounds average gain in 106 days, shortening the fattening period by three weeks. Corn silage fed at the rate of two pounds daily improved the barley and alfalfa combination and saved considerable hay, while a cut mixture of barley, beet molasses, cottonseed meal and alfalfa produced much larger gains than where barley and alfalfa were fed alone.

An improved strain of barley was shown to be about 10 per cent more efficient than a common barley for lamb fattening. Comparison of whole and steam-rolled barley showed that while there was a slight advantage in the fattening qualities of the steam-rolled, this advantage amounted to only 30 cents a ton, and the cost of rolling the barley was $2 a ton.

"These results bear out the general contention that 'sheep with good teeth can grind their own grain,'" Maynard points out.

"Marketing grains and roughages through live stock has proved to be the most advisable plan for the farmer. If feeding operations are based on home-grown roughages and an adequate value figured for the manure produced, the element of speculation is largely eliminated.

"Barley production is increasing in Colorado, and the grower should be able to secure the highest total value for this crop by feeding it on his place in a well-balanced ration."

IT'S PLUMB COMMON SENSE
to hold on to a good thing while you can. Experienced beet tenders leave a better stand, see the crop through to the finish better than "green" hands. Why if there is some way to hold the tested workers in the district over winter should they be booted out of the locality.
Not Manured Since 1852—But Rotated

The Remarkable Rotation Experiment at Rothamsted, England

DRESSED GRAIN PER ACRE

<table>
<thead>
<tr>
<th>Continuous Wheat</th>
<th>Wheat after fallow</th>
<th>Rotation Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushels</td>
<td>Bushels</td>
<td>Bushels</td>
</tr>
<tr>
<td>11.8</td>
<td>17.2</td>
<td>26.9</td>
</tr>
</tbody>
</table>

The first two plots are both unmanured. The rotation wheat plot is not manured and wheat comes every four years in the course of the rotation. It has not been manured since 1852. The rotation is turnips (completely removed), barley, fallow, wheat. The figures above compare fifteen crops of the rotation plot with the wheat yields of the other two plots in those years.

Comment is hardly necessary on this plain showing of the advantages of a rotation.
With the help of Great Western growers a remarkable betterment has taken place in the quality of hand work on the beet crop. Isn’t this explainable, in part, by the fact that:

Four times as many Spanish-speaking laborers remained over winter on the farm last season than did six years ago.

The grower profits by keeping proven labor. He gets his beet work done timely and well. His labor can be depended upon in fair weather or foul. Maybe you noticed last spring during the rainy spell how the proven labor went through with the thinning under discomforts while “pick-up” workers in many fields let plants get too large for best thinning.

Growers often find that their beet labor kept on the farm over winter, make good farm hands and are a ready source of help when needed during winter or early spring.

A big beet acreage is being planned for next year. Experienced beet tenders will be in much demand. Naturally much “green” labor will have to be brought in. It’s good insurance to retain known labor rather than take a chance on the unproven kind.
Bacterial Wilt and Root Rot of Alfalfa

By FRED R. JONES, Pathologist,
United States Department of Agriculture

(Last month this publication printed an article on “Winter Injury and Bacterial Wilt of Alfalfa,” by Dr. Jones and J. L. Weimer, the substance of a government circular of recent date. In the following article, which appeared in the “Journal of Agricultural Research” two years ago, Dr. Jones gave the results of his earlier studies. It is reprinted here due to the interest of our readers in probable causes of the death of many alfalfa fields.)

The most conspicuous character of alfalfa plants thoroughly diseased by the bacterial wilt is a dwarf habit. Dwarfing is usually more conspicuous when plants have reached one-half to two-thirds growth after the field has been cut. Dwarfed plants are usually paler in color than their healthy neighbors, and their leaves are smaller. On dwarfed stems with short internodes the leaves may be very small and curled upward and yellowed at the margins. Sometimes a bleaching and drying of the foliage of a few stems or of the margins of a few upper leaves like that following frost injury is the only indication of the disease.

Whenever this disease has developed sufficiently to be dis-

The three dark circles at the upper left are vessels of the vascular system of a diseased alfalfa plant, plugged with bacteria. The “circulation system” of the plant is stopped; it dies. This cross section of the root is magnified 280 times.
cernible in the foliage, the taproot almost always shows unmistakable discoloration, which is readily observed when it is cut across with a sharp knife. The discoloration, yellow or pale-brown in color, is located in the outermost part of the woody cylinder just beneath the bark.

When the bark is stripped back the woody vascular cylinder thus exposed is seen as straw yellow to brownish-yellow in color, very different from white or ivory-white, rather dry appearance of the same tissue in the healthy plant.

Dwarfing and yellowing of plants, or bleaching of the foliage, together with discoloration of the outermost woody tissue of the taproot, are the distinguishing characters by which this disease can usually be easily recognized. The distribution of the disease in the field may be uniformly scattered, especially if the field is level and uniform, but more frequently it occurs in patches. It is always more abundant along depressions where surface drainage takes place, and along irrigation ditches.

Direct inoculation of alfalfa plants with pure culture of the parasite has been made successfully by two methods, both involving wounding of the host. The organism has not yet been found to enter uninjured tissue.

Whatever the manner in which the parasite gains entrance into the vascular system, it travels in that system slowly, passing through the crown from root to stem or from stem to root with equal facility. The yellow material in the vessels becomes denser and darker in color with age, until the lumen of the cell is filled with a yellow gum.

Bacterial wilt of alfalfa has not been found thus far a disease of

A two-year-old alfalfa root infected with bacterial wilt. The bark has been cut and separated from the woody cylinder to expose abundant reddish brown lesions, some of which appear to mark the point of entry of the parasite into the root through lesions about injured and killed rootlets.
seedlings or young plants, but chiefly of plants 3 years old or older. For the most part it occurs more frequently in alfalfa fields in regions where this crop has been grown for a considerable number of years.

CONTROL MEASURES

The parasite is carried in a living condition for a long time in alfalfa hay. Survival of the organism for five months in hay has been demonstrated, and beyond doubt it lives longer. Such hay scattered in new fields could be a source of infection.

After the disease has appeared in a field it seems to be distributed principally by natural agencies—e.g., flow of surface water—agencies which hardly can be controlled. However, spreading by the mower will undoubtedly be greatly lessened if fields are cut only when they are dry.

In irrigated fields the disease has been observed to spread with the flow of irrigation water over a group of diseased plants. Use no more water than is necessary, and any cultivation of the field which wounds the crowns when the soil is wet should be avoided.

Fields where the disease has been should not be replanted to alfalfa until all the old plants which can carry such infection are dead and thoroughly disintegrated.

Alfalfa Root Rot Not Now Curable—Nor All Bacterial

"The nature of root rot in alfalfa makes treatment of any kind very difficult if not impossible," says Dr. L. W. Durrell of the Colorado experiment station. "No method is known at present whereby the diseased plants can be cured but shorter rotations have been suggested as possible preventive measures and there is also some hope of securing resistant varieties."

Many fields of alfalfa have been plowed up in recent years because of root rot. The first signs of trouble are wilting and flagging of the top which is usually most noticeable in the spring after the first cutting. The immediate cause of this is the lack of water, for the water tubes in the roots that carry the water to the leaves become plugged. On cutting the root near the crown a ring of yellow or brown can be seen.

Miscroscopic examination and chemical tests show that this ring is due to a gum deposited in the water pores of the root, plugging them so effectively that little water can be carried up to the tops. Thus wilting is one of the first symptoms.

Experiments by Dr. Durrell at the college have shown that several of the important chemicals in the soil, when drawn into the roots, will produce a gum similar to that found in diseased plants. Some research men claim that the gum is caused by bacteria but it is Dr. Durrell's opinion that the salts in soil and irrigation water are also of prime importance in this connection; that bacteria may play a part in root rot of alfalfa but they are not the sole cause.
The Future of Beef

The farmer interested in beef should obtain from the United States Department of Agriculture a recently published report dealing with the outlook for beef cattle.

In brief the report declares that the industry is near the low point of the cycle of production and the high point in the cycle of prices. This may mean production will probably increase from now on and unless consumption takes up the increased supply cattle prices may work downward.

The demand for beef apparently has been increasing at about two per cent a year since 1921. The annual supply of beef increased at a rate almost equal to the increase in demand; hence average prices of cattle and beef advanced only slightly. In 1927 the upward trend in slaughter of cattle was abruptly checked. Production of beef in the latter half of this year was 12.4 per cent less than in the last half of 1926.

During the first half of 1928 beef production inspected for slaughter dropped 10.7 per cent under that of the first half of 1927 and 14.3 per cent under that of the first half of 1926. At the same time the average cost of cattle to slaughterers advanced 27.8 per cent above 1927 and 41 per cent above 1926.

The general cattle price outlook during the next year indicates maintenance of approximately present levels rather than a continuance of the upward trend which has characterized the market since 1921, in the opinion of Department authorities. During the spring and summer of 1929 both slaughter and feeder prices are expected to about equal those prevailing during the corresponding period of 1928.

"Cattle feeders should bear in mind that with prospective 1929 beef and slaughter cattle prices no higher than in 1928 feeding margins will depend chiefly on prices paid for feeder cattle," says the report.

"Any material break in prices during the next twelve months must come from an unexpected lowering of the general commodity price level or a marked lowering of industrial activity rather than from any weakness in the cattle situation itself.

"Cattle producers contemplating expanding their operations should keep in mind that while the outlook during the next few years is favorable the industry is now near the low point of the production cycle and the high point of the price cycle."

“AM I MY BROTHER’S KEEPER?”

The beet workers benefit by living on the farm over winter. They save train fares and the expenses of moving away from the beet district and returning in the spring. Work in the cities is scarce. Most of the beet tenders, if means could be found of holding them on the farms over the idle season, would be the better off for it.
How Many Years In Beets?

By N. R. McCREEERY
Colorado District Manager

Surveys show quite an increase in nematode-infested farms. The company tried for many years to avoid any arbitrary measures for the control of this disease. Failure to observe the only known relief for nematode infestation—no beets or other host plants for at least four years—invited positive measures.

One of the reasons for urging crop rotation has been its influence toward freedom from disease in lands and crops.

This year in our Colorado district less than 10 per cent of the acreage is on land in beets more than three years in succession.

It would indicate that by far the majority of growers have already started on a system of rotation.

The few who have not already done so should be giving rotation serious consideration, rather than force us into making an arbitrary rule that no beets can be grown on land in this crop continuously for more than three seasons.

A Case of Nematode. Rotation Will Help This Farm
When a Soil Is "Sick"

What Is the Remedy? And What Proofs Are There That the Remedy Cures?

Farmers know that a certain plant grows better when it follows one crop than another. Isn’t this a strong indication that different plants exert different influences on soil?

For example, farmers know that wheat, corn, beets, and potatoes do well after clover or alfalfa. Potato ground is good for beets and for wheat, but after a corn crop potatoes do not do so well. One crop “sickens” the soil for another; too many crops of the same kind off the same soil may “sicken” it for most any succeeding crop.

Type and character of soil, the climate, manuring—these, too, influence results and conclusions must be drawn with care. But there is no question among successful farmers that the “sick” soil problem is mainly a question of rotation, of over-cropping, of taking out much and returning little.

There are commonly three kinds of farming “systems:”

1—a systematic rotation, that is, planning the sequence of crops to give each succeeding crop the benefit of the best possible soil and fertility conditions.

2—continuous cropping; that is, where one crop follows itself year after year on the same ground.

3—hit-and-miss cropping; that is, no regular sequence as in (1), but planning the fields and crops each spring based mainly on the price outlook.

There is another way of stating the beneficial effects of crop rotation, known to most successful farmers. It has long been known, especially in alfalfa-producing districts, that certain legumes have a beneficial effect on crops succeeding them; that intertilled crops are beneficial to broadcasted crops following them; and that poor lands remaining in sod for a few years are improved in physical condition and producing power.

Perhaps no fact in farming is better established than the damage from growing the same crop on soil continuously. New England and the old South furnish conspicuous examples of this, although the Dakotas, Kansas and even some western beet and potato growing localities are no exception. Almost without variation the tests of experiment stations and the experience of commercial farmers have proven the profit in substituting rotation for continuous cropping.

An experiment at the Kansas Station showed a 17 per cent increase from a rotation of alfalfa, corn and wheat compared to wheat continuously.
A 30-year comparison of rotations at the Missouri Station gave a 6-year rotation of corn, oats, wheat, clover and timothy more than 100 per cent higher wheat yields than continuous wheat. Like increases were shown for corn and oats. No fertilizer was added in the two cases noted above.

At the Illinois station rotation tests have been conducted for more than 45 years. In one 16-year period a 3-year rotation of corn, oats and clover produced 48 bu. corn compared with the plots grown continuously in corn that went 39.7.

The same plots, summarized for a later period of 20 years, showed the continuously cropped corn plots averaged only 25½ bushels while the rotated plots (7 times in corn during the period) produced an average of 51.1 bushels per acre.

At the Scotts Bluff Field Station crop rotation under irrigation has been studied since 1912.

If the results of the first five years are omitted the average yields for the next nine years show:

Sugar beets on unmanured land yielded 10 tons per acre; on manured land 17.9 tons; on alfalfa land the second and third year after it was plowed up, 17.5 tons; on alfalfa land manured, 19.4 tons; and on pastured sweet clover land, 20.1 tons.

This is an increase of 7.9 tons from manure, 7½ tons from growing alfalfa in the rotation, 9.4 tons from both alfalfa and manure, and 10.1 tons from pasturing second-year sweet clover on the land.

When no manure is applied or no alfalfa or sweet clover is grown on the land at frequent intervals, it soon loses its productive power and the yields become so low that they are unprofitable.

To Billings and Lovell Growers

The unhappy effects of the dry spring in 1928 ought to carry their own reminder that for the 1929 beet crop fall plowing will pay big dividends. After the irrigations of the present season the ground contains a reservoir of moisture below the surface. If you can save some of this moisture for next spring—and fall plowing helps do this—you will be able to plant early, irrigate early if rains do not come, and stand a better chance of getting a good germination in 1929.
Work of Scotts Bluff Station on Potatoes

By JAMES A. HOLDEN

In the crop-rotation experiments there are 15 plots of potatoes grown in as many different cropping systems. On one plot potatoes are grown continuously. Potatoes are also grown in six 2-year, two 3-year, two 4-year, three 6-year rotations and one 7-year rotation. Two of the 2-year and one each of the 3-year, 6-year, and 7-year rotations receive manure at the rate of 12 tons per acre. In the 2-year rotations potatoes follow manure the first year; in the 3-year rotations they follow manure the second year; and in the 6-year and 7-year rotations they follow manure the fifth year. In all of the alfalfa rotations potatoes follow the alfalfa; potatoes also follow corn, oats, and sugar beets.

Thirteen of these cropping systems were begun in 1912 and the other two, a 6-year and a 7-year rotation, in 1920. The same kind of seed is used for all plots and each receives the same cultural treatment. Any difference in yield is therefore due chiefly to the effect of the preceding crop or of the manure.

In 1913, which was the second year of the experiment, the yields of the potatoes following sugar beets were consistently much higher than those following either corn or oats; but this difference soon disappeared, and there has been little difference in the later yields of potatoes following either sugar beets, corn, or oats. Some farmers have the notion that it improves the land for potatoes to grow sugar beets on it, and likewise that it improves the land for sugar beets to grow potatoes on it. This is true only when the land is good to begin with. It is impossible to put worn-out land in good condition for potatoes by growing sugar beets on it, or to make it more productive for sugar beets by growing potatoes on it. The only crops that seem to have a beneficial effect on the yield of potatoes are the legume crops, such as alfalfa and sweet clover.

The beneficial effect of alfalfa on the yield of potatoes is very marked—much more so than that of manure, although of late the indications are that as time goes on the good effect from the manure will increase. In 1925 for the first time the highest yielding manured plot produced more potatoes than did the lowest yielding plot on alfalfa land.

In rotations in which potatoes follow three years of alfalfa in the six-year and seven-year rotations, the yield is usually higher than in rotations in which they...
follow two years of alfalfa in the four-year rotation. If a farmer has both manure and alfalfa land, and if he is growing both sugar beets and potatoes, he should put sugar beets on the manured land and potatoes on the alfalfa land.

The main differences in the potato yields from these different cropping systems are due largely to the fact that the yields from the rotations not receiving manure or alfalfa have decreased, those from the manured rotations remaining about the same, while those following alfalfa have increased. The seasonal variation is rather large, but the differences between the plots receiving their respective treatments remain rather constant year after year, with a tendency to widen rather than to become less. The acre yields in 1922 were about normal, the average for all plots being 234 bushels; the 1923 yield, 115 bushels, was far below normal; while the yields for 1924 and 1925, averaging 297 and 332 bushels, respectively, were the highest in the history of the experiment.

The effects of manure and of alfalfa on the yield of potatoes are shown in Table 1, which gives a summary by three-year periods since 1913.

Table 1—Summary by three-year periods and for 1925 of the yields of potatoes from irrigated rotations, showing effect of manure and alfalfa, Scotts Bluff Field Station, 1913-1925:

<table>
<thead>
<tr>
<th>Period</th>
<th>No Manure</th>
<th>Manure</th>
<th>Alfalfa</th>
<th>Increase in favor of Manure</th>
<th>Alfalfa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913-15</td>
<td>172</td>
<td>247</td>
<td>297</td>
<td>75</td>
<td>125</td>
</tr>
<tr>
<td>1916-18</td>
<td>142</td>
<td>172</td>
<td>275</td>
<td>30</td>
<td>133</td>
</tr>
<tr>
<td>1919-21</td>
<td>119</td>
<td>188</td>
<td>271</td>
<td>69</td>
<td>152</td>
</tr>
<tr>
<td>1922-24</td>
<td>131</td>
<td>228</td>
<td>287</td>
<td>97</td>
<td>156</td>
</tr>
<tr>
<td>1925</td>
<td>208</td>
<td>386</td>
<td>409</td>
<td>178</td>
<td>201</td>
</tr>
<tr>
<td>Average</td>
<td>146</td>
<td>222</td>
<td>292</td>
<td>76</td>
<td>146</td>
</tr>
</tbody>
</table>

As shown in Table 1, the three-year average acre yields in favor of the manured rotations have ranged from 30 bushels in the second period to 97 bushels for the fourth and 178 bushels for 1925, the 13-year average being 76 bushels; while the difference in favor of alfalfa has ranged from 125 bushels in the first period to 156 bushels for the last three-year period and 201 bushels for 1925, the average for the 13 years being 146 bushels.

During the last four years the average acre yield has been 150 bushels in rotations, without manure or alfalfa; 268 bushels in the manured rotations; and 317 bushels for those following alfalfa. Assuming that it requires an acre yield of 125 bushels to cover cost
of production, the potatoes grown in rotations without manure or alfalfa show a profit of 25 bushels, those from manured rotations a profit of 143 bushels, and those from alfalfa rotations a profit of 192 bushels. On this basis it will require 1.35 acres of manured land or 7.68 acres of land on which neither manure is applied or alfalfa grown, to produce as many bushels of profit as 1 acre of alfalfa land. The foregoing figures are based on yields only; the quality of the potatoes as affected by the cropping system is not considered.

Effect on Quality

The cropping system has a marked effect not only upon the yield but also upon the quality of the potatoes. In the short rotations, scab soon became rather prevalent and increased rapidly with each crop until the potatoes became unmarketable. Since about the second cycle the potatoes grown in the continuously cropped plot and in the two-year and three-year rotations have, with one exception, been so scabby that they were unmarketable, notwithstanding the fact that clean treated seed is used each year. The potatoes grown in the four-year rotations have much less scab than those in the three-year rotations, while those grown in the six-year and seven-year rotations are usually rather free from scab. The potatoes from the short rotations in 1925 were very much freer from scab than those of previous years. A large part of this crop was graded U. S. No. 2. The climatic conditions evidently were unfavorable for scab development.

Control of Scab Disease

There is no doubt that the scab disease lives in the soil at least two years and to a slighter degree for three years, but it seems to die out before the fifth year. Although it is true that there is occasionally some scab on the potatoes grown in the six-year and seven-year rotations, the same is true of potatoes grown on new lands. It is possible that this scab germ is carried by wind or irrigation water to new land, where if climatic conditions are favorable, scab develops. The amount of scab from this source is usually very small compared with the amount that lives over in the soil from one potato crop to the other in short rotations. The effect of the rotation on yield and quality is shown in the profit-and-loss chart in Figure 9.

It is evident from the results of 14 years of experiment with these different cropping systems that a farmer, in order to keep the scab down to a minimum, must plan his rotations so that potatoes will not come on the same land oftener than once in five or six years. An ideal rotation for potatoes is one in which potatoes follow three or four years of alfalfa, with enough other crops included to make a six or seven year rotation. It is sometimes permissible to follow alfalfa with two crops of potatoes, provided there is little or no scab present on the tubers from the first crop.
Tops Like Leather Shoe Laces—Can’t Make Sugar

Farmers may see at a sugar factory unsightly piles of leaves and trash removed from the stream of beets. Tons of this material collect in a day’s run.

It contributes difficulties at the receiving stations, increases the tare, leads to spoilage in piled beets.

Some leaves possibly may be expected in the beet loadings, and only an unreasonable amount rouses dump crews. Careful topers keep tops and roots separated; careless topers can be cured by hand-picking a wagon load or two.

The worst form of leaves is the dried-up kind adhering to poorly-topped beets. At one of our large plants nine delays in an eight-hour shift were occasioned by stringy, tough leaves gumming up the slicers.

This year’s harvest is practically ended but the problem returns annually. Great Western growers appreciate the value of attention to details which make for efficiency throughout the industry. On its part the company, too, is seeking to lighten the grower’s burdens.
Company Gave Phosphate to 170 Growers for Fertility Tests

EVERY farmer his own scientist is the possibility suggested in demonstrations arranged by The Great Western Sugar Company on commercial beet farms throughout its territory.

Hundreds of such tests were made in 1928. There is a likelihood, if farmers evidence a desire to continue such co-operation, of further widespread tests in 1929. Demonstrations cover irrigations, different dates of planting, and a variety of artificial fertilizer experiments.

The Company's own experimentation is, of course, continued in seed planting, variety tests, study of the effect of doubles, mechanical blocking, big and little beet, seed production, etc., etc. Often, however, the results obtained on a small experimental plot are not accepted by practical farmers as conclusive. They like to try it out themselves on their own farms. It was in response to such a sentiment that the Company encouraged demonstrations on commercial beet farms.

In the Fort Morgan district two tests have been staged this year, one on the effect of applying the first irrigation water at varying dates, and early blocking compared with beets blocked and thinned on the date when the early blocked beets were thinned.

Results of these as well as all other demonstrations have not yet been tabulated. They will be made public when available.

In the Ovid district a field of beets was planted in three stages, the object being to study the effect of date of planting on leaf spot. Other factors may be vital, such as rotation, fertility and weather conditions. It is possible that late planting will reduce leafspot but earlier plantings may still outyield delayed sowings. Beets will be harvested and tested for sugar content to ascertain the sugar per acre figure as well as tons of roots per acre.

Ford's ammonium sulphate and super sulphate figure in a fertilizer test in the Lovell, Wyoming, district. Nine different plots on a single farm are being used in an attempt to ascertain whether ammonium sulphate may have a bad effect on sugar percentage.

Twenty-one different combinations of nitrogen, phosphoric acid and potash fertilizers are being studied in the Billings district where also the effect of sulphate upon alfalfa is a subject of inquiry.

The phosphate tests in the Wheatland district have been an outstanding accomplishment. Growers there, encouraged by
results in previous years of Company experimentation, bought a carload of phosphate on their own account. Next year the purchase of artificial fertilizer in that locality is likely to set a new high record. The Company again this year in the Wheatland district is studying the effect of manure, phosphate (2 kinds) at different rates of application, and manure and phosphate combined.

It doesn't follow that all growers need to apply superphosphate because a few have had success with it. The only safe procedure is to have one's soil tested to learn whether the land is deficient in phosphate. Or to test the effect of phosphate in a small way on a piece of suspected land.

Last winter Neubauer tests were run on four hundred samples of soils taken from all parts of Great Western territory. It was found that in most districts some soils were deficient in phosphate. None were short in potash. The tests did not cover nitrogen.

In order, then, to check the soil examinations against actual field demonstrations the Company gave out about nineteen tons of phosphate to some one hundred seventy growers. These farmers are running their own tests.

In one locality two pieces of farm land have been rented by the Company to test principles of increasing yields by soil building through rotation and fertilization.

What Benefits from Higher Duties on Foreign Farm Products

By HON. REED SMOOT, U. S. Senator from Utah

1—A larger percentage of the domestic markets for American farmers and producers and growers;

2—Less domestic competition, and therefore better prices in the domestic markets;

3—No decline in exports of either agricultural or manufactured goods;

4—No serious loss in revenue for the Federal Treasury.

American farmers will find a market in the United States for from half a billion to a billion dollars' worth of additional domestic farm products, now supplied by foreign producers. It goes without saying that American farmers would profit far more by obtaining such a domestic market at home, than in a foreign market in competition with the producers of the world. The domestic market is of far more value to the American farmers than any foreign markets.—In "The Farm Journal."
How Many Feeder Lambs Should One Farmer Buy?

The conservative farmer plans his feeding operations with reference to his available feed. If he has studied the matter in past years he has an excellent basis for deciding how many feeders he will need in the fall of 1928.

Detailed records on fifty-four lots of feeder lambs in northern Colorado during a five-year period show that it took nearly 200 pounds of alfalfa to feed a lamb. Some men used more hay, some used less. This means 10 lambs per ton. If one has 50 tons of hay to feed, he can handle 500 lambs.

These same men fed 100 pounds of barley and corn per lamb. At this rate it would take 50,000 pounds of grain for the 500 lambs.

“A farmer who keeps his lamb-feeding operations down to this scale will be reducing the risk of loss from feeding,” says R. T. Burdick, associate economist for the Colorado experiment station. “At the same time he will use all the surplus feed which he produces. That should be the chief purpose of feeding.”

To buy both the feeders and the feed for them is too risky an undertaking for the average small farmer.
What Did It? And How Again?

Something Happened This Summer to Make a Good Quality of Sugar Beet

It would be worth much to farmers and the beet sugar industry as a whole if the secret of getting a beet of high sucrose content and purity combined with high yield was more under control than, as at present, largely accidental.

As regards the seed factor, we buy the best obtainable. Some other controllable factors are worthy of more attention from the growers.

The beet is better grown on land in high condition from previous manuring than enriched by immediate manuring, except perhaps where there is a phosphoric acid soil deficiency.

Quality is improved by thorough and deep cultivation of the seed bed before planting.

The season of 1928 promises to result unusually favorably from the standpoint of sugar content and purity of the beets, in most districts. If the causitive factors could be isolated with certainty and in future years duplicated or controlled by growers, definitely raising the average number of pounds extractable sugar, the industry would indeed be advanced. This is worthy of consideration by beet raisers. Is there any insight to be obtained from a backward look?

After a dry spell at planting time came numerous beneficial rains. The soil was warmer for the early dryness. Rain then brought not only a quick germination but a close stand. Other things equal, close spacing tends to increase sugar content. Furthermore, rain is a saturated solution of oxygen. It not only supplies the soil with needful water but also renews the supply of soil oxygen, thus giving micro-organisms and plant roots new life.

Throughout the irrigating season—and more particularly favoring early irrigation—emphasis was laid upon keeping the beet soils moist, keeping the plants growing steadily with no intervening periods of suffering for water. How much it had to do with the improved sugar content and purity this season is unascertainable. But by experimentation we know this course tends to increase both tonnage and sucrose.

How much did the previous winter season contribute to last summer's fine work for sugar beet quality? It is notoriously difficult to generalize about seasonal effects but here is a reliable outline of winter's relation to the growing season. During winter the
cold and generally unfavorable conditions have a partial sterilizing effect on the soil population of microbes and protoza, also producing a certain amount of disintegration of soil organic matter.

With the first sunny days of spring and a rise in temperature comes a new activity of the beneficial microorganisms in the soil. Carbon dioxide production increases and carbon dioxide is an essential in the sugar-making function of the beet plant. At winter's end, therefore, everything is ready for a great outburst of activity underground. Hence the sense of timely planting: and despite a delay on some of the acreage this spring due to the contract controversy a large percentage of the crop was sown early. Fall plowing, too, fits this outline.

The harvest was put off a fortnight later than usual. The fine Indian summer contributed to growth in tonnage and sugar per cent. Most fields went on making sugar until November first.

For publication the reasonable views of any beet grower on how to increase the sugar content and purity of the crop, given in correspondence to the Editor of Through The Leaves, would be welcomed.

Notes on English Beet Growing Practices

On the Kelham estate in England a striking financial success is reported in the growing of sugar beets. Deep plowing is practiced—10 to 12 inches. With relatively little hand labor compared to cultural practice on the Continent the Kelham rows are 22 inches apart but beets are singled to 9 or 10 inches between plants. While the workers favor a wide hoe, the Estate manager insists on 5-inch hoes for blocking, to avoid gaps.

Farmers delivering beets to English factories return with loads of waste lime mud or cake. Five tons per acre are applied as a top dressing and worked in with the soil. To farmers in less favorable locations for obtaining this factory by-product it is recommended by British authorities to mix as little as one ton of ground quicklime just previous to working the land down in the spring.

Kelham Estate top dresses beet land (in addition to dung) with a mixture of about seven hundredweight of artificial manures, including two cwt. sulphate of ammonia, three cwt. of 30 per cent superphosphate, 50 pounds steam bone flour, and 150 pounds muriate of potash.

Burn Weeds

Insects will not be so plentiful during the next season if all weeds are cut and burned this fall. Many insects live through the winter in stems of weeds and unless they are burned they will furnish propagation centers for next year's insects. Millions of weed seeds will also be destroyed at the same time.
Cloddy Fields and Fall Plowing
Call for Attention

Drouth has left many fields cloddy after the beet harvest. As soon as possible a cloddy field should be worked with harrow or roller. Evaporation is rapid in a loose, lumpy soil.

In order thus to improve surface conditions for wintering a beet field the tops should be taken off and stored in small piles or ricks near the feedlot. A hay shortage this season makes advisable utmost care of beet tops. Keep piles small to avoid mold. Pasturing tops on soil moistened by rains is damaging to tilth and may be felt in next season's yields.

Where it is the generally approved practice growers who have experienced higher beet yields from fall plowing need no urging to get this work done immediately even if hired.

Less than a normal acreage has been fall-plowed this season due to the drouth. If weather and soil conditions permit the shortage can yet be made up. Follow the plow with some other tool to work down the seed bed a little before it goes into the winter. A firm soil retains moisture better than a porous soil.
In What Way Does Sugar-Beet Culture Affect the Soil?

By HARRY A. AUSTIN

Humbert, von Ruemker, Knauer, Woge, Kiel, Lilienthal, Helot, Briem, Zurn, Bassett and other distinguished agronomists, economists, and scientists are a unit in declaring that sugar beets are the greatest crop-yield stimulator known to agricultural scientists; that their culture so improves the mechanical and physical condition of the soil that for four to five years after having been cropped to sugar beets, fields yield an increase of 50 to 80 per cent in the tonnage of other crops.

The sugar beet grows long, deep into the soil if it can penetrate it. As a consequence, land to be planted to sugar beets is plowed deep, the result being that the farmer increases the quantity of his fertile soil without increasing its area.

In order that the tender young plant may secure a good start, a mellow seed-bed is required, the preparation of which improves the mechanical condition of the soil. As the leaves gather the sugar from the surrounding atmosphere by the aid of light, shading by weeds and other noxious growth reduces the sugar content; the frequent hoeing and cultivating which are required to eliminate shading still further improve the mechanical condition of the soil and clear the fields of foul growth which saps the vitality of the soil.

Millions of fibrous roots from the size of a cambric needle to that of a lead pencil, penetrate the soil to a depth of several feet; broken off and left to decay when the beets are plowed out, they add an average of one ton of humus to the acre. As the roots decay, the air penetrates the network of minute channels, aerating and making fertile the lower strata of soil; the root channels fill with winter moisture and form an underground reservoir which supplies the roots of succeeding crops with summer moisture, thereby stimulating plant growth and increasing the crop yield.

To secure maximum results the sugar beet requires generous fertilization, but absorbs only a portion of the fertilizer applied, leaving quantities of it in the ground to stimulate the growth of succeeding crops. By reason of its by-products furnishing an excellent stock food, it doubles the stock-carrying capacity of the farm, a consideration of the utmost importance to the husbandman. Doubling the stock on the farm doubles the quantity of barnyard manure with which to improve the condition of its soil and add to its fertility.

The experience of Germany, largest beet sugar producing country in the world, best illustrates the value of the indirect agricul-
tural advantages of sugar-beet culture. The expansion of the German sugar industry from 450,000 tons in 1879, to 3,000,000 tons in 1913, together with the introduction of other hoed root crops so revolutionized agricultural methods in that country that the production of her reinvigorated, worn out, sandy soils increased 80 per cent and were made to yield twice the quantity of bushels which are harvested from the rich virgin soils of the United States.

In 1879, Germany cropped 32,491,000 acres to wheat, rye, barley and oats and from this acreage harvested 693,187,000 bushels of the four crops; in 1909 from a like number of acres of the same crops, Germany harvested 1,281,770,000 bushels, an increase of 588,583,000 bushels or 80 per cent increase in yield per acre in 30 years. With all her ports blockaded during the World War, this increased crop yield enabled Germany to maintain a population of 70,000,000 people on the products harvested from a cultivated area less in extent than the total area of the State of Colorado.

So desirous were German economists to increase the area devoted to sugar beets that numerous forms of bounties, subsidies and cartels were devised and when the domestic sugar production overtook domestic consumption, export bounties on sugar, sometimes reaching $30,000,000 a year, were paid out by the German government. It was estimated that the export bounties at one time amounted to $25 per ton and that by reason of the bounties, Great Britain was purchasing 1,600,000 tons of sugar annually for $40,000,000 less than the cost of production, but as it was ruining her colonial sugar production, Great Britain finally compelled the abolition of European sugar export bounties.

What They Tell the Irish Beet Growers......

“All beets should be gapped before being singled, the crop will then be properly spaced and it will be easier to keep the land clean. Singling in the majority of cases is delayed too long. In short, the crop should be better attended to in the early stages of its growth. In this lies the whole secret of successful beet growing. Early sowing, also, when condition permits, would increase the yield. To this effect the land, wherever possible, should be ploughed before winter, and ploughed again or grubbed early in spring.”—The Irish Sugar Manufacturing Company, Ltd.

Southern Alfalfa Seed Is Not Hardy Enough

“Southern-grown alfalfa seed is not hardy under Colorado conditions and there is no use trying to make us believe it is,” says Miss Anna M. Lute of Colorado Agricultural College. “It has been tried out again and again and never proved satisfactory. Practically all of the trouble with winter-killing throughout the state has been due to planting southern seed.”
A Farmer's Sugar Tariff Views

By E. J. LEONARD
Ex-President Colorado State Farm Bureau

(From "Along the Irrigation Ditches," in Western Farm Life)

SINCE October 15 the harvesting of sugar beets has been on full blast in northern Colorado. Everyone wants them out of the ground and weighed over the Sugar Company scales at the earliest possible moment. No one now stops to think of delaying activities in order to increase the sugar content and thus get a little higher price. No one stops to think now about those beet piles and the losses incurred by the company through depreciation. More thought and co-operation of the growers with the company along some of these lines would be profitable to all concerned. But now the first and only important matter in the minds of the growers is to get this harvest over as soon as possible and let the company worry over its part of the difficulty.

The officers of the Beet Growers' Marketing Association are now awakening to the need of much more co-operation between association and manufacturer than has prevailed in the past. The new policy is a wise one.

The sugar beet is without doubt the most valuable Colorado crop under irrigation. It is the basis of a big industry in this state. Growers and manufacturers are both mutually and vitally concerned, for their interests in a large tonnage of beets of high sugar content are common.

Both are also vitally concerned about the sale price of beet sugar, the chief cash production of the industry. Heavy importations of sugar from Cuba, the Philippines and other tropical islands associated with this country are playing havoc with prices until now sugar is selling at the lowest figure for years.

The beet industry in this country is absolutely dependent upon a sugar tariff. The problem is a troublesome one due to the fact that nearly all sugar imports come from the islands so closely associated with this country. Some action must be taken by Congress soon to check the heavy sugar imports or every sugar company in America will soon be out of business. A definite policy must be adopted. Something on this order will be well for everyone to think about:

1. That first consideration in all legislation be given to the citizens of continental United States with the end in view of saving the industry now established in this country.

2. Consider next the interests of inhabitants of the islands that
are fully acknowledged as possessions of this country, such as Hawaii and Porto Rico.

3. Next, to consider those only temporarily connected, such as the Philippines.

4. Cuba as an independent nation, although due to American intervention, is in a class by itself, and deserves less consideration than the rest.

Up to this time there have been no restrictions placed on imports from Porto Rico, Hawaii and the Philippines. Cuba during the past year restricted exports to this country, but now has withdrawn and turned its people loose to produce and sell all they can.

The low wages and living standards existing in Cuba and the Philippines enable them to produce and place sugar on our markets at such a low figure that it means absolute ruin to our domestic sugar industry unless this country raises a tariff barrier much higher than the present rates. With the present rates, Cuba alone with all its own restrictions removed, can produce enough to supply all our needs.

The Philippine people are clamoring to be permitted to send us unlimited quantities. They resent the proposed restriction to limit their marketing to a half million tons a year. Perhaps the better solution would be to grant them the independence long promised and make them subject to tariff rates which do not now apply.

And the new tariff rates that must be put in effect to save our domestic sugar industry must be high enough so as not to encourage the people of Cuba and the Philippines in continuing to expand in sugar production designed chiefly for American markets.

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**A Whitewash for the Chicken House**

Slack lump lime with water to the consistency of cream. Take five quarts of this, add one pint of good coal tar disinfectant and one quart of kerosene. Stir thoroughly. Add an equal amount of water. Strain the whitewash through a fine screen or a piece of burlap before using it in a force spray pump or sprayer.

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**Straight from the Shoulder**

“If a farmer follows a well-planned cropping system and properly cares for the crop, he should realize a profit, but if he follows a poor cropping system he will lose money even though he gives his crops the best of care.”—James A. Holden.
Potatoes May Be Fed Successfully to Live Stock

Potatoes have been successfully used in fattening rations for both cattle and lambs and may also be fed in limited quantities to hogs and horses. Farmers who have a surplus of potatoes this year may find it profitable to feed them to live stock, says Colorado Agricultural College.

In the tests conducted at its Experiment Station, potatoes proved to be particularly valuable fed with grain and alfalfa to fattening lambs.

A ration consisting of grain, alfalfa, and two pounds daily of chopped raw potatoes showed a feed replacement value of $8.54 per ton for the potatoes used. Fed to fattening beef calves at the rate of nine pounds per head daily, the raw potatoes had a feed replacement value of $5.00 per ton. Potato silage made by cutting the potatoes into a silo with a two percent addition of corn meal gave practically the same net results. The only advantage gained in ensiling the potatoes was the ability to store the ensilage for an indefinite period.

Starch is the chief constituent of the dry matter of potatoes and there is very little crude protein present, consequently a good protein feed is necessary to properly balance any ration where potatoes are used.

Raw potatoes may be safely fed to live stock if the daily ration is not too large and the feeding period not too extensive, according to E. J. Maynard of the Station. They are best not fed, however, to pregnant stock on account of their acid taste and tendency to increase the flow of digestive juices in the stomach and intestine.

Raw potatoes should be gradually introduced into the ration and if taken away, this should be done by degrees. Feeds such as beet molasses and beet tops which tend to irritate the digestive tract should not be fed at the same time. Although potatoes should be chopped up, they may also be fed whole. If fed whole, it has been found worth while to feed them to cattle in low bunk under a pole or beam. This method tends to prevent choking.

Cattle are least sensitive to raw potatoes. Large quantities have been fed in fattening rations with no bad effects. It is safest, however, not to feed too great an amount. Sheep also do well on raw potatoes. It is best to feed lambs not over two pounds per head daily.

Horses are more easily affected by raw potatoes but small quantities, three to five pounds per head per day, may be used.

It is usually better to cook or steam potatoes for pigs. Experiments show that about 420 pounds of cooked potatoes equal 100 pounds of corn in feeding value if fed in a properly balanced ration. Raw potatoes proved to be only two-thirds as valuable when fed to pigs. If cooked the potatoes should be salted and the water in which they are cooked should be thrown away.

A poisonous material, solanine, is a regular constituent of all parts of the potato plant but exists in such minute quantity that it causes no harm. Although this poison does not increase when potatoes are stored or when they decompose, it passes in considerable quantities into the young shoots when the potatoes germinate, so the sprouts may contain a considerable amount. This means the young sprouts should not on any account be used in feeding.
To the Man Who Says:

"I Can't Do Better Until I Can Manure All My Farm"

Uncle Sam replies—

A study of the long-continued soil fertility experiments of this country and of England shows:

1—In general crop rotation has been found to be practically 95 per cent as effective as farm manure and complete commercial fertilizers in maintaining yields of wheat, corn and oats; and about 90 per cent as effective as these fertilizers in increasing the yields of these three major crops.

2—The beneficial effects of crop rotation do not impair the benefits derived from the use of fertilizers; so that when these two farm practices are combined the one practice adds to the benefits of the other.

3—When compared with the effectiveness of manure and commercial fertilizers, the relative value of crop rotation is practically 20 per cent higher on soils neutral or slightly alkaline rather than acid.

4—On soils long under cultivation the highest yields are possible only when the use of manure or commercial fertilizers AND rotation are conjoined or practiced together.


[Your Great Western Fieldman May Be Consulted on Rotation Plans for your farm.]
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THROUGH
the
LEAVES

DECEMBER, 1928

THE GREAT WESTERN SUGAR CO.
To Absentee Landlords...

WRITE US A LETTER

Crop rotation is a "program" with the agriculturists of the Great Western Sugar company.

But a program may be too general for a specific problem on a specific farm. Blanket recommendations for the so-called "average" farmer are too indefinite.

The company's agricultural department is ready and willing to make an analysis of individual farms and their rotation requirements.

With resident landlords this is not difficult. But with non-resident owners, especially those unrepresented locally by a capable manager, the problem of incepting a well-planned rotation system is almost impossible.....

unless the absentee landlord co-operates.

Are your yields below what you need to make the farm pay?

Do you want to know why your farm is not coming up to expectations?

The agricultural department of the company has no patent device, no cure-all for your farm's ills. But it knows how other farms in the same locality are being operated successfully and it may be able to make suggestions to absentee landlords of real value to them.

Why not write us a letter?
Editor’s Notes

THE GROWERS GAIN BY TARIFF

An outraged reader from upstate wrote to The New York Times protesting the retail rate of 60 cents a dozen on lemons because prior to the enactment of the present Fordney tariff lemons on the Underwood free list sold for 25 cents the dozen. "The whole country was being taxed for the benefit of a few lemon farmers in California!" The same sort of complaint is made against the sugar tariff, and virtually all the schedules.

Lemons are taxed at two cents a pound (four to six lemons). The Times’ correspondent could have bought them duty paid in New York at wholesale for about a cent and a half a piece. Coal and shoes are now on the free list. They probably are proportionately as much higher than in pre-war days as are the lemons. Price increases are as great or greater on duty-free items as on dutiable goods.

It is erroneous to ascribe all price increases on protected articles to the tariff or to assert that the duty collected at seaboard never is paid by the consumer. While conditions frequently relieve the consumer of a portion or even the whole of the import tax the protectionist should be prepared to defend it even if borne entirely by the consumer.

When the consumer asks why pay more for articles produced locally than for like importations if admitted duty-free answer with Abraham Lincoln: "It is easier to pay a big bill if you have the money than a little one if you haven’t." The protectionist policy in the United States has unquestionably increased industrialism, furnished employment, aided to establish and maintain our high-wage system, fixed our physical living standards far above those.
of any other nation in history, furnished agriculture with a home market of great buying power, and otherwise contributed to our unexampled national prosperity.

To separate consumers and producers, protected from unprotected, is becoming increasingly difficult in view of the diversification of industry under our tariff system and industry’s interrelation with commerce, finance, and agriculture. On many things the beet raiser consumes he pays a protective tariff. He may ask himself is this disproportionate to his benefits from a protected market for sugar beets, a protected beef and lamb market, a protected price for potatoes, wheat, pork, poultry, eggs, milk, cheese, butter, fruits and vegetables. Probably he is the gainer by the tariff.

* * *

HOW IT WORKS ON BEETS

If the average consumer pays $1.76 more per bag of sugar because there is a tariff rate of $1.76 per hundredweight against Cuba the beet raiser can quickly estimate how much he gets out of it.

Under the sliding scale contract now in effect he gets one-half or more.

If the net sugar proceeds obtained from the beets are increased by $1.76 per bag, at an average rate of 30 bags per acre the total increase is $52.80. At least half of it—or at least $26.40—goes to the beet farmer.

Or, to put it another way: if the tariff were taken off and by that act the net price per bag of sugar were in like measure reduced the value of the beets would be lowered by $52.80 per acre, and if only half of that value were taken from the average farmer his loss would be $26.40 per acre, or over $2 per ton decrease in price.

Of course, the damage to the grower would be greater than indicated. The industry could not survive such a calamity: growers would not grow beets on any large scale for $5 per ton under present conditions surrounding their operations.

* * *

PROTECT THE HOME MARKET

This improved domestic market for his products is of the utmost importance to the farmer. During 1927 we sold to foreign countries what represented about 6 per cent of our total production in the United States. The other 94 per cent was the home market. No theory of marginal surpluses for export controlling our domestic market can justify lowering of duties and destruction of this vital home market.
This domestic market would have been even better had the agricultural third of our population enjoyed prosperity equal to, as continuous, and as general as that of other classes. The farm lack is now receiving recognition born anew of political promises. That portion of this lack attributable to tariff deficiency is likely to receive attention. The sugar beet grower is asking a share be devoted to his commodity. Certainly something is amiss when refined sugar is selling at pre-war levels and lower, when raw Cuban sugars as in November were laid down in New York at a third or more less than the Great Western is able to pay Colorado growers per pound of sugar sacked not including our costs of manufacture or any item other than the raw beet roots at receiving stations.

Incidentally that price paid to the Colorado farmer is nearly twice as much as the average payment by efficient Cuban manufacturers to cane growers per pound of sugar sacked.

The beet raiser is asking, too, for relief from the unlimited free importation of Philippine sugars, and from the reduction in net sugar proceeds due to activities of government-subsidized barge lines carrying competing sugars into the logical and attractive beet markets.

Beet growers more than ever are taking part in tariff making because they understand how the present sliding scale contract pays them at least fifty per cent of the net sugar proceeds, they profiting in that degree from any tariff benefits reflected in the sugar price. Laid forever should be the false and vicious notion that the sugar company gets the only or major tariff benefit.

We may congratulate ourselves that the problems barely outlined here are to be among the tasks assumed by the newly elected administration in Washington. Without partisanship it can be said that Mr. Hoover has shown a practical idealism which should weigh heavily toward a sensible, far-visioned tariff and agricultural policy, one having in view the best feasible reconciliation of conflicting local, national, and international interests.

“Diversification in farming is the mother of crop rotation. And rotation is not only a major factor in the maintenance of soil productivity, but the establishment of systematic cropping systems or of proper rotations is the real beginning of business farming.”
Rotation or Nematodes

By ASA C. MAXSON

WHICH shall it be, rotation with all its benefits in the form of increased returns, freedom from weeds, animal pests and diseases or continuous cropping with the ultimate reduction in returns and increase in weeds, pests and disease? The sugar beet nematode is forcing beet growers to choose.

Unwillingness on the part of growers to follow rotation may force the adoption of stringent rules in order to prevent the spread of this disastrous disease. On the other hand the adoption of proper control methods will not only prevent disaster but will actually increase the returns from all crops grown on the farm.

Our problem is one of rotation and not one of nematode control. Rotation will control the sugar beet nematode but it is also needed for other reasons as well.

During 1927 and 1928, there were examined 21,246 beet fields. Six per cent of these were found to be infested with the sugar beet nematode. When these are grouped according to the number of years either in or out of beets, the relation of continuous cropping and rotation to nematode infestation is clearly shown.

Continuous Cropping:
Years in Beets... 1 2 3 4 5 6
No. of Fields..... 1276 4667 2265 1269 710 1568
Per Cent Infested 1.57 4.05 5.92 8.04 15.21 22.26
Rotation:
Year out of Beets 1 2 3 4 5 6
No. of Fields..... 1571 814 530 1462 3476 26
Per Cent Infested 5.28 3.44 0.90 1.71 1.09 0.00

Once more, which shall it be: continuous beet growing and an increase in the sugar beet nematode and loss in returns from the crop or rotation, a reduction in nematodes and increased returns from sugar beets?

“A proper rotation is the basis of profitable land utilization. It permits of farming with live stock; it provides rest for the land in that legumes and other renovating crops are alternated with those of an exhausting nature; it permits of clean cultivation and weed control; and it creates other productive-soil conditions.”

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Who'd Set a Match to Tons of $15 Hay?

From practical experience farmers made up the rule: the average acre of beet tops is worth a ton of alfalfa hay.

It's a loose rule. The beet tops probably need a heap of careful handling to make the rule full true; and applied to dairy cows the rule might go farther than with fattening steers.

At their Fort Collins Experiment Station Colorado Agricultural College specialists, in a test with calves last year, found tops had a feed replacement value of $5.71 per ton of tops fed, or $1.16 for the tops from each ton of beets produced.

But the rule is a fair yardstick for measuring the prevailing methods of handling the tops. The college authorities recommend for 1928-29, with the high hay prices, handling the beet tops to save every bit of their feed value.

They say pasturing them in the field is wasteful; recommend ricking them with alternate layers of straw near the feed lot; and feeding in a balanced ration to make the tops displace the most possible high-priced ingredients.

It's like putting a lighted match to a hay stack to waste beet tops this season or to feed them wastefully.
The Place of Alfalfa in Fighting Nematode

By GERALD THORNE
Bureau Plant Industry, U. S. Department of Agriculture

So far as known, alfalfa is not attacked by the sugar-beet nematode. Since it usually remains for three or more years after seeding, alfalfa has become the most popular crop for rotations covering three or more years.

A good stand is essential because weeds will grow in spaces between plants, and on these the nematodes may live over from year to year.

Examination of soil from alfalfa fields 6 to 12 years old has shown that the only nematodes remaining are in the spaces between plants where weeds have grown. Since alfalfa usually begins to thin out about the fourth or fifth year in most fields, it should not be allowed to remain longer as the weeds which come in serve as host plants for the nematodes. After four or more years most of the nematodes have hatched out and died, but invariably a few live over so that it is apparently impossible to eradicate them completely.

Usually it is not advisable to follow the alfalfa immediately with sugar beets, since many growers find difficulty in obtaining a good crop, probably because of the fact that it is difficult to get a good seed bed.

If the seed bed is not good the young beets fail to get a good start in the spring and are more susceptible to the attacks of nematodes, damping off, and other diseases. Most growers prefer to follow the alfalfa with a crop of potatoes, tomatoes, grain, or corn, which puts the soil in much better condition for the crop of beets following. Potatoes and other cultivated crops are especially good and give better results than the small grains.

Sweet clover is NOT a host plant of the sugar-beet nematode and therefore fits in well for short rotations on slightly or moderately infested fields. It is especially valuable on poorly drained or alkaline soils where alfalfa does not thrive.

Since the bean is not a host of the nematode and is a legume this crop is suitable to include in any rotation.

"On soils long under cultivation highest yields are possible only when rotation and the use of fertilizers are practiced together."
Thieves of the Soil

What you get out of a soil depends largely upon what you do to it, commonly called farm practices; that and the "season."

Three farm practices are most important: 1, cultivation; 2, rotation; 3, animal or green manuring.

Benefits of cultivation have been known since farming began; nearly as long the value of manuring. The ancient Romans knew legumes. But rotation is not much over a century old.

Rotation is now recognized as the foundation of improvements in farming that have taken place in Europe during the last 100 years. The Germans did not have much to criticize about American beet farming except a lack of rotation.

There may be thieves around your farm if you are not getting the yields you desire from your soil. The thieves of the soil probably are some lack in one or more of those three vital elements of successful farming.

Which one is most likely being overlooked appears from the very general appreciation among farmers of the value of manuring and good cultivation: the lack is probably in rotation.

For a full presentation of the rotation question see the special demonstration trains to tour Great Western territory this winter.
Tare, a Many-Sided Problem

Repeatedly it happened that after being cautioned against dirty loads, with penalties looming large, hired helpers in the fields and on wagons were sharply brought to a sense of their responsibility; after which loads from the same contracts were much cleaner.

Like the fairly recent development of keener appreciation of the common interest in the protective tariff on sugar there is room for a better understanding of the harvest problems, including the relationship between unnecessary dirt, the loss of sugar in beets piled and the efficient operation of factories.

Interference with slicing capacity by reason of dirty beets means more hand shoveling at receiving stations. Avoidable loss of sugar in beet piles reduces the “pot” which can be divided between factory and grower. Introduction of impurities in poorly topped crowns reduces the amount of sugar finally sacked. Trash in the beets dulls slicing knives or requires constant attention to cleaning them.

The 1928 harvest is ended but we may gather from its shortcomings lessons of value in future seasons.

Dirt dropping through the crack in the sideboard gets away in this manner. A tight pipe-hinge type of wagon box would correct this obvious evil.
Landslide for Rotation

In every Great Western district experiment stations and commercial farms have proven the profit in planning operations to take account of benefits from rotation of crops. Colorado Agricultural College states:

“In the long run a farmer will be ahead if he grows a rather uniform acreage of such crops as alfalfa, feed, grains, and crops for which there are contract prices that do not vary greatly from year to year and limit the changes to the more speculative crops. On most profitable farms, well-balanced systems are followed.”

The Scotts Bluff station, where crop rotation under irrigation has been studied since 1912, states:

“Sugar beets on unmanured land yielded 10 tons per acre; on manured land 17.9 tons; on alfalfa land the second and third year after it was plowed up, 17.5 tons; on alfalfa land manured, 19.4 tons; and on pastured sweet clover land 20.1 tons. The cropping system has a marked effect not only upon the yield but also upon the quality of crops.”

The Huntley Field Station in the Yellowstone Valley of Montana, also experimenting since 1912 with rotation of irrigated crops, says:

“The maximum yields are usually obtained from some rotation which includes alfalfa or manure. Minimum yields generally occur in the shorter rotations or continuously cropped plats.” There has been a difference of nearly 100 per cent between yields on rotated and non-rotated or poorly planned systems.

The United States Department of Agriculture declares that crop rotation is nearly as effective as manure in maintaining or increasing yields although it prefers the conjoined effect of fertilizer and rotation.

This winter the company with the co-operation of railroads hopes to put on special trains demonstrating rotations for more profitable beet culture.
Why I Believe in Rotation

By C. V. Maddux

The proper Crop Rotation plan for any given farm is that one which produces the largest profit. Many different cropping plans are being used today on various farms where the soil conditions are uniform. Some produce larger profits than others—when the same care is given to the growing of the crops. Twenty-two per cent more profit was realized from following a certain crop plan, than from following another crop plan at the Scotts Bluff Field Station. Both plans were used on different parts of the same farm continuously since 1912.

The crops included in the first mentioned plan are: Alfalfa 3 years, followed by potatoes, followed by beets, followed by grain as nurse crop.

The crops included in the second plan mentioned are: Alfalfa 2 years, followed by potatoes, followed by beets. Other like examples at that station and the other stations could be cited.

Higher Yields is the explanation of the increase in profits. An increased yield of 23 bushels of corn, 146 bushels of potatoes, 6.4 tons of beets and 24 bushels of oats per acre was obtained on the average from those crop plans that included alfalfa (or sweet clover) as compared with yields obtained from crop plans that did not include alfalfa (or sweet clover), at the Experiment Station above mentioned.

Twenty-one per cent increase in the yield of potatoes, 15.9% increase in the yield of grain and 21.5% increase in the yield of beets is the report covering similar tests made at the Huntley Field Station continuously over a long period of years. In every district there are farmers who are obtaining like results from their commercial operations, by using a good rotation plan.

Lower yields follow the practice of continuous cropping or that of using a cropping plan that is not suitable to local requirements. They cause heavy losses from insect pests and plant diseases. A very important example is the sugar beet nematode, the infestation of which is increasing in the territory where this company operates. The control of this pest is one of the big problems of the industry. In other sections, it caused farmers to stop growing beets until a practical control method was developed.

The method is the adoption of a proper Crop Rotation plan. For four consecutive years or more, crops are grown on which the
nematode does not feed. Thereafter beets are grown for one or two years, preferably only one. The process starves the pest, holds it in control. Shorter rotations will not give the desired control because the nematode is provided by nature with means of sustaining itself for several years, even in the absence of host plants.

On five infested fields that yielded on the average 4.2 tons of beets per acre, grain was grown for one year and followed by a crop of beets that yielded 3.1 tons per acre. On another infested field, an increase of only one ton per acre was obtained by growing two grain crops between the beet crops.

Where three grain crops were grown before the next crop of beets an increase of 4.9 tons was realized. On another field wheat, as nurse crop, and alfalfa 3 years were grown before the next crop of beets was planted, resulting in an increase of 8.5 tons. Four years intervened between beet crops in that case.

The proper crop rotation plan controls nematodes on infested fields, prevents the development of any serious infestation on fields now free from that pest, and in all cases produces higher yields and greater profits.

Thoughts on the Cattle Market and Feeding

Writing on "The Cattle Market Outlook," E. A. Stokdyk, of Kansas Agricultural College, in "Successful Farming," offers this suggestion:

"Present price levels for cattle and the demand for 'cheap beef' have enabled many farmers to dispose of the old red cow at a profitable figure and replace her with a well-bred dairy cow. The present time is an ideal one for such a procedure. It would pay every dairyman to cull his cow herd closely and dispose of his poorer cows on the beef market."

In-between grades to supply cheaper beef are in great demand, according to Prof. Stokdyk, and this in his opinion is an indication that at least the top grades of cattle have reached their peak. High prices in the United States are attracting cattle from other countries not affected by foot-and-mouth disease quarantine.

"Although the peak in cattle prices may have been reached," he states, "it seems reasonable that cattle prices will stay at comparatively high levels for a few more years. The consensus of opinion among students of cattle prices is that cattle will be in a strong position until at least 1931."

He warns against "pyramiding;" that is, against feeders doubling the number of carloads they finish next year if they make some money this season.
To Grow 22 Tons Per Acre

Mr. William Stanley, one of the most successful farmers and stock feeders in the Lucerne (Colo.) district, has grown beets every year for over twenty years for the Eaton factory. Twenty-ton yields are nothing unusual for Mr. Stanley; he has dropped below that average only two or three times during this long period.

Mr. Stanley each season has about the same acreage of the crops that he grows in his rotations regardless of the price outlook, and he thinks part of his success is due to having a regular cropping system. Mr. Stanley also obtains these good yields by good farming practices and manuring.

During the past year Mr. Stanley had 21.6 acres of beets, which yielded 22.04 tons per acre. Half of the land in this field was cropped to beans the previous year, the other half broken out of alfalfa and planted to potatoes. Both fields were manured the spring of 1927 and then fall plowed in 1927 for the 1928 crop of beets. Mr. Stanley makes it a practice to fall plow for beets every year that he can, and has probably raised more beets on fall plowed land than any other grower at the Eaton factory. At the present time he is manuring his land and fall plowing for an early start in 1929.

His 1928 beets were planted April 2nd, thinned by June 5th and the first irrigation applied June 27th. They were irrigated seven times, the last irrigation being applied September 20th.

After the first irrigation the beets were cultivated and then reditched again. This particular field is 80 rods long and lies very flat. Mr. Stanley had a cross ditch in the center of the field, running the water only the length of 40 rods. When irrigating he never allowed the water to stay on the beets very long, but irrigated oftener and did not allow the ground to get too wet.

Mr. Stanley has four farms in the Eaton district, on which he has long term tenants who feed and produce good yields every year.
Barley Good for Fattening Lambs

By E. J. MAYNARD, Colorado Experiment Station

(In Western Farm Life)

AMBS in the fattening pen make cheap and economical gains on barley as the grain part of the ration. Feeding barley and alfalfa alone, however, does not give as good results as will come from adding other feeds to this basal ration. Recent lamb fattening tests at the Colorado experiment station have shown excellent returns where the supplementary feeds, cut corn fodder, wet beet pulp, corn silage and beet molasses have been added to the barley-alfalfa ration. In the experiments the increases in gains from feeding the lambs these different supplementary feeds, and especially the beet by-products, along with alfalfa and barley, were particularly noticeable.

The addition of a pound daily of ground, dried corn fodder, reduced the alfalfa consumption 50 per cent and at the same time increased the gain per lamb 20 per cent.

Five and one-half pounds of wet beet pulp daily per lamb, fed with barley and alfalfa, produced a 40.2 pounds average gain in 106 days, shortening the fattening period by three weeks. Corn silage fed at the rate of two pounds daily improved the barley and alfalfa combination and saved considerable hay, while a cut mixture of barley, beet molasses, cottonseed meal and alfalfa produced much larger gains than where barley and alfalfa were fed alone.

An improved strain of barley was shown to be about 10 per cent more efficient than a common barley for lamb fattening. Comparison of whole and steam-rolled barley showed that while there was a slight advantage in the fattening qualities of the steam-rolled, this advantage amounted to only 30 cents a ton, and the cost of rolling the barley was $2 a ton. These results bear out the general contention that "sheep with good teeth can grind their own grain."

Marketing grains and roughages through livestock has proved to be the most advisable plan for the farmer. If feeding operations are based on home-grown roughages and an adequate value figured for the manure produced, the element of speculation is largely eliminated.

Barley production is increasing in Colorado, and the grower should be able to get the highest total value for this crop by feeding it on his place in a well-balanced ration.

The Sound Basis of Beet Growing

"With the beet farmer putting in 178.3 days of productive work on his farm during the year while the non-beet farmer puts in 131.7 days, the former receives $5.47 for a day's work while the latter receives but $2.75.

"Not only does the beet farm pay the farmer almost twice as much per day for his labor as the non-beet farm but it furnishes many more days of productive work."—Farm Management Studies, Montana Experiment Station, Circular 101.
Alfalfa Good for Sow

By DR. JOHN M. EVYARD
Iowa Experiment Station

ABOUT this time of year the pastures usually get short, and the sows because of colder weather do not get out into the fields as much as formerly. It is a pretty good plan to provide a rack of alfalfa hay for the brood sows so that they may have it available at all times. This free access to alfalfa should be encouraged throughout the entire late fall, winter and spring so that the sows may never want for this green feed.

And now what happens when one feeds alfalfa to the brood sow? Well do I remember one of the first experiments on alfalfa that we ran, the alfalfa hay being allowed in an open rack along with ear corn fed on the side. Another group was fed straight ear corn.

The latter gained about one-third of a pound a head daily. On the alfalfa the sows given practically the same amount of ear corn (32 pounds daily) gained almost two-thirds of a pound a head each day. The alfalfa fed sows ate the leaves and lighter stems from approximately one and one-tenth pounds of alfalfa hay daily.

When farrowing time came the alfalfa fed matrons produced a litter averaging 17.4 pounds as contrasted with 13.2 pounds in the corned group; the average weight per pig was 2.3 pounds for the alfalfa-corn litter against 1.7 pounds in the corn group.

The alfalfa-ed pigs were stronger, of better bone. And another test with young growing gilts showed better gains for the pigs from alfalfa-fed sows.

Alfalfa is fairly rich in minerals of all kinds but particularly in calcium, the stuff which makes up some 40 per cent of the dry ash or minerals of bone. Brood sows especially need considerable calcium for the litters which are to come. Alfalfa is rich in iron, essential in blood building; in protein and in vitamins. Essential for reproduction are the vitamins found in alfalfa.

The better the sows are managed and fed during the winter, avoiding excesses of course, the earlier will they come to their milk around farrowing time and the more milk will they produce for their youngsters. The big thing is to build up a store of nutrients in the bodies of these sows so that they may have plenty of reserve to call upon when the strenuous days of suckling come.

Agriculture Fixes Its Own Program

In South Dakota leaders of the farm bureau, grange, co-operatives, and practically every farm organization in the state met to draw up a sane program. Prominent in their findings, under the heading "For Increased Profits," appears:

"CROP ROTATION: a definite crop rotation consisting of a cultivated crop, small grain crop, and a legume crop in almost equal acreages is to be encouraged to help control weeds, maintain soil fertility, and to furnish a variety of feed."
Effect of Beet Culture on Yield of Other Crops

By HARRY A. AUSTIN
Secretary, U. S. Beet Sugar Association

Not only has the beet-sugar industry been a potent factor in increasing the world production, and lowering the price of sugar to such an extent that it is now used in every home throughout the civilized world, but it has had an important and far-reaching influence in the national economy of all countries in which it has been established.

In addition to saving hundreds of millions of dollars by substituting home-produced sugar for imported sugar, it has added other hundreds of millions of dollars to the national wealth by increasing the acreage yield of all cereal crops by the introduction of sugar beet culture into the cycle of rotation.

It is a fact, established in continental Europe for more than a century and demonstrated in this country by our sugar-beet farmers, that by rotating sugar beets with cereal and other crops, the acreage yield of the latter is increased from fifty to one hundred per cent.

The proportion of our total cultivated area devoted to sugar beet culture is so small that the effect of this culture is not perceptible in the average acreage yield of cereal crops for the entire country. However, in continental Europe, where a more considerable proportion of the total cultivated area is devoted to beet culture, the result is shown in a very marked degree.

For instance, in 1913, the seven northwestern countries of Europe, where the beet sugar industry has been established for more than a century, harvested an average of 24.7 bushels of wheat per acre to our average of 15.2 bushels; 28.4 bushels of rye to our 16.2 bushels; 36.2 bushels of barley to our 23.8 bushels; 47.7 bushels of oats to our 29.2 bushels; 210.7 bushels of potatoes to our 90.4 bushels.

Of the five crops they produced an average of 61.4 bushels per acre, while of the same crops the United States produced only an average of 23.8 bushels per acre.

While the total average yield per acre of these crops in the United States is small compared to the acreage yield secured in the beet-sugar producing countries of Europe, American farmers who
are engaged in sugar-beet culture have secured more wonderful results in increasing their acreage yields of other crops by rotating them with sugar beets than have the beet-growing farmers of Europe.

Some time ago the United States Beet Sugar Association collated reports from 500 American farmers engaged in growing sugar beets, showing the average increase in the yield of cereals and other crops after injecting sugar beets into the cycle of rotation.

The five hundred reports received showed an average increase of 49.87 per cent in the yield of wheat; corn, 29.81 per cent; oats, 50.49 per cent; barley, 56.88 per cent; rye, 120 per cent; peas, 71.72 per cent; potatoes, 45.15 per cent; beans, 40.18 per cent; and tame hay, 26.78 per cent.

The average yield per acre before and after rotating with sugar beets and the average yield of all these crops in the United States are shown in the following table. It will be noted that while the farmers reporting secured more than the average yield per acre of these crops before rotating with sugar beets, by the introduction of sugar beet culture they were able to increase their already large yields to a very great extent.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average U.S. Yield Per A. 1923</th>
<th>Bushels per Acre Before Beet Culture</th>
<th>Bushels per Acre After Beet Culture</th>
<th>Increase in Bushels</th>
<th>Percentage of Increase</th>
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</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>15.2</td>
<td>29.98</td>
<td>44.93</td>
<td>14.95</td>
<td>49.87</td>
</tr>
<tr>
<td>Corn</td>
<td>23.1</td>
<td>55.41</td>
<td>71.93</td>
<td>16.52</td>
<td>29.81</td>
</tr>
<tr>
<td>Oats</td>
<td>29.2</td>
<td>45.65</td>
<td>68.70</td>
<td>23.05</td>
<td>50.49</td>
</tr>
<tr>
<td>Barley</td>
<td>23.8</td>
<td>42.26</td>
<td>66.30</td>
<td>24.04</td>
<td>56.88</td>
</tr>
<tr>
<td>Rye (1)</td>
<td>16.2</td>
<td>25.00</td>
<td>55.00</td>
<td>30.00</td>
<td>120.00</td>
</tr>
<tr>
<td>Peas (2)</td>
<td>39.18</td>
<td>67.28</td>
<td>28.10</td>
<td>71.72</td>
<td>45.15</td>
</tr>
<tr>
<td>Potatoes</td>
<td>90.4</td>
<td>285.31</td>
<td>88.75</td>
<td>40.18</td>
<td>28.78</td>
</tr>
<tr>
<td>Beans (2)</td>
<td>15.28</td>
<td>21.42</td>
<td>6.14</td>
<td>40.18</td>
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<tr>
<td>Hay, tons</td>
<td>1.31</td>
<td>2.71</td>
<td>3.49</td>
<td>.78</td>
<td></td>
</tr>
</tbody>
</table>

(1) Three reports only. (2) No data.

If, through the expansion of the beet sugar industry in the United States the total production of our agricultural food products could be doubled, without any additional expense and with very little additional labor, the boon it would be to this country in lowering the high cost of living is apparent.
Moving Farm to Factory

Frequently on the factory operating sheets this season has appeared the note: “dirty beets.” It is a citation explaining low slicing capacity, delays, higher costs.

Fluming becomes wasteful when tons of dirt are moved along with beets. Dirt has been screened from these beets at the dumps; still a high percentage of dirt reached the factory bins.

High tares are as unwelcome to sugar company men as to farmers: it generally means dirt bought at beet prices: it spells difficulties in factory operation.

The wet harvest season favored dirty beets this Fall, but deliveries were received with a minimum of friction, thanks to the fairness and accuracy with which tare was taken and to the good sense of the growers.

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What Rotation Means to Me

By R. M. BARR

In the past three years much has been said throughout Colorado on the benefits derived from rotation of crops, and our Through the Leaves has published for its readers more detailed results from different rotations than any agricultural paper in the west. As a result crop rotation in those years has made a material increase.

The main farm relief required in Colorado is a better cropping system, and this can be done by systematic rotation. The results from same are a much better mechanical condition of soil, a better tilth, freer working soil, and much heavier production.

A good rotation will also reduce soil or plant diseases and pests, such as cut worms, nematodes, etc. If we cannot entirely eradicate pests and soil and crop diseases, we can at least hold them at a minimum.

A proper rotation of crops will bring us nearer a maximum production than we have seen in past years. Our beet crop has averaged two or more tons higher per acre in these last three years, and much of this increase has to be attributed to a better cropping system; some to better crop management and better irrigation.

This issue of Through the Leaves reports some crops of over 20 tons of beets per acre in the Longmont District, and in every case rotation is practiced. While a few are not scientifically based according to soil requirements, they are showing wonderful results. Fair rotations in the past two years increased some beet crops $20.00 to $50.00 per acre.

Seeing those results why not get down to a better system. We still have some six to ten-ton crops, which are holding down our averages. Most of them are on the one year lease system, or on lands with non-resident owners who appoint a banker or a lawyer or real estate man as local agent—not to see to the land being properly farmed and buildings, fences and ditches kept in proper repair, but to hold down expenses and collect his rents. This does not tend to any good rotation.

Many farmers have different rotations running from 4 to 7 years. Badly infested nematode fields should be on the long time rotation, say 8 or 10 years with one crop of beets on this land every 4 or 5 years, and while we cannot eradicate the pest such a rotation will maintain high yields. Good rotations will increase yields on all crops, so why don't we all get busy.

AN EDITOR SPEAKS

"The grower, as well as the manufacturer, must through self-preservation band themselves together for the betterment of the industry. The farmer would suffer, it is true, through being forced to change his farm activities, through adapting his investment to the production of some other crop to replace the beets—the farmer of this section does not want this to occur. If the industry is suffering, and we believe it is, it behooves the grower to forget his quarrel with the manufacturer and work with him for their common good in obtaining a higher tariff against imported sugars."—The Scottsbluff Republican.
A NY farmer with time and inclination to do a bit of research reading may with profit obtain a copy of “Green Manuring,” by Adrian J. Pieters, agronomist in charge of clover investigations, for the United States Department of Agriculture. It is published by John Wiley & Sons, Inc., New York City. Dr. Pieters is not unfamiliar with farming conditions in the intermountain west. He has visited Colorado and has manifested a deep interest in the welfare of farmers here. Also he writes after a most comprehensive study of the subject of green manuring.

This practice, finds Dr. Pieters, is common in all parts of the United States except on “dry land” farms where lack of moisture makes green manuring impossible.

He also finds that it is thoroughly established in Germany and other foreign countries, particularly on the sandy soils, and that even on the better soil types it is not uncommon to find farms without live stock but maintaining the fertility of their land by green manuring.

“The value of a green manure crop,” says Dr. Pieters, “lies principally in the fact that by its use organic matter and, when a legume is used, additional nitrogen are added to the soil with a consequent improvement in soil tilth and in the quantity of available plant-food material.

“If keeping live stock is profitable, legumes can be better utilized for feed than for fertilizer, but when the sole profit in keeping live stock consists in the manure the legumes can be more profitable turned under than fed at a loss. In this way overhead and capital investment are both reduced.”

After a consideration of the economic factors in green manuring Dr. Pieters concluded that it is a fallacy to limit legume acreage to that needed for feed or for sale. “Legumes of many kinds,” he says, “especially when grown as companion crops or as winter cover crops, can profitably be grown for green manuring alone and thus supplement the unusually inadequate supplies of stable manure.”

From a study of every available report of experiment stations and with his wide knowledge of commercial farms Dr. Pieters finds that the practice of green manuring definitely increases the yields of corn, small grain, beets, and potatoes.

“The best increases in yields are commonly secured with hoed crops,” he declares.

In words that are quite readable and style not too technical, Dr. Pieters explains the scientific aspects of green manuring: 1—as a source of nitrogen; 2—its function in improving tilth; 3—how
the decomposition of plant material gives rise to carbon dioxide, with its beneficial effect in dissolving soil minerals and possibly making phosphates more available; 4—its suppression of weeds; 5—preventing evaporation, and 6—placing by means of decaying roots its beneficial effects into the lower reaches of soil where succeeding crops may obtain them.

What Rotation Means to Me

By A. H. HELDT, Agricultural Superintendent, Nebraska District

BY CROP rotation we mean, in general, the growing of different kinds of crops in recurring succession on the same land. The rotation best suited to the condition of the soil and to the characteristics of the crops grown, and from which the grower may receive maximum benefit, may be called a proper rotation. Crop rotation alone has been found to be almost as effective as barnyard manure or commercial fertilizer in producing all kinds of farm crops.

The good effects of crop rotation do not destroy the benefits derived from fertilization so when these two farm practices are combined the one practice adds to the benefit from the other.

On soils that have been cropped a long time the highest yields may be obtained only by the use of both manure and crop rotation. In other words maximum yields cannot be obtained by rotation alone but rotation must be combined with fertilization and good cultivation.

By experiment it has been found that when rotation of crops and the use of fertilizer are combined, the total increase in yield is about equal to the sum of the separate increases.

Rotation is of direct benefit in keeping the soil free from diseases and also lessens the danger of loss from hail and other storms.

Mistakes are often made by following some general system of rotation which is not adapted to the land on which it is applied, and for this reason the rotation will not show the good results it should. The mistaken farmer, therefore, condemns rotation.

The rotation best suited to a field of low-producing, sandy soil is hardly suited to a highly productive loam. A hillside field subject to soil washes calls for different treatment in regard to rotation than a field on a flat area. Be sure you have the proper system and then follow it out.

Cultivation of the soil, rotation of crops and fertilization are the outstanding farm practices on which permanent success in farming must rest.

Barley and Skim Milk Fine for Hogs

At Wisconsin Experimental Station hogs fed barley and whey made most economical gains. The barley is crushed. It can be fed with corn or as a substitute and as the barley matures earlier than corn it affords a chance to push pigs forward to rapid maturity.
English Beet Sugar Mills Got $2.50 Per Pound from Government

No Specification in English Law Giving Growers Any Direct Portion of Tariff Benefits

When the British beet industry was under tariff protection only, with no subsidy, there were built only a few factories. Not all operated each season. The industry languished under the tariff alone. The tariff act specified no minimum price the factories must pay the farmers.

It was only on the passage of the subsidy act in 1925 that the industry developed rapidly—and for obvious reasons. The government paid the mills a net bounty of slightly more than $2.50 cents per pound; this in addition to any benefits arising from the tariff which on refined sugar was $2.50 cents per pound.

The bounty or subsidy act did specify a minimum price the farmer was to receive, but this specification covered only the crops of 1926 and 1927. The minimum was so low that the factories paid more. Even then farmers complained they were not adequately sharing in the government's bounty.

With sugar prices higher in the United Kingdom than in the United States, plus the direct payment to the English sugar manufacturers of a subsidy from the Exchequer, there is no question that they had much more left after paying for beets to cover manufacturing costs and profit than was left to American factories.

The price of sugar beets in the United Kingdom is arrived at by negotiation between representatives of growers and factories.
$2.57 Net Cost per Ton Beets Paid by British Factories

An Inquiry Into Certain Aspects of the United Kingdom's Tariff and Subsidy

During the period of protection for the new British beet sugar industry by tariff or subsidy or both, dissatisfaction has been prominent among farmers over the payments made to them by the sugar manufacturers. In March, 1928, says "The British Beet Grower," "farmers in the Atherstone district have raised the question as to whether the sugar factories are not making big profits at the expense of the growers."

The reduction in the beet price in 1928 brought a report from Yorkshire that the farmers were "very chary about next year's prospects, and many who grew beets in 1927 have not yet contracted for 1928. This forms the chief topic at most Farmers' Union meetings." In the February 1928 "British Beet Grower," the Yorkshire correspondent reports: "The discontent I referred to in my last notes which continues to agitate local Farmers' Union meetings over the question of sugar beet prices continues.

"At a meeting of the Pocklington branch of the Union Mr. A. Bristow referred to the complaints of sugar beet growers. It was something like a picture puzzle, he said, and the puzzle in all earnestness was 'Who gets the sugar beet subsidy?'"

The Subsidy's Cost to the U. K. Exchequer

From the date on which the sugar subsidy act of 1925 became operative until September 30, 1927, there were produced 229,186 tons of beet sugar and 5,700 tons of molasses, from 1,714,493 tons of beets, clean weight.

Of this a total of 4,956,021 pounds sterling was paid in subsidy. By way of excise, however, 1,693,430 pounds was returned to the Exchequer. The net cost to the government of the United Kingdom was 3,262,591 pounds sterling.

In the same seasons about 4,870,000 pounds sterling were paid to farmers for beets, and 613,000 pounds sterling for freight, leaving a net to the farmers of approximately 4,260,000 pounds sterling.

The 1,714,493 tons (long) of beets, therefore, cost the factories about 4,260,000 pounds sterling less the subsidy of 3,262,591 pounds, or $2.57 per ton of 2,000 pounds.
Sugar Is Higher in Britain

Not only have the beet sugar manufacturers in the United Kingdom paid out of their own pocket only a fraction of the price paid per ton of beets in the United States: *the market price they have received for the refined sugar was higher than in this country.*

In the same issue, the South Lincolnshire report states: “The South Lincolnshire farmer just now does not show any great enthusiasm for sugar beet. The new price is considered very unsatisfactory.”

It prints at the same time an attack on the English beet sugar industry and the protective measures of subsidy and tariff, the author of the attack declaring “the general public now realizes with a shock that the beet-sugar subsidy is not merely useless to help unemployment but actually creates more unemployment,” “waste of public money vitally injuring our own people,” “vicious subsidy.”

“The British Beet Grower” of May, 1928, mentions again the pending difficulties between growers and factories over prices and adjustment of tariff benefits.

The following June this publication reports an address at the Farmers’ club by the Rt. Hon. E. G. Pretyman who said: “We must remember that the grower is in a very weak position vis-a-vis the factory, because the factory gets the subsidy and can make its own bargain, and the grower has to take what is given.” On another page of the same issue several prominent Lincolnshire farmers refer to the agreement between the Farmers’ Union and the beet factories as “unsatisfactory.”

Other British journals, notably “The International Sugar Journal,” have repeatedly and from season to season carried comment on the state of dissatisfaction over the beet price and the farmers’ share of benefits from the tariff and subsidy.

Proof is overwhelming that there is no warrant for any comparison belittling the state of affairs in the United States on the assumption that in England the law directly hands the beet growers tariff benefits, or that the populace and the farmers in the United Kingdom are satisfied with present conditions.
Why Do Sound Rotations Make More Money for the Farmer?

WHY isn’t there rotation planning on the average beet farm?

The answer: there is. Every farm has a rotation, of a sort. In most cases it is founded on some immediate necessity or condition from year to year rather than on any “long run” profit basis. The landlord, the tenant, or the mortgage holder may have more to say about a rotation than science or experience. Any effort to extend better farming principles must take into account the conditions peculiar to the individual farm.

Hence the appeal of the agricultural department of the Great Western Sugar Company: let us work with you in planning a sequence of crops for your farm if you have not already put into effect one that is proving satisfactory.

For some men the only question about a rotation is: will it make money for me? A mighty practical and sensible question, too. The rotation planned should make a profit for the farmer; that is, it should make a better living for him than the system he may have been following to his regret.

But if he really wants to give the rotation a thorough trial and to co-operate with the plan intelligently he must ask still a second question:

WHY will a rotation planned for my needs and conditions make more money for me than a hit-and-miss system of farming? In short, he must understand what the assigned sequence of crops is supposed to accomplish for him.

To sense the why of rotation the farmer must look and think underground. Crops differ in the demands they make upon the fertile elements of a soil. A heavy feeder on nitrogen, for example, is better followed by a crop light in its demand upon this element. And as the principal ingredients of crop growth are consumed they must be replaced, if fertility is to be maintained, by manures, crop residues and green growth turned under.

It sounds technical but you need only turn to common experience to discover how practical it is. When sod lands were first brought under cultivation in this territory that land raised a number of handsome crops. Nitrogen in those soils was readily available and for a few seasons big yields obtained. Thereafter the nitrogen in soil organic matter was less available, its decomposition was slower, and yields were not as good as earlier.
The nitrogen is broken down in the decay of organic matter liberating ammonia. Micro-organisms attack this plant material and a by-product of their life activity is ammonia also. The ammonia is transformed to nitrate in which form the nitrogen of soils is most readily available to crops. The turning under of legumes or manures, high in nitrogen, thus results in crop benefits.

Moreover, the shortage or unavailability of any one important element of fertility restricts crop production no matter how abundant are the others. Few soils lack any one fertile element completely; continuously the same crop may lower the available supply temporarily but if given a chance time and nature will create or liberate more, as in fallowing. Hence the need of rotation to maintain production, to avoid depleting the soil of any single element essential to high yields.

To these advantages a good rotation affords the farmer a better distribution of his work, helps to reduce crop diseases and pests and, as vital as any reason, gives him the safety that comes from not having all his eggs in one basket.

The "Average" Farmer

One of the difficulties of dealing with the agricultural problem, as pointed out by William Butterworth, President of the Chamber of Commerce of the United States, is the tendency to take the "average" farmer and the "farm dollar" as something real.

"We get the average farmer," he said in an address before the Chicago Association of Commerce, "by pouring together farmers—white, black and yellow, farmers efficient and inefficient, farmers who operate 5,000 acres and farmers who operate less than ten acres—farmers in the arid regions and farmers in the humid regions, cotton planters and potato growers, poultrymen and citrus growers. We pour them all together into a statistical machine and turn out this product which we call the "average farmer." Obviously no safe conclusion is to be drawn from such broad and loose generalization.

"Another instrument of averages used to indicate the situation in agriculture is the so-called farm dollar. It is itself an average. In other words, the so-called farm dollar represents the combined purchasing power of grain, fruits and vegetables, meat animals, dairy products, poultry products, cotton and cotton seed, in terms of retail prices paid by farmers for the things they buy for use on the farm and in the home. But grains and vegetables may be suffering temporary depression and these low levels will pull that whole farm dollar down to a point which enables the dealer in averages to say 'all agriculture is depressed.'"
Farming Incomplete Without Rotation

By E. J. LEONARD
(In "Western Farm Life")

The irrigation ditches will be idle now for several months. Storage of water in the reservoirs from now until April is about the only water activity. We can now forget the shovel, the dams and the running water. There are many other matters on the irrigated farm that demand our attention and thought.

Among these are crop rotations. Every farmer is ready to admit that some sort of a change in crops is desirable, but very few are working on any definite fixed rotation. We must bear in mind that there are three general classes of crops; grain crops, grass crops, and row crops. Rotations of these crops should be planned for a term of years in a somewhat regular order, depending on the type of farming being practiced. Soil building and soil exhausting crops should alternate with each other. Legumes like alfalfa and the clovers are soil builders. They are also good hay and pasture crops and so provide forage and fodder, essential in handling livestock. Not only do legumes store nitrogen in the soil to enrich it for succeeding crops, but they also provide the protein so essential in helping balance livestock rations.

Cultivated crops, such as sugar beets, potatoes, beans, peas, do not restore the elements removed by wheat, rye, barley, oats or millet, but they do leave the soil in excellent physical condition and do much toward increasing the yields of succeeding crops.

While certain crops are essential on a farm where the various kinds of livestock are raised or fed, it is generally desirable to have one or more cash crops in the rotation. The sugar beet is one of the very best of these—it not only pays its way with a profit generally, but provides by-products in the tops, the pulp and molasses which fit so admirably in the rations for feeding sheep and cattle.

No farming system is complete even with a well-planned systematic crop rotation unless more or less livestock is kept on the farm most of the year to supplement the fertility supplied by the legume crops. In fact, a permanent, lasting, profitable system of agriculture must include livestock, which should not only pay its own way with a profit, but leave a by-product in the form of manure which is just as essential in enriching and improving the soil condition as are the legumes. In fact, the system for profit is not complete with either legumes or manure alone. It takes both to make the most satisfactory returns over a long term of years.

Another thing to consider in crop rotations is that these changes combat the evils of insect pests and soil diseases which are bound to play havoc with any crop planted year after year on the same land.

Manure Top Dressing Seems to Prevent Winter-Killing of Alfalfa

It has been found that feeding the alfalfa plant well, supplying it with the elements of plant food necessary to develop a strong, healthy growth, lessens the damage to alfalfa in open winters. In Wisconsin a light manure dressing over the alfalfa brought some hay through a winter which killed unmanured fields. The top dressing also seemed to help the alfalfa to a quick healthy growth in the following spring.
WHEN SPRING COMES
Will Your Beet Land Be Ready for Timely Planting?

There is an impression at large that more beet acreage will be offered next spring than can be accepted. Hence growers are planning, by fall plowing where advisable, by manuring and other means, to put only their best land in shape for beets. They figure that a proffer of good ground made ready early and well will be more acceptable than poorer fields.

Plowing of heavy soils is being done by numerous growers as long as conditions permit. Farmers have been busy with beet harvest later than usual and until moisture fell recently many fields were too dry for plowing. But as long as soil can be worked plowing activity is certain to be much in evidence.

Tops are being removed to permit working down cloddy surfaces and leveling V-ed pile rows with the balance of the field.

A farmer with heavy soil and a definite crop rotation generally finds it advisable to do some of this fall work; 1st, to lighten the spring peak load; 2nd, to plant earlier; and 3d, to make more economical use and distribution of his man and horse hours and equipment.

In several districts average yields this year are lower than these localities are capable of producing without much effort. Delayed spring germination is now seen to be the main cause, due either to late planting or failure to irrigate up a stand in the absence of timely rainfall. The experience points to the wisdom of avoiding another such a setup next spring.
Wheat Tariff DOES Help American Farmer

What's Wrong With the Oft-Heard Charge That an Import Duty on an Export Commodity Is Not Effective

IN THE last few months the proposition has been widely circulated that a tariff on wheat can be of no benefit to the American farmer because this nation exports wheat. In 1922 the United States Tariff Commission made a study of the effects on prices of the Agricultural Emergency Tariff Act of 1921. The then tariff rate on wheat was 30c per bushel. (It has since been increased to 42c). Under free trade conditions between the United States and Canada, Winnipeg prices normally exceeded Minneapolis prices on hard spring wheat by five to six cents per bushel. The commission found: “After the passage of the Emergency Act, however, Minnesota prices gradually came to exceed Winnipeg prices by 25 to 27c per bushel. Therefore, if allowance is made for the higher quality of the Canadian wheat, it appears that the differential between the prices in the two markets is now almost equal to the duty.”

The Food Research Institute of Stanford University, heavily endowed, conducting its investigations scientifically, and truly free from the bias of partisan politics, made probably the most intensive study of the international wheat trade. It reported:

Comparison between highest cash closing prices of No. 1 Dark Northern Spring Wheat at Minneapolis and Cash Closing Prices of No. 1 Manitoba Northern at Winnipeg:

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<td>163.9</td>
<td>160.3</td>
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<tr>
<td>Average</td>
<td>187.6</td>
<td>170.5</td>
<td>17.1</td>
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—Food Research Institute Wheat Studies (Copyrighted).

“There is not a question that with a substantial tariff duty on wheat, prices tend to stand higher in the United States than in Canada. The differences are usually quite substantial between
spring wheats of comparable milling quality and smaller between American winter wheat and Canadian spring wheat of comparable grades. The difference is highest in years of short American crops and large Canadian crops as in 1925-26. When the American crop is large and the Canadian crop is small as in 1924-25 American wheats may average lower in price than Canadian but this will rarely hold true for comparable spring wheats of the two countries."

The institute finds that while the full duty of 42c a bushel may not be reflected in what the average American farmer receives for his wheat the tariff is effective to a large degree on wheat of comparable quality.

World prices may decline, thus lowering domestic prices regardless of tariffs. But no student of the effect of a duty on wheat importations into the United States will make the sweeping charge that a wheat tariff is of no aid to American farmers.

A Sidelight on the Potato Situation

New or early potatoes of the 1929 crop face a serious competitive situation, according to Dr. F. B. Bomberger of the University of Maryland and director of the potato farmers' association of Delaware, Maryland and Virginia.

He harks back to the situation in 1928 for his warning. New potatoes came into the markets this summer in volume at a time when there was a considerable carry over of the old crop. And a similar condition faces the grower next season, Dr. Bomberger warns. A present excess of 100 million bushels over consumptive demands will bear down heavily on the new crop, in his opinion.

Growers in the Kaw Valley of Kansas, which produces in a narrow strip of ninety miles about 5,000 car loads of potatoes annually, lost $38 per acre average on the crop this past season. Dr. Bomberger told the Kaw farmers at a conference in November that the potato farmer was partly to blame himself for the glutted markets.

The U. S. Department of Agriculture last January warned farmers that the intention to plant potatoes indicated a 35 per cent increase in acreage despite 32,000 car loads of old potatoes in storage. Still farmers went ahead with their excessive potato plantings; and the South brought in a large new acreage using potatoes to diversify with cotton.

“In rotation of crops a farmer has at his command, ordinarily without monetary cost to him, a means whereby he can materially increase the output of his land and reduce acre costs.”
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