

T H E S I S

A STUDY OF THE EFFECTS OF SUPPLEMENTARY FEEDS
ON
HOGS FATTENING ON PEAFIELD PASTURES

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Submitted by

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In partial fulfillment of the requirements
for the Degree of Master of Science

Colorado Agricultural College

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A STUDY OF THE EFFECTS OF SUPPLEMENTARY FEEDS
ON
HOGS FATTENING ON PEAFIELD PASTURES

INTRODUCTION

The production of field peas, Pisum sativum, in Colorado, has increased from 24,230 acres in 1917, to 50,000 acres in 1929 according to the Colorado yearbook (19). Most of the peas produced in the state are raised in the San Luis Valley and are used largely for hog and lamb feeding, altho some are used for seed or for the split pea market.

The common feeding practice in the San Luis Valley is to hog-off the mature, unharvested peas in September or October. The pigs are then put in a dry lot to be fattened and sheep are pastured on what the pigs have not eaten. The hogging-off period lasts from 20 to 40 days, depending on the size of the fields and the number of hogs used, and the pigs usually receive no other feed than the peas during the period.

The writer spent several months in the San Luis Valley and was told by many ranchers that there were good reasons for this method of feeding. One of the principal reasons seems to be that at this time of the year the farmers are all busy harvesting their crops and the pigs require no attention when on peas. Another

reason given by several was that usually barley is not threshed until October or November and is therefore not available for feeding at the beginning of the fall.

They all agreed that pigs made good gains on peas alone at the beginning, but that peas had to be supplemented by some other feed if these gains were to be maintained later in the fattening period.

REVIEW OF LITERATURE

With a few exceptions all experiment stations report the results of pea feeding in terms of pounds of pork per acre, in other words the results of hogging-off without the aid of supplements.

In comparing field peas and corn, ten year trials in North Dakota (15) showed 385 pounds of pork per acre from field peas as compared with 372 pounds of pork from an acre of corn, both crops being hogged-off. In comparing corn and peas as hog feed, Thomas Shaw in 1895 U. S. D. A. Yearbook says that field peas are superior to corn prior to the fattening period. Shaw adds that "they (field peas) promote growth while they fatten in excellent form, and they furnish a sweet, firm and excellent quality of pork." Other work shows that North Dakota (11) reported 437 pounds of pork per acre in 1917; Washington (3) reports only 159 pounds on a 17-bushel yield; Idaho (5) reports 126 pounds gain per acre.

In 1917, North Dakota (11) found that 10 pigs, weighing from 80 to 100 pounds could be pastured on an acre of peas yielding 20 to 25 bushels for 30 days and make a total gain of 440 pounds. In 1919, (18) they secured a gain of 411 pounds of pork per acre.

In all the hogging-off trials the pasture period ranged from 15 to 40 days and usually no supplementary feed was added to the field pea ration.

Washington (13) reports work done on drylot fattening with peas furnishing 60 percent of the ration, by weight. It was found at this station that pigs receiving a ration of 6 parts peas, 3 parts shorts and 1 part tankage produced greater and cheaper gains than those receiving a ration consisting of 6 parts barley, 3 parts shorts and 1 part tankage.

Field peas are also used to some extent, as a green forage for summer pasture. Washington (12) concludes that peas are equal to alfalfa as a green forage in the Palouse country. At the Michigan Station (14), peas and oats were seeded together in the ratio of 3 to 1 and the average of two years showed a pork crop of 188 pounds per acre when hogged-off before maturity.

Field peas are very palatable according to investigators at Ontario (1) but wasteful since they are not completely digested. It was found here in 1903 that peas should always be combined with barley or oats in a ration for pigs.

Digestion trials with peas were run at the Maine Station and reported in the 1889 annual report of that

station. The percent digestibility of protein was given as 83.2 percent, of nitrogen-free-extract as 93.6 percent, ether extract 54.5 percent, ash 43.7 percent and fiber 25.7 percent. This makes the total digestible nutrients higher than reported by Henry and Morrison in their book, "Feeds and Feeding", but this is due to the higher chemical analysis of the peas at Maine.

Nordby and Snyder at the Idaho experiment station have done considerable work on the influence of field pea rations on the quality of pork; on the skeleton on swine and also, on the physiological effect of feeding field pea rations on growth and reproduction in swine.

Idaho (5) reports the results of the influence of field pea rations on the skeleton. Thirty-six pigs were divided into 4 lots as nearly uniform as possible and fed as in drylot fattening. Lot 1 received only cracked peas; Lot 2, cracked peas and minerals (30 pounds steamed bone meal, 30 pounds ground limestone and 30 pounds salt); Lot 3 was fed 1 part cracked peas to 2.5 parts of rolled barley and Lot 4 received the same as Lot 3 with the addition of the minerals given to Lot 2. Strength of skeleton was reported as the number of pounds required to break the right femur of the pigs. This required 555 pounds in Lot 1, 634 in Lot 2, 569 in Lot 3 and 643 in Lot 4. One hundred pounds gain

was produced with 30 pounds less feed when peas were supplemented.

In 1925, Nordby and Snyder (7) reported results of the test they had made on the influence of pea rations on the quality of pork. The investigation was divided into two parts, in Part I the hogs were confined to drylot feeding, and in Part II a preliminary hogging-off period preceded the drylot feeding.

In Part I, 32 pigs, averaging 120 pounds, were divided into 4 uniform lots and fed 76 days. In Part II, the pigs averaged 98.5 pounds at the start but a forage period of 30 days was introduced prior to the drylot feeding and this brought them above the weight of the pigs in Part I. In Part II, the lots receiving peas were run on peafields during this period and those not receiving peas in the later drylot period were grazed on alfalfa forage plus a grain supplement. Lot 1, in both parts of the test was fed cracked peas alone in drylot, Lot 2 was given cracked peas and rolled barley, Lot 3 received rolled barley and tankage and Lot 4 was fed cracked corn and tankage.

The results showed that the pea-fed hogs made cheaper gains but yielded slightly less in the slaughter test. The quality of pork, when judged by the physical observations of the carcasses, shrinkages in the curing process, melting points of the lard, and iodine values,

tends to show that field peas, fed alone or with barley, compare favorably with such standard rations as barley and tankage or corn and tankage.

Continuing their investigations with field peas the Idaho Station (8) conducted an experiment to determine the physiological effect of feeding rations of Canadian field peas, Pisum sativum, on growth and reproduction in swine. In Part I of this test 12 gilts were divided into 3 lots and bred to farrow in March. The following year six of the same sows were divided into two lots and bred. One lot in Part I of the experiment received cracked peas only while the other two lots were fed a combination of cracked corn, rolled barley, rolled wheat, rolled oats and ground alfalfa hay in addition to cracked peas. In Part II, Lot 2 was fed cracked peas only, while Lot 1 received cracked peas, rolled barley and alfalfa hay.

The sows and gilts were kept in a strong vigorous condition carrying only a moderate amount of finish. No attempt was made to fatten and immediately after farrowing the pea-fed lots were put on a different diet.

Altho the gilts and sows that were fed on peas alone displayed poor appetites and frequently went off feed, they farrowed as many pigs as their check lots. One sow suffered from partial paralysis for 14 days prior to farrowing.

There was a decided difference in the condition of the litters born. Over 10 percent of the pigs farrowed by the straight pea-fed gilts were born dead and the pigs were classified largely from fair to strong while in the check lots, none were born dead and most of the pigs were in the strong to very strong groups. The pea-fed sows farrowed nearly six percent dead pigs and three percent very strong while the checklot sows farrowed no dead pigs and over 53 percent very strong. In both parts of the test most of the pigs farrowed in the pea-fed lots weighed from 1.5 to 2.5 pounds while the greater number in the check lots weighed from 2.0 to 3.5 pounds. The authors concluded that the experiment "seems to indicate that there is something lacking in the peas for complete nourishment of the pig in utero, and that a supplementary ration is to be desired in the feeding of field peas to brood sows during their gestation period."

Considerable work has been done with feeding field peas to rats. Since a few investigators confused vetch, Vicia sativa, with the common pea, Pisum sativum, Dr. C. V. Piper (2) Agrostologist in charge of forage crop investigations, Bureau of Plant Industry, United States Department of Agriculture was called upon to identify the peas. He described them as follows: "the

true pea, Pisum sativum, consists of two groups of varieties, the sugar or garden pea whose seeds wrinkle when dry and the field peas which remain smooth when dry. The former are only grown for human food and eaten green; the latter are used largely for forage, particularly in Canada, and therefore, are called Canadian field peas. The split peas of the market are field peas. The vetch, Vicia sativa, is used as a forage and most varieties have dark colored seeds and are not used as a human food."

McCullum, Simmonds and Parsons (6), in their work on the dietary properties of the pea, found that the mother rat ate her young when flaxseed and peas supplied the only protein in a ration otherwise balanced. They also found that when one-third of the protein fed was from millet seed and the other two-thirds was fed in the form of peas, that quite normal growth and good reproduction resulted. With later trials they had a complete reversal of results. Frinks, Jones and Johns (2) attributed this to the fact that the vetch, Vicia sativa, was used first and in later tests the true pea, Pisum sativum, was used and proved by their work that the field pea could be used as a sole source of protein in a ration and that normal growth could be sustained. They proved further that cooking field peas did not improve them nor did the addition of cystine to a ration, 75 percent of which was in the form of peas, promote

better growth or reproduction. Sure (17) found that adding arachin and edestin did not improve the protein in peas.

Steenbock, Sell and Boutwell (16) studied the pea, Pisum sativum, as to its fat-soluble vitamin content. They used three varieties of yellow peas and three varieties of green peas and in their summary say, "In ripe peas those of a green color, also carrying considerable yellow pigment, were far richer in their fat-soluble vitamin content than yellow peas which contained much less pigment." These investigators had previously observed that yellow pigmentation and content of Vitamin A are not always closely associated.

Most of the literature reviewed indicates that peas alone is unsatisfactory for fattening hogs. Common practice and experimental work has shown that hogs can be pastured on peas alone for a short time at the beginning of a fattening period to a good advantage but have also indicated that hogged-off peas can be used to a better advantage if they are supplemented by another protein feed.

The problem then is to find a feed or a combination of feeds that will supplement field peas so that they can be hogged-off during the entire fattening period.

PEA FIELD HOG FEEDING EXPERIMENT 1929-30Objects of the Experiment:

To determine the effect of feeding pastured field peas without supplements.

To study the effects of various supplementary feeds when fed with pastured field peas.

To find a homegrown feed or combination of home-grown feeds that improve the quality of the pea protein.

To determine the most economical feed or feeds to use in supplementing hogged-off peas.

Plan:

To feed uniform lots of pigs on unharvested pea fields. All lots excepting Lot No. I to be fed supplements and one lot to be fed in dry lot. The experiment was conducted one-half mile from Romeo, Conejos County and continued for 100 days.

Methods:

This experiment was conducted according to the standard methods used by the Animal Investigations Section of the Colorado Agricultural College. All data was compiled as instructed in the standard record book of that department.

Hogs Used:

Ninety uniform Hampshire hogs were selected from a ranch six miles north of Monte Vista. They were

vaccinated for hog cholera, fed a few days and allotted in lots uniform as to weight, sex and condition.

Peas Used:

A good uniform field of Canadian field peas, Pisum sativum, was bought from a rancher one-half mile south of Romeo on the main highway. They were mixed as to varieties but all of the yellow colored strain. Three and one-third acres constituted a pasture for each lot except Lot 1 which was given twice that amount. A yield test showed a crop of 19.8 bushels per acre.

Ration Fed:

Lot No. 1 Peafield.

Lot No. 2. Peafield, barley.

Lot No. 3. Peafield, alfalfa meal.

Lot No. 4. Peafield, barley, alfalfa meal.

Lot No. 5. Peafield, barley, tankage.

Lot No. 6. Peafield, barley, potatoes, alfalfa meal.

Lot No. 7. Peafield, barley, potatoes, tankage.

Lot No. 8. Peafield, barley, skim milk.

Lot No. 9. Drylot, barley, tankage.

Salt was self-fed in all lots.

Feeds Fed:

Barley was purchased from local ranchers and was a typical improved variety. All barley was ground before feeding. It contained 8.77 percent protein and

11.36 percent moisture.

Fresh, leafy alfalfa hay containing 18.44 percent protein and 10.35 percent moisture was obtained from a nearby ranch.

Tankage containing 51.50 percent protein and 10.69 percent moisture was secured from the Nuchols Packing Company, Pueblo.

Skim milk was bought from the local Frink Creamery, Manassa.

Potatoes were bought locally and fed frozen because of the lack of proper storing facilities.

Salt was self-fed in all lots.

No minerals were fed.

Equipment:

Self-feeders were built especially for this experiment. Partitions were built in feeders in lots where more than one dry feed was supplemented so that all feeds were fed separately.

Automatic waterers were used and the water was kept from freezing by lamps under the supply tank and troughs.

Potatoes and skim milk were fed in shallow, wooden troughs.

Portable weighing equipment was used. This consisted of two panels, a chute, platform scales, scale platform and weighing crate.

Management:

Self-feeders were filled regularly with feed and salt and waterers were filled daily. Each day a careful check was taken of each lot as a precaution against mixing. Sufficient straw for bedding was kept in the shelters at all times. A local man was employed to feed and care for the hogs and it was his duty to feed milk and potatoes each morning. At the beginning and end of the experiment and each 30 days during the experiment, H. B. Osland from the Animal Investigations Section was present to supervise weighing and give his attention to the problems that had presented themselves during his absence.

Chemical Composition of Feeds Used in the 1929-1930Experiment

Analysed by Max Parshall, Dairy Commission Chemist

| | <u>Water</u> | <u>Ash</u> | <u>Fat</u> | <u>Protein</u> | <u>Fiber</u> | <u>N.F.E.</u> |
|------------|--------------|------------|------------|----------------|--------------|---------------|
| Tankage | 10.69 | 24.00 | 0.62 | 51.50 | 3.06 | 11.82 |
| Hay Meal | 10.10 | 10.10 | 2.45 | 18.44 | 23.84 | 45.17 |
| Field Peas | 10.86 | 3.19 | 1.63 | 21.09 | 8.70 | 64.89 |
| Barley | 11.36 | 3.38 | 1.76 | 8.77 | 7.51 | 78.57 |

Table I A

Results of the Peafield Hog Feeding Experiment

October 23, 1929 to February 4, 1930

(Based on one average pig)

| Lot Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|----------|--------------------|-----------------------------|---------------------------------------|-------------------------------|--|---|------------------------------------|-------------------|
| Ration fed | Peafield | Peafield Barley | Peafield Alfalfa Meal | Peafield Barley Alfalfa Meal | Peafield Barley Tankage | Peafield Barley Potatoes Alf.Meal | Peafield Barley Potatoes Tankage | Peafield Barley Skim Milk | Barley Tankage |
| Salt self-fed | | | | | | | | | |
| Pigs per lot | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| No. days fed | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 |
| Initial weight | 64.3 | 63.8 | 62.6 | 63.4 | 62.6 | 63.5 | 65.3 | 63.5 | 63.6 |
| Market weight | 158.6 | 194.6 | 164.4 | 187.7 | 190.4 | 189.8 | 203.7 | 214.8 | 190.1 |
| Total gain | 94.3 | 130.8 | 101.9 | 124.3 | 127.8 | 126.3 | 138.4 | 151.3 | 126.5 |
| Average daily gain | .90 | 1.25 | .97 | 1.18 | 1.22 | 1.20 | 1.32 | 1.44 | 1.20 |
| Feed required per cwt. gain | | | | | | | | | |
| Peafield (acres) | .785 | .255 | .466 | .234 | .196 | .198 | .178 | .147 | |
| Gr. barley | | 409.0 | | 405.5 | 384.0 | 384.8 | 370.5 | 398.3 | 554.0 |
| Tankage | | | | | 24.6 | | 19.9 | | 29.0 |
| Alfalfa Meal | | | 14.10 | 3.50 | | 3.70 | | | |
| Cull potatoes | | | | | | 25.10 | 22.60 | | |
| Skim milk (gallons) | | | | | | | | 61.30 | |
| Pounds of pork produced per acre of peas* | 127.59 | 392.16 | 214.59 | 427.35 | 510.20 | 505.05 | 561.80 | 680.27 | |

*Based on feed required per cwt. gain.

Table I B

Financial Statement Based on Actual Costs and Market Returns

10 pigs per lot fed 105 days (October 23, 1929 to February 4, 1930)

(Based on one average pig)

| Lot Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|----------|--------------------|-----------------------------|---------------------------------------|-------------------------------|---|---|------------------------------------|-------------------|
| Ration fed | Peafield | Peafield Barley | Peafield Alfalfa Meal | Peafield Barley Alfalfa Meal | Peafield Barley Tankage | Peafield Barley Potatoes Alfalfa Meal | Peafield Barley Potatoes Tankage | Peafield Barley Skim Milk | Barley Tankage |
| Salt self-fed in all lots | | | | | | | | | |
| Cost per pig @ \$10.00 per cwt. | 6.43 | 6.38 | 6.26 | 6.34 | 6.26 | 6.35 | 6.52 | 6.35 | 6.36 |
| Feed cost per head (mkt.) with peas \$15 per acre | 14.81 | 14.69 | 9.61 | 13.41 | 13.47 | 12.50 | 13.74 | 16.27 | 11.80 |
| Est. fixed costs (interest, labor and equipment) | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 |
| Shipping and selling expense | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 |
| Total cost at market | 21.24 | 23.11 | 17.19 | 21.99 | 22.18 | 21.29 | 22.73 | 25.21 | 21.86 |
| Selling price per cwt. | 9.80 | 9.70 | 9.80 | 9.90 | 9.90 | 9.90 | 9.90 | 9.90 | 10.05 |
| Gross receipts per pig | 15.54 | 18.87 | 16.11 | 18.58 | 18.85 | 18.79 | 20.16 | 21.37 | 19.11 |
| Loss per pig | 5.70 | 4.24 | 1.08 | 3.41 | 3.33 | 2.50 | 2.57 | 3.84 | 2.75 |

Feed prices used:

Peafield \$15.00 per acre
Ground barley 30.00 per ton
Alfalfa meal 15.00 per ton

Tankage \$70.00 per ton
Skim milk .03 per gallon
Cull potatoes 10.00 per ton



The pig on the left developed a rachitic
condition on the straight pea
ration



Lot No. 6. Fattened on peasfield, barley,
potatoes and alfalfa meal

Discussion of Results:

This test shows that it is not advisable to attempt to fatten hogs on hogged-off peas alone. It required 932.58 pounds of peas to produce 100 pounds gain at market. This is equivalent to an acre of peas yielding 15.54 bushels. The pigs in this lot made an average daily gain of only .9 pounds and at the end of the experiment were not in good finished condition.

That peas constitute an incomplete ration was indicated by one of the pigs in Lot No. 1 when it developed a condition similar to rickets. This test also brought out that peas, when hogged-off, made a quite satisfactory ration at the beginning of the fattening period. There was no great difference in the average daily gains, between lots, that first month.

Adding barley to peafield pasture increased the average daily gain and decreased the feed cost per hundred pounds gain. The test showed that 409 pounds of barley replaced .530 acres of peas or that one ton of barley replaced one acre of peas yielding 51.28 bushels.

Alfalfa meal had the highest feed replacement value of all the supplements used but since very little is consumed by the hogs its replacement value might be misleading if considered alone. It was found

in this test that 14.10 pounds of alfalfa meal replaced .319 acres of peas. Its replacement value was also high when added to barley or barley and potatoes as field pea supplements. Alfalfa meal does not increase daily gains when fed with peas but reduces the cost of gains. When used as a supplement to a straight pea ration, alfalfa meal does not produce finish in hogs but promotes growth.

One ton of tankage showed a feed replacement value of 4.8 acres of peas and 2032.5 pounds of barley. Tankage increased the daily gains and produced a good finish but owing to its high price it did not decrease the cost of gains as much as the alfalfa meal did.

Altho skim milk produced the best finish of any of the lots it did not prove the most economical from the standpoint of cost of gains. One hundred gallons of skim milk replaced .173 acres of peas and 14.5 pounds of barley. The test proved that unless skim milk is cheap and the other feeds are high in price it does not pay to add this feed to a pea and barley ration. Three cents per gallon or 35 cents per cwt was paid for skim milk in this experiment.

Cull potatoes are not eaten in large quantities by pigs but a small amount will increase daily gains and decrease cost of gains. Cull potatoes have a very

low commercial value in the San Luis Valley because of its large production of that crop and for this reason can usually be fed.

The best combination of home grown feeds was found to be peas, barley, potatoes and alfalfa meal. If skim milk is produced on the farm and has a low selling price it could very well be used since it finishes out hogs with more bloom than the ration mentioned above. Cull potatoes should always be added, when available because of the succulence which they provide. It is not necessary to use tankage to fatten hogs on peas but if it is not too high in price it can be used since it supplements any of the feeds used in this test.

PEAFIELD HOG FEEDING EXPERIMENT 1930-1931Object:

To continue the studies made the previous year.

Compare the feeding value of field peas with garden or canning peas.

To determine the value of the practice of hogging-off peas followed by a dry lot fattening period.

To test the value of triple mixture as a supplement to a peafield pasture ration.

Plan:

To continue the experiment on the same location used last year and to use the same equipment. Two more lots were to be added this year, one dry lot receiving barley and tankage slop and one lot to be pastured 60 days and then fed in the dry lot 40 days. One lot was planted to garden peas instead of field peas this year.

Equipment:

The same equipment used last year was used again this year. Two more self-feeders were built and an additional waterer was bought.

Management:

The author was placed in Romeo and was present during the entire experiment. He was directly in charge of feeding operations, besides keeping all

records. He was supervised by H. B. Osland of the Animal Investigations Section of the Colorado Agricultural College.



Feeding skim milk to Lot No. 4



Taking 30-day individual weights



Temporary pens used feeders' day.
This shows the type of self-feeders
and waterers used



The peafields at the close of the
experiment

Hogs Used:

The hogs were bought from ranchers six miles north of Monte Vista. It was found impossible to buy uniform pigs, of the size wanted, from one source so 50 pigs were bought at one place and 38 at another. Hampshires were again used. They were vaccinated, ear marked and allotted into lots uniform as to weight, sex, origin and condition.

Peas Fed:

The peas used were of the same variety as those used the year before. Lot No. 9 was planted to Perfection canning peas but owing to the volunteer field peas which also grew to maturity it was estimated by count that the field contained 60 percent garden peas and 40 percent field peas. A yield test showed an average of 10.85 bushels of peas per acre.

Rations Fed:

- Lot No. 1. Peafield and alfalfa meal (60 days);
barley and alfalfa meal (38 days).
- Lot No. 2. Peafield.
- Lot No. 3. Peafield, barley.
- Lot No. 4. Peafield, barley, skim milk.
- Lot No. 5. Peafield, barley, alfalfa meal.
- Lot No. 6. Peafield, barley, tankage.
- Lot No. 7. Peafield, barley, potatoes, alfalfa meal.

Lot No. 8. Peafield, barley, triple mixture.

Lot No. 9. Garden peafield, barley, triple mixture.

Lot No. 10: Dry lot, barley, tankage.

Lot No. 11. Dry lot, barley and tankage slop.

Salt was self-fed in all lots.

No mineral was fed.

Feeds Fed:

Barley was bought locally and ground for feeding. It was of a good improved variety and showed 10.83 percent moisture and 9.26 percent protein on analysis.

Tankage was bought from Armour and Company, Denver. Analysis revealed 5.41 percent moisture and 57.43 percent protein.

Cottonseed meal was secured from Ayres Milling and Grain Company of Denver. It contained 8.60 percent moisture and 46.58 percent protein.

Alfalfa meal was left over from the previous year. This was in an excellent condition and used again in this year's test. It analysed 9.21 percent moisture and 11.48 percent crude protein.

Triple mixture is the name given to a mixed feed containing 50 percent tankage, 25 percent cottonseed meal and 25 percent alfalfa meal. Computing the analysis of this mixture shows it contains 7.15 percent

moisture and 43.51 percent protein.

Skim milk was hauled each morning from the Frink Creamery near Manassa.

Potatoes were secured locally and stored in a warm place so they were not frozen when fed.

Chemical Composition of Feeds Used in the 1930-31

Experiment

Analysed by Max Parshall, Dairy Commission Chemist

| | <u>Water</u> | <u>Ash</u> | <u>Crude Protein</u> | <u>Fiber</u> | <u>N.F.E.</u> | <u>Fat</u> |
|-----------------|--------------|------------|--------------------------|--------------|---------------|------------|
| Field peas | 9.84 | 2.52 | 25.47 | 7.23 | 53.50 | 1.44 |
| Garden peas | 8.84 | 2.69 | 24.63 | 8.37 | 53.63 | 1.85 |
| Ground barley | 10.84 | 2.56 | 9.16 | 10.72 | 64.47 | 2.28 |
| Tankage | 6.03 | 21.32 | 57.46 | 3.17 | 1.08 | 10.99 |
| Cottonseed meal | 8.61 | 5.65 | 42.58 | 12.47 | 23.88 | 6.83 |
| Alfalfa meal | 9.21 | 5.94 | 11.48 | 30.25 | 41.35 | 1.80 |

Table II A

Results of the Peafield Hog Feeding Experiment

November 9, 1930 to February 15, 1931

(Based on one average pig)

| Lot Number * | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|----------|--------------------|------------------------------------|---------------------------------------|-------------------------------|---|---|---|-------------------|
| Rations fed | Peafield | Peafield Barley | Peafield Barley Skim Milk | Peafield Barley Alfalfa Meal | Peafield Barley Tankage | Peafield Barley Potatoes Alfalfa Meal | Peafield Barley Triple Mixture | Garden Peafield Barley Triple Mixture | Barley Tankage |
| Salt self-fed in all lots | | | | | | | | | |
| Pigs per lot | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Days on feed | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| Initial weight | 79.8 | 80.5 | 79.6 | 81.0 | 80.2 | 80.0 | 81.6 | 81.1 | 81.7 |
| Final market weight | 155.3 | 180.4 | 202.8 | 190.1 | 189.7 | 185.2 | 187.9 | 199.8 | 195.3 |
| Total gain | 75.5 | 99.9 | 123.2 | 109.0 | 109.5 | 105.2 | 106.3 | 118.7 | 113.6 |
| Average daily gain | .75 | 1.02 | 1.26 | 1.11 | 1.12 | 1.05 | 1.08 | 1.21 | 1.16 |
| Feed required per cwt. gain: | | | | | | | | | |
| Peafield (acres) | 1.428 | .572 | .520 | .559 | .505 | .565 | .540 | .555 | |
| Ground barley | | 550.72 | 596.64 | 505.89 | 496.49 | 442.55 | 514.86 | 466.19 | 546.02 |
| Tankage | | | | | 30.59 | | | | 45.64 |
| Alfalfa meal | | | | 5.85 | | 2.67 | | | |
| Triple mixture | | | | | | | 50.91 | 27.48 | |
| Cull potatoes | | | | | | 91.10 | | | |
| Skim milk (gallons) | | | 79.55 | | | | | | |
| Salt | .85 | .56 | .36 | .57 | .57 | .55 | .41 | .65 | .55 |
| Pounds of pork produced per acre of peas** | 70.03 | 268.82 | 312.50 | 278.55 | 327.87 | 275.48 | 294.12 | 298.51 | |

* Lot No. 1 not reported due to uncontrollable factors which influenced the results.
Lot No. 11 not reported. Four hogs were stolen at the start of the experiment.

**Based on feed required per cwt. gain.

Table II B

Financial Statement Based on Actual Costs and Market Returns

8 pigs per lot fed 93 days (November 9, 1930 to February 15, 1931)

(Based on one average pig)

| Lot Number | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--|----------|----------|-----------|--------------|----------|----------|----------------|----------------|---------|
| | Peafield | Peafield | Peafield | Peafield | Peafield | Peafield | Peafield | Garden | Barley |
| Ration fed | | Barley | Barley | Barley | Barley | Barley | Barley | Peafield | Tankage |
| Salt self-fed in all lots | | | Skim Milk | Alfalfa Meal | Tankage | Potatoes | Triple Mixture | Triple Mixture | |
| Cost per pig @ \$10.00 cwt. | 7.98 | 8.05 | 7.96 | 8.10 | 8.02 | 8.00 | 8.16 | 8.11 | 8.17 |
| Feed cost per head (mkt.) | 8.40 | 10.41 | 12.70 | 10.63 | 11.21 | 9.42 | 11.74 | 13.52 | 10.23 |
| Est. fixed costs (interest, labor and equipment) | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 |
| Shipping and selling expense | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 |
| Total cost at market | 20.09 | 22.17 | 24.37 | 22.44 | 22.94 | 21.15 | 23.61 | 25.34 | 22.11 |
| Selling price per cwt. | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 |
| Gross receipts per pigs | 10.89 | 12.81 | 14.40 | 13.50 | 13.47 | 13.01 | 13.34 | 14.19 | 13.86 |
| Loss per pig | 9.20 | 9.36 | 9.97 | 8.94 | 9.47 | 8.12 | 10.27 | 11.15 | 8.25 |

Feed prices used:

Field peas \$8.00 per acre
 Garden peas 13.00 per acre
 Ground barley 27.00 per ton
 Tankage 71.00 per ton
 Alfalfa meal 15.00 per ton

Triple Mixture \$53.30 per ton
 Skim milk .03 per gallon
 Cull potatoes 5.00 per ton
 Salt 20.00 per ton



Lot No. 2. Ration of field peas
alone. An unsatisfactory
ration



Lot No. 7. Peafield, potatoes, barley
and alfalfa meal. An excellent
combination



Lot No. 9. Garden peas, barley and triple mixture. The added cost of producing garden peas prohibits their use as a hog feed.



Lot No. 8. Field peas, barley and triple mixture.

Discussion of Results:

Pastured field peas alone made an unsatisfactory ration again this year but proved to be a good foundation feed as before. None of the pigs developed a rachitic condition this year but the daily gains were low and the feed replacement value was about the same considering that yield per acre was only 10.85 bushels compared with 19.8 bushels the year before. It required 929.63 pounds of peas to produce 100 pounds of gain on the market basis. This is equal to an acre of peas yielding 15.49 bushels.

Since the garden pea lot contained a mixture of peas, the results can not be discussed on the basis of a ration of pure garden peas. However, the added cost of producing garden peas indicate that they can not compete with field peas as a hog feed. The added cost is caused by the higher price of garden pea seed, the extra labor in preparing a seed bed and added cost of irrigation, since garden peas require more water than field peas. The hogs in the garden pea lot ate less feed and gained more rapidly than those in the field pea lot but the cost of gains in the field pea lot were smaller.

One ton of barley replaced 3.84 acres of peas yielding 10.85 bushels in this year's test, again proving its worth as a supplement to a field pea ration.

Both year's tests showed that barley was necessary to increase gains and degree of finish as well as to decrease the cost of gains when hogs are run on field peas. When combined with alfalfa meal or potatoes and alfalfa meal its value was increased as a protein supplement to field peas.

Alfalfa meal added to a barley and pea ration increased the gains nearly as much as tankage and the cost of 100 pounds gain was smaller with alfalfa meal than with tankage. The consumption of alfalfa meal is very small but both year's tests proved it to be very valuable as a supplement in a combination of feeds.

One ton of tankage had a replacement value of 4.38 acres of 10.85-bushel peas plus 3545.61 pounds of barley. Tankage makes a good supplement when fed with barley and peas, but is not economical with the present prices of the other feeds. The hogs finished on tankage were valued higher than those fattened on alfalfa meal but the cost of gains was in favor of the alfalfa-meal-fed pigs.

Skim milk produced the highest finish of any of the lots again in this year's test but its price, 3 cents per gallon or 35 cents per hundred pounds increased the cost of gains. One hundred gallons of milk replaced only .07 acres of peas and 193.68 pounds of barley. Alfalfa meal and tankage both produced more economical

gains than skim milk.

Triple mixture was used this year to check with tankage and alfalfa meal. Altho it contains 50 percent tankage and 25 percent alfalfa it did not produce gains as cheaply as either tankage or alfalfa meal fed alone as a supplement. The average daily gain was smaller also than when tankage or alfalfa meal were used to supplement peas and barley. One ton of triple mixture was found to replace 1.26 acres of peas and 1408.76 pounds of barley.

Potatoes again showed their value as a succulent feed when added to a ration of field peas, barley and alfalfa meal. They did not increase the average daily gain but because of their low market value did decrease the cost of gains. The peas required per 100 pounds of gain was about the same with or without potatoes but one ton of cull potatoes replaced 69.81 pounds of alfalfa meal plus 1391.00 pounds of barley.

In general, the results of the two year's tests checked. Peas fed alone, proved to be an unsatisfactory ration and peas supplemented with the three home grown feeds (barley, potatoes and alfalfa meal) proved to be the most satisfactory ration.

Lot No. 11 was discontinued at the beginning of the experiment when four pigs from this lot were stolen during the night of the tenth day of the experiment.

This lot was fed in a dry lot and received barley and tankage in slop form.

Lot No. 1 was not reported because two of the pigs turned out to be very poor feeders. This lot was pastured on field peas with alfalfa meal self-fed for 60 days and then finished on barley and alfalfa meal in the dry lot.

Results from triple mixture proved to be disappointing. Good results were secured the first year with tankage or alfalfa furnishing the supplementing protein so it was thought that a combination of these two feeds plus cottonseed meal would form even a more complete and satisfactory supplement for a peafield and barley ration.

SUMMARY AND CONCLUSIONS BASED ON TWO YEAR'S WORK

1. Field peas made an unsatisfactory ration when fed alone to fattening pigs. Three observations may be stated here:

A. One pig developed a condition similar to rickets during the first year's experiment. This proves that field peas alone furnish an incomplete ration.

B. Pigs in the unsupplemented peafield lot were not finished at the end of the experiment.

C. A ration of peas alone proved to be uneconomical. It required 931.20 pounds of peas to produce one hundred pounds gain.

D. The pigs receiving peas alone made the poorest gains of all the lots.

2. Field peas made a good foundation feed when pastured but must be supplemented by other feeds for satisfactory results. Barley was used as one of the supplements and barley and peas comprise a better ration than peas alone. The barley-peafield ration, however, is improved by the addition of still another supplement. What this second supplement shall be will be determined by the feeds available and the price of those feeds. The best combination found in this test was peafield, barley, cull potatoes and alfalfa meal. The barley and cull potatoes were used as the two carbonaceous

supplements, and the alfalfa meal as a nitrogenous supplement, which is needed to improve the quality of the protein in field peas.

3. Skim milk added to a peafield-barley ration produced the greatest gains and highest degree of finish in all the lots in the experiment. Under farm conditions it would pay to include this feed in the ration but when it must be bought its price will determine the practability of its use. One hundred gallons of skim milk replaced .123 acres of field peas with a 15.32-bushel yield and 105.57 pounds of barley according to the average of the two tests.

4. Tankage ranked next to skim milk in gains produced and finish at the end of the test. It balances a peafield-barley ration but it proved uneconomical in this test because of its cost. One ton of tankage replaced 4.59 acres of peas yielding 15.32 bushels per acre and 2789.56 pounds of barley.

5. Alfalfa meal showed the greatest feed replacement value of all supplements tested. One ton of alfalfa meal replaced 8.22 acres of 15.32-bushel peas and 1766.33 pounds of barley. It is growth promoting rather than fattening, it improves the quality of the proteins, and it should be included in the ration when available because it reduces the cost

per unit gain. Because of its bulk hogs will only eat small quantities of it.

6. Raw cull potatoes also reduced the cost of gains. Potatoes furnish succulence and stimulate the appetite of pigs. They should always be fed with concentrates because of their low protein value. Under conditions where potatoes are grown locally, cull potatoes are usually cheap enough to be included in the ration.

7. Since only one year's work was conducted with garden peas or triple mixture the author does not feel justified in drawing definite conclusions on these two feeds. One year's work with garden peas indicates, however, that the extra cost of producing these peas prohibits their use as a hog feed. The results with triple mixture proved disappointing. Good results were secured with tankage and alfalfa meal and it was hoped that the addition of cottonseed meal would increase the value of the mixture.

8. One hundred twenty-seven pounds of pork were produced on an acre of peas yielding 19.8 bushels and 70 pounds on a 10.85 bushel yield.

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SUMMARY

The production of field peas, *Pisum sativum*, in Colorado, has increased from 24,230 acres in 1917, to 50,000 acres in 1929 according to the Colorado yearbook. Most of the peas produced in the state are raised in the San Luis Valley and are used largely for hog and lamb feeding altho some are used for seed or for the split pea market.

The common feeding practice in the San Luis Valley is to hog-off the mature, unharvested peas in September or October. The pigs are then put in a dry lot to be fattened and sheep are pastured on what the pigs have not eaten. The hogging-off period lasts from 20 to 40 days, depending on the size of the fields and the number of hogs used, and the pigs usually receive no other feed than the peas during the period.

The writer spent several months in the San Luis Valley and was told by many ranchers that there were good reasons for this method of feeding. One of the principal reasons seems to be that at this time of year the farmers are all busy harvesting their crops and the pigs require no attention when on peas. Another reason given by several was that usually barley is not threshed until October or November and is therefore not available for feeding at the beginning of the fall. They

all agreed that pigs made good gains on peas alone at the beginning but that peas had to be supplemented by some other feed if these gains were to be maintained later in the fattening period.

The practice of hogging-off field peas is quite common in the United States. Hogging-off trials are reported at the North Dakota, Idaho and Washington experiment stations and Idaho and Washington report peas fed in the dry lot. Gains ranging from 126 to 437 pounds were secured on an acre, depending on the yield.

Investigators at the Idaho station report results of field pea rations on the skeleton, the quality of pork and on growth and reproduction in swine. They conclude that a ration of peas alone is unsatisfactory.

Results from feeding field peas to rats all indicated that usually normal growth could be sustained on a ration of peas alone but the young born of mothers on a pea ration were not as strong and vigorous as those farrowed by the females on a supplemented pea ration.

Table I A is a report of the 1929-30 experiment and can be used as a summary of the results of this year's work. The hogs used in this test were uniform Hampshires allotted into nine lots as nearly alike as possible. They were fed, watered and housed in such a manner as to eliminate, as far as possible, all experimental error.

Table I A

Results of the Peafield Hog Feeding Experiment

October 23, 1929 to February 4, 1930

(Based on one average pig)

| Lot Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|----------|--------------------|-----------------------------|---------------------------------------|-------------------------------|--|---|------------------------------------|-------------------|
| Ration fed | Peafield | Peafield Barley | Peafield Alfalfa Meal | Peafield Barley Alfalfa Meal | Peafield Barley Tankage | Peafield Barley Potatoes Alf.Meal | Peafield Barley Potatoes Tankage | Peafield Barley Skim Milk | Barley Tankage |
| Salt self-fed in all lots | | | | | | | | | |
| Pigs per lot | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| No. days fed | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 |
| Initial weight | 64.3 | 65.8 | 62.6 | 65.4 | 62.6 | 65.5 | 65.3 | 63.5 | 63.6 |
| Market weight | 158.6 | 194.6 | 164.4 | 187.7 | 190.4 | 189.8 | 205.7 | 214.8 | 190.1 |
| Total gain | 94.3 | 150.8 | 101.9 | 124.3 | 127.8 | 126.3 | 136.4 | 151.3 | 126.5 |
| Average daily gain | .90 | 1.25 | .97 | 1.18 | 1.22 | 1.20 | 1.32 | 1.44 | 1.20 |
| Feed required per cwt. gain | | | | | | | | | |
| Peafield (acres) | .785 | .255 | .466 | .234 | .196 | .198 | .178 | .147 | |
| Ground barley | | 409.0 | | 405.5 | 384.0 | 384.8 | 370.5 | 398.3 | 554.0 |
| Tankage | | | | | 24.6 | | 19.9 | | 29.0 |
| Alfalfa meal | | | 14.10 | 3.50 | | 3.70 | | | |
| Cull Potatoes | | | | | | 25.10 | 22.60 | | |
| Skim milk | | | | | | | | 61.30 | |
| Pounds of pork produced per acre of peas * | 127.39 | 392.16 | 214.59 | 427.35 | 510.20 | 505.05 | 561.80 | 630.27 | |

*Based on feed required per cwt. gain.

Table II A is a report of the results of the 1930-31 experiment. It will be noted that those lots which are reported from last year check quite closely with last year's results. Hogs were carefully selected and allotted and the experiment was conducted the same as last year as to methods.

Two lots were not reported. Lot No. 11 was discontinued when half the hogs were stolen the tenth day and Lot No. 1 was not reported because results were influenced by several uncontrollable factors.

The author was present at the experiment during the entire feeding period.

Table II A

Results of the Peafield Hog Feeding Experiment

November 9, 1930 to February 15, 1931

(Based on one average pig)

| Lot Number * | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|----------|--------------------|--------------------|--------------------|--------------------|-----------------------------|--------------------|-----------------------------|-------------------|
| Rations fed | Peafield | Peafield Barley | Peafield Barley | Peafield Barley | Peafield Barley | Peafield Barley | Peafield Barley | Garden Peafield | Barley Tankage |
| Salt self-fed in all lots | | | Skim Milk | Alfalfa Meal | Tankage | Potatoes Alfalfa Meal | Triple Mixture | Barley Triple Mixture | |
| Pigs per lot | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Days on feed | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| Initial weight | 79.8 | 80.5 | 79.6 | 81.0 | 80.2 | 80.0 | 81.6 | 81.1 | 81.7 |
| Final market weight | 155.3 | 180.4 | 202.8 | 190.1 | 189.7 | 185.2 | 187.9 | 199.8 | 195.3 |
| Total gain | 75.5 | 99.9 | 123.2 | 109.0 | 109.5 | 105.2 | 106.3 | 118.7 | 113.6 |
| Average daily gain | .75 | 1.02 | 1.26 | 1.11 | 1.12 | 1.05 | 1.08 | 1.21 | 1.16 |
| Feed required per cwt. gain: | | | | | | | | | |
| Peafield (acres) | 1.428 | .372 | .320 | .359 | .305 | .365 | .340 | .335 | |
| Ground barley | | 590.72 | 396.64 | 505.89 | 496.49 | 442.53 | 514.86 | 466.19 | 548.02 |
| Tankage | | | | | 30.59 | | | | 45.64 |
| Alfalfa meal | | | | 5.85 | | 2.67 | | | |
| Triple Mixture | | | | | | | 50.91 | 27.48 | |
| Cull potatoes | | | | | | 91.10 | | | |
| Skim milk (gallons) | | | 79.55 | | | | | | |
| Salt | .85 | .56 | .36 | .57 | .57 | .55 | .41 | .65 | .55 |
| Pounds of pork produced per acre of peas** | 70.03 | 268.82 | 312.50 | 278.55 | 327.87 | 275.48 | 294.12 | 298.51 | |

*Lot No. 1 not reported due to uncontrollable factors which influenced the results.

Lot No. 11 not reported. Four hogs were stolen at the start of the experiment.

**Based on feed required per cwt. gain.

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A. One pig developed a condition similar to rickets during the first year's experiment. This proves that field peas alone furnish an incomplete ration.

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C. A ration of peas alone proved to be uneconomical. It required 931.20 pounds of peas to produce one hundred pounds of gain.

D. The pigs receiving peas alone made the poorest gains of all the lots.

2. Field peas make a good foundation feed when pastured but must be supplemented by other feeds for satisfactory results. Barley was used as one of the supplements and barley and peas comprise a better ration than peas alone. The barley-peafield ration, however, is improved by the addition of still another supplement. What this second supplement shall be will be determined by the feeds available and the price of those feeds. The best combination found in this test was peafield, barley, cull potatoes and alfalfa meal. The barley and cull potatoes were used as the two carbonaceous supplements, and the alfalfa meal as a nitrogenous supplement, which is needed to improve the quality of the protein in the

field peas.

3. Skim milk added to a peafield-barley ration produced the greatest gains and highest degree of finish in all the lots in the experiment. Under farm conditions it would pay to include this feed in the ration but when it must be bought its price will determine the practability of its use. One hundred gallons of skim milk replaced .123 acres of field peas with a 15.32-bushel yield and 105.57 pounds of barley according to the average of the two tests.

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6. Raw cull potatoes also reduced the cost of

gains. Potatoes furnish succulence and stimulate the appetite of pigs. They should always be fed with concentrates because of their low protein value. Under conditions where potatoes are grown locally, cull potatoes are usually cheap enough to be included in the ration.

7. Since only one year's work was conducted with garden peas or triple mixture the author does not feel justified in drawing definite conclusions on these two feeds. One year's work with garden peas indicates, however, that the extra cost of producing these peas prohibits their use as a hog feed. The results with triple mixture proved disappointing. Good results were secured with tankage and alfalfa meal and it was hoped that the addition of cottonseed meal would increase the value of the mixture.

8. One hundred twenty-seven pounds of pork were produced on an acre of peas yielding 19.8 bushels and 70 pounds on a 10.85-bushel yield.