Type of Farming Areas in Colorado

By Byron Hunter,
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Type of Farming Areas in Colorado

By Byron Hunter, L. A. Moorhouse, R. T. Burbick, and H. B. Pingrey

The term "type-of-farming" as here used refers to the kind and proportion of the productive enterprises found on individual farms. Thus farms which produce the same kind of crops and livestock in much the same proportions and under similar methods and conditions may be said to be following the same type of farming. Likewise the term "type-of-farming area" refers to an area in which there is a fairly high degree of uniformity in the type of farming and in the physical and economic conditions which prevail. However, uniformity of a high degree, either in the type of farming practiced or in the physical and economic conditions which prevail, rarely exists except in relatively small areas. Therefore, type-of-farming areas of considerable size are delimited on the basis of the dominant type of farming that prevails in each area.

A type-of-farming study in Colorado was undertaken in order to acquire a more comprehensive understanding of the agriculture of the state as a whole; to locate and delimit the different type-of-farming areas within the state; to determine the general character of the farming carried on in each area; and to identify and evaluate the relative importance of the various forces and conditions which have been and are now shaping the type of farming in the various parts of the state.

As a result of the study Colorado has been divided into 17 major type-of-farming areas. Differentiating the state into areas in this way gives a much clearer picture of the agriculture of the state as a whole and also in its various parts. The study further provides background material in dealing with the agricultural problems of the state, in teaching agriculture and related subjects in the colleges and public schools, in making recommendations to farmers, in placing a limit on the application of such recommendations and in formulating land-use policies.

The primary sources of data used in this analysis are as follows: The Bureau of The Census, United States Department of Commerce, special use being made of the monogram entitled "Types of Farming in the United States;" Geological Survey, United States Department of Interior; Bureaus of Agricultural Economics, Chemistry and Soils, and Weather, United States Department of Agriculture; Colorado State Board of Immigration; History of Agriculture in Colorado, by A. T. Steinel, D. W. Working collaborating; Bancroft's Works, vol. V, Nevada, Colorado and Wyoming; Colorado Agricultural Experiment Station;
and the many individuals interviewed who are familiar with local conditions in each of the 17 type-of-farming areas into which the state has been divided.

The method of study has been historical, graphical and analytical. The development of agriculture within the state has been studied from early in its beginning; the various factors which have been and now are shaping Colorado's agriculture have been carefully considered; the distribution of crops and livestock on a county basis and types of farms by minor civil divisions have been shown graphically; the state has been divided into type-of-farming areas on the basis of the dominant type of farm and also on the basis of the proportion of the gross income from different sources within each area; and finally, the mapping of the state into type-of-farming areas has been verified by inspecting each area and consulting men familiar with local conditions.

HISTORICAL BACKGROUND

The territory now included in the State of Colorado was acquired by the United States from three different sources, namely, by the Louisiana purchase from France in 1803, through the annexation of Texas in 1845 and by treaty with Mexico in 1848. Official American explorers were sent into the territory purchased from France early in the nineteenth century: Lewis and Clark in 1804, Zebulon M. Pike in 1806, and Stephen H. Long in 1820. These in turn were followed by hunters, trappers, and fur traders who, during the period 1820 to 1845, established several trading posts on the Platte and Arkansas Rivers. Colorado's scant population, up to the late fifties, very generally lived in or near the forts or defensive establishments of the trading posts and a limited amount of farming was done to supply the needs of the hunters and traders.

The discovery of gold in California in 1848 caused a wave of population to roll westward. Piqued with curiosity and expectation, these fortune seekers, as opportunity offered, prospected anywhere along the tributaries of the Platte River. They met with but little success, however, until 1858 and 1859, when rich diggings were discovered in what was then known as the Pike's Peak region, i.e., the mountainous territory lying north of the Arkansas River and east of the Continental Divide. The discovery of gold caused a great influx of people and with that event the real settlement of the state began.

The first agricultural development of any consequence also began soon after the discovery of gold. Many of the searchers for the yellow metal soon learned they knew far more about
gardening, farming and stock raising than about mining. Living in the mining camps was expensive and, seeing the opportunity of producing food products near the mining camps, some of them turned to farming. The increase in population for a decade or more following the discovery of gold was largely confined to the mining districts, the city of Denver and to the valleys along the streams from which water could be diverted for irrigation purposes.

A territorial government was organized in 1861 and in 1876 Colorado was admitted to the Union as the thirty-fourth state. A survey of public lands was begun in 1861 and during 1862 nearly all of the land that could be irrigated from comparatively small ditches was taken up along the following streams: Cache-la-Poudre, Big Thompson, Little Thompson, St. Vrain, Boulder, Ralston, Clear Creek, Bear Creek, Cherry Creek and Fountain Creek. In 1866 the Surveyor General estimated there were 100,000 acres under cultivation and that about half of the population of 35,000 was engaged either directly or indirectly in agriculture. The first effort of any consequence to put the use of irrigation water on a practical and cooperative basis was made by the Union Colonists of Greeley, Colorado. This colony was organized in 1869, had 600 members who were mostly heads of families, purchased land and built and operated the irrigation systems cooperatively.

The plains region of Colorado, except relatively small irrigated areas, was first used by white men as an open free range for livestock. Prior to 1866 comparatively few herds of cattle were to be found in Colorado. Prior to that date also, but two herds of cattle, one from Texas and the other from Mexico, had been driven across the Divide between the Arkansas and the Platte Rivers for summer grazing. The bringing of cattle into the state for summer grazing, chiefly from Texas, continued until the early nineties. In 1884 it was estimated that 4,708,000 head had been trailed into Colorado from Texas during the period 1866 to 1883, inclusive. The Texas and Mexican longhorn type of cattle was gradually displaced in both Colorado and Texas through the processes of elimination and crossing with better cattle. Because of the introduction of splenic fever by the Texas cattle, there was strife from the very beginning between the nomadic and the local cattlemen.

The sheep industry of Colorado dates back to the earliest of the Mexican settlements in the southern part of the state and it is known there were such settlements in the San Luis Valley as early as 1852. The first importation of any importance into the state was a flock of about 1,000 head of very low-grade
sheep driven into Conejos County from near Taos, New Mexico, in the middle sixties. A flock of fine-wooled Merino sheep was brought into Weld County in 1869 and still another into Larimer County in 1873. From these small beginnings the sheep industry developed slowly until about 1880. In 1884 it was estimated there were 1,497,000 sheep in Colorado.

The range livestock industry, especially that of cattle, was given a great impetus by the extensive railroad construction that took place in Colorado during the late sixties and the early seventies. The first trainload of cattle shipped to eastern markets from Colorado was loaded in 1869 at Kit Carson, then the western terminal of the Kansas Pacific. Shipments increased steadily each year and during 1872 the number of cattle shipped from the state by rail amounted to 46,000 head.

During the early development of the plains region of Colorado, general farming lagged far behind the production of range livestock. This was probably due largely to the fact that the plains area formed a portion of what the early explorers had called "The Great American Desert," it being very generally supposed that crops could not be grown successfully without irrigation. In the next place the lack of railroad transportation made the hauling of crops to distant markets very expensive, whereas it was possible to trail the livestock to the shipping points.

The settlement of the state, it has been shown, was given a great impetus by the discoveries of gold during 1858 and 1859. Another inrush of people occurred from 1886 to 1890. This was largely an overflow of the wave of landseekers that overran western Kansas from 1883 to 1885. This land-settlement movement seriously interfered with the large-scale free-range livestock business as conducted at that time. Many of the settlers attempted to make their living by crop farming and succeeded fairly well from 1888 to 1892. Then came 3 "lean years," 1894 being a complete crop failure. Many of the settlers left in 1893, more in 1894 and by the close of 1895 practically all had gone who could get away. In some parts of the plains region as many as 90 percent left their farms. Thus crop farming received a serious setback and much land was again available for grazing purposes. Following this recession in land settlement, there was a gradual recovery, the number of farms and the farm population increasing slowly as the settlers learned from experience how to cope more effectively with the unfavorable crop years. Many of them, however, leaned more heavily on livestock.

A third impetus was given to land settlement and crop farming by the high prices of agricultural products which pre-
vailed during and immediately following the World War. Promoters seized the opportunity and launched campaigns to get settlers onto the land who would crop-farm instead of producing livestock. As a result of the high prices and these campaigns, much land changed hands at exorbitant prices; tractors and other labor-saving implements and machinery were introduced; and grain farming was undertaken on a relatively large scale.

Some idea of the progress made in the agricultural development of the state from 1880 to 1930 is presented in table 1. Of the state’s total land area (66,368,000 acres, U. S. Geological Service figures), 1.8 percent was in farms in 1880. This increased steadily from decade to decade, reaching 43.5 percent in 1930. The number of farms increased from approximately 4,500 in 1880 to nearly 60,000 in 1920 and then increased but slightly during the next decade. The number of farms reporting irrigation increased from a little less than 10,000 in 1890 to a little more than 31,000 in 1930. Thus, more than half of the farms of the state practiced irrigation in 1930. The average size of all farms increased from 259 acres in 1880 to 482 acres in 1930. The area irrigated per farm reporting irrigation varied from 92 acres in 1880 to 116 acres in 1920, and 108 acres in 1930.

The acreages of the principal crops and the numbers of livestock shown in table 1 for the 50-year period, 1880 to 1930, must be used with caution. The dates upon which the census enumerations were taken during this period vary. Three times out of six the date was June 1, and one each it was January 1,
April 1 and April 15. The methods employed in gathering and tabulating the census data also varied considerably from decade to decade. Furthermore, the rise and fall in livestock numbers due to cyclical movements seriously interferes with representing trends with data which apply only each tenth year.

The population of Colorado has increased steadily since the discovery of gold in 1858. The total population in 1870 was 39,864. Following 1870 there was a substantial increase each decade, reaching 1,035,791 in 1930. The distribution of those gainfully employed among the major industries in 1930 follows: Agriculture had 26.3 percent; the manufacturing and mechanical industries 19.0; the trades 13.6; domestic and personal service 10.2; and the professional services 8.3 percent. Figure 1 shows the population of the principal cities and the distribution of the total population of the state in 1930.
## Table 1

<table>
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<tr>
<th>Item</th>
<th>1890</th>
<th>1890</th>
<th>1900</th>
<th>1910</th>
<th>1920</th>
<th>1930</th>
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<td>Land in farms</td>
<td>1.165</td>
<td>4.599</td>
<td>9,475</td>
<td>13,522</td>
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<td>28,876</td>
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<td>Ratio land in farms to total land area</td>
<td>1.8</td>
<td>6.9</td>
<td>14.3</td>
<td>26.4</td>
<td>36.9</td>
<td>43.5</td>
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<tr>
<td>Ratio of irrigated land to land in farms</td>
<td>↑</td>
<td>19.4</td>
<td>17.0</td>
<td>20.6</td>
<td>13.7</td>
<td>11.8</td>
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<tr>
<td>Farms:</td>
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<tr>
<td>Total</td>
<td>4,506</td>
<td>16,389</td>
<td>24,700</td>
<td>46,170</td>
<td>59,934</td>
<td>59,956</td>
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<td>Farms reporting irrigation</td>
<td>↑</td>
<td>9,669</td>
<td>17,613</td>
<td>25,857</td>
<td>28,756</td>
<td>31,280</td>
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<td>Average size of farm</td>
<td>259</td>
<td>261</td>
<td>384</td>
<td>293</td>
<td>408</td>
<td>482</td>
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<td>Average area irrigated per farm</td>
<td>↑</td>
<td>92</td>
<td>91</td>
<td>109</td>
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<td>specified crops</td>
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<td>Corn</td>
<td>1.000</td>
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<td>1.000</td>
<td>1.000</td>
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<td>Wheat</td>
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<td>Oats</td>
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<td>Barley</td>
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<td>12</td>
<td>22</td>
<td>71</td>
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<tr>
<td>All hay</td>
<td>97</td>
<td>482</td>
<td>929</td>
<td>1,183</td>
<td>1,638</td>
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<td>Alfalfa</td>
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<td>455</td>
<td>509</td>
<td>728</td>
<td>810</td>
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<td>Wild grasses</td>
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<td>↑</td>
<td>336</td>
<td>395</td>
<td>411</td>
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<td>Sorghums</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>12</td>
<td>342</td>
<td>280</td>
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<td>Potatoes</td>
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<td>44</td>
<td>86</td>
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<td>Sugar Beets</td>
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<td>↑</td>
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<td>Broomecorn</td>
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<td>↑</td>
<td>↑</td>
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<td>14</td>
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<tr>
<td>Dry beans</td>
<td>↑</td>
<td>↑</td>
<td>2</td>
<td>5</td>
<td>66</td>
<td>336</td>
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<tr>
<td>Ripe peas</td>
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<td>↑</td>
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<td>Livestock on farms and ranges</td>
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<td>Horses</td>
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<td>155</td>
<td>273</td>
<td>294</td>
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<tr>
<td>Mules</td>
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<td>5</td>
<td>9</td>
<td>15</td>
<td>31</td>
<td>29</td>
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<tr>
<td>All cattle</td>
<td>347</td>
<td>718</td>
<td>1,454</td>
<td>1,128</td>
<td>1,757</td>
<td>1,454</td>
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<td>Milk cows</td>
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<td>77</td>
<td>109</td>
<td>146</td>
<td>192</td>
<td>219</td>
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<tr>
<td>Sheep</td>
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<td>$718</td>
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<td>Swine</td>
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<td>64</td>
<td>104</td>
<td>179</td>
<td>450</td>
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Compiled from U.S. Census of Agriculture.

*The data presented in the table are not strictly comparable because of variations in the census year dates and methods employed in gathering and tabulating the census data. The crop data relate to the years previous to the census year data.

†Data not reported.

‡Less than 500 acres.

§Exclusive of lambs.

## FACTORS IN THE AGRICULTURAL DEVELOPMENT OF COLORADO

Some 70 years have elapsed since the real beginning of Colorado's agricultural development and during this time many shifts and changes have taken place. In the beginning all was new and the settlers had much to learn, mostly by trial and error, concerning the production and marketing of Colorado's agricultural products. As the years passed there developed from the accumulated knowledge gained from farm and ranch experiences, fairly well-settled opinions as to the kinds of farming that best fit the local conditions in the various parts of the state. During all this time dynamic forces were exerting material influence in the development of agriculture and in molding the types of farming. That the reader may better understand...
Figure 2.—Relief features and major watersheds of Colorado.
the basis for dividing the state into 17 type-of-farming areas, a brief discussion follows of the effect these forces have had in the development of types of farming in the respective areas.

Types of farming in fairly well-developed areas generally result from the influences of two groups of forces: The one is physical and biological in nature and includes such factors as land-surface features, drainage, soil, climate, pests, animal and plant diseases, and crop adaptations. The other group is economic in character and includes transportation facilities, distance to markets, demand for the products which can be produced, prices received, production costs, competition, etc.

**Physical Factors**

**Land Surface.**—The land-surface features of Colorado play an important role in shaping its agricultural development. The relief map of the state, figure 2, shows its general surface characteristics. The high mountain ranges, the intermountain valleys and parks, the Colorado River Plateau, and the Great Plains area all stand out in bold relief. The heavy lines on the figure divide the state into its major watersheds. The western part of the state drains into the Colorado River, the south central into the Rio Grande, the north central into the North Platte and the northeastern and southeastern chiefly into the South Platte and the Arkansas Rivers respectively.

The southern portion of the Rocky Mountain system which Colorado embraces is often spoken of as the roof or backbone of the North American Continent. This rugged area within the state presents numerous mountain ranges and intermountain valleys and basins. About 1,000 mountain peaks rise 10,000 feet or more above sea level and 51 peaks vary in altitude from 14,000 to 14,420 feet. These lofty peaks and ranges have a marked influence on rainfall, snowfall, and the supply of irrigation water, and these in turn largely determine the agricultural use that can be made of much of the land.

Table 2.—Land Area of Colorado Classified by Counties.
(Thousand acres, i.e., 000 omitted)

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| *Includes 16,000 acres in National Park in Boulder County, 76,700 acres in Grand County, 146,000 acres in Larimer County and 51,000 acres in Montezuma County. |
| †Reported as "grain-crop" land in the Geological Survey land classification report. |
| ‡Reported as "forage-crop" land in the Geological Survey land classification report. |
| §Does not include Denver County (36,000 acres). |
Land Classification as to Utility.—A classification of Colorado’s total land area as to its fitness for different purposes is presented in table 2. The data in this table have been compiled from reports of a land classification study of Colorado made by the Geological Survey, United States Department of the Interior. Approximately 66,000,000 acres were mapped in that study. The principal factors considered in classifying the land in the study were: Surface features, texture and depth of soil, precipitation, crop yields obtained by farmers during past years, and the native vegetative cover where the land had not been plowed.

The geographical distribution of the different classes of land presented in table 2 is shown in figure 3 with the exception that in figure 3 second and third-grade dry-farming lands have been combined and mapped together. Frequently these two grades of land are so interspersed in narrow strips as to make it impractical to represent them separately on a map as small as figure 3. While the boundaries of the different classes of land are definitely located on the map, the reader must bear in
mind that in many instances there is a gradual transition from one class of land to another and that within the land areas as mapped there frequently are many small areas of other classes of land that cannot be shown.

Dry-Farming Land.—The area mapped as first-grade dry-farming land (2,343,000 acres, table 2) is intended to represent the best of the non-irrigated land of the state. It has a level-to-gently rolling surface, a fertile soil with a texture favorable to the absorption and retention of moisture and an annual precipitation of not less than approximately 17 inches.

Table 2 shows a total of 5,514,000 acres classified as second-grade dry-farming land and 11,948,000 acres as third grade. Second-grade dry-farming land is similar in relief features to those of first grade but is somewhat lower in crop yields. This may be due to lower average annual precipitation or to coarser or finer texture of soil, the latter resulting in a lower capacity for absorbing moisture. While second-grade dry-farming land produces practically the same crops as first-grade land, it is used more extensively for grazing.

Third-grade dry-farming comprises areas where either soil or climate is unfavorable for the successful growth of cultivated crops except in years of favorable rainfall. While forage crops can be grown with average precipitation, this land very generally is better adapted to grazing.

Irrigated Land.—The irrigated land (4,017,000 acres, table 2) includes all areas within the state to which water is artificially applied for crop production and also bottom lands that are watered by natural sub-irrigation. Considerable undeveloped
land within irrigation districts is also included. Irrigation in eastern Colorado has developed to the stage where the normal flow of all streams during the irrigation season is being used and, by means of storage reservoirs, much of the flow during the non-irrigation season. The available supply of water is adequate for but a small percentage of the land that is suitable for producing crops under irrigation. So great has been the demand for irrigation water as to result in the construction of six canals which now carry water from the streams of the western slope of the Rocky Mountains either across or through the Continental Divide to increase the supply on the eastern side of the mountains. Even with the storage reservoirs and the transmountain canals which have been provided, a scant seasonal snowfall in the mountains may result in a shortage of irrigation water and a serious curtailment in crop production. Much surplus water still flows down the Colorado River and several of its tributaries, unused as yet because of the high cost of diversion and the lack of suitable land for irrigation in the territory through which the streams flow.

Grazing Land.—The areas mapped as grazing land include approximately 25,317,000 acres. It is impracticable to dry-farm this class of land because of one or more of the following factors: Rough or stony surface features, scant precipitation, short growing season or soil that is not suitable for crop production. Much of the areas so mapped would be productive were it possible to provide irrigation water.

Sand Hills.—The sand-hill areas contain about 2,137,000 acres and consist for the most part of nearly pure sand that has been blown into mounds or dunes. In general the dunes are held in place by a growth of native grasses which are both palatable and nutritious for livestock. The chief economic importance of the sand-hill areas is for grazing. Some corn and feed crops are grown where the surface features and soil conditions are favorable.

National Forests and National Parks.—The national forests and national parks comprise some 15,092,000 acres or about 25 percent of Colorado's total land area. The usefulness of the national forests has three primary aspects: They are potential sources of timber; they protect the watersheds of the state and thus tend to stabilize the supply of water for irrigation; and, they furnish pasturage during the grazing season for thousands of head of cattle, sheep, and wild game. The grazing is done under a system of permits which are generally issued to farmers and ranchmen located adjacent to the forest reserves.
Soils.—The plains area of eastern Colorado may be divided into irrigated and non-irrigated lands. The irrigated lands lie along the streams and on the lower benches adjacent to the valleys. The valley lands are largely alluvial. They exhibit a high degree of variation in texture, ranging all the way from stream gravel to stiff clays. Silt loams generally predominate on the bench lands. While practically all of the irrigated soils are rich in potash and lime, most of them respond readily to the proper application of phosphorus fertilizers and manures. Nitrogen is variable in these soils, but may be maintained usually by the use of manures and crop-rotations, including legumes.

The non-irrigated or dry-land soils of eastern Colorado are mostly residual but are frequently modified by wind. In texture these soils vary from dune-sands, mapped in figure 3 as sand hills, to stiff clays. Soils, to be well adapted to dry farming, should be deep, uniform, and neither coarse nor stiff in texture. Sandy soils generally blow readily when the vegetative cover is removed. Heavy clay soils, on the other hand, are too stiff and difficult to work to pay well under dry-farming conditions. These characteristics restrict the use of the clays and very sandy soils largely to grazing.

The bulk of the arable lands of eastern Colorado vary from sandy loams to silt and clay loams. The former is often referred to locally as “sandy land” and the latter as “hard land.” The sandy loams are preferred for the production of the row-tilled crops such as corn, the feed sorghums, and dry beans, and the “hard lands” for the growing of winter wheat. The silt and clay loams are colder in the spring and during wet weather than are the sandy loams. This lengthens somewhat the time required to mature crops. This characteristic, coupled with greater resistance to tillage, tends to reduce the acreage of row-tilled crops on the “hard lands.” Thus, type of soil frequently has much to do in determining the kind of crop to be planted.

The relief features of the western portion of Colorado are generally broken and mountainous. The surface soils vary all the way from solid rock to soils that are friable and fertile. The arable irrigated lands generally lie in mountain parks and in the valleys along the streams. The limited areas of dry-farmed land are mostly located in the northwestern and southwestern parts of the state on the mesas and slopes above the water courses.

Climate.—Climatic conditions in Colorado vary widely. At one extreme is the arid valley with an average frost-free period of around 180 to 185 days while at the other extreme are the lofty mountains where frosts and snow storms may occur any time during the summer and where the annual precipitation

Figure 4.—Average precipitation for Colorado in inches and average monthly rainfall at nine weather observation stations.
may reach 50 inches or more. Climate under such a range of conditions has much to do in determining the types of farming, if any, that may be carried on most advantageously in different parts of the state.

Precipitation.—In figure 4 the state has been divided into zones on the basis of average annual precipitation. The zones range from 10 inches or less to 20 inches or more. Superimposed on figure 4 are bar charts which show the average monthly precipitation at nine weather observation stations in different parts of the state.

There are five areas within the state that have an average annual precipitation of less than 10 inches, three of them being in the high mountain valleys and two in the extreme western part of the state. The zones of highest average precipitation coincide with the high mountain ranges. In general the annual precipitation in the western part of the state increases from west to east as the altitude increases and as the mountain ranges are approached. In eastern Colorado, on the other hand, the average annual precipitation decreases from east to west as the

![Variation of Precipitation from Normal, 6 Colorado Stations, 1900-32](image)

Figure 5.—Variation in the annual precipitation from the normal at six weather observation stations.
altitude increases until a point is reached where the influence of the mountains is encountered when it increases with the altitude, thus giving the central plains area a lower rainfall than adjacent areas. (See figure 4, and table 3.) A very large proportion of the Great Plains area has an average annual precipitation varying from 13 to 16 inches while that of two smaller areas varies from 10 to 13 inches.

The bar charts superimposed on figure 4 show the type of rainfall that prevails at nine weather stations in different parts of the state. In the eastern part of the state, it is seen, a very large proportion of the annual precipitation comes during the growing season, an average of about 75 percent falling from April to September, inclusive. In the western part of the state and also in much of the mountain area the annual precipitation is more evenly distributed throughout the year, about 50 to 55 percent coming from April to September, inclusive.

Figure 5 is presented to show the variation of the annual precipitation from the normal at six representative weather observation stations. Cheyenne Wells, for example, has a normal precipitation of 17.1 inches. From 1900 to 1932, inclusive, the annual precipitation was below the normal 18 times and above it 15 times. With the exception of the year 1907, the annual precipitation was above the normal from 1904 to 1909, inclusive. This period was followed by 6 consecutive years when the annual precipitation was below the normal every year. Similarly it may be seen from each of the other graphs in figure 5 that the annual precipitation may be expected to be either above or below the normal from 2 to 6 years in succession at any of the six stations. The average annual precipitation and the average seasonal precipitation at 27 stations are shown in table 3.

The total amount and the seasonal distribution of the annual precipitation has much to do with the choice of the crops that may be grown. Furthermore, variations in the annual precipitation from year to year together with fluctuations in its seasonal distribution may determine whether there will be an abundant harvest or a crop failure. Finally, the amount of snow that accumulates in the mountain areas during the winter very largely governs the supply of the irrigation water for the following season. If the supply is adequate, there is a full harvest. If it is scant, on the other hand, crop yields are materially reduced and in some instances crops must be selected that mature early in the season.

Length of Growing Season.—The kind and variety of crops that may be grown in any particular district are governed largely by the length of the growing season. For example, wild and
### Table 3.—Annual and Seasonal Rainfall at Selected Stations in Colorado.

<table>
<thead>
<tr>
<th>Region and weather station</th>
<th>Average annual precipitation</th>
<th>Average seasonal precipitation*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of years of record</td>
<td>Amount inches</td>
</tr>
<tr>
<td><strong>Eastern Plains:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Buttes</td>
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<tr>
<td>Lamar</td>
<td>44</td>
<td>15.6</td>
</tr>
<tr>
<td>Burlington</td>
<td>42</td>
<td>17.4</td>
</tr>
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</tr>
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<td>37</td>
<td>17.7</td>
</tr>
<tr>
<td>LeRoy</td>
<td>44</td>
<td>17.5</td>
</tr>
<tr>
<td><strong>Central Plains:</strong></td>
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<td></td>
</tr>
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<td>Las Animas</td>
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<td>Fort Morgan</td>
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<td>Grover</td>
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<td><strong>Western Plains:</strong></td>
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<td></td>
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<tr>
<td>North Lake</td>
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<td>22.5</td>
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<td>Fort Collins</td>
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<td>Westcliffe</td>
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<td>11.7</td>
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<td>Gunnison</td>
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<td>Hartsel</td>
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<td>Meeker</td>
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<tr>
<td>Lay</td>
<td>41</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Compiled from U. S. Weather Bureau reports.

*Seasonal precipitation is that falling from April to September, inclusive.

†Standard deviation is a measure of the extent to which the annual precipitation tends to deviate from the average. Standard deviation = \( \sqrt{\frac{\sum (x - \overline{x})^2}{N}} \)

\( \frac{\text{Coefficient of variation}}{\overline{x}} = \frac{\text{Standard Deviation}}{\text{mean}} \times 100 \)

To evade dryness, tame grasses replace alfalfa under irrigation in the high mountain parks and valleys. Likewise, corn replaces grain sorghums in the northern part of the state because it will mature with a shorter growing season and at lower average temperatures.

**Evaporation.**—Evaporation of moisture from the surface of the soil must be considered in judging the adequacy of the annual precipitation for crop production. In practically all of
the dry-farming districts of Colorado, the atmosphere is relatively dry and more or less wind prevails during much of the growing season. The evaporation of soil moisture under these conditions is likely to be high, especially if accompanied by relatively high temperatures.

Surface Run-off.—Like evaporation the proportion of the annual precipitation that may become available for the growing of crops is greatly reduced by surface run-off. The chief factors which contribute to run-off are: Torrential rains, rough surface features, tight compact soil conditions, and the absence of a vegetative covering. Shantz (1911) has shown that the average run-off from the short-grass sod at five sub-agricultural experiment stations in the Great Plains region was 37 percent.

Seepage and Drainage.—Colorado has been no exception to the general rule that sooner or later all irrigation districts have their seepage and drainage problems. The San Luis Valley probably offers the most striking example within the state as to how seepage and lack of adequate drainage may influence the agriculture of an area. Concerning the need of drainage in this valley Cone and Kezer wrote: “The best available evidence shows that there are approximately three-fourths of a million acres more or less needing artificial drainage. . . . A large amount of the seeped land is damaged by irrigation—largely sub-irrigation. A small amount has been damaged by the flow of springs and artesian wells.”* To this should be added the natural flow of a dozen or more streams which empty into the undrained basin above the big bend of the Rio Grande River. As the years have passed the seeped area has materially increased in size and crop production on many farms has been abandoned.

Biological Factors

These factors include insect pests, plant diseases, weeds, and plant adaptations, all of which influence the development of types of farming.

Insect Pests.—The bean beetle has restricted and largely eliminated bean production within a narrow strip parallel to and east of the Rocky Mountain foothills. The codling moth makes it necessary to spray as many as nine times, or more in parts of western Colorado, thereby increasing the cost of apple production. For this and other reasons thousands of apple trees have been pulled out.

Plant Diseases.—Curley top of sugar beets, which is caused by the white fly or beet-leaf hopper, reduces sugar beet production on the Western Slope; likewise leaf spot interferes seriously

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with the production of this crop in the Arkansas Valley and northeastern Colorado. In some areas farmers have turned to other crops, such as onions, potatoes, melons and truck crops.

Alfalfa diseases, principally wilt, have lowered yields and shortened the profitable life of hay meadows to about 3 years. This makes it necessary to seed alfalfa more frequently or to reduce the total production of hay for the farm or the region.

Weeds.—Small areas have been abandoned on individual farms due to such perennial weeds as bindweed, pepper grass, Canadian thistle, sow thistle and Russian knapweed. The bindweed has spread over some irrigated districts to such an extent that the Federal Land Bank, when making loans, has seriously considered requiring the mortgagee to adopt specific methods for eradicating this noxious weed and also of making no loan at all where infestation is widespread on a farm.

Crop Adaptation.—The work of the plant breeder frequently results in the introduction or development of new strains or varieties of crops which have wider adaptations than the crops formerly grown. Thus, the introduction of Trebi barley and resistant strains of sugar beets and the development of Colorado No. 13 corn have resulted in a material expansion of the acreage devoted to these three crops. The mountain vegetable-growing areas of the state were developed by testing the adaptability of lettuce, green peas, snap beans, etc., in the valleys of high altitude.

Economic Factors

Distance to Market.—Colorado farmers are handicapped by the long distance that surplus products must be shipped in order to reach the more densely populated areas of the United States. Attempts to overcome this handicap have been made along the following lines: (1) By the concentration of certain crop products before they are shipped. For example, sugar beets are reduced to sugar and alfalfa hay, barley and corn are converted into fat lambs and cattle; (2) by producing products of high quality such as vegetables, potatoes, melons, and pure seeds (alfalfa, clover, cantaloupe, cucumber and flowers) that command premiums on the distant markets; (3) by adjusting production more or less to supply the local markets. For example, truck, dairy, poultry and fruit farms are concentrated around Denver in order to supply the needs of that city; (4) by producing crops that can be shipped long distances without being damaged such as wheat, corn and dry beans; and (5) by producing crop products that are concentrated and have high values per unit of bulk.
or weight, such as the seed crops of alfalfa, clover, cantaloupe, melon, cucumber and flowers.

Transportation.—The construction and operation of the railroads of the state made possible the development of much of Colorado’s agriculture as it existed up to within very recent years. The construction and maintenance of the extensive highway systems of the state and the introduction of the motor truck and automobile have created another phase in the development of agriculture. The highways and motor truck have widened the market for perishable products such as milk, fruits and vegetables. Likewise, they have widened the areas in which these perishable products may now be produced. The peaches and apples which now go by truck to the mountain towns and villages and to the small and more remote farming communities in the Plains area represent additional sales in many instances. Corn for feeding lambs and cattle in the northern Colorado feeding area is brought in from eastern Colorado and Nebraska by motor trucks. The trucks, in turn, take out loads of potatoes on the return trip. This tends to improve the market for the corn and potato producers and it also assists the cattle and lamb feeders in obtaining corn.

Competition from Other Competing Areas.—The Corn Belt is Colorado’s strongest competitor in the fattening of lambs and cattle. Losses which Colorado feeders have sustained during some years may be directly attributable to over-expansion of feeding operations in other areas.

The production of several of the orchard fruits and vegetable crops might be increased materially were it not for the competition still encountered from other producing states whose products enter the markets at the same time as those of Colorado. Likewise the producers of wheat in the scantly rainfall dry-farming districts of Colorado meet with ruinous competition from the many growers of wheat in other states where climatic conditions are more favorable or where growers are nearer to central markets.

Improved Machinery and Implements.—The tractor, one-way disc, press drill, duck-foot cultivator and combine represent a series of inventions in farm machinery and implements which have materially increased the area one man can farm and have reduced the cost per acre and per bushel of producing wheat. This also contributed materially in the shift from grazing to crop farming in many areas of Colorado, especially in the eastern part of the state.
CLASSIFICATION OF FARMS BY TYPE

In the United States Census of Agriculture, 1930, the farms of Colorado have been classified into 12 major types and 5 sub-types. The major types are: General, cash-grain, crop-specialty, fruit, truck, dairy, animal specialty, stock ranch, poultry, self-sufficing, abnormal and unclassified. The farms classified as abnormal have been divided into 5 sub-types: Institutional or country estate, part-time, boarding and lodging, forest products, and horse farm, or feedlot, or livestock dealer. This classification has been used in this study with one exception: The two types, animal-specialty and stock ranch, have been combined to form one type, and termed stock farms and ranches.

A Farm Defined

In considering the classification of farms by type, it is necessary to understand the meaning of the term "farm" and how it is used. With this in view the definition below is quoted.

"A 'farm,' for census purposes, is all the land which is directly farmed by one person, either by his own labor alone or with the assistance of members of his household or hired employees. The land operated by a partnership is likewise considered a farm. A 'farm' may consist of a single tract of land or of a number of separate tracts, and these several tracts may be held under different tenures, as when one tract is owned by a farmer and another tract is rented by him. When a landowner has one or more tenants, renters or managers, the land operated by each is considered a farm. . . . The enumerators were instructed not to report as a farm any tract of land of less than 3 acres, unless its agricultural products in 1929 were valued at $250 or more."†

Basis of Classifying Farms by Type

The primary basis of classifying farms by type is source of income. That is, the type to which each farm belonged in 1929 was determined by the relation of the value of the product or products from a particular source to the total value of all products of the farm from all sources. Source of income in each case refers to the product or products from which income is derived. The total value of all products of the farm includes the sum of the values of all products sold, traded, held for sale or consumed by the operator's family but does not include the amounts received from boarders, lodgers and campers. The last three items were not included in order to avoid duplication.

Below are listed the characteristic sources of income for each of the respective types of farms. The sum of the sales or anticipated sales of the products from the characteristic sources of each of the first seven types of farms (cash-grain to poultry, inclusive) had to equal 40 percent or more of the sum of the sales or anticipated sales from all products. Thus, to be classified as a truck farm, the sum of the sales and anticipated sales from all vegetables had to equal 40 percent or more of the sales and anticipated sales from all products of the farm. The types of farms and their characteristic products follow:

**Cash-grain.**—Corn, wheat, barley, oats, rye, grain sorghum, flax, emmer, spelt, buckwheat.

**Crop-specialty.**—Sugar beets, potatoes, dry beans, ripe peas, hay, broomcorn, and alfalfa, clover, melon and flower seeds.

**Fruit.**—All tree fruit, small fruit, nuts and grapes.

**Truck.**—All vegetables harvested for sale.

**Dairy.**—Milk, cream, butterfat, butter, dairy cows and calves.

**Stock farm and ranch.**—Beef cattle, sheep, hogs, horses, mules, goats, wool and mohair. Stock farms have less than 10 acres of pasture land to each acre in crops while stock ranches have 10 acres or more of pasture per acre in crops.

**Poultry.**—Chickens, ducks, geese, turkeys, and chicken eggs.

**General.**—The general farms were divided into two groups: First, farms having less than 40 percent of the total value of all products from any one source and, second, farms having 40 percent or more of the total value of all products from each of two sources, except in localities where one type of farm strongly predominated, the classification was governed by the dominating type. Thus, farms in the intensive fruit area near Grand Junction, Colorado, having 40 percent or more of the total value of all products coming from two sources, as for example, from fruit and truck or from fruit and poultry, were classified as fruit farms.

**Self-sufficing.**—Farms having 50 percent or more of the total value of all products used by the operator’s family.

**Unclassified.**—Farms not operated in 1929 or having incomplete reports of the sale of crops, livestock and livestock products.

**Abnormal.**—Farms noticeably different from ordinary farms. The meaning of the term “abnormal,” as here used, is quite evident from a reading of the descriptions of the five sub-types into which this type is divided:
TYPE OF FARMING AREAS

(1) **Institution or Country Estate.**—Institution.—Farms either operated or owned by public or semi-public agencies such as schools, colleges, churches, or asylums. Country Estate.—Farms of 10 acres or more having residences valued at $25,000 or more.

(2) **Part-time.**—Farms having products valued at not to exceed $750 in 1929 and the operators of which either reported other occupations than farmer or spent 150 days or more at work not connected with their farms.

(3) **Boarder and Lodger.**—Farms having 50 percent or more of the total value of all products and receipts of the farm represented by receipts from boarders, lodgers, campers, etc.

(4) **Forest Products.**—Farms having 50 percent or more of the total value of all products and receipts of the farm represented by forest products sold.

(5) **Horse Farm, Feedlot, or Livestock Dealer.**—Horse farm.—Farms having 50 percent or more of the total value of all farm products represented by the value of horses and mules sold in 1929. Feedlot.—Farms small in acreage which produced little or no crops, and which had large expenditures for feed and 50 percent or more of the total value of all farm products coming from the sale of cattle, sheep and hogs. Livestock dealer.—Farms for which the purchase and sale of large numbers of livestock were reported in 1929; which had 50 percent of the total value of all farm products represented by the sale of livestock; on which little or no feed was produced or purchased; and the operators of which reported other occupations than farmer, or spent several days for pay in 1929 at work not connected with their farms.

**Distribution of Gross Income by Type of Farm**

It is of interest to note how this classification distributed the total value of all farm products sold, traded, held for sale or used by the operator’s family among the several types of farms. Such information for the state as a whole is presented in tables 4, 5 and 6. The unclassified type, consisting of 3,758 farms, is not included in these three tables.

Table 4 shows the proportional distribution of the total value of all farm products (1) from all sources and (2) from each of five different sources by type of farm. That is, table 4 shows the relative importance of the several types of farms in 1929 when measured by the gross value of all products sold, traded, held for sale or used by the farm family. Stock farms and ranches ranked first, receiving the highest proportion (37.3 percent) of the total value of all farm products from the five
Table 4.—Proportional Distribution Among Ten Types of Farms of Colorado’s Gross Farm Income Derived from (1) Five Different Sources and (2) All of the Five Sources, 1928.

<table>
<thead>
<tr>
<th>Type of farm</th>
<th>Crops Percent</th>
<th>Livestock Percent</th>
<th>Livestock products Percent</th>
<th>Forest products Percent</th>
<th>Products used by operator's family Percent</th>
<th>Total from five sources Percent</th>
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</thead>
<tbody>
<tr>
<td>General</td>
<td>6.7</td>
<td>4.5</td>
<td>16.0</td>
<td>11.0</td>
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Compiled from 1930 U. S. Census of Agriculture, Statistics by Counties, Third Series, Type of Farm.

*Total value of all farm products sold, traded, held for sale or used by the operator’s family.

sources. The highest proportion (75.8 percent) of the total value of all livestock sold or traded also went to this type of farm. The relative importance of the other types of farming may be judged in like manner.

Table 5 shows the relative importance of the five different sources of income by type of farm when measured by sales and anticipated sales of farm products. Considering general farms it will be seen that an average of 37.4 percent of the total value of all farm products came from crops, 21.5 percent from livestock, 27.1 percent from livestock products and 13.7 percent consisted of the value of the products used by the operator’s family. Crops, plants and flowers were the most important source of income for the general, cash-grain, crop-specialty, fruit, and truck farms; livestock was the major source of income for the stock farms and ranches and the abnormal farms; livestock products for the dairy and poultry farms; and products used by the operator’s family for self-sufficing farms.

Table 6 shows the distribution of 56,198 Colorado farms among ten types of farms; the average size of farm for each of the ten types; and the average gross value of all farm products sold, traded, held for sale or used by the operator’s family, (1) from all sources and (2) from each of five different sources.

In number of farms crop-specialty ranked first, stock farms and ranches second, and poultry last. In size of farm, stock farms and ranches averaged largest and fruit farms smallest.
Table 5.—Proportional Distribution of the State Total Gross Farm Income of Each of Ten Types of Farms Among Five Different Sources, Colorado, 1929.

<table>
<thead>
<tr>
<th>Type of farm</th>
<th>Crops</th>
<th>Livestock</th>
<th>Livestock products</th>
<th>Forest products</th>
<th>Products used by operator's family</th>
<th>Total from five sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>Percent</td>
<td>Percent</td>
<td>Percent</td>
<td>Percent</td>
<td>Percent</td>
</tr>
<tr>
<td>General</td>
<td>87.4</td>
<td>21.5</td>
<td>27.1</td>
<td>.3</td>
<td>13.7</td>
<td>100</td>
</tr>
<tr>
<td>Cash-grain</td>
<td>74.8</td>
<td>10.4</td>
<td>8.6</td>
<td></td>
<td>6.2</td>
<td>100</td>
</tr>
<tr>
<td>Crop-specialty</td>
<td>73.8</td>
<td>8.4</td>
<td>6.9</td>
<td>.1</td>
<td>4.8</td>
<td>100</td>
</tr>
<tr>
<td>Fruit</td>
<td>83.4</td>
<td>4.0</td>
<td>6.5</td>
<td></td>
<td>6.1</td>
<td>100</td>
</tr>
<tr>
<td>Truck</td>
<td>88.2</td>
<td>2.5</td>
<td>3.3</td>
<td></td>
<td>6.0</td>
<td>100</td>
</tr>
<tr>
<td>Dairy</td>
<td>11.4</td>
<td>14.0</td>
<td>66.5</td>
<td>.1</td>
<td>8.0</td>
<td>100</td>
</tr>
<tr>
<td>Stock farm and ranch</td>
<td>12.9</td>
<td>75.2</td>
<td>8.7</td>
<td>.1</td>
<td>3.1</td>
<td>100</td>
</tr>
<tr>
<td>Poultry</td>
<td>8.6</td>
<td>3.6</td>
<td>73.1</td>
<td></td>
<td>9.7</td>
<td>100</td>
</tr>
<tr>
<td>Self-sufficing</td>
<td>18.8</td>
<td>6.7</td>
<td>14.3</td>
<td>.9</td>
<td>64.3</td>
<td>100</td>
</tr>
<tr>
<td>Abnormal</td>
<td>11.3</td>
<td>69.8</td>
<td>8.5</td>
<td>3.8</td>
<td>6.6</td>
<td>100</td>
</tr>
<tr>
<td>All types</td>
<td>43.9</td>
<td>37.0</td>
<td>13.3</td>
<td>.2</td>
<td>5.6</td>
<td>100</td>
</tr>
</tbody>
</table>

Compiled from 1930 U. S. Census of Agriculture, Statistics by Counties, Third Series Type of Farm.
*Total value of all farm products sold, traded, held for sale or used by the operator's family.

Stock farms and ranches had the highest average gross income $6,891, while at the other extreme gross income for the self-sufficing farms averaged only $309. Table 6 also shows the distribution of the value of all products from all sources among the different types of farms.

Table 6.—Number of Farms, Average Size of Farm and Average Gross Value of All Receipts Derived from Five Different Sources for Each of Ten Types of Farms, Colorado, 1929.

<table>
<thead>
<tr>
<th>Type of farm</th>
<th>Number of farms</th>
<th>Average Size of Farm, acres</th>
<th>Crops, Dollars</th>
<th>Livestock, Dollars</th>
<th>Livestock products, Dollars</th>
<th>Forest Products, Dollars</th>
<th>Products used by operator's family, Dollars</th>
<th>Total from five sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>8,538</td>
<td>348</td>
<td>644</td>
<td>370</td>
<td>466</td>
<td>6</td>
<td>256</td>
<td>1,72</td>
</tr>
<tr>
<td>Cash-grain</td>
<td>8,928</td>
<td>567</td>
<td>1,933</td>
<td>270</td>
<td>221</td>
<td>2</td>
<td>160</td>
<td>2,58</td>
</tr>
<tr>
<td>Crop-specialty</td>
<td>13,686</td>
<td>256</td>
<td>2,900</td>
<td>394</td>
<td>253</td>
<td>2</td>
<td>175</td>
<td>3,83</td>
</tr>
<tr>
<td>Fruit</td>
<td>1,777</td>
<td>43</td>
<td>2,094</td>
<td>101</td>
<td>162</td>
<td>1</td>
<td>150</td>
<td>2,50</td>
</tr>
<tr>
<td>Truck</td>
<td>2,185</td>
<td>68</td>
<td>2,204</td>
<td>63</td>
<td>82</td>
<td>1</td>
<td>150</td>
<td>2,50</td>
</tr>
<tr>
<td>Dairy</td>
<td>3,533</td>
<td>342</td>
<td>299</td>
<td>365</td>
<td>1,741</td>
<td>4</td>
<td>210</td>
<td>2,61</td>
</tr>
<tr>
<td>Stock farm and ranch</td>
<td>10,184</td>
<td>1,286</td>
<td>892</td>
<td>5,181</td>
<td>596</td>
<td>6</td>
<td>216</td>
<td>6,89</td>
</tr>
<tr>
<td>Poultry</td>
<td>1,619</td>
<td>78</td>
<td>141</td>
<td>59</td>
<td>1,254</td>
<td>4</td>
<td>150</td>
<td>1,64</td>
</tr>
<tr>
<td>Self-sufficing</td>
<td>1,685</td>
<td>179</td>
<td>42</td>
<td>21</td>
<td>44</td>
<td>3</td>
<td>190</td>
<td>30</td>
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<tr>
<td>Abnormal</td>
<td>4,103</td>
<td>186</td>
<td>209</td>
<td>1,287</td>
<td>157</td>
<td>70</td>
<td>122</td>
<td>1,84</td>
</tr>
<tr>
<td>All types*</td>
<td>56,108</td>
<td>482</td>
<td>1,464</td>
<td>1,232</td>
<td>443</td>
<td>8</td>
<td>186</td>
<td>3,33</td>
</tr>
</tbody>
</table>

Compiled from U. S. Census of Agriculture, 1930, Statistics by Counties, Third Series Type of Farm.
*Does not include 3,758 unclassified farms.
GEOGRAPHY OF COLORADO'S AGRICULTURE

As an agricultural state, Colorado ranks considerably above the average when measured by the proportion of the population gainfully employed in the field of agriculture, the ratio in 1930 being 26 percent for Colorado as compared with 21 percent for the United States. Surface features, elevation above sea level, soil, climate, and availability of water for irrigation vary greatly within the boundaries of the state and variations in these factors, in turn, largely determine the geographical distribution and relative importance of the crop and livestock enterprises.

Of Colorado's total land area, consisting of approximately *66,368,000 acres, 44 percent was in farms in 1930. Of the total land area in farms that year, 29 percent was classified as crop land, 67 percent as pasture land and 4 percent as all other land in farms. A considerable portion of the 37,464,949 acres not included in farms is used for one or more of the following purposes: Grazing, national forest reserves, national parks, mining, residences and business and industrial locations. Our chief interest here is the distribution of the crop and livestock enterprises within the state, the relative importance of these enterprises, and also the distribution of farms; first, all farms; and second, farms classified by type.

Distribution of Crop Enterprises

A relatively large variety of crops is produced in Colorado. Measured in terms of the acreage harvested during the 5-year period 1929-1933, the more important crops ranked as follows, the figures given representing thousands of acres: Corn for all purposes, 1,734 acres; all hay, 1,648; all wheat, 1,141 acres; barley, 508; dry beans, 346; sugar beets, 209; grain and feed sorghums, 207; oats, 169; potatoes, 94; broom corn, 58; commercial truck crops, 47. The distribution of Colorado's total crop land and the distribution of the production of the more important crops are presented in figures 7 to 19. Figure 6, a map showing the names and location of counties of Colorado, will be helpful in studying these figures.

*U. S. Census figures.
Figure 6.—County identification map with railroads.
A general picture of where Colorado's crops are grown within the state is presented in figure 7. Crop land in farms as shown in this figure consists of the land from which crops were harvested in 1929, land on which crops failed, and land that lay idle or was fallowed that year. This figure shows a very uneven distribution of the land used for the purpose of growing crops. The reason for this will be evident from a careful comparison of figure 7 with figures 2 to 5. The greatest concentration of dots on the map occurs in certain areas where water is available for irrigation and where the soil and surface of the land are suitable for irrigated farming. At the other extremes it may be said that the absence of dots in other parts of the map is due to one or more of the following conditions: Rough mountainous surface features, soil poorly adapted to crop production, the lack of water for irrigation, inadequate and poorly distributed rainfall.
Figure 8.—Corn: Total acreage for all purposes, 1929.

Practically all corn is grown in the eastern half of the state, the greatest concentration being on the better grades of dry-farming land. (Compare figures 3 and 8.) Of the total acreage harvested in 1929, approximately 9 percent was grown with and 91 percent without irrigation. Measured by the total acreage devoted to each crop in 1929, corn ranked considerably below all hay crops combined and but a trifle below all wheat. If judged, however, by the estimated harvested acres of the respective crops as made by the Bureau of Agricultural Economics, U. S. Department of Agriculture, for the 5-year period 1929-1933, corn ranked first. During this period the estimated corn acreage fluctuated between 1,386,000 acres in 1930 and 2,004,000 acres in 1933. Since 1922 there has been a substantial upward trend in the acreage devoted to corn.
By comparing figures 8 and 9, it will be seen that the distribution of wheat and corn in 1929 was very similar. The greatest concentration of wheat, like that of corn, was in the northeastern quarter of the state on the best grade of dry-farming land. Wheat, that year, was more evenly distributed over the western part of the state than corn. No dots appear in ten of the mountain counties. This means that less than 100 acres of wheat were harvested in each of these counties. Approximately 11 percent of the total wheat crop was produced with and 89 percent without irrigation. That grown under irrigation is generally spring wheat. The acreage of wheat harvested varies greatly from year to year, the range during the 5-year period 1929-1933 being from 1,563,000 acres in 1930 to 548,000 acres in 1933. The variation in the harvested acreage is caused chiefly by winter killing, drought during the spring and early summer and lack of sufficient soil moisture to properly germinate and maintain fall-sown wheat. When the latter condition obtains, farmers in the non-irrigated areas have the following alternatives: The land intended for winter wheat may lie idle, may be fallowed, or planted to corn, barley, oats, spring wheat or to grain and feed sorghums.
The distribution of barley in Colorado is very similar to that of wheat. (Compare figures 9 and 10.) Measured by the acreage harvested in 1929, barley ranked third as a grain crop, being about 40 percent as important on that basis as either wheat or corn. During the 5-year period 1929-1933, the harvested acreage of barley decreased from 608,000 acres at the beginning of the period to 430,000 acres at the close, being replaced to a considerable extent by corn. Of the total acreage harvested in 1929, 27 percent was grown with and 73 percent without irrigation. Although grown primarily as a feed crop, barley is marketed as a cash crop on some farms. Considerable barley is grown in the mountain valleys where the altitude is too great for corn.
Figure 11.—Sugar Beets for Sugar: Acreage harvested, 1929.

The production of sugar beets in Colorado is confined almost entirely to four irrigated areas: The large irrigated district of north central Colorado, the South Platte River valley, the Arkansas River Valley and the Western Slope, given in the order of their importance. In addition to these four districts, sugar beets are produced also in Las Animas County and the San Luis Valley. While sugar beets are grown primarily for the production of sugar, the by-products, tops and pulp are used extensively in feeding sheep and cattle.
There are two areas of concentration of the potato crop, the most important being in the San Luis Valley and the other in Weld County in the northern part of the state. In 1929, 83 percent of the crop was grown with and 17 percent without irrigation. Potatoes yield well at relatively high altitudes and considerable of the non-irrigated crop is grown in the mountain counties. Reference to figure 12 will show no dots in 20 of the 63 counties of the state. Each of these counties harvested less than 100 acres of potatoes in 1929. The harvested acreage of potatoes fluctuates considerably from year to year, the range of variation during the 5-year period 1929-1933 being from 101,000 acres in 1931 to 87,000 acres in 1933.
Figure 13.—Dry Beans: Harvested acreage grown alone, 1929.

Practically all of Colorado's dry bean crop is grown in the eastern half of the state, the greatest concentration being in the west central portion of the Great Plains area. The harvested acreage of this crop averaged 846,000 acres during the 5-year period 1929-1933 and varied during this same period from 221,000 acres in 1932 to 458,000 acres in 1930. Approximately 10 percent of the crop was grown with and 90 percent without irrigation in 1929.
The greatest concentration of the ripe field-pea crop of 1929 was in the five counties of the San Luis Valley where approximately 90 percent of the total crop was grown that year. Outside of this area the field pea is of minor importance. Of the total harvested acreage of all crops in the five San Luis Valley counties in 1929, ripe field peas made up 13 percent and of the 4,462 acres of peas grown, 75 percent was produced under irrigation. The pea crop in this area may be cut, cured and threshed or harvested by turning hogs or lambs into the field.
The distribution of all vegetable crops harvested for sale in 1929 is shown in figure 15. The area of greatest concentration, it will be noted, is in the Arkansas River Valley in Otero, Crowley and Bent counties where irrigation is practiced. This area produces largely for shipping to distant markets. The leading truck crops named in the order of their importance are as follows: Cantaloupes and muskmelons, dry onions, cucumbers, tomatoes, snap beans and watermelons. The next most important area is around the city of Denver where production is generally for the local market and where the individual farms usually produce a variety of crops. In the high mountain valleys, head lettuce, cauliflower, and pod peas are the leading vegetable crops grown for sale. Figure 15 shows no dots for 20 of the 63 counties of the state. This means, it should be understood, that in each of these counties less than 100 acres of all vegetables were harvested for sale in 1929.
Figure 16.—Sorghums: Acreage harvested for grain, silage, hay, fodder, 1929.

The growing of the grain and feed sorghums is confined almost entirely to the eastern part of the state, the greatest concentration being in the eastern tier of counties. In 1929 approximately 36,000 acres were grown for grain and 244,000 acres for hay, fodder and silage. The harvested acreage of this crop increased about 50 percent from 1929 to 1933. It is mainly grown without irrigation under practically the same conditions as corn.
Figure 17.—All Hay Crops: Acreage harvested, 1929.

The distribution of the harvested acreage of all hay crops combined is presented in figure 17, each dot representing 250 harvested acres. As might be expected the greatest concentration is in the irrigated areas of the state. In 1929 all hay crops combined occupied a larger proportion of the total area of crop land than any other single crop. That year the total hay crop consisted of 800,574 acres of alfalfa, 361,601 acres of wild grasses, 307,017 acres of tame grasses and clovers; 123,206 acres of small grains cut for hay; and 16,774 acres of annual legumes. Seventy-eight percent of the total hay crop was grown with and 12 percent without irrigation. The wild grasses strongly predominate in mountain valleys where the elevation above sea level is too great for alfalfa.
Alfalfa is the most important hay crop in Colorado when measured either by the tonnage produced or the area harvested. Of the total harvested acreage of all hay crops in 1929, approximately one-half was alfalfa. Its production is largely confined to land that is either irrigated or sub-irrigated, only 11 percent of the total acreage being grown without irrigation. The distribution of the 1929 alfalfa crop is presented in figure 18, each dot representing 250 acres. The production of alfalfa, as well as that of most other hay crops of the state, is closely related to the livestock industry. Approximately two-thirds of the crop is fed on the farms where produced, the other one-third being sold. A part of the crop that is sold goes to alfalfa mills and is ground into meal, much of which is shipped to distant markets.
Figure 19.—Orchards, Vineyards, Nut Trees, Small Fruits: Total acreage, 1929.

Figure 19 presents the distribution of the land area that was in orchard fruits, vineyards, nut trees and small fruits in 1929, each dot representing 100 acres. That year 34,423 acres were occupied by all fruits and nuts. Of this acreage 91 percent was irrigated. Named in the order of their importance the orchard fruits consisted of apples, peaches, cherries, pears, plums, prunes and apricots. The small fruits were made up of the following: Raspberries, strawberries, black and dewberries, gooseberries and currants. The greatest concentration of fruit occurs in Delta, Mesa, Larimer, Jefferson and Fremont counties. Some fruit is produced also in Montrose, Montezuma and La Plata counties.
Distribution of Livestock Enterprises

Livestock production occupies an important place in Colorado’s agriculture. Because of the relatively large amount of grazing land within the state, beef cattle and sheep strongly predominate. The livestock enterprises are not equally distributed in all parts of the state. This is due largely to variations in the proportion of grazing land to crop land, to competition between cash crops and feed crops for the use of land and the kind and nature of the crops that can be grown. The distribution of the livestock enterprises is presented in figures 20 to 25. A discussion accompanies each figure. The distribution of horses and mules is not shown since their use is chiefly to provide farm power. The number of goats in the state in 1929 was only 30,512 and because so unimportant their distribution is not given.

Figure 20.—Cows and Heifers Over Two Years Old Kept Mainly for Beef Production: Number on farms April 1, 1930.

The production of beef cattle is the most important livestock enterprise in Colorado. While beef production is primarily a grazing enterprise, the winter fattening of feeder cattle is practiced extensively in northern Colorado on many irrigated farms in Boulder, Larimer, Weld, Morgan and Logan counties. Considerable winter fattening of feeder cattle is carried on also on the irrigated farms of the Arkansas Valley in Pueblo, Otero, Crowley and Bent counties. The distribution of cows and heifers over 2 years old, kept mainly for beef production and on farms April 1, 1930, is presented in figure 20, each dot representing 25 head. Except for the concentration in the irrigated areas and the mountain valleys, beef cows and heifers were very generally distributed over the state. From approximately the whole of the western half of the state, beef cattle are shipped either to markets as grass finished or to distant feedlots to be fattened. In much of the eastern part of the state feeder cattle are usually produced in connection with cash-crop dry farming. These cattle are generally shipped to feedlots and fattened before being slaughtered. The Hereford type of beef cattle generally predominates in western Colorado and on the large ranches of the eastern part of the state. On the smaller ranches of eastern Colorado where considerable milking is done, the Shorthorns predominate.
Figure 21.—Cows Milked: Total number, 1929.

The distribution of cows and heifers milked during 1929 is shown in figure 21, each dot representing 25 head. The average number of cows milked per farm reporting the milking of cows was 5.4 head. The greatest concentration, it is seen, occurs in the irrigated areas, especially in the large irrigated district of northcentral Colorado. The lowest concentration, on the other hand, was in the mountain counties and on the Colorado River plateau in the extreme western part of the state. The average production of milk per cow milked in 1929 was 4,420 pounds.

Colorado produces a surplus of dairy products. Approximately 20 percent of all milk produced in 1929 was sold as whole milk. The production of milk sold as whole milk is confined almost entirely to the irrigated areas adjacent to the cities and towns. Sour cream is produced throughout the Great Plains area, in the San Luis Valley, in most of the mountain counties and in the northwestern part of the state. Both sweet and sour cream are produced in southwestern and westcentral Colorado. Both cream and butter are shipped to markets outside the state.
The fifteenth United States Census of Agriculture reports a total of 234,530 cows milked in Colorado during 1929. Of this number, 85,665 or a little over 36 percent were of beef or dual-purpose breeding. The distribution of these cows is shown in figure 22, each dot representing 25 head. The greatest concentration is in the Great Plains area, more than 75 percent of the 85,665 head being in eastern Colorado. The average number of cows milked per farm reporting the milking of this type of cow was 5.5 head. Beef and dual-purpose cows are mostly of Shorthorn breeding and are generally milked in connection with cash-crop production on non-irrigated farms where the chief dairy product sold is sour cream.
It will be seen from figure 23 that the concentration of sheep and lambs in Colorado stands out quite prominently in two areas, namely, the large irrigated district of north-central Colorado and the San Luis Valley in the southern part of the state. While sheep are not evenly distributed over the remainder of the state, concentration is much less marked than in these two areas.

The sheep industry of Colorado may be divided into three phases: (1) Production on the ranges by grazing; (2) fattening feeder lambs and sheep in feedlots; and (3) “lambing-down” field peas. Most of the sheep produced are marketed as lambs. Many of the lambs coming from the mountain ranges are grass fat and are sold for immediate slaughter, the remainder going to the feedlots for fattening. Feedlot fattening of lambs is confined largely to the irrigated districts of northcentral Colorado. Considerable lamb-feeding also takes place on many of the irrigated farms (1) of the Arkansas River Valley, (2) of the San Luis Valley, and (3) of west central Colorado. The lambs fed may come from the ranges of Colorado, Wyoming, Montana, Idaho, Utah, Arizona, New Mexico or Texas. They are shipped into the feeding areas from September to December and are marketed from January to May. The “lambing-down” of ripe peas is practiced in the San Luis Valley. The lambs are transferred from the range to the farms when the peas are mature and are turned into the fields to harvest the crop.
Figure 24.—Sows and Gilts: Total number farrowing between Jan. 1 and June 1, 1930.

The number and approximate distribution of the sows and gilts that farrowed between January 1 and June 1, 1930 is shown in figure 24, each dot representing 25 head. Of the total number of sows and gilts farrowing between these dates, approximately 60 percent was in the northern half of the Great Plains area, 10 percent in the five counties of the San Luis Valley and 30 percent unevenly distributed over the remainder of the state. In six of the mountain counties there were less than 13 sows per county. A large percentage of the hogs in northeastern Colorado is produced in connection with dry farming and is finished mainly on corn. In the irrigated districts of northern Colorado and the Arkansas River Valley the hogs produced are generally pastured on alfalfa and finished on corn, barley and other purchased feeds. In the San Luis Valley the field pea is the most important feed used for finishing hogs for market. A very common method of harvesting the peas is to turn the hogs into the field when the peas are ripe.
Figure 25.—Chickens over 3 Months Old on Farms April 1, 1930, Total Number.

The number and distribution of poultry over 3 months old on farms April 1, 1930, is shown in figure 25, each dot representing 1,000. The greatest concentration occurs in Boulder, Jefferson, Adams and Arapahoe counties around the city of Denver. The poultry enterprise is an important source of income on many Colorado farms. 54 percent of the total number of farms within the state reporting receipts from the sale of eggs in 1929. Commercial poultry farms are relatively few and are mainly located in the vicinity of Denver and other urban centers. The bulk of poultry products is produced on farms where the enterprise is carried as a side line. The production of poultry in Colorado increased materially during the last census decade, the number of chickens raised being approximately 3,881,000 in 1919; 5,006,000 in 1924; and 6,338,000 in 1929.
Distribution of Farms by Type

In 1929 there were 59,956 farms in Colorado according to the fifteenth United States Census of Agriculture. The distribution of all the farms within the state is shown in figure 26, each dot representing the approximate location of 5 farms. Likewise figures 27 to 35 present the distribution of the farms of the state when classified by types of farming. Each dot in the 9 figures represents 3 farms. Figure 26 gives a general picture of the localization of Colorado's agriculture as a whole while figures 27 to 35 show where the different types of farming are practiced.

In considering the distribution of farms by type as presented in figures 27 to 35, it must be kept in mind that the count of farms as made by the fifteenth U. S. Census of Agriculture is of April 1, 1930, while the primary basis for classifying the

![Figure 26.—All Farms, 1929.](image)

Colorado's 59,956 farms are distributed very unevenly over the state, the greatest concentration occurring in the irrigated areas: namely, in the large irrigated district of north central Colorado, along the Arkansas, Colorado, Gunnison, Uncompahgre and South Platte Rivers and in the San Luis Valley. There is a considerable concentration of farms in the San Juan Basin in the southwestern part of the state. The most even distribution occurs in the Great Plains area under non-irrigated conditions.
farms by type is the income derived from the different sources in 1929. It should be remembered also that, with the exception of the abnormal, self-sufficing and general farms under certain conditions, at least 40 percent of the total gross receipts had to come from a particular source in order for a farm to fall within a given type. As weather conditions vary from year to year and from season to season, as prices of farm products change, and as the acreage devoted to the respective crops vary, there are corresponding changes in the total value of the products derived from each particular source. This in turn causes some shifting in the classification of farms from one type to another. Therefore the data presented in figures 27 to 35 should be looked upon as subject to more or less change from year to year. Brief discussions of the distribution and characteristics of the respective types of farms accompany the figures.

![Cash-Grain Farms, 1929.](image)

Of Colorado's total number of farms, 8,933 or approximately 15 percent, were classified as cash-grain farms. Farms of this type are found mainly in the northeastern and southeastern parts of the state. A limited number is also to be found in southwestern and northwestern Colorado. Cash-grain farms are generally operated without irrigation and the kinds of grain grown are wheat, corn, barley, oats, rye, sorghums, and a limited amount of emmer.
Of the ten major types of farms, crop-specialty was the largest numerically, numbering 13,696 in 1929. In interpreting figure 28 it should be kept in mind that the 40 percent or more of the total gross farm receipts that determined whether a farm should fall within the group crop-specialty, was derived from one or more of the following special crops: sugar beets, potatoes, hay, dry beans, ripe peas, broomcorn, and seed crops of alfalfa, red clover, sweet clover, cantaloupes, muskmelons, cucumbers and annual flowers. Thus in Baca County under dry-farming conditions in 1929 broomcorn was the major crop that contributed the necessary 40 percent of the gross receipts to put farms into the crop-specialty type. In northern Colorado, under irrigation, on the other hand, the necessary 40 percent of the gross income might have come from one or more of the following crops: sugar beets, hay, dry beans and potatoes. It should be evident, therefore, that the crop-specialty farms present a wide variation in organization and production plans.
The fruit farms are mainly concentrated in five rather definite localities, that is, in Mesa County near Grand Junction; in Delta County northeast of Delta; in Fremont County about Canon City; in Jefferson County just west of Denver; and in the southeastern part of Larimer County. The fruit produced in these areas consists of apples, apricots, cherries, peaches, pears, plums, prunes, grapes, and the small fruits. If measured by the number of bearing trees in 1929, apples ranked first in Delta and Fremont counties, cherries in Jefferson and Larimer counties, and peaches in Mesa County. Mesa and Fremont counties had the largest numbers of bearing grape vines in 1929. In acreage devoted to the small fruits, Jefferson County ranked first, Larimer County second, and Garfield County third.
Figure 30.—Truck Farms, 1929.

Truck farms make up 3.5 percent of the total number of farms within the state. The farms producing for local markets are usually located around urban centers and generally produce a variety of vegetables. The farms that produce for shipping or canning, on the other hand, generally specialize in a few varieties and in many cases only one. The farms growing head lettuce in the high mountain valleys and cantaloupes along the Arkansas River in Otero, Crowley and Bent counties are examples of the specialized truck farms.
The dairy farms of Colorado have a marked tendency to be concentrated around urban centers, especially about the city of Denver and in certain irrigated districts. Dairy farms are found also thinly scattered over the non-irrigated farming areas of the state. This type of farm made up 5.9 percent of all farms in 1929. The production and sale of fluid milk predominates around the urban centers while in other parts of the state the dairy income is largely derived from the sale of cream or whole milk for the production of butter. Approximately 19 percent of the cows milked in 1929 was of beef or dual-purpose breeding.
Stock farms and ranches, it is to be remembered, include the two types, animal-specialty and stock ranches, of the Bureau of the Census classification. This consolidated type constituted 18.9 percent of all of Colorado's farms in 1929. It is more evenly distributed about the state than any other type of farm. There is a noticeable concentration, however, in the irrigated portions of Larimer, Weld and Morgan counties. This is due mainly to extensive feeding operations carried on in these three counties each year. Income on this type of farm comes largely from the sale of fat cattle, sheep, wool and to a limited extent, hogs. The hogs are mostly raised in the northeastern part of the state where corn is a prominent crop. As a rule only one kind of livestock, either cattle or sheep, is carried on stock farms and ranches, but occasionally both sheep and cattle are produced. It may be noted that there were 10,134 farms in this group.
Of Colorado's total number of farms, 1,619 or 2.7 percent was classified as poultry farms in 1929 and of the eleven major types into which the total number of farms of the state were classified, poultry is the smallest. The poultry farms are mainly concentrated around the urban centers, over 700 being located about the city of Denver. Income on these farms is derived chiefly from the sale of eggs and poultry, turkeys being a primary source of income on many of the poultry farms.
Figure 34.—General Farms, 1929.

General farms are quite evenly distributed over the state. Of the total number of farms, 8,538, or 14.2 percent was classified as general in 1929. Income from the various sources also is more evenly distributed than for any other type, the proportion in 1929 being approximately as follows: From crops 37 percent, livestock products 27, livestock 22 and farm products used by the operator's family 14 percent. On some farms the income is derived from but two or three enterprises while on other farms there may be several sources each of considerable importance.
Part-time farms tend to be concentrated around the urban centers where the operators of comparatively small farms have the opportunity of conducting other lines of business than farming or of securing part-time employment at work not connected with their farms. In 1929 there were 3,545 farms or 6.9 percent of the total number of farms in Colorado classified as part-time. The heaviest concentration of this type is around the city of Denver where approximately 600 such farms are located. Part-time farms are much smaller around the cities and towns than in areas remote from the urban centers, the average size for the state being 122 acres.
TYPE OF FARMING AREAS CHARACTERISTICS

(Legend to Figure 36)

No.
2. Routt-Moffat Plateau—Range cattle and sheep, general, cash-grain, potatoes, alfalfa seed, lettuce, hay, dairy.
3. Western Slope Irrigated Districts—
   a. Potatoes, sugar beets, hay, range cattle and sheep, dairy, general.
   b. Fruit, some dry beans, potatoes, part-time, general, poultry.
   c. Dry beans, potatoes, hay, general, cash-grain, poultry, part-time.
   d. Potatoes, sugar beets, general, cash-grain, range cattle and sheep, part-time, truck, poultry, dairy.
   e. Fruit, general, range cattle and sheep, hay, sugar beets, part-time.
   f. Range cattle and sheep, general, potatoes, hay, dairy.
4. San Juan Basin Area—Range cattle and sheep, general, cash-grain, dairy, self-sufficing, part-time, some fruit.
5. Rocky Mountains and Associated Valleys—Range cattle and sheep, scattered farming (hay, potatoes, lettuce, dairy, general, part-time).
7. Trinidad-Walsenburg Foothills—Range cattle and sheep, some dairy, dry beans, lettuce, green peas, forest products.
9. Northern Colorado Irrigated District—
   a. Major Area—Sugar beets, lamb and cattle feeding, potatoes, hay, general, some dairy, cash-grain, fruit, truck, poultry.
   b. Denver Area—Truck, dairy, poultry, general, fruit, sugar beets, cash-grain, part-time.
11. Northern Colorado High Plains—Range cattle and sheep, some cash-grain, general, dry beans, hay, feed crops.
12. Northeastern Colorado Plains—Cash-grain (wheat, corn, barley), some swine and range cattle.
TYPE OF FARMING AREAS

The foregoing discussions have dealt mainly with the historical setting of Colorado's agriculture, the factors and forces which have been and now are shaping types of farming with the state and the geographical distribution of the principal crops and livestock enterprises and the several types of farms. We now turn to a consideration of the 17 type-of-farming areas into which the state has been divided as shown in figure 36.

Crop and livestock enterprises are combined in more or less definite proportions and fitted together into types of farming in the operation of individual farms. With the passing of time the types tend to become more or less stable. The physical, economic and biological factors are such in some localities as to cause one type of farming to predominate strongly. The range livestock area No. 1 in the western part of the state, and the cash-grain area No. 12 in the northeastern part, are examples of such a situation. In other localities, on the other hand, market demands, and other factors governing production may be favorable to a mixture of types. This condition is illustrated by area 9-b in which relatively large numbers of types of farms are located about the city of Denver. Thus, the types of farming within the 17 areas, as shown in figure 36, vary greatly.

The boundary lines separating the different areas, it should be understood, are not to be looked upon as fixed. In most cases, especially under non-irrigated conditions, the areas generally grade insensibly into each other. Furthermore, changes in economic conditions and also climatic conditions such as one or more scant or heavy rainfall years, may cause some shifting in the proportion of farms that may fall into the different classes or types. Such shifts are likely to cause corresponding changes in the location of the lines separating the type-of-farming areas.

Area 1.—The Colorado River Plateau Grazing Area

Description of Area.—The Colorado River Plateau grazing area occupies the extreme western part of the state and extends from the Colorado-Wyoming State line on the north to the New

15. Upper Arkansas River Plains—
   a. Range cattle, some range sheep, scattered cash-grain, feed crops, dry beans.
   b. Dry beans, general, range cattle, some cash-grain (mostly corn).
16. Cimarron River Plains—Cash-grain (wheat and corn), range cattle, broomcorn, some range sheep, sorghum, dry beans, swine.
17. Arkansas Valley Irrigated Districts—
   a. Alfalfa, sugar beets, corn, lamb and cattle feeding, truck, wheat, dairy.
   b. Sugar beets, truck (cantaloupes, melons, onions, tomatoes, cucumbers), lamb and cattle feeding, dairy, seed crops (melons, cucumbers, flowers, alfalfa).
   c. Fruit, truck, poultry, dairy, part-time, general.

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Mexico border on the south, being divided into two parts by area
4 which traverses the southwestern corner of the state. (See
figure 36.)

The surface features of the area consist of valleys, plains,
mesas, rolling hills and mountain slopes. The altitude varies
from less than 5,000 feet in the southwestern corner of the state
and where the Colorado River enters Utah to around 8,000 feet
on some of the highest ridges. Practically the whole area has
been classified as grazing land, very little of it being either irri-
gated or dry farmed. (Figure 3.) The surficial cover varies
from fertile friable loams and clay soils to solid rock. Lands
that are sufficiently level and free from rock are generally very
fertile soils.

The climate varies considerably between the lower and
higher altitudes. The annual precipitation is quite evenly dis-
tributed throughout the year, especially in the northern portion.
It varies from less than an average of 10 inches in the lower
Colorado River valley and the southwestern part of the state
to around 16 inches in districts of high elevation. (Figure 4.)
While the winter precipitation falls mostly as snow over much
of the area, the snow mantle does not cover the grazing lands
all of the time which permits of more or less winter grazing. The
winter feeding season is much shorter in this area than in
areas 2 and 4. During the summer the days are usually hot
and the nights relatively cool, while during the winter the at-
mosphere is generally dry and cold. Railroad transportation
facilities are rather meager and in much of the area livestock
must be trailed or transported by truck considerable distances
in making delivery to the shipping points.

Approximately 3 percent of all land in area 1 is in farms
and of the total land in farms 89 percent is used for pasture and
8 percent is crop land. About five eighths of the crop lands are
irrigated and three eighths are dry farmed. About 62 percent
of the crop land is used for producing hay and 13 percent for
growing other feed crops. Approximately 96 percent of the hay,
21 percent of the feed crops (mainly corn, barley and oats) and
1 percent of the cash-grain are produced under irrigation.

Summarizing, it may be said that the foregoing charac-
teristics practically limit the use of the area to the grazing of
sheep and cattle, the former predominating in the area as a
whole; that 89 percent of all the land in farms is used for pas-
ture and that grazing is the only use made of 97 percent of the
land not in farms; that three-fourths of the crop land is used
for producing hay and feed crops; and that approximately five-
eighths of the crop lands are irrigated and three-eighths are dry
farmed.
Crops.—The crops grown on the small and widely scattered irrigated areas, consisting mostly of alfalfa, oats, barley and corn, are used chiefly for carrying livestock through the winter. Such roughage is frequently supplemented with cottonseed cake. Wheat, corn, barley and oats are the principal crops grown without irrigation.

Livestock.—The production of range sheep and cattle is the chief industry throughout the whole area. The Rambouillet, crossed more or less with mutton breeds, is the dominant breed of sheep. The cattle are mostly of Hereford breeding, there being some Shorthorns. While both sheep and cattle may occupy the free open range, it has been allocated between them in certain districts. A few chickens and hogs are generally to be found at each ranch headquarter.

Types of Farming.—Stock farms and ranches, in 1929, made up 44 percent of all farms within the area. Part-time farms constituted 20 percent of the total number; general, 8; crop-specialty, 8; self-sufficing, 5; cash-grain, 4; poultry, 2; dairy and fruit, 1 each; and unclassified, 6 percent. Ninety-three percent of all the stock farms and ranches had 10 acres or more of grazing land per acre in crops, while 7 percent of them had less than 10 acres. The dominating position of livestock in this area is also shown by the proportional distribution of the gross income from the different sources. Of the total gross receipts, meat animals and wool contribute 79 percent; poultry and poultry products, 3; cash-grain, 3; dairy animals and dairy products, 2; all crops other than cash-grain, 7; and farm products used by the operator's family, 6 percent. The statistical data given above should be considered only close approximations, for area 1 makes up only about 20 percent of the total area for which the data are averages.

The Dominant Type.—It is evident from what is said above that stock ranches are the dominant type of farm in area 1. The ranch headquarters are generally located along the drainage channels where water is available for livestock and where some irrigation may be done in the growing of hay and feed crops. For the most part area 1 is used chiefly for early spring, late fall and winter pasture. The winter grazing is mostly done with sheep in the southwestern part of Montezuma County and along the following rivers: Dolores, Colorado, White, Yampa and Little Snake. In the past, considerable numbers of Utah and Wyoming sheep have been trailed across this area on their way to the summer ranges of the national forest reserves, in type-of-farming area 5, and back again during the autumn at the close of the high-altitude grazing season. In like manner, many of the sheep and cattle, that ordinarily belong in area 1, are moved into
area 5 in the spring or early summer to be grazed on the forest reserves, the public domain and state lands. At the end of the grazing season, in area 5, the livestock that is to be carried through the winter is returned to the home ranches, in area 1, where the winter-feeding season is much shorter, than in area 5, and where considerable grazing (especially of sheep) may be done. Little or no fattening of livestock is attempted in this area, the lambs and cattle that can not be marketed as grass fat are shipped as feeders.

Other Types of Farms.—The second most important type of farm in area 1, numerically, is part-time. As the name implies, the farms in this class are generally relatively small. They are too small to furnish the operator full employment and are insignificant when measured in terms of the proportion of the gross income they produce. General and crop-specialty farms rank next, numerically. The general farms are usually much smaller than the stock ranches and produce a variety of products, no one of which amounts to 40 percent of the total receipts from all sources. The crop-specialty farms are usually larger than general farms. Ordinarily they may be considered as stock ranches in this area, however, in 1929 enough hay was sold to put them in the crop-specialty class. That is, any farm or ranch that had 40 percent or more of its gross receipts coming from the sale of hay and less than 40 percent from any other source was classified as a crop-specialty farm. There is a very limited amount of dry farming carried on in area 1, wheat being the principal cash crop grown.

Area 2.—Routt-Moffat Plateau

Description of Area.—The Routt-Moffat Plateau area is situated in the northwestern part of Colorado and includes the west central part of Routt County, the eastern part of Moffat County, and the north central part of Rio Blanco County. The surface features of area 2 are rolling and semi-mountainous. Rolling to hilly plateaus extend back from the two river valleys, the Yampa River in Routt and Moffat counties and the White River in Rio Blanco County. The general slope is from east to west, the altitude varying from approximately 8,000 feet on the eastern border to 6,000 feet on the western.

The climate is somewhat varied. The frost-free growing season averages about 50 days in the eastern part of the area near the Continental Divide and 80 days in the western part. While day-time temperatures may occasionally reach a maximum of 103 degrees during the summer months, the nights are generally cool. Temperatures of 25 to 30 degrees below zero sometimes occur during the winter. The average annual precipitation varies from about 13 to 23 inches, increasing from west to
east. Approximately one-half of the yearly precipitation falls from April to September, inclusive, the balance coming mostly as snow during the remainder of the year. The snow mantle, especially in the eastern part of the area, covers the ground during most of the winter. The small chart (No. 9) superimposed on figure 4 indicates the annual precipitation is quite uniformly distributed throughout the year. Figure 5 shows the variation in the annual precipitation from the normal at Lay, Moffat County, from 1900 to 1932. The annual precipitation, it is to be observed, may be either above or below the normal during several years in succession. A succession of scant rainfall years makes dry farming hazardous, especially in the western portion of the area.

The land of area 2 has been classified and mapped as grazing land, second and third-grade dry-farming or forage-crop land, first-grade dry farming or grain-crop land and irrigated land, named in the order of the acreage occupied by each. (Figure 3.) Of the total land in farms in 1929 approximately 84 percent was used for pasture and 14 percent was crop land. About 7 percent of the total land in farms was irrigated.

Summarizing it can be said that a very large proportion of area 2 is rough and unsuited for crop production, being classified as grazing land; that another large portion of the area has been classified as "forage crop" or third-grade farming land which the experience of settlers has shown is more suitable for grazing purposes than for crop production; that the growing season is relatively short; and finally, that the average annual precipitation in the western part of the area is scant for dry-farming.

Crops.—The principal crops grown under dry-farming methods are wheat, oats, barley, certified seed potatoes, alfalfa hay and certified alfalfa seed. About 44 percent of the alfalfa acreage for the whole area was non-irrigated. The hay crops occupied about 68 percent of the harvested acreage in 1929; wheat, 13 percent; oats, 9; barley, 4; and lettuce and potatoes about one-tenth of 1 percent each. The hay crops consist mostly of alfalfa, tame grasses and clovers, small grain and native or wild grasses. About 68 percent of the hay acreage is irrigated. Figures 8 to 19 show the distribution of the crops grown in area 2.

Livestock.—The relative importance of the different kinds of livestock produced in area 2 is indicated by the number kept per square mile of total land area in 1929. That year there were averages of about 1 cow kept mainly for milk; 3 cows kept mainly for beef; 1 yearling steer and bull; 2 two-year-old steers; 2 other cattle; 24 sheep; and 9 chickens per 640 acres of land.
Thus it is seen when reduced to animal units, the cattle are about twice as important as the sheep. While Hereford cattle predominate, there are some Shorthorns, many of the cows kept for milk being of Shorthorn breeding. The sheep are mainly Rambouillet crossed with the mutton breeds. Limited amounts of swine and turkeys are also produced in this area.

Types of Farming.—Of the total number of farms in area 2, stock farms and ranches make up 25 percent; general farms, 16; cash-grain, 12; crop-specialty, 11 (farms that received at least 40 percent of their gross income from the sale of hay, potatoes and alfalfa seed); self-sufficing and part-time, 8 each; dairy, 7; truck, 3; poultry, 1; and abnormal and unclassified farms combined, 9 percent. The farms reported as stock farms and ranches are more important than their percentage of the total number of farms would indicate. This is because they are, as a rule, much larger and do a much greater volume of business than do the farms of the other types. Of the total number of stock farms and ranches, 72 percent had 10 acres or more grazing land per acre in crops and 28 percent of them had less than 10 acres of grazing land to each acre in crops. Figures 27 to 35 inclusive show the approximate location and number of farms by types.

The gross income of all farms and ranches within this area in 1929 was derived from the respective sources in approximately the following proportions: Meat animals and wool contributed 60 percent; dairy products and dairy animals, 9 percent; vegetables (mostly head lettuce), 7; cash-grain, 6; potatoes, 5; other cash crops, 2; and farm products used by the operator's family, 7 percent.

The Dominant Type.—It is evident from the foregoing discussion that the conditions prevailing in area 2 as a whole are best adapted to the production of range livestock and that the stock farms and ranches are by far the most important type of farm.

Area 2 lies in close proximity to the national forest reserve on which livestock may be grazed during the summer for 3 to 4 months beginning June 15 to July 1, depending on the weather and the altitude of the range in question. The public domain and leased and privately owned lands are also used for the grazing of livestock.

Most of the stock ranches are located along the streams, the irrigated land being used chiefly for the production of hay for winter feeding. In addition to producing hay, the meadows furnish pasturage during the fall, early winter and for a limited period in the spring prior to moving the livestock to the grazing lands.
There is some variation in the methods employed by ranch operators in the handling of their stock. On the one hand some ranchmen who can obtain permits to graze all their stock on the national forest reserve find it to their advantage to own but a small percentage of the total pasture land they use, since taxes and interest on the investment in such land are generally greater than the national forest grazing fee. Other operators, on the other hand, who are limited as to the amount of stock they can graze on the national forest reserve find it to their advantage to control by purchase or lease sufficient grazing land to enable them to carry approximately the amount of livestock for which the home ranch will produce winter feed.

On some ranches the cattle or sheep enterprise is combined with the production of crops for sale. A large percentage of the cattle raised is of Hereford breeding or a cross between Hereford and Shorthorn. Some of the cows are milked in order to increase the farm receipts and to utilize surplus farm labor. While cattle ranches predominate, sheep ranches are quite common, the Rambouillet being the leading breed. Occasionally both cattle and sheep are produced on the same ranch. Ranchmen who specialize in sheep may keep from 1,000 to 2,000 ewes, the size of the flock depending very largely on the capacity of the home ranch for grazing and producing winter feed and also on the possibility of grazing livestock on the national forest reserves and the public domain. A description of the organization and operation of a stock ranch may be found at the close of the discussion of area 5.

Other Types of Farms.—The general farm is the second most important type in area 2 when measured by the proportion of the total number of farms, making up 16 percent of the total number. As the name implies general farms usually have incomes from several sources, none of which contribute 40 percent of the total. In this area the receipts of the general farms may come from beef cattle, sheep, dairying, poultry, hogs, the small grains, hay, lettuce, potatoes and alfalfa seed.

Cash-grain farms are third in numerical strength and make up 12 percent of the total number. Wheat, the principal cash-grain crop, is mainly produced on the hills and rolling plateaus lying back from the river and creek valleys. Figure 27 shows the approximate location of cash-grain farms.

Crop-specialty farms are of about the same numerical importance as the cash-grain farms. They are widely scattered throughout the area. The special crops from which 40 percent or more of the gross receipts must come are hay, potatoes and alfalfa seed. Other types of farming in this area are relatively unimportant.
Organization of a Dry-Land Farm.—The dry-farmed portions of area 2 have not been settled long enough for agriculture to have become well established through the process of trial and error. The farm described below has been selected as representative of the organization of many non-irrigated farms in this area. It includes 640 acres of rolling land which, in its virgin state, was covered with sagebrush. Of the 640 acres, 320 acres were filed on in 1916; 40 acres were purchased in 1918; 120 acres were filed on in 1921 and 160 acres in 1926. One hundred fifty acres of this farm, or 22 percent, are under cultivation, the balance being used as pasture land. The average acreages of crops grown during the 5-year period 1926-1930 were as follows: Legumes (mostly alfalfa) 60 acres; oats, 25; wheat, 18; barley, 10; potatoes and fall rye, 8 acres each, an average of 21 acres being summer fallowed. During this same period the following average yields per acre were secured: Wheat, grown mostly on summer fallow land, 27 bushels; oats, 23; barley, 20; potatoes, 100; alfalfa hay, one-half ton; small grain hay three-quarters to 1 ton; and alfalfa seed, 200 pounds.

The livestock kept on this farm has increased from 3 head of cattle, 25 chickens and 8 work horses in 1926 to 10 head of dual purpose cattle (5 milk cows), 50 chickens, 7 turkeys and 12 work and saddle horses in 1930. One brood sow is kept mainly to provide meat for the farm household. The cattle and horses are pastured on the sagebrush land during the grazing season and wintered on straw and hay.

The gross cash income of this farm averaged $2,244 during the 5-year period. Of the total cash income, outside labor of the operator away from the farm contributed an average of 36 percent; small grains, 31; potatoes, 13; dairy products, 8; cattle and swine, 4 each; alfalfa seed, 3; and poultry and eggs, 1 percent. The estimated value of the vegetables, meats, and dairy and poultry products consumed by the operator's family averaged $390 per year during the 5-year period.

The average yearly cash expenses of operating this farm amounted to $950. Approximately 26 percent of this was for the repair and improvement of buildings, upkeep of machinery and for the purchase of additional breeding livestock purchased. Likewise, 26 percent was for hired labor. The balance or 48 percent consisted of general items such as threshing, taxes, fuel, oil, binding twine, etc. This farm is located 30 miles from the nearest railroad shipping point in a hilly country with dirt roads. The operator is still making adjustments in his production program in his attempt to work out the most satisfactory organization under the existing conditions.
Area 3.—Western Slope Irrigated Districts

Description of Area.—Area 3 includes the principal irrigated districts of Pitkin, Garfield, Mesa, Montrose and Delta counties and also a small part of the irrigated land in Eagle County. The elevation of the several irrigated districts above sea level varies from around 4,500 feet in the western part of Mesa County to about 8,000 feet in Pitkin County. The surface of area 3 in the various districts varies from comparatively flat, smooth areas to small mesas and rolling slopes having both good air and water drainage. Seepage has become a serious problem in some localities, making it necessary to construct drainage systems to reclaim lands that have become waterlogged and impregnated with alkali.

The area presents a rather wide range of climate. The frost-free growing season varies from an average of about 100 days in Pitkin County to 186 days at Grand Junction in Mesa County. During the summer the days are usually hot, especially at the lower altitudes. Since the relative humidity of the atmosphere is low at that time of the year, the nights are relatively cool.

The average annual precipitation varies from less than 9 inches in parts of Mesa and Montrose counties to 16 inches or more in Pitkin County. The amount and monthly distribution of the annual precipitation are not very important in this area since all crops are grown with irrigation and since the supply of irrigation water is generally adequate. The soils of the several irrigated districts vary from sand or sandy loam to clay loam and heavy clay. Of all the land in farms within the area, approximately 39 percent was irrigated in 1929. About 75 percent of the irrigated land was crop land and 25 percent was used for pasture. Grazing is practically the only use made of non-irrigated land in farms as well as the land not in farms.

Area 3 has been divided into six sub-areas designated as 3-a, 3-b, 3-c, 3-d, 3-e and 3-f. This subdivision is based on the variation in the farming carried on within the respective sub-areas in 1929 and this in turn was largely due to variations in such factors as altitude, length of the growing season, freedom from frosts, and soil conditions. Following the general discussion of the area as a whole, each of the six sub-areas will receive attention. Because it is the most important and intensively developed fruit district in the state sub-area 3-b will be given special attention.

Crops.—A very wide range of crops is produced in area 3, due, for the most part, to the variation in the climatic conditions. Roughly estimated, the hay crops made up 55 to 60 per-
cent of the harvested acreage in 1929; the grain crops, about 23 percent; orchard fruits, 6; and potatoes, sugar beets, and dry beans together, 8 percent. The remainder of the harvested acreage consisted of vegetables, peas, root crops, alfalfa seed, clover seed, etc. Alfalfa constituted nearly 90 percent of the total hay acreage, the remainder being tame grasses, clovers, small grains and native or wild grasses. The grain crops, named in the order of their harvested acreage, are spring wheat, corn, oats, barley and winter wheat. The orchard fruits consist of peaches, apples, pears, cherries, apricots, and a few others. Two of the most important fruit districts of the state are in area 3.

Livestock.—Some of the farms in this area are simply stock farms and ranches having the ranch headquarters on the irrigated lands where hay for winter feed is grown, the grazing land being mostly outside of the area. Beef cattle is the dominant kind of livestock with sheep the second most important kind. Dairy cattle, chickens, turkeys and swine are of some importance.

Types of Farming.—A rather wide variety of types of farming is carried on within area 3 as a whole with no single type strongly dominating except in certain districts. The proportional distribution of farms by type for the whole area as of 1929 is as follows: of the total number of farms, crop-specialty constituted 23 percent; general and fruit, 17 each; stock farms and ranches, 15; part-time, 7; dairy, 6; poultry, truck, and self-sufficing, 3 each; cash-grain, 2; and abnormal and unclassified, 4 percent. The distribution of these farms within the area is shown in figures 27 to 35, inclusive. The crop-specialty, general, dairy, stock farms and ranches, part-time and cash-grain farms are fairly well distributed over the area. The fruit, truck and poultry farms, on the other hand, are concentrated in certain areas. The special crops from which the crop-specialty farms received at least 40 percent of their gross income in 1929 were potatoes, sugar beets, dry beans, hay, clover seed and alfalfa seed.

The gross income for area 3 as a whole in 1929 was derived from the following sources: Meat animals and wool contributed approximately 35 percent; fruit, 19; vegetables, 12; white potatoes, 8; dairy animals and dairy products, 7; family used products, 7; poultry and poultry products, 5; dry beans, 2; and all other cash crops, 1 percent. As a source of gross income it is seen that meat animals, wool and mohair ranked first whereas stock farms and ranches, numerically, were third.

Sub-Area 3-a.—Sub-area 3-a is situated in Mesa, Garfield and Pitkin counties along Plateau Creek and the Colorado and Roaring Fork rivers. Of the total number of farms in this sub-area in 1929, crop-specialty made up 33 percent; stock farms and
ranches, 27; dairy and general, 12 each; part-time, 7; self-sufficing, 2; and cash-grain and poultry, 1 percent each. The principal crops named in the order of their probable importance are hay for range livestock and dairy cattle, potatoes and grain. During past years the sugar beet has been of some importance. While crop-specialty farms lead numerically stock ranches were a close second and due to their larger size and greater income are the most important type. The beef cattle and sheep are mostly summer grazed outside of 3-a.

Sub-Area 3-b.—This is a relatively small specialized fruit-producing district situated in the central part of Mesa County in the Colorado River Valley. It lies at an altitude varying from approximately 4,600 to 4,800 feet. Just to the north of the area cliffs rise abruptly 1,500 to 2,000 feet above the orchards. From the base of the cliffs the surface slopes southward toward the Colorado River. Near the eastern extremity of the area the river emerges from a canyon and from the mouth of the canyon the valley broadens out to the west and southwest. The topographical features of the area afford excellent air drainage which tends to prevent the formation of frosts.

The climate is relatively mild and quite well adapted to fruit production. At Grand Junction near the southern extremity of the area, the temperature has reached a maximum of 100 degrees or more 15 out of 36 years and a minimum of zero or lower 20 out of 39 years. The growing season is long, the frost-free period averaging 171 days at Palisade and 186 days at Grand Junction. The average annual precipitation is scant, being but 8.75 inches at Grand Junction and 10.90 inches at Palisade. Irrigation water is depended upon entirely for crop production.

The predominating type of soil, silt loam, is generally fertile and well adapted to the production of tree fruits. Seepage problems have arisen during past years and many fruit trees have been pulled just outside the present border of parts of area 3-b, much of which has been drained. Seepage problems are now being handled fairly well by this means. A favorable climate, fertile soil, good air drainage, and an adequate supply of irrigation water are the most important physical factors which favor the production of fruit.

In 1929 fruit farms made up 59 percent of the total number of farms in this sub-area; crop-specialty, 13 percent; part-time, 6; general, 5; poultry, 4; truck and dairy, 3 each; cash-grain and self-sufficing, 1 each; and other types including unclassified and abnormal together, 5 percent. The relative importance of the several types of farms in this area is shown also in figures 27 to 35.
Peaches, pears and apples, ranking in the order named, are the most important types of fruit grown. Statistics as to the number of orchard trees in bearing and not in bearing are not available for this area. However, such data for Mesa County as a whole should reflect conditions fairly well for the area, especially for late years, since it contains most of the fruit farms in the county. In 1929, the fruit farms of Mesa County as a whole varied in size as follows: there were 159 that varied in size from 3 to 9 acres; 222 farms, 10 to 19 acres; 208 farms, 20 to 49 acres; 70 farms, 50 to 99; 14 farms, 100 to 174 acres; and 5 farms containing 175 acres or more. The larger fruit farms are in the western part of area 3-b in the less favorable fruit district while the smaller farms, which are highly specialized in the production of peaches and some pears, are adjacent to the town of Palisade.

The total number of all orchard trees in bearing in Mesa County increased from 789,000 (in round numbers) in 1900 to 853,000 in 1919 and then declined to 545,000 in 1929. There were also 95,000 trees not in bearing in 1919 and 296,000 in 1929. Peach trees in the latter year made up 50 percent of all trees in bearing and 80 percent of those not in bearing. Pear trees in bearing are second in importance while apples are third. There were 478,000 apple trees in bearing in this county in 1919 and this number had declined to 109,000 in 1929. The reader must bear in mind that the reduction in fruit trees occurred for the most part outside of area 3-b. Difficulties in the control of codling moth, the development of seepage in certain areas, relatively high fixed costs, and low prices are factors that have been responsible for this reduction. Cherry trees in bearing declined from 11,000 in 1899 to about 4,000 in 1929.

The trees in the peach orchards vary in age from young, non-bearing, to bearing trees of 20 or more years. The profitable life of an orchard is estimated to be about 20 years and during this period two crop failures are likely to occur. The trees are usually set 16½ feet apart each way, which gives 160 per acre. If allowance is made for a few losses, the grower may count upon having 130 producing trees per acre. A fair average yield is estimated at 350 bushels per acre or a total production of 6,300 bushels per acre for the life of the orchard. It requires around 150 hours of man labor per acre to bring the crop of a bearing orchard to the harvest stage. Pruning, cultivating and irrigating will absorb about 50 percent of the foregoing total. The heaviest demand for labor occurs during the harvesting and marketing period.

Organization of a Fruit Farm.—The following description of an individual farm will illustrate, in part, the organization that is necessary in producing peaches. The unit in question
includes 22 acres. The bearing peach orchard in this case occupied 8 acres while 11 acres are in non-bearing trees. In addition 3 acres are devoted to the production of pears. The yield of peaches for a given year totaled 6,400 bushels while the pear orchard produced 185 bushels. The average price paid for peaches in 1933 was $1.30 per bushel. The livestock on this farm included 2 horses, 1 cow and 60 chickens. The working equipment embraced 1 wagon, 1 float, 1 sled, 2 harrows, 1 disk, 1 2-horse cultivator and 1 spray machine. The miscellaneous orchard equipment was valued at $70. Prior to 1930 the orchard land in this district was valued at $1,000 to $2,000 per acre, while on this farm it was estimated at $1,136 per acre.

While most of the fruit farms in this area are highly specialized, some of them produced other products such as truck crops, dry beans and potatoes to supplement the income from fruit. The fruit produced is marketed chiefly in Colorado, Nebraska and Kansas, with some carlot shipments going to the Twin Cities, Chicago, New York and other eastern cities. Motor truck transportation of late years has made it possible for fruit from this area to reach many rural and small urban markets not formerly contacted.

Sub-Area 3-c.—Sub-area 3-c occupies the extreme western part of area 3 as a whole and extends from Grand Junction to near the Utah State line. Here the type crop-specialty represents 53 percent of all farms; general, 17; cash-grain, poultry and part-time, 5 percent each; self-sufficing, 4; stock farms and ranches, 3; fruit and dairy, 2 each, and truck, 1 percent; the remainder being abnormal and unclassified. This is the most important dry-bean section in western Colorado and beans, potatoes, poultry and cash-grain are the principal enterprises with some livestock, and dairying and a very little truck and fruit. There is perhaps a higher degree of specialization of poultry in 3-c than in either of the other five sub-areas. Thirty years ago 3-c was a fruit-producing area, apples, peaches and pears being grown successfully. Following excessive irrigation much of the land became waterlogged and fruit growing was practically abandoned. This in turn necessitated drastic readjustments in the farm organization.

Sub-area 3-d.—Sub-area 3-d lies within Montrose and Delta counties in the Uncompahgre and Gunnison River valleys at an average altitude around 6,000 feet. Its two most outstanding types of farms, numerically, are general and crop-specialty. In 1929 general farms included 33 percent of all farms in 3-d; crop-specialty, 28 percent; stock farms and ranches, 11; cash-grain, truck and part-time, 5 each; poultry and dairy, 4 each; and fruit and self-sufficing, 2 percent each. The principal agricultural
enterprises of the area are the production of potatoes, sugar beets, onions and other truck crops, cash-grain, sheep, cattle, poultry and dairy products. Seepage has developed to a stage in parts of 3-d where the drainage and the reclamation of waterlogged and alkali impregnated areas have become a serious problem.

Sub-area 3-e.—Sub-area 3-e occupies the central part of Delta County and includes a number of relatively small rather intensive fruit districts. The fruit farms are limited more or less to the small mesas and the relatively narrow valley of the North Fork of the Gunnison River. Thirty-seven percent of all the farms in 3-e in 1929 were classified as fruit farms; 22 percent as general; 16 percent as stock farms and ranches; 10 percent as crop-specialty; and 5 percent as part-time; the remaining 10 percent was distributed among several other types of farms. Sub-area 3-e produces apples, pears, peaches and a limited amount of apricots, plums, sweet cherries and grapes. The fruit farms are less specialized than those in sub-area 3-b. The stock ranches are very similar to that described under area 5.

For Delta County as a whole the total number of orchard trees in bearing decreased, in round numbers, from 787,000 in 1909 to 681,000 in 1919 and again to 604,000 in 1929. Orchard trees not in bearing increased from 44,000 in 1919 to 129,000 in 1929, of which about 75,000 were peach trees. Apple trees constituted about two-thirds of all bearing orchard trees in Delta County in 1929, peach trees being second and cherry trees third. Cherry trees in bearing increased from approximately 7,000 in 1909 to 14,000 in 1919 and then decreased to 10,000 in 1929.

Sub-area 3-f.—Sub-area 3-f lies in the southeastern part of Delta County and the northeastern part of Montrose County. The types of farming are more evenly divided in 3-f than in the other five sub-areas. Stock farms and ranches included 26 percent of the total number of farms; general, 23; crop-specialty, 21; dairy, 17; part-time, 4; self-sufficing, 3; and cash-grain and fruit, 2 percent each. The crop-specialty farms derive a major portion of their income from potatoes and a much less amount from hay.

Since the cattle and sheep belonging in sub-area 3-f are chiefly grazed on the adjacent forest reserves during the summer it is not necessary for the ranchmen to control by ownership or lease large tracts of grazing land. As in other areas described elsewhere, the ideal arrangement is for each ranchman to control considerable grazing land located at lower altitudes than the forest reserves that can be used for early spring and late fall pasture.
Area 4.—San Juan Basin Area

Description of Area.—Area 4 lies in the southwestern part of Colorado and forms a portion of the San Juan River drainage basin. It is a comparatively narrow body of land that extends in a southeasterly direction from the southwestern corner of San Miguel County across Dolores, Montezuma and La Plata counties to the southwestern corner of Archuleta County. The slope of the area is to the south and southwest. The surface varies from rough and semi-mountainous districts to lands of a gentle-sloping character. The river valleys are generally comparatively level and some of them are rather broad.

The altitude varies from about 6,000 feet in the southeastern part where the Animas River flows into New Mexico to 7,500 feet at points along the north central border. The average length of the frost-free period in the higher elevations varies from 100 to 116 days while at the lower elevations the season is sufficiently long to permit corn to mature.

The average annual precipitation varies from about 13 inches in the northwestern portion to 20 inches or more in the north central part where the elevation is greatest. The annual precipitation is unevenly distributed throughout the year. (See small chart No. 7 superimposed on figure 4.) July and August are the heavy and May and June the light-rainfall months of the year. At Durango in La Plata County an average of more than twice as much rain falls during July and August as falls during May and June, and the average precipitation during the first 6 months of the year is considerably less than that of the latter half. In this area as a whole about half of the precipitation comes during the 6-month period April to September. The data given in figure 5 for the weather station at Durango show a wide variation in the annual precipitation from year to year and that as many as 5 drouth or low-rainfall years may occur consecutively.

The land of area 4 has been classified and mapped as first and second-grade dry-farming land, grazing land and irrigated land. The location of the different grades of land is shown in figure 3. The areas classified as first-grade land include approximately 177,000 acres, the second-grade land around 83,000 acres and the irrigated areas about 157,000 acres. No figures are available as to the extent of the grazing land. The soils range from sandy loam to stiff heavy clay and are generally fertile and well adapted to crop production.

Lack of adequate transportation has been the chief handicap in the development of area 4. The principal markets of the state, Denver, Pueblo and Colorado Springs, are reached by a narrow-gauge railroad from the eastern part of the area to
either Alamosa or Montrose and from thence by standard-gauge railroads to the cities named. Lack of transportation especially places the extreme western part of the area at a disadvantage. Over either of the narrow-gauge roads the distance is considerable and the grades over the mountain passes relatively steep. Hence much time is required to reach the larger cities of the state or to contact outside markets. The development of motor transportation has been exceedingly important in opening up new markets and a substantial amount of produce is now being handled by truck. However, transportation costs are still equal to a very large percentage of the price the farmers of this area receive for their products.

**Crops.**—In 1929 about 123,000 acres of crops were harvested in area 4 and of this total acreage approximately 71 percent was irrigated and 29 percent dry farmed. Substantially the same crops are grown with and without irrigation though not in the same proportions.

The hay crops made up 61 percent of the harvested acreage of the irrigated crops, grain crops, 33; orchard fruits, 2; and potatoes and dry beans, about 1 percent each. Of the total acreage of irrigated hay, alfalfa formed 83 percent, tame grasses and clovers, 10; small grains, 6; and wild grasses, 1 percent. Wheat, oats, corn and barley, named in the order of their importance, are the principal grain crops grown under irrigation.

Of the dry-land crops harvested in 1929, the grain crops constituted 58 percent of the total acreage; hay crops, 15 percent; dry beans, 15; sweet clover, 6; and potatoes and sorghum, 2 percent each. Wheat formed 46 percent of the harvested acreage of dry-land grain crops; corn, 33 percent; oats, 15; barley, 5; and rye, 1 percent.

**Livestock.**—The livestock enterprises associated with area 4 are beef cattle, dairy cattle, sheep, swine, poultry and a few goats. The beef cattle are of first importance and sheep second. Much of the cattle and the sheep are grazed on the national forest reserves during the summer grazing season. Many cows of beef and dual-purpose breeding are milked and of the total number of cows about 60 percent are kept mainly for beef production and 40 percent for milk. The farms reporting brood sows had an average of about 2.5 per farm.

**Types of Farming.**—A count of the 2,219 farms located in the minor civil divisions lying within area 4 shows that around 87 percent are in minor civil divisions where most all of the crops are produced under irrigation and that the remaining 13 percent are in precincts where very little irrigation is done. In the precincts where irrigation strongly predominates, general farms made up 29 percent of the total number; stock farms and
ranches, 18 percent; crop-specialty, 11; cash-grain, 10; dairy, 8; self-sufficing, 7; part-time and unclassified, 6 each; and fruit and poultry, 2 percent each. About two-fifths of the 369 stock farms and ranches had less than 10 acres of pasture land to each acre of crops produced while the other three-fifths had 10 acres or more of grazing land per acre in crops.

In the minor civil divisions where practically all crops are produced without irrigation, the crop-specialty farm formed 23 percent of the total number; unclassified, 20 percent; cash-grain and general, 17 each; self-sufficing, 9; part-time, 8; stock farms and ranches, 5; and dairy, 1 percent.

The relative importance of the different types of farms is indicated also by the proportional amounts of the total gross receipts contributed in 1929 by the respective types of farms. Of the total gross receipts derived from all farm products sold, traded, held for sale or used by the operator's family, the stock farms and ranches contributed approximately 46 percent; general farms, 23; cash-grain and crop specialty, 10 each; dairy, 7; fruit, 3; and poultry, about 1 percent.

Likewise the relative importance of the different sources of income is indicated by the proportional amounts of the gross income of the area derived from each source. That year livestock contributed about 39 percent of the total gross income; crops, 29; livestock products, 22; family used products, almost 10; and forest products, less than one-half of 1 percent.

Figures 27 to 35 show the distribution of the different types of farms within the area. The dairy farms are mostly confined to the irrigated lands. The fruit farms are concentrated near the center of Montezuma County while the other types are fairly well distributed.

Area 5.—Rocky Mountains and Associated Valleys

Description of Area.—Type-of-farming area 5, the Rocky Mountains and associated valleys, extends across central Colorado from the Wyoming border on the north to New Mexico on the south. It is much the largest of the 17 type-of-farming areas into which the state has been divided and includes either all or parts of 43 of the 63 counties of the state. Sixteen counties lie almost wholly within the area and make up a high proportion of its land area. The southern part of the Rocky Mountain system is within this area and the Continental Divide passes through it from north to south. The surface of practically the whole area is rough and rugged. (Figure 2.) The altitude varies from less than 6,000 feet on both its eastern and western borders to over 14,000 feet on many of the mountain peaks while several of the mountain ranges rise to heights of 11,000 and 12,000 feet, a very large proportion of the whole area being 8,000 feet or more above sea level.
The area is drained chiefly by the following rivers and their tributaries: From the north by the North Platte; from the east by the South Platte and the Arkansas; from the south by the Rio Grande and from the west by the Colorado. Within the area are many high intermountain valleys and parks, the more important of which are: North Park in Jackson County; South Park in Park County; Wet Mountain Valley in Custer County; Eagle River Valley in Eagle County; Gunnison River Valley in Gunnison County; and Middle Park in Grand County. Most of these valleys may be located readily by the use of figures 2 and 6.

The rough surface features of the area give it a rather rigorous climate. The winters are long and cold and the summers short. The frost-free growing season averaging 56 days at Walden, Jackson County; 95 days at Westcliffe, Custer County; and 112 days at Salida, Chaffee County. The annual precipitation varies from less than 10 inches in some of the high valleys to around 50 inches on several of the mountain ranges. (Figure 4.) Practically the whole area receives a heavy snowfall and snow storms may occur on the high mountain ranges at any time during the summer months.

As the moisture-laden winds ascend the slopes of the mountain ranges, the atmosphere is cooled and much of its moisture is condensed and falls either as rain or snow. Thus the atmosphere descends into the valleys below depleted of much of its moisture. This results in a relatively scant precipitation for many valleys that are practically surrounded by comparatively high mountains and usually makes irrigation necessary in crop production.

A comparison of figures 3 and 36 shows the land in area 5 to consist mostly of national forest reserves, grazing land and irrigated land. Of the total land area of the 16 counties lying almost wholly within area 5, approximately 20 percent is in farms, 33 percent is crop land, 32 percent is irrigated land and about .1 percent is used for crop production without irrigation. Practically all of the 80 percent of the total land area of these 16 counties not in farms is either in national forest reserves on which livestock is grazed during the summer or is classified as grazing land.

Of the total land area of the 16 counties that was in farms in 1929, about 80 percent was used for pasture and 17 percent was crop land. This leaves 3 percent for ranch headquarters, corrals and waste. Approximately 94 percent of the crop land was irrigated and 6 percent dry farmed. About 87 percent of the irrigated land produced hay and 13 percent other crops. Since grazing is practically the only use made of the 80 percent of the total land area not in farms and since 80 percent of the
20 percent of the land in farms is used for pasture, it follows that grazing is practically the only agricultural use made of approximately 96 percent of the land area of the 16 counties.

Crops.—Of the total acreage of hay grown in the 16 counties in 1929, wild or native grasses made up about 51 percent; tame grasses and clovers, 33; alfalfa, 9; and small grains, 7. Wild-grass hay is generally produced in the high valleys and parks whereas alfalfa is grown at lower levels. Irish potatoes, head lettuce, pod peas and cauliflower are the other more important crops grown.

Livestock.—Both beef cattle and sheep are produced extensively in area 5 and their relative importance is indicated by the number of animals of each kind per square mile of total land area in 1930. That year there were approximately 5 beef cows, 2 yearling steers and bulls, 4 other cattle and 11 sheep per 640 acres of land area. When these figures are reduced to an animal unit basis it appears the cattle are about five times as important as the sheep. It is probable, however, that a considerable number of both sheep and cattle are brought into area 5 for summer grazing that were not covered by the census enumeration. While there are some Shorthorn cattle in this area, a very large proportion are of Hereford breeding. The sheep are mostly the Ramboullet crossed more or less with the mutton breeds. Some dairy cattle, swine and poultry are also to be found within the area.

Types of Farming.—The distribution of farms by type is presented in figures 27 to 35, inclusive. Of the total number of farms in the 16 counties in 1929, 31 percent is classified as stock farms and ranches; 23 percent crop-specialty; 12 percent general; 9 percent part-time; 7 percent dairy; and 5 percent self-sufficing. There are also a few truck, cash-grain and poultry farms. Table 7 gives a better idea of the relative importance of the different types of farms than does percentage of farms by type. Thus, an average of 1, 5, 2.4, 3.0, 9.4 and 11 times as many acres of crops were harvested on the stock farms and ranches, respectively, as were harvested on the crop-specialty, dairy, general, self-sufficing and part-time farms.

Table 7.—Number of Farms, Average Size of Farm, and Average Acreage of Crops Harvested per Farm in the 16 Mountain Counties in Area 5, by Type of Farm, 1929.

<table>
<thead>
<tr>
<th>Type of farm</th>
<th>Number of farms</th>
<th>Size of farm, acres</th>
<th>Crops harvested, acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock farms and ranches</td>
<td>1,039</td>
<td>1,315</td>
<td>188</td>
</tr>
<tr>
<td>Crop-specialty</td>
<td>766</td>
<td>640</td>
<td>124</td>
</tr>
<tr>
<td>Dairy</td>
<td>224</td>
<td>466</td>
<td>78</td>
</tr>
<tr>
<td>General</td>
<td>399</td>
<td>348</td>
<td>63</td>
</tr>
<tr>
<td>Part-time</td>
<td>305</td>
<td>255</td>
<td>17</td>
</tr>
<tr>
<td>Self-sufficing</td>
<td>173</td>
<td>221</td>
<td>20</td>
</tr>
</tbody>
</table>
Perhaps the most reliable indication of the relative importance of the different types of farms is a comparison of the gross income from the various sources. This for area 5 as a whole is approximately as follows: Meat animals and wool contributed 65 percent; dairy products and dairy animals, 5; potatoes, 6; all vegetables (mostly head lettuce, green pod peas and cauliflower), 6; all other crops, 8; and products used by the operator's family, 8 percent. This leaves 2 percent of the gross income unaccounted for.

Summarizing, it may be said that a very large proportion of the total land in area 5 is too rough or otherwise unfit for any agricultural purpose except the grazing of livestock; that the climate is rigorous, the winters long and the snowfall relatively heavy to very heavy; that all livestock kept within the area must be fed during the winter; that practically 96 percent of the crop land is irrigated, hay occupying around 87 percent of the irrigated land; that from 60 to 65 percent of the gross income comes from meat animals and wool; and that stock farms and ranches are more numerous and more than twice as large in size than any other type of farm in the area. It is evident, therefore, that the area is best adapted to livestock production and that the stock ranch is the dominant type.

The Dominant Type.—Stock ranches are well distributed over area 5 considering its rough mountainous surface features. (Figures 2 and 32.) While cattle ranches predominate, sheep ranches are not uncommon and in many cases both sheep and cattle are handled under the same management. The ranch headquarters are generally located in the valley where water and suitable land are available for the production of hay. Like all other types of farms, stock ranches vary greatly in size. Some are small and, in addition to the meadow land, contain but a relatively small acreage of owned or leased land. The livestock of this type of ranch is summer grazed chiefly on the national forest reserves and the public domain. At the other extreme are ranches containing as much as 15,000 to 20,000 acres, most of which is grazing land. The number of cattle kept per ranch may vary from less than 200 to 2,500 head or more. The number of cattle per ranch is perhaps the most reliable measure of size of business.

A large proportion of the livestock in area 5 is summer grazed on the national forest reserves. The remainder is grazed on the public domain and in fenced pastures, consisting of deeded and leased state land. The beginning of the grazing season on the national forest reserves varies from around May 15 in the earlier districts to about July 1 in other localities where the
altitude is high and the growing season short. One of the problems of the ranchmen is to provide satisfactory pasture for a period of 1 to 2 months between the closing of the winter feeding season and the placing of the livestock on the national forest reserves. A similar problem is faced in the autumn between the time when the cattle are forced off the summer range by storms and the beginning of winter feeding. The hay meadows are used extensively for fall pasture. A limited area along the Colorado and Gunnison rivers in area 5 is adapted to some winter grazing.

The winter feeding of livestock varies greatly. In some districts where the altitude is relatively high and the snow cover generally remains all winter, it is necessary to feed continuously. In other districts the snow mantle is on the ground but a portion of the time and there may be more or less grazing during the winter. The winter grazing is supplemented with the feeding of hay and other roughage. The average amount of hay necessary to winter a cow varies from about 3,500 pounds where the feeding is continuous to about 1,200 pounds in some of the foothill districts. The feeding of grain and cottonseed cake to bulls and calves, though not general, is quite common. Death losses of cattle on stock ranches vary from as low as 1 percent to about 6 percent, the average being a little above 3 percent. Cattle and lambs that cannot be marketed as grass fat are generally shipped as feeders.*

Other Types.—Crop-specialty is the second most important type of farm when measured either by number of farms, acres per farm, acres of crops harvested or percentage of gross receipts coming from the special crops. The special crops grown on these farms are chiefly hay and potatoes. They may also produce vegetables, carry either sheep or cattle, and a few milk cows. The dairy, general, part-time and self-sufficing types then follow in the order named. Their distribution within the area, with the exception of self-sufficing, is presented in figures 31, 34 and 35 while figure 28 shows the approximate location of the crop-specialty farms.

Organization of a Cattle Ranch.—The description of a 3,500-acre cattle ranch is presented herewith in order to illustrate the organization and production program of cattle ranches in the high mountain valleys of area 5. The ranch described is located in North Park in Jackson County at an altitude of 8,500 feet and consists of 2,300 acres owned by the operator and 1,200 acres of leased land. The ranch may be divided on the basis of its use in 1930 into 2,230 acres of grazing land, 240 acres of

irrigated pasture, 970 acres of irrigated native or wild-grass hay land, 40 acres of grain-crop land, and 20 acres occupied by corrals and the ranch headquarters.

The improvements on the deeded part of the ranch consisted of a 9-room dwelling, a combination horse and milk-cow barn; 2 cattle sheds; 48 hay-stack pens and cribs; 2 sets of corrals equipped with branding chutes; machine shed; garage, bunk house, poultry house, granary, blacksmith shop, and 14 miles of fence.

The machinery and implements used in producing grain consisted of a riding plow, spike-tooth harrow, disk harrow, grain drill, grain binder, tractor, three-bottom tractor plow, and a threshing machine. Since few mountain ranches at this high altitude raise grain, most of them are not obliged to keep much of the machinery and implements listed above. The hay-making equipment included 4 mowing machines, 3 sulky rakes, 3 sweep rakes, and 2 hay-stacking outfits. The balance of the equipment embraced 2 ditching plows, 4 dirt scrapers, 3 wagons, 2 sleds with hay racks, a feed grinder, a small new automobile, an old small automobile used for pick up jobs, a sagebrush grubbing machine, 10 sets of harness, 3 saddles, blacksmithing equipment and a multitude of small hand tools. The entire equipment was considerably above the actual needs of the business.

The livestock on the ranch at the beginning of the year consisted of 133 range cows 3 years old and over, 49 2-year-old heifers, 49 yearling heifers, 6 bulls, 27 work horses, 3 saddle horses, 2 unbroken horses, 1 stallion, and 60 chickens and turkeys.

The estimated investment of the operator at the beginning of 1930 was $12,145 in land; $10,636 in improvements; $3,632 in machinery and implements; $16,082 in range cattle; $1,430 in horses; $5,231 in feed and supplies; and $48 in poultry, or a total of $49,154.

The snow mantle generally remains on the ground all winter, making it necessary to feed the cattle continuously for 6 months, or more. In the spring of 1930, winter feeding ceased May 10. However, a carload of yearling heifers was fed until the time of their sale, July 28. This was an experiment in baby-beef production. At the close of the winter feeding the cattle are held on the irrigated pasture and hay meadows until the upland pastures are ready for grazing. On this ranch there is an abundance of hay meadow land and irrigated pasture that can be used for early spring and late-fall grazing. Winter feeding was begun November 15 and 300 cattle were handled in comparison with 237 head the previous season.
The operator put in 10 months on the ranch from March 1 to December 31. One hired man did all of the feeding and chores from the beginning of the year until March 1. The operator then did all the work up to April 20 when an extra man was employed for 20 days to help prepare the land to be seeded to oats and barley. Irrigation, which consists mainly of opening the headgates and setting the water, was begun May 20 and continued until July 10. Between the completion of irrigation and the beginning of hay harvest, which was August 11 in 1930, there are many things to be done such as shipping cattle, putting haying machinery in order, draining water out of the meadows, and gathering and working-in the horses. One hired man was kept throughout July and a second one from July 25 to August 10.

A full haying crew on this ranch consisted of nine men, including the operator. Two men operate the mowers, 3 the sulky hay rakes, 2 the sweep rakes, 1 the plunger and 1 does the stacking. The first 2 or 3 days of hay harvest are devoted largely to mowing and the full crew does not get into action until the third or fourth day when the hay is dry enough to stack. Many interruptions occur during the hay harvest so that none of the men put in more than 22½ days in 1930. The extra labor required in threshing and in handling such special tasks as branding, dehorning, vaccinating and sorting the cattle is obtained by exchanging work with the neighbor ranchmen.

The production during the year consisted of 105 calves from 182 cows and heifers; 364 hundredweight of grain from 40 acres, and approximately 805 tons of hay from 970 acres of irrigated native grass meadow land. The owner of 300 acres of the leased irrigated meadow land and 180 acres of dry pasture received 129 tons of the hay as share rental. The general marketing policy on this ranch was to sell steer calves, yearling heifers, cull cows and surplus hay.

The sales on this ranch in 1930 were as follows: Four cows brought $164; 35 yearling heifers $1,842; and 250 tons of hay $1,188, the total gross receipts being $3,194. However, there was an increase in the inventories of 59 calves, 15 dry cows, and 175 tons of hay. Had these items been sold the gross receipts would have been increased about $3,000.

The cash operating expenses during the year amounted to $2,208 and included the following items: Hired labor $933; leased pasture land $125; feed and salt $227; repairs $127; automobile expense $92; and miscellaneous $340 and taxes $364. Interest payments amounted to $411 and new machinery purchased to $170. These figures indicate the profitableness of operating the ranch during the season of 1930.
Area 6.—San Luis Valley

Description of Area.—Area 6 is the second most important irrigated area in Colorado. It is situated in the south central part of the state and includes all of the floor of the San Luis Valley and the major portion of five counties. It extends northward from the New Mexico State line for a distance of about 90 miles; has a maximum width of approximately 50 miles where the Rio Grande River enters the area on its western border; and contains a total land area of approximately 1,728,000 acres, of which about 634,000 are irrigated. The San Luis Valley floor has a very gentle slope, averaging but 4 to 5 feet per mile. The elevation above sea level ranges from 7,400 feet at the New Mexico-Colorado State line to 8,000 feet at its northern extremity. The smoothness of the surface is broken in the southern portion by the San Luis Hills through which the Rio Grande River has cut its channel. Mountain ranges varying in altitude from around 10,000 to 14,000 feet surround the area except on the south.

The Rio Grande River enters area 6 from the mountains near the middle of its western border, flows in a southeasterly direction to near the center of the valley floor, and then turns to the south. An extensive alluvial fan built up by the overflowing of the river spreads out across the valley and divides the area into (1) an undrained northern section comprising, in round numbers, some 922,000 acres and (2) a southern portion of about 806,000 acres which naturally drains into the Rio Grande River. The total quantity of water that reaches the northern undrained portion, by the falling of rain and snow, by the flow of a dozen or more streams and numerous artesian wells and also by the application of excessive irrigation water may be accounted for by the increase in the size of the area that has become seeped and waterlogged, by evaporation, by transpiration, and possibly by the percolation of water through the alluvial fan barrier. Much of the undrained section is now used only as salt grass pasture and a considerable part of it has become so impregnated with alkali that it is practically barren of vegetative growth. It has been estimated that the area of potential farm land can be increased some 300,000 acres by the construction of a drainage system that will lower the groundwater level to about 5 feet below the surface.

The high mountain ranges surrounding the area rob the rain-bearing winds of much of their moisture as they pass over the divides and into the valley below. As a result the annual precipitation is very scant, averaging from less than 7 inches near the center of the area to about 10 inches on its outer rim.
at the base of the foothills. The length of the frost-free growing season at points on the Rio Grande River in the center of the area averages 100 days, the minimum being about 68 days. On both the western and eastern borders of the area the average frost-free period is around 120 days. The short growing season makes it necessary to grow crops that mature in a relatively short period.

The land included in area 6 has been classified as grazing land, irrigated land and dune-sand hills. Roughly estimated the grazing land occupies about two-thirds of the area and the irrigated land one-third, the dune-sand hills comprising a very small area. (Compare figures 3 and 36.)

The soils, for the most part, have a sandy loam texture but vary from nearly pure drifting sand to clay loam. The clay loam types are generally limited to the flood plains along the Rio Grande River and other streams and also to the undrained section, especially that about the San Luis Lakes which have no outlets. The soils of the area are usually friable, easily tilled, but well supplied with potash and phosphoric acid. The sub-soil over much of the area consists of sand and coarse gravel through which water drains quite rapidly. While the soils of most of the southern portion that drains into the Rio Grande River are more or less alkaline, the areas that are most strongly impregnated are to be found in the undrained northern portion.

Of the total land area in farms in 1929, about 71 percent was used for pasture, 26 percent was crop land and 3 percent was used for such purposes as farmsteads, canals, ditches, fences, etc. Since 37 percent of all land in farms was irrigated and only 26 percent was crop land, approximately 30 percent of the irrigated land was used for pasture. Of the total crop land, hay occupied about 54 percent, feed crops and cash-grain, 8 percent each; and other cash crops, 15 percent, leaving about 15 percent of the crop land unaccounted for as to use.

Crops.—A rather wide range of crops is grown in area 6 considering its elevation above sea level. Owing to the scant annual rainfall substantially all crops are grown either under irrigated or natural sub-irrigated conditions. Three methods are used in applying the irrigation water: Flooding the surface, running the water in shallow furrows, and sub-irrigation. Under the latter method the level of the ground water in some localities is raised as much as 15 to 20 feet in order to bring the water up to the root zone of the growing crop. This is not only a very wasteful method of irrigating crops but it also contributes materially to the development of seepage and drainage problems.
Of the total acreage of crops harvested in 1929, the hay crops made up 56 percent; the grain crops, 16; annual legumes, 12; sweet clover used for pasture, 3; vegetables harvested for sale, 2; and all other crops, 11 percent. The native or wild grasses made up about 40 percent of the total acreage of hay crops harvested; alfalfa, 30; tame grasses and clover, 19; annual legumes, 7; and small grains cut for hay, 4 percent. Barley made up 36 percent of the total grain crop acreage; oats, 34; spring wheat, 28; winter wheat, 1; and corn and rye together, about 1 percent. Field peas constituted 94 percent of the annual legumes; dry beans, 3; and other legumes, 3 percent. Of the other field crops, 68 percent of the acreage was in potatoes; 23 in sweet clover; 4 in mixed grains not separated in threshing; about 2 percent was in sugar beets; and 3 percent in other crops. Of the acreage of vegetables harvested for sale, green peas made up 47 percent; head lettuce, 35; cauliflower, 16; and several other vegetable crops together, 2 percent.

For the most part the crops grown within area 6 are distributed very unevenly. Of the crop acerages harvested in 1929, for example, Rio Grande County contained 61 percent of all the head lettuce grown, 51 percent of the potatoes, and 8 percent of the wild hay as compared with 3 percent of the head lettuce, 19 percent of the potatoes and 53 percent of the wild hay harvested in Saguache County. No green peas were harvested in either of these two counties that year whereas 60 percent and 37 percent of the acreage were harvested, respectively, in Conejos and Costilla counties. The wild hay is mostly produced on the low flat lands along the water courses, especially at the higher elevations. The head lettuce also is generally grown at relatively high elevations while the potatoes are more or less concentrated on the sandy loam types of soil. The remaining crops are more widely scattered.

Livestock.—The livestock enterprises associated with area 6 are range sheep and cattle, dairy cattle, swine and poultry. Much of the cattle and sheep enumerated within the five San Luis Valley counties are summer grazed on the national forest reserves outside of the area and wintered within the area. The grazing land of the floor of the valley afford considerable late fall, winter, and early spring pasture. Lambs and swine are used quite extensively to harvest the pea crop by turning them into the fields when the peas are ripe. On the farms reporting swine an average of about 5.5 sows per farm farrowed between January 1 and June 1, 1930. Dairying is relatively unimportant in this area. Within the five San Luis Valley counties, 2,456 farmers reported an average of 47 chickens over 3 months old.
per farm as on hand April 1, 1930. An average of 94 turkeys was raised per farm in 1929 on 769 farms reporting turkeys.

Types of Farming.—A rather wide range of types of farming are carried on within area 6. The crop-specialty farms in 1929 made up about 42 percent of the total number; stock farms and ranches, 20 percent; general, 9; part-time, 8; truck, 6; and self-sufficing, cash-grain, and dairy, 3 percent each. The distribution and relative importance of the several types of farms are indicated in figures 27 to 35, inclusive.

The special crop farms (those receiving 40 percent or more of their gross income from the combined sales of potatoes, hay, ripe peas and sugar beets) were concentrated mostly in three counties, Alamosa, Rio Grande and Saguache. (Figure 29.) The data for 1929 probably exaggerate the relative importance of this type of farm because of the unusually high price of potatoes that year. With low or even average potato prices many of these farms would doubtless drop into some other type. Furthermore, the crop-specialty type is not to be considered as made up of farms that produce practically nothing except one or more of the four special crops enumerated above.

The stock farms and ranches are more evenly distributed over the area than any other type. They are much larger than farms of other types and are of far greater relative importance than their proportional number would indicate. More than two-thirds of this type are bona fide stock ranches while many of the remainder are simply farms on which either hogs or lambs are turned into fields of ripe peas and fattened or partly finished, 40 or more percent of the gross farm receipts coming from the sale of the hogs and lambs. Much of the beef cattle and sheep connected with stock ranches located in area 6 is sent to the adjacent national forests for summer grazing. The organization of the stock ranch described under area 5 is more or less representative of cattle ranches in this area.

The general and part-time farms are fairly well distributed over the area. The farms of these two types are much smaller than either the stock farms and ranches or the special crop farms. The truck farms are mainly concentrated in a few relatively small areas. The chief truck crops grown are lettuce, green peas, and cauliflower.

Of the total gross receipts of all farms within area 6 in 1929, approximately 60 percent came from the sale of crops; 28 percent from livestock, 9 percent from livestock products; and 3 percent from the farm products consumed by the operator’s family. About 72 percent of the total receipts from the sale of crops came from potatoes, 9 percent from vegetables harvested.
for sale, 6 percent from grain crops, and 13 percent from other crops.

Organization of a 160-Acre Farm.—The description of a 160-acre farm given below is presented to illustrate, in a very general way, the organization of farms in the potato-growing localities of area 6. Information as to the operation of this farm was obtained for the year 1927. The production program for other farms and for this same farm for other years might be quite different.

The estimated value of this farm in 1929 was $150 per acre, or $24,000. The machinery and implements used in operating the farm were valued at $2,000, a $400 truck being included in this amount. The livestock listed in the inventory when the record was taken was as follows: Seven work horses, 4 cows, 1 heifer, 5 calves, 4 brood sows, 1 boar, 18 pigs, and 75 chickens. The total estimated value of the livestock amounted to $1,701.

The following crops were produced during 1927: Forty acres of potatoes, 28 of alfalfa, 20 of field peas, 12 of sweetclover, 30 of oats, 10 of spring wheat and 4 of barley, making a total of 144 acres of crops produced that year. Crop yields were as follows: Potatoes made 99 hundredweight per acre; alfalfa, 2 tons; spring wheat, 30 bushels; oats, 50 bushels, and barley, 20 bushels. The sweetclover was used for pasture and the field peas were harvested by turning hogs or lambs into the field after the peas had matured.

No very definite cropping system is followed. The potatoes may be grown in a rather short rotation with sweetclover as the chief soil-building crop. In that case the land produces a crop of peas the first year, sweetclover being seeded with the peas. The second year the land is used as sweetclover pasture, the third year it produces potatoes and the fourth year a small grain crop. However, a 3-year rotation may be used by dropping out the grain crop or by dropping out the peas and seeding the sweetclover with the grain crop. Where alfalfa occupies a place in the cropping system, it is usually allowed to occupy the land as long as the stand is in satisfactory condition which is usually 3 or more years. Following the alfalfa the cropping system is flexible and may consist of 1 or 2 years of potatoes, and from 1 to 3 years of field peas and small grain.

Area 7.—Trinidad-Walsenburg Foothills

Description of Area.—Area 7 lies in the south central part of the state in a comparatively narrow strip extending from the southeastern corner of Fremont County to the mountains just south of Trinidad in Las Animas County. It embraces the major
portion of the Rocky Mountain foothills of Pueblo, Huerfano and Las Animas counties.

The elevation varies from approximately 5,500 feet at the northern extremity of the area to about 7,500 feet along much of its western border. The surface slopes to the northeast and varies from gently rolling mesas to rough mountain foothills and narrow valleys along the numerous streams which flow across the area and into the Arkansas River.

The land embraced by area 7 has been classified as grazing and second and third-grade dry-farming lands, the grazing land predominating and the third-grade dry-farming land ranking second in area. The soil mapped as second-grade farming land is chiefly a silt to sandy loam; that of the third grade is mostly clay or clay loam; while the grazing land is generally a tight gumbo or adobe or is gravelly in texture.

The average annual precipitation varies considerably within the area, being about 13 inches at its northern extremity and 20 inches or more along most of its western boundary. Of the total annual precipitation, from 65 to 80 percent falls from April to September, inclusive, the amount varying within this range at the different weather stations. The whole area is subject to wide variations from year to year in both the annual and monthly precipitation. As a rule the winters are comparatively open, the grazing season long and the period of winter feeding relatively short.

Dry farming within this area is not practiced extensively. This is due to the small amount of land that is well adapted to crop production without irrigation. The second-grade land, all of which lies in Pueblo and the northern part of Huerfano counties, is practically all under cultivation, whereas only about 8 to 10 percent of the third-grade land is used for crop production. Irrigated farming in area 7 is also meagre and confined mostly to the narrow valleys along the streams. Further development of irrigated farming is prevented chiefly by the rough broken surface features of the land through which the streams flow and the excessive cost of diverting water to such land. The irrigated land is chiefly used to produce feed for livestock.

Approximately 52 percent of the land in this area is in farms. Of the land in farms about 36 percent is used for pasture and 10 percent is crop land. This leaves but 4 percent for farmsteads, town sites, roads, streams, waste land, etc. About 60 percent of the crop land is irrigated and 40 percent is dry farmed. Likewise, about 50 percent of the crop land produces hay, 10 percent feed crops, 10 percent cash-grain and 10 percent other cash crops. This leaves unaccounted for, 20 percent of the crop land some of which was idle or in fallow.
Crops.—The crops grown under dry-farming conditions, named in the order of their harvested acreage in 1929, are corn, dry beans, wheat, oats, barley and sorghum. The corn occupied about 44 percent of the harvested acreage that year. These crops are grown chiefly on the second-grade land. Corn and beans are the crops generally grown on the third-grade land.

Under irrigation the hay crops occupied about 83 percent of the harvested acreage and the grain crops around 13 percent. Alfalfa made up about 73 percent of the hay acreage, and the tame grasses and clovers 24 percent. Dry beans, vegetables, seed crops, peas, potatoes, pop corn and fruit together made up about 4 percent of the harvested acreage of irrigated crops.

Livestock.—Beef cattle ranked first in importance of the livestock enterprises and sheep second. Within this area in 1929 there were approximately the following numbers of the different kind of livestock per square mile of total land area: Cows kept mainly for beef, 6; cows kept mainly for milk, 2; yearling steers and bulls, 2; other cattle, 5; sows and gilts, 1; and chickens, 19.

Types of Farming.—Stock farms and ranches are the dominant type of farm in this area, there being more than twice as many in this group as of any other type. In 1929 stock farms and ranches made up 35 percent of the total number of farms; crop-specialty, 14; general, 12; part-time, 11; self-sufficing, 9; dairying, 5; cash-grain and poultry, 2 each; truck, 1; and unclassified and abnormal together, 9 percent.

Sixty percent of the stock farms and ranches have 10 or more acres of grazing land to each acre in crops while 40 percent of them have less than 10 acres. Approximately half of the range cattle are wintered within the area and grazed on the forest reserve to the west in area 5 during the summer. The other half is both wintered and summer grazed within the area. The meat animals, wool and mohair contributed about 57 percent of the gross farm receipt of the area during 1929; farm products used by the operator’s family, 12; dairy products and dairy cattle, 11; poultry and poultry products, 4; vegetables and dry beans, 3 each; and all other cash crops, 10 percent.

Thus it is seen that livestock production predominates in this area. This is chiefly due to the rough land surface of much of the area, the scant amount of land adapted to dry farming, uncertain precipitation, and obstacles involved in extending the irrigated area.

Area 8.—Central Colorado Dairy and Range Cattle Area

Description of Area.—Area 8 is situated near the central part of the state and includes parts of five counties. (Figure
36). It lies at an elevation varying from approximately 5,000 feet at its northern extremity to 7,500 feet in its southern portion. The area, in general, is a plain, the major portion of which slopes to the north and is drained chiefly by five creeks or streams. The streams all follow relatively broad valleys which lie but little below the general level of the plain. The flow of the streams is more or less intermittent. Their channels are frequently dry and are also subject to heavy floods for short periods. The southern portion of the area forms a part of the “Black Forest” and is covered with scrubby yellow pine, there being but little merchantable timber. The extreme southern portion of the area slopes to the south and drains into the Arkansas River. The surface of the plain is interrupted by breaks along the stream and also by areas of low rolling hills.

The land included in area 8 has been classified into four grades: Second-grade dry-farming land, third-grade dry-farming land, grazing land and irrigated land. The soils of the second and third-grade farming land are much alike in texture and range from sandy loam to clay loam. The soils of the second-grade land are generally of good depth while those of the third grade are shallow. The third-grade land predominates in this area and is used mostly for grazing purposes. The irrigated land is limited and the water supply for irrigation is scant and uncertain. Of the total land in farms in 1929 it has been roughly estimated that 78 percent is used for pasture and 19 percent for producing crops. It will thus be seen that the waste land in this area is very low.

The length of the growing season varies considerably. The frost-free period averages about 150 days in the northern part of the area and 130 days in the southern portion. The average annual precipitation also varies from approximately 14 inches in much of the northern and eastern parts to about 20 inches at the higher altitudes. Of the total annual precipitation about 70 percent falls from April to September, inclusive. Both the annual and monthly precipitation is subject to much variation from year to year. (Figures 4 and 5).

Crops Grown.—Dry farming is confined very largely to the second-grade land. The dry-farming crops, named in approximately the order of their relative importance, are as follows: Corn, wheat, barley, oats, alfalfa, beans and sorghum, corn occupying much the greatest acreage. The order of the importance of these crops vary considerably in different parts of the area. In the light of our present knowledge, it seems that dry farming has been pushed too far in this area, especially in the low rainfall portion, and that it would have been more satisfactory to
have used for grazing purposes much of the low-grade land now under cultivation. Under irrigation alfalfa leads in harvested acreage, followed first by the tame grasses and clover and second by wild grasses.

Livestock.—The numbers of livestock kept per square mile in 1929 were approximately as follows: Five cows kept mainly for milk; 4 cows kept mainly for beef; 3 yearling steers and bulls; 1 steer 2 years old and older; 9 other cattle; 4 sheep; 1 sow or gilt; and 49 chickens.

Types of Farming.—The total number of farms in area 8 in 1929 was distributed among the several types in about the following proportion: Dairy farms made up 29 percent; stock ranches, 26; general, 17; crop-specialty, 9; cash-grain, 8; part-time, poultry, and self-sufficing, 2 each; and unclassified and abnormal together, 5 percent.

Dairy farms and stock ranches, it thus appears, are about equal in importance in this area, the stock ranches generally being much the larger. Some of the dairy herds are strictly dairy cattle. However, many Shorthorn cows are milked and on some farms the same cows are used to produce both milk and beef. In the main, whole milk is produced for the cities of Denver and Colorado Springs. The proximity of these two cities to the area; the available railroad and truck service; a grazing season of 8 to 9 months with some winter grazing; a very high percentage of the land area that is best adapted to grazing; a seasonal distribution of the annual precipitation that tends to produce pasturage of fair quality during the grazing season;
and a limited amount of irrigated and sub-irrigated land along the streams where hay is produced are the primary factors which tend to make this a dairy-livestock area.

As the name implies, the general farms produce a variety of products for sale. The crops that characterize the crop-specialty farms in this area are dry beans and hay. The production of beans has contributed materially to soil blowing which has become a serious problem on many farms. Attempts have been made to control soil blowing by planting corn or sorghum in alternate strips with beans, locating the rows at right angles to the prevailing winds. Soil erosion is becoming more common than formerly, especially on the more rolling fields.

Organization of a Dairy-Beef Cattle Farm.—A brief outline of the organization and operation of a farm that is typical of many in this area is given below. The farm in question contains 1,425 acres of owned and 320 acres of rented land valued at $40,000. The cropped area embraces approximately 250 acres. Under normal conditions 100 acres are kept in alfalfa from which two cuttings per year are obtained, and 150 acres are planted to small grain and corn. A large part of the corn crop is stored as silage.

The livestock on this farm includes 60 to 70 beef cattle in the breeding herd; 30 to 40 dairy animals; and 50 to 75 laying hens. The milk from the dairy herd is sold mainly on the Denver market. The average production of this herd is 361 pounds of butterfat per cow. The cash receipts in 1931 were $5,265 and miscellaneous expenses amounted to $3,563, leaving a farm income of $1,702. Three men in addition to the operator are employed regularly.

Area 9.—Northern Colorado Irrigated District

Description of Area.—Area 9 is the largest and most important irrigated district in Colorado. It is situated in the north central part of the state with a narrow strip extending eastward along the South Platte River to the Nebraska State line. Reference to figure 36 will show this area has been subdivided into areas 9-a and 9-b. The discussion that follows, except where noted in the text, deals with area 9 as a whole. This is due to lack of statistical information pertaining to each of the sub-areas separately.

The surface area of 9 is generally rolling and undulating. Bluffs occur along the margins of the stream valleys that cross the area from west to east. Low hills and ridges occur here and there, rising above the highline irrigation canals. Many of these elevated areas are dry farmed, the principal crop pro-
duced being wheat, corn and dry beans. The altitude varies
from about 3,400 feet where the South Platte River enters Ne-
braska to approximately 6,000 feet at the southwestern ex-
tremity of the area south of Denver.

Area 9 presents a large variety of soil types which range
from sandy gravelly loam to clay loam.* The soils as a rule are
productive and easily cultivated. The bottom land of the stream
valleys usually consists of sandy loam soil with small areas of
heavier types. The surface soils of the western part of the area
are about equally divided between sandy loams and clay loams
while farther east the lighter soils predominate.

The average annual precipitation varies from slightly less
than 13 inches in the east central part of the area to 17 inches
at Sedgwick near the Nebraska State line. Along much of the
western border of the area it is around 15 to 16 inches. Chart 1
superimposed on figure 4 shows the average monthly distribu-
tion of the annual precipitation at Fort Collins during a 52-year per-
iod. At that station an average of 72 percent of the annual pre-
cipitation falls from April to September, inclusive. The rela-
tively high seasonal precipitation materially lessens the amount
of water required for irrigation. Owing to torrential rains, how-
ever, considerable of the summer rainfall is lost as surface
run-off.

A heavy winter snowfall in the mountains to the west of
area 9 generally provides an abundance of irrigation water
throughout the growing season. On the other hand, the supply
of water during the late summer and autumn is likely to be
scant if the winter snowfall in the mountains is light. This in
turn materially curtails crop production during such seasons. By
means of an elaborate system of canals and reservoirs, the flow
of the streams is efficiently stored and conserved for irrigation
purposes. The water, likewise, is applied to the land with a rela-
tively high degree of efficiency. During 1934, a year of extremely
low water supply, a large number of pumping plants were in-
stalled to supplement the water available from ditch and reser-
voir sources.

The frost-free growing season ranges from about 160 days
near the foothills along the western border of the area to around
140 days over its major portion. Occasionally crops are severely
damaged in relatively narrow belts by hail storms which sweep
across the area during the growing season.

Crops Grown.—Approximately 785,300 acres of irrigated
crops were harvested within area 9 in 1929. Of this total har-

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*S. P. survey of the Fort Collins area, Series 1927, No. 27. Soil survey of the Greeley
area, Series 1939, No. 5.
vested acreage, hay crops made up 35 percent, 31 percent being alfalfa and other hay crops, 4 percent. Sugar beets made up 21 percent of the total acreage; barley, 14; wheat, 12; corn, 5; oats, 4; potatoes, 3; dry beans, slightly over 2; vegetables harvested for sale, slightly under 2; and all fruit, about 1 percent, leaving 1 percent in miscellaneous crops. A comparison of area 9 as shown by figure 36 with figures 8 to 19, inclusive, will indicate approximately where each crop is grown and the relative importance of the respective crops as measured in terms of acres harvested. The so-called special crops (hay, sugar beets, potatoes and dry beans) occupied 61 percent of the harvested acreage of irrigated crops in 1929. The hay crops, sugar beets, barley and beans are fairly well distributed over the area. Wheat is more or less concentrated in the northern and western parts and especially on the bodies of non-irrigated land lying within the area. Potatoes are not important except in parts of Weld County. The vegetables or truck crops are mainly grown around the city of Denver, on the sandy soils along the Platte River northeast of Denver and near the center of Weld County in the vicinity of Greeley. Fruit is chiefly grown in eastern Laramie County and also in Jefferson County near Denver.

Livestock.—There is a greater concentration of dairy cattle and poultry in area 9 than in any of the other types of farming areas of the state. This is due, of course, to the concentration of the population of the state within the area. (See figures 1, 21 and 25). There is also a concentration of sheep and beef cattle in this area. This, it should be remembered, is largely due to the extensive feeding operations carried on each year. While there are a few farm flocks of sheep, a high percentage of the total number is range lambs bought in the fall for feeding on irrigated farms for 60 to 90-day periods. Likewise large quantities of range feeder cattle are shipped to this area to be finished for the market.

Types of Farming.—The proportional distribution of the total number of farms by types in 1929 as classified in the U. S. Census of Agriculture was as follows: Crop-specialty made up 50 percent of the total number; stock farms and ranches, 16; general, 8; cash-grains and dairy, 6 each; poultry and fruit, 3 each; and abnormal (including part-time) and unclassified together, 6 percent. Figures 27 to 35, inclusive, present the distribution of the various types of farms over the area.

If data similar to that given above were available for sub-area 9-a separately, it would tend to show a lower percentage of general, dairy, poultry, truck and fruit farms and a higher proportion of farms classified as crop-specialty than is shown by
the data for area 9 as a whole. The types crop-specialty, stock farms and ranches, general and cash-grain are more or less unevenly spread over the whole area while the other types tend to be concentrated in the vicinity of the cities and larger towns.

The Dominant Type: Cash-crop Production and Lamb and Cattle Feeding.—The data just presented concerning the percentage of the harvested acreage occupied by each of the respective crops and the proportional distribution of farms by type may be somewhat misleading as to the characteristics of the type of farming that predominates over much of area 9. The farms classified as crop-specialty (50 percent of the total number) in most cases are not to be considered farms which specialize in the growing of one or more of the four special crops (sugar beets, hay, potatoes and beans) to the exclusion of other lines of production. Neither are the farms classified as stock farms and ranches to be considered as in the class of range-stock ranches simply because 40 percent or more of the total gross farm receipts came from the sales of the livestock fed. They are simply farms on which lambs or cattle are fed during the late fall and winter, 40 percent or more of the gross farm receipts coming from the sale of the animals fed. While the feeding of lambs and cattle and the production of the four special crops are important enterprises, each of them only fills its place in a well rounded type of farming that has developed in this area.

Area 9 is the most important sugar beet producing district
in the United States and within its borders a dozen sugar factories operate. It is likewise a very intensive lamb and cattle feeding district, feeding operations being carried on, it is estimated, on 60 percent of the farms. The animals fed are on the farms but a relatively short time, being purchased in October and November and sold from February to May the following spring. Since the normal movement of lambs and cattle is from the mountain grazing districts to the eastern markets, the livestock feeders of area 9 are given a feeder-in-transit freight rate. The feeder stock may be purchased in one of the western range states and shipped to area 9 and unloaded but with the freight prepaid to one of the Missouri River marketing points. After having been fattened the stock is shipped to said market, the shipper paying a small additional freight charge on the original weight of the stock for the stop-over feeding privilege and the local freight rate on the increase in weight due to feeding.

For many years the sugar beet has been the leading cash crop of the area. It is well adapted to a wide variety of soil types and during past years has occupied from 15 to 25 percent of the harvested acreage of irrigated crops. However, the acreage of beets that can be produced on an individual farm one year with another is somewhat limited. To avoid the damaging effects of the sugar beet nematode and other pests, beets seldom are grown on the same tract of land more than 2 years in succession and frequently only 1 year. That is, sugar beets must be grown in a fairly long crop rotation or cropping system. Furthermore,
attention must be given to the maintenance of soil productivity in order to obtain satisfactory beet yields.

The cropping system followed is flexible and varies considerably from farm to farm and from year to year on the same farm. Ordinarily it consists of 3 years of alfalfa, 1 or 2 years of sugar beets, and from 1 to 3 years of small grain, corn or potatoes. Since the soils of area 9 vary widely, soil and economic conditions largely determine the sequence of crops and the acreage devoted to each in different parts of the area. Where the soil conditions and price outlook are favorable for potatoes, that crop may occupy a portion of the acreage ordinarily devoted to sugar beets or some of the other crops. If the potato situation is unfavorable the acreage may be reduced and sugar beets or other crops will constitute a larger place in the farm economy.

The hay, barley, oats, corn, and sugar beet tops are generally all consumed on the farm where grown by the feeder livestock purchased and by the farm animals. Wet beet pulp, beet molasses, by-products of the beet sugar industry, and considerable corn shipped in from eastern Colorado and Nebraska are used also in the feeding operations. Alfalfa is the soil-building crop and the manure obtained from the feeding of livestock is used in maintaining soil productivity. The financial importance of such cash crops as beets, potatoes and beans to the livestock enterprise is frequently overlooked. The cash income received from the sale of these crops is used not only for the purpose of meeting obligations for seed, labor, fertilizer, etc., incurred during the season, but also for the purchase of feeder lambs and cattle which are handled by these farm operators during the winter months. Thus it is seen there is a close relationship between the feeding of livestock and the production of feed and cash crops in this area. The several enterprises are generally either supplementary or complementary to each other on most farms and together they make up a fairly well-balanced though flexible type of farming that includes both cash-crop production and livestock feeding, neither being complete without the other.

**Organization of a 153-Acre Farm.**—A brief description of a 153-acre irrigated farm is presented below in order to illustrate the organization and operation of farms in this area. The data presented were compiled from unpublished farm accounting records kept on this farm during the 12-year period, 1922 to 1933.

The farm in question is situated in the potato-growing section of Weld County in the vicinity of Greeley. The crop and pasture land of this farm includes 146.4 acres and in addition to this six-tenths of an acre are used for the family garden.
The acreage of the respective crops grown and the number of lambs and cattle fed each year from 1922 to 1933, inclusive, are shown in table 8.

Table 8.—Production Program on a 153-Acre Irrigated Farm, 1922 to 1933.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pasture</th>
<th>Alfalfa</th>
<th>Sugar beets</th>
<th>Potatoes</th>
<th>Barley</th>
<th>Oats</th>
<th>Wheat</th>
<th>Corn</th>
<th>Livestock fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>6.2</td>
<td>48.1</td>
<td>22.5</td>
<td>30.1</td>
<td>11.0</td>
<td>10.8</td>
<td>18.7</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td>1923</td>
<td>7.1</td>
<td>44.4</td>
<td>27.1</td>
<td>22.8</td>
<td>3.0</td>
<td>11.0</td>
<td>22.5</td>
<td>8.5</td>
<td>1,000</td>
</tr>
<tr>
<td>1924</td>
<td>7.1</td>
<td>44.4</td>
<td>34.3</td>
<td>22.5</td>
<td>27.1</td>
<td>11.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td>10.6</td>
<td>25.4</td>
<td>14.9</td>
<td>24.5</td>
<td>16.8</td>
<td>25.5</td>
<td>25.2</td>
<td>3.5</td>
<td>Cattle</td>
</tr>
<tr>
<td>1926</td>
<td>10.4</td>
<td>23.4</td>
<td>34.5</td>
<td>28.4</td>
<td>33.5</td>
<td>12.5</td>
<td></td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>1927</td>
<td>10.4</td>
<td>41.8</td>
<td>44.1</td>
<td>15.3</td>
<td>19.1</td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>5.2</td>
<td>39.4</td>
<td>8.5</td>
<td>39.0</td>
<td>27.0</td>
<td>21.3</td>
<td>5.0</td>
<td>15.0</td>
<td>65</td>
</tr>
<tr>
<td>1929</td>
<td>13.0</td>
<td>44.9</td>
<td>44.8</td>
<td>15.6</td>
<td>13.0</td>
<td></td>
<td>Popcorn</td>
<td>18.1</td>
<td>111</td>
</tr>
<tr>
<td>1930</td>
<td>13.0</td>
<td>41.0</td>
<td>39.0</td>
<td>22.3</td>
<td>12.7</td>
<td></td>
<td></td>
<td>14.8</td>
<td>6.6</td>
</tr>
<tr>
<td>1931</td>
<td>13.0</td>
<td>41.0</td>
<td>10.1</td>
<td>15.5</td>
<td>17.1</td>
<td>10.7</td>
<td>30.0</td>
<td></td>
<td>165</td>
</tr>
<tr>
<td>1932</td>
<td>13.0</td>
<td>58.2</td>
<td>20.2</td>
<td>14.4</td>
<td>24.5</td>
<td></td>
<td></td>
<td>16.1</td>
<td>64</td>
</tr>
<tr>
<td>1933</td>
<td>13.0</td>
<td>44.1</td>
<td>50.7</td>
<td>5.5</td>
<td>19.1</td>
<td>14.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*One-half acre of stock beets were grown in 1923, there being no sugar beets produced that year.*

The acreage devoted to pasture, during the 12-year period, varied from 5.2 acres to 13 acres. The acreage of the respective crops likewise varied greatly. Alfalfa, potatoes and barley were grown each year and sugar beets each year except in 1928; oats were grown 9 out of the 12 years; corn, beans and pop corn, 3 years each; wheat, 2 years; and cucumbers and stock beets, 1 year each. Thus it is seen, there was no fixed plan of crop production, the operator shifting his acreage according to circumstances. During the 12-year period pasture occupied an
average of approximately 7 percent of the pasture and crop land combined; alfalfa, 28 percent; sugar beets, 20; potatoes, 14, and oats, 12 percent. The acreage devoted to potatoes on this farm is much higher than the average per farm for the area. Potatoes generally drop out of the production program on farms having no soil well adapted to that crop.

Lambs were fed during the first 3 years of the 12-year period, the number varying from 700 to 1,050 per year. No feeding was done in 1925 but from 1926 to 1933 cattle were fed, the number varying from 63 to 165 per year. The number of milk cows kept on this farm varied from 4 to 12 during the 12-year period, and from 1922 to 1928 some hogs were purchased and fed.

This is what may be termed a 3-man farm. In other words, it required the labor of three men most of the time to handle the regular work. In addition to the labor of the three men, the blocking, thinning, hoeing, pulling, and topping of the sugar beets and a considerable portion of the picking of the potatoes were done by contract labor. The number of work horses used averaged about 12 head from 1922 to 1926. A tractor was purchased in 1927 and the number of work horses was eventually reduced to an average of about 7 head.

The gross cash receipts of this farm during the 12 years averaged as follows: From the sale of crops $4,462, from livestock $8,338, from livestock products $815 and from the other sources $804. During this same period cash expense averaged as follows: Current expenses $6,355 and livestock products purchased $4,476. Likewise, during the 12-year period farm inventories decreased about $303 per year. Depreciation averaged $1,138, unpaid family labor $223 and farm income $1,925.

The farms of area 9, especially those of area 9-a, vary greatly from the type just presented, both in their production programs and in size of farm. Approximately 40 percent of them carry on no feeding of lambs and cattle and many of them are strictly cash-crop farms. In connection with the production of cash-crops one or more of the following enterprises may be carried on many farms as sidelines: Dairy cattle, hogs, chickens, turkeys and farm flocks of sheep. The farms of this area likewise vary in size from around 20 to 1,000 acres, the dominant size being around 160 acres.

Sub-area 9-b.—The foregoing discussion has dealt with area 9 as a whole. The following remarks pertain to sub-area 9-b. This area surrounds Denver, a city having a population of approximately 300,000. The needs of the city have greatly influenced the development of the agriculture of the immediately surrounding territory. Reference to figures 27 to 35 will show
a greater concentration of poultry, dairy and part-time farms in this sub-area than in any other part of the state, and that there is also a marked concentration of fruit and truck farms.

Area 10.—North Central Colorado High Plains

Description of Area.—Area 10 embraces two separate bodies of land which lie directly northeast and southeast, respectively, of area 9. (Figure 36). It is situated on the high plain above the valleys of the South Platte and Cache la Poudre rivers and includes parts of Adams, Arapahoe, Larimer and Weld counties. The surface is gently rolling. Practically the entire area has been classified as second and third-grade dry-farming land, the two grades occupying about equal areas. Texture and depth of soil form the chief basis for differentiating the two grades of land. The soils of the second-grade land are of good depth and range in texture from sandy loam to sandy clay loam. The third-grade land, on the other hand, is either shallow in depth or heavy in texture. There are very limited amounts of irrigated and sub-irrigated bottom land along the intermittent stream channels which cross the area. Practically all crops are produced without irrigation.

The climate of area 10 differs but little from that of area 9. The average annual precipitation is very scant for dry farming, varying from 13 to 15 inches in different parts of the area. The data given in figure 5 for the weather station at Fort Collins illustrate the variability of the annual precipitation from
year to year. Hail storms are not infrequent, especially during the early part of the growing season. The area is subject to high winds and soil blowing is quite common on the lighter types of soil. The combined influences of the scant and variable annual precipitation, hail storms and the blowing of the soil make dry farming in this area quite hazardous.

Crops.—The principal cash crops produced in area 10 are winter wheat, dry beans and corn. While these crops are grown mainly on the second-grade land, attempts are frequently made to produce them on third-grade land. Much of the wheat is grown alternately with summer fallow, the land being in wheat one year and fallowed the following year. Wheat and barley may follow corn or beans grown as row-tilled crops. Barley and corn are the principal feed crops. The minor feed crops are sorghum, small grains cut for hay, and alfalfa and wild grass.

Livestock.—Beef cattle is the dominant type of livestock within the area. However, the cattle on some farms is of Short-horn or dual purpose breeding and kept mainly for milk. Sheep and swine are of minor importance. The poultry is largely confined to farm flocks of chickens with here and there some turkeys.

Types of Farming.—About 85 percent of the farms in this area in 1929 were distributed among four types of farms. Cash-grain farms led with 36 percent of the total number. Crop-specialty made up 21 percent; general, 15; stock farms and ranches, 13; dairy, 5; poultry, 2; and abnormal and unclassified together, 8 percent. The distribution of types of farms just enumerated is shown in figures 27 to 33. The chief source of income on the cash-grain farms in 1929 was wheat and corn while beans contributed the major portion of the income on the crop-specialty farms. Eight of the 13 stock farms and ranches had less than 10 acres of pasture land to each acre in crops whereas the other five had 10 acres or more of pasture to each acre of crops.

Area 11.—Northern Colorado High Plains

Description of Area.—Area 11 comprises the major portion of the northern part of Weld County and small sections of Laramie and Logan counties. Its western end blends into the foothills of the Rocky Mountains while the remainder of it lies within the Great Plains province. The surface is generally rolling to undulating with a few hills and ridges here and there. Bluffs occur along the margins of the valleys of the intermittent streams which penetrate the land surface in a southerly direction. The elevation ranges from 5,000 to 6,500 feet.
The average annual precipitation varies from about 14 inches in the central part of the area to 16 inches at its eastern and western extremities. From 70 to 75 percent of the annual precipitation comes from April to September, inclusive. The frost-free growing period varies from 115 to 140 days. Hail storms are common during the late spring and early summer and strong winds prevail during certain seasons of the year. A light snowfall permits year-round grazing, except for brief periods when unusually heavy storms may occur.

The area contains a relatively large amount of third-grade dry-farming land, a limited amount of second-grade land and numerous small bodies of grazing land. Experience has shown the third-grade land to be much better adapted to grazing than to crop production. The soils vary materially, the lighter types predominating. A fine sandy loam covers much of the uplands. Small areas of clay loam or adobe are widely scattered while along the stream channels the soil may contain considerable gravel. The lighter types of soil have a tendency to blow when plowed and put under cultivation. This has become a problem of major importance where cash-crop farming has been undertaken.

The vegetation of the uplands is chiefly a grama grass sod supplemented with wire grass on the sandy and gravelly types of soil and wheat grass on the heavier types. Little rabbit brush and matchweed, both indicators of overgrazing, are the more prominent shrubs. There are also extensive areas covered with prickly pear.

Thus it is seen area 11 is best adapted to the production of beef cattle and sheep because such a high proportion of the land is best adapted to grazing, because of the tendency of much of the soil to blow when put under cultivation, and because of a scant and variable rainfall.

Crops Grown.—Wheat and dry beans are the principal cash crops grown in this area. These two crops are produced mainly on the second-grade dry-farming land although they are grown to a limited extent on third-grade land. Much of the wheat land is cropped every other year, being in wheat one year and fallowed the next year. Sorghum, millet, sudan grass, corn, and barley are produced for winter feed. Native hay and alfalfa are grown on the lower lands along creek bottoms.

Types of Farming.—Cattle and sheep ranches dominate in this area and the sale of livestock and livestock products provide the principal source of income. The lands of the area are practically all under private ownership and fenced. Consequently most of the livestock is kept in definite pastures. The
third-grade lands have a carrying capacity of 15 to 40 animal
units per square mile. The second-grade land that still retains
its native sod is slightly above that of the third-grade land
in carrying capacity, while that of the grazing land is a trifle
lower.

The operation and organization of stock ranches in this
area do not differ greatly from the description and illustrations
which accompany areas 14 and 15-a.

The cash-grain farm is the second type, numerically, in this
area with the general farm third. A limited number of farms in
1929 were classified as crop-specialty because of their receipts
which came from the sale of beans and hay. In general, it may
be said cash-crop farming is not advisable in most of this area
because of the limitations of moisture and other natural condi-
tions. The production of feed and forage crops is justified, how-
ever, in the ranch program in as much as it is necessary to
provide winter feed for livestock which is the outstanding in-
dustry of the area.

Area 12.—Northeastern Colorado High Plains Cash-Grain Area

Description of Area.—Area 12 is the most highly developed
dry-farming area in Colorado. It is situated on the high plains
in the northeastern part of the state. It embraces four separate
bodies of land and includes parts of eight counties. Phillips is
the only county, the major portion of which lies within this
area (figure 36).

The surface, for the most part, is level to slightly rolling
and has a general slope to the east and northeast. But few
stream channels interrupt the surface, and they in turn are
entrenched only slightly below the level of the plain. The flow
of practically all drainage streams is intermittent. The eleva-
tion varies from about 3,500 feet at certain points along the
Colorado-Nebraska and Colorado-Kansas State lines to about
4,500 feet in the northwestern part of the area.

The average annual precipitation increases from west to
east and varies from slightly less than 16 inches to about 18
inches. Of the total annual precipitation, from 75 to 80 per-
cent comes during the 6-month period April to September,
inclusive. (See small chart No. 2 superimposed on figure 4). Much of the seasonal rainfall may be lost as surface run-off,
due largely to the torrential rains which occur at that time
of the year. The annual precipitation also varies greatly from
year to year as is shown by the data presented in figure 5 for
the weather observation station located at Yuma, Colorado. The
range in the variation at that station during the 33-year period
1900 to 1932 was from about 12 inches above the normal in 1915 to 9 inches below in 1931. The length of the frost-free growing season in different parts of the area varies from about 135 to 140 days. High winds are quite prevalent, especially during the early part of the growing season; crops are sometimes seriously damaged in comparatively narrow belts by hail storms that sweep across the area; and the sandy soils within the area are more or less subject to blowing when under cultivation.

Practically all of that portion of area 12 lying south and east of the South Platte River has been classified as first-grade dry-farming land, there being a limited amount of second-grade land around the border, and also narrow strips of third-grade land along the few stream channels which traverse the area. Likewise that portion of the area lying west and north of the river is made up of second-grade, third-grade and first-grade land, named in the order of the acreage occupied by the three classes of land.

The soils of the first-grade land are deep, friable silt and sandy silt loams. Locally these soils are generally spoken of as "hard soil" or "wheat land." The soils of the second-grade land are also silt and sandy silt loams. However, they are mixed with more or less gravel and also with considerable sand. Very generally the soils of the third-grade land are sandy, clay, clay loams or are shallow. Practically the entire area was originally covered with a grama-buffalo grass sod associated with more or less wheat grass, June grass and matchweed.

Roughly estimated, 89 percent of all the land in area 12 in 1929 was in farms, and of all the land in farms that year 73 percent was crop land and 24 percent was used for pasture. The remaining 3 percent was either waste land, or was used for such purposes as townsites, farmsteads, roads and fences. About 50 percent of the pasture land is plowable.

Summarizing, it may be said that area 12 contains comparatively little waste land; that a very high proportion of the total land area is in farms; that in 1929 about 73 percent of all land in farms was used for producing crops and 24 percent for pasture; that a very high proportion of the area has been classified as first-grade dry-farming land made up, for the most part, of soils that are deep, fertile and well suited to grain-crop production; that the surface of the area is well adapted to the use of large-sized labor-saving implements and machinery; but that, on the other hand, the irregularities in the annual and monthly precipitation and the losses of water by surface
run-off and evaporation make crop production more or less uncertain.

**Crops.**—The principal crops grown in area 12 are winter wheat, corn, barley, oats, sorghum, hay and spring wheat. Limited amounts of rye, millet seed and dry beans are also grown. The acreages devoted to these crops vary greatly from year to year, but during a normal season winter wheat makes up from 45 to 50 percent of the harvested acreage, corn from 25 to 30, barley from 10 to 12, sorghum and hay from 2 to 3 each, and spring about 2 percent. Wheat is the major cash crop, while corn is produced both to sell and for feed. Barley, oats, rye and sorghum do not enter into commercial channels to any great extent, but are, for the most part, used locally for livestock feeds. Spring wheat is used chiefly as a catch crop following the winter killing of winter wheat. It is subject to great variation in yield due to the hot dry winds of short duration which occur during the early summer. Winter wheat is generally matured sufficiently to withstand these periods. The 10-year average crop yields for Phillips County, which should represent the yields for the area as a whole fairly well, are as follows: Winter wheat 12.1 bushels per acre, spring wheat, 8.1; corn, 14.9; barley, 17.8; and oats, 19 bushels.

**Livestock.**—The livestock enterprises in area 12 are practically limited to swine and cattle. Swine fit into the organization of many farms because of the prominent place occupied by corn in the cropping system. Of the total number of cows on farms April 1, 1930, about 72 percent were kept mainly for milk production and the remainder for beef. Approximately 40 percent of the cows milked were of dual purpose breeding. An average of slightly less than 5 cows per farm was milked on farms reporting the milking of cows. The cattle utilize the pasture land, the corn stalks and other roughage of the farm. A flock of chickens is maintained on practically every farm and turkeys are raised on about 20 percent of them.

**Types of Farming.**—Cash-grain farms made up approximately three-fourths of all the farms in area 12 in 1929, stock farms and ranches about 10 percent and general farms around 6 or 7 percent. There was also a limited number of poultry, part-time, crop-specialty, dairy, and self-sufficing farms. The cash-grain farms are well distributed over the entire area, their greatest concentration being in Phillips County, in the southern part of Sedgwick County, and in the southeastern portion of Logan County. The stock farms and ranches and the general farms are also distributed over the area quite evenly. Most of the crop-specialty farms are located in the western part of the
area where considerable beans are grown. Figures 27, 28, 31, 32 and 34 show the distribution of farms by type within the area.

The Dominant Type.—Cash-grain farms are the predominating type within area 12. These farms average about 500 acres in size and vary from less than 100 acres to as much as 5,000 acres. They likewise vary greatly in their production programs and plans of organization. Some of them are strictly cash-grain farms, while others produce either hogs, beef cattle, dairy products or poultry as sidelines to cash-grain farming. In 1929 averages of about 75 percent of the gross income of the cash-grain farms comes from the sale of crops, around 12 percent from livestock, 8 percent from livestock products and about 5 percent from the products used by the operator’s family.

Winter wheat ranks first as a cash crop and corn second. However, the relative importance of those two crops varies considerably from year to year. On an average about 50 percent of the winter wheat is grown on corn land. In this case the wheat is planted with small drills between the rows of corn. Another large proportion of the winter wheat follows wheat, barley or oats, while a relatively small amount is grown on land that has been summer fallowed. On some farms, however, practically all of the winter wheat is produced on land that was fallowed the previous year. When winter wheat winter kills or when a drought occurs during the latter part of the growing season and there is not sufficient moisture in the soil at seeding time to germinate winter wheat seed, the land intended for that crop is generally planted the following spring to corn, but sometimes to spring wheat, barley or oats. In such cases corn may become the principal cash crop. It is evident from the foregoing discussion that there can be no very definite acreage allotments in the cropping system on cash-grain farms in this area.

Other Types.—The second dominant type of farm in this area is the stock farm and ranch type. On these farms an average of about 65 percent of the gross income in 1929 was derived from livestock (mostly cattle or hogs), 20 percent from the sale of crops, 8 to 10 percent from livestock products, while the value of the products used by the operator’s family amounted to about 5 percent. The general farm is the third most important type. These farms are generally much smaller than either the cash-grain or the stock farms. As would be expected, gross income is more evenly distributed among the different sources, there being on the average but little difference between the amounts derived from crops, livestock and livestock products.
The gross income of the general farm is much less than that of the other two types just discussed, and the value of the family used products amounts to about 10 percent of the total. The other types of farms within area 12 are of very minor importance.

Organization of a Cash-Grain Farm.—The cropping system followed on cash-grain farms in area 12 is built around winter wheat and corn as the cash crop. Definite crop rotations are seldom followed in this area, due, chiefly, to the irregularities and variations in the amount and distribution of the annual precipitation. Some of the adjustments that must be made from year to year in the acreage of the respective crops grown are well illustrated by the description of a cash-grain farm which follows. Data showing the receipts and expenses of operating this farm are not available.

The farm in question is located on first-grade dry-farming land in the extreme eastern part of Logan County. It contains 640 acres, 550 acres being crop land and 90 acres pasture and waste land. The farm is operated by its owner and his two sons, one of whom is in school. The machinery and implement equipment consists of the following: Two 2-row listers, two 18-foot disks, two 2-row lister cultivators, four 1-horse drills, one 12-foot drill, one mower, one 14-foot combine, one 15-20 tractor and the usual amount of farm tools.

The livestock in 1933 consisted of 5 work horses, 4 milk cows, 3 head of young cattle, 24 sheep, 1 brood sow, and 50 chickens. In addition to the 5 work horses, the operator had the use of several young horses and mules that he broke for their use.

The acreage of winter wheat seeded, the acreage of all crops harvested and the acreage of crop land from which no crops were harvested on this farm during the 5-year period 1929 to 1933, inclusive, are shown in table 9.

The acreage of winter wheat seeded, it is seen, varied from 50 acres in 1931 to 480 acres in 1930. Only twice during the 5-year period (1929 and 1933) was all the winter wheat harvested that was seeded the previous fall. During 3 years out of the 5 a considerable portion of the land planted to winter wheat each fall was planted to some other crop the following spring. For example, the entire 370 acres of land planted to winter wheat in the fall of 1932 was planted to other crops in the spring of 1933.

In the fall of 1932, 230 acres of winter wheat were planted on land that had raised a crop of wheat that year. The stubble land was disked in August and planted to winter wheat during
Table 9.—Use of Crop Land: Winter Wheat Seeded, Crops Harvested, and Crop Land From Which No Crops Were Harvested on a 640-Acre Farm, 1929-1933.

<table>
<thead>
<tr>
<th>Crop</th>
<th>1929 Acres</th>
<th>1930 Acres</th>
<th>1931 Acres</th>
<th>1932 Acres</th>
<th>1933 Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter wheat seeded*</td>
<td>100</td>
<td>480</td>
<td>50</td>
<td>470</td>
<td>370</td>
</tr>
<tr>
<td>Crops harvested:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter wheat</td>
<td>100</td>
<td>360</td>
<td>50</td>
<td>200</td>
<td>0</td>
</tr>
<tr>
<td>Corn</td>
<td>250</td>
<td>160</td>
<td>300</td>
<td>230</td>
<td>440</td>
</tr>
<tr>
<td>Spring wheat</td>
<td>120</td>
<td></td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>40</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cane</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudan grass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td></td>
<td>10</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Dry beans</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land from which no crop</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>Total crop land</td>
<td>550</td>
<td>550</td>
<td>550</td>
<td>550</td>
<td>550</td>
</tr>
</tbody>
</table>

*Seed the previous autumn for harvest in the year indicated.
†Winter wheat that was too poor to harvest.
‡Dry beans that were ruined by hail.

September. That same autumn 140 acres of winter wheat were planted in corn in September and November with 1-horse grain drills. Before drilling in the wheat the corn land was cultivated dry with a lister cultivator. Likewise in the spring of 1933 corn was planted on land that had raised wheat the previous year. The land was disked in April and planted with a lister in May, harrowed in June and cultivated with a lister cultivator in June and July.

Crop yields on the acres harvested on this farm during the 5-year period 1929 to 1933 were as follows: The average yield of wheat in 1929 was 18 bushels per acre on 100 acres of winter wheat and 120 acres of spring wheat; 24 bushels for winter wheat in 1930; 3 bushels per acre on 50 acres of winter wheat and 120 acres of spring wheat in 1931; and 3 bushels for winter wheat in 1932. No wheat was harvested in 1933. The yield of corn is given for but 4 years, it being 45 bushels per acre in 1930 and 25 bushels in 1931. The corn crop was so poor in 1932 that it was used only for fodder, while in 1933 the yield was but 3 bushels per acre, due mainly to a severe hail storm. That same year 40 acres of beans were abandoned because of hail. Yields are not available for the other crops.

Area 13.—South Platte-Arikaree Rivers Sand Hills

Description of Area.—Area 13 occupies portions of six counties in northeastern Colorado and lies in five separate sub-areas, four of them along the South Platte River and one just north of the Arikaree River. The four areas lying along the South Platte consist of comparatively narrow strips of land
between the river valley and the high plain whereas the one north of the Arikaree River is broader and more irregular in shape.

For the most part area 13 consists of gently undulating to rolling sand hills that rise 200 to 400 feet above the river valley and from 25 to 50 feet above the general surface of the plain. The sand hills are mainly composed of dune-sand deposits with small valleys scattered among the hills. In the valleys among the hills of the area north of the Arikaree River, there is considerable very sandy third-grade dry-farming land that contains so little silt that cultivation must be done with care in order to prevent soil blowing. Small areas of second-grade land having a high percentage of silt and valuable for crop production are also to be found in the valleys. While there is some second and third-grade land in the four areas lying along the South Platte, the proportions are very much less than in the Arikaree River area. The length of the growing season and the climate in general differ but little from that of area 12 already described.

In their natural conditions the sand dunes are held in place by a growth of grasses that are highly nutritious throughout the year. The native vegetation of the sand hills consists mostly of little and big bluestem, sand grass, feather grass, sand dropseed, and sand sage while in the valleys between the hills there is considerable grama grass and wire grass.

Roughly estimated it may be said that around 90 percent of the total land in area 13 is in farms and that probably 65 percent of the land was used for pasture and about 30 percent for crop production. In 1929 feed crops occupied about 65 percent of the crop land, hay 10 to 12 percent and cash-grain about 10 percent.

Crops.—Corn and the sorghums are the principal feed crops grown, followed by barley. Corn is also the principal cash-grain crop. Owing to the sandy nature of the soil of so much of the area, comparatively little wheat is produced.

Livestock.—Cattle is the dominant type of livestock and the dual purpose breeds are favored by many farmers. Around 40 percent of the cows are kept mainly for milk production and 60 percent for beef. On account of the prominent position of corn in the area, hogs are the principal class of livestock on some farms. Sheep are of but little importance and poultry is practically restricted to rather small-farm flocks. Practically all of the cattle produced are sold as feeders.

Types of Farming.—A very high percentage of the farms of this area are distributed among three types, cash-grain,
stock farms and ranches, and general. In the area north of the Arikaree River, cash-grain farms in 1929 made up around 40 percent of the total number; stock farms and ranches, 30; general, 18; unclassified, 4; dairy and part-time, 3 each; and self-sufficing, 2 percent. About one-third of the stock farms and ranches had less than 10 acres of pasture to each acre of crops while the other two-thirds had 10 acres or more of pasture land to each acre of crops. No definite data are available as to the distribution of farms by type in the four sand hill areas lying along the South Platte River. It is well known, however, that in these areas a much greater proportion of the land is used for pasture and that a much higher percentage of the farms are stock farms or ranches.

Area 14.—East Central Colorado Plains

Description of Area.—Area 14 occupies a portion of the Great Plains region in east central Colorado and includes parts of 13 counties. Much of it has a level to slightly undulating surface that has been modified by a comparatively few drainage streams that follow rather wide valleys only slightly entrenched below the general surface of the plain. The remainder of the area has been modified more extensively by erosion and presents a more rolling surface with some comparatively small areas of rough broken land occurring on a few of the ridges and along the margins of some of the drainage channels.

The area drains into the South Platte River to the north, into the Arkansas River to the south and into the Arikaree, Republican and Smoky Hill rivers to the east. The flow of most of the drainage streams is intermittent. The elevation varies from approximately 3,300 feet on the eastern border near the Arkansas River to about 6,000 feet in Elbert County.

The average annual precipitation varies from about 13 to 17 inches, being lowest in the north central part of the area and along the southern portion of its western border. As in all of eastern Colorado, the major portion of the annual precipitation comes during the growing season. The annual precipitation also varies greatly from year to year and may be above or below the average during 4 and 5 successive years. (See the data for Cheyenne Wells presented in figure 5.) Much of the rainfall that comes during the growing season falls as torrential rains which, together with the tightness of the soil over a large portion of the area, results in considerable loss of moisture by surface run-off. Crops are not infrequently damaged by hot winds and hail storms. The frost-free growing season ranges from about 140 to 170 days.
Practically all of the land in area 14 has been classified into four grades: Grazing land and first, second and third-grade dry-farming land. The grazing land is not extensive and consists mostly of numerous small tracts in the western part of the area. There is but one small body of first-grade land which is located in the north central part of Lincoln County. Roughly estimated the areas of second and third-grade land are about equal in size. The major portion of the second-grade land lies in the northeastern part of area 14 where the rainfall is most favorable to crop production. The bulk of the third-grade land is to be found in the southern and western parts of the area where the rainfall is generally quite scant for cash-crop farming. In figure 3 the second and third-grade lands are mapped together.

The small body of first-grade land in Lincoln County has a silt loam soil of good depth and of high productivity when the rainfall is not too scant. The soil of the second-grade land is somewhat variable, the dominant type being a silt loam locally known as "hard land" or "wheat land." It generally varies in depth from 8 to 18 inches and in some parts of the area is underlain with a thin layer of calcareous material which indicates the depth to which the soil moisture penetrates. Beneath the calcareous material there is usually a heavy clay. The soil of the third-grade land generally is either too heavy, too sandy, or too shallow to be graded as second-grade land. The bulk of the third-grade land receives a very scant rainfall and experience has shown that perhaps all of it and much of that mapped as second-grade are much better adapted to the grazing of livestock and to the production of feed crops than to cash-crop farming. During the spring of 1935 the sandy soils of this area were subject to severe wind erosion.

The dominant native vegetation on the silt loam and sandy silt loam soils is a grama-buffalo sod associated more or less with western wheat grass, June grass, and scattering overgrowths of matchweed. On the soils of lighter texture the following are the principal plants to be found though not all in the same locality: Wire grass, matchweed, soapweed, dry-land sedge, little bluestem, and side oat grama. In some of the drier sections prickly pear makes a very noticeable and dense growth on limited areas that practically prevents the land from being used for grazing purposes.

Of all the land in area 14 in 1929, approximately 67 percent was in farms and of the land in farms that year 64 percent was pasture land and 34 percent crop land. That same year about 41 percent of the crop land produced feed crops, 23 percent cash-
grain, and 6 percent hay crops, thus leaving 30 percent for such purposes as fallow land, idle land and other cash crops.

Crops Grown.—The principal cash crops grown in area 14 are corn and winter wheat. The greatest concentration of corn is on the second-grade land in the northeastern part of the area. Winter wheat has three areas of concentration: On the small body of first-grade land in Lincoln County and in the northwestern and northeastern parts of the area. Limited amounts of spring wheat and dry beans are produced also as cash crops. The dry beans are mainly grown on the sandy types of soil in the western parts of the area.

The feed crops produced are corn, grain sorghums, barley, oats and millet. The relative importance of these crops, measured in terms of acreage harvested, shifts greatly from year to year as is the case also in area 12. When winter wheat winter kills or when there is insufficient moisture to get a stand of winter wheat, the land must be planted the following spring to some other crop, summer fallowed or allowed to lie idle. While such land may be planted to any of the spring crops, corn is the cash crop to which most farmers turn. In this way the acreage of corn may be doubled in a single year.

Livestock.—Beef cattle is the outstanding kind of livestock produced. Approximately the following amounts of the different kinds of livestock per square mile were within this area on April 1, 1930: Cows kept mainly for milk, 2; cows kept mainly for beef, 4; yearling steers and bulls, 3; 2-year-old steers and older, 1; other cattle, 7; sheep, 6; sows and gilts, 1; and chickens, 40. Many of the cows in this area are of dual purpose breeding and about one-third of all cows were milked. The surplus dairy products are mostly sold as sour cream. The milking of cows tends to increase during years when crops fail or partially fail and when the prices of beef cattle are low. Most of the cattle disposed of are sold as feeders.

Summary.—In summarizing, it may be said that a very large proportion of area 14 lies in east central Colorado where the average annual precipitation is very scant; that the annual precipitation varies greatly from year to year and may be above or below the average during periods of 4 and 5 years in succession; that much of the moisture that falls is lost as surface run-off, due mainly to torrential rains; that the major portion of this low rainfall area is third-grade land that is either too shallow, too sandy, or too heavy for successful crop production one year with another; and that it is much better adapted for grazing purposes than for cash-grain farming. In attempting to shift from cash-grain farming to the production of grazing
animals, two major problems are encountered: One of these is the difficulty encountered in establishing satisfactory stands of pasture grasses on lands that have been cultivated for a number of years. The other problem is that of increasing the size of the farms sufficiently to be operated economically with livestock as the dominating farm enterprise.

Types of Farming.—A count of farms in the minor civil divisions lying within area 14 shows that cash-grain farms made up 39 percent of the total number in 1929; general farms, 23 percent; stock farms and ranches, 20; dairy and crop-specialty, 4 each; part-time and self-sufficing, 2 each; poultry, 1; and abnormal and unclassified together, 5 percent. The stock farms, those having less than 10 acres of pasture land to each acre of crops, out-numbered the stock ranches 5 and two-thirds to 1. The average size of farm varies greatly among the several types. The stock ranches average around 3,230 acres in size; the stock farms 730, acres; cash-grain, 720; crop-specialty and dairy, 550 each; general, 540; and poultry, 270 acres. Figures 27 to 35, inclusive, show the approximate distribution of the several types of farms within area 14.

The chief sources of income in this area are cash-grain (mostly wheat and corn) and beef and dual purpose cattle. There is also considerable income from dairy cattle and dairy products, sheep and wool, hogs, poultry and poultry products, and some from dry beans. In 1929 cash-grain contributed about 38 percent of the total gross income; meat animals (cattle, sheep and hogs), and wool, around 40 percent; dairy cattle and dairy products, 8; poultry and poultry products, 5; other cash crops, 2; and the family used products, 7 percent.

Area 15.—Upper Arkansas River Plains

Description of Area.—Area 15 is very irregular in shape and occupies about two-thirds of the Great Plains province of southeastern Colorado. While no county lies entirely within this area, it includes parts of 15 counties. It is crossed from west to east near its middle by the Arkansas River to which the whole area drains, excepting two relatively small areas in the northern part which drain to the South Platte and the Republican rivers. The area is almost traversed also by the irrigated lands of area 17 which lies along the Arkansas River. Reference to figure 36 will show area 15 has been divided into two sub-areas designated as 15-a and 15-b. This division is based on the difference in the types of farming carried on within the two sub-areas. The discussion that follows, except where noted in the text, applies to the area as a whole.
The surface of the major portion of area 15 consists of broad smooth-to-gently rolling plains that are more or less broken here and there by rocky ridges and lines of cliffs that rise above the general level of the plain. The surface of parts of the area, however, varies from rolling-to-rough broken hills and buttes. The drainage channels in the southern portion are generally narrow and deeply entrenched while in the northern part they are usually rather broad and shallow. The elevation varies from about 4,000 feet on the Arkansas River in Otero County to as much as 6,000 feet at points on the western border.

The climate is very similar to that of the whole of eastern Colorado. The average annual precipitation varies from less than 12 inches along the Arkansas River to slightly over 16 inches in the northwestern and southwestern portions. The annual precipitation varies greatly from year to year and from 70 to 80 percent of it falls between April and September, inclusive. Evaporation is high and considerable moisture is lost as surface run-off, due largely to the tightness of the surface soil and to the torrential rains that occur during the growing season. Occasional hail storms sweep across the area and high winds are quite common during the late spring and early summer. The average length of the frost-free growing season in different parts of the area varies from about 140 to 160 days. The winters are generally sufficiently open to permit of year-round grazing except during occasional severe storms.

The major portion of area 15 has been classified and mapped by the United States Geological Survey as grazing land and third-grade dry-farming land. Grazing land predominates in the southern part of the area and third-grade land in the northern portion. Of the total area grazing land makes up around 50 to 55 percent, third-grade land close to 40 percent, and sand hills 4 to 5 percent. Practically all of the land mapped as second and third-grade land in figure 3 is third-grade land, there being but a very small amount of second-grade land within the area. Figure 3 shows five quite extensive sand-hill areas north of the Arkansas River. Practically all of the irrigated land is located along the streams.

The grazing land consists of extensive areas of heavy clay, adobe and gumbo soils which are generally too tight for dry farming. The soils of much of the grazing land are of shallow depth with shale material exposed in some places. Some of the adobe flats contain more or less alkali. Sandy soil predominates in many small areas of grazing land.

Much of the third-grade land is what is locally called "hard land" and consists of clay to clay loam soils of shallow depth.
There are also numerous areas of third-grade land having soils that are decidedly sandy in texture and that are subject to blowing when exposed to the wind. The sandy type of third-grade land covers practically all of area 15-b. There are also limited areas of third-grade land having a thin layer of sand deposited on clay. The soil of the second-grade land in the northeastern portion of the area is mostly a sandy loam. The sand hills, for the most part, consist of typical dune-sand deposits. Wind erosion was especially severe on the sandy soils of area 15 in the spring of 1935, particularly in sub-area 15-b.

The vegetation of areas having a compact soil consists chiefly of a short-grass sod made up of grama and buffalo grasses and associated in different places with one or more of the following: Wire grass, ring grass, western wheat grass, slender wheat grass, matchweed, and in slightly alkaline areas salt grass. The sandy soil areas generally have a grama grass cover with more or less bluestem, June grass, needle grass, wire grass, dry-land sedges, and in some places soap weed. The vegetation of the sand hills includes chiefly big and little bluestem, grama, sand grass, wire grass and sand sage. In some localities cactus is very conspicuous and materially reduces the carrying capacity of the grazing land. In the breaks along some of the principal streams and their tributaries there is a scrubby growth of junipers. Groves of native cottonwood trees are to be found also along some of the larger streams.

Crops Grown.—While crops are grown in area 15 both with and without irrigation, much the larger acreage is non-irrigated. Of the total acreage of crops harvested under irrigation in 1929, about 70 percent was hay crops. Alfalfa made up approximately 74 percent of the hay acreage; tame grasses and clover, 15 percent; wild grasses, 8; and small grains cut for hay, 3 percent. Around 17 percent of the total acreage of irrigated crops consisted of corn, oats, barley and wheat, corn being the most important. Dry beans made up about 8 percent. There were also some sugar beets, grass seed and vegetables.

Roughly estimated it may be said that the grain crops made up about 44 percent of the total harvested acreage of non-irrigated crops in 1929. Approximately three-fourths of the acreage of the grain crops were corn. Dry beans made up about 28 percent of the harvested acreage; feed and grain sorghums, 19 percent; and the hay crops, 7 percent. The hay crops consisted mostly of the small grain, alfalfa and wild grasses. The beans are chiefly grown on the sandy land in sub-area 15-b. Of late years the blowing of the soil has become a serious problem in this sub-area and it is now a very common practice to grow beans
and corn or beans and sorghum in alternate strips 60 feet or more wide to lessen the danger of soil blowing.

Livestock.—The production of beef cattle is the leading industry in area 15 as a whole and particularly in sub-area 15-a. The winters are generally sufficiently open to permit of much winter grazing provided pasture lands are reserved for use during that season of the year. Many of the cows in this area are of dual purpose breeding and are used for both milk and beef production. There are also some herds of strictly dairy cattle. Sheep are the second most important class of livestock and are followed by hogs and poultry. Turkeys are quite an important source of income on some farms.

Types of Farming.—A count of 2,607 farms in the minor civil divisions lying within sub-area 15-a shows that 470 of them were located where the crops are produced largely under irrigation whereas 2,137 were in precincts where there is but little irrigation. In the precincts where but little irrigation is practiced, stock farms and ranches constituted 34 percent of the total number of farms; general, 17 percent; crop-specialty, 10; unclassified, 9; dairy, 9; cash-grain, 7; part-time, 7; and poultry, 7 percent. About one-fourth of the stock farms and ranches had less than 10 acres of pasture land to each acre of crops while three-fourths of them had 10 acres or more of pasture land to each acre of crops.

In the precincts where most of the crops are produced under irrigation, crop-specialty farms constitute 35 percent of the 470 farms; general farms, 14; stock farms and ranches, 11; dairy, 11; unclassified, 7; poultry, 6; truck and part-time, 5 each; self-sufficing, 4; and cash-grain, 1 percent. Under irrigation the chief sources of income on the crop-specialty farms in 1929 were hay and beans while under non-irrigated condition these farms generally received their greatest gross income from dry beans.

It has been pointed out that in area 15-b sandy soils that are inclined to blow predominate and that dry beans have been the major cash crop during recent years. For several years after being brought under cultivation much of the land of this sub-area was used continuously for bean production. During that period a very high percentage of the farms would classify as crop-specialty. Owing to the problem of controlling soil blowing, the proportion of the land devoted to dry beans has been reduced by producing corn or sorghum in alternate strips with the beans. This required an increase in the amount of livestock carried in order to utilize the sorghum and corn. In 1929 crop-specialty farms made up approximately 51 percent of the total
number in sub-area 15-b; general farms, 22 percent; stock farms and ranches, 11; cash-grain, 6; dairy, 3; poultry, part-time and self-sufficing, 1 each; and abnormal and unclassified together, 4 percent. Practically no irrigation is practiced in this sub-area.

Organization of a Cattle Ranch.—The description that follows will illustrate in a general way how cattle ranches in area 15 are organized and operated. The ranch selected for the illustration is located about 45 miles from a railroad shipping point and contains 9,480 acres. The operator of the ranch owns 1,840 acres all of which is grazing land except 50 acres which are under cultivation and partially irrigated from three small reservoirs. He also rents 7,640 acres of grazing land at a cost of 14 to 16 cents per acre. The owned part of the ranch was valued at $17,915. The improvements were valued at $5,088 and included a 9-room frame house, a bunk house, a garage, cattle sheds, corrals, 16 miles of wire fence, 3 wind mills, 3 water tanks, and 3 small reservoirs.

The principal items of equipment include 2 mowers, 3 sulky hay rakes, 1 land roller, 1 disc harrow, 2 walking plows, 1 one-horse grain drill, 1 one-row cultivator, 2 wagons, 2 sets of harness, 3 saddles, the usual amount of small ranch tools, an automobile, 2 work horses, 2 mules, and 2 saddle horses, all valued at $537.

The productive livestock consisted of 510 head of range cattle classified as follows: 187 cows, 83 two-year-old heifers, 9 bulls, 73 two-year-old steers, and 158 yearling steers and heifers. One hundred eighty-six calves were saved from the 270 head of cows and two-year-old heifers. The calf crop on this ranch was 69 percent compared with an average of 57 percent for 16 Eastern Colorado ranches the same year.

The feed produced consisted of 30 tons of alfalfa hay and 30 tons cane fodder grown on the 50 acres of cultivated land. These two crops were partially irrigated. In addition to the 60 tons of hay and fodder just mentioned, 150 tons of native grass or wild hay were put up. This was obtained mainly from the low lying lands and from land that was reserved for winter grazing. The hay and roughage are usually reserved for periods during the winter when severe storms occur or for use when the range does not provide enough pasturage to sustain the cattle. When grass is short during the winter, grain is frequently purchased and fed to weaned calves and weak cows. The customary rate of stocking the ranch is 30 to 35 head per section.

The cash receipts from the sale of cattle during the year amounted to $7,676. The cattle sold were 78 yearling steers,
73 two-year-old steers, and 26 cows. The steers were all sold in April and the cows in October. The steers were sold early in the season because the outlook for summer pasture was unsatisfactory.

The cash operating expenses amounted to $3,562 and interest on borrowed money to $867, making a total cash outlay of $4,429. The net cash income, it is seen, was $3,247. The operation of the ranch required the full time of the operator and 21 months of hired labor. Looking after the cattle is the main task on a prairie ranch.

Area 16.—Cimarron River High Plains

Description of Area.—Area 16 occupies the southeastern corner of Colorado and includes practically all of Baca County and a small part of both Las Animas and Prowers counties. The surface slopes to the east and is made up, for the most part, of smooth to slightly rolling high plains. In the southeastern part of the area there is a series of low sand ridges and sand hills. The elevation varies from around 3,500 feet along the Colorado-Kansas State line to more than 5,000 feet at the western extremity of the area in Las Animas County. Practically the whole area drains to the Cimarron River which usually flows continuously throughout the year. The remaining drainage streams are intermittent and occupy shallow depressions in the surface of the general plain.

The average annual precipitation in different parts of the area varies from about 15 inches along the northwestern border to around 18 inches in the southeastern part, the major portion coming from April to September. The average length of the frost-free growing season varies with the altitude and ranges from 140 to 160 days. Like all of the Great Plains region of eastern Colorado, area 16 is subject to torrential rains, hail storms, high winds, and high evaporation during the late spring and summer months. It is also subject to great variation in the annual precipitation which results in periods of severe drought.

This area contains four grades of land—second and third-grade dry farming, sand hills and grazing land. The third-grade land predominates over most of the area and is locally called "hard" or "wheat land." The top soil of this type is generally a black silt loam having a compact texture that greatly retards the penetration of moisture. The subsoil of the third-grade land usually contains considerable gypsum and where this material is at or near the surface the land is poor for crop production. The second-grade land generally consists of areas where a thin layer of sand has accumulated on compact
silt loam, the cultivation of which produces a friable soil hav-
ing excellent capacity for absorbing and retaining moisture. This type is locally called "corn land" but is used also for producing wheat, broomcorn, sorghum and beans. The main body of the dune-sand hills lies in the southeastern corner of the area south of the Cimarron River. The land classified as grazing land is of very minor importance, the largest body of which lies just north of the Cimarron River.

The vegetation of the hard-land areas classified as third-
grade land is generally a grama-buffalo grass sod with only scattered patches of other species. The sandy soil area of third-
grade land supports a grama grass cover with considerable little bluestem, and sand sage replacing the grama and with sand grass and sand dropseed in some places. The second-grade land also has a grama grass cover but with less of the little bluestem and sand grass than is found on the third-grade land. Big and little bluestem, sand grass, sanddrop seed, and sand sage are the dominant species in the sand hills south of the Cimarron River.

Approximately 69 percent of the total land in area 16 was in farms in 1929. Of the land in farms 62 percent was used for pasture and 35 percent was classed as crop land. Cash-grain occupied about 41 percent of the crop land; feed crops, 32 per-
cent, and other cash crops, chiefly broomcorn, 27 percent. About 73 percent of the pasture land is plowable.

In summarizing it can be said that around 80 to 85 percent of area 16 has been classified as third-grade land primarily because of the tight compact nature of the surface soil, because so much of the surface soil is shallow and underlain with gypsum and because a portion of the area has an average annual precipi-
tation as low as 15 inches. These conditions have tended to restrict the use of the land to the grazing of livestock and the production of feed crops. These factors have been counteracted, however, by the high prices of wheat and other farm commo-
dities that prevailed during and immediately following the world war, by the possibility of using large scale labor-saving ma-
chinery on the smooth gently rolling surface of this area and by an average annual precipitation that increases from west to east, reaching about 18 inches on the Kansas State line. The influence of all these forces resulted in bringing about one-
fourth of the area under cultivation by 1930. Furthermore it may be said the area has suffered from the development of absentee or so-called "suitcase" farming. The operators of some of the large wheat farms spend a few weeks within the
area during the summer and autumn, harvesting one crop of winter wheat and seeding another. The balance of the year they live elsewhere.

Crops Grown.—Crops are grown in area 16 with and without irrigation. About 1 percent of the crops harvested in 1929 was produced with irrigation, corn, wheat and alfalfa being the principal crops. Winter wheat, corn, broomcorn and the feed sorghums are the more important non-irrigated crops. Figures 8, 9, and 16 indicate these crops are fairly well distributed over the area, the corn, broomcorn and feed sorghums being somewhat concentrated on the sandy soils. In 1929 winter wheat made up approximately 32 percent of total harvested acreage of non-irrigated crops; corn, 25; broomcorn, 19; the sorghums, 15; barley, 5; dry beans, 2; and the combined acreage of oats, rye, alfalfa, small grains cut for hay and annual legume hay, about 2 percent. Winter wheat, broomcorn and corn are the principal cash crops. The average yields per acre of some of the more important non-irrigated crops for the 5-year period ending 1931 are as follows: Winter wheat, 13 bushels; spring wheat, 5; barley, 9; corn, 13; and potatoes, 77 bushels. The average yields of these crops under irrigation were: Winter wheat, 28 bushels; spring wheat, 21; barley, 27; and corn, 30 bushels.

Livestock.—Cattle, kept mostly for beef production, is the dominant kind of livestock in this area. The average amount of livestock kept per square mile of total land area in 1930 was approximately as follows: Cows kept mainly for beef, 4; cows kept mainly for milk, 2; yearling steers, 1; other cattle, 6; sows and gilts, 1; sheep, 4; and chickens, 40. The most of the dairying that is done in this area is based upon the milking of cows of beef or dual purpose breeding.

Types of Farming.—The farms located within this area were grouped by the 1930 Census of Agriculture into about 9 different classes. Of the total number, cash-grain farms made up approximately 29 percent; crop-specialty, 24; general, 14; stock farms and ranches, 11; dairy, part-time and self-sufficing, 2 each; and poultry, 1 percent. The cash-grain farms, stock farms and ranches, and the general farms are quite evenly distributed over the area while the crop-specialty farms tend to be concentrated on the sandy soils of the second-grade land. (See figures 27, 28, 32 and 34.)

The average size of farm varied considerably among the several types. All farms within the area in 1929 averaged approximately 644 acres in size; stock ranches (those having 10 acres or more of grazing land to each acre of crops), 1,929 acres; stock farms (those having less than 10 acres of grazing
land to each acre of crops), 702; cash-grain, 692; crop-specialty, 529; dairy, 514; general, 512; self-sufficing, 232; and poultry, 202 acres. The total gross farm receipts of the area were distributed among the different sources in the following proportions: Cash-grain contributed 38 percent; all other cash crops (chiefly broomcorn, corn and beans), 24; meat animals and wool, 21; dairy animals and dairy products, 6; poultry and poultry products, 4; and the family used products, 7 percent.

The Dominant Type.—While there is no outstanding type of farm in this area, cash-grain is easily the most important. In 1929 this group included 29 percent of all farms and produced 41 percent of the total gross farm receipts of the area. The cash-grain farms that year derived averages of 84 percent of their gross income from the sale of crops, 6 percent from livestock, and 5 percent each from livestock products and the family used products. The farms of this type vary in size from as small as 50 acres to over 5,000 acres, the average being 692 acres. Winter wheat, the major cash crop, is followed by corn. While winter wheat may follow corn, much of the wheat follows wheat and some of it is grown on land that has been fallowed. Where winter wheat winter kills the land may be planted to corn, broomcorn, spring wheat, barley or the grain and feed sorghums.

Other Types.—Crop-specialty is the second most important type when measured both numerically and in terms of gross farm receipts. This group, in 1929, included 24 percent of all farms and produced 28 percent of the total gross farm receipts of the area. Broomcorn contributed the major portion of the receipts derived from the special crops, a very minor part coming from dry beans. Seventy-eight percent of the gross receipts of this type came from the sale of crops, 9 percent from livestock, 6 percent from livestock products and 5 percent from family used products.

In point of numbers the general farms stood third, with 14 percent of the total number of farms. Thirty-nine percent of the gross income of the general farms came from the sale of crops, 25 percent from livestock, 22 percent from livestock products and 14 percent from the family used products. The stock farms and ranches were fourth, numerically, and derived 72 percent of their gross income from livestock, 12 percent from crops, 10 percent from livestock products and 6 percent from the family used products.

Organization of a Cash-Grain Farm.—The description of a 640-acre farm that follows will illustrate the organization, equipment, and production programs of cash-grain farms in this area. The farm described is located in the east central part
of the area on sandy second-grade land and consists of 450 acres of crop land and 190 acres that is used for pasture, roads, fences and the farmstead. It is operated by the owner with the assistance of 12 months of family labor.

The major items of the machinery and implement equipment consist of a 15-27 horse power tractor, a disc plow, a one-way disc, a spike tooth harrow, a grain drill, a combine harvester, numerous small farm tools and an automobile. Although not a part of the equipment when the record was taken, the operator said a truck was very much needed. The livestock on this farm in 1933 consisted of 8 cows kept for milk, 7 beef cows, 2 sows, 60 chickens and 50 turkeys. Nine calves, 1,800 pounds of butterfat, 16 pigs, and 360 dozen eggs were produced.

The crop production program and the way the 450 acres of crop land were used are shown by table 10. Winter wheat is the cash crop produced on this farm and from 1929 to 1932 the total acreage seeded to this crop was harvested. In 1933, however, winter wheat was a complete failure. Of the 450 acres seeded in the fall of 1932 for the 1933 harvest, 100 acres were planted to cane and 350 acres were abandoned. Summer fallowing was practiced on this farm 2 out of the 5 years and 100 acres of cane were grown for the livestock each year. The yield of wheat was as follows: Eight bushels per acre in 1929, 1930 and 1932, and 20 bushels in 1931, there being no crop harvested in 1933.

Table 10.—Use of Crop Land: Winter Wheat Seeded, Crops Harvested, Land Fallowed and Land from Which No Crops Were Harvested on a 610-Acre Farm, 1929-1933.

<table>
<thead>
<tr>
<th>Item</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter wheat seeded</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>350</td>
<td>450</td>
</tr>
<tr>
<td>Winter wheat harvested</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>350</td>
<td>.....</td>
</tr>
<tr>
<td>Cane harvested</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>† 100</td>
</tr>
<tr>
<td>Land fallowed</td>
<td>100</td>
<td>50</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
</tr>
<tr>
<td>Crop land from which no crop was</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>350</td>
</tr>
<tr>
<td>harvested</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total crop land</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
</tr>
</tbody>
</table>

*Seeded the previous autumn for the 1929 harvest and so on through the other years.
†Grown on land that had been planted to winter wheat the previous fall.

**Area 17.—The Arkansas Valley Irrigated Area**

**Description of Area.**—Area 17 is located in the southeastern part of the state and includes some 375,000 to 400,000 acres of irrigated land lying along the Arkansas River in a comparatively narrow strip between Canon City in Fremont County and the Colorado-Kansas State line, a distance of approximately 185 miles. The area is not contiguous throughout its length and its width is quite irregular. (Figure 36). The elevation
above sea level is approximately 3,400 feet at the Kansas State line, 4,700 feet at Pueblo, and 5,333 feet at Canon City in Fremont County, the western extremity of the area.

From about 20 miles east of Canon City to within a few miles of Pueblo, the Arkansas River flows through a narrow valley or canyon with steep walls which are about 200 feet high and in places nearly perpendicular. Near its western end the canyon opens out into a broad valley in which Canon City and some 15,000 acres of irrigated land are located. From the eastern end of the canyon near Pueblo to the Kansas State line, the river has cut a broad but comparatively shallow valley. "This valley is bordered by steep rocky bluffs, high mesas, and terrace slopes in its upper part; by slopes of low lying mesas, hills, low river bluffs and terraces in the central part; and by more nearly level undulating country only slightly higher than the river valley in the lower part."

The area has the characteristic plains type of climate. That is, "A low relative humidity; a large amount of sunshine; a light rainfall, confined largely to the warmer half of the year; a moderately high-wind movement; a large daily range in temperature; high day temperatures in summer, and generally mild winters, with little snow and few protracted cold spells."**

The average annual precipitation ranges from about 12 inches in the western and central parts of the area to nearly 16 inches at Holly near the Kansas State line. The data given in figure 5 for the weather station at Pueblo show a wide variation in the annual precipitation from year to year. Likewise, the amount of snow that accumulates during the winter in the mountains drained by the Arkansas River and its tributaries varies greatly from winter to winter. This in turn largely determines whether there will be an abundance or a shortage of irrigation water during the latter part of the growing season. Of the total annual precipitation, from 75 to 80 percent comes from April to September, inclusive. (See small chart No. 3 superimposed on figure 4.) While the rainfall that comes during the growing season is erratic and not to be depended upon, it supplements the available irrigation water and may be very beneficial to crops when the flow of water in the river is low. However, much of the seasonal rainfall may be lost because so much of it comes as torrential rains, especially near the mountains. The area as a whole has a rather long growing season, the frost-free period in different parts varying from about 160 to 170 days.

**Climatic Summary of the United States, Section 24—Southeastern Colorado.
Area 17 occupies much of the floor of the Arkansas River Valley and some of the lower terraces bordering the valley to which water can be diverted most easily. For the most part the surface of the irrigated lands is fairly smooth and generally slopes both with and toward the river. Water is diverted directly from the Arkansas River and its tributaries by 23 large ditches or irrigation systems. A few of these systems have reservoirs for impounding water when it is possible. The present storage facilities are inadequate and crops frequently suffer for moisture toward the end of the irrigation season. It may be said, therefore, that with the present storage facilities all the land is now under irrigation for which there is available water. The water table is shallow in some localities and a number of pumping plants have been installed. Experience has shown, however, that pumping does not pay except where the lift is small, where the power is comparatively cheap, and where the crops produced make a high return per acre.

Area 17 presents a large variety of soil types which range from sand and sandy loams to clay loams and clay. Sandy loams and fine sandy loams are prominent close to the river while silt loams predominate on the bench lands adjoining the river valley. The large variety of soils permit a wide selection and adaptation of crops. In general, the soils are well supplied with nitrogen and lime but are rather low in organic matter. It was believed during the early years of the development of the area that the soils were so fertile that no fertilizers would be needed. Experience has shown, however, that the growing of alfalfa, sweet clover and green manure crops and the application of farm manure, well-rotted organic matter and commercial fertilizers rich in phosphates are very helpful in maintaining soil productivity and increasing crop yields. Drainage has become necessary in some localities, many open ditches have been dug and considerable land has been tile drained. A few areas have become so impregnated with alkali as to become unproductive.

Area 17 produces a wide variety of crops including corn and the small grains, hay and other feed crops, vegetables, melons, fruits, and a number of seed crops. It is also the second most important livestock feeding area in the state. It has been estimated that on January 1, 1934, there were 5,000 cattle and 275,000 sheep and lambs on feed within this area. For the 7 years, 1928 to 1934, the average number on feed January 1 was approximately 353,000 sheep and lambs and 9,000 cattle.

The first settlers came to area 17 during the early sixties. After the completion of the first large irrigation ditch in 1874,
development was quite rapid. The area is now served by three railroads: The Denver and Rio Grande Western, Missouri Pacific, and the Atchison, Topeka and Santa Fe. Towns are distributed at regular intervals along the railroads with shipping points in between. The area is also traversed from one end to the other by improved highways and all parts are reached by good roads. Many of the products of this area have a wide distribution in the markets of the United States.

During more than half a century types of farming within area 17 have been developing gradually under the process of trial and error. Markets have developed for certain products and farmers have learned much concerning the adaptability of the various crops to the different soil types, soil conditions, and the shortage of irrigation water that frequently develop toward the end of the growing season. All these have resulted in considerable variation in the types of farming now carried on in different parts of the area. Owing to these variations area 17 has been divided into three sub-areas: Sub-area 17-a includes the eastern part of area 17, sub-area 17-b the middle, and sub-area 17-c the western part. These three sub-areas are treated separately in this discussion.

Sub-area 17-a.—This sub-division includes all of the irrigated land lying along the Arkansas River in Bent and Prowers counties which is practically all of the irrigated land in these two counties and approximates 176,000 acres. Of the total irrigated area crops were harvested from about 147,000 acres in 1929. The remaining 19,000 acres represent irrigated pasture land and crop land from which no crops were harvested. It has been pointed out in the general discussion of area 17 that the supply of irrigation water is frequently inadequate for the production of crops that require water late in the growing season. This has, in sub-area 17-a, tended to favor the production of crops which mature early such as the small grains and to restrict the production of other crops such as sugar beets, which need water late in the season, to certain local areas that have an adequate supply of water for such crops.

In 1929 the hay crops made up about 48 percent of the total harvested acreage of irrigated crops, 99 percent of the hay acreage being alfalfa. The grain crops constituted 37 percent of the total; sugar beets, 7; alfalfa, clover and flower seed crops, less than 4; and vegetables and sorghum, less than 2 percent each. There were also small acreages of fruit, dry beans, cowpeas, tame grasses, clovers and small grains cut for hay. Corn occupied 55 percent of the area devoted to the grain crops; barley, 21; wheat, 20; and oats, 3 percent. Figures 8, 9, 10, 11
and 18 show the concentration of the principal crops along the Arkansas River in this sub-area.

The farms of this sub-division in 1929 were composed of the following types: Crop-specialty made up 59 percent of the total number; stock farms and ranches, 14; general, 11; cash-grain, 6; dairy and poultry, 2 each; self-sufficing, 1; and abnormal and unclassified, 5 percent. Crop-specialty, it is seen, is the pre-dominating type. Alfalfa hay, sugar beets, alfalfa seed and clover seed are the special crops from which the crop-specialty farms derived 40 percent or more of their gross receipts. Since the Arkansas Valley is the second most important cattle and lamb-feeding district in Colorado, much of the alfalfa hay is fed on the farms where grown, some of it is sold locally to extensive cattle and lamb feeders and much of it is shipped to mid-western markets either as hay or alfalfa meal.

The second dominant type in this sub-area is the stock farm and ranch. About 93 percent of this type may be considered stock farms, since they have less than 10 acres of pasture land to each acre in crops. The other 7 percent have 10 acres or more of pasture land per acre in crops. For the most part the stock farms and ranches are only partially irrigated, the grazing land lying to the north or south of the river outside of this sub-division. Many of the stock farms are simply farms on which lambs or cattle are fed during the late fall and winter.

The agriculture of sub-area 17-a differs from that of sub-area 9-a* in the following particulars: Alfalfa occupies a much higher and sugar beets a much lower proportion of the crop land in 17-a than in 9-a; a much higher proportion of the alfalfa hay crop is sold in 17-a than in 9-a; lamb and cattle-feeding operations are carried on much less extensively in 17-a than in 9-a in proportion to their areas of irrigated land; and the water supply for the closing portion of the growing season is not so adequate one year with another in 17-a as it is in 9-a.

Sub-area 17-b.—This sub-division consists of that part of area 17 lying within Otero, Crowley and Pueblo counties. Roughly estimated it includes about 200,000 acres of irrigated land lying along the Arkansas River in these three counties. In 1929 crops were harvested from approximately 73 percent of the irrigated land. The remainder (27 percent) was irrigated pasture land or crop land from which no crops were harvested.

The hay crops formed 36 percent of the total acreage of harvested crops; the grain crops made up 26 percent; sugar beets, 15; vegetables, 12; seed crops, 5; dry beans, 4; and all fruits, 1 percent. Fully 93 percent of the hay acreage was al-

*In Northern Colorado.
falfa, the remaining 7 percent consisting of tame grasses, clovers, wild or native grasses, and small grain cut for hay. Corn is the leading grain crop and occupied 60 percent of the grain-crop acreage. The other grain crops, mentioned in the order of their importance in terms of acres harvested, were barley, wheat and oats.

A large variety of vegetables is produced in this sub-division. Cantaloupes (including muskmelons) are the most important of this group of crops and in 1929 made up 43 percent of their total acreage; onions occupied 17 percent of the acreage; cauliflower, 11; cucumbers, 7; tomatoes and snap beans, nearly 5 each; and watermelons, 3 percent. Cabbage, sweet corn, table beets, celery, lettuce, green peas, and asparagus are the more important other vegetables grown. The more important seed crops are alfalfa, clover, cantaloupes, cucumbers, and annual flowers. Figures 8, 11, 15 and 17 show the concentration of the principal crops in this sub-area.

A rather wide variety of types of farming is carried on within sub-area 17-b. Crop-specialty farms in 1929 made up 43 percent of the total number of farms; truck farms, 19 percent; general, 13; stock farms and ranches, 7; poultry, 3; dairy, 2; fruit, cash-grain and self-sufficing, 1 percent each; and abnormal and unclassified together, 10 percent. Figures 28 and 30 show the concentration of the crop-specialty and truck farms along the river within the area.

The above percentages show the dominating position of the crop-specialty farms in this subdivision. Sugar beets, alfalfa hay, and seed crops of alfalfa, clover, melons, cucumbers, and annual flowers are the special crops from which the crop-specialty farm received 40 percent or more of their gross farm receipts. Truck farms are next in importance, numerically, and stock farms and ranches third. Twenty-nine percent of the stock farms and ranches had 10 acres or more of pasture land to each acre in crops and may be considered real stock ranches. The remainder, 71 percent, had less than 10 acres of pasture per acre in crops. Since this is an important cattle and lamb-feeding area, the 71 percent may be only farms on which feeding operations were carried on for 60 days or more during the fall and winter, the stock being purchased at the beginning of the feeding period.

As in area 9-a* the cropping systems followed in this subdivision are very flexible. This is due mainly to the large number of crops that are well suited to the climatic and soil conditions of the area and from which farmers may choose in making up their production programs. The cropping system

*In Northern Colorado.
varies greatly from farm to farm and on the same farm from year to year. Shifts in the acreage devoted to the respective crops on an 80-acre farm during a 10-year period are presented in table 11.

The proportional distribution of farms by types in this subdivision as given above should not be considered as a fixed classification. Rather the type to which individual farms belong may be looked upon as shifting more or less from year to year. This is due, chiefly, to changes in the prices of farm commodities, to changes in the acreage devoted to the respective crops produced, and to changes in the numbers of cattle and lambs fed year by year. Such changes cause corresponding changes in the gross receipts from the various sources and this in turn may shift the individual farm from one type to another. The livestock of this area is chiefly concerned with the fall and winter feeding of lambs and cattle purchased during the late fall to utilize sugar beet by-products, alfalfa, corn and barley. In this respect area 17-b is very similar to area 9-a in northern Colorado inasmuch as the production of sugar beets and feed crops (alfalfa, corn and barley) and the feeding of cattle or lambs are each a necessary part of a well-defined type of farming.

Organization of an 80-Acre Farm.—A brief description of an 80-acre irrigated farm located in Otero County is given herewith to illustrate the organization and the variability of the crop-production program of farms in sub-area 17-b. The owner-operator of this farm maintains a record of his receipts and expenditures. From 1922 to 1931 inclusive, the farm was visited each year by a representative of the Colorado Agricultural College who prepared annually a summary of the business of the farm.

The average capital involved in this farm business during the 10-year period was distributed approximately as follows: Farm dwelling, $3,968; other buildings, $744; land, $7,288; livestock, $1,405; and machinery, implements and tools, $503.

The average amount of livestock on the farm during the 10 years at the time the summaries were made included 5 work horses, 1 pony, 6 dairy cows, 2 calves, 1 bull, 6 brood sows, 24 other hogs, and 90 chickens.

Practically all of the land in this farm was used for producing crops except that occupied by the farmstead, fences, roads, ditches, canals, etc. The acreage of the various crops harvested each year during the period is shown in table 11. The total acreage of all crops harvested average 75.4 acres and varied from 70.5 acres in 1922 to 78.0 in 1927. The variation in the
total acres of crops harvested annually was probably due to errors in the estimates of the acreage of the individual crops and to bringing more land under irrigation during the later years of the period.

The acreage devoted to each of the 12 crops listed in table 11 varied greatly from year to year. A careful inspection of the table indicates there was no fixed crop rotation or cropping system followed on this farm. While alfalfa, sugar beets, and corn were grown every year of the 10-year period, the acreage devoted to each of these crops varied considerably. The acreage in alfalfa ranged from 11 to 21 acres; that of sugar beets from 13 to 24 acres; and that of corn from 2 to 11 acres. Oats and cantaloupes were each grown 8 out of the 10 years; dry beans, 5; barley and wheat, 4; onions, cucumbers and red clover seed, 3; and cowpeas, 2 years. The cantaloupes and the cucumbers were marketed both as fresh vegetables and as seed crops while the red clover produced a crop of hay and a crop of seed.

Table 11.—Acreage of Crops Harvested on an 80-Acre Irrigated Farm, Otero County, Colorado, 1922 to 1931.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total crop harvested</th>
<th>Alfalfa</th>
<th>Sugar beets</th>
<th>Corn</th>
<th>Oats</th>
<th>Wheat</th>
<th>Cantaloupes</th>
<th>Cucumbers</th>
<th>Cowpeas</th>
<th>Dry beans</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>70.5</td>
<td>17.0</td>
<td>19.0</td>
<td>5.0</td>
<td>4.5</td>
<td>3.0</td>
<td>22.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1923</td>
<td>71.5</td>
<td>14.0</td>
<td>24.0</td>
<td>5.0</td>
<td>5.0</td>
<td></td>
<td>6.0</td>
<td>12.0</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1924</td>
<td>75.5</td>
<td>19.0</td>
<td>19.0</td>
<td>2.0</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td>19.0</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td>77.0</td>
<td>13.0</td>
<td>21.0</td>
<td>4.0</td>
<td>5.0</td>
<td>9.5</td>
<td></td>
<td></td>
<td>18.0</td>
<td></td>
<td>6.0</td>
</tr>
<tr>
<td>1926</td>
<td>77.0</td>
<td>15.0</td>
<td>13.0</td>
<td>4.0</td>
<td>7.0</td>
<td>6.0</td>
<td></td>
<td></td>
<td>12.0</td>
<td></td>
<td>14.5</td>
</tr>
<tr>
<td>1927</td>
<td>78.0</td>
<td>19.0</td>
<td>14.0</td>
<td>4.5</td>
<td>5.0</td>
<td>8.0</td>
<td>22.0</td>
<td></td>
<td></td>
<td></td>
<td>5.0</td>
</tr>
<tr>
<td>1928</td>
<td>75.5</td>
<td>21.0</td>
<td>17.0</td>
<td>11.0</td>
<td>5.0</td>
<td>5.0</td>
<td>13.0</td>
<td></td>
<td></td>
<td></td>
<td>3.9</td>
</tr>
<tr>
<td>1929</td>
<td>77.0</td>
<td>20.0</td>
<td>13.0</td>
<td>5.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td></td>
<td>3.5</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>75.5</td>
<td>16.0</td>
<td>14.0</td>
<td>10.0</td>
<td></td>
<td>8.0</td>
<td>5.0</td>
<td></td>
<td>6.0</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>76.5</td>
<td>11.0</td>
<td>16.5</td>
<td>10.0</td>
<td></td>
<td>8.5</td>
<td>10.0</td>
<td></td>
<td>3.0</td>
<td>14.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

It is thus seen that the operator of this farm had a large list of crops from which to choose each year in making up his crop-production program. He followed no fixed rotation plan, shifting the acreage devoted to the respective crops in accordance with his interpretation of the prospects of the future markets. On the basis of the gross income, this farm would have classified as a crop-specialty farm each year of the 10-year period. The farm income (receipts less expense) from this farm during the 10 years averaged $2,704 and ranged from $1,607 in 1931 to practically $7,000 in the best year.

Sub-area 17-c.—This subdivision of area 17 is confined to the irrigated lands adjacent to the Arkansas River in the east central part of Fremont County. It is completely isolated from
sub-area 17-b and differs from that subdivision chiefly by the greater attention given to fruit, poultry and part-time farming and by a decrease in the relative importance of livestock feeding, and the production of sugar beets, cantaloupes, onions and seed crops.

Alfalfa in 1929 occupied the greatest acreage of any of the crops, the grain crops, chiefly corn, came next with orchard fruits third. That year about 2,000 acres were devoted to orchard fruits and 1,500 acres to vegetables. The area is one of the important apple districts of the state. It also produces some cherries and small fruits. The vegetables grown consist mostly of snap and string beans, cabbage, lettuce, cauliflower, tomatoes, sweet corn, green peas and celery.

The farms of this subdivision in 1929 were distributed among the several types in the following proportion: Part-time farms made up 21 percent; fruit farms, 16; general, 12; stock farms and ranches, 9; truck, 8; poultry, 7; crop-specialty, 6; dairy and self-sufficing, 5 each; cash-grain, 1; and abnormal and unclassified together, 10 percent. Canon City (a town of about 6,000 inhabitants), and the mines and cement mills in the surrounding country provide a local market for much that is produced. This is one of the few localities within the state where part-time farming is the leading type, numerically.
Cost of producing 100 pounds of gain in feeding steers, 1922-30

Cost of producing 100 pounds of gain in feeding lambs, 1922-30

Comparison of Steer and Lamb Costs
THE OLD VS. THE NEW

This study includes a discussion of some of the more important factors which have had a direct bearing upon the agricultural development of Colorado and it embraces a picture of this essential industry as shown by the United States census records for the year 1929.

Since that date a period of extremely low rainfall years has occurred and it has been apparent that some of our land utilization plans have been fundamentally unsound. An attempt has been made to grow crops on lands which, under recent conditions, would have been better adapted to grazing. If maximum returns are to be secured from these areas in future years some abrupt adjustments should be made. Recent studies have indicated the necessity for such changes.

Through education and sympathetic cooperation on the part of all who have the best interests of this state at heart, it is hoped that constructive plans may be made effective so that the errors of the past can be avoided in the future. A sound future policy must be based upon a careful review of the facts and conditions of the past.

The authors of this publication trust that this contribution may serve as a stepping stone to a more permanent agriculture in Colorado.