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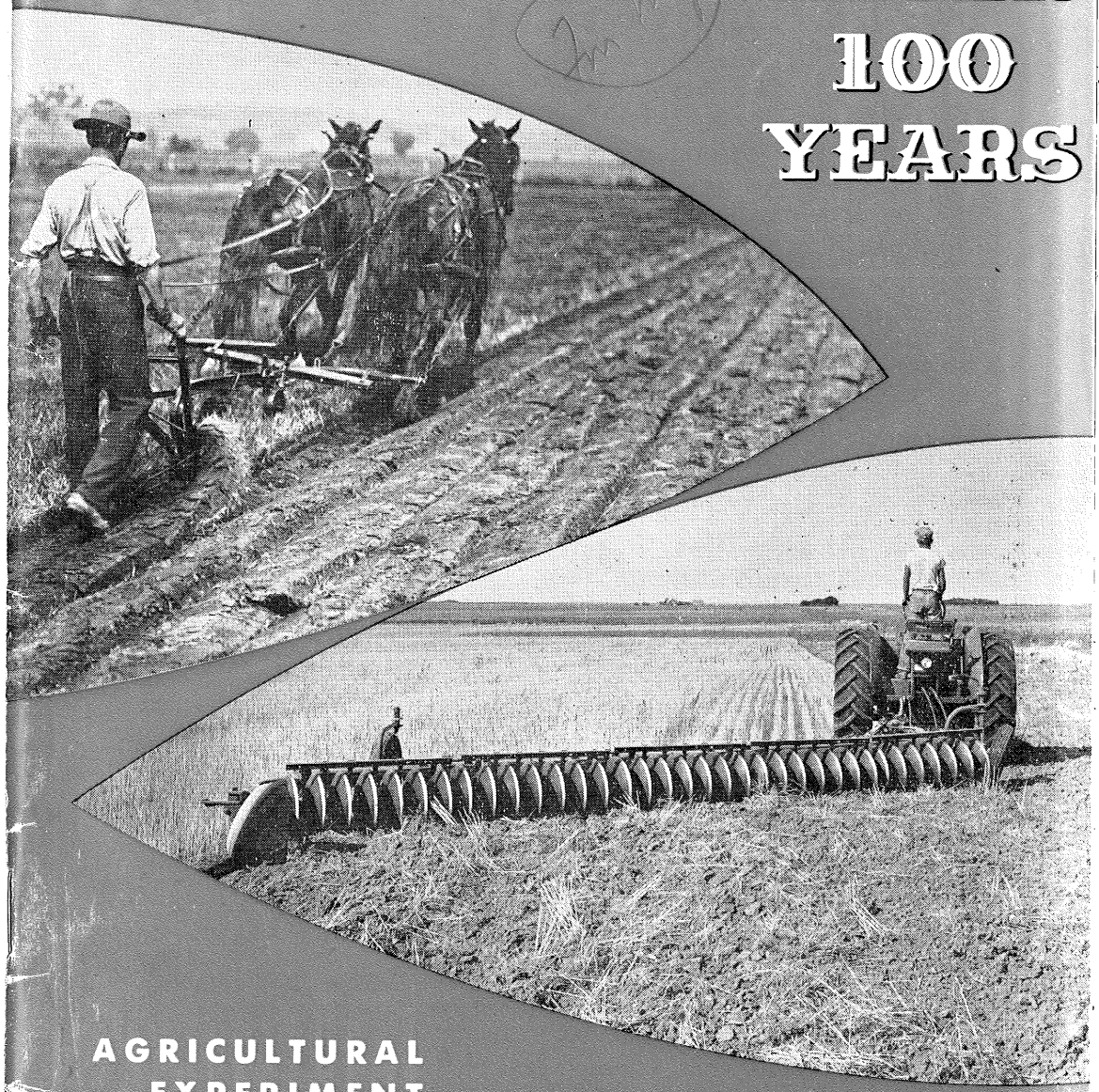
KANSAS AGRICULTURE AFTER 100 YEARS



AGRICULTURAL EXPERIMENT STATION

KANSAS STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE

CONTENTS

Kansas Agriculture After 100 Years[1]

by
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INTRODUCTION

The purpose of this bulletin is to provide a brief summary of the agriculture of Kansas, of the changes which have occurred, and of some of the factors that have influenced its development.

The type of farming carried on in any area is determined by physical, biological, and economic factors. Topography, soil, and climate (particularly rainfall and length of growing season) are among the most important physical factors. The Flint Hills area is a grazing region because of its topography. Cotton never became an important crop in Kansas because the growing season is too short. Corn is less well adapted than wheat to the temperature and rainfall conditions of central and western Kansas. As a result, corn production is now largely restricted to the eastern quarter of the state and the northern tier of counties. Insect pests and diseases have influenced the crops produced in various areas of the state. Development of new varieties, for example the combine-type sorghums, has been a decisive influence in determining the agriculture of certain areas.

Nearness to markets is one of the most important economic factors. Perishable products, and those that are bulky relative to their value, tend to be produced near their markets. This tendency is illustrated by the concentration of fluid milk production in the Kansas City and Wichita milksheds.

Change has been the rule rather than the exception in Kansas agriculture. The changes brought about during the last 30 or 40 years by technological progress and economic forces have been almost as dramatic as the changes from "Indian country" to "cow country" to a settled agriculture a half century earlier. The great expansion in wheat production in western Kansas following World War I resulted from a combination of technological and economic factors. More efficient tractors, tillage equipment, and combines made it possible to farm large acreages quickly and at relatively low cost. At the same time a high price for wheat, which reflected the strong demand, stimulated farmers to plow up grassland and produce wheat.

Some changes in the agriculture of the state resulted from the conditions of settlement. Most of the early settlers came from places with humid climates and they attempted to trans-

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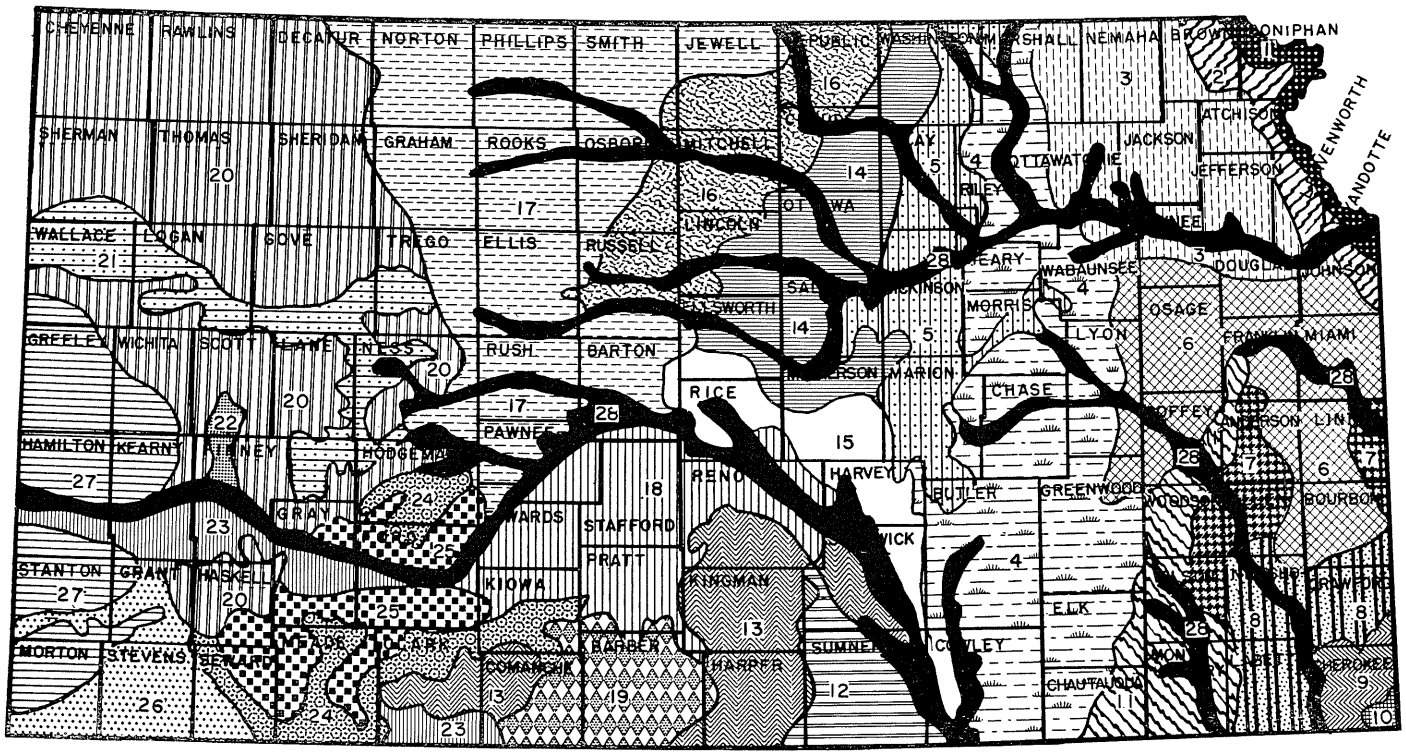

Fig. 1.—Major soil areas shown on map of Kansas, above, are described by their corresponding numbers and "keyed" shaded areas on page 3. Source: O. W. Bidwell, **Major Soils of Kansas,** Kansas Agricultural Experiment Station, Circular 336, Manhattan, 1956.

1. Monona, Marshall. Productive corn soils in the loess hills region bordering the Missouri river; sheet erosion and gullying are serious problems, so terracing and contouring are necessary.

2. Sharpsburg, Shelby, Marshall. Loessial soils cap the ridge tops, and glacial till soils occur on the lower slopes. All three soils are adapted to corn, wheat, red clover, and alfalfa.

3. Grundy, Crete, Pawnee, Burchard, Shelby. The first two are loessial soils that occur on ridge tops. The last three are glacial till soils found on lower slopes. Much of the "9" Area land has been damaged by sheet erosion. The nearly level loessial soils are suited to corn, and all five soils are adapted to wheat and alfalfa.

4. Sogn, Summit, Florence, Idana. Mostly thin, rocky soils good for bluestem and associated grasses. Many pastures have been overgrazed. Getting enough cultivated land to go with pasture is a problem that has caused too much land suitable only for grasses to be cultivated.

5. Crete, Ladysmith, Kipp, Idana. Fine textured, claypan soils well adapted to wheat, may be cropped to sorghum if care is taken to prevent erosion—which is a serious hazard.

6. Summit, Woodson, Labette, Bates. General farming prevails on these acid, residual soils that tend to lack phosphorus. Erosion, poor pasture management, and low fertility are the chief problems of this area.

7. Woodson, Parsons, Labette, Bates. Problems of these residual soils vary from the poorly drained Parsons to the somewhat excessively drained Bates. These soils are deficient in plant nutrient elements, so need fertilizers. Best crops are small grains, corn, and alfalfa.

8. Parsons, Dennis, Bates. Soils lack fertility in this area, but adding fertilizers and lime overcomes this problem. In addition, the claypan of the Parsons soil causes drainage problems during wet seasons.

9. Cherokee, Taloka, Parsons, Dennis, Bates. The first three of these soils have a distinct claypan that reduces moisture penetration. Wheat yields in years of wet springs are reduced. Drought is a serious hazard on all of these soils, and all have low fertility.

10. Bodine. The thin, stony, acid, soils of this area are best adapted to forest and grassland.

11. Darnell, Stephenville, Dennis, Boone. The more nearly level areas of these sandy residual soils may respond to good management, fertilizer, and lime. Although some areas are adapted to crops, in general, this area is more suitable for grazing than for cultivation.

12. Idana, Renfrow, Kipson. The dark clay and claypan, residual soils of this area are well adapted to wheat if care is taken to prevent erosion and if fertilizers are supplied.

13. Grant, Albion, Vernon, Renfrow. Soils of this area developed from old, sandy outwash materials which overlie clay and pack sand, resulting in sandy and clayey soils. More level areas adapted to wheat production.

14. Lancaster, Hedville, Longford. Soils of this area are naturally infertile. Where suitable for cultivation, they respond well to good management, liming, and fertilizing. Many thin soils and steep slopes are best adapted to pasture.

15. Crete, Goessel. These nearly level claypan soils have slow permeability which adapts them best to wheat. In years of adequate moisture grain sorghums do well.

16. Crete, Hastings, Nuckolls. Corn is grown in the northern part of this area; wheat and sorghum in the southern part. The heavier Crete soils tend to occur on the nearly level areas.

17. Hastings, Holdrege, Colby. Wheat and sorghum are adapted to these soils with corn in addition in the north one-fourth of the area.

18. Pratt, Albion, Derby. These sandy loam and loam soils are adapted to wheat, sorghum, and alfalfa. Their permeable nature and high water table provide good moisture relations for crops, pastures, and shelterbelts.

19. Vernon, Quinlan, Albion. This area has limited cultivated acreage. Pastures contain mid and short grasses where canyons and gully walls are not too steep.

20. Keith, Colby. Except for steep slopes adjacent to stream valleys, the nearly level soils of this area are adapted to wheat and sorghum. The Keith soil irrigates well.

21. Canyon. Shallow soils occur on steeply sloping lands adjoining the streams. Grasses do poorly on these barren slopes.

22. Keith, Hoisington. Water tends to accumulate in the undrained depressions during summer months making them unsuitable for wheat. Extensive areas of land suitable for cultivation and pasture occur between the depressions.

23. Dune Sand, Tivoli. These undulating to rolling soils are best suited to native grasses such as sand bluestem. When properly managed, they should produce good pasturage.

24. Canyon, Mansker. These steeply sloping, highly eroded, droughty, and limy soils should not be cultivated. Sorghum chlorosis may be expected to occur here.

25. Richfield, Colby. The soils of this area are finer textured than those of adjoining areas and problems of water erosion are more serious. Wheat yields well on these soils.

26. Dalhart, Richfield, Mansker. These sandy land soils are susceptible to wind erosion and need native grasses to protect them. Many cultivated areas have suffered severe wind erosion.

27. Richfield, Colby. Except for receiving less rainfall, the soils of this area are similar agriculturally to those of Area 25.

28. Alluvial soils of the flood plains and terraces. These water-deposited soils are generally highly productive, except where poorly drained. In eastern Kansas much of this area is devoted to corn and alfalfa. With irrigation, intensive vegetable and fruit production is possible on most of these soils.

fer the crops and cultural methods of their former homes to the subhumid climate of central and western Kansas. As a result, corn was the most important crop in the early agriculture of Kansas. Spring wheat was more important than winter wheat. Some changes came quickly, others came quite slowly. By 1879, spring wheat occupied only about one fifth of the total wheat acreage but not until 1907 did the acreage of wheat exceed that of corn.

Dramatic changes have occurred in the income of Kansas farmers. Cash farm income from marketings of crops, livestock, and livestock products increased from an average of only $259,460,000 for the period 1935-39 to $1,192,000,000 in 1952 but declined to about $943,000,000 in 1954.

PHYSICAL CHARACTERISTICS OF THE STATE

Topography and soils.[3] Geologically, Kansas is a series of northeastward trending plains, with the largest and smoothest at the extreme west. The elevation varies from 744 feet above sea level in Montgomery County, near the southeastern corner, to 4,059 feet in Wallace County, on the border nearly 400 miles west. The tilt of each of the series of plains is generally southwestward, the east edge of each plain being irregular and marked by a series of east-facing bluffs, escarpments, or low hills that run roughly northeastward and expose the bedrock.

A great mantle of outwash materials was brought down by ancient streams from the old Rocky Mountains and deposited on the bedrock at the western portion of the broad western plain and along the general course of the Arkansas River. Glaciers covered the northeastern corner of the state with boulders, gravel, sand, and clay. Then winds deposited fine silty material over much of the state. Figure 1 shows the major soils of Kansas. The areas do not have fixed boundaries but overlap to some extent.

Precipitation and temperature. Average annual precipitation varies from approximately 42 inches in the southeastern corner of the state to between 16 and 18 inches along the western border.[4] Figure 2 shows that this variation is remarkably uniform. Counties in the northeastern part of the state have less precipitation than those in the southeastern part but northwestern counties have more than those in the southwest. A higher proportion of the rainfall comes in heavy rains in eastern than in western Kansas; as a result, damage from runoff is much greater. On the other hand, a higher proportion of the rainfall in western Kansas comes as light rains which may not penetrate to the root zone of plants.

3. For a more complete discussion of Kansas topography and soils see Fly, Claude L., "Natural Agricultural Resource Areas in Kansas" in **Soil Conservation in Kansas,** a report of the Kansas State Board of Agriculture, 1946, and Bidwell, O. W., **Major Soils of Kansas,** Kansas Agricultural Experiment Station, Circular 336, Manhattan, 1956.

4. Data on precipitation and other climatic factors are from Cardwell, A. B., and Flora, S. D., **Kansas Weather and Climate,** Bulletin 302, Kansas Agricultural Experiment Station, 1942, and **Climate of Kansas,** a report of the Kansas State Board of Agriculture, 1948.

The eastern third of the state, with an elevation of 800 to 1,200 feet, has higher relative humidity, less sunshine, and less range between day and night temperatures than the rest of the state. The middle third, with an elevation of 1,200 to 2,000 feet, is drier, has more sunshine and more wind, and a greater difference between day and night temperatures than the eastern part. The western third, often known as the "Short Grass Country," has an elevation ranging from 2,000 to 4,000 feet from east to west. The air is drier and there is more wind movement than elsewhere in the state. As a result evapora-

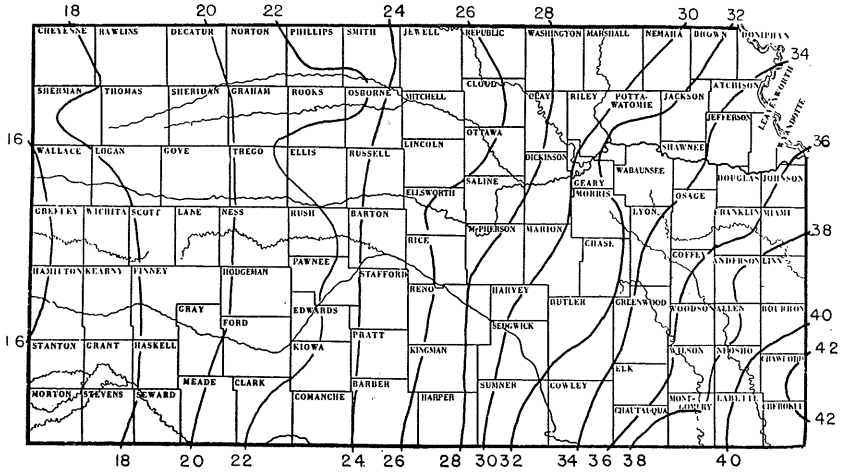

Fig. 2.—Average annual precipitation in Kansas, in inches, 1898-1942. Source: Adapted by L. D. Bark, climatologist, Kansas Agricultural Experiment Station, 1956, from **Climate of Kansas,** Report of the Kansas Board of Agriculture, 1948.

tion from both plant and ground surfaces is more rapid, intensifying the effect of low rainfall. The range between day and night temperature is much greater in this area. Although summer days are hot, the nights are usually cool.

Equally as important as the total precipitation is its seasonal distribution. Figure 3 shows that Kansas is particularly fortunate in that a high percentage occurs during the growing season. Although average annual precipitation is lighter than in most states farther east, from 70 to 78 percent of the annual fall of moisture occurs during the period April to September.

> Except for some of those along the Gulf Coast, no state in the country has as much rainfall during the summer months as the eastern third of Kansas. Even in the middle third of the state, approximately 20 inches fall during these six months, which is within 2 inches of the amount that falls in the same season

in Illinois, Indiana, Ohio, New York, and the New England states; and the western third, sometimes referred to as the "semiarid region," has an average fall of 15 inches for this period, which almost equals the normal amount for Michigan and Wisconsin and is approximately three-fourths of average for Iowa for these months.[5]

Figure 3 shows that the decrease in rainfall from east to west in Kansas is partially offset by the higher proportion that occurs during the growing season. The winters, particularly in the western part of the state, are usually dry. For example, the normal precipitation for the five months, No-

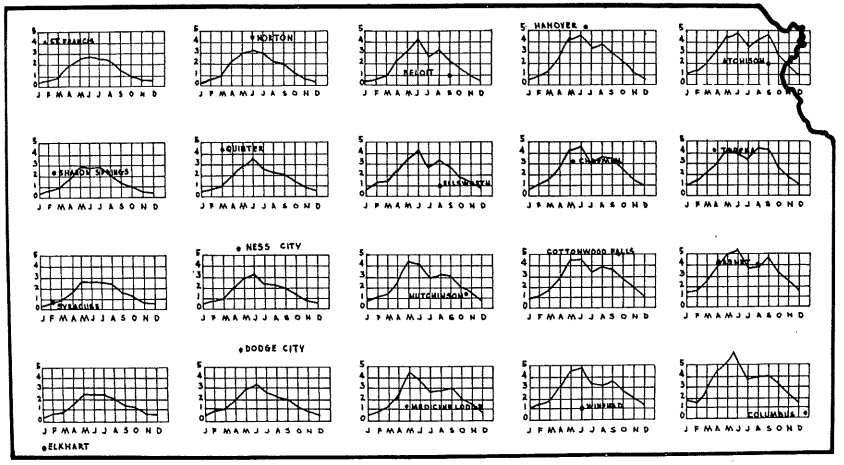

Fig. 3.—Distribution of normal precipitation in Kansas. Source: **Climate of Kansas**, Report of the Kansas State Board of Agriculture, 1948.

vember to March, is less than 3½ inches at Ness City, in Type-of-Farming Area 10a, and less than 2½ inches at Sharon Springs in Area 12. These dry winters are healthful and favorable for livestock production, particularly pasturing of wheat and buffalograss. However, they often leave the ground dry and in a condition for wind erosion in the spring.

The annual mean temperature of Kansas is almost as high as that of Virginia but the range from hot summers to cold winters is much wider. Extremely cold winters accompanied by unfavorable moisture conditions may result in winterkilling of wheat. Only a few days of hot, dry winds during the critical tasseling period may greatly damage Kansas corn crops.

Hail. The geographical distribution of hail is almost exactly the reverse of the annual precipitation, the hail hazard increasing from east to west across the state. Occasional hail-

5. Cardwell, A. B., and Flora, S. D., **Kansas Weather and Climate,** Bulletin 302, Kansas Agricultural Experiment Station, 1942, p. 9.

storms are severe in the high plains, where hailstones have accumulated in drifts more than a foot deep. They are most frequent in May and June when wheat is approaching maturity. Damage may be severe over limited areas. Hail damage varies greatly from year to year but in Kansas a wet summer (particularly in May and June) usually is accompanied by more hail loss than usual.

Individual hailstorms striking in the heart of the wheat belt have caused great losses but average annual loss from 1936 to 1945 was only 4 percent of the total wheat yield of the state, which is much less than insect damage.[6]

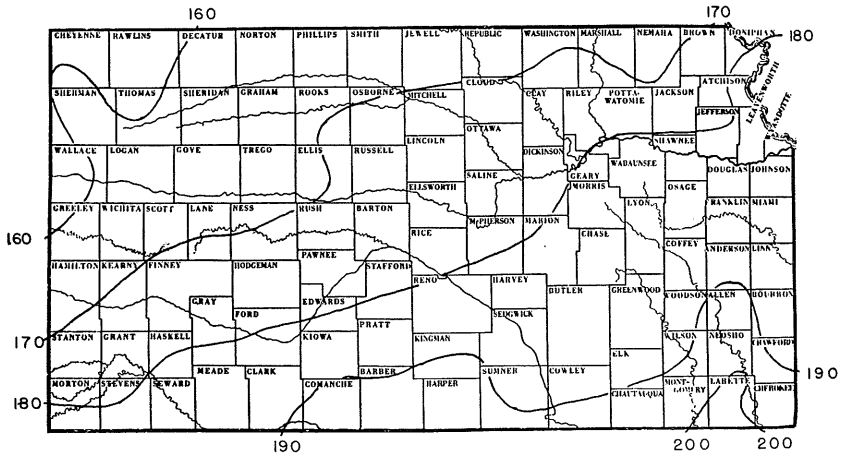

Fig. 4.—Average number of frost-free days in Kansas. Source: Adapted in 1956 by L. D. Bark, climatologist, Kansas Agricultural Experiment Station, from **Climate of Kansas,** Report of the Kansas State Board of Agriculture, 1948.

Length of growing season. The average length of the frost-free season (Fig. 4) varies from about 195 days in the southeastern corner of the state to 155 days in the northwestern corner, an average difference of 40 days. In all parts of the state the length of the season varies. Hamilton County's growing season, on the western border, has varied from 117 to 193 days and Cherokee County's, in the southeast corner, from 161 to 231 days.

Crops are limited by the length of the growing season. The short growing season of most of Type-of-Farming Area 11 makes it necessary to grow earlier maturing varieties of summer crops such as grain sorghum, which usually yield less than later maturing varieties.

Changes in climate. Many farmers who settled Kansas were convinced, or wishfully thought, that the climate was becom-

6. **Climate of Kansas,** Report of the Kansas State Board of Agriculture, 1948, p. 265.

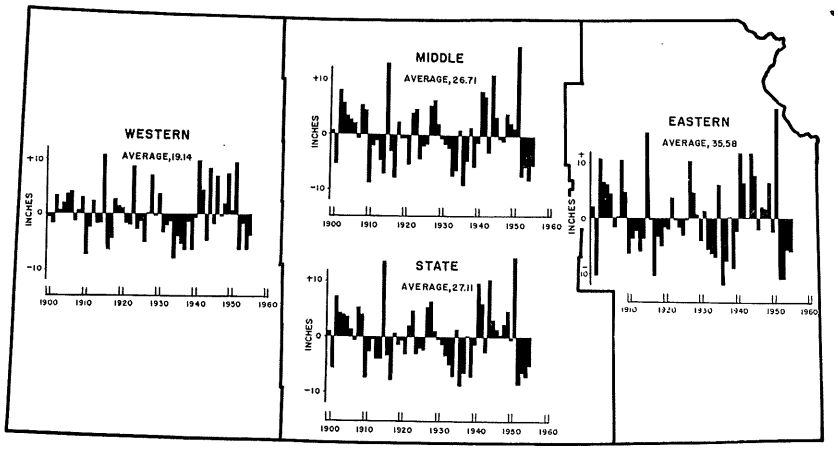

Fig. 5.—Deviations from average precipitation, Kansas, 1900-1955. Source: Calculated from Reports of the Kansas State Board of Agriculture.

ing more humid. The principal arguments were that plows opened the soil to absorption and retention of moisture, that trees induced rainfall, and that rainfall followed civilization. The idea was especially prevalent from 1875 to 1885 and again during the rather wet period 1901 to 1915. But Prof. E. M. Shelton of the Kansas State Agricultural College argued that the climate was not changing and urged farmers to seek methods of farming appropriate to a subhumid climate.[7] Prof. E. Gale, also of the Kansas State Agricultural College, formulated a tree-ring calendar from 1760 based on his study of tree rings from the Republican River valley and the vicinity of Manhattan. He concluded:

> For a period of one hundred and fifty years, at least, the wood growth of our native forests, in the variableness of its successive seasons, is almost a perfect repetition of what we have witnessed for the last twenty years. It remains for man, so far as he has the power, instead of indulging in quixotic dreams of cosmic revolutions, to counteract on the one hand unfavorable influences, and, on the other, make all possible provision for the contingencies of the climate. We may also come to the conclusion that it is not wise to infer, because we have enjoyed three or four bountiful years, that the order of nature has changed, for the testimony of the forest is that there were years, long ago, just as fruitful, before the white man had come with his plow, and smoke, and electricity.[8]

7. The Industrialist, Manhattan, Kansas, January 11, 1877, quoted by Malin, James C., **Winter Wheat in the Golden Belt of Kansas,** University of Kansas Press, Lawrence, 1944, p. 107.

8. The Nationalist, Manhattan, February 22, 1878. Quoted by Malin, p. 107.

Kansas, like most of the Plains area, has had alternately recurring wet and dry periods. But there are no known clues to suggest when they will occur in the future and no reason to believe that a rather irregular sequence will not occur indefinitely.

Figure 5 shows the precipitation for the three principal sections of the state and for the entire state for 1910-55 expressed in deviations from the average for that period. There is clear evidence of great variability but not of systematic change. The period 1900-1910 was one of above-average rainfall, as was the 1940 decade. However, in 1911-1920 and the decade of the 1930's rainfall was well below normal. Yet occasional dry years occurred in periods of above-normal rainfall and vice versa. For example, 1915 was one of the wettest years Kansas has known, yet it occurred in a period of below-normal rainfall.

HISTORY AND DEVELOPMENT

The Great American Desert. For some time after the geography of the West was fairly well known, much of Kansas was supposed to be unfit for human habitation, at least by civilized people. Even after settlement of eastern Kansas had begun, it was thought that the western part could never become agricultural. Most maps of the 1830's and 1840's showed an area called the "Great American Desert," which was frequently compared with the Sahara. The location was rather indefinite. The earliest maps included all the area between Missouri and the Rocky Mountains, while later ones gave the eastern boundary as approximately the center of Kansas. Of this early misconception Connelley wrote:

> If the facts could have been known, the geographers would have put the desert districts back of the Rocky Mountains where they may still be found. The two great divisions of Kansas, as applied to natural productions, are well defined. They are separate, one from the other, and entirely unlike in physical aspect. They are the Prairies and the Great Plains. The Prairies extend from the Missouri Border to an irregular line passing through Council Grove. It is one of the fairest regions of the world. It is rolling country and well watered. The streams are fringed with fine trees. . . . For some thousands of years, at least, the prairies have been grass-clad, well watered and fertile. They never possessed in historic times any of the characteristics of the desert.
>
> The Great Plains extended from the western borders of the Prairies about Council Grove to the Rocky Mountains. . . . That was a country of frayed out and disappearing streams. There was little or no timber. Stretches of drifting sand were to be found, but these were not deserts in the true sense. The country was almost all covered with buffalograss—perhaps the

> most nutritious of all grasses. . . . The Great Plains were the pastures, par excellence, of the buffalo. The antelope was also native to the Great Plains. . . . The deer, the wolf, the coyote, the rabbit, and numerous birds were to be found on the Great Plains. So, even there the characteristics of the desert were entirely wanting.
>
> There was a Great American Desert. It exists to this hour but . . . it never did exist in the territory composing Kansas. The mistake of the early geographers was in placing the Great American Desert on the Great Plains.[9]

Early Development. Kansas territory was opened for settlement in May, 1854. In 1874, Secretary Gray,[10] of the Kansas State Board of Agriculture, writing of preterritorial days, said:

> At that time its choicest lands were occupied as reservations by the New York Indians, Pottawatomies, Sacs and Foxes, Weas, Shawnees, Wyandottes, and other Indian tribes, in the eastern portion of the territory; while the Comanches, Kiowas, Cheyennes, Arapahoes, and other wild tribes, wandered over the western portion.

From the beginning, Kansas was the battleground between the North and the South. Many of its settlers came not so much to farm as to fight for or against the extension of slavery. After bloody fighting, Kansas entered the Union as a free state in 1861. Because it furnished more soldiers for the Civil War than it had voters, it is not surprising that little progress in farming was made during the Civil War.[11] The history of Kansas virtually begins at the close of the war, in the summer of 1865.

The geographical order of the early development is indicated rather roughly by the date of organization of the various counties (Fig. 6). The first settlements were in the northeastern corner of the state and along the Missouri border. By the end of the Civil War settlements had been made in most counties in the eastern third of the state, although population was sparse except in the northeastern counties.

Great impetus to settlement of Kansas was given by the Homestead Act of 1862, especially by the pre-emption privilege extended to Union soldiers. In 1863 Congress granted Kansas land for railroads, and for some time much of this land was on the market at low prices. The railroads actively promoted land sales and brought in new settlers. This cheap land, the return of soldiers from the Civil War, rapid railroad development,

9. Connelley, William E., **A Standard History of Kansas and Kansans.** Lewis Publishing Company, Chicago, New York, 1918, pp. 82-83.

10. Report of the State Board of Agriculture, 1874, quoted by Anderson, J. A., "Sketch of Kansas Agriculture" in **Centennial Edition of the Fourth Annual Report of the Kansas State Board of Agriculture,** 1875.

11. Anderson, J. A., "Sketch of Kansas Agriculture" in **Centennial Edition of the Fourth Annual Report of the State Board of Agriculture,** 1875.

improvements in farm machinery, and increasing immigration were important factors in the rapid westward expansion of population. Opposing these were unfavorable weather conditions, grasshoppers, unadapted crops, and the fact that most of the settlers had come from humid regions and knew little of farming in low-rainfall areas like central and western Kansas. Few of them had sufficient resources to survive a poor crop year, especially the first year or two after their arrival. Yet by 1875, settlements had been made in most counties in the eastern two thirds of the state.

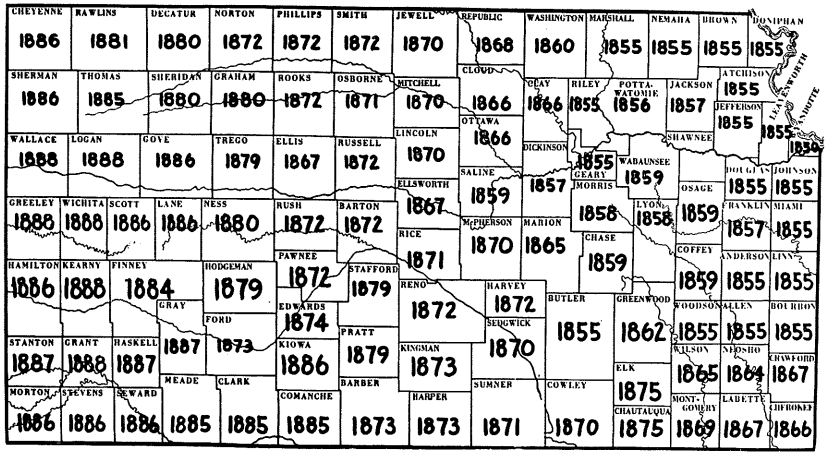

Fig. 6.—Date of organization of Kansas counties.

In the western third the few small settlements were along the two principal railroads. The Kansas Pacific followed the Kansas and Smoky Hill valleys from Kansas City to Saline County and roughly paralleled the Smoky Hill River across the western half of the state. Construction began at Wyandotte (now Kansas City) in 1863, and the roadbed reached Denver in 1870.[12] The Atchison, Topeka, and Santa Fe ran in a southwesterly direction from Kansas City to the Arkansas River in Reno County and followed that river westward across the state. It reached Newton in 1871, and was extended to Granada, Colorado, in 1873. These two railroads were of great importance in the settlement and development of the western half of the state.

Cow country. Following the Civil War, Texas ranchers began driving cattle northward in search of a market and soon there were hundreds of professional drovers moving their herds over the "long drive." Relatively small herds were first driven into southeastern Kansas and the adjacent areas of

12. Thatcher, T. Dwight, "The Railroad of Kansas." **Fourth Annual Report of the Kansas State Board of Agriculture.**

Missouri but by 1867, the Kansas Pacific Railroad reached Abilene, which became the most famous of the "cow towns." McCoy[13] states that in 1867, about 35,000 cattle arrived in Abilene, 75,000 in 1868, and 150,000 in 1869. In 1870, about 300,000 cattle reached Kansas and in 1871 about 600,000. Of this number nearly half were wintered rather than shipped, and an extremely hard winter caused many thousands of them to die. The year 1871 was the last year a cattle business was done in Abilene. Fort Harkness, 65 miles farther west, became the shipping point. Also in 1871, the Santa Fe reached Newton and became a competitor for part of the trade, since this represented a somewhat shorter drive. In 1872, a branch of the Santa Fe reached Wichita and nearly 80,000 cattle were shipped from there that year. However, only about 350,000 cattle reached central and western Kansas in 1872. By 1873, the number increased to 450,000 in addition to about 50,000 that were shipped from eastern Kansas. McCoy estimates that "of this number (500,000) fully three-fifths were stock cattle; that is, cows, heifers, yearlings, and steers younger than four years old. The season was marked as the first, in which there was nearly no demand for stock cattle."[14]

The Santa Fe reached Dodge City (Ford County) soon after the beginning of the cattle trade at Newton and Wichita, and for the next several years this town was one of the most important shipping points for Texas cattle.

Many of the cattle were wintered in Kansas, almost entirely on dry buffalograss pasture. Ranches were established and there was a scramble for grassland. Thousands of acres were enclosed, either legally or illegally, with barbed wire. Ranchers and settlers competed for land. The danger of Texas fever to domestic cattle and the competition between established ranchers and the Texas drovers for grassland aroused agitation for protection, and "in the spring of 1885 . . . Kansas and Colorado passed quarantine laws under which their governors found it practicable to exclude the driving of Texas stock across their state."[15]

Even before passage of this quarantine law the days of the "long drive" were numbered. "The zone of free grass on the public domain was nearly free and unobstructed in 1880, but by 1885, it was broken so badly that its future was at stake. . . . By 1885, Dodge City had ceased to be a cow town, since no herd could be pastured within many miles of it."[16]

> As suddenly as it arose, the cow country disappeared in the last half of the eighties, for reasons as obvious as those which caused it. Over-stocking of

13. McCoy, Joseph G., **Historic Sketches of the Cattle Trade of the West and Northwest,** 1874. Reprinted, the Rare Book Shop, Washington, D.C. 1932.

14. **Ibid.,** pp. 248-249.

15. Schmidt, Louis B., and Ross, Earl D., **Readings in the Economic History of American Agriculture,** New York, The Macmillan Company, 1925, p. 399.

16. **Ibid.,** p. 397.

> the plains was among the primary causes. . . . The railroads that made the cow country destroyed it as they normally progressed . . . with the cessation of Indian Wars and renewed railroad building, the migration of the farmers was resumed; . . . before 1885 the rapid settlement of the plains had thrust the range into western Kansas and narrowed its extent.[17]

Early agriculture. Agriculture in the settlement period suffered from drought, winds, the severe grasshopper infestation of 1874, and from a woeful lack of operating capital. ". . . it is by no means rare for hundreds of toiling men, with just enough money to break a few acres, in Kansas, to expect that the 'sod crop' therefrom will not only furnish a year's provisions, but also build houses and buy cattle."[18] A crop failure left them bankrupt, yet ignorance of proper farming techniques in a subhumid environment, lack of capital, and unadapted crops increased the number of failures. ". . . near the frontier the system of agriculture was more than ordinarily inefficient and under these circumstances crop failures were frequent. . . . Partly as cause and partly as effect of the uncertainty of crops, the farm population was highly unstable. . . ."[19]

Corn was the most important crop, with wheat, both spring and soft winter varieties, in second place. Of the tilled land in 1875 about 58 percent was in corn and 22 percent in wheat. In that year 80,799,000 bushels of corn and 13,209,000 bushels of wheat were produced. Even in the grasshopper year of 1874, there were 16 million bushels of corn compared with 10 million bushels of wheat. This dominance continued until well into the twentieth century. The maximum acreage of corn, 8 950.000 acres, was harvested in 1910. Except for 1894, when wheat harvested exceeded corn by 284.000 acres, considerably less wheat than corn was grown until 1914—when 8,157,000 acres of corn and 8,650.000 acres of wheat were harvested. Since then corn acreage has diminished almost steadily while wheat acreage has increased. In 1949, the acreage seeded to wheat was more than six times that seeded to corn.

As early as 1875, J. A. Anderson, president of Kansas State Agricultural College, and other agricultural leaders were pointing out that wheat yields varied less than corn yields and that winter wheat was better adapted than spring wheat.[20] Mennonites who came from southern Russia to Reno, McPherson, Marion, and Harvey Counties beginning in 1874 are credited with introducing hard winter wheat.[21] Although production of spring wheat exceeded winter wheat in 1870, spring wheat had

17. Paxson, Frederic L., **History of the American Frontier, 1763-1893,** Houghton Mifflin Company, Boston and New York, 1924, Ch. LVI.

18. Anderson, **op. cit.**

19. Malin, James C., **Winter Wheat in the Golden Belt of Kansas.** University of Kansas Press, Lawrence, 1944, p. 4.

20. Anderson, **op. cit.,** pp. 28-30.

21. Bracke, William B., **Wheat Country,** Duell, Sloan and Pearce, New York, 1950. Ch. V.

Table 1.—Average size of farms in Kansas from 1910 to 1954 by type-of-farming areas.
(Acres)

Area	Census year								
	1910	1920	1925	1930	1935	1940	1945	1950	1954
1	139	150	140	146	140	151	163	173	200
2	157	165	152	168	157	180	199	212	238
3	122	126	118	126	113	128	134	144	164
4	150	153	148	157	155	171	178	195	215
5	241	261	251	266	269	302	344	369	416
6a	210	217	216	227	215	236	263	284	326
6b	213	229	229	238	229	243	272	285	318
7	315	332	330	347	347	380	439	472	513
8	202	221	212	227	224	250	286	307	338
9	355	369	361	391	398	414	464	485	534
10a	554	712	651	652	624	704	798	849	889
10b	465	587	571	617	613	715	826	893	950
10c	761	721	711	785	776	831	1,033	1,035	1,097
11	481	579	513	541	535	618	755	796	827
12	462	930	749	821	801	1,028	1,405	1,319	1,392
Kansas	244	275	264	283	275	308	344	370	416

Source: Census for the United States for the respective years.

largely disappeared except in northwestern counties by the 1880's.[22]

Both crop production and livestock numbers were expanded during the settlement of Kansas. Cattle increased from 93,000 in 1860 to 703,000 in 1875; sheep from 18,000 to 106,000. Although only 95,000 swine were reported in 1865, by 1875 there were 293,000. Horses and mules increased from 21,000 in 1860 to 232,000 in 1875.[23]

The settlement of the plains area posed at least one important problem which the pioneer settler of the more humid eastern states had not faced. In the East the first settlers had practiced largely a subsistence type of agriculture. Capacity to produce its own food had been a test of the desirability of an area for settlement. But most staple fruits, vegetables, and nuts were not adapted to the Plains, so plains settlers depended in varying degrees upon the outside for certain foods. A traditional subsistence agriculture was not possible as a regular system. In years of cash-crop failures, when subsistence was critical, these crops had usually already failed. They were conspicuously less drought resistant than the field crops. A subsistence agriculture was not even available to plains settlers as crop insurance.[24]

THE TYPES OF FARMING AND THE FARMS

Type-of-farming areas.[25] Kansas has been divided into the type-of-farming areas shown in Figure 7. The areas are shown in Figure 7. The areas are bounded by county lines because most of the data are available only by counties. However, the type of farming is not uniform throughout all counties and in most cases there is no well-defined line of demarcation between the areas. There are rather transitional zones between them.

The basis of classifying the counties was: (1) the percentage of farm land in different crops and pastures; (2) the kind and number of livestock per 100 acres of farm land; (3) the trends of the acreages of crops and numbers of livestock; (4) the number and percentage of farms of a given type; and (5) the acreage and percentage of farm land occupied by farms of a given type.

Size and number of farms. The average size of farms in Kansas increased from 244 acres in 1910 to 416 acres in 1954. The size in 1954 varied, as shown in Table 1, from 164 acres in Type-of-Farming Area 3 to 1,392 acres in Area 12. Kansas farms increase in size from east to west across the state, and the percentage increase in size during the period has been greater in the west.

22. Malin, **op. cit.,** p. 45.
23. Anderson, **op. cit.,** pp. 32-33.
24. Malin, **op. cit.,** pp. 104-105.
25. This discussion of type-of-farming areas is abstracted from Hodges, J. A., **Farm Organization as Found in Types of Farming Areas in Kansas,** a Ph.D. thesis in the Harvard library, 1938, pp. 142-146.

Table 2.—Number of Kansas farms by size (in acres) groups, 1954.

Type-of-farming area	Under 10 acres	10-29	30-49	Total under 50	50-99	100-179	180-259	260-499	500-999	1,000 and more acres	Total
1	949	918	750	2,617	1,585	2,142	1,482	2,020	643	104	10,593
2	698	660	680	2,038	1,879	2,993	2,136	3,038	991	181	13,256
3	895	1,040	678	2,613	1,490	1,881	1,111	1,307	372	65	8,839
4	497	398	309	1,204	994	1,896	1,534	1,813	435	51	7,927
5	890	583	436	1,909	1,324	2,606	1,942	3,806	1,969	844	14,400
6a	359	229	191	779	596	1,556	1,450	3,062	1,067	211	8,721
6b	864	516	338	1,718	1,030	2,482	2,037	4,604	2,016	356	14,243
7	186	99	80	365	273	766	594	2,352	1,883	679	6,912
8	449	264	219	932	645	1,805	1,779	3,697	1,740	330	10,928
9	209	85	53	347	170	642	434	2,296	1,841	565	6,295
10a	102	44	18	164	49	256	104	1,037	1,335	1,055	4,000
10b	187	59	21	267	60	304	128	1,014	1,492	1,343	4,608
10c	78	31	12	121	30	112	72	386	470	461	1,652
11	110	48	30	188	80	290	168	1,264	1,976	1,319	5,285
12	69	14	7	90	30	150	57	373	660	1,148	2,508
Kansas	6,542	4,988	3,822	15,352	10,235	19,881	15,028	32,069	18,890	8,712	120,167

Source: 1954 Census (preliminary).

Table 3.—Percentage of Kansas farms by size groups, 1954.

Type-of-farming area	Under 10 acres	10-29	30-49	Total under 50a	50-99	100-179	180-259	260-499	500-999	1000 and more	Total
1	8.9	8.7	7.1	24.7	15.0	20.2	14.0	19.0	6.1	1.0	100.0
2	5.3	5.0	5.1	15.4	14.2	22.6	16.1	22.9	7.5	1.3	100.0
3	10.1	11.8	7.7	29.6	16.8	21.3	12.6	14.8	4.2	.7	100.0
4	6.3	5.0	3.9	15.2	12.5	23.9	19.4	22.9	5.5	.6	100.0
5	6.2	4.0	3.0	13.2	9.2	18.1	13.5	26.4	13.7	5.9	100.0
6a	4.1	2.6	2.2	8.9	6.9	17.9	16.6	35.1	12.2	2.4	100.0
6b	6.1	3.6	2.4	12.1	7.2	17.4	14.3	32.3	14.2	2.5	100.0
7	2.7	1.4	1.2	5.3	4.0	11.1	8.6	34.0	27.2	9.8	100.0
8	4.1	2.4	2.0	8.5	5.9	16.5	16.3	33.9	15.9	3.0	100.0
9	3.3	1.4	.8	5.5	2.7	10.2	6.9	36.5	29.2	9.0	100.0
10a	2.6	1.1	.4	4.1	1.2	6.4	2.6	25.9	33.4	26.4	100.0
10b	4.1	1.3	.4	5.8	1.3	6.6	2.8	22.0	32.4	29.1	100.0
10c	4.7	1.9	.7	7.3	1.8	6.8	4.4	23.4	28.4	27.9	100.0
11	2.1	.9	.6	3.6	1.5	5.5	3.2	23.9	37.4	24.9	100.0
12	2.7	.6	.3	3.6	1.2	6.0	2.3	14.9	26.3	45.7	100.0
Kansas	5.4	4.2	3.2	12.8	8.5	16.5	12.5	26.7	15.7	7.3	100.0

Source: Calculated from 1954 Census figures (preliminary).

Tables 2 and 3 (number and percentage of farms by size groups) give a more nearly accurate idea of farm size than can be gotten from a single average figure. The 260- to 499-acre group, which includes 320- and 480-acre farms, was modal. However, the modal (most common) size varied greatly from area to area. In eastern areas part-time, subsistence, and other very small farms surrounding major cities and towns make the "under 50-acre" group important. In the western areas only a very small percentage of all farms was in this group. In Area 9 the modal group was 260 to 499 acres; in Areas 10a, 10b, 10c, and 11 the 500- to 999-acre group was modal, while in Area 12 more than two fifths of all farms were 1,000 acres or more, although for the entire state only 7 percent were this large.

There are many more very small farms and many more large farms but fewer middle-sized farms now than 40 years ago. Approximately 10.5 percent of all farms were less than 50 acres in 1910, but there were 12.8 percent in 1954. The per-

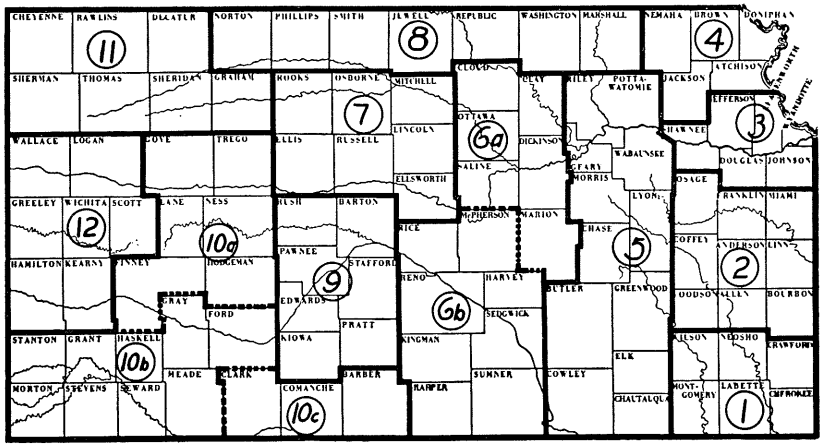

Fig. 7.—Type-of-farming areas in Kansas.

Area 1—Cash grain, livestock, dairy, general, part-time and residential farms. Wheat, corn, oats in order.
Area 2—Livestock, cash grain, dairy, general. Corn, wheat, oats.
Area 3—Cash grain, livestock, dairy, general, part-time and residential. Corn, wheat, oats, hay.
Area 4—Cash grain, livestock, general, dairy. Part of the Corn Belt.
Area 5—Range livestock, cash grain, general, dairy. Wheat, sorghums, hay.
Area 6a—Cash grain, livestock, general. Wheat, sorghums, hay, some corn.
Area 6b—Similar to 6a, more wheat, less corn, less pasture, less livestock but more dairying.
Area 7—Cash grain, livestock, general. Wheat, sorghums, very little corn.
Area 8—Cash grain, livestock, general. More hay and much more corn than Area 6 or 7.
Area 9—Cash grain, some livestock and general. High percentage in cropland, wheat dominant.
Area 10a—Cash grain, livestock, some general. Wheat and grain sorghums.
Area 10b—More cash grain, less livestock and general than 10a. Sorghums more important.
Area 10c—Less cash grain, more livestock, especially range livestock, than 10a or 10b.
Area 11—Cash grain, livestock, general. Wheat, sorghums, some corn.
Area 12—Cash grain, range livestock, some general. Wheat, sorghums. Average size largest of all areas.

Table 4.—Percentage of Kansas farms by economic class, 1954.

Economic class	Type-of-farming area															State total
	1	2	3	4	5	6a	6b	7	8	9	10a	10b	10c	11	12	
Commercial farms:[1]																
Class I	.6	1.2	1.8	2.4	3.6	2.1	3.3	2.9	2.2	4.1	6.3	5.9	9.8	4.9	8.0	3.0
Class II	6.2	7.4	8.4	11.8	12.6	17.4	21.9	20.8	14.2	32.1	23.0	20.8	23.5	23.5	22.6	15.7
Class III	16.1	17.0	18.0	24.3	20.3	29.7	31.4	32.4	30.5	29.6	30.3	24.7	26.9	30.0	21.9	24.8
Class IV	20.3	24.4	18.1	23.3	22.6	25.6	19.8	20.8	25.6	18.0	22.4	21.5	17.5	21.6	19.6	21.9
Class V	18.2	21.1	15.6	14.9	17.2	12.3	8.7	10.6	13.6	6.6	10.4	14.7	10.9	12.1	13.9	14.1
Class VI	8.7	9.4	6.4	6.7	7.0	4.9	3.0	4.5	6.4	2.3	2.6	3.8	3.4	3.9	4.7	5.8
Total	70.1	80.5	68.3	83.4	83.3	92.0	88.1	92.0	92.5	92.7	95.0	91.4	92.0	96.0	90.7	85.3
Other farms:																
Part-time	12.3	10.4	14.0	7.8	9.2	4.3	5.5	4.9	4.1	3.1	3.5	2.7	3.3	2.1	5.0	7.2
Residential	17.6	9.4	19.4	7.3	7.7	4.2	6.3	2.6	3.6	2.8	2.0	4.6	5.2	2.7	4.2	7.6
Abnormal	.....	....	.1	....	.0	.1	.0	.3	....	....	....	....	....	....	.2	.0
Total	29.9	19.8	33.5	15.1	16.9	8.6	11.8	7.8	7.7	5.9	5.5	7.3	8.5	4.8	9.4	14.8
Total all farms[2]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 1954 Census (preliminary).

1. Class I farms—value of products sold $25,000 or more.
Class II farms—value of products sold $10,000-$24,999.
Class III farms—value of products sold $5,000-$9,999.
Class IV farms—value of products sold $2,500-$4,999.
Class V farms—value of products sold $1,200-$2,499.
Class VI farms—value of products sold $250-$1,199.

2. Percentages of farms by class do not check exactly to 100 percent because the number of farms in each class by counties was estimated from a 20 percent sample of all farms. In this classification all farms in Kansas were taken as 100 percent.

centage of 500- to 999-acre farms more than doubled, from less than 6 percent in 1910 to 15.7 percent in 1954. The 1,000-acre and larger group increased from less than 2 percent in 1910 to 7.3 percent in 1954. The 50- to 99-acre group (which includes the 80-acre farm) decreased from about 15 to less than 9 percent. The 100- to 179-acre group, which includes the 160-acre farm, showed the greatest decrease. Prior to 1930 the census reported the number of farms in the size groups 100 to 139 acres and 140 to 174 acres. In 1910 nearly one third of all farms were in these two groups. The present classification increases the breadth of these groups (combined) to 100 to 179 acres. But in 1954 only 16.5 percent of all farms were in this group.

Total value of products sold per farm varies from east to west similar to acres per farm. Table 4 shows that the percentage of farms reporting small sales was much higher in eastern Kansas than in the central and western areas. The higher proportion of part-time and residential farms in eastern Kansas is particularly noticeable. In Areas 1, 2, and 3, which border Missouri, more than one third of all farms were part-time, residential, or Class VI commercial farms, all of which sold products valued at less than $1,200. Less than one tenth were Class I or II farms, with sales of $10,000 or more. In contrast, in the three areas that adjoin Colorado only about one tenth of all farms were classed as part-time, residential, or Class VI, while nearly one third were Class I or II.

Types of farms. Table 5 gives the percentage of farms by type in each type-of-farming area of Kansas in 1954. The largest group, 45.1 percent, were cash-grain farms. About 25 percent of all farms were of this type. Cash-grain farms were dominant, however, in central and western Kansas. In Area 9, 80 percent of all farms were cash-grain.

Livestock farms other than dairy and poultry ranked second. A small proportion of these specialized in hogs or sheep but the most were cattle farms. This group constituted 21.2 percent of all farms and was dominant in Areas 2 and 5. In Area 5, the "Flint Hills," 39.8 percent of all farms were of this type.

General farms were third with 10.7 percent of the total. They were common in eastern and central Kansas but not important in the west.

Dairy farms, 6.8 percent of all farms, ranged from 1.1 percent in Area 9 to 14.7 percent in Area 3. The relatively large urban populations in Areas 1, 2, 3, and 4 help account for dairy farms in these areas.

Specialized poultry farms ranged from 0.1 percent in Area 10a to 1.9 percent in Area 2.

Approximately one seventh of all farms were miscellaneous or unclassified. A large proportion of this group were the small suburban, part-time, and subsistence places that surround larger cities and towns. They constituted more than 30

Table 5.—Percentage of Kansas farms by type of farm.

Type of farm	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6a	Area 6b	Area 7	Area 8	Area 9	Area 10a	Area 10b	Area 10c	Area 11	Area 12	State total
Field-crop farms other than vegetable and fruit and nut	32.1	22.3	20.1	31.6	24.2	53.8	63.2	65.9	50.2	80.2	63.0	69.7	43.5	64.6	61.4	45.1
Cash-grain	(32.1)	(22.3)	(20.0)	(31.4)	(24.2)	(53.8)	(63.2)	(65.9)	(50.1)	(80.2)	(62.6)	(69.4)	(43.5)	(64.6)	(61.2)	(45.1)
Other field crops	....	....	(.1)	(.2)	....	....	(0)	....	(.1)	....	(.4)	(.3)	....	....	(.2)	(.0)
Vegetable farms	....	....	1.0	....	.1	.1	.1	....	....	.1	....	.2	....	....	....	.1
Fruit and nut farms	.2	.0	.3	.3	....	....	.0	....	....	....	....	....	....	....	....	.1
Dairy farms	11.2	15.2	14.7	10.1	5.8	4.4	4.7	2.6	2.7	1.1	2.7	2.2	2.4	2.4	1.5	6.8
Poultry farms	1.2	1.9	1.7	1.3	1.9	1.5	1.2	.8	1.1	.5	.1	.5	1.2	.4	.5	1.2
Livestock farms other than dairy and poultry	14.8	25.6	18.7	29.7	39.8	17.4	10.5	16.4	21.3	7.4	20.2	16.3	38.1	19.9	24.1	21.2
General farms	10.5	15.1	10.2	11.7	11.7	14.0	8.2	7.3	17.0	4.5	8.5	3.9	6.1	7.9	4.6	10.7
Primarily crop	(.8)	(.6)	(1.6)	(.4)	(1.3)	(1.3)	(.8)	(.5)	(.7)	(1.1)	(2.7)	(1.0)	(.4)	(1.1)	(1.4)	(1.0)
Primarily livestock	(2.2)	(3.7)	(1.8)	(2.6)	(2.4)	(1.4)	(1.0)	(1.0)	(3.5)	(.2)	(.4)	(.7)	(.4)	(.9)	(.1)	(1.9)
Crop and livestock	(7.5)	(10.8)	(6.8)	(8.7)	(8.0)	(11.3)	(6.4)	(5.8)	(12.8)	(3.2)	(5.4)	(2.2)	(5.3)	(5.9)	(3.1)	(7.8)
Miscellaneous and unclassified farms	30.0	19.9	33.3	15.3	16.5	8.8	12.1	7.0	7.7	6.2	5.5	7.2	8.7	4.8	7.9	14.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 1954 Census (preliminary).

For a farm to be classified as a particular type, sales or anticipated sales of a product or a group of products had to represent 50 percent or more of the total value of products of the farm. For example, to be classed as a cash-grain farm, sales of corn, sorghum, small grains, field peas, field beans, cowpeas, and soybeans had to represent 50 percent or more of the total value of products of the farm.

percent of all farms in Areas 1 and 3 in the eastern part of the state but (except for Area 6b in which Wichita and Hutchinson are located) did not make up more than 9 percent in any area in central or western Kansas.

The geographical distribution of cash-grain, general, dairy, and livestock farms other than dairy or poultry is shown in Figure 8. Dairy farms are concentrated in eastern Kansas, but cash-grain and livestock farms, other than dairy or poultry, are more evenly distributed.

Tenure.[26] In 1954 for the state 37.7 percent of all farms were operated by owners, 33.3 percent by part-owners, 28.7 percent

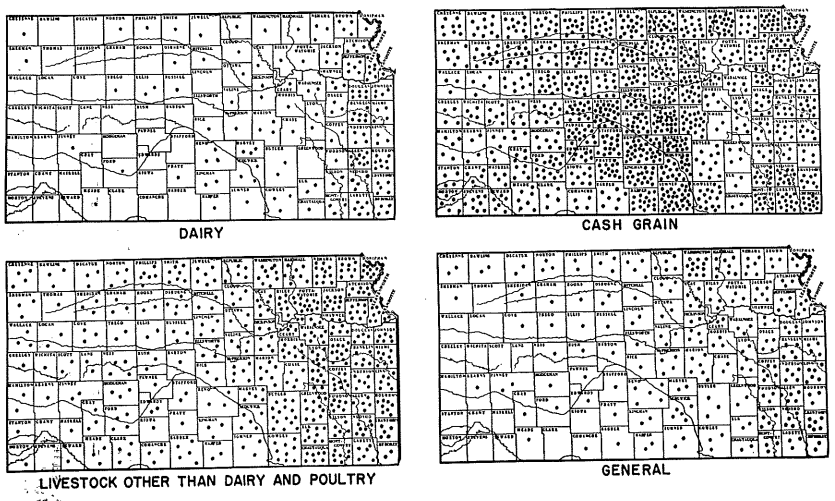

Fig. 8.—Distribution of types of farms, Kansas, 1954. Source: 1954 Census (preliminary). Each dot represents 50 farms.

by tenants, and 0.3 percent by managers. Only 2.6 percent were operated by cash tenants and 26 percent by other types of tenants, largely crop-share. (See Table 6.)

The proportion of owners decreased rather regularly from east to west from 60.3 percent in Area 3 to 18.7 percent in Area 12. The percentage of tenants ranged from 39.2 in Area 9 to 17.2 in Area 3. In general the proportion of tenants in the eastern areas was lower than in the central and western areas. Cash tenancy, however, was more common in the eastern than in the other areas. The proportion of part-owners, like that of full tenants, was lowest in the eastern and highest in the western parts of the state. Area 3 was lowest with 22.0 percent and Area 12 highest with 47.0 percent.

Ownership is highest where farms are smaller than the aver-

26. For a more complete discussion of this subject see Pine, Wilfred H., **Mid-Century Farm Tenure in Kansas,** Kansas Agricultural Experiment Station, Agricultural Economics Report No. 53, May, 1953.

Table 6.—Percentage of farms by tenure in type-of-farming areas in Kansas, 1954.

Area	Owner	Part owner	Manager	Tenant			All farms
				Total	Cash	Other	
1	52.4	26.5	.2	20.9	4.1	16.8	100.0
2	48.6	33.1	.1	18.2	3.7	14.5	100.0
3	60.3	22.0	.5	17.2	3.4	13.8	100.0
4	44.0	25.8	.2	30.0	2.6	27.4	100.0
5	43.9	29.1	.5	26.5	4.8	21.7	100.0
6a	30.9	35.2	.2	33.7	2.9	30.8	100.0
6b	29.9	35.7	.2	34.2	2.4	31.8	100.0
7	26.4	39.8	.2	33.6	1.9	31.7	100.0
8	35.2	33.5	.1	31.2	1.5	29.7	100.0
9	21.3	39.4	.1	39.2	1.1	38.1	100.0
10a	23.3	43.7	.2	32.8	.9	31.9	100.0
10b	20.8	43.4	.3	35.5	1.0	34.5	100.0
10c	27.1	34.1	.5	38.3	3.5	34.8	100.0
11	27.2	45.4	.1	27.3	.8	26.5	100.0
12	18.7	47.0	.5	33.8	.7	33.1	100.0
Kansas	37.7	33.3	.3	28.7	2.6	26.1	100.0

Source: Calculated from 1954 Census (preliminary).

age for the state, and tenancy is highest in the more recently developed areas, which also have the largest farms and in which the increase in average size during the last 40 years has been greatest. In general, part-ownership, like tenancy, is highest in the areas where the farm unit should be large for the efficient use of power equipment. It can be shown that technical risk, as indicated by the percentage of wheat acreage abandoned and the variability of wheat yields, is also highest in the areas with the greatest proportion of tenants and part-owners. It appears that these forms of tenure provide a means by which operators are relieved of part of this risk.

From 1930 to 1954 owners increased from 34.4 to 37.7 percent, and part-owners from 22.6 to 33.3 percent, but tenants decreased from 42.4 to 28.7 percent.

THE CROPS AND LIVESTOCK

Distribution of crops. Wheat is king of Kansas crops. During the 10 years 1945-1954 wheat accounted for 36.8 percent of all cash farm income from marketings compared with 9.5 percent by all other crops. Nevertheless, as a result of acreage controls, unfavorable weather, and other factors, the percentage of all farm land from which wheat was harvested decreased from 27.6 percent in 1950 to 19.0 percent in 1954. Grain sorghums ranked second with 7.1 percent (Table 7) having increased from only 2.8 percent in 1950. In 1954 corn occupied 4.1 percent, forage sorghums 3.7 percent and hay 2.8 percent. Native or cultivated pasture made up 39.6 percent of all land in farms.

Corn acreage exceeded wheat in Areas 2, 3, and 4. In all other areas except 8 the proportion of corn land was much less than that in wheat. In Areas 6b and 7 and in all areas farther west corn occupied less than 2 percent of all land in farms.

Grain sorghums occupied 10 percent or more of all farm land in Areas 9, 10a, 10b, and 12. Although slightly less important in Areas 7 and 11, grain sorghums were second only to wheat in these areas also. Corn plantings in 1955 totaled only 1.893,000 acres, the lowest in 60 years, while sorghum plantings of 6,032,000, the largest of record, indicated the continuing shift to sorghums.

Oats and barley are minor crops, constituting only 2.0 and 0.8 percent, respectively, of the land in Kansas farms in 1954. In the four easternmost areas, however, oats occupied from 5 to 7 percent. Areas 1 and 6b were the only areas in which barley occupied as much as 2 percent of the land in farms.

The geographical distribution of the acreage of wheat, corn, grain sorghums, oats, barley, and alfalfa for the five years 1950-54 is given in Figures 9 and 10. Wheat is grown in every county of the state but is of much less importance in the eastern third than elsewhere. It is of least importance in Area 5, the "Flint Hills," which extends south from Riley and Pottawatomie counties in a belt roughly two counties wide. Central

Table 7.—Percentage of the farm area in specified crops by type-of-farming areas, Kansas.

Area	Corn (all purposes)	Wheat harvested	Oats harvested	Barley harvested	Grain sorghums	Sorghum, hay, silage, or fodder	Total[1] sorghum	All[2] hay	Total[3] pasture
1	6.2	12.9	6.5	2.4	1.0	2.7	3.7	2.3	40.8
2	8.6	6.5	5.0	1.5	3.4	2.5	5.9	3.0	46.3
3	13.9	9.8	5.4	.6	2.7	1.3	4.0	5.1	39.9
4	22.5	8.5	7.1	.1	1.6	1.1	2.7	4.5	35.5
5	3.7	6.9	2.3	.6	1.9	3.2	5.1	3.8	65.5
6a	5.7	25.2	3.7	.6	3.5	4.8	8.3	5.9	36.9
6b	1.2	35.7	3.3	2.1	4.8	5.7	10.5	4.5	26.7
7	1.1	25.2	.8	.5	6.2	5.4	11.6	2.2	40.3
8	12.4	16.9	1.8	.3	6.2	2.0	8.2	6.4	36.2
9	.2	37.0	.4	1.4	10.4	3.8	14.2	1.9	25.2
10a	.1	17.4	.2	.6	14.0	4.9	18.9	1.0	38.5
10b	.1	21.7	0.0	.3	18.0	3.9	21.9	.5	25.8
10c	.1	17.7	.1	.7	11	5.2	6.3	1.0	64.4
11	1.9	19.6	.2	.7	7.1	3.8	10.9	.9	35.4
12	.2	13.3	0.0	.4	14.5	3.2	17.7	.6	36.3
Kansas	4.1	19.0	2.0	.8	7.1	3.7	10.8	2.8	39.6

Source: 1954 Census (preliminary).

1. Does not include sorghums for sirup.
2. Excluding sorghum hay: alfalfa and alfalfa mixtures cut for hay (or for dehydrating).
3. Includes: Cropland used only for pasture, woodland pasture, and other pasture (not cropland, not woodland).

Kansas is the great wheat belt, although its acreage is nearly as great in the southwest and northwest. Area 10c (especially Barber county) and Area 12, the "short-grass area" (Wallace, Logan, Greeley, Wichita, Scott, Hamilton, and Kearny counties), have a higher proportion of grassland than most of the western two-thirds of the state.

Even though previous acreages were reduced by production controls, Reno and Sumner Counties each seeded more than 300,000 acres of wheat in 1953. Ford County seeded 295,000 acres, Barton County 253,000 acres and Gray, Pawnee, Thomas, Ness, Finney, and Harper Counties each seeded more than 200,000 acres.

Corn was practically limited to the eastern one fourth of the state and a narrow belt across the northern boundary. A little corn was grown in central Kansas but it occupied a very small

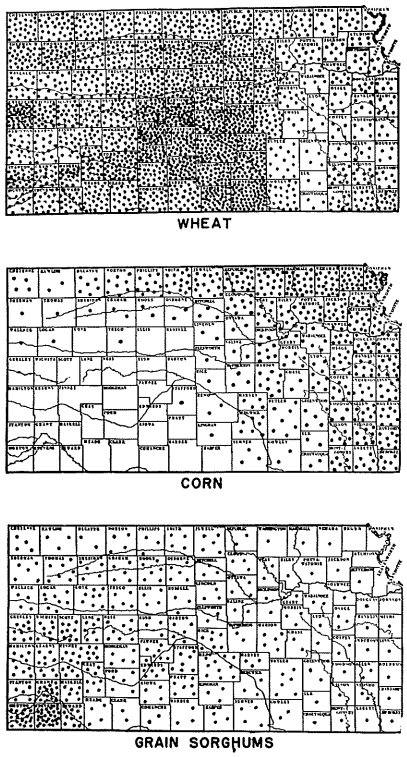

Fig. 9.—Distribution of principal grain crops in Kansas. Average acreage harvested, 1950-54. Source: Reports of the Kansas State Board of Agriculture. Each dot represents 5,000 acres.

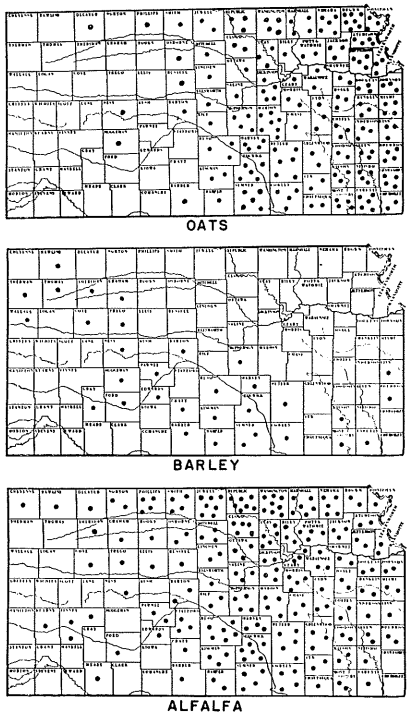

Fig. 10.—Distribution of oats, barley, and alfalfa in Kansas. Average acres harvested, 1950-54. Source: Reports of the Kansas State Board of Agriculture. Each dot represents 5,000 acres.

percentage of the land. No county in the southwestern part of the state grew as much as 5,000 acres of corn.

The acreage of grain sorghums was largest in the extreme southwestern corner of the state, but some is grown in all counties except for a few in northeastern Kansas.

The distribution of oats and alfalfa was similar except that the acreage of oats exceeded that of alfalfa in southeastern Kansas while more alfalfa than oats was grown in the western half of the state. In western Kansas alfalfa production was

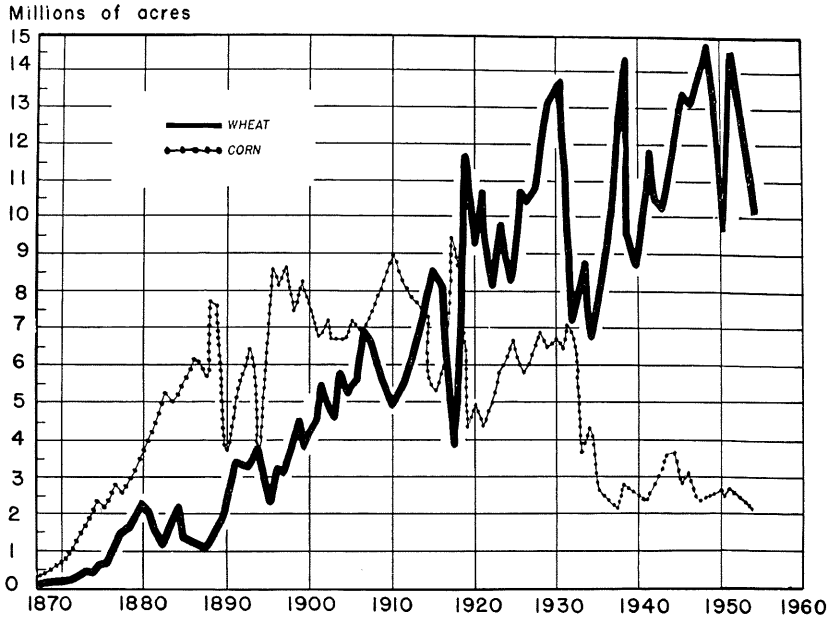

Fig. 11.—Acres of wheat and corn harvested in Kansas, 1868-1954. Source: Reports of the Kansas State Board of Agriculture.

largely confined to the creek and river valleys. In the Arkansas River valley considerable alfalfa was grown under irrigation. Very little barley was grown in north-central and northeastern Kansas and only a small acreage in the rest of the state.

Changes in the relative importance of wheat and corn. The relative importance of wheat and corn has undergone drastic changes during the last 75 years (Fig. 11). Except for 1894, when the acreage of corn harvested fell slightly below that of wheat, corn acreage was well above wheat acreage until World War I. In 1914 wheat exceeded corn by 2.8 million acres and has remained the dominant crop since. In 1917, one of the poorest wheat years, fewer than 4 million of the 9.6 million acres seeded to wheat were harvested. That was the last year

more acres of corn than wheat were harvested. Record acreages of wheat were harvested in 1931 and 1938. Wheat acreage harvested dropped sharply in 1939 and 1940 but rose to an all-time peak of 14.9 million acres in 1947.

The average for 1945-49 was 13.8 million acres per year, an increase of 31.4 percent over the previous five years. Less favorable weather and acreage allotments reduced the acreage harvested to an average of 11.6 million acres per year for 1950-54. However, the 14.6 million acres harvested in 1952 were the second largest of record. In 1954 there were 10.1 million acres of wheat harvested compared with 2.1 million acres of corn.

There have been seven years, 1931, 1942, 1945-48 and 1952 when total wheat production in Kansas exceeded 200 million bushels. The largest crop, 308 million bushels, was harvested in 1952. There have been four years when the Kansas corn crop exceeded 200 million bushels but the most recent one was 1902. The last one that exceeded 100 million bushels was in 1932.

Corn has decreased in importance for several reasons: (1) Earlier and more complete mechanization of wheat growing. Wheat was handled largely by tractors and machinery while corn was still a horse and hand-labor proposition. The general-purpose or row-crop tractor was not introduced until 1924 and did not come into general use for several years. But by 1924 rather satisfactory standard tractors for pulling plows and other wheat production implements had been in use for several years. Development of machine harvesting of corn lagged greatly behind that of wheat. By 1924 there were more than 3,000 combines in Kansas but it was not until 1942 that the number of corn pickers reached 1,000. (2) The drought of the 1930's being even more unfavorable for corn than wheat. The yield per harvested acre of corn (state average) was only 3.5 bushels in 1934 and 4.0 bushels in 1936, the two worst drought years. But the yield per harvested acre of wheat was 9.8 and 9.3 bushels, respectively, the same two years. The acreage of wheat rose sharply in 1937 and 1938, while the acreage of corn increased very little. (3) Development of low-growing, combine-type grain sorghums for the western two thirds of the state which are more drought resistant than corn and can be grown and harvested with the same machinery used for wheat. When wheat winterkills, the land frequently is seeded to grain sorghums. Formerly it frequently was planted to corn. (4) Fading of the traditional preference for corn in the face of a proven unfavorable environment. Kansas was settled by people from states where corn was the dominant crop and they brought their cropping system with them. It took many years to convince them (and their descendants) that corn was not well adapted to the western two thirds of the state. The shift to wheat began during the decade of World

War I. The drought of the 1930's convinced most farmers that wheat was better adapted.

Shifts in wheat acreage. The shifts in winter wheat acreage in Kansas are shown in Figures 12 and 13 by five-year periods from 1875-79 to 1950-54. In the first period, most of the winter wheat was in southeastern Kansas and in a group of counties just west of the Flint Hills. Most of the western third of the state was either "cow country" or not settled at all. The maps showing the spread of wheat westward, and the intensification of acreage summarize the history of settlement of the western half of the state. Areas 6a and 6b remained important throughout the 80-year period. By 1890 settlement of the west had proceeded far enough that some wheat was grown in every

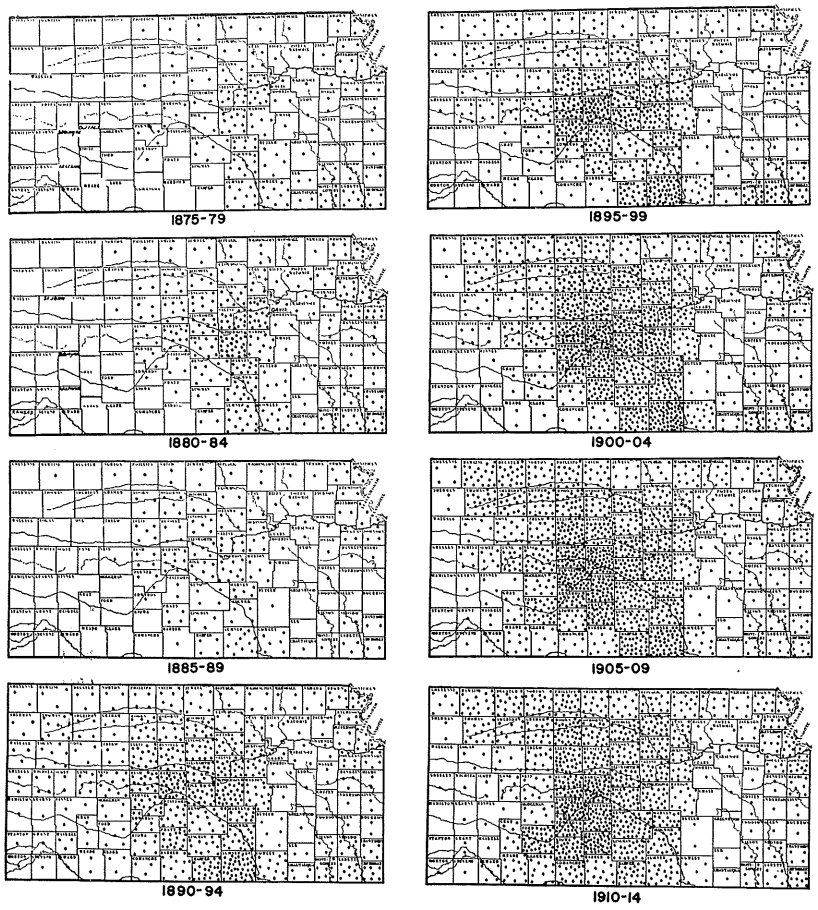

Fig. 12.—Wheat acreage harvested in Kansas. Average by five-year periods, 1875-1914. Each dot represents 5,000 acres. Source: Calculated from reports of the Kansas State Board of Agriculture.

county. The densest concentration had shifted to Area 9 by 1895-99. By 1900 the movement of concentration toward the northwest was well under way. The concentration toward the southwest began just prior to World War I and developed rapidly during and after the war. Thousands of acres of grass were plowed and seeded to wheat. The west-central section, embracing most of Area 12, was the last to develop wheat production, and it has never reached the concentration of the surrounding areas. It is the driest portion of the state.

The acreage seeded to wheat in the eastern third of the state has never been so great as in the central and western parts. Throughout the 80 years, Area 1 has been relatively more im-

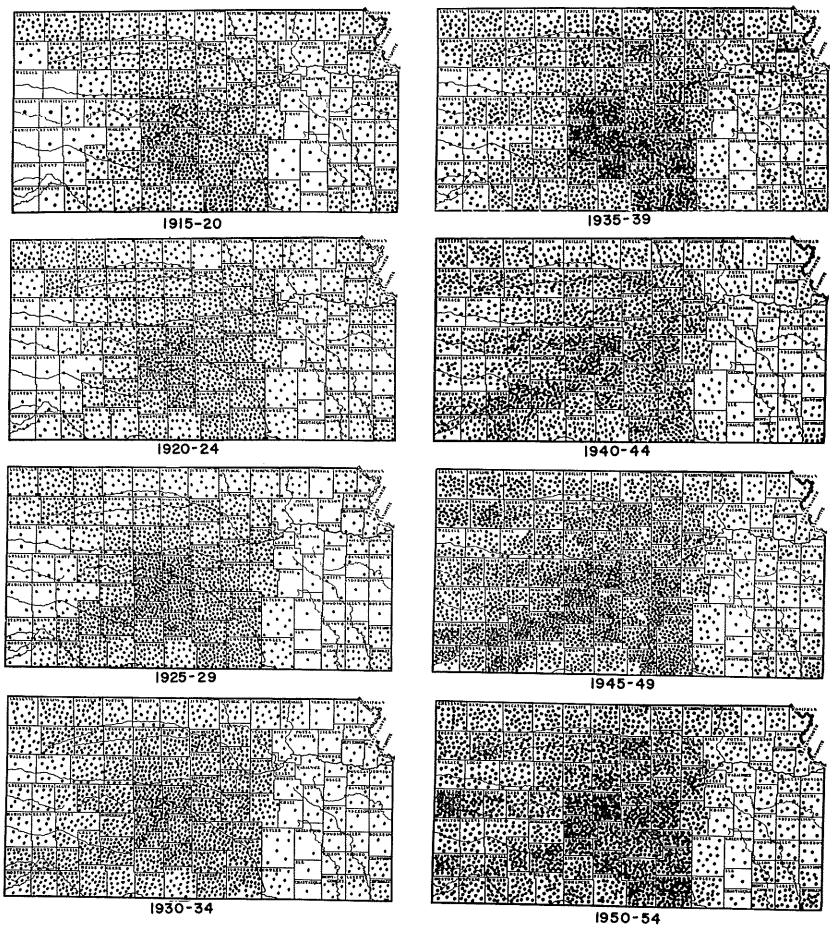

Fig. 13.—Wheat acreage harvested in Kansas. Average by five-year periods, 1915-1954. Each dot represents 5,000 acres. Source: Calculated from reports of the Kansas State Board of Agriculture.

portant in wheat production than any other eastern area.

Table 8 shows the average winter wheat acreage harvested by five-year periods from 1875-79 until 1950-54 in each type-of-farming area. Table 9 shows the percentage of the total crop harvested in each area by the same five-year periods. The acreage harvested increased 1400 percent from 988,000 in 1875-79 to 13,830,000 in 1945-49. A comparison of eastern with west-

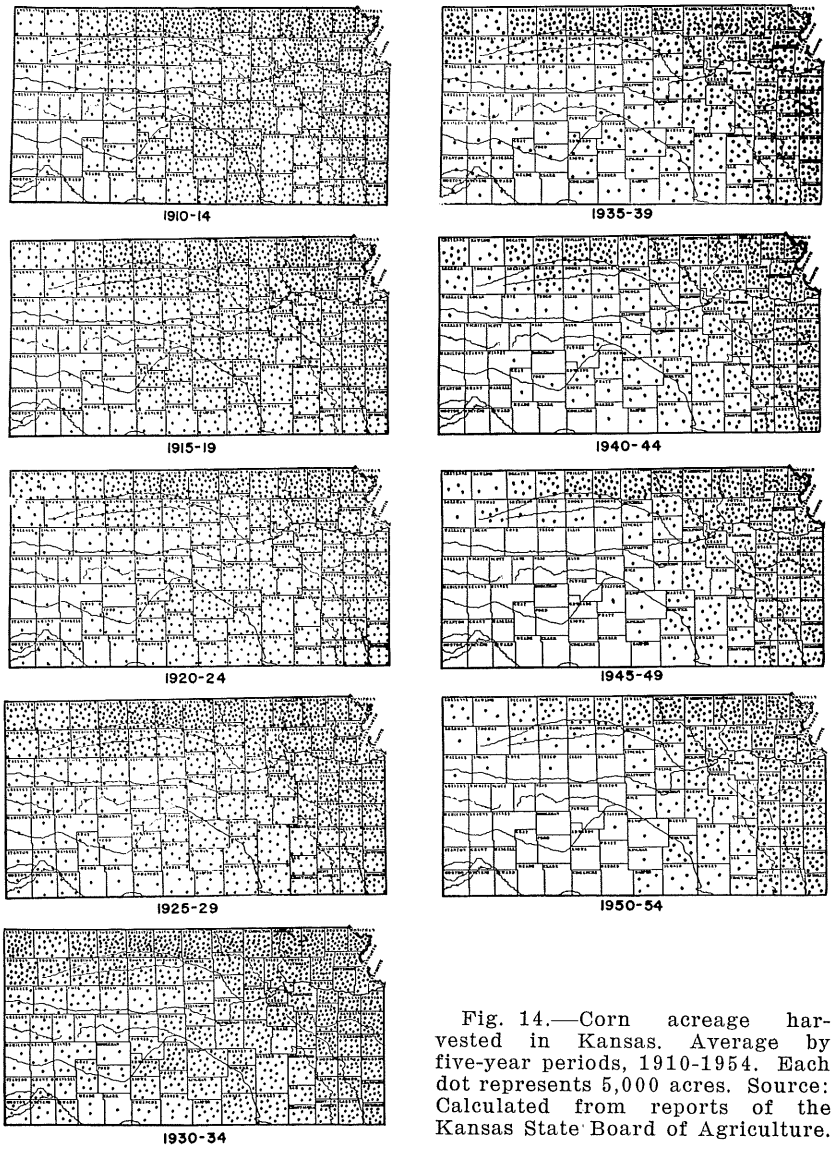

Fig. 14.—Corn acreage harvested in Kansas. Average by five-year periods, 1910-1954. Each dot represents 5,000 acres. Source: Calculated from reports of the Kansas State Board of Agriculture.

Table 8.—Average winter wheat acreage harvested in the various type-of-farming areas in Kansas by five-year periods from 1875-79 to 1950-54. A small quantity of spring wheat is included after 1925, amounting to less than 1 percent of the total.

(Thousand acres)

Period	Area															State total
	1	2	3	4	5	6a	6b	7	8	9	10a	10b	10c	11	12	
1875-79	124	38	75	52	153	178	232	50	36	48	....	1	1	....	....	988
1880-84	148	75	161	93	172	327	433	218	74	140	7	4	....	5	....	1,857
1885-89	67	23	65	54	73	146	239	168	43	120	12	7	8	14	3	1,042
1890-94	172	68	126	120	214	416	891	502	165	536	151	91	94	131	102	3,779
1895-99	218	45	78	101	163	418	944	593	171	706	188	54	41	166	88	3,974
1900-04	199	51	101	109	188	574	1,319	891	378	969	235	73	61	301	52	5,501
1905-09	166	142	146	121	184	549	1,265	905	403	1,227	421	240	112	492	95	6,468
1910-14	143	82	180	169	118	540	1,005	903	509	1,218	232	337	222	428	34	6,120
1915-19	299	216	237	208	280	569	1,436	822	461	1,192	367	374	295	659	41	7,456
1920-24	320	261	249	233	477	779	1,592	900	550	1,370	556	562	291	970	117	9,227
1925-29	249	81	136	162	287	774	1,950	1,048	439	1,703	856	1,268	437	894	180	10,464
1930-34	198	125	109	134	235	790	1,694	1,140	463	1,507	988	1,413	379	927	516	10,618
1935-39	342	303	253	289	577	957	2,097	953	725	1,492	629	743	402	824	361	10,947
1940-44	184	153	167	180	389	873	1,725	1,008	616	1,279	901	1,277	318	977	495	10,540
1945-49	306	229	191	179	492	1,000	2,054	1,282	770	1,676	1,236	1,816	468	1,250	881	13,830
1950-54	326	216	167	173	490	872	1,998	1,149	791	1,419	808	1,131	382	1,032	700	11,654

Source: Reports of the Kansas State Board of Agriculture. Collins revisions from 1925-34.

Table 9.—Percentage of the total winter wheat acreage of Kansas which was harvested in each type-of-farming area by five-year periods from 1875-79 to 1950-54. A small quantity of wheat is included after 1925, amounting to less than 1 percent of the total.

Period	Area															State total
	1	2	3	4	5	6a	6b	7	8	9	10a	10b	10c	11	12	
1875-79	12.5	3.8	7.6	5.3	15.5	18.0	23.4	5.1	3.7	4.9	....	.1	.1	....	....	100
1880-84	8.0	4.0	8.7	5.0	9.3	17.6	23.3	11.7	4.0	7.5	.4	.2	.0	.3	....	100
1885-89	6.5	2.2	6.3	5.2	7.0	14.0	22.9	16.1	4.2	11.5	1.1	.6	.8	1.4	.2	100
1890-94	4.5	1.8	3.3	3.2	5.7	11.0	23.6	13.3	4.4	14.2	4.0	2.4	2.5	3.4	2.7	100
1895-99	5.5	1.1	2.0	2.5	4.1	10.5	23.8	14.9	4.3	17.8	4.7	1.4	1.0	4.2	2.2	100
1900-04	3.6	.9	1.8	2.0	3.4	10.4	24.0	16.2	6.9	17.6	4.3	1.3	1.1	5.5	1.0	100
1905-09	2.6	2.2	2.2	1.9	2.8	8.5	19.6	14.0	6.2	19.0	6.5	3.7	1.7	7.6	1.5	100
1910-14	2.4	1.3	2.9	2.8	1.9	8.8	16.4	14.8	8.3	19.9	3.8	5.5	3.6	7.0	.6	100
1915-19	4.0	2.9	3.2	2.8	3.8	7.6	19.2	11.0	6.2	16.0	4.9	5.0	4.0	8.8	.6	100
1920-24	3.5	2.8	2.7	2.5	5.2	8.4	17.2	9.8	6.0	14.8	6.0	6.1	3.2	10.5	1.3	100
1925-29	2.4	.8	1.3	1.6	2.7	7.4	18.6	10.0	4.2	16.3	8.2	12.1	4.2	8.5	1.7	100
1930-34	1.9	1.2	1.0	1.3	2.2	7.4	16.0	10.7	4.4	14.2	9.3	13.3	3.6	8.7	4.8	100
1935-39	3.1	2.8	2.3	2.6	5.3	8.7	19.2	8.7	6.6	13.6	5.8	6.8	3.7	7.5	3.3	100
1940-44	1.7	1.5	1.6	1.7	3.7	8.3	16.4	9.6	5.8	12.1	8.5	12.1	3.0	9.3	4.7	100
1945-49	2.2	1.7	1.4	1.3	3.6	7.2	14.8	9.3	5.6	12.1	8.9	13.1	3.4	9.0	6.4	100
1950-54	2.8	1.8	1.4	1.5	4.2	7.5	17.1	9.9	6.8	12.2	6.9	9.7	3.3	8.9	6.0	100

Source: Reports of the Kansas State Board of Agriculture.

ern areas shows the much greater increase in the latter. Although the absolute acreage harvested in all five of the eastern areas increased rather irregularly over the 80-year period, the percentage of the crop harvested in these areas dropped sharply so it made up less than 12 percent of the total in 1950-54 in these five areas combined compared with almost 45 percent in 1875-79. Most of this decrease in relative importance took place in the first 20 years, while the western half of the state was being settled. Areas 6a, 6b, 7, and 9, in the middle of the state, provided the bulk of the wheat throughout most of the 80 years. Until 1930 they had provided at least half of the harvested acreage.

Shifts in corn acreage. The shifts in corn acreage are shown in Figure 14 by five-year periods from 1910-14 to 1950-54. The 8,950,000 acres of corn harvested in Kansas in 1910 were greater than in any previous year and were exceeded only in 1917 when 9,156,000 acres were harvested. The severe droughts of the middle and late thirties, particularly of 1934 and 1936 when corn was almost a complete failure, resulted in a rapid decrease in corn acreage in central and southwestern areas.

There is a marked decrease in the concentration of dots in these areas on the map for the 1935-39 period. During this period the acreage for the state fell sharply from the 6,994,000 acres harvested in 1933 to 2,260,000 acres in 1938. The shift away from corn in central and southwestern Kansas continued; by 1945-49 no county in the southwestern third of the state harvested as much as 5,000 acres per year and even in central Kansas the acreage devoted to corn was a small fraction of that used for wheat production. A shift away from corn in most of the northwestern counties has also occurred. These same counties have shown a corresponding increase in wheat acreage.

Use of fertilizer. As shown in Figure 15, the use of commercial fertilizers on Kansas farms has increased sharply in recent years. The amount used was very small until World War II. The increase in use after the war was so rapid that the amount applied in 1950 was almost four and a half times the amount applied in 1945. In addition to commercial fertilizer, large amounts of agricultural lime have been applied in the eastern half of the state, the greatest amount for any one year, 1,460,000 tons, having been applied in 1947.

The principal crops fertilized have been wheat, corn, oats, and alfalfa. A study made in 1951 showed that 55 percent of the fertilizer used that year was applied to wheat, although only 14 percent of the wheat crop was fertilized.[27] Superphosphate made up 31 percent of the commercial fertilizer used in 1951, rock phosphate 11 percent, ammonium nitrate 13 per-

27. Data on fertilizer are from **Kansas Fertilizer Trends,** a Report on the Kansas State Board of Agriculture, March, 1952.

cent, mixed fertilizers about 25 percent, and other materials 20 percent.

Nearly all the wheat fertilized was in the eastern half of the state, with the heaviest use in the eastern one fourth. Because of the heavier rainfall, the soils in the eastern third of the state have been leached to a much greater extent than in the central and western parts. In the western third of the state rainfall is usually the limiting factor in crop production, and in periods of normal rainfall little or no response is obtained from the use of fertilizer on most soils.

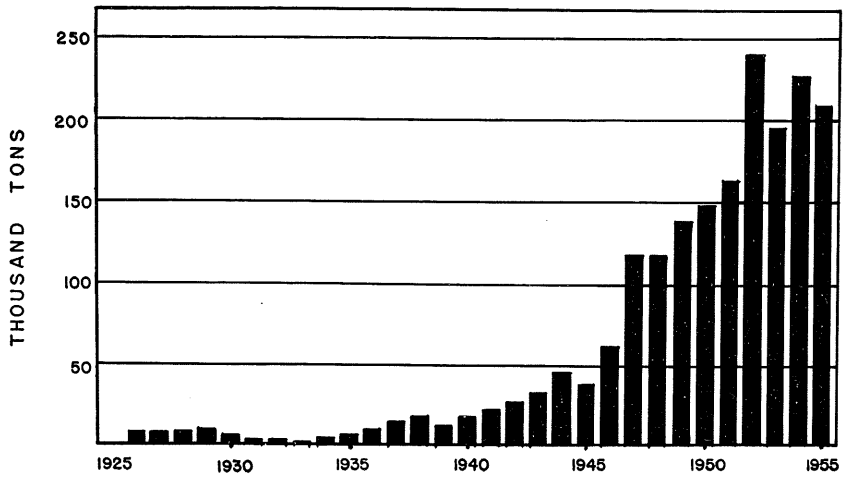

Fig. 15.—Commercial fertilizer used on Kansas farms, 1926-1954. Source: **Kansas Fertilizer Trends,** Report of the Kansas State Board of Agriculture, 1952, and **Plant Food Review,** Summer, 1956.

Crop yields. Long-time average yields of important Kansas crops, by areas, are given in Table 10. Relative county yields of wheat, corn, and grain sorghums are shown in Figure 16. The three maps are similar in that relative yields are highest in the northeastern corner of the state and decrease toward the southwest. They differ in that the parts of the state with yields of 85 to 124 percent of the state average extend much farther west for both wheat and grain sorghums than for corn. In the entire western half of Kansas average county yields of corn were less than 85 percent of the state average, whereas yields of grain sorghums equaled 85 percent or more of the state average in the majority of western counties. In all counties in southwestern Kansas except Scott and Finney (which have a larger-than-average percentage of crops under irrigation) corn yields were less than 65 percent of the state average, whereas only in Morton County was the relative wheat yield so low and no county had a grain sorghum yield

less than 65 percent of the state average. The rapid decrease in corn acreage in central and western Kansas during the last 20 years reflects the inferior corn yields in those areas.

Although northeastern Kansas has an absolute advantage in yields for all three crops over all other sections, relatively little wheat and very little grain sorghum are grown there. The comparative advantage of the northeastern corner over the central and western parts of the state in the production of corn is greater than for the other two crops, and corn is the principal grain crop.

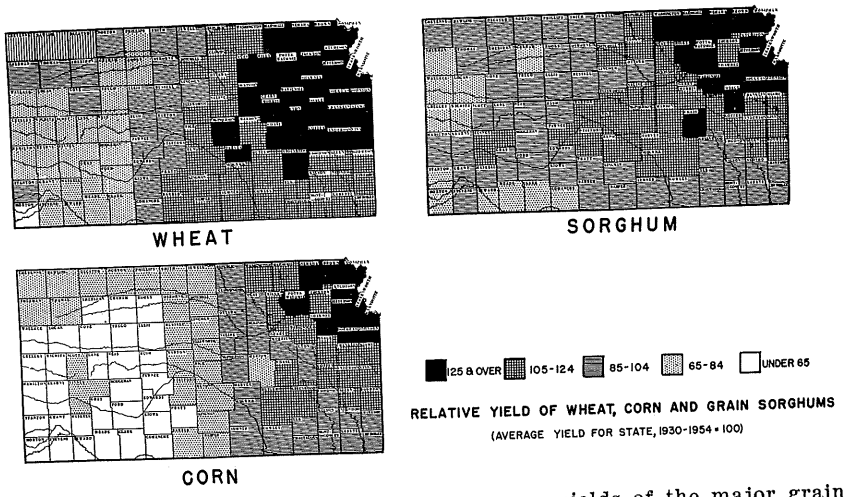

Fig. 16.—Compared with the state average, yields of the major grain crops are highest in northeastern Kansas and lowest in the southwest, as shown above. Source: Calculated from data provided by the Federal-State Crop Reporting Service.

But long-time average yields do not give a complete picture of the returns a farmer can expect when he plants his crop. The acreage of crops harvested never equals the acreage seeded. Figure 17 shows the acreage seeded to wheat, acreage harvested, and the acreage abandoned from 1910-1954. The highest proportion ever abandoned during this period was in 1917, when 61.2 percent of the acreage seeded was not harvested. There was relatively heavy abandonment during most of the 1920's. Very heavy abandonment was the rule throughout the drought-ridden thirties. In contrast, the decade of the 1940's was a period of low abandonment. From 1940 to 1950 there were seven years in which the acreage abandoned was less than 10 percent of that seeded. There have been six years in the period 1910-1950 when less than 5 percent of the acreage seeded was abandoned. The least abandonment for the period occurred in 1919, when only 0.4 percent of the acreage seeded was abandoned.

Table 10.—Average yields of the principal crops by areas, Kansas, 1930-1954.[1]

Area	Wheat seeded, bu.	Wheat harvested, bu.	Corn, bu.	Oats, bu.	Barley, bu.	Soybeans, bu.	Grain[2] sorghums, bu.	Alfalfa hay, tons	Prairie hay, tons
1	14.1	15.0	17.6	19.9	16.5	9.1	14.1	2.0	1.0
2	15.2	16.2	19.6	21.5	17.6	10.1	16.4	2.0	1.0
3	16.9	17.9	24.4	23.5	18.8	11.6	19.3	2.1	1.0
4	17.2	17.9	26.4	24.2	18.3	11.9	19.9	2.0	1.0
5	16.4	17.4	19.5	21.7	17.6	9.9	16.7	2.0	.9
6a	14.5	15.4	16.6	20.9	16.0	8.9	16.5	1.8	1.0
6b	14.4	15.1	14.7	20.0	16.4	8.3	15.6	1.8	1.0
7	11.7	12.9	13.1	16.6	12.4	8.2	14.3	1.8	.9
8	13.0	14.2	15.7	17.8	13.5	9.4	15.5	1.7	.9
9	11.8	13.0	11.4	16.2	12.8	8.1	14.5	1.8	.9
10a	9.6	11.7	10.7	12.4	9.5	7.5	13.3	2.0	.9
10b	8.9	11.0	9.2	12.3	8.4	7.7	11.9	2.0	.8
10c	11.3	12.5	10.5	15.0	11.9	7.8	11.9	1.7	.9
11	11.8	14.1	12.7	14.7	11.1	6.5	12.7	2.0	.9
12	9.5	12.0	11.2	11.7	9.0	7.9	12.4	2.0	.9
Kansas	12.1	14.2	18.1	20.7	11.4	10.1	14.4	1.8	1.0

Source: Calculated from reports of the Kansas State Board of Agriculture except Collins revision of wheat yields 1930-42, Collins revision of corn yields 1930-44.

1. Yield of corn, oats, and barley per acre seeded. Other crops yield per acre harvested.

2. Calculated from data for "Grain Sorghums," 1930-40, and "All Sorghums for Grain," 1941-54. The two series are not entirely comparable.

The average percentage abandoned for the 25 years 1930-54 is shown by Table 11. The general picture is one of increasing abandonment from east to west as rainfall decreases, wind velocities become higher, evaporation greater, and the hail hazard increases. There are some exceptions. Abandonment in Areas 1 and 2 has been greater than in Areas 3, 4, 5, 6a, and 6b, although precipitation is greater in Areas 1 and 2 than any other part of the state. Abandonment has been greater in Area 7 than in Areas 9 and 10c, although the two latter areas have little if any more rainfall. Area 12, with the least rainfall, has had the highest percent of abandonment.

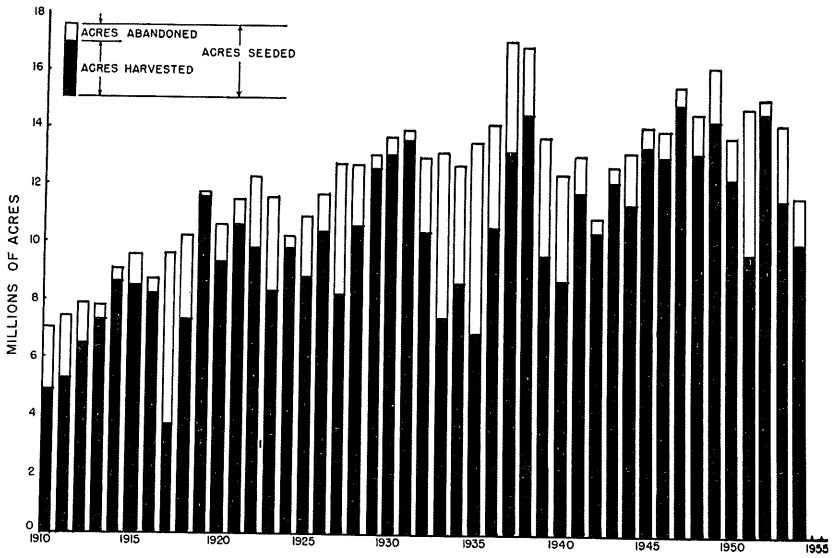

Fig. 17.—Acres of wheat seeded, acres harvested, and acres abandoned in Kansas, 1910-1954. Source: Reports of the Kansas State Board of Agriculture.

The variability of wheat yields over the state, shown by Figure 18, gives an indication of the differences in technical risk in crop production. The figure written in for each county is the coefficient of variation. A 60 (Trego County) indicates that in relation to the average yield for the 23 years (1930-52) annual yields varied three times as much as in Brown County with a 20. For the eastern half of the state there is no consistent pattern from east to west. In the western half, however, yield variability increases rapidly from east to west, almost every county having greater variability than its neighbor to the east. Area 12, with the lowest average precipitation, has the highest variability.

A comparison of Hamilton County (coefficient of variation = 87) with Riley County (coefficient of variation = 18) points

Table 11.—The percentage of wheat acreage seeded, then abandoned, by type-of-farming areas, for 1930-54, Kansas.

Area	Annual average acreage seeded (thousand acres)	% abandoned (wt. av.)	Area	Annual average acreage seeded (thousand acres)	% abandoned (wt. av.)
1	290.1	6.6	9	1,680.2	12.2
2	222.6	7.9	10a	1,281.2	28.8
3	190.6	7.0	10b	1,851.7	31.1
4	200.1	4.6	10c	447.2	12.8
5	467.4	6.6	11	1,310.2	23.5
6a	955.5	6.0	12	900.6	34.4
6b	2,027.0	5.6			
7	1,288.3	14.1	Kansas	13,881.0	17.0
8	768.3	12.4			

Source: Calculated from reports of the Kansas State Board of Agriculture.

up the difference in variability between western and eastern areas. The average wheat yield for Hamilton County for the 23 years was 9.9 bushels per acre but average annual yields ranged from 0.1 to 28.9 bushels per acre or from 1 percent to 292 percent of the average yield. In 9 of the 23 years the yield was less than 50 percent of the average but in 5 of the years it was more than 200 percent of the average. In contrast in Riley County, with an average per acre yield of 17.9 bushels, the annual average range was from 12.1 to 23.5 bushels. Thus county yields during the period were never less than 67 percent nor more than 131 percent of the average.

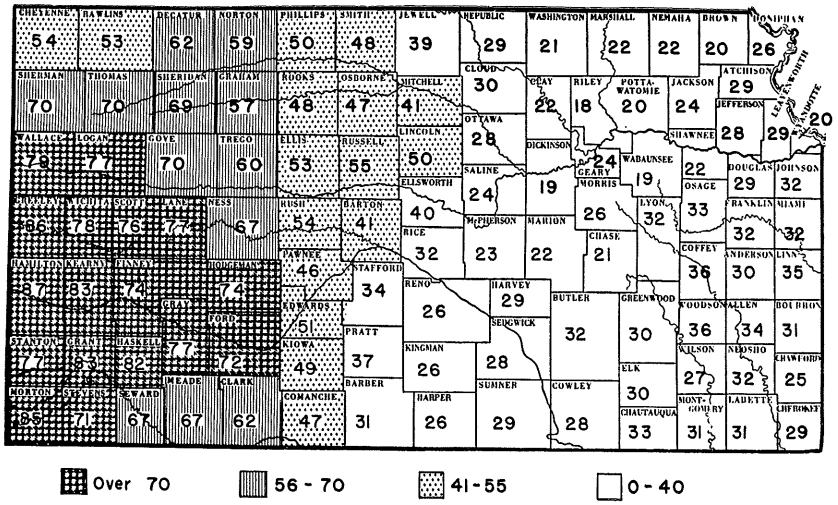

Fig. 18.—Variability of wheat yields per acre seeded in Kansas, 1930-1952 (coefficient of variation). Source: Calculated from data provided by the Federal-State Crop Reporting Service.

Effectiveness of summer fallow. Summer fallowing is the principal cultural practice advocated to reduce risk of crop failure in those areas of Kansas where yields are highly variable. Separate data, by counties, on yields and abandonment of wheat seeded on fallowed and continuously cropped land are available only for 1947-54. Eight years is a relatively short time on which to base conclusions. Nevertheless, the information presented in Table 12 and Figure 19 supports experimental evidence and indicates that fallowing was relatively effective in increasing yields and reducing the percentage of wheat abandoned. The average area yields of wheat on fallow ranged from 141.3 percent to 184.2 percent of their respective yields on continuous cropland. The average acreage abandoned on fallow land ranged from only 59.3 percent to 82.8 percent of that abandoned on continuously cropped land. Fallowing appeared to be particularly effective in increasing yields and decreasing abandonment in Areas 11 and 12 where average yields on continuously cropped land are relatively low and variability high.

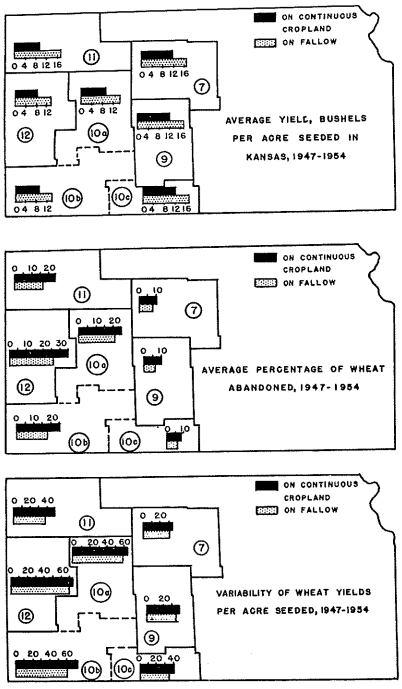

Fig. 19.—Summer fallow was effective in increasing wheat yields and in decreasing abandonment but did not greatly decrease the variability of yields in Kansas, 1947-1954. Source: Table 12.

Fallowing, however, appears to be much less effective in stabilizing yields than in increasing them. The variability of yields on fallowed land was 85 percent or more of the variability on continuously cropped land in all western areas except Area 11 (where it was 75.5 percent). In evaluating the effectiveness of fallow from Table 12, it must be remembered that abandonment or poor yields sometimes result from disease, insects, hail, or other causes not affected by summer fallow.

Livestock and livestock products. In the 1954 census, 85.4 percent of all farms reported cattle and calves, with rather wide variation in the number per farm reporting (Table 13). Areas 10c, 12, and 10a reported the largest number with 93, 89, and 74 animals per farm, respectively. The 54 per farm for

Table 12.—Average yield of wheat per acre seeded, average percentage abandoned, and coefficient of variation of yields per acre seeded in Kansas, 1947-54.

Area	Average yield per acre seeded			Average percentage abandoned			Coefficient of variation of yields		
	Continuous cropland	Fallow	Fallow as % of cont. cropland	Continuous cropland	Fallow	Fallow as % of cont. cropland	Continuous cropland	Fallow	Fallow as % of cont. cropland
7	11.9	16.8	141.2	10.6	8.1	76.4	35.1	30.7	87.5
9	12.1	17.1	141.3	10.4	6.7	64.4	38.7	34.9	89.7
10a	9.4	14.5	154.3	25.0	20.7	82.8	64.4	58.1	90.2
10b	9.1	13.9	152.7	25.6	18.1	70.7	67.9	61.6	90.7
10c	12.1	17.1	141.3	8.9	6.5	73.0	40.4	34.4	85.1
11	9.5	17.5	184.2	24.1	14.3	59.3	50.6	38.2	75.5
12	8.3	13.7	165.1	35.1	23.7	67.5	73.8	69.3	93.9

Source: Computed from data provided by the Federal State Crop Reporting Service.

Area 5 is misleading. This is the Flint Hills area, a fine grazing region. From 250,000 to 300,000 cattle are shipped in each year from southwestern ranges for the grazing season but they had been shipped out before October when the census was taken.

Slightly more than one third of all Kansas farms reported hogs and pigs, with an average of 21.7 per farm reporting. The highest percentage of farms and the largest number per farm were in the northeastern areas and Area 8, which includes most of the northern tier of counties. The average number per farm indicated few, if any, specialized hog farms. Area 4, with the largest number, reported only 39 hogs and pigs per farm reporting.

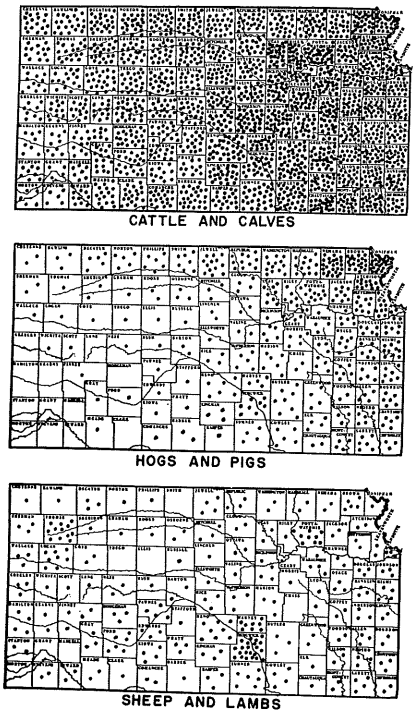

Fig. 20.—Numbers of principal types of livestock on Kansas farms, October-November, 1954. Each dot represents 2,000 animals. Source: 1954 Census (preliminary).

Only 6.6 percent of all farms in the state reported sheep and lambs. A slightly higher percentage of farms reported sheep and lambs in the eastern than in the central and western areas but the flocks in the eastern areas averaged much smaller.

The size and relative importance of poultry enterprises are indicated by egg sales. Approximately 56 percent of all farms reported some egg sales but poultry was clearly a supplementary enterprise on most. Average egg sales over the state were less than 3 dozen per day per farm reporting. Areas 6a, 8, and 6b led with sales of 1,327, 1,240, and 1,155 dozen, respectively, per farm reporting.

The geographical distribution of cattle and calves, hogs and pigs, and sheep and lambs is shown in Figure 20. The most striking feature is the much more nearly uniform distribution of cattle and calves than of the other livestock. The distribution of hogs is similar to that of corn production, being practically limited to the eastern third of the state and the northern tier of counties. The highest concentration of hogs, like that of corn, is in the northeast corner of the state. The distribution of sheep and lambs is irregular. There are a number of minor concentrations. The total number in most counties

Table 13.—Percentage of all farms that reported specific livestock on the farm in 1954,[1] and percentage that reported egg sales in 1954, Kansas.

Area	Cattle and calves		Hogs and pigs		Sheep and lambs		Egg sales	
	% of farms reporting	Number per farm reporting	% of farms reporting	Number per farm reporting	% of farms reporting	Number per farm reporting	% of farms reporting	Dozens sold per farm
1	89.1	26.0	32.1	15.6	10.2	29.5	50.6	807.2
2	90.5	32.1	36.2	21.7	9.4	36.7	61.7	1,065.0
3	83.1	25.8	35.1	25.7	6.4	48.0	43.3	813.2
4	90.3	32.8	54.5	39.2	6.8	47.6	64.5	1,008.7
5	88.9	53.7	35.8	24.7	5.7	67.8	58.2	1,072.2
6a	86.6	40.0	33.4	19.3	5.3	64.2	68.6	1,327.3
6b	82.2	33.6	28.8	17.5	11.5	66.0	57.3	1,154.9
7	85.8	52.0	34.0	10.9	3.7	67.7	59.5	819.9
8	89.5	38.5	46.9	26.7	3.4	70.1	68.7	1,240.3
9	80.7	42.7	23.0	10.4	5.4	106.9	45.4	732.3
10a	80.9	73.7	27.9	8.1	2.7	221.1	44.7	636.7
10b	68.8	56.3	19.6	9.1	2.7	265.1	32.4	727.6
10c	84.7	93.1	21.1	15.5	5.5	95.7	38.1	894.9
11	81.9	60.5	35.5	17.3	4.5	182.0	50.7	744.9
12	69.8	88.8	25.4	13.5	3.9	436.0	36.5	557.6
Kansas	85.4	41.9	34.6	21.7	6.6	69.6	55.7	1,011.1

Source: Calculated from 1954 Census (preliminary).
1. On the day the census taker visited the farm, which was October-November 1954.

is not large and the presence of only three or four fairly large lamb feeders in any one county is sufficient to show a concentration on the map.

Figure 21 shows the geographical distribution of milk and egg production in Kansas. Except for Area 5, the Flint Hills grazing region, there is considerable milk produced in almost all counties in the eastern half of the state. Around Kansas City and Wichita and in southeastern Kansas, sales are largely of fluid milk. In the rest of the state, except for fluid milk production for local towns, sales of cream are more important. Most of the western half of the state is a milk-deficit area. Local production does not fill local demand even for fluid milk. Additional fluid milk and other dairy products are shipped in.

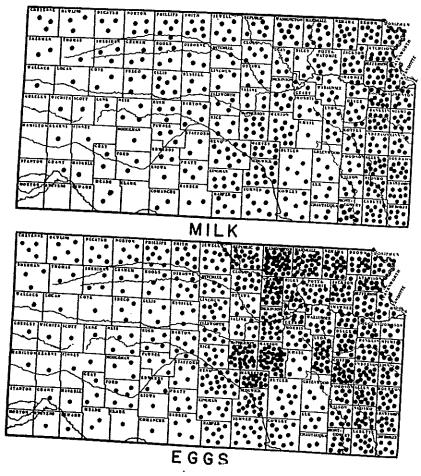

Fig. 21.—Production of milk and eggs in Kansas, 1954. Each dot in top map represents 5 million pounds of milk. In bottom map, each dot represents 1 million eggs. Source: Egg Production, 1954 Census (preliminary), milk, 1954-55, **Farm Facts**, Report of the Kansas State Board of Agriculture.

The distribution of egg and hog production is similar. The northeast corner of the state, the northern tier of counties, a belt along the eastern border of the state, and Areas 6a and 6b in the center account for the bulk of Kansas eggs. In most counties in the western half, most eggs are for home consumption, with a small excess. Production in most western counties does not meet local demand.

Production of hogs, milk, and eggs is chiefly confined to the eastern half of the state. In the western half there is much less "general farming." Cash-crop farms are the dominant type in most of the western type-of-farming areas. Wheat is the principal crop and beef the most important livestock in almost all western counties.

Area 6b in south-central Kansas is somewhat unusual in that it is one of the most important wheat-producing areas, yet sizeable quantities of milk and eggs and a considerable number of hogs are produced.

CHANGES IN FARM MACHINERY AND AGRICULTURAL PRODUCTIVITY

The machinery of pioneer Kansas.[28] By the end of the Civil War—which ended before any but the extreme eastern part of Kansas was settled—most of the basic machines needed for commercial agriculture were in the process of development.

By 1850, the steel plow was being produced by John Deere on a commercial scale. The sulky plow was introduced on a small commercial scale in 1864, and prior to 1880 the two-bottom riding plow had come into use on the plains except for breaking the prairie sod. A practical springtooth harrow—still one of the most popular tillage implements in western Kansas—was patented in 1877 and was used extensively by the early eighties.

End-gate seeders that scattered the seed from the end of a wagon were used to plant wheat in the early 1870's. Manufacture of a grain drill had begun in Pennsylvania as early as 1841 but it was not widely adopted in Kansas until the seventies. In 1877 carloads of drills were sold in Kansas. Riley County reported 60 to 80 percent of its wheat crop was drilled; Geary (Davis) 75 to 90 percent.[29]

Harvesting machinery was particularly important in the Plains because large acreages of grain ripened at one time. The reaper had come into general use before the end of the Civil War. The first successful wire binder was sold in 1873 and "about twenty thousand wire binders were in use in the harvest of 1878."[30] A few twine binders were made and sold during the late seventies but the 3,000 sold by Deering in 1880 represented the first appearance on a commercial scale.[31] However, "contrary to the traditions and the historians it was not the reapers, harvesters, and binders that made history on the Western prairie and plains. It was the header that should always be identified with the Plains region."[32] In the eastern part of Kansas, however, the header never supplanted the binder. A combine had been used to cut wheat in California as early as 1854 but this method of harvesting was not truly inaugurated in that state until about 1880. Acceptance by operators of the very large farms during the late eighties was so rapid that "by the early nineties the combine almost completely superseded the header on the bonanza farms of the state."[33] The combine did not come into general use on the Plains until much later. In 1918 the combine was tried out in Kansas, with about 14 being used, but during 1919 and 1920

28. For a discussion of the development of tillage and harvesting machinery see Rogin, Leo, **The Introduction of Farm Machinery in Its Relation to the Productivity of Labor in the Agriculture of the United States During the Nineteenth Century.** University of California Press, Berkeley, 1931.

29. Malin, **op. cit.,** pp. 60-61.

30. Rogin, **op. cit.,** p. 111.

31. **Ibid.,** p. 115.

32. Malin, **op. cit.,** p. 62.

33. Rogin, **op. cit.,** p. 123.

more than 1,500 were sold.[34] With reference to the combine, Sanders wrote in 1920, "Its chief advantage is in eliminating the necessity for the vast army of floating harvest hands that have been brought to the state in years past to work a short time at high wages and low efficiency."[35]

The present machinery situation. Almost from the beginning, most of the tillage, seeding, and (with the exception of corn) harvesting of crops has been done by machinery in

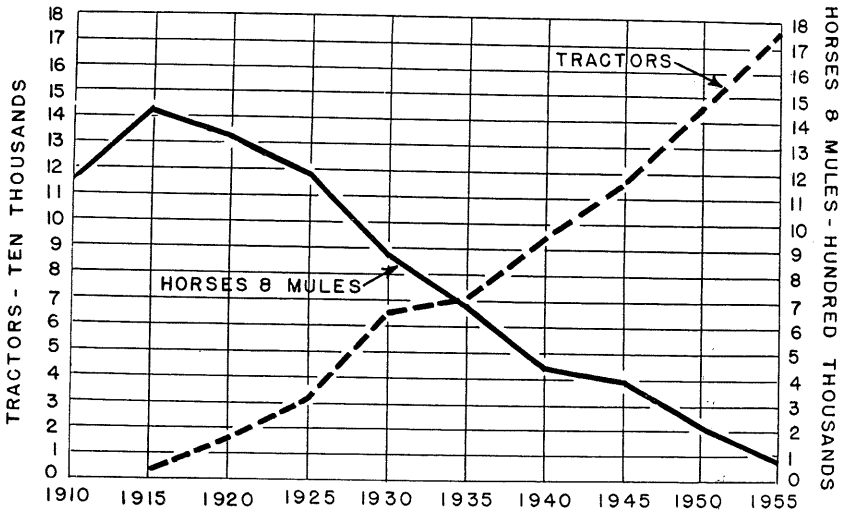

Fig. 22.—Numbers of horses and mules, and tractors on Kansas farms, 1910-1955. Source: Reports of the Kansas State Board of Agriculture.

Kansas. But until the period following World War I horses were used for power. The rapid change to a truly mechanized, machine-powered agriculture is indicated by Figure 22 which shows the number of horses and mules and of tractors in Kansas from 1910 to 1955. The change in the source of farm power is symbolic of the general shift toward equipment with which larger acreages could be operated with less man-labor.

Changes in the number of major farm machines are shown in Table 14. In 1915 there were about 3,000 tractors in Kansas of which 39 percent were in the eastern, 46 percent in the central, and only 15 percent in the western section of the state. During the 1920's the increase in the western section was so great that, whereas in 1920 there was only 1 tractor per 11.1 farms, in 1930 there was 1 per 1.9 farms. In the central section the increase was from 1 per 9 to 1 per 2.3 farms and in the eastern section from 1 per 14.3 to 1 per 6 farms.

34. Walker, H. B., in **Kansas Facts,** Vol. I, Topeka, 1929, p. 127.

35. Sanders, W. H., **Some New Farm Machines.** Twenty-second Biennial Report of the Kansas State Board of Agriculture, 1920.

The general acceptance of general-purpose (row-crop) tractors stimulated a rapid increase in numbers, especially in eastern Kansas, during the late 1930's and 1940's. By 1950 there were more than 146,000 tractors in Kansas, and the number had increased to 176,000 by 1955.

Table 14.—Major farm machines on Kansas farms, 1915-1955.

Year	Tractors	Trucks	Combines	Corn pickers	Pickup balers	Field forage harvesters
1915	3,000					
1920	17,177	3,900				
1925	31,171		4,700			
1930	66,275	33,700	24,239			
1935	71,000		28,000			
1940	95,139	42,600	42,800			
1945	116,651	60,908	48,067	2,100	1,175	
1950	146,498	89,254	68,906	12,232	8,160	5,000
1955	176,319	112,441	75,592	19,562	17,961	13,084

Source: Report of the Kansas State Board of Agriculture, 1954-1955, Farm Facts, p. 86.

Following World War I the number of combines in the state increased rapidly. Although only 4,700 were used in 1925, the number had increased to 24,239 by 1930. Most of these were in the central and western parts of the state. The combines in use at this time were large, heavy, rather cumbersome, and were not well adapted to the rolling topography and relatively small farms of eastern Kansas. In spite of the depression of the 1930's, the number of combines almost doubled during the decade so that 46,572 were reported in the state in 1940. The rate of increase in eastern Kansas, resulting from the introduction of small machines operated by power-takeoff from the tractor, was more rapid than in the central and western sections. By 1955 Kansas had more than 75,000 combines.

Census data for some of the principal items of farm and home equipment are presented by areas in Tables 15 and 16. The general picture is of a rather high degree of mechanization, but the extent of mechanization is understated because of the census definition of "farm". In 1954 nearly 10 percent of all census "farms" in Kansas were of less than 30 acres and in some of the eastern areas, where the percentage of farms reporting tractors and other equipment was unusually low, part-time and residential units made up as much as 33 percent of all farms. Few of them would be considered "farms" by the average Kansas farmer. Most are too small to support tractors, combines, and other large equipment.

More than 85 percent of all farms reported one or more tractors in 1954, with an average of 1.7 tractors per farm reporting. In the western areas the percentage of farms reporting tractors was considerably higher than in the eastern areas. This is partially accounted for by the fact that in the western areas there are no cities and few large towns and, conse-

quently, fewer of the "under 30-acre" farms which surround the towns and cities in the eastern areas. In the western areas the number of tractors per farm is greater than in the eastern and central areas. This difference is rather closely correlated with differences in the average size of farm, which has been discussed. More than half of all Kansas farms reported a tractor but no horses or mules. This does not mean, however, that the remainder used horses as a source of power. No distinction in made in Table 15 between draft and riding animals but a fairly high (but unknown) proportion are the latter, especially in the central and western areas.

Combines were reported by 57 percent of all Kansas farms in 1954 but they were unevenly distributed over the state. In Areas 1 to 5, inclusive, in which wheat is comparatively unimportant, less than half of all farms reported combines and only one per farm was reported. But in central and western Kansas most areas reported combines on 65 percent or more of the farms and there were an average of 1.1 to 1.3 machines per farm reporting.

Mechanization of corn harvesting came much more slowly and is still less complete. Only in the easternmost areas and the northern tier of counties is the acreage of corn large. But even in Area 4, in which corn production is most highly concentrated, only about two fifths of all farms reported corn pickers in 1954. Because farmers with pickers had larger-than-average corn acreages, and did custom work for their neighbors, the percentage of the corn crop harvested by machine was much higher. The number of corn pickers has increased rapidly since World War II. On January 1, 1942, there were only 1,000 pickers in Kansas. By 1945 the number had doubled; by 1950 there were 12,232 and by 1954 there were 19,562 pickers in the state.

About 70 percent of all farms had one or more trucks but, as with tractors and combines, the percentage was greater in the western than in most eastern areas. Automobiles were reported by more than 87 percent of all farms and the distribution was rather uniform.

Only about one out of every seven Kansas farms had a milking machine in 1954. One would not expect a very high proportion of farms with milking machines in a state in which only 6.8 percent of all farms were classified by the census as dairy farms. Nevertheless the number of machines has increased rapidly since World War II. There were only 3,000 milking machines on Kansas farms on January 1, 1942. By 1945 the number had increased to 5,338. Although the census classified only 8,174 farms as dairy farms in 1954 compared with 8,534 in 1950, there were 17,445 milking machines on farms in 1954 compared with 13,226 in 1950. It is probable that machines are used on almost all farms on which 10 or more cows are milked.

Census data are not available on tillage and seeding equip-

Table 15.—Percentage of Kansas farms that reported tractors, trucks, and combines. 1954.

Area	Tractors			Trucks		Combines	
	% of all farms reporting	No. per farm reporting	% reporting tractors but no horses or mules	% of all farms reporting	No. per farm reporting	% of all farms reporting	No. per farm reporting
1	75.2	1.4	48.3	88.1	1.1	44.2	1.0
2	83.2	1.5	52.9	53.0	1.1	46.3	1.0
3	77.1	1.6	50.5	57.9	1.2	35.7	1.0
4	79.0	1.6	53.0	49.0	1.1	42.7	1.0
5	83.5	1.6	39.3	66.3	1.2	48.6	1.0
6a	90.8	1.7	60.7	76.7	1.2	70.0	1.1
6b	89.4	1.8	63.7	80.6	1.3	65.8	1.1
7	90.9	1.8	55.0	84.7	1.4	71.6	1.1
8	87.8	1.7	53.1	63.3	1.2	59.5	1.1
9	91.6	2.0	65.7	89.3	1.5	75.4	1.2
10a	90.5	2.0	54.4	90.0	1.8	72.8	1.2
10b	88.8	2.1	57.3	85.9	1.9	71.3	1.3
10c	86.9	1.9	35.9	83.2	1.6	51.3	1.2
11	92.9	1.9	57.2	89.8	1.6	70.3	1.2
12	91.3	2.2	52.9	89.2	2.1	66.5	1.3
Kansas	85.5	1.7	53.5	70.3	1.3	57.0	1.1

Source: 1954 Census (preliminary).

Table 16.—Percentage of Kansas farms that reported specified equipment and facilities, 1954.

Area	Automobiles	Corn pickers	Milking machines	Electricity	Piped running water	Telephone	Television sets	Home freezers
1	80.3	14.8	14.9	88.0	47.3	62.4	31.2	17.5
2	83.8	22.6	18.4	94.6	45.9	71.7	32.9	24.3
3	84.8	22.8	20.7	98.5	65.3	78.4	58.9	38.7
4	83.9	43.7	17.9	92.7	51.3	75.5	41.1	27.6
5	85.3	15.3	10.6	94.7	56.8	76.8	23.6	26.6
6a	93.1	16.0	16.1	95.9	62.1	87.3	24.8	31.6
6b	89.9	3.8	18.7	94.8	76.8	81.8	40.7	31.0
7	89.9	3.1	9.4	88.5	61.6	76.9	17.3	31.5
8	90.7	40.4	12.0	91.4	52.1	82.0	14.3	25.0
9	91.5	0.8	12.0	91.2	75.4	77.5	34.0	36.8
10a	90.7	0.2	13.9	90.5	74.3	70.2	11.9	43.9
10b	85.0	0.4	7.4	82.6	76.7	59.1	7.4	42.3
10c	91.9	....	8.8	91.5	75.5	74.6	23.8	36.3
11	92.3	7.6	11.9	90.0	74.3	68.3	6.1	42.3
12	89.8	2.5	7.5	83.4	72.0	42.1	3.1	41.9
Kansas	87.4	16.1	14.5	92.9	61.3	74.8	28.3	30.4

Source: 1954 Census (preliminary).

ment but a fairly good idea of the types of equipment used in the western part of the state can be gotten from a study made by Scoville and Hodges of farms in Pawnee, Lane, and Thomas counties which are in Areas, 9, 10a, and 11, respectively.[36] They found that the implements used in tillage operations varied greatly from farm to farm but the principal ones were moldboard plows, one-way disks, and listers. In addition to these major items the duckfoot cultivator, the springtooth harrow, and the disk harrow were frequently used with the one-way disk, while those most frequently used with the moldboard plow were the spiketooth harrow, springtooth harrow, and one-way disk.

Table 17.—Typical operations in wheat production, 1947 crop.

County	Continuous cropping	Fallow
Pawnee	one-way, twice spike harrow drill combine haul	moldboard plow springtooth, twice one-way, twice drill combine haul
Lane	one-way, twice drill combine haul	one-way, four times springtooth drill combine haul
Thomas	one-way, twice drill combine haul	one-way, twice duckfoot, twice rodweed drill combine haul

They found that "an array of individual fields by method of seedbed preparation showed a marked lack of uniformity. All of the 45 summer-fallowed fields for which records were obtained in Pawnee County were different either with respect to implements used or number of times used, and there was nearly as much variation in the other sample counties."[37]

Operations involved in wheat production in 1947 are shown for each county in Table 17.[38] The authors emphasize that the sequence of tillage operations is of no particular significance because this varies with soil moisture and weed conditions. The number of operations also varies widely with moisture and weed conditions.

In addition to the implements listed in Table 17 tool-bar implements are rather widely used. These are made in various widths and can be equipped with a variety of shovels, from

36. Scoville, O. J., and Hodges, J. A., **Practices and Costs on Wheat Farms in Western Kansas,** 1947. Kans. Agr. Exp. Sta. Circ. 268. Manhattan, December 1950.

37. **Ibid.,** p. 16.

38. **Ibid.,** Table 12, p. 16.

chisels for subsoiling to wide sweeps for killing weeds on fallow land.

A relatively high standard of living on Kansas farms is indicated by the percentage of farms with telephones, electricity, and certain electrical appliances (Table 16). Almost three fourths of all Kansas farms had telephones in 1954. Nearly 93 percent had electricity, and 61 percent piped running water. Home freezers were reported by 30 percent and television sets by 28 percent of all farms. As would be expected, the percentage of farm homes with home freezers was highest in western Kansas, where towns are fewer and smaller. Television sets, quite naturally, were more numerous in areas near major towns and cities.

Electricity has not been a major source of farm power in Kansas. Recent data are not available but a study of farms in Areas 9 and 10b showed that in 1948 about 90 percent of all electricity consumed was for household use.[39]

Changes in agricultural productivity. Tremendous gains in agricultural productivity in the United States have been made possible in the last half century by improved agricultural technology. The substitution of machinery for labor, with the resultant decrease in man-hours per acre of crops, has been the largest single factor. But changes that increased yields per acre and/or reduced labor requirements for livestock and livestock products also have been important. Chief among these latter changes were development of higher yielding hybrids and varieties of crops, higher producing animals, new chemicals and techniques to improve disease, insect, and weed control, and greater use of commercial fertilizers.

Labor productivity in the production of crops has shown a greater increase than productivity in total farm production, primarily because gains in crop production have exceeded gains in the production of livestock and livestock products. According to Hecht and Barton:

> In 1948, farmers in this country raised about 90 percent more total crops per hour of labor than they did in 1910. They raised more than 3⅓ times as much wheat, about 2¼ times as much corn, more than 100 percent more fruit, more than 75 percent more cotton, and 30 percent more hay. . . . For crops as a whole the West North-Central Division (which includes Kansas) stands at the head of the list, with an increase of 113 percent in production per hour of labor from 1919 to 1948. . . .[40]

Wheat is by far the most important crop in Kansas, particularly in the western half of the state. The increased produc-

39. Bortfeld, C. F., and Davis, Joe F., **Electricity on Farms in the Winter Wheat Area of Southwestern Kansas.** Kans. Agr. Exp. Sta. Bul. 351. Manhattan, December 1951.

40. Hecht, Reuben W., and Barton, Glen T., **Gains in Productivity of Farm Labor.** U.S. Dept. of Agr. Tech. Bul. No. 1020. December 1950, p. 9.

tivity in raising wheat was greater than for any other crop and arose largely from increased mechanization rather than from higher yields. Hecht and Barton estimate that for the United States it required 15.2 man-hours per acre of wheat in 1910-14 but only 6.1 man-hours in 1945-48. To produce 100 bushels of wheat in 1910-14 required 106 man-hours but in 1945-48 it required only 34 man-hours.[41] In the West North-Central Division (which includes Kansas) they estimated that 100 man-hours produced 191 more bushels of wheat in 1944-46 than in 1919-21. Of this gain of 191 bushels, 114 bushels were associated with mechanization and other factors which reduced man-hours per acre and 77 bushels with increases in yield per acre.[42]

The great variability in labor requirements in the production of wheat in different regions is illustrated by Rogin's data.[43] On a large California wheat farm in 1895-96, which used a steam tractor and combine, time required for an acre of wheat yielding 20 bushels was 2 hours and 58 minutes, including hauling to the granary. On another large farm, which used combines pulled by horses instead of a steam tractor, 3 hours and 19 minutes was required. This is much less than Hecht and Barton's estimate of the time required in 1945-48 as an average for the United States. This small requirement was not typical, however, of wheat production even in California except on the very large farms that used large equipment and many men and were highly organized. In central Kansas in 1894 on a farm with 100 acres of wheat, which bound, shocked, stacked, and later threshed, it was estimated that 10 hours and 24 minutes of labor was required. It was estimated that in 1895 in Illinois with wheat threshed from the shock, 14 hours and 17 minutes of labor per acre of 20-bushel wheat was required. As an extreme example of large labor requirements, on a one-horse farm in Maine with 6½ acres of spring wheat, 27 hours and 41 minutes was required just to put in the 1889 wheat crop.

The labor requirement per acre of wheat in Kansas, and particularly on farms in central and western Kansas, is a good deal less than the 6.1 hours estimated by Hecht and Barton for the United States in 1945-48. Scoville and Hodges estimated that for western Kansas wheat farms in 1947, assuming 59 percent of the acreage was under continuous cropping, 41 percent on fallow, and 4 percent volunteer, with one-waying and seeding the only preharvest operations, an average of 2.21 man-hours and 1.35 tractor-hours was used per acre.[44]

CHANGES ASSOCIATED WITH MECHANIZATION

Custom work. A large amount of capital would be required if each farmer were to own all the equipment needed for full mechanization of farm operations. At the same time many of

41. **Ibid.,** p. 11.
42. **Ibid.,** p. 76. Total production per man-hour was 106 bushels in 1919-21 and 297 bushels in 1944-46.
43. Rogin, **op. cit.,** pp. 216-229.
44. Scoville and Hodges, **op. cit.,** p. 21.

the more specialized (and more expensive) machines would be used such a short time each year that owning of a full line of machinery would be an inefficient use of resources. To a considerable extent farmers have solved the problem either by cooperative ownership of specialized machinery or by custom work.

Trucks, hay balers, silo fillers, field forage harvesters, corn pickers, and combines are the machines most frequently used on a custom basis in Kansas. The best available information on the extent to which these machines are custom used is given

Table 18.—Percentage of farms reporting machine work hired and expenditure per farm reporting, 1954, Kansas.

Area	% of farms reporting machine work hired	Expenditure per farm reporting
1	52.7	$ 224
2	61.1	219
3	58.7	247
4	66.2	243
5	57.8	262
6a	68.1	256
6b	65.5	318
7	66.4	362
8	69.5	270
9	62.6	462
10a	59.0	600
10b	49.7	740
10c	56.7	600
11	63.3	655
12	51.8	1,038
Kansas	61.6	337

Source: 1954 Census (preliminary).

in Table 18. It shows the percentage of farms that reported machine work hired in 1954 and the expenditure per farm reporting. Slightly more than 60 percent of all Kansas farms reported that they had hired machine work done, with an average expenditure of $337 per farm reporting. There was no consistent pattern among the various type-of-farming areas with respect to the proportion of farms that hired machine work, the percentage varying from 51.8 in Area 12 to 69.5 in Area 8. However, the expenditure per farm was much greater in the western than in the central or eastern areas. Each of the five areas (10a through 12) which make up the western third of the state, averaged $600 or more per farm reporting. Probably 75 percent or more of the expenditure for custom work in the western areas was for combining and hauling wheat.

In the eastern, and to a lesser extent in the central, areas

custom combining is done largely by local farmers, but in the western areas local farmers do less custom work than itinerant operators who follow the harvest from Texas to Canada. Many of these combine outfits, perhaps the majority, consist of a single unit—one combine, one tractor (if the combine is not self-propelled), one truck, and the crew. Many outfits, however, are multiple unit. According to Leker:

> The "Hammtown" outfit of Perry, Kansas, represents a typical organization of this type. Starting modestly as a one-combine outfit, it had expanded, by 1947, into eight 14-foot, self-propelled combines, eight grain trucks, and eight trailers for transporting the combines. Additional trailers in this outfit included two bunk houses, kitchen and dining quarters, a completely equipped machine shop, a smoker and recreation center, bathing facilities, and a trailer to carry baggage and general caravan supplies. . . . A crew of 23 made up the personnel of this outfit in 1947. This crew started operations in Texas in early June and followed the harvest trail into North Dakota in early fall. Each day from 400 to 500 acres of grain fell before the sickles of the machines and found the way to storage.[45]

The importance of itinerant combine operators to the western Kansas harvest is indicated by the 8,048 combines that entered Kansas through ports of entry in 1947, and the 5,084 outside trucks estimated to have been used that same year.[46]

Farming by absentee operators. Increased mechanization, especially the development and adoption of easily transported tractors, contributed to the development of what have become known as "sidewalk" and "suitcase" farming. "Sidewalk" farming is found to a limited extent in eastern and central Kansas as well as in the western part, while "suitcase" farming is largely confined to the western third. "Sidewalk" refers to the operation of farms by persons who live in town and who may or may not have some other occupation. This type of operation is not new in Kansas, although the number of "sidewalk" farmers has increased considerably the last two or three decades. As early as 1873, T. C. Henry, an Abilene real estate dealer, seeded 500 acres of wheat, all the work being done on a contract basis. He expanded his operations until in 1877 he had 3,000 acres of winter wheat and 700 acres of other crops.[47]

"Suitcase" farmers are true absentee operators—those who reside at a distance from land they operate. They may farm land as much as 200 miles or more from their homes. They

45. Leker, E. H., **Farm Labor for Wheat and Other Small Grain Harvest in the Great Plains States, 1943-47.** U.S. Dept. of Agr. Ext. Service. Unnumbered publication.

46. **Ibid.,** pp. 26-27.

47. Malin, **op. cit.** Ch. VI, T. C. Henry, Real Estate Dealer and Wheat King, and Ch. VIII, T. C. Henry's Later Career.

may or may not farm where they live. Many of them operate farms in central Kansas on which they live and in addition farm from 100 to several hundred acres in the western part of the state. Farms thus operated are almost always cash-grain with no livestock. Wheat and milo are the usual crops grown. The operator may hire the plowing, tillage, and seeding done on a contract basis but more frequently he loads his tractor and implements on a truck and travels to the land, which may be either owned or rented. After harvesting one crop or planting another he returns to his home until the next harvest.

Several results of this type of farming are socially undesirable.[48] Since buildings are not needed, they are removed, thus lowering the tax base. An already sparse population is made sparser. "Suitcase" farmers are usually not interested in the social life of the community in which they operate, and the difficulty of maintaining schools, churches, and other social institutions is increased. Perhaps the most severe criticism leveled at them by resident farmers is that they do not protect their land against soil blowing. Winds are strong much of the time in western Kansas and the soil blows easily.

Kansas law gives the board of county commissioners the power and duty to inspect land from which dust is blowing and, at their judgment, to order that action be taken to prevent or lessen the blowing. If the owner cannot be consulted without unreasonable delay or if he cannot or will not do the work in the manner or within the time it should be done, the county commissioners may do the work or employ someone to do it. Unless the owner can show that the work was necessitated by conditions beyond his control and which could not reasonably have been anticipated, the expense can be assessed against his land as a special assessment.[49]

Nevertheless, residents complain that nonresidents may be either unaware of or indifferent to soil blowing on their farms and, because of delays in notifying them and/or the county commissioners and the time required to take remedial action, severe damage is often done to crops on adjoining farms.

Data are not readily available on the quantity of land operated in Kansas by "sidewalk" and "suitcase" farmers. According to Bell, of the 550 farm units in Haskell County in 1940, 59.5 percent were operated by farm-resident operators. Of the remaining operators, 10.7 percent lived in towns within Haskell County, 11.1 percent lived in bordering counties, 16.4 percent lived in Kansas but not in bordering counties and were therefore "suitcase" farmers, and 2.3 percent resided out of the state.[50]

48. For a discussion of this problem and of farming and social conditions in general in the Kansas Plains see Bell, Earl H., **Culture of a Contemporary Rural Community, Sublette, Kansas.** Rural Life Studies: 2, U.S. Dept. of Agr., Bureau of Agr. Econ., September 1942.

49. Par. 2-2001 to 2-2011, 1947, Supplement to General Statutes of Kansas. 1935.

50. **Ibid.,** p. 12.

POPULATION

In 1860, near the end of its territorial period, Kansas' population was 107,206. There was an increase each decade until 1930. Drought, dust storms, and depression reduced the population from 1,880,999 in 1930 to 1,801,028 in 1940. But during the 1940's, with good crops and favorable prices, population rose to 1,905,299 in 1950. The trend in population is shown by Figure 23. The largest percentage increase was from 1860 to 1870 but the greatest absolute increase was from 1870 to 1880. Settlers from older areas in the United States, as well as from Germany, England, Sweden, and Russia, stimulated by cheap land and the promotional activities of the railroads, poured

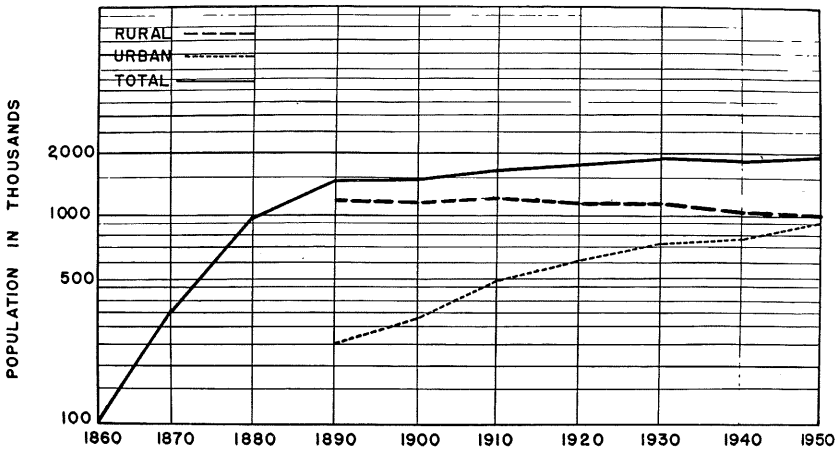

Fig. 23.—The trend of population in Kansas, 1860-1950. Source: U.S. Census.

into central Kansas. During this decade population increased 631,697, making a total of 996,096 in 1880. Although population continued to increase rather rapidly until 1890, the rate of growth in the decade 1880 to 1890 was less rapid than in the previous two decades. Since 1890, population has grown rather slowly, the increase being almost entirely urban. Since 1910, although the total population increased each decade except between 1930 and 1940, rural population has shown a steady decline.

Data on rural farm population are available only since 1920. The trend of percentage of Kansas population living on farms has been strongly downward since that time. Although 41.6 percent of the population lived on farms in 1920, the proportion had declined to 37.5 percent in 1930. Despite a nationwide back-to-the-farm movement in the early thirties, the influence of increasing mechanization and the enlargement of farms is shown by a further decline to 33.6 percent in 1940.

World War II, with its demand for manpower in industry and the armed forces, accelerated the off-farm migration so that by 1950 only 23.3 percent of the Kansas population lived on farms. However, 52.6 percent of the population was classed as "rural" and only 47.4 percent as "urban" in 1950 (Table 19).

Industrial employment and military requirements following outbreak of hostilities in Korea encouraged a high rate of net migration from farms. In the western third of the state the off-farm migration since 1920 has been offset to a limited extent by an increase in the number of persons who operate farms but live in towns.

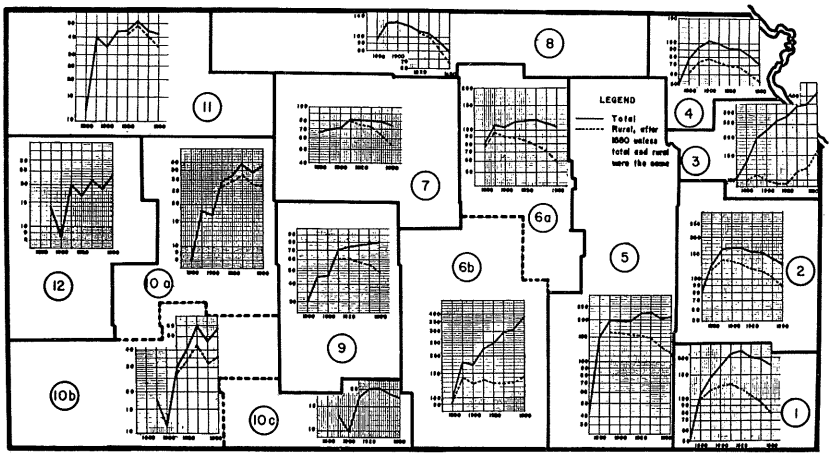

Fig. 24.—The trend of population in Kansas by type-of-farming areas, 1870-1950. Source: U.S. Census.

Figure 24 shows the trend in population by type-of-farming areas since 1870. The much earlier settlement of the eastern areas than of the western half of the state is clearly shown. Most of the eastern areas grew most rapidly before 1890. By 1900 rural population in all eastern areas, except Area 1, had begun to decline and in Areas 2, 4, and 8 total population had passed its peak. But in all areas in the western half of the state except Area 11 (where the most rapid settlement occurred between 1880 and 1890), the decade 1900-1910 was when population grew most rapidly.

During the 1930's population decreased in all type-of-farming areas except 3, 6b, and 9. Areas 10a, 10b, 10c, 11, and 12, the "dust bowl" areas, all lost population rather rapidly. The greatest decrease was in Area 10b. The total population of Areas 1, 2, 4, 6a, 7, 8, 10c, and 11 continued to decrease during the 1940's. Although all others showed some increase, the 1930 level had not been reached by 1950 in Areas 5, 10a, and 10b. Area 12, which lost approximately one seventh of its

people during the '30's, had 1,655 more people in 1950 than in 1930. Areas 3 and 6b have shown a continuous increase in population since they were settled, the increase being quite rapid in the 1940-1950 period. This has been due largely to the rather rapid growth of the urban areas of Kansas City, Topeka, Lawrence, and Leavenworth in Area 3 and of Wichita and Hutchinson (particularly Wichita) in Area 6b.

The density and type of population for each type-of-farming area are shown in Table 19. From east to west population becomes less dense and the urban population becomes a smaller proportion of the total (Area 6b with Wichita and Hutchinson

Table 19.—Density and type of population in Kansas by type-of-farming areas, 1950.

Area	Population		% urban	% rural
	Total in thousands	Per 1,000 acres of farm land		
1	176.3	85.5	55.4	44.6
2	127.2	39.8	30.3	69.7
3	421.0	284.3	61.2	38.8
4	72.1	43.1	26.1	73.9
5	210.1	35.2	44.5	55.5
6a	106.0	39.0	44.8	55.2
6b	381.6	85.6	63.0	37.0
7	75.5	21.5	29.0	71.0
8	79.0	21.4	15.7	84.3
9	79.8	24.5	39.1	60.9
10a	37.8	11.1	28.8	71.2
10b	56.9	14.6	37.2	62.8
10c	16.4	9.1	.....	100.0
11	42.2	9.7	20.3	79.7
12	23.5	7.4	13.6	86.4
Kansas	1,905.3	39.2	47.4	52.6

Source: 1950 Census.

is an exception). This is not surprising when one remembers that almost all the larger towns are in the eastern half of the state. West of Hutchinson (Reno County) only two towns, Garden City and Great Bend, have populations of 10,000 or more. In Area 10c the census classes the entire population as rural. Another factor affecting the density of population is the much larger size of farms in the western areas.

Native whites made up 94 percent, foreign-born whites 2 percent, and nonwhites 4 percent of the total Kansas population in 1950. Major sources of foreign-born population were: Germany, 18.6 percent; British Isles, 11.5 percent; U.S.S.R., 11.2 percent; Mexico, 10.9 percent; Norway, Sweden, and Denmark, 9.1 percent; Canada, 6.1 percent; and Italy, 3.1 percent.

Nearly 98 percent of the rural farm population was native white and about 1.6 percent foreign-born white. Negroes made up slightly less than 0.4 percent and other nonwhites about 0.1 percent. More than 99.6 percent of all farm operators were white.

FARM PRICES AND INCOME

Indexes of farm prices, volume of marketings, farm income, wage rates, and prices of farm real estate from 1935 to 1954 are given in Table 20 and Figure 25.

The volume of marketings, which measures roughly the volume of physical production, increased only moderately from 1935 to 1940 but under the impetus of war it increased sharply from 1940 to 1943. Throughout the remainder of the war and postwar years (except 1951) marketings were more than 60 percent above the 1935-39 average. This large increase resulted from a combination of favorable weather, improved crop

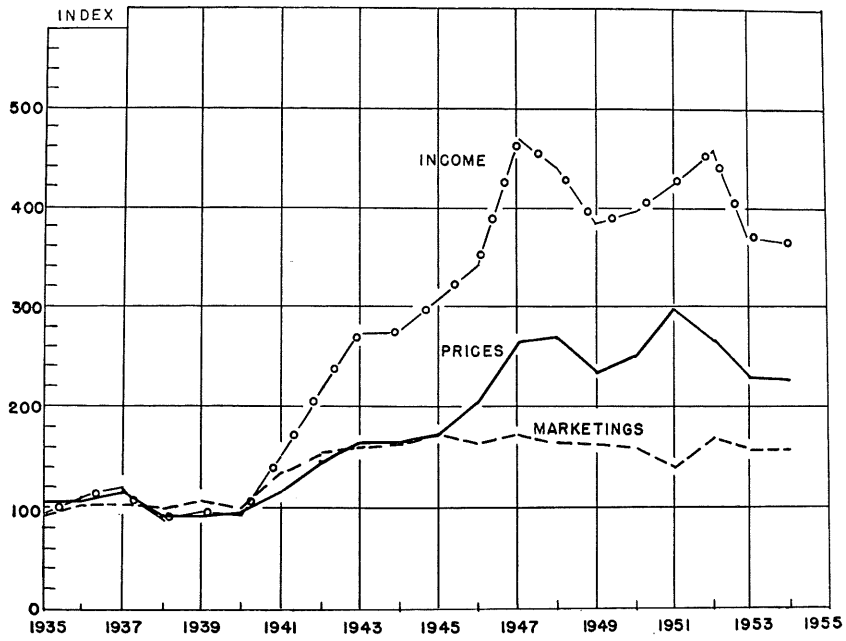

Fig. 25.—Indexes of farm prices, volume of marketings, and cash income from marketings, Kansas, 1935-1954, (1935-1939—100). Source: Table 20.

varieties, increased use of commercial fertilizer, increased mechanization, and other technological improvements. As a result of excessive rainfall in 1951 the volume of marketings dropped sharply. Influenced by the record wheat crop, it rose even more sharply in 1952 but unfavorable weather caused a decline in 1953 and 1954.

Farm prices fell from an index of 115 in 1937 to only 89 in 1939. With the beginning of World War II, however, prices began a rather sharp rise which lasted until 1943, leveled off moderately until 1945, and then increased sharply until 1948.

Farm prices fell off in 1949, rose as a result of the Korean War to reach an all-time high in 1951, but have declined steadily since.

Cash farm income rose in 1936 and 1937 but declined sharply in 1938 and remained low until 1941. Under the influence of increased marketings and higher prices, income began a sharp increase in 1941 that continued until 1947. A rather sharp decline occurred from 1947 to 1949 but the rise in prices from 1949 to 1951 more than offset the drop in volume of marketings, and cash farm income increased moderately. In 1952,

Table 20.—Indexes of farm prices, volume of marketings, and cash farm income from marketings for Kansas (1935-39 = 100).[1]

Year	Prices[2]	Volume of marketings	Income[3]	Farm wages	Farm real estate
1935	103	91	93	88	96
1936	104	101	105	98	99
1937	115	102	118	107	103
1938	90	99	89	105	102
1939	89	107	95	103	100
1940	95	99	94	106	93
1941	115	133	149	133	94
1942	143	156	220	184	98
1943	166	162	276	251	111
1944	166	164	278	305	126
1945	173	173	305	339	146
1946	203	166	342	363	158
1947	265	174	467	393	184
1948	269	166	440	430	217
1949	236	162	383	412	225
1950	251	160	398	418	222
1951	296	142	422	466	249
1952	267	170	459	505	274
1953	231	159	370	511	278
1954	225	162	369	512	261

1. Calculated from reports of the USDA, BAE, by J. A. Hodges.
2. Old series, 1935-48, with estimates from new series, 1949-54.
3. Excluding government payments. Calculated from Table 1, page 21, Farm Income Situation, June 1946, and later issues.

although prices declined, the increased volume of marketings more than offset the price decline, and cash farm income from marketings reached an all-time high. A combination of decreased marketings and sharply lower prices caused incomes to be much lower in 1953 and 1954.

Changes in farm wage rates have roughly paralleled the changes in cash farm income. Each year since 1941 wage rates have been considerably higher than in the preceding year. The direction of movement of farm real estate values has also been similar to that of farm income. There was, however, a considerable lag and the rise was much more gradual.

Table 21 shows the cash farm income from marketings and government payments for Kansas; and Table 22, the percent-

Table 21.—Cash farm income from marketings and government payments for Kansas.[1]
1,000 dollars

Year	Wheat	Other crops	Total crops	Meat animals including wool	Dairy products	Chickens and eggs	Other livestock and livestock products	Live-stock and live-stock products	Total	Govern-ment pay-ments	Cash from income and govern-ment pay-ments
1935-39	80,090	14,654	94,744	108,816	29,406	22,740	3,754	164,716	259,460	28,208	287,668
1940	68,048	19,675	87,723	104,848	29,630	18,544	3,863	156,885	244,608	38,941	283,549
1941	138,367	24,947	163,314	151,371	39,440	28,497	4,084	223,392	386,706	31,742	418,448
1942	180,168	39,733	219,901	248,606	49,322	47,717	5,712	351,357	571,258	34,203	605,461
1943	164,079	73,279	237,358	336,154	62,165	73,437	6,006	477,762	715,120	42,007	757,127
1944	244,081	73,470	317,551	269,136	63,349	64,764	6,301	403,550	721,101	24,920	746,021
1945	251,812	92,972	344,784	307,598	60,590	70,843	7,491	446,522	791,306	22,169	813,475
1946	324,993	75,387	400,380	340,805	70,736	68,255	8,294	488,090	888,470	20,220	908,690
1947	528,929	89,454	618,383	437,868	76,137	73,576	6,985	594,566	1,212,949	11,737	1,224,686
1948	509,900	85,920	595,820	387,743	82,080	69,266	5,839	544,928	1,140,748	7,365	1,148,113
1949	357,460	97,856	455,316	405,569	62,882	65,061	5,991	539,503	994,819	6,069	1,000,898
1950	347,420	114,234	461,654	448,870	63,020	52,871	5,629	570,390	1,032,044	9,117	1,041,161
1951	262,371	134,042	396,413	550,309	71,108	69,379	6,945	697,741	1,094,154	7,992	1,102,146
1952	455,508	103,013	558,521	499,869	74,206	53,352	5,975	633,402	1,191,923	11,352	1,203,275
1953	377,193	82,359	459,552	364,448	68,754	61,963	5,372	500,537	960,089	6,049	966,138
1954	352,335	98,154	450,489	379,150	65,167	42,657	5,291	492,265	942,754	8,638	951,392

1. Table prepared by J. A. Hodges.

Source: Appropriate issues of the Farm Income Situation, United States Department of Agriculture, Bureau of Agricultural Economics, for 1935-1954.

Table 22.—Percentage distribution of cash farm income from marketings and government payments for Kansas.

Year	Wheat	Other crops	Total crops	Meat animals including wool	Dairy products	Chickens and eggs	Other livestock and livestock products	Live-stock and live-stock products	Total	Govern-ment pay-ments	Cash from income and govern-ment pay-ments
1935-39	27.8	5.1	32.9	37.8	10.2	7.9	1.4	57.3	90.2	9.8	100.0
1940	24.0	6.9	30.9	37.0	10.4	6.5	1.4	55.3	86.2	13.7	100.0
1941	33.1	5.9	39.0	36.2	9.4	6.8	1.0	53.4	92.4	7.6	100.0
1942	29.7	6.6	36.3	41.1	8.1	7.9	0.9	58.0	94.3	5.7	100.0
1943	21.7	9.7	31.4	44.4	8.2	9.7	0.8	63.1	94.5	5.5	100.0
1944	32.7	9.9	42.6	36.1	8.5	8.7	0.8	54.1	96.7	3.3	100.0
1945	30.9	11.4	42.3	37.8	7.5	8.7	0.9	54.9	97.2	2.8	100.0
1946	35.7	8.3	44.0	37.5	7.8	7.5	0.9	53.7	97.7	2.3	100.0
1947	43.1	7.3	50.4	35.8	6.2	6.0	0.6	48.6	99.0	1.0	100.0
1948	44.4	7.5	51.9	33.8	7.2	6.0	0.5	47.5	99.4	0.6	100.0
1949	35.7	9.8	45.5	40.5	6.3	6.5	0.6	53.9	99.4	0.6	100.0
1950	33.3	11.0	44.3	43.1	6.1	5.1	0.5	54.8	99.1	0.9	100.0
1951	23.8	12.2	36.0	49.9	6.5	6.3	0.6	63.3	99.3	0.7	100.0
1952	37.8	8.6	46.4	41.5	6.2	4.4	0.5	52.6	99.0	1.0	100.0
1953	39.1	8.5	47.6	37.7	7.1	6.4	0.6	51.8	99.4	0.6	100.0
1954	37.0	10.3	47.3	39.9	6.8	4.5	0.6	51.8	99.1	0.9	100.0

Source: Calculated from Table 21.

age distribution of income by sources since 1940 and for 1935-39. The increase in income from marketings has been phenomenal. Income from marketings alone in 1947 was more than $1.2 billion compared with less than $0.3 billion annually in the 1935-39 period. Total cash income from marketings and government payments of $951 million in 1954 was the lowest since 1947.

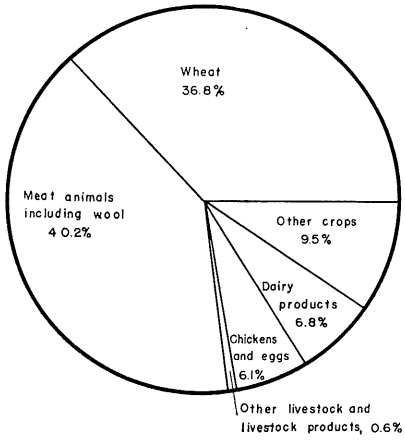

Fig. 26.—Sources of cash farm income from marketings in Kansas, 1945-1954. Source: Computed from data provided by the Federal-State Crop Reporting Service.

The changing ratio of government payments to cash farm income from marketings is noteworthy. Government payments made up 9.8 percent of the total in the 1935-39 period and 13.7 percent in 1940 but the percentage has decreased almost steadily since then. **Government payments have not exceeded 1 percent of the total since 1946.**

Since 1935-39 the proportion of the cash farm income derived from marketing crops has fluctuated between 30.9 and 51.9 percent. There has been no pronounced trend over the period. The percentage derived from crops varies irregularly with crop yields and the relative prices of crops and livestock.

Kansas could well be described as a "meat and wheat" state. More than three fourths of all cash farm income from marketings during the 10 years, 1945-54, was from these sources (Fig. 26). Wheat accounted for nearly four times as much cash income as all other crops, and income from meat animals was three times that of poultry, dairy, and other livestock and livestock products.

A CENTURY OF KANSAS AGRICULTURE

The summary of Kansas agriculture presented covers approximately 100 years. This century might well be called the period of the Agricultural Revolution because the changes that occurred were nearly as far-reaching as the changes in industrial production known as the Industrial Revolution. When the settlement of Kansas began, horses and oxen were the sources of farm power and farmers still walked behind rather crude tillage implements. The mechanization of farming operations during the last century has been the most obvious and spectacular of the technological changes that occurred but the importance of new crop varieties, improved breeds of livestock, new chemicals to control insects, diseases,

and weeds, and the greatly increased use of commercial fertilizers can scarcely be overestimated.

One of the most important changes has been in the attitude of Kansas farmers toward new crops and cultural methods. The early settlers had had no experience with a subhumid environment and many of them clung stubbornly to the crops and methods to which they had been accustomed. Corn was the principal crop and as late as 1917 the acreage of corn harvested exceeded that of wheat. Soft winter wheat and spring wheat were both grown by the earliest settlers. The acreage of spring wheat was greater than winter wheat in the early years but by the 1880's spring wheat had largely disappeared except in the northwestern counties. Hard winter wheat was introduced in the middle 1870's but the relative merits of hard and soft winter wheats were being argued at least 20 years later. The development of combine types of grain sorghums has made sorghums a competitor with both wheat and corn, particularly in the western third of the state.

Important changes have been made in cultural methods as well as types of crops. Emphasis gradually shifted from traditional methods to an effort at adaptation to the environment. Summer fallowing for wheat became a standard practice in the western part of the state. Farmers learned that practices that were "good farming" in the humid areas from which the early settlers came did not fit central and western Kansas. A finely prepared seedbed, free of clods and crop residues, was an open invitation to wind erosion, whereas "trashy farming," with clods and crop residues left on the surface, protected the wheat seedling.

Economic forces, as exemplified in the great demand for wheat following both World Wars, had an important influence in the changing pattern of crop production. Under the combined influence of economic and technological forces, farms have grown larger and the percentage of the population living on farms has grown smaller. Yet farm labor productivity has increased so rapidly that total farm production has increased, even though a progressively smaller part of the population has been engaged in farming.

These trends—greater mechanization, larger farms, fewer farmers but more farm production—are expected to continue. Consideration of them suggests the need of greater industrialization in the state (already begun) to maintain opportunities for the excess farm population in other sectors of the state's economy.

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