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AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE
MANHATTAN, KANSAS

A REPORT OF THE TRIBUNE BRANCH AGRICULTURAL EXPERIMENT STATION

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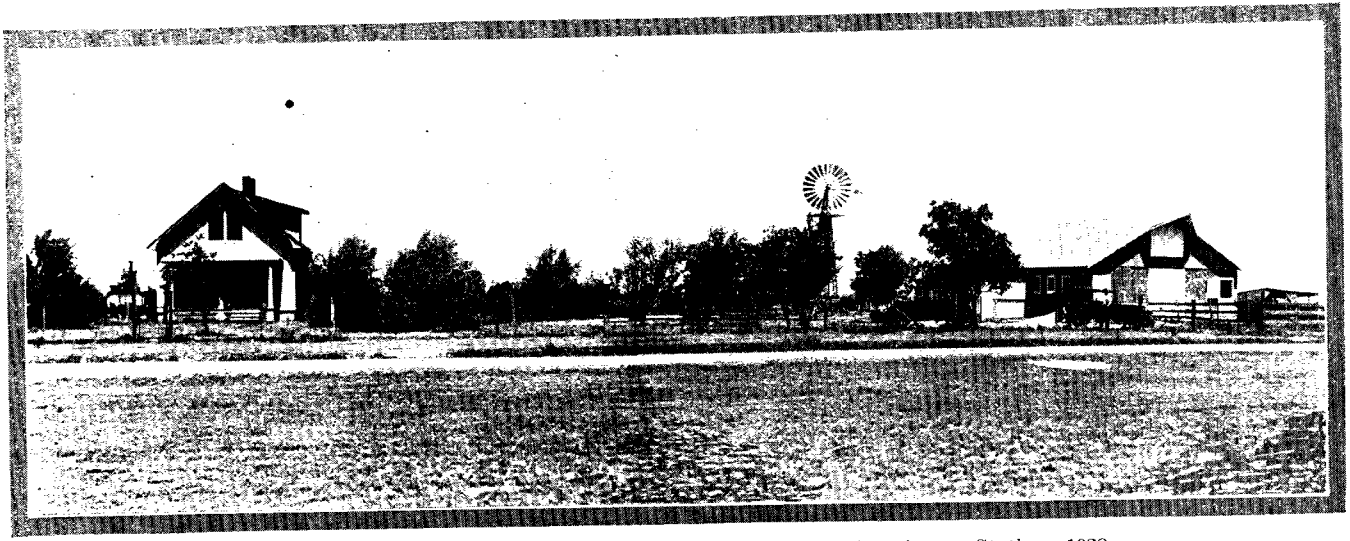

FIG. 1.—Buildings and trees, Tribune Branch Agricultural Experiment Station, 1928.

A REPORT OF THE TRIBUNE BRANCH AGRICULTURAL EXPERIMENT STATION[1]

T. B. STINSON AND H. H. LAUDE

The Tribune Branch Agricultural Experiment Station[1] is located in Greeley county midway between the Smoky Hill and Arkansas rivers, 16 miles from the Colorado line. Its location is representative of the high plains of western Kansas. The Tribune station is a branch of the Kansas Agricultural Experiment Station.

THE AGRICULTURE OF THE REGION

In its original state the Tribune district is a grazing region, the prevalent types of vegetation being buffalo and grama grasses. While the quality of this pasture is good the carrying capacity is relatively low, being about 15 acres per head. The best grazing season prevails during the late spring and early summer months. Consequently only few animals can be maintained on the native vegetation during much of the year. The importance of growing feed in the region has long been realized, and it was the need for information in this regard that led to the establishment of the station, and has been one of the main viewpoints in the work of the station.

In recent years large areas of native sod have been plowed and the fields planted to wheat as well as feed crops. In Greeley county, for example, 14,714 acres of crops were grown in 1919 while in 1924 the acreage was 49,333 and in 1928, 54,063. In Wallace county (just north of Greeley) more than twice as much land was under cultivation in 1924 as in 1919. The cultivated acreage was doubled in Wichita county (just east of Greeley) in the same period and smaller increases were reported in other counties in the section.

The topography of the region is level to gently rolling. The streams other than the Arkansas and Smoky Hill rivers carry little water except in flood periods, although the channels in most cases are relatively large. Well water is abundant generally throughout

1. Contribution No. 185 from the Department of Agronomy.

2. The Tribune branch of the Kansas Agricultural Experiment Station was established in 1911 in accordance with an act of the thirty-fourth session of the Kansas legislature. The land was donated by George L. Reid, of Tribune, and includes: All that part of the southeast quarter of section 19, in township 18 south, range 40 west of the sixth principal meridian lying south of the right of way of the Missouri Pacific railway as now located upon and across said land, comprising approximately 110 acres. The work of the station has been in charge of the following superintendents for the periods indicated: Charles E. Cassel, from the establishment of the station to July, 1917; M. W. Kirkpatrick, July, 1917, to July, 1918; Ivar Mattson, July, 1918, to May, 1920; G. E. Lowrey, May, 1920, to April, 1924; T. B. *Stinson, April, 1924* ———.

3. Reports Kansas State Board of Agriculture.

the region at reasonable depths for stock use, but only in very restricted areas is it practical to irrigate large fields from wells. The soil type known as Colby silt loam occupies the regions except a strip along the Arkansas river and some other streams where lower lying formations come to the surface. Colby silt loam is a fine dark gray soil. It was formed by wind and consequently contains no rocks or gravel. It is generally fertile and highly productive in seasons of ample rainfall.

The principal crops of the region[4] in order of greatest acreage are winter wheat, sorghum, corn, barley, oats, millet, and alfalfa. The acreage of winter wheat is three times as great as that of sorghum and as much as all other crops combined. Slightly more acreage is devoted to sorghums for hay than for grain. Kafir and milo are the leading grain types, while feterita is planted only to a limited extent. The acreage of sorgo or sweet sorghum for hay is about fifteen times as great as the acreage of Sudan grass. The acreages of corn and barley are nearly the same and each is only a little less than that of all sorghums. Oats are grown only one-sixth as extensively as barley. As an average of the eleven years the acreage of millet was three times as great as Sudan grass, however, the Sudan grass acreage increased during the period while in most counties the millet acreage decreased. Alfalfa, which is restricted to irrigated areas, is the most extensively grown legume, although the acreage is only one-eighth as much as that devoted to other hay crops. Spring wheat is usually of little importance, the average being less than 1 per cent of the winter wheat acreage.

CLIMATIC CONDITIONS OF THE REGION

The average annual rainfall at Tribune for the last 16 years was 17.45 inches, as given in Table I. The driest year was 1926 with 8.78 inches and the wettest was 1915 with 33.39 inches. The greatest precipitation during any month, 8.38 inches, occurred in August, 1915; the least was in January, 1919, when there was no precipitation. Slightly more than three-fourths of the annual rainfall, or 13.56 inches, occurs in the six-month period, April to September, inclusive, when it is most, beneficial to crops. A considerable portion falls in showers of less than one-half inch which are ordinarily ineffective for plant growth. May, June and July are the months of highest rainfall as shown in figure 2, the averages being 2.81, 2.71, and 2.76 inches, respectively. November, December, January, and February are the driest months.

4. The data referred to are reported by the Kansas State Board of Agriculture and cover 11 years, 1915 to 1925, inclusive, for Greeley, Wichita, Scott, Lane, Gove, Logan, and Wallace counties.

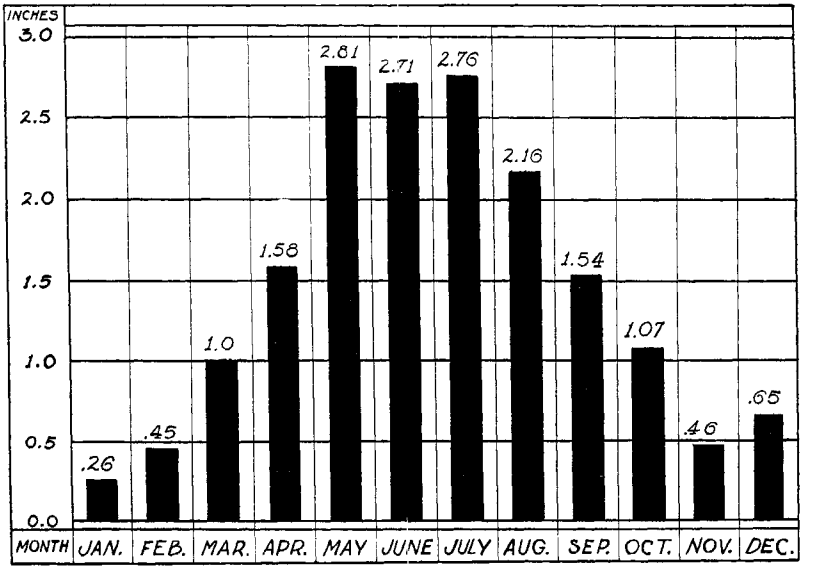

FIG. 2.—Average monthly rainfall at Tribune, Kan., for 16 years, 1913 to 1928.

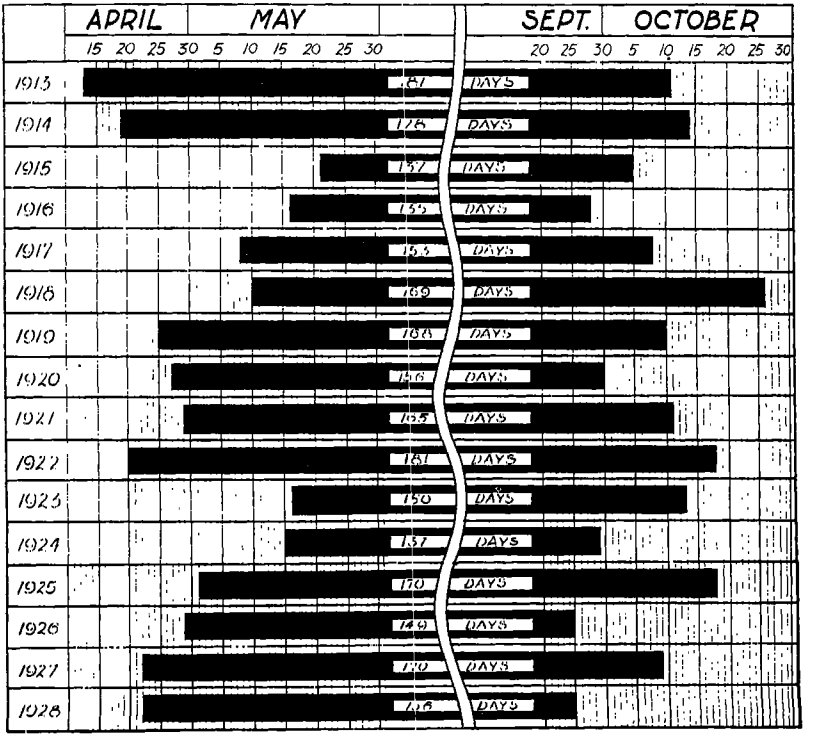

FIG. 3.—Length of growing season, Tribune, 1913 to 1928. Average date last killing frost in spring, May 2. Average date first killing frost in fall, October 9. Average frost-free period, 160 days.

TABLE I.—MONTHLY AND YEARLY RAINFALL, TRIBUNE, KANSAS, 1913 TO 1928.

YEAR.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly.
1913	0.25	0.79	0.23	1.34	1.69	3.97	3.02	0.25	2.70	0.07	0.35	2.08	16.76
1914	0.25	0.17	0.15	1.65	5.80	5.26	0.70	0.82	T	1.50	T	0.35	16.65
1915	0.32	1.34	0.42	2.65	8.20	5.18	5.89	8.38	0.57	0.41	T	0.03	33.39
1916	0.57	T	0.20	2.44	1.88	1.95	1.43	3.84	0.12	0.81	0.10	0.80	14.14
1917	0.45	0.05	0.13	1.45	3.29	1.63	2.84	2.30	3.59	0.15	0.01	0.05	15.94
1918	0.23	0.79	2.90	0.96	3.25	2.62	2.77	1.37	1.24	1.73	0.18	1.72	19.76
1919	0.00	0.36	1.89	2.79	1.69	1.30	2.67	0.32	2.32	1.27	0.68	0.22	15.51
1920	0.02	0.07	0.25	0.89	2.40	1.86	2.36	1.48	2.43	1.29	0.30	0.78	14.13
1921	1.68	0.60	0.18	1.88	1.76	2.34	2.24	2.09	1.68	0.40	0.20	1.11	16.16
1922	T	0.65	0.51	3.68	2.62	1.59	3.25	2.05	T	0.03	0.96	T	15.34
1923	T	0.25	0.50	1.72	2.86	5.14	4.11	3.56	3.90	5.35	0.45	1.16	29.00
1924	T	0.68	5.03	0.51	1.10	0.54	2.58	2.07	1.14	0.80	T	0.76	15.21
1925	T	0.27	0.09	0.71	2.13	1.02	3.02	2.82	1.73	0.72	2.17	0.10	14.78
1926	0.06	0.14	1.00	0.59	1.48	1.09	0.60	0.29	1.96	0.07	0.56	0.94	8.78
1927	0.28	0.39	1.62	1.38	0.11	2.54	2.21	2.11	0.69	0.50	0.14	0.13	12.10
1928	T	0.62	0.98	0.63	4.77	5.33	4.45	0.85	0.59	2.08	1.29	0.09	21.68
1913 to 1928 (*a*)	0.26	0.45	1.00	1.58	2.81	2.71	2.76	2.16	1.54	1.07	0.46	0.65	17.45
1888 to 1928 (*b*)	0.39	0.50	0.93	2.27	2.38	2.70	2.69	1.98	1.21	0.73	0.36	0.50	16.64

(*a*) Normal or average for the 16-year period.
(*b*) Report of United States Weather Bureau. Normal or average for the 29 years. Some years are not used because of incomplete data.

The average length of the growing season from 1913 to 1928, inclusive, was 160 days. (Fig. 3.) The average date of the last killing frost in the spring was May 2, and of the first killing frost, in the fall, October 9. The latest killing frost in the spring occurred May 21, 1915, and the earliest in the fall vas September 25 in 1926 and 1928. The shortest growing season was 135 days in 1916 and the longest was 181 days in 1913 and 1922.

PLAN OF THE STATION

The plan of the Tribune station farm (fig. 4) shows the location and arrangement of the experimental fields, the buildings and grounds, and the portion in native pasture.

The superintendent's cottage (fig. 1) was built soon after the station was started, while the barn was erected in 1925, the office and garage in 1927, and the machine shed and electric light and power line in 1928. Two pit silos were made early in the development of the station and have been filled regularly. A three-wire fence surrounds the station and separates the pasture from the experimental fields.

Four cropping rotations are used. One is located in field A, divisions 1, 2, and 3 (fig. 4), and consists of one year of fallow and two years of Sudan grass planted in close drills for hay. Another

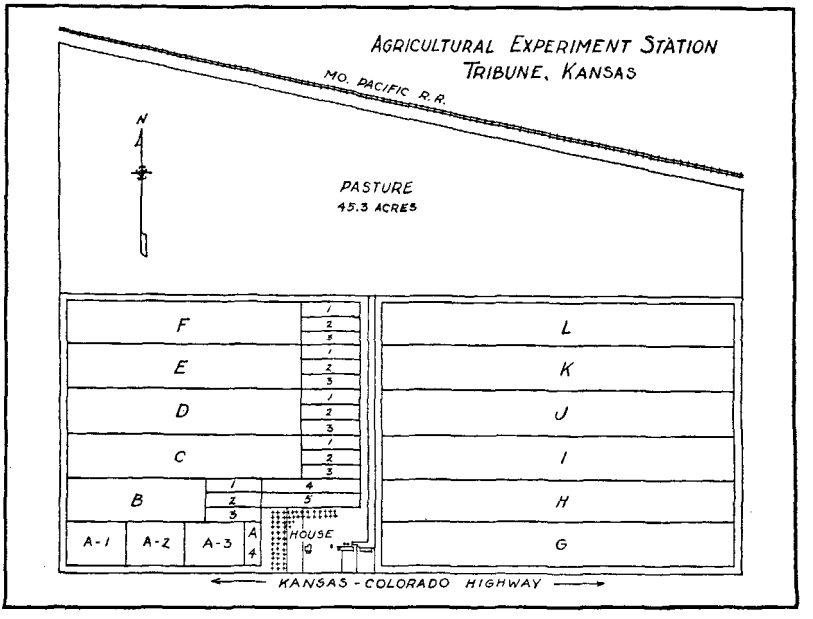

FIG. 4.—Plat of Tribune Agricultural Experiment Station.

rotation occupies field B, except divisions 4 and 5, and fields C to F. This rotation includes fallow, small grain, corn, sorghums, and milo. A third rotation is located on fields H and L and consists of corn, small grains, Red amber, sorgo, Sudan grass, and Freed sorgo. The fourth rotation includes division 4 of field A and divisions 4 and 5 of field B. It consists of one year of fallow, one year of potatoes and one year of peas and beans. Continuous cropping is practiced in field G, where sorghum is grown for silage.

Divisions 1, 2, and 3 of fields B to F are used in fertility experiments. Other experiments including variety tests, time and method of seeding, method of seed-bed preparation, width of row, sorghum selection, pasture tests, etc., are located in the fields of the particular crops with which such tests are made.

CROPS OF WESTERN KANSAS

The choice of crops to grow in western Kansas lies chiefly among sorghum, corn, winter wheat, spring wheat, barley, and oats. Resistance to drought, capacity to ripen before frost, and adaptation to prevailing temperature are perhaps the most important factors in determining the relative suitability of sorghum and corn. The success of winter wheat is determined largely by moisture supply and winter temperature. The relative adaptation of spring wheat, barley, and oats depends mainly upon resistance to drought and resistance to high temperature.

SORGHUM VERSUS

Sorghum (fig. 5) is more drought-resistant than corn. It may grow little if any during severe periods of drought but resumes normal growth when moisture is supplied. Thus the date of ripening is often delayed to such an extent that the crop may be cut short by frost. Corn, although sensitive to drought which may result in very low yields or failure in adverse seasons, may yield considerably higher than sorghum in favorable seasons.

The comparative grain yields of corn and sorghum given in Table II show that the best varieties of corn have averaged 4 bushels higher in yield of grain over an eight-year period than adapted varieties of sorghums. In four of the years reported both varieties of corn made less than 10 bushels per acre while in only one year did both Dwarf Yellow milo and Sunrise kafir yield less than 10 bushels. The highest yield of sorghum, 29.9 bushels, was made by milo, while both varieties of corn made more than 50 bushels in one year and more than the highest yield of sorghum in two other sea-

sons. The sorghums not only yield more forage, but the quality of kafir and sorgo forage is superior to that of corn.

The advisability of growing both corn and sorghum is indicated by the results of experiments. In 1921 corn was practically a failure while sorghum made about an average crop. In 1925 sorghum made more than 23 bushels per acre while the best variety of corn made about 7 bushels. In 1923 sorghum made a good crop but corn was decidedly better. It is also desirable to grow more than one type of grain sorghum as is shown by the results in 1924 when Dwarf Yellow milo yielded three times as much as Sunrise kafir and in 1927 when the reverse was the case. Thus it is desirable to divide the

FIG. 5.—Red Amber cane. Sorghum ordinarily produces good yields of forage which may be used for fodder, silage, or hay.

acreage of row crops among adapted varieties of corn, kafir, and milo, since this practice affords considerable insurance against crop failure.

TABLE II.—COMPARISON OF CORN AND SORGHUM FOR GRAIN.

CROP.	Yield in bushels per acre.								
	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Av. for 8 years.
Corn.									
Cassell White Dent.....	0.0	21.7	53.6	38.6	7.2	0.0	5.0	44.8	21.4
Freed White Dent.....	6.1	21.5	52.9	35.1	2.8	0.0	3.6	40.6	20.3
Sorghum.									
Dwarf Yellow milo.....	22.0	29.9	16.5	27.1	23.3	0.0	3.9	15.4	17.3
Sunrise kafir.....	15.0	25.1	31.1	9.1	28.8	0.0	12.2	11.5	16.6

WINTER WHEAT VERSUS SPRING SMALL GRAINS

Among the small grains winter wheat is ordinarily the best cash crop and barley the best feed crop. Table III gives the comparative yields of small grains for the five-year period 1924 to 1928. The average yield of winter wheat was 9.3 bushels, ranging from 0 to 21.1 bushels per acre. Winter wheat tests extending over a longer period have shown that profitable crops are obtained in about one-third of the seasons; marginal crops in one-third of the seasons; and low yields or failures in one-third of the seasons. Table IV, taken from the report of the Kansas State Board of Agriculture, shows about the same condition for Greeley county since 1912. When winter wheat fails spring small grains or row crops may be planted with little or no additional preparation of the land and ordinarily an excellent seed bed is obtained under those conditions.

TABLE III.—COMPARATIVE YIELDS OF DIFFERENT KINDS OF SMALL GRAIN, 1924 TO 1928.

CROP.	Yield in bushels per acre.					Average yield, 5 years.	
	1924.	1925.	1926.	1927.	1928.	Bushels.	Pounds.
Winter wheat	21.1	8.2	15.2	2.3	0.0	9.3	558
Barley	23.8	15.5	12.2	1.1	17.2	14.0	672
Oats	26.2	16.9	19.9	5.8	21.5	18.1	579
Spring wheat	16.1	6.1	9.3	2.2	1.9	7.1	426

USE OF MANURE

Manure was used in experimental tests and was applied in a five-year rotation of sorgo, milo, fallow, barley, and corn. The application was made before the sorgo crop at rates of 5 tons and 10 tons per acre or an average annual rate of 1 ton and 2 tons per acre. Increased yields of sorgo, corn, and milo were obtained as given in Table V. Barley which was planted on summer-fallowed land yielded slightly less on the manured than on the untreated land. This was probably due to the rank growth on the fallowed land and the consequent burning where manure was used.

The 5-ton rate of application increased the average yield of Red Amber sorgo silage 12 per cent, the grain yield of corn 30 per cent, and of milo 21 per cent, while the increases resulting from the 10-ton application were 4 per cent, 10 per cent, and 2 per cent, respectively. The larger increases of the 5-ton rate indicate the desirability of

light applications in regions of deficient rain. The opinion that manure cannot be used to advantage in semi-arid regions may be based on observations of heavy applications. It seems evident that manure may be applied to advantage in the vicinity of Tribune provided light applications are made averaging about 1 ton per acre annually.

TABLE IV.—ACREAGE AND YIELD OF WHEAT IN GREELEY COUNTY, 1912 TO 1927.

YEAR.	Number of acres.		Per cent abandoned.	Average yield of acres harvested.
	Seeded.	Harvested.		
				Bushels.
1912	690	179	75	4
1913	231	24	90	6
1914	.....	905	.....	11
1915	283	283	0	15
1916	417	313	25	7
1917	1,231	37	97	5
1918	263	103	61	4
1919	.....	825	.....	9
1920	864	734	15	12
1921	19,616	18,635	5	10
1922	9,334	7,187	23	10
1923	20,368	7,536	63	7
1924	15,632	14,382	8	15
1925	16,656	10,993	34	7
1926	30,442	27,398	10	8
1927	57,676	22,494	61	2

TABLE V.—INFLUENCE OF MANURE ON CROP YIELD.

TREATMENT.	Yield per acre.							
	Red Amber sorgo.		Barley.		Corn.		Dwarf Yellow milo.	
	Silage, av., 7 years.	Increase for manure.	Average, 6 years.	Increase for manure.	Average, 6 years.	Increase for manure.	Average, 5 years.	Increase for manure.
	Tons.	*Per cent.*	*Bus.*	*Per cent.*	*Bus.*	*Per cent.*	*Bus.*	*Per cent.*
No treatment	7.35	.....	21.5	.....	20.8	.....	16.8	.....
Five tons manure per acre once in 5 years	8.25	12	21.1	—2	27.0	30	20.4	21
Ten tons manure per acre once in 5 years	7.67	4	20.8	—3	22.8	10	17.2	2

SUMMER FALLOW

Summer fallow has a definite place in the cropping system in western Kansas since the limitation of moisture is often the chief factor in determining crop yields. Experiments reported in Table XII show that, barley yielded 51 per cent more on fallowed land than on cornstalk land, oats 97 per cent more, and spring Wheat 94 per cent more. Winter wheat on fallow-produced 23 per cent more than after corn. At Garden City wheat on fallow made 42 per cent more than on early-listed wheat stubble.[5] The crops on fallow yielded approximately as much or more than on cornstalk land in every case, and in most instances there was an appreciable difference in favor of the fallow. Fallow is least effective in years of high rainfall and when very little precipitation occurs during the period of fallowing.

The insurance summer fallow ordinarily provides against crop failure or low yields is perhaps its greatest value. This benefit may be secured in large measure by fallowing one-fifth to one-third of the land, that is, fallowing each field every three to five years.

The proportionate acreage of crops depends upon the particular needs of the farm. In order to insure against crop failure and to provide feed for live stock it is advisable to divide the acreage among several crops, for example, two-fifths wheat, one-fifth barley, one-fifth corn or sorghum, and one-fifth fallow in which one-half of the wheat is planted on fallowed land, one-half in stubble, the barley follows wheat, and the corn or sorghum follows barley.

GROWING FIELD CROPS

SORGHUM

The success of a sorghum crop depends much upon the stand and the supply of moisture, both of which may be influenced greatly by the method of preparing the land.

Preparation of Land.—Where sorghum follows a small grain such as barley or wheat early fall listing, east-west, or on the contour of the slope, is desirable. Such spring tillage should be done as will prevent weed growth In doing this it is ordinarily advisable to work down the ridges. Planting may then be done either with a furrow opener or loose ground lister attachment on the surface planter or with the lister by relisting in the furrows or by splitting the ridges.

5. Coles, E. H., and Wagner, F. A., Crop Production in Southwestern Kansas. Kan. Agr. Expt. Sta. Bul. 239: 1-30. Reference, Table II, p. 14.

At Garden City best results were obtained where the land was listed in the fall, ridges worked down in the spring and surface planted with the loose ground lister. At Fort Hays slightly better results have been secured by fall listing, working down the ridges in the spring, and relisting in the same furrows, planting the seed in the loose soil that was blown and washed into the furrow during the winter.

Planting.—Sorghums do not thrive well if planted in cold ground. This is particularly true of the grain types such as feterita, milo, and kafir. Only the quick-maturing varieties may be planted late in the season. Thus there is a relatively short planting period for milo and kafir. The experiments reported in Table VI indicate that the best yields of grain will ordinarily result from planting during the last half of May, and that slightly better yields of forage may be obtained by planting during the first ten days of June. Early maturing varieties such as Freed may usually be planted as late as June 15 for either grain or forage. It is particularly important that the surface soil be moist enough to insure satisfactory germination and that there be sufficient subsoil moisture to keep the plants growing.

TABLE VI.—YIELDS OF SORGHUM PLANTED ON DIFFERENT DATES.

YEAR AND VARIETY.	Early planting.			Late planting.		
	Date planted.	Yield per acre.		Date planted.	Yield per acre.	
		Grain.	Fodder.		Grain.	Fodder.
		Bushels.	*Pounds.*		*Bushels.*	*Pounds.*
1926.						
Dwarf Yellow milo	5-20	0	498	6-5	0	1,743
Sunrise	5-20	0	1,245	6-5	0	2,864
Dawn	5-20	0	996	6-5	0	3,864
Freed	5-20	5.2	1,660	6-5	0	1,868
1927.						
Dwarf Yellow milo	5-20	4.4	3,733	6-6	3.3	4,231
Sunrise	5-20	23.3	5,351	6-6	1.1	4,704
Dawn	5-20	7.4	5,475	6-6	1.1	5,185
Freed	5-20	8.2	3,671	6-6	9.6	4,521
1928.						
Dwarf Yellow milo	5-23	16.7	6,288	6-7	14.1	7,632
Sunrise	5-23	12.2	9,126	6-7	10.7	9,872
Dawn	5-23	7.4	8,130	6-7	13.0	9,623
Freed	5-23	30.2	7,923	6-7	22.2	7,839
Av., 1926 to 1928.						
Dwarf Yellow milo	5-21	7.0	3,540	6-6	5.8	4,535
Sunrise	5-21	11.8	5,241	6-6	3.9	5,813
Dawn	5-21	7.4	4,867	6-6	4.7	5,891
Freed	5-21	14.5	4,418	6-6	10.6	4,743

6. Coles, E. H., and Wagner, F. A., Crop Production in Southwestern Kansas. Kan. Agr. Expt. Sta. Bul. 239:1-30. Reference, Table VI, p. 25.

Cultivation.—The frequency, time, and method of cultivation should be such as to prevent growth of weeds and keep the soil in condition to absorb rain most efficiently. Shallow cultivation is usually most effective in securing these conditions. The drag harrow may ordinarily be used to best advantage for the first and perhaps also the second cultivation. The next two cultivations may be given with the curler or disk cultivator, adjusted to throw the dirt away from the row the first time and toward the row the second

FIG. 6.—Variety test of sorghums being studied by a group of farmers. About 25 different kinds of sorghum were planted in four-row plats side by side under the same conditions so that the best ones might be found.

time. Later cultivations may well be given with the six-shovel cultivator or the spring-tooth cultivator.

Harvesting.—The row binder is ordinarily the most satisfactory implement for harvesting sorghum since both the forage and grain are harvested at one operation. After the crop has cured in the shock the bundles may be topped and the heads stacked or threshed. It is not desirable to harvest with the row binder if the entire acreage of forage is not needed for feed. The header or combine would be preferable, provided a very dwarf variety were grown. No satisfactory variety of this type is available now although experiments are under way which may lead to the development of a suitable variety.

Varieties for Grain.—Only early and medium-early varieties of sorghum will ordinarily mature grain in this section. Later varieties may be used for hay or fodder. (Fig. 6.) The yields of grain of some of the better varieties are given in Table VII for the eight-year period, 1921 to 1928, inclusive. The failure in 1926 was due to extended dry weather, the precipitation from January 1 to September 1 being 5.25 inches. In these conditions Freed (fig. 7), which is the earliest and apparently most drought-resistant, made 5.2

FIG. 7.—Freed sorgo, a good early-maturing drought-resistant sorghum.

bushels per acre. Dwarf Yellow milo averaged 17.3 bushels per acre over eight years and yielded slightly more than any other variety. It is well adapted in this section provided it is planted by about June 1. Later planting is usually satisfactory unless growth is retarded by drought.

Sunrise kafir averaged 16.6 bushels per acre and produced grain every year except in 1926. This variety has a sweet', juicy stalk and grows considerably taller than milo. It is well adapted for use on the farm where both grain and forage are desired.

Dawn is a dwarf variety of Blackhull kafir and is well suited to western Kansas. It ordinarily matures at about the same time as Dwarf Yellow milo and Sunrise kafir. The forage is of good quality. The stalk is not sweet and it yields less than Sunrise.

TABLE VII.—GRAIN YIELDS OF SORGHUM VARIETIES, 1921 TO 1928.

VARIETY.	Yield in bushels per acre.									
	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Av., 7 years, 1922 to 1928.	Av., 8 years, 1921 to 1928.
Dwarf Yellow milo	22.0	29.9	16.5	27.1	23.3	0.0	3.9	15.4	16.6	17.3
Sunrise kafir	15.0	25.1	31.1	9.1	28.8	0.0	12.2	11.5	16.8	16.6
Feterita	11.0	28.8	9.1	21.1	28.3	1.1	10.4	15.2	17.3	16.5
Dawn kafir	14.0	18.4	19.8	11.1	30.5	0.0	4.3	10.2	13.5	13.6
Pink kafir	18.5	0.0	35.7	6.8	29.7	0.0	2.6	10.2	12.2	12.9
Freed sorgo	.....	15.3	30.1	6.0	4.9	5.2	9.8	26.2	13.9	.....
Hegari	19.0	14.3	7.0	15.5	12.7	0.0	6.9	.....	.....	.....
Early Sumac	.....	24.6	27.1	19.2	23.8	0.0	2.0	11.7	15.5	.....
Red Amber	.....	16.7	27.8	13.1	31.6	0.0	2.9	12.2	14.9	.....
Black Amber	.....	23.1	25.1	16.7	24.3	0.0	5.2	17.3	15.9	.....
Leoti Red	.....	20.5	23.4	4.2	19.5	0.0	3.1	13.5	12.0	.....
Kansas Orange	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Pink kafir matures later than the other varieties mentioned and may fail to produce grain unless planted early and the season is favorable.

Feterita is earlier than the other varieties mentioned and will ordinarily withstand dry weather better. The seed is soft, which may account in part for the poor stands that are often obtained. It should not be planted early, particularly if the ground is wet and cold. On the other hand, it may be planted somewhat later than the other varieties; in fact it may often be seeded where other crops failed to make satisfactory stands.

Freed ripens earlier than Feterita and is better suited to dry seasons than the other varieties. In favorable seasons it will usually mature grain if planted as late as July 1. It grows as tall as Sunrise kafir, has a sweet stalk, and has few leaves. Ordinarily it makes some grain when planted broadcast or with a grain drill.

Several strains of Pink-Freed (fig. 8), a cross between Pink kafir and Freed sorgo, have been tested four years and have given good yields. These are early and hardy, thus making them well adapted to unfavorable conditions. Some of them are sufficiently dwarf to make them suitable for cutting with the header or combine. Further testing is necessary in order to determine definitely their suitability in this section.

Varieties for Forage.—The results of tests of varieties of sorghum suitable for forage are given in Table Viii. Kansas Orange was the highest-yielding variety although it did not mature grain. The forage of Kansas Orange is of good quality either when grown in cultivated rows or in close drills. The seed may be obtained from eastern Kansas where the season is sufficiently long to permit it to ripen.

FIG. 8.—Pink-Freed No. 14 (left) and No. 12 (right). These are new dwarf kafir types of grain sorghum that have been developed by crossing Pink kafir and Freed sorgo. They are being tested with others for adaptation and suitability for combine harvesting.

Red Amber and Early Sumac (fig. 9) averaged about 3½ tons of cured forage per acre. They grow to about the same height and mature at the same time. These varieties require about the full season, but ordinarily ripen before frost. Red Amber is susceptible to head smut and therefore should not be grown where this disease is present.

Sunrise kafir made slightly less forage than Early Sumac and since it produced a little more grain of superior quality it may be considered a good variety for either forage or grain.

Leoti Red is a leafy sorgo that has yielded nearly one-half ton less than Early Sumac.

FIG. 9.—Early Sumac (1927) on field cropped continuously to sorgo.

Black Amber has been grown extensively in western Kansas for many year. It yields about a ton less per acre than Kansas Orange and Red Amber. Black Amber ordinarily volunteers more than other varieties.

TABLE VIII.—CURED FORAGE YIELDS OF SORGHUM VARIETIES, 1921 TO 1928.

VARIETY.	Yield of fodder in tons per acre.								
	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	AV., 8 years, 1921 to 1928.
Kansas Orange	2.20	2.89	3.97	6.23	7.77	0.50	3.02	5.31	3.99
Red hmber	2.90	2.89	2.83	5.24	6.66	.67	3.01	5.02	3.65
Early Sumac.. . .	2.40	2.95	2.88	4.42	7.34	.59	2.85	4.81	3.53
Sunrise kafir .. .	4.40	2.10	2.37	3.72	6.46	.67	2.51	4.75	3.37
Pink kafir,, ...	3.60	2.10	2.24	4.32	6.05	.51	2 41	4 44	3.21
Leoti Red.. . ..	2.15	2.74	2.55	3 08	5.63	.70	2.58	5.58	3.13
		1.73	3.03	3.73	4.28	.54	2.26	5.52	2.87
Dawn kaffir.	2.20	1.68	1.75	3.58	5.01	.61	2.67	4.44	2.74
Dwarf yellowmilo.. .	2.70	1.43	1.39	2.90	3.23	.34	1.99	3.51	2.19
Freedsorgo . . .	2.56	1.29	1.14	2.30	2.71	.59	2.05	3.94	2.07

Dawn kafir and Dwarf Yellow milo make relatively low yields of forage and are ordinarily grown for grain, but the forage is often harvested, particularly when the yields of grain are low. Freed sorgo is satisfactory for forage if cut early, but the yield is usually low.

CORN

The yields of corn are often limited materially by insufficient moisture, which can be partly overcome by proper tillage methods and the choice of a suitable variety. High temperature, particularly at tasseling time, is sometimes injurious; however, the elevation is sufficient to temper the winds. A good supply of soil moisture is an important factor in corn production.

Preparation of Land and Planting.—The preparation of the land and methods of planting corn are the same as for sorghum.

Corn planted in wide rows, about 7 feet apart, has an advantage over the ordinary width of row in dry periods. The difference in yield between 42-inch and 84-inch rows is slight as shown by experimental results over 13 years. The narrow rows are preferable with slightly deficient stands or in seasons of sufficient summer rainfall, while in dry seasons or with thick stands the wide rows give better yields and a better quality of corn. It is well as a precaution to plant corn in every row at the rate desired for 84-inch rows. If a perfect stand is secured alternate rows should be cultivated out while the corn is small. If it comes up fairly well one row in each three might be cultivated out, while if the stand is thin it would be advisable to leave it in 42-inch rows.

It is desirable to have the plants spaced 30 to 36 inches apart in 42-inch rows, 24 inches apart where one row in three is blank, and 18 inches apart in 84-inch rows. The rate should vary somewhat with the condition and fertility of the soil and the type of corn that is planted. Somewhat thicker stands are desirable on fertile soil that is well supplied with moisture and in excellent physical condition or if a very small early variety of corn is grown.

The seed need not be covered more than $1\frac{1}{2}$ inches if planted early in moist, mellow soil. Slightly deeper planting may be desirable later in the season and when moisture is lacking. Corn should ordinarily be planted about the middle of May. Slow germination and poor stands are apt to result if planted too early, and unfavorable growing conditions may be encountered if planted late.

Cultivation.—The first and perhaps the second cultivation can usually be given to best advantage with the harrow. As soon as

weeds start low on the sides of the ridges it is advisable to throw the dirt out with a curler and thus keep the field clean. At the next cultivation the dirt may be thrown to the corn. Another cultivation before the corn tassels may be given with the six-shovel cultivator or the spring-tooth cultivator and is ordinarily advisable to keep the needs from starting before the corn approaches maturity.

FIG. 10.—Early-maturing types of corn that produce sound, solid ears are desirable.

Varieties.—Early-maturing varieties of corn (fig. 10) are preferable in this section. In experimental tests reported in Table IX covering 12 years Cassel White averaged 24.3 bushels per acre and outyielded Freed White 3 bushels, Colby 4.7 bushels, and Pride of Saline 12.4 bushels. Blue Squaw was included in the tests during

TABLE IX.—YIELDS OF VARIETIES OF CORN, 1915 AND 1918 TO 1928.

VARIETY.	Yield in bushels per acre.													
	1915.	1918.	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Av., 12 years.	Av., 7 years, 1922 to 1928.
Cassel White Dent	62.2	19.1	16.5	22.2	0.0	21.7	53.6	38.6	7.2	0.0	5.03	44.84	24.3	24.4
Freed White Dent	61.9	1.1	19.8	10.3	6.1	21.5	52.9	35.1	2.8	0.0	3.56	40.55	21.3	22.3
Colby	52.3	1.7	20.8	14.8	0.0	18.2	43.8	36.1	6.0	0.0	4.43	36.99	19.6	20.9
Pride of Saline	16.0	5.2	3.4	8.9	6.4	12.5	35.2	31.8	0.7	0.0	2.95	19.38	11.9	14.6
Blue Squaw	.....	.....	.....	.....	6.3	19.0	64.1	36.5	5.3	0.0	2.66	47.70	.....	23.4

the last seven years, when it yielded 1 bushel less than Cassel White. Cassel White is an early-maturing, hardy variety of dent corn that is especially adapted in west central and southwestern Kansas. It was obtained from Finney county and was selected on the station for adaptation and quality. The stalk is short and sturdy and the ear rather thick with medium smooth kernels.

Freed White was developed by J. K. Freed, Scott City, and is well adapted throughout the western part of Kansas. It is hardy,

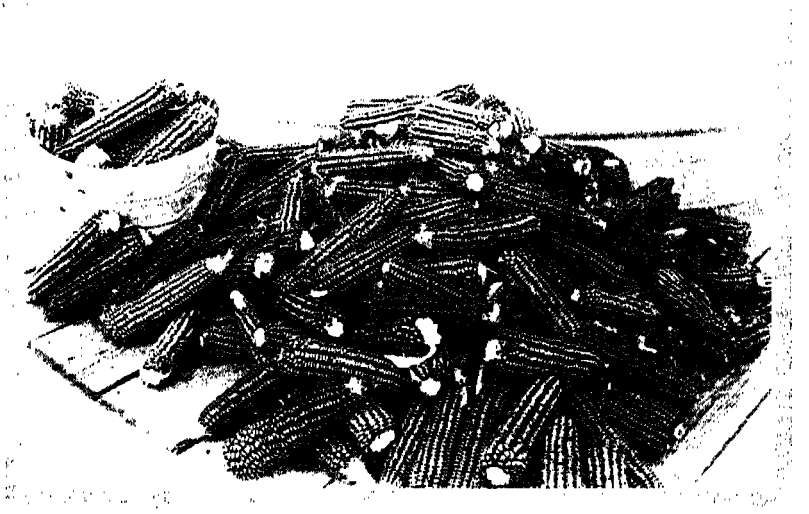

FIG. 11.—Seed ears of Colby, an early-maturing variety.

matures at about the same time as Cassel White, and is similar to it except that the ear is slightly more slender.

Colby is a red corn with yellow and white kernel caps. (Fig. 11.) It is about five days earlier than Cassel White and both plant and ear are slightly smaller. It was developed by the Colby Agricultural Experiment Station and is especially well adapted in northwestern Kansas, where it is probably superior to Cassel White and equal to Freed White.

The poor results with Pride of Saline, which is an excellent variety in central and eastern Kansas, show the necessity of growing only early, hardy, adapted western varieties in this section.

Blue Squaw is a variety of soft corn that produces several stalks per plant. The ears are small. They grow close to the ground and often there are two or more on a stalk. It is not convenient to husk, but is a desirable variety to hog down.

WINTER WHEAT

The acreage of winter wheat in Greeley and neighboring counties has increased greatly in recent years as shown in Table IV. The crop is subjected to important climatic hazards which result in more

FIG. 12.—Two fields of winter wheat. (A) Furrow drilled, 1921. (B) After fallow, 1914.

or less abandonment as noted in column four of the table. Deficient moisture is probably the chief factor in causing this loss, although winterkilling is sometimes important. Thorough preparation of the land to conserve moisture is ordinarily helpful in preventing loss of stands. (Fig. 12.)

Preparation of Land.—Early preparation of the land for wheat is desirable. When wheat follows wheat the disk or the one-way plow may be used to advantage immediately after the field is harvested. Ordinarily the land should be listed soon after the first operation or it may be worked later with the one-way. As weeds start in the listed ground the ridges should be worked down with the curler. By September 1 it is desirable to have the land fairly level, well packed, and with a cloddy surface.

When wheat follows corn it is desirable to fall list, east-west. The ridges may be worked down as required to control weed growth the following spring. It is important to prevent the growth of weeds during the summer and to keep the soil in condition to absorb rain. Wheat planted in cornstalk fields ordinarily does not yield so well as on prepared land. The moisture supply is usually deficient and it is difficult to prepare a satisfactory seed bed.

Planting.—September is the preferable time to plant wheat in this section and ordinarily it does best if planted during the first half of the month. In a three-year experiment reported in Table X wheat seeded September 1 made 10.8 bushels per acre, that seeded September 15 made 6.8 bushels, and that seeded October 1, 5.9 bushels. Wheat seeded as early as September 1 may make too much fall growth and thus reduce the soil moisture more than necessary and consequently lower the yield. On the other hand, late-planted wheat may not become established well enough to withstand the winter satisfactorily.

Two types of drills are used for wheat, the wide-furrow drill (fig. 12, A) and the 8-inch common drill. The furrow drill has an advantage over the common drill when the top three or four inches of soil is dry, since the seed may be placed deep enough to reach moisture. The ridges left by the furrow drill afford the plant some protection from wind. It is advisable to drill wheat east-west so that the furrows will catch more snow which protects the plants from low temperature. The furrow drill probably has no advantage over the common drill when conditions are favorable.

Ordinarily three pecks of seed per acre should be planted, although on new land and where moisture and seed-bed conditions are favorable good stands may be obtained with one-half bushel per acre. Stinking smut or bunt of wheat may be effectively controlled by treating the seed with copper carbonate. Seed wheat that has even a trace of smut or which was threshed with a machine that might have threshed smutty wheat should be treated.

TABLE X.—YIELDS OF WINTER WHEAT SEEDED ON DIFFERENT DATES, 1925 TO 1927.

DATE OF SEEDING.	Yield in bushels per acre.			
	1925.	1926.	1927.	Three-year average.
September 1	11.4	20.2	1.0	10.8
September 15	6.6	13.4	0.3	6.8
October 1	4.8	11.4	1.3	5.9

Soil blowing may sometimes seriously damage or even destroy a stand of wheat. This is most apt to occur in late winter and spring and when the wheat has made a scanty growth. Soil blowing can best be controlled by listing furrows across the field at right angles to the wind and at intervals of from three to ten rods. The severity of soil blowing varies with the nature of the wind and the growth of the wheat. Preventive measures, in order to be most effective, must be taken as soon as the soil starts to blow.

Varieties.—Hardy varieties of hard red winter wheat have given best results in varietal tests. As shown in Table XI, Kanred has outyielded other varieties, averaging 11.6 bushels per acre for seven years. It has sustained less winter injury than other varieties and has ripened slightly earlier than Turkey. Blackhull has winterkilled more than Turkey or Kanred, which perhaps accounts for its relatively lower yield, the average being 7.1 bushels per acre. Turkey yielded 9.5 bushels per acre, being intermediate between Blackhull and Kanred.

TABLE XI.—YIELDS OF VARIETIES OF WINTER WHEAT.

VARIETY.	Yields in bushels per acre (a).							
	1921.	1922.	1924.	1925.	1926.	1927.	1928.	Av., 7yrs.
Kanred	19.4	6.0	29.5	9.9	16.1	0.6	0	**11.6**
Turkey	9.4	**8.5**	23.9	9.4	14.3	**1.2**	0	**9.5**
Blackhull	0.0	7.2	16.7	8.1	16.5	1.1	0	**7.1**

(a) Yields were not taken in 1923 because of hail.

SPRING SMALL GRAINS

Among the spring seeded small grains barley is better adapted and ordinarily yields more than either oats or spring wheat; however, it may be advisable to sow some spring wheat in seasons when winter wheat fails. Oats do relatively well on a good seed bed and under favorable conditions.

Preparation of Land and Planting.—Preparation of the land and time of seeding is similar for each of these crops. They usually are planted after wheat, fallow, or corn. Experiments reported in Table XII have shown good increases on fallow as compared to cornstalk land—51 per cent. for barley, 97 per cent for oats, and 94 per cent for spring wheat as an average of five years. Wheat or other small-grain stubble land should be summer listed, kept, free of weeds, and left, rough over winter.

TABLE XII.—COMPARATIVE YIELDS OF BARLEY, OATS, AND SPRING WHEAT AFTER FALLOW AND AFTER CORN, 1924 TO 1928.

CROP.	Average yield per acre.		Per cent increase for fallow.
	Bushels.	Pounds.	
Barley.			
After fallow	15.4	739	51
After corn	10.2	490	.....
Oats.			
After fallow	23.5	752	97
After corn	11.1	355	.....
Spring Wheat.			
After fallow	9.1	546	94
After corn	4.7	282	.....

It is advisable to plant spring small grains early in order that they may more often ripen ahead of warm, dry weather. However, if planted too early they may be injured by late spring freezes. The middle of March is ordinarily a good time, although good results may be expected by planting the last, half of March.

About forty-five pounds per acre of each of the grains should be sufficient for good stands under favorable conditions. The furrow drill is satisfactory for planting these crops, although it apparently does not have so much advantage as with winter wheat.

Varieties of Barley.—Stavropol barley, which is of the type commonly grown in western Kansas, has done about as well in experimental tests reported in Table XII as any variety. It is medium early, stands up well, and produces good yields. Club Mariout and Coast have averaged about the same in yield for seven years as Stavropol. The head of Club Mariout, as the name suggests, is short and compact. The plant is usually not so tall as Stavropol and sometimes has a tendency to lodge. Coast is similar to Stavropol.

TABLE XIII.—YIELDS OF VARIETIES OF BARLEY.

VARIETY.	Yield in bushels per acre.								
	1920.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Av., 8 yrs.
Stavropol	43.6	11.3	17.2	24.8	14.0	10.5	1.1	18.6	17.6
Club Mariout	47.9	13.5	17.8	22.7	15.2	14.2	0.9	12.8	18.1
Coast	47.6	7.8	16.7	24.0	15.9	10.6	1.2	19.8	18.0

Varieties of Oats.—Kanota oats has yielded 21.9 bushels over a nine-year period as indicated in Table XIV. It has made 4 bushels more than Red Texas and 4.5 bushels more than Burt. Early maturity and capacity to fill probably account for the superiority of Kanota.

TABLE XIV.—YIELDS OF VARIETIES OF OATS, 1920 TO 1928.

VARIETY.	Yield in bushels per acre.									
	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Av., 9 yrs.
Kanota	36.6	16.3	20.2	27.9	25.7	21.4	18.4	7.8	23.3	21.9
Red Texas	28.0	0.0	14.4	20.3	28.4	20.8	24.2	4.8	20.3	17.9
Burt	25.1	0.0	21.1	26.3	20.0	16.4	22.5	6.2	19.5	17.4

Varieties of Spring Wheat.—Among the varieties of spring wheat tested for nine years Prelude and Kubanka each averaged 6.2 bushels, as given in Table XV. Marquis and Preston averaged slightly less. Prelude is an early bearded red spring type and is well

TABLE XV.—YIELDS OF VARIETIES OF SPRING WHEAT, 1919 TO 1928.

VARIETY.	Yield in bushels per acre (*a*).									
	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1928.	Av., 8 yrs.
Marquis	6.0	17.6	7.1	1.7	0.4	17.2	6.6	8.1	1.9	6.1
Kubanka	7.0	16.2	7.8	2.7	2.5	20.7	4.9	6.0	1.4	6.6
Preston	6.1	3.6	7.8	0.0	1.1	13.2	6.4	7.3	1.4	5.4
Prelude	10.3	.....	4.3	5.1	3.0	14.4	5.9	9.8	2.6	6.9
Hard Federation	.....	.....	.....	.....	.....	17.6	7.1	12.6	1.9	.....

(*a*) Comparative yields were not obtained in 1927 because of damage by hail. Averages do not include figures for 1920.

adapted. Kubanka is a variety of Durum wheat. It matures ten days to two weeks later than Prelude. Marquis is a beardless red spring variety of high milling quality. Preston yields less and is not so well adapted as the other varieties. Hard Federation, an early-maturing, short-stemmed variety of white spring wheat, has

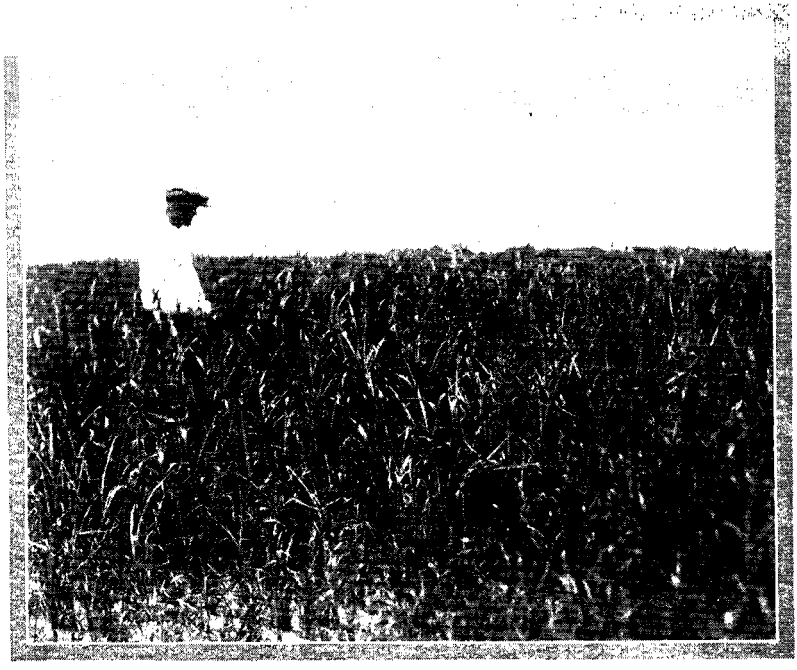

FIG. 13.—Sudan grass on fallow.

been tested a few years in which it, has made a good showing in comparison with other varieties.

SUDAN GRASS

Sudan grass is the best summer pasture crop in western Kansas and perhaps the best hay crop. Early thorough preparation of the land is important to kill weeds and provide a supply of soil moisture. Table XVI gives the yields of Sudan grass hay seeded by a common drill as compared to that seeded by a furrow drill; also yields of Sudan grass sown on fallow land (fig. 13) as compared to that sown in Sudan grass stubble the second year after fallow.

TABLE XVI.—YIELDS OF SUDAN GRASS HAY.

(A) Common drill versus furrow drill.
(B) After fallow versus after Sudan grass.

	Yield in pounds per acre.								
	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	Average.
(A) Common Drill Versus Furrow Drill									
Common drill	3,110	7,000	4,125	7,140	1,873	320	343	5,520	3,690
Furrow drill	3,240	5,200	3,475	7,506	2,216	340	336	5,646	3,495
(B) After Fallow Versus After Sudan Grass									
After fallow			3,345	3,767	5,877	2,300	478	5,272	3,339
After Sudan grass			3,100	3,500	2,300	167	0	3,211	2,046

Sudan Grass for Pasture.—Sudan grass may be pastured from about July 1 until frost, during which time it will ordinarily carry one mature animal per acre, although in favorable seasons it will furnish more pasture. Milk production is maintained and cows usually gain in weight while on Sudan grass pasture.

It is usually considered that about fifteen acres of native grass are required to pasture an animal through the year. By supplementing with Sudan grass, eight acres of native pasture and one acre of Sudan grass will graze a mature animal, thus nearly doubling the number of live stock that, may be pastured on the farm. The gain in milk or flesh or both will ordinarily be sufficient to pay for the seed and labor of the Sudan grass pasture. Sudan grass for pasture is seeded about June 1 at the rate of 25 pounds of good recleaned seed per acre.

Sudan Grass for Hay.—Sudan grass hay is fine, leafy, and of high quality. The yield, however, is less than that of sorgo such as Early Sumac. When grown in rotation with other crops Sudan grass averaged 3,593 pounds of hay per acre over a period of eight years from 1921 to 1928. Two crops of Sudan grass have been grown after fallow on somewhat poorer land, where the yield of the first crop after fallow averaged slightly higher than when grown in rotation and the yield of the second crop a little more than one ton per acre.

The common drill is preferable to the furrow drill for seeding Sudan grass since it gives a more even distribution of plants, which

is desirable in pasture, and weeds offer less competition than where the drill rows are 14 inches apart. Sudan grass for hay should be seeded at about the same time and rate as for pasture. It should be cut when about one-third of the heads are out. If allowed to stand longer it will probably be less palatable. The second crop may be cut just before frost or immediately after it is frosted.

LEGUMES

Among the annual legumes beans and cowpeas are perhaps best. Soybeans have been tested and in some seasons make good yields

FIG. 14.—Annual legumes, cowpeas (left), soybeans (right).

of hay and grain. If not protected they may be severely damaged or even destroyed by rabbits.

Annual legumes (fig. 14) do best when planted on summer-fallowed land or after potatoes. They should be planted about June 1, preferably with a loose-ground lister which puts the seed in shallow furrows.

Pinto is the best variety of beans tested. In a four-year test this variety averaged 447 pounds per acre. A bean harvester and a bean thresher are necessary in order to grow this crop satisfactorily.

Cowpeas are best adapted for hay and make an excellent quality and a fair yield. They may be cut with the mower and should be raked before the leaves break, cured in the shock, and stored in

the barn or stack. Blackeye and Early Buff are among the best varieties tested.

Alfalfa may be grown successfully only with irrigation and in especially favorable locations on bottom land. Sweet clover has about the same requirements as alfalfa, although if a stand is obtained it may do well in somewhat less farorable conditions.

POTATOES

Potatoes are adapted to this section and do well if enough moisture is provided either by irrigation or by fallowing the land the preceding year. Windmill irrigation may be used satisfactorily for a small area, but fallowing is more practical for a larger acreage. The fallow should begin early in the spring a year before the potatoes are to be planted. The land may be listed and worked later with the curler and relisted 6 to 8 inches deep in the fall. One or two crops of weeds can be killed the following spring with the curler.

Planting.—It is advisable to plant seed in the loose, mellow soil that blew and washed into the furrows during the winter. This may be done with a potato planter, or if planted by hand the lister may be run shallow in the old furrows and the potatoes dropped in the row and covered with the cultivator. Plants that are 20 to 24 inches apart in rows 3 1/2 feet apart are usually considered a good stand.

The seed potatoes may be cut with two buds in each piece. They may be planted from the middle of March to the middle of April. Small areas for home use or local market may well be planted early, but it is ordinarily advisable to plant the main crop the first half of April.

Cultivation.—Cultivation need not be deep but should be frequent and thorough to kill all weeds while they are small and to keep the land in good condition to take in rain. The crop should not be cultivated after the plants begin to bloom.

Spraying.—It is important that potatoes be sprayed to protect them against potato beetles. A spray consisting of 1 1/2 to 2 pounds of arsenate of lead mixed with 50 gallons of water is ordinarily effective. A barrel spray equipped with a fine-spray nozzle may be used on a small area, but a power spray is needed if the crop is grown on a field scale.

Harvesting.—It is advisable to delay harvesting the main crop until the potatoes are well matured, which is usually after the warm weather. However, potatoes may be ready for home use or local

market about August 1 if planted early. The potato digger is the most satisfactory implement for harvesting potatoes, but small areas may be listed or plowed out and picked up by hand.

Storing.—Potatoes ordinarily keep well during the winter and spring in a cellar, cave, or earth pit, provided they are well matured when stored.

Varieties.—In variety tests Irish Cobbler averaged 80.2 bushels per acre over a period of 10 years, as given in Table XVII, and Red River Ohio made 75.1 bushels. Both of these varieties are well adapted, although the Cobbler is usually of slightly better quality than the Ohio. Early Triumph has not yielded so well as the two varieties mentioned nor were the potatoes so uniform in size or so well developed. Rural New Yorker, Early Rose, and some other varieties were tested but did not give good results.

TABLE XVII.—YIELDS OF VARIETIES OF POTATOES.

VARIETY.	Yield in bushels per acre.									
	1912.	1913.	1914.	1915.	1922.	1923.	1926.	1927.	1928.	Av., 9 yrs.
Irish Cobbler.....	91.1	42.0	27.3	73.6	160.0	8.5	37.6	150.0	89.9	75.6
Red River Ohio....	80.1	27.2	20.1	56.4	184.0	13.8	61.8	126.3	89.3	73.2
Early Triumph....	61.3	39.7	26.4	74.8	84.0	6.5	75.3	112.9	62.2	60.4
Rural New Yorker.	69.1	33.0	12.6	95.2	80.0	8.0	48.4	91.4	.....	.....

ORNAMENTAL PLANTINGS

No farm home should be considered complete without trees (fig. 15), shrubs, and flowers.

Trees.—Red cedar, Russian olive, green ash, and cottonwood are among the best trees in this section. Honey locust does well but is relatively short-lived chiefly on account of the borer. It is advisable in setting out trees and shrubs to dig a large hole, fill it with water two or three times, and place finely pulverized soil around the roots. Frequent and abundant irrigation and careful cultivation should be given, particularly during the first year.

Flowers.—Numerous flowers, including both perennials and annuals, are adapted to this section. Several annuals that reseed themselves do well. A succession throughout the season may be had by choosing from among aster, calendula, cosmos, snapdragon, pansy, mountain moss, verbena, golden glow, and chrysanthemum.

Lawns.—Buffalo grass is perhaps the most satisfactory lawn grass, although Kentucky blue grass may he maintained in good condition if watered abundantly. A stand of Buffalo grass can readily be obtained by setting pieces of sod 2 to 4 inches in size at intervals of 12 to 15 inches each way. The land should be well prepared and mellow and the sod should be placed a little below the surrounding surface. It is best to transplant Buffalo sod at about the time it starts spring growth. A good lawn may be obtained at once by laying large pieces of sod solid. In this case land should also be

FIG. 15.—A grove provides shade, serves as a wind-break, catches snow, and adds materially to the appearance of the homestead.

well prepared and the sod pressed into place, packed and smoothed with a heavy roller, and thoroughly watered. Frequent mowing with a lawn mower or mowing machine will keep weeds and coarser grasses out of a Buffalo grass lawn.

HOME GARDEN

A garden, including a variety of vegetables, of sufficient size to supply the family, may be had with comparatively little effort. (Fig. 16.) Careful attention must be given, however, to the preparation of the land at the time of planting, to irrigation, and to the choice of varieties.

Soil Moisture and Preparation of Land.—Adequate irrigation supplied by windmill or other power is essential. A small reservoir

FIG. 16.—Tomatoes and cabbage in the vegetable garden which may be irrigated to advantage with a windmill pump.

or storage tank facilitates quick and even distribution of water, although the water may be distributed directly from the pump. It is advisable to have the subsoil well filled with water early in the spring and to supply additional water before the plants show the effect of drought. If it is not convenient to alternate the garden with fallow, care should be taken to prevent the growth of weeds or of a truck crop after it has served its purpose, thus conserving moisture and keeping the land in better condition for the nest crop.

Adapted Vegetables and Fruits.—Only limited tests have been made with garden crops, but the work has shown that many may be grown successfully, including lettuce, radish, carrot, parsnip, bean. beet, cabbage, tomato, celery, cantaloupe, sweet corn, onion. and spinach. Strawberries do well provided great, care is taken in starting the plants. Currants, cherries, and plums are apparently well adapted.

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