

KANSAS STATE AGRICULTURAL COLLEGE.

Agricultural Experiment Station.

Bulletin No. 198.

KAFIR **IN FIELD AND FEED LOT.**



Kafir at the Fort Hays Branch Experiment Station.

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SUMMARY.

The material of this bulletin applies primarily to upland soils in the western half of Kansas.

Kafir is a native of central Africa and is naturally adapted to a warm, dry soil.

In western Kansas, kafir is worth twice as much, acre for acre, as corn.

Kafir is adapted to practically any Kansas soil except those that are poorly drained or strongly alkaline.

Dwarf Blackhulled kafir is best in extreme northwest Kansas, Whitehulled White in central west and northwest Kansas, and Standard Blackhulled White is best over all of central and southern Kansas.

Listing is more satisfactory than surface planting. Row plantings are more economical than broadcast plantings.

Kafir should be planted in a warm soil one or two weeks later than Indian corn.

The objects of cultivation are to:

1. Conserve moisture.
2. Catch all water that falls.
3. Kill weeds.
4. Aerate the soil.

Cutting with a binder is the most economical method of harvesting row plantings.

The silo offers the cheapest and most convenient method of storing kafir fodder for cattle feeding.

Threshed grain stored in bins will heat unless it is clean and very dry.

Home-grown seed is usually superior to imported seed.

Seed selections should be made in the field in the fall before the first hard frost.

Kafir to be used as seed should not be threshed until planting time.

The formalin treatment effectually kills kernel smut.

The Fort Nays Experiment Station has been instrumental in the improvement of the three principal kafirs now grown in this state, namely, Whitehulled White, Dwarf Blackhulled White and Early Standard Blackhulled White.

Kafir compares favorably with corn either as fodder, grain or ensilage.

ACKNOWLEDGMENTS.

Recognition is hereby accorded G. E. Thompson, General Superintendent of the Branch Experiment Stations, for suggestions and aid in writing and editing the manuscript of the accompanying paper.

KAFIR.

By GEO. K. HELDER, Superintendent Fort Hays Branch Experiment Station.

THE purpose of this bulletin is to show, briefly, the value of kafir in the western half of Kansas and particularly on upland soils. A discussion of the varieties best adapted for each locality and a discussion of the most economical methods of handling them is included. The material given is largely the result of experimental work and field tests conducted on the State Experiment Farm at Hays, in the western third of Kansas.

HISTORY OF KAFIR.

NATIVE HOME.

Kafir is a native of south central Africa, and in its natural home is accustomed to a warm soil and drouthy conditions.

INTRODUCTION INTO THE UNITED STATES.

Kafir was first introduced into the United States about 1875-6, coming in through the southern states. It did not prove especially valuable under southern conditions, and it was not until several years later, when it had reached the drier portions of Kansas, Oklahoma, and Texas, that it became prominent. The report of the Kansas Experiment Station for 1888 shows kafir as being under experimental test. About 1889, the Kansas Experiment Station began growing kafir as a regular field crop, and from that date until the present time the acreage in the state has constantly increased.

IMPORTANCE AT THE PRESENT TIME.

In 1893 there were 46,900 acres of kafir in Kansas. In 1912 there were 1,422,000. This comparison shows the rapid increase in the acreage planted. In the western one-half of the state, during the last fifteen years, kafir has returned an average value of practically twice that of corn. To be exact, the actual average acre value of corn, according to the reports of the State Secretary of Agriculture, in Ellis, Ellsworth, Gove, Logan, Sheridan, Osborne, Lincoln, Rooks, Russell,

Thomas, Trego, and Wallace counties, from 1893 to 1911, inclusive; was \$4.55 while during the same years the acre value of kafir was \$9.26.

ADAPTABILITY OF KAFIR.

Kafir, as well as the other sorghums, is adapted to practically all classes of soils except those that are poorly drained or strongly alkaline. It will give best results on a rich loam soil that would be considered good corn ground, and it should not be expected to do its best on swampy ground or on very light, thin, sandy soil.

VARIETIES FOR EACH SECTION OF KANSAS.

The conditions under which kafir is grown will have much to do with its value as a farm crop. It must have time to mature if it is to return the largest profit to the grower.

Northwest Kansas. In the extreme northwestern portion of Kansas where the altitude is high and the growing season short, the Dwarf Blackhulled White kafir has proven the best variety. This variety, when planted from home-grown and well-selected seed, will mature probably four years out of five, providing proper methods of tillage are employed. Dwarf kafir does not make as heavy a yield of grain or fodder as Standard Blackhulled kafir in the localities where the Standard kafir does its best, but because of the fact that it is almost two weeks earlier in maturity it is the best variety of kafir for eight or ten counties of northwestern Kansas.

West and Northwest Central Kansas. In that section of Kansas below the ten counties in the northwest corner of the state and lying west of a line from the northwest corner of Jewell to the southeast corner of Stevens county, the Whitehulled White kafir has proven more profitable than any other variety grown. Whitehulled White kafir will mature from five days to a week earlier than Standard Blackhulled White kafir, and because of this fact is a more certain crop than the Standard Blackhulled kafir for this area. The quality of feed produced is practically the same as that of the Standard Blackhulled kafir. Red kafir has also been grown with considerable success in this area. Both of these sections are pretty well adapted to the growing of Dwarf milo, Feterita, and Freed sorghum.

Central Kansas. East of the section just described, Standard Blackhulled White kafir is the most profitable variety to grow on the average farm. With the exception of about ten counties in the extreme northeastern portion of the state and the rich river and creek bottom lands, kafir throughout Kansas has proven more valuable, acre for acre, than corn. In the northeastern portion of the state, corn has been more profitable than kafir.



Blank listing as practiced at the Fort Hays Experiment Station.

CAUSES OF CHANGES IN METHODS OF SEED-BED PREPARATION.

In the spring of 1905 the Hays kafir crop was planted on spring-plowed ground, opening small furrows in front of the planter with the furrow opener. The season proved to be a dry one and the crop suffered seriously from drouth, the field producing less than a ton of fodder per acre. Apparently, the failure of this crop was due to the fact that it rooted too near the surface of the ground and the roots were quickly affected by the dry weather.

In the spring of 1906 the Hays Station lost a piece of wheat from excessive soil drifting and consequent smothering of the larger portion of the stand. One-half of this field was blank listed and the other half double disked between April 18 and 24. Both tracts were harrowed later to kill weeds which had started, and were planted about May 17 to 20, using the two-horse planter with furrow openers. Both of these methods of seed-bed preparation proved very satisfactory, although this season the disking proved superior to the listing. However, in no case has spring disking proved as good a method of seed-bed preparation as fall listing. The season of 1906 was dry, but as planting was considerably deeper and in a deeper furrow than the season previous the crop withstood the drouth surprisingly well. After these tests, as well as others of a similar nature, the Fort Hays Experiment Station has often planted kafir following corn or wheat. Occasionally kafir has followed kafir.

BEST METHOD OF SEED-BED PREPARATION.

At present the most practical and economical method of seed-bed preparation in western Kansas is by the use of the lister. Preparation of the seed bed should begin even before the previous crop is removed. When any crop has been well tended, the soil left in good physical condition and some moisture stored, the prospects for the following crop are much better than they are when the soil has been left dry and cloddy or in otherwise bad shape. Shallow fall listing, leaving the furrows open through the winter to catch all snow or rain, also leaves the ground rough so that no blowing can occur and is the cheapest and best method of handling the ground until the frost is out in the spring.

Later preparation depends upon the season and the farmer must be the judge of conditions. If the spring proves very dry, in many cases the best thing that can be done is to plant with an ordinary two-row corn planter with furrow opener attached, planting in the bottom of the furrow opened the previous fall. If the spring proves wet the lister cultivator is used to kill the weeds and form a mulch that will hold moisture in the soil. The harrow may be used after subsequent rains, if they come prior to planting time. When the ground is warm and the right time arrives, planting may be done with a two-

row planter in small furrows thrown out in the bottom of the furrows listed the previous fall, or the ridges may be split and the planting done at the same operation. In listing to split ridges in the spring, the furrow should be a little deeper than for blank listing in the fall. Since 1909 the usual method of handling kafir on this Station has been fall listing, early spring cultivation, and re-listing (splitting ridges) at planting time.



Working ridges down with a lister cultivator in early spring.

PLANTING.

The time of planting will depend upon the locality, the variety, the warmth of the soil, and the method of planting used. In the high altitude of northwestern Kansas planting should be from one to two weeks later than in lower altitudes where the season is correspondingly longer. The quicker maturing varieties may be planted a little later than those which ripen more slowly. The warmth of the soil will depend much upon the method of seed-bed preparation. If the ground has received no working previous to planting time it will be cold, and the planting must be delayed at least a week longer than

where the ground has been properly prepared. Ground that has been blank listed in the fall and worked with a harrow or lister cultivator in the spring to kill weeds, and then had the middles split a week or ten days before planting time, can usually be planted considerably earlier than with any other method of seed-bed preparation, except flat planting; and flat planting is seldom advisable in western Kansas.

The depth at which planting is done has some effect on the time of planting. Where plantings are made very shallow the ground is warmer near the surface and planting can be correspondingly earlier, but where planting is done in a deep furrow in cold ground it must be late to insure success. Kafir will not sprout satisfactorily in cold ground, and it is practically useless to plant milo or feterita before the ground is thoroughly warm. As a general rule, kafir should be planted one to two weeks later than Indian corn in the same locality. In the neighborhood of Hays this means that plantings made from May 15 to 20 have been most satisfactory.

AMOUNT TO PLANT.

In planting for seed production in western Kansas, with seed of known good germination, four pounds per acre is sufficient. If planting for forage or for silage, many growers will use twice this amount, and some use even a greater quantity. The amount to be planted is governed entirely by the vitality of the seed, the locality in which planted, and the purpose for which it is planted.

CULTIVATION.

Objects of Cultivation. Where ground has been properly prepared and the crop well planted, there are four main objects in later cultivation:

- First. The conserving of moisture already stored.
- Second. The catching of any rain that falls.
- Third. The killing of weeds.
- Fourth. Aeration of the soil.

With the right kind of soil mulch, from two to four inches deep, depending upon the soil and season, much evaporation can be prevented. In all cultivation in western Kansas the farmer should be careful to leave the ground rough, in order that, any water which falls will be held on the ground until it

soaks into the soil, instead of being lost by surface run-off. Cultivation must be done at such times and be of such a nature that the field is kept free from weeds. Weeds use large quantities of water, and no crop can do its best when its moisture supply is taken from it by such a growth. The aeration of the soil is also an important factor in cultivation. Unless the air is allowed to penetrate the soil, aiding in the decay of vegetable matter and carrying oxygen into the ground, but little plant food is set free and the crop does not grow rapidly, even though the soil is naturally rich. In all cultivation care must be taken that the feeding roots of the plant are not broken or injured. This requires that late cultivations be very shallow.

METHODS OF CULTIVATION FOR ECONOMY AND RAPIDITY.

Where the crop has been planted in listed furrows the first cultivation can usually be made with the harrow. The next cultivation can be made with the disk-lister cultivator, setting the disks to throw the dirt from the row. When the crop has attained sufficient size the disks may be reversed and the dirt thrown to the stalks. By this means the roots are well buried and are deep below the few inches of soil which gets hot and dry in late summer. The crop is usually "laid by" with a regular six-shovel cultivator. However, in case late heavy rains form a crust over the surface of the soil, this crust must be broken if the best results are to be secured. This can be accomplished by using the one-horse cultivator, even though the crop has reached or passed the heading stage. When all cultivation for the season is completed it is usually better to have a small furrow in the row rather than to hill the crop, as is often practiced. Methods of cultivation will vary with every season, and each grower must work out the system best suited to his own farm.

CULTIVATION OF DRILLED PLANTINGS.

In cases where the sorghum is drilled or planted broadcast, and the rain crusts the surface of the ground before the crop has attained a height that thoroughly shades and protects the ground, it is often best to harrow or cultivate with a weeder. This cultivation can be done rapidly, and the results of tests which have been made show that it is worth the trouble.

HARVESTING.

TIME OF HARVESTING.

The time to harvest will depend upon the purpose for which the crop is to be used and the probability of being able to cure it properly. If kafir is harvested for feeding from the bundles as a roughage crop, experience has shown that it is best to cut when the seeds are in the milk or soft dough stage. If both grain and fodder are desired it is best to allow the crop to stand until the seed is hard enough so that it can just be cut readily between the thumb nail and finger. This is also the right stage for cutting when the crop is to be used as silage. In case the crop has been planted broadcast and is to be used for hay purposes, if there has been sufficient moisture to allow the crop to head, most growers prefer to let it reach the soft dough stage before cutting. When kafir is headed in the field it should be allowed to stand until the stem at the base of the head is dry. If headed before this date there is apt to be trouble from heating.

METHODS OF HARVESTING.

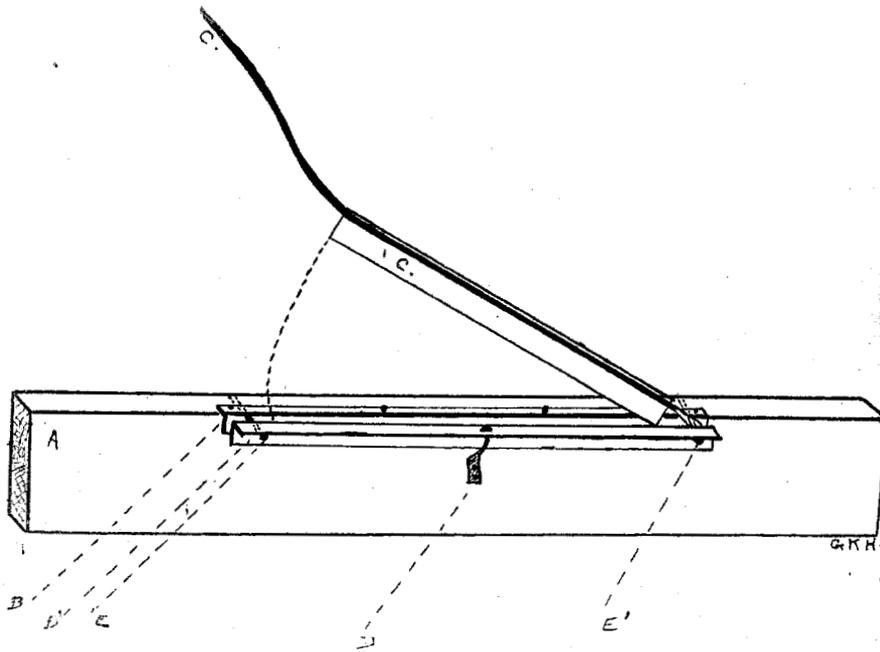
The method of harvesting depends upon the manner in which the crop was seeded and the purpose for which it is harvested. In broadcast or drilled seedings, usually the most economical method is to cut with an ordinary mowing machine, and then to shock in large shocks. After it is cured sufficiently in these large shocks, it should be stacked, though a more common practice is to feed from the shock as it is needed during the winter.

HARVESTING CULTIVATED ROWS.

In the harvesting of cultivated rows, where it is desired to make use of the fodder, the most rapid and economical method has been by use of the row binder. When the grain alone is used, if the farmer is growing only a small acreage, it is usually cheaper to head by hand than to hire or to buy a machine for heading. Where large acreages are handled, machine heading is more rapid and cheaper than hand heading. There are a number of machines on the market for heading by rows, but on the Fort Hays Station a very satisfactory method has been by the use of an ordinary grain or wheat header. The platform is elevated to the proper height, and

the ordinary force of men can head from fifteen to twenty acres in a day.

When the corn binder has been used and the feed has been shocked, the bundles can be headed either by the broad-ax-and-block method or by the use of a long-bladed clipper attached to the side of the wagon box or barge. The accompanying sketch of the clipper will show the method of construction and operation.



Kafir or sorghum header.

Key:

- A, a 3 x 6-in. plank (or 2 x 10-in.).
 - B, B', angle irons. Length optional. 24 to 30 in. B fastened with lag screws through top to the plank. B' bolted to B with the bolts, E and E', so that a 1/2-in. space separates two irons.
 - D, iron bracket, or brace, to support B' and keep it rigid.
 - C, blade of clipper.
 - C', iron bar handle, onto which blade is bolted. End of handle has eye through which bolt (E') passes.
- Equipment may be bolted to side of header barge by passing bolts through plank and wagon side; or it may be mounted on standards to place upon rear of wagon or header barge.

Two or three men hand the bundles to the clipper, while one man operates the knife, and the heads, as they are clipped, fall inside the barge. The bundles can then be reshocked or hauled at once to the stack.

THRESHING.

There are two things which must be carefully watched in threshing kafir. First, have the grain thoroughly dry; and second, prevent excessive breaking. Ordinarily it is better to have the kafir headed with comparatively long stems, that is, with stems from a foot to a foot and one-half or two feet in length. This furnishes enough straw or fodder with the head so that only a small amount of grain is cracked by the cylinder



Harvesting kafir at the Fort Hays Experiment Station.

as it goes through the machine. It can also be handled much more rapidly when in this condition than when an attempt is made to run the entire bundle through the machine, and it is also much easier on the thresher, and less expensive.

STORING.

Proper handling and storing of the crop after harvest means increased profit for the farmer. When the crop has been cut with an ordinary grain binder it should be well shocked in the field and allowed to stand until thoroughly cured. It should

then be stacked in long ricks. This will prevent much damage from water as well as from blowing dirt and will also save considerable loss from damage by mice and rats.

STORING IN SILOS.

The cheapest and best means of storing kafir where it is to be fed to cattle or sheep is by means of the silo. When stored in the silo the shrinkage should not exceed ten per cent. There is no loss from weather conditions; dust and dirt do not blow into the fodder; and neither insects, rats nor mice bother it. It is also convenient to feed and it costs no more to put a crop into the silo than to properly shock and stack bundle fodder. Silage has been kept as long as four years in perfect shape.

STORAGE OF GRAIN IN BINS.

In storing kafir in large bins, great care must be taken that the grain does not heat. The kafir seed is hard and flinty and often not as dry as it appears. The grain should not be put into bins in large quantities until it is thoroughly dry and until it has been well cleaned. Kafir grain that contains dust, dirt and chaff will heat worse in the bin than clean grain. Grain that is to be used for planting purposes should never be threshed and stored in bins.

IMPROVEMENT OF KAFIR AND OTHER SORGHUMS.

Danger of Importing Seed. When the seed of any crop is imported from a distance, there is danger of bringing with it plant diseases and insect pests. When seed is imported from a distance the conditions under which it was grown are not known and it is doubtful if the seed is acclimated and adapted to the locality to which it is brought. When it is necessary to bring seed from a distance the responsibility of the man from whom the seed is purchased should be known and care should be taken to get seed grown under conditions similar to the locality in which the following crop will be grown.

Advantage of Seed Selection at Home. Home-grown seed, other things being equal, is always superior to imported seed. Under average conditions it takes a crop two or three years, and in many cases longer, to become acclimated and do its best. There is no danger of importing insect pests when home-grown seed is used, and there is less danger of getting plant diseases than where seed of uncertain origin is secured. Care-

ful selection of home-grown seed for a number of years will give seed that is adapted to any particular locality. By this method yields can be materially increased.

TIME TO MAKE SELECTIONS.

There is but one right time and place to make seed selection, that is on your own farm, in your own field, and in the fall before the first frost.

TYPE TO SELECT FOR FORAGE.

In selecting kafir for growing in western Kansas, select stalks that mature early, because in many cases early maturity means drouth evasion, and drouth evasion may mean a crop. Select those plants that do not have an excessive tendency to sucker and on which the main stalks ripen at approximately the same time as the suckers. Select a leafy plant. Select a plant that grows upright and has no tendency to fall down or lodge when it begins to mature. Always choose a plant with an upright head; one grown under average conditions, so that it has no advantage as regards distance from other plants or moisture supply, and if possible, one that has shown good drouth resistance.

TYPE FOR GRAIN.

In selecting for grain production, it is well to pay some attention to all points considered in selecting for forage purposes, and in addition the seed head itself must be carefully inspected. Choose seed heads that are large, of uniform type, and well filled from butt to tip; always choose a head that is entirely out of the boot; choose those heads which are fairly compact, and that you know from experience will thresh out a high per cent of grain. A compact head having short internodes usually threshes out best. Avoid all heads which have a tendency to shatter. In all selection work, watch carefully the uniformity and choose only those heads which ripen at approximately the same time. Since all sorghums cross readily, seed selection should be made at least one hundred yards from any other variety.

In all selection work avoid hybrids, because in most cases they do not breed true. Hybrid plants can usually be distinguished by their extreme vigor, coarseness, and late maturity.

STORING KAFIR OR SORGHUMS FOR PLANTING.

Kafir, milo, feterita and other sorghum seeds heat readily when the threshed grain is stored in large bins. Seed that is to be used for planting purposes should never be threshed until planting time. When the seed has been selected, either the heads should be threaded on a string and hung from the rafters of the granary or barn, where the birds can not reach them, or piled very loosely in burlap or thin sacks and hung where there is free circulation of air and where they are out of the reach of birds and rodents. They should be inspected occasionally to make sure that weevils or other insects may not reach them. The seed can be threshed by hand at planting time, and when it has been handled in this manner the grower is practically certain to secure a stand, provided his ground has been properly prepared and growing conditions are favorable.

DISEASES OF KAFIR.

Kernel Smut. Kernel smut is the most important disease of kafir in this state. In kernel smut each individual grain of the head is affected separately, although usually every grain in an affected head is diseased. The kernel has a dirty appearance and is slightly elongated, and when broken open or crushed between the fingers the entire kernel is found to be a mass of smut.

Head Smut. Head smut is readily distinguished from kernel smut because in head smut the entire kafir or sorghum head is affected as one ball or mass. In this respect it is similar to the smut ordinarily found on corn,

Both of these smuts affect all members of the kafir group of sorghums, and most, if not all, of the sweet sorghums. Up to the present time they have never been found on milo, and there has been no complaint regarding their presence on feterita.

TREATMENT FOR KERNEL SMUT.

There are a number of methods of treating kafir and other sorghums for kernel smut. Most of them, when carefully carried out, are satisfactory, but under farm conditions the easiest and probably the best method is as follows:

One pound (standard strength or 40% solution)
formalin in 30 gallons of water. Soak the
seed for one hour. Dry at once.

It is important that the seed be thoroughly dried before being placed in sacks, or that it be planted as soon as it is dry enough to run through the planter box. If the seed is but half dry, and is sacked up, it will often heat enough in twenty-four hours to damage the germination considerably. Formalin can be purchased at any drug store for 75 cents to \$1 per pound.

TREATMENT FOR HEAD SMUT.

As yet there is no satisfactory method of treating sorghum head smut, and fortunately this variety of smut has caused very little damage in Kansas. Planting clean, home-grown seed will keep it under the grower's control.

IMPROVEMENT OF KAFIRS AS ACCOMPLISHED AT THE FORT HAYS STATION.

The Fort Hays Experiment Station has done considerable work in the improvement of the kafirs as they are being grown at present in this state. The work has included variety tests to determine those varieties which were best adapted for this locality, as well as similar territory throughout western Kansas.

Two varieties or strains have been developed until they are especially well adapted for this section. One is an early-maturing strain of the Standard Blackhulled kafir, and the other an early-maturing kafir known as the Whitehulled White kafir.

WHITEHULLED WHITE KAFIR.

The Whitehulled White variety was secured in 1906 from a farmer in Russell county who had already spent several years in selecting and improving it. When the Fort Hays Station secured this kafir, the first year's test indicated that it was superior to any other varieties that had been grown up to that time, and work was immediately started in breeding by the head-to-row method, selecting those rows which proved best, and increasing seed of the more uniform and higher-producing types. The early maturity and uniformity of this variety has been maintained and considerably improved by careful seed selection. At the present time it is earlier and perhaps more drouth resistant than the Blackhulled kafir, and for this reason is better adapted for growing in the vicinity of Hays and west and northwest of Hays than the Standard Blackhulled kafir.

BLACKHULLED WHITE KAFIR.

The Standard Blackhulled kafir has been improved by head-to-row selection, and the variety as it is now being grown at Hays is several days earlier and more uniform than that ordinarily grown throughout the state.

The Fort Hays Station has also played an important part in the selection and development of the Dwarf Blackhulled kafir, which during the past two or three years has been distributed by the United States Department of Agriculture. This is the variety of kafir that is especially well adapted to the extreme northwestern part of Kansas or to similar sections where the altitude is high and the growing season is short.



A crop of kafir at the Fort Hays Station.

KAFIR SEED DISTRIBUTION BY THE FORT HAYS STATION.

Since the year 1905 the Fort Hays Experiment Station has distributed more than 1600 bushels of kafir for seed purposes, much of it remaining in Kansas, but a portion of it being distributed through Nebraska, Oklahoma, Colorado, Texas and

other states. The United States Department of Agriculture has purchased several hundred bushels of seed from the Fort Hays Station. This Station has also distributed considerable pure seed of dwarf milo and other sorghums.



Kafir on left. Corn on right.
Corn has been completely ruined by drouth and grasshoppers. Kafir is still in good condition. Fort Hays Experiment Station, 1918.

KAFIR IN CROP ROTATIONS.

A rotation system which has given good results on the Fort Hays experiment farm is as follows:

Fallow,
Winter wheat,
Kafir.

Or, if desirable, kafir may be grown two years following the wheat and before the next summer fallow. It has often been stated and is generally believed that kafir, and also other sorghums, are hard on the ground. This is no doubt true to the extent that any crop which produces a large tonnage of forage or a large yield of seed must necessarily use considerable plant food. However, the main reason that kafirs are considered

hard on the ground is due to the fact that they grow late in the season, using all available moisture and plant food until frost kills the plant.

For the benefit of those who wish to compare their own climatic conditions with the conditions of Hays, Kan., the accompanying rain or precipitation table is given.

PRECIPITATION TABLE, HAYS, KANSAS.
1908 TO 1913.

| YEAR. | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|------------|---------|----------|-------|-------|-------|-------|------|--------|-----------|---------|----------|----------|-------|
| 1908 | 0.15 | 4.20 | 1.03 | 2.01 | 10.08 | 4.40 | 2.72 | 4.55 | 0.55 | 1.95 | 0.98 | T. | 32.52 |
| 1904 | T. | T. | .10 | .85 | 2.99 | 4.33 | 2.33 | 3.15 | 1.07 | .15 | 2.31 | 0.49 | 15.84 |
| 1905 | .60 | .55 | .36 | 1.87 | 2.70 | 3.90 | 4.64 | 2.75 | .42 | .87 | 2.18 | T. | 20.67 |
| 1906 | .15 | .87 | .73 | 1.67 | 1.51 | 2.29 | 5.79 | 2.87 | 3.39 | 2.94 | .85 | .51 | 23.08 |
| 1907 | .64 | .22 | .85 | .60 | .88 | 4.97 | 9.15 | 3.12 | 1.75 | 1.40 | .11 | 1.76 | 25.40 |
| 1908 | .02 | .92 | T. | 2.18 | 3.06 | 6.02 | 2.90 | 5.86 | .81 | 1.76 | 1.79 | .03 | 25.35 |
| 1909 | .39 | .23 | 1.16 | .47 | 1.60 | 10.21 | 3.71 | 1.48 | 2.78 | 1.64 | 3.55 | 1.00 | 28.27 |
| 1910 | .58 | .26 | .03 | .91 | 3.55 | 2.71 | 2.45 | 3.92 | 1.28 | .36 | T. | .14 | 16.19 |
| 1911 | .12 | 2.12 | .14 | .82 | 2.27 | .81 | 2.09 | 4.47 | 2.05 | .30 | .14 | 1.81 | 17.14 |
| 1912 | .02 | 1.93 | 1.60 | 1.66 | 2.70 | 4.32 | .83 | 3.52 | 1.85 | .51 | 1.13 | .03 | 20.20 |
| 1913 | .36 | .68 | .41 | 2.78 | 5.72 | 3.58 | .63 | 1.11 | 4.80 | .25 | .72 | 3.14 | 23.13 |
| Mo. mean.. | 0.26 | 1.05 | 0.58 | 1.43 | 3.36 | 4.31 | 3.39 | 3.25 | 1.88 | 1.56 | 1.06 | 0.81 | 22.52 |

KAFIR FOR FEEDING.

PASTURING.

In pasturing kafir, the stockman must be careful that he does not incur loss by prussic acid poisoning. Kafir, as well as other sorghums, sometimes contains this acid, and when eaten by stock it is a quick and deadly poison. This acid is most apt to be present after a period of drouthy weather or after the kafir growth has been checked or stunted in some manner. Even though kafir contains the acid when cut, it seems to be harmless when the crop is thoroughly cured; and up to the present time there has never been a case of prussic acid poisoning from kafir or sorghum fed as silage.

WINTERING BEEF COWS.

A feeding test at Hays, Kan., during the winters of 1912 to 1914 showed that kafir silage, when fed in the right proportion with straw and cottonseed or linseed meal, was the cheapest winter feed obtainable.

In one lot of cows in this test, each cow received 20.05 pounds of kafir silage, 17.18 pounds of straw and one pound of cottonseed meal daily. During the one hundred days' feeding test

they made a small gain in weight and the cost for each cow per 1000 pounds of live-weight was only \$4.14. This is indeed a cheap winter feed. Another ration that cost a little more, but which is probably a better ration to use because the cows came through in a more thrifty condition, was as follows:

| | | |
|----------------------------------|---|--------|
| 35.63 pounds kafir silage | } | daily. |
| 14.20 pounds wheat straw | | |
| 1.00 pound cottonseed meal | | |

On this ration each cow gained 1.34 pounds per day, and at the end of the feeding period they were exceptionally strong and thrifty. The cost for one hundred days was \$5.84 per 1000 pounds of live weight.

At the same time and under the same conditions, in another lot of nineteen cows, each was fed 27.20 pounds of kafir fodder, 10.28 pounds of wheat straw and one pound of cottonseed meal per day. They made a daily gain of only one-half pound each and it cost \$8.72 for one hundred days' feed for each 1000 pounds of live weight. These tests show kafir silage to be much better and much cheaper than kafir fodder, and, in addition, it is easier to feed.

In this test, kafir silage was valued at \$2.66 per ton, straw at 50 cents per ton, and cottonseed meal at \$30 per ton. Kafir fodder grown under the same conditions was worth \$5 per ton. Another point that shows the advantage of converting the kafir crop into silage is the fact that in this feeding test it took a half more ground to produce the kafir fodder than to produce the kafir silage for the same number of cows where the best silage ration is considered, and more than twice as much ground to produce the fodder as to produce the silage where the cheapest silage ration is considered.

WINTERING BEEF COWS.

| | Daily ration per cow, lbs. | Daily gain per cow, lbs. | Cost for 100 days' feed. | |
|-----------------------|-------------------------------|-----------------------------|--------------------------|-------------------------------|
| | | | Per cow. | Per 1000 lbs. live weight. |
| Lot III. | | | | |
| Kafir fodder | 27.20 | 0.5 | \$9.91 | \$8.72 |
| Wheat straw | 10.28 | | | |
| Cottonseed cake | 1.00 | | | |
| Lot IV. | | | | |
| Kafir silage | 35.63 | 1.34 | 6.30 | 5.84 |
| Wheat straw | 14.20 | | | |
| Cottonseed cake | 1.00 | | | |
| Lot V. | | | | |
| Kafir stover | 25.60 | .35 | 5.61 | 4.95 |
| Wheat straw | 10.79 | | | |
| Cottonseed cake | 1.00 | | | |
| Lot VI. | | | | |
| Kafir silage | 20.05 | .56 | 4.44 | 4.14 |
| Wheat straw | 17.18 | | | |
| Cottonseed cake | 1.00 | | | |

Value of feeds.

| | |
|---|-----------------|
| Kafir silage | \$2.66 per ton. |
| Kafir fodder | 5.00 " |
| Kafir stover (fodder without grain) | 3.00 " |
| Wheat straw | .50 " |
| Cottonseed cake | 30.00 " |

The yields of these feeds were:

| | |
|--------------------|--------------------|
| Kafir silage | 8.5 tons per acre. |
| Kafir fodder | 3.0 tons per acre. |
| Kafir stover | 2.0 tons per acre. |
| Wheat straw | 1.0 tons per acre. |

In other words, the acres necessary to produce the feed for one cow for 100 days were as follows:

| | |
|-----------------------------|------------|
| Lot III.—Kafir fodder | 0.34 acre. |
| Wheat straw | .51 acre. |
| Lot IV.—Kafir silage | .22 acre. |
| Wheat straw | .71 acre. |
| Lot V.—Kafir stover | .43 acre. |
| Wheat straw | .54 acre. |
| Lot VI.—Kafir silage | .12 acre. |
| Wheat straw | .86 acre. |

WINTERING BEEF STEERS.

Very similar results were secured in the wintering of beef steers at Manhattan in the winter of 1912-'13 as were secured during the same winter at Fort Hays in handling beef cows.

Five lots of steers (ten head in each lot) were fed during the winter. The lot fed on corn silage and cottonseed meal made an average gain of one and one-half pounds per day per head, and the net profit above all expenses on the lot was \$47.05. In comparison with this lot the same feed with kafir silage substituted for corn silage made a slightly larger gain and a net profit of \$60.46. Sweet sorghum silage made a larger gain and a larger net profit than corn silage, but not as large as kafir silage. Corn silage and alfalfa hay made a slightly better feed than corn silage and cottonseed meal. In comparison with these feeds the best dry feed obtainable, which was corn stover, shelled corn, and alfalfa hay, fed under the same conditions, made a net profit of \$49.34. This feed was bulky and hard to handle, and it required a much larger acreage to produce the necessary corn stover than to produce silage for feeding the same number of cattle.

The following table gives in detail the results of this feeding test:

WINTERING BEEF STEERS.

| RATION. | LOT 1. Corn silage, cottonseed meal. | LOT 2. Kafir silage, cottonseed meal. | LOT 3. Sweet-sorghum silage, cottonseed meal. | LOT 4. Corn silage, alfalfa hay. | LOT 5. Corn stover, shelled corn, alfalfa hay. |
|----------------------------------|---|--|--|-------------------------------------|---|
| Original value per cwt..... | \$7.80 | \$7.80 | \$7.80 | \$7.80 | \$7.80 |
| Value by the lot*..... | 325.40 | 321.65 | 333.90 | 331.35 | 334.95 |
| Original weight..... lbs. | 4,172 | 4,124 | 4,281 | 4,248 | 4,294 |
| Feed consumed: | | | | | |
| Corn silage..... lbs. | 27,431 | | | 18,533 | |
| Kafir silage..... lbs. | | 30,365 | | | |
| Sweet sorghum silage..... lbs. | | | 30,355 | | |
| Cottonseed meal..... lbs. | 927 | 927 | 927 | | |
| Alfalfa hay..... lbs. | | | | 5,332 | 5,912 |
| Corn stover (fed)..... lbs. | | | | | 8,710 |
| Corn stover (consumed)..... lbs. | | | | | 5,792 |
| Shelled corn..... lbs. | | | | | 1,897 |
| Details: | | | | | |
| Final weight..... lbs. | 5,700 | 5,751 | 5,365 | 5,748 | 5,918 |
| Total gain..... lbs. | 1,528 | 1,627 | 1,584 | 1,500 | 1,624 |
| Average daily gain..... lbs. | 1 1/4 | 1.62 | 1.58 | 1.50 | 1.62 |
| Cost of feed..... | \$55.05 | \$54.96 | \$54.94 | \$57.45 | \$59.56 |
| Daily cost by the head..... | .055 | .0549 | .0549 | .057 | .059 |
| Cost of gain..... | 3.60 | 3.37 | 3.46 | 3.83 | 3.66 |
| Value, hundredweight..... | 7.50 | 7.60 | 7.50 | 7.60 | 7.50 |
| Final value by lot..... | 427.50 | 437.07 | 439.87 | 436.84 | 443.55 |
| Profit by the lot..... | 47.05 | 60.46 | 61.03 | 48.04 | 49.84 |

* Ten steers in each lot.

HOG-FEEDING TESTS.

From rather extensive hog-feeding tests carried on at the Fort Hays Station from 1905 to 1909 the following conclusions have been drawn:

It is more profitable to full-feed hogs of medium age and weight (125 lbs.) for a short period (seventy-five days) than to full-feed old or very young hogs for a long period,

Hogs following cattle require less grain than when fed in separate pens, even though the cattle are fed ground grain.

The addition of a few sugar beets to a kafir ration is advisable. It reduces the amount of grain and the cost per pound of gain while it increases the average daily gain of the hogs.

Kafir and milo when fed with the proper concentrates are satisfactory feeds for fattening hogs.

The value of kafir, milo, and sweet sorghum seed for hog feeding is of practical importance to every farmer in the western half of Kansas. Extensive hog-feeding experiments conducted at the Kansas State Agricultural College in 1911 showed that there was little practical difference between kafir and milo grain as a hog feed. Both were slightly inferior to

corn and both were considerably better than sweet sorghum seed. All were much more efficient when given with some feed rich in protein, such as tankage, than when fed alone. In case tankage can not be secured at a reasonable price alfalfa hay can be used to a limited extent, but it seldom pays to feed both tankage and alfalfa hay.

In the hog-feeding test last mentioned the sweet sorghum seed, the milo and the kafir, as well as the corn, were ground. They were all fed wet or as a slop in connection with the proper concentrates, which were usually shorts and tankage.

COMPARISON OF CORN, MILO, KAFIR AND SORGHUM SEED FOR FATTENING HOGS.

January 23, 1911, to April 23, 1911.

| | Lot 50.—Ground corn and alfalfa hay..... | Lot 51.—Ground corn alone..... | Lot 52.—Ground corn, 62 per cent; shorts, 30 per cent; tankage, 8 per cent; alfalfa hay..... | Lot 53.—Ground corn, 62 per cent; shorts, 30 per cent; tankage, 8 per cent..... | Lot 54.—Ground cane seed and alfalfa hay..... | Lot 55.—Ground cane seed, 62 per cent; shorts, 30 per cent; tankage, 8 per cent..... | Lot 56.—Ground milo seed and alfalfa hay..... | Lot 57.—Ground milo seed, 62 per cent; shorts, 30 per cent; tankage, 8 per cent..... | Lot 58.—Ground kafir seed and alfalfa hay..... | Lot 59.—Ground kafir seed, 62 per cent; shorts, 30 per cent; tankage, 8 per cent..... |
|---|--|--------------------------------|--|---|---|--|---|--|--|---|
| Number of days in period..... | 80.00 | 80.00 | 60.00 | 60.00 | 80.00 | 60.00 | 80.00 | 60.00 | 80.00 | 60.00 |
| Number of hogs in lot..... | 10.00 | 9.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Average weight of each at beginning, pounds..... | 124.00 | 126.10 | 124.50 | 124.90 | 125.80 | 125.00 | 125.20 | 124.10 | 124.10 | 125.10 |
| Average weight of each at close, pounds..... | 248.50 | 220.80 | 241.60 | 244.90 | 196.50 | 227.30 | 221.60 | 227.20 | 255.60 | 287.00 |
| Average daily gain per hog, pounds..... | 1.531 | 1.18 | 1.95 | 2.00 | .88 | 1.70 | 1.20 | 1.70 | 1.30 | 1.80 |
| Average grain consumed daily per hog, pounds..... | 6.60 | 6.26 | 7.45 | 7.40 | 5.70 | 7.40 | 6.20 | 6.70 | 7.30 | 7.40 |
| Average grain consumed daily per 100 lbs live wt..... | 3.50 | 3.60 | 4.10 | 4.00 | 3.50 | 4.20 | 3.90 | 3.80 | 3.30 | 4.10 |
| Average hay consumed daily per hog, pounds..... | .60 | ..... | .50 | ..... | .90 | ..... | .90 | ..... | .90 | ..... |
| Average hay consumed daily per 100 lbs. live wt..... | .32 | ..... | .25 | ..... | .57 | ..... | .52 | ..... | .52 | ..... |
| Grain per pound of gain, lbs..... | 4.32 | 5.30 | 3.50 | 3.70 | 6.50 | 4.40 | 5.10 | 3.90 | 5.20 | 3.90 |
| Hay per pound of gain, lbs..... | .39 | ..... | .23 | ..... | 1.03 | ..... | .74 | ..... | .67 | ..... |
| Cost per 100 pounds gain..... | \$4.25 | \$5.03 | \$4.40 | \$4.20 | \$6.57 | \$4.95 | \$5.21 | \$4.45 | \$5.21 | \$4.50 |

The feed which made the cheapest gain was ground corn 62 per cent, shorts 30 per cent, and tankage 8 per cent. The next cheapest gain was made on ground corn and alfalfa; but while this gain was cheaply made it was considerably smaller than the gain made on corn, shorts and tankage.

Ground milo 62 per cent, shorts 30 per cent, and tankage 8 per cent made 100 pounds of gain at a cost of \$4.45. The same

feed with ground kafir substituted for ground milo made 100 pounds of gain at a cost of \$4.50. Ground cane seed in place of ground milo made 100 pounds of gain at a cost of \$4.95.

For those who are especially interested in hog feeding, the table (page 631), taken from Kansas Bulletin No. 192, is given in detail.