TEXAS AGRICULTURAL EXPERIMENT STATION.

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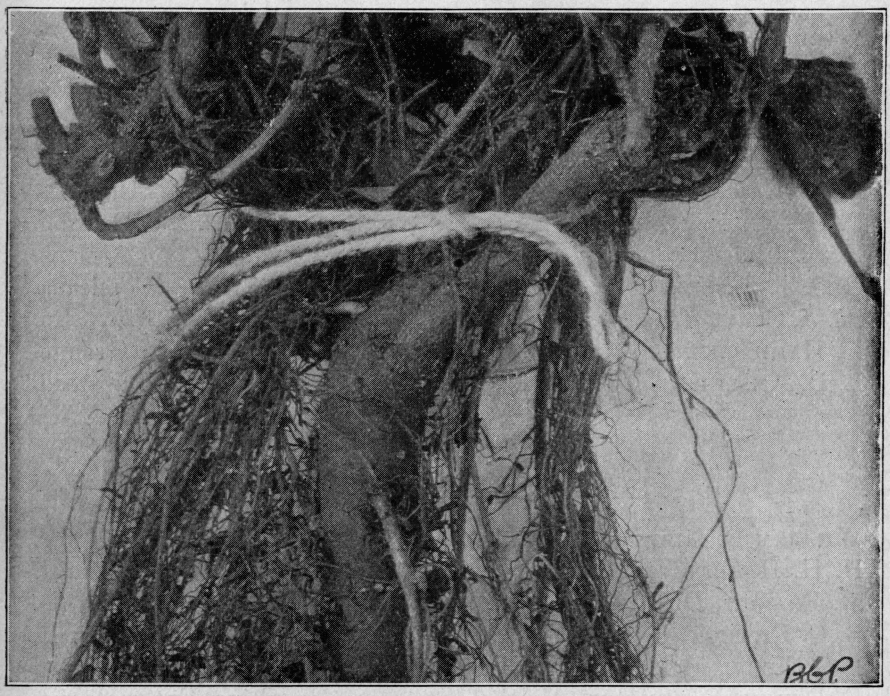
Agricultural Section—MAY, 1903—*Forage Crops.*



Alfalfa crown showing tubercles (natural size)—planted March 20, 1901—yielded per acre 3165 pounds hay during 1901, and 11000 pounds during 1902.

ALFALFA
PEANUTS
VELVET BEANS
MILLET
RAPE

POSTOFFICE:
COLLEGE STATION, BRAZOS COUNTY, TEXAS.

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NOTE.—*The main station is located on the grounds of the Agricultural and Mechanical College, in Brazos county. The postoffice address is COLLEGE STATION, TEXAS. Reports are sent free of cost to farmers, horticulturists and stockmen of the State upon application to the Director.*

* Resigned March 1, 1903.

FORAGE CROPS.

B. C. PITTUCK.

To say that grasses and forage plants constitute the foundation of agricultural prosperity and progress is merely to restate a fact well known in every civilized country for more than two thousand years. This fact becomes every year more and more important as population increases and open range decreases. That this importance is being appreciated, the correspondence of this Station and its intercourse with farmers abundantly proves. There is a greater acreage and money value represented in grasses and forage plants than in any other crops.

Every farmer who raises live stock should grow forage crops, for by their use his native pastures can be reduced in area and the productive capacity of his farm increased; they enable the farmer to secure green feed at seasons of the year when most needed; the leguminous forage crops furnish a cheap but very valuable form of manure for maintaining soil fertility.

Our virgin soils are usually well supplied with nitrogen and potash, and with phosphoric acid and lime in medium quantities. The system of farming practiced in Texas reduces the phosphoric acid and nitrogen to minimum quantities, and very frequently the acids, due to the decay of organic matter and processes of nitrification which take place in the soil, almost destroy the lime content. The only remedy is the application of plant food in the form of commercial fertilizers, or manures, and the growing and turning under of leguminous crops. The legumes furnish to the farmer the cheapest source of nitrogen for his soil.

Live stock should form a large part of every system of farming, both from the profits resulting from their feeding and sales and for the manure produced, which should be carefully saved and returned to the land. It was long ago discovered that growing the same crops continuously would exhaust the best of soils, but it was not known why. Chemical analyses have shown the substances removed by such crops, and as they vary with the different growths, the explanation of the exhaustion is apparent. On all cultivated lands the cowpea, or some other nitrogen gathering plant, should occupy the fields once at least in four years, for the purpose of replacing the nitrogen removed by other growths. The other constituents are usually maintained in due proportion by the general rotation. Five tons of alfalfa hay contain about 219 pounds of nitrogen, 51 pounds of phosphoric acid and 168 pounds of potash. One might suppose the production and removal of such crops would rapidly exhaust the soil, especially of its nitrogen; but it is well known that the soil actually improves in nitrogen, the most costly element of plant food. This is why the legumes when grown and plowed under are such beneficial fertilizers.

All the legumes are nitrogen gatherers. This peculiar property is due to minute bacteria which live on the roots of the plants, forming nodules. These bacteria have the property of extracting nitrogen from the air in more than sufficient quantities for their own use, which is utilized by the host plant. They multiply rapidly and live a very short time, dying and adding nitrogen to the soil. With the exception of the early growth of the legumes all of the nitrogen used by them is secured from the air. These bacteria do not live in acid soils, consequently for best results with this family of plants on such soils, conditions should be corrected by applications of lime. In some sections of the country the absence of these bacteria renders the growing of many of our legumes difficult. In such localities inoculation of the land with soils from fields where such crops are being successfully grown will be found beneficial. In Texas, however, the natural wild growth of the legumes is so great that there is hardly any soil within the State that does not contain the nitrogen gathering bacteria in sufficient numbers to insure profitable growths, provided other conditions are favorable.

The advent of the Mexican boll weevil into the cotton area of Texas, and the admission of entomologists that it is a most difficult problem to solve, has

caused the farmers of that section to turn their attention to other crops. The system of farming practiced so long in this section will undoubtedly have to be changed. The fertile river bottom lands of Texas that have so long produced a large per cent of the cotton of this State will produce from four to six tons of alfalfa per acre. Four tons of alfalfa hay at $18 (the present price) per ton, is more than equal to 1.44 500-pound bales cotton at 10 cents per pound, and six tons per acre is more than equal to 2.16 500-pound bales. In the overflow districts alfalfa is liable to be killed by standing water of twenty-four to thirty-six hours duration, depending upon the season of overflow. But if only one or two cuttings can be had, it would pay to replant each year. This district will grow other crops to perfection such as oats, peas, potatoes, rape, peanuts, sorghum, etc. The change seems to be most naturally in the direction of stock farming.

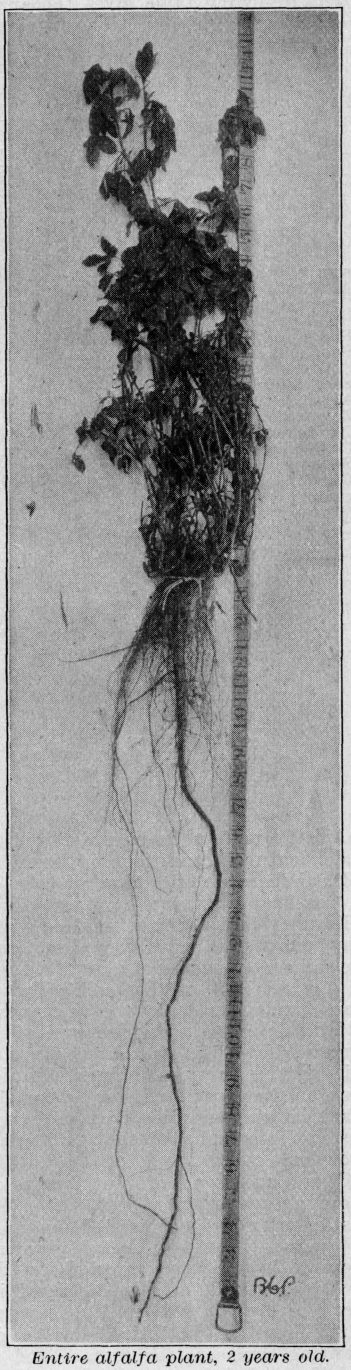
Texas is peculiarly adapted to stock raising. Upon the western plains where land is cheap the native grasses afford abundant green pasturage during the summer, and many species self cure without losing their nutritive properties, thus affording pasturage during the winter months. In these sections the native pastures can be supplemented to good advantage with Kaffir corn, milo maize, rape, and where irrigation is to be had, alfalfa. In other sections where the rainfall is more abundant the number of forage plants of value greatly increase in number. Corn, sorghum, alfalfa, Kaffir corn, milo maize, rape, peanuts and many of the cultivated grasses will afford pasturage, meadows and dry forage during the hot months, while oats, wheat, rape, vetches, burr clover, rescue grass and others will furnish green feed during the fall, winter and early spring months. Bearing in mind that the cheapest meat is produced without grain, the advantage of green crops and proper rotations to secure such feeds at all seasons, is apparent.

In the following pages the experiences of many reliable farmers are noted concerning the growth and adaptability of many of our forage crops. Seeds were distributed by the Station to all farmers sufficiently interested to give them a fair and impartial trial. The first report on co-operative experiments was included in Bulletin No. 59. It is the intention of the Station to furnish upon request small amounts of seeds of grasses and forage plants to farmers, whenever practicable, requiring in return a full report concerning growth, maturity, adaptation, value, etc.

ALFALFA.

Alfalfa should receive the attention of farmers in every section of Texas where conditions are in any way favorable to its growth. At present prices, after it is once established, a yield of one ton of hay per acre will afford a good profit, while yields of four and six tons, which are not unusual on favorable soils, makes the investment exceedingly profitable. The present demand is much greater than the supply and bids fair to increase in greater proportion during the coming year. Its increasing popularity with the farmer is based upon sound business principles, as its value does not consist solely in its market price, but in its value as feed for his stock and food for his soil. It will furnish green pasturage and hay of the best quality without materially impoverishing the soil.

Many farmers refrain from planting alfalfa because some neighbor, far or near, planted on land apparently similar to theirs, and it died of the disease commonly known as cotton root rot. It would be far better for each farmer to test his own land, for alfalfa may be affected by this fungus at one place and entirely unaffected on ground only a few rods away. The value of an alfalfa meadow is such as to warrant a farmer in giving considerable time, labor and study to the plant, before deciding that natural conditions prohibit him from successfully growing it.



Entire alfalfa plant, 2 years old.

The following table gives the analysis of a number of our feed stuffs, showing the percentage of digestible nutrients and fertilizing constituents in each:

	Dry matter in 100 pounds.	Digestible nutrients in 100 pounds.			Fertilizer constituents in 1000 pounds.		
		Protein.	Carbo-hydrates.	Ether extract.	Nitrogen.	Phosphoric acid.	Potash.
Hays:							
Alfalfa	91.6	11.0	39.6	1.2	21.9	5.1	16.8
Cowpea	89.3	10.8	38.6	1.1	19.5	5.2	14.7
Oat hay	91.1	4.3	46.4	1.5	.....	.....	.....
Fodder corn	57.8	2.5	34.6	1.2	17.6	5.4	8.9
Sorghum	82.04	2.4	40.6	1.2	.....	.....	.....
Cotton seed hulls	88.9	.3	33.1	1.7	6.9	2.5	10.2
Green feeds:							
Alfalfa	28.2	3.9	12.7	.5	7.2	1.3	5.6
Cowpea	16.4	1.8	8.7	.2	2.7	1.0	3.1
Oat fodder	37.8	1.6	18.9	1.0	4.9	1.3	3.8
Corn silage	20.9	.9	11.3	.7	2.8	1.1	3.7
Sorghum	82.4	2.4	4.1	1.2	.....	.....	.....
Rape	14.0	1.5	8.1	.2	4.5	1.5	3.6
Grains:							
Wheat bran	88.1	12.2	39.2	2.7	26.7	28.9	16.1
Cotton seed meal	91.8	37.2	16.9	12.2	67.9	28.8	8.7
Corn	89.1	7.9	66.7	4.3	18.2	7.0	4.0
Cowpea	85.2	18.3	54.2	1.1	33.3	.....	.....
Cotton seed	89.7	12.5	30.0	17.3	31.3	12.7	11.7

From the above table we find that five tons of alfalfa hay contain 1,100 pounds protein, and is equal in this food element to

Cotton seed meal	2,956 pounds
Linseed meal	3,754 pounds
Wheat bran	9,016 pounds
Cowpea hay	10,185 pounds
Red clover hay	16,176 pounds
Timothy hay	39,285 pounds

Alfalfa prefers deep, moist and warm soils. Its range of profitable growth under natural conditions in Texas practically coincides with the corn growing belt. Wherever fair crops of corn can be grown profitable crops of alfalfa may be reasonably expected. Wet soils are distinctly unfavorable for alfalfa, and soils underlaid near the surface with stiff subsoils are ill suited to its longevity. Any warm soils with a good moisture content and containing a fair per cent of the mineral elements of plant food will grow alfalfa—the yield per acre depending on the fertility of the land. The rich and fertile river bottom lands and the black lands formed by the decomposition of limestone formations are ideal soils. Alfalfa delights in the presence of the mineral elements of plant food, especially lime. Alfalfa is a fastidious plant. It is a deep rooted plant and requires deep soils for best results. Much also depends upon the preparation of the seed bed even on the most fertile soils, for the reason that it is necessary that the young plant be well supplied with moisture near the surface, and that a vigorous root system be established that will enable it to withstand the effects of frosts and drouths.

There are none of our forage crops that will respond more readily to a thorough preparation of the seed bed than alfalfa. It might be said that for best results it is demanded, and no mistake will be made, if the same degree of preparation and careful planting is given the seed bed for alfalfa as is required by the truck grower for his onion crop. Many failures with this crop in Texas would have been turned into success if this important step had been more carefully considered. Thorough harrowing breaks up the soil into fine particles so that it easily comes in direct contact with the seed, and rolling after planting compacts the surface and serves to hold the moisture around the seed. Alfalfa seed being small, demand favorable conditions for successful germina-

Alfalfa (two years old) ready for first cutting in spring. Growing in Station Grass Garden.

tion. Rains following close after rolling of the land are liable to compact the surface of the soil to such an extent as to render it a difficult matter for the young plants to push through. This condition can be remedied by harrowing, which not only breaks the crust and allows the plants to easily push through, but exerts a beneficial effect on the tilth of the soil and the eradication of weed growth.

Alfalfa may be planted either during the fall or spring, the presence of favorable conditions determining the exact time. Fall plantings in Texas are to be preferred because a longer growing season is usually obtained before the appearance of unfavorable conditions. Spring plantings, however, are not to be discouraged. Land that has been thoroughly broken up during the winter and well prepared during early spring and that is fairly free of weed growth may be successfully sown in alfalfa. Avoid planting alfalfa on newly broken land.

The amount of seed to be sown to the acre depends upon the method of planting and thoroughness of preparation of the soil. In the drill ten to fifteen pounds will be sufficient, while a broadcast planting will require from twenty to twenty-five pounds. The depth of planting will vary according to the amount of moisture in the soil. If the surface soil is dry the seed should be covered not less than one inch. Utah and Kansas furnish the bulk of our commercial crop of alfalfa seed. Well-matured seed will retain their germinating power without showing any perceptible degree of deterioration for a number of years. This statement is contrary to the general belief, but is supported by the results of well authenticated tests. Professor Headden, of Colorado, gives out the following results of tests made to determine the germinability of alfalfa seed:

Description	Years Old.	Germinating Power.
Prime seed	2	96
Prime seed	2	92
Prime seed	3	98
Prime seed	5	93
Screenings, first quality	1	66
Screenings, first quality	2	55
Screenings, first quality	3	79
Screenings, second quality	2	38
Screenings, third quality	1	38

It is evident from the above table that it is a waste of seed to plant as much as thirty pounds of alfalfa seed to the acre, especially on thoroughly prepared soil. Professor Headden found that a six-year-old field of alfalfa contained 635,400 plants per acre (15 to the square foot) and another ten years old contaied 526,793 (12 to the square foot) plants per acre, and still another which contained 139,392 (3 to the square foot) plants per acre. These fields yielded practically the same amount of hay—about four tons per acre. A twelve-year-old field was found to contain only 70,283 plants per acre, and yielded more than three tons of hay per acre. Professor Clothier, of the Kansas Stations, says that a pound of alfalfa seed contains approximately 210,000 seed. Good seed will germinate ninety per cent. Thirty pounds with a ninety per cent germination would give 5,670,000 plants. Calculating that one-tenth of the young plants live we would have 567,000 plants per acre. Twenty to twenty-five pounds is amply sufficient, and even less under favorable conditions.

A Brazos bottom planter who has a large acreage in alfalfa, in a conversation concerning the amount of seed to be sown per acre, said: "My manager planted thirty pounds of seed per acre last fall. It is too much. The plants are crowded, and compared with my old fields, there are at least three times as many plants to the acre."

The general conditions existing in Texas are favorable to the successful curing of alfalfa hay. Where large acreages are grown it is of the utmost importance that barn space be provided for the hay. It is a difficult matter to cure and stack it in the field. If the weather is warm and dry the crop can be cut in the morning after the dew is off the ground and winrowed during the afternoon after the plant has become wilted but the leaves not yet brittle. Usually, however, it is raked on the following morning. Much of the nutriment of alfalfa is contained in the leaves, which fact emphasizes the statement that it should be handled in curing as little as possible. Cut alfalfa that has been rained on

demands the utmost care to cure properly, because of the tendency of the leaves to become brittle and shatter. The injurious effects of rains on cut alfalfa is not so much the leaching out of food elements, but the accompanying loss of leaves caused by the extra handling which is necessitated. Alfalfa should be cut when about one-fourth the crop is in bloom. Its protein composition is highest at this time and lowest when in full seed.

Alfalfa should not be pastured until it has matured a good hardy crown and root system to enable it to withstand the trampling of stock. At least two years should be allowed the crop for this purpose, and even more would be conducive to a hardy crop. If green feed is desired the alfalfa can be cut and fed as a soiling crop during this time. Spring pasturing of alfalfa is responsible for the disappearance of many good stands. At this time of year the plant is just recovering from the effects of low temperature and needs all of its energies. If cut during early spring, the sickle bar should be set higher than usual.

Do not turn a hungry or thirsty animal in an alfalfa field. By observing this rule and further accustoming them to it by gradually increasing their time of feeding, little or no injurious effect will accompany the pasturing of horses and hogs. Cattle are more liable to bloat, and even with the best of care and attention fatal cases will occur. Soiling cattle is the safest method of feeding them alfalfa. The Kansas Station estimated the value of green alfalfa fed for seventy-four days to dairy cattle at $25.26 per acre. Profitable results have been secured by feeding alfalfa to steers, care being exercised to prevent scouring, by gradually increasing the amount to the maximum quantity. Pigs thrive on alfalfa pasture—twelve to fifteen head of pigs may be turned on an acre of alfalfa with the best results. In combination with a finishing ration of grain it is most effective. Experiments in feeding alfalfa to horses indicate that the cost of maintenance is reduced.

ALFALFA ON BRAZOS BOTTOM SOILS.

Alfalfa has been successfully sown both during the spring and fall season on Brazos bottom lands, preference, however, being given to fall plantings. The soil of this section is deep, fertile, warm and well drained—an ideal soil for alfalfa. It produces the finest alfalfa in the world. The uncertainty of the cotton crop will naturally increase the acreage of alfalfa. A large part of this section is subject to overflows of from one to eight days' duration. The unqualified statement that such conditions existing from twenty-four to thirty-six hours will kill alfalfa, has caused many to hesitate. Alfalfa is naturally opposed to wet soils, but where favorable soil conditions exist, well-matured alfalfa has a wonderful power of recuperation. Winter overflows have been found to be less injurious than those occurring during the summer months. The late summer overflows are not of frequent occurrence. Much practical experience of value has been gained by the planters concerning summer overflows in this region during the past four or five years. The destructive effect of the overflows is greater on the immediate river front land, and in practically every instance where such lands were devoted to alfalfa the crop was killed out to an unprofitable stand. The heavy deposits of sediment on the plants, in some instances completely covering them, prevents the natural life functions of the plant. As we go further back from the river front the amount of sediment carried by the water is materially reduced.

Mr. J. O. Chance, who has a large acreage of alfalfa in the Brazos bottom, in speaking of the effect of overflow said: "My alfalfa is on land about two miles from the river. The overflow of last summer did not completely cover my crop, but remained on the land the greater part of six days. It was running water. My alfalfa land is well drained, except in spots. The crop was only slightly injured except in the low places where the water stood for some time after the overflow waters had receded. In such places it was killed out. I have an old alfalfa field located on creek bottom land which has been overflowed not less than twenty times during the past two years. The drainage of this piece is excellent, and the water rarely remains on the land for more than eighteen hours. No particular ill effects from these overflows have been noticed. The deposit of sediment on alfalfa is dangerous to its growth, but if light rains follow the overflows it will be washed off. Succeeding hot, dry weather is generally fatal to the stand."

Robert F. Smith, of the Smith & Carson plantation, said: "A large part of our alfalfa was under water nearly eight days last summer, and being located near the river front was covered with eight to ten inches of sediment. About four weeks later this land was prepared for fall oats. A good sprinkling of alfalfa came up with the oats, having survived the severe conditions to which it had been subjected. I believe there is very little danger to alfalfa from overflows back from the river, say from one to two miles, except in poorly drained spots. A light rain following the receding of the overflow waters is a great help, as it washes the sediment off the plants. The overflow of this winter did not injure my crop planted last fall, although it was on the land for at least two days and completely covered it during a part of that time."

Mr. Coulter said: "The recent winter overflow did not seriously injure my alfalfa, although it is located on the river front. The rains following the receding of the waters cleaned off the sediment that had been deposited on the leaves. After last summer's overflow, which covered my alfalfa for six or seven days, the land was plowed as soon as possible and planted in peas. Quite a lot of the alfalfa came up with the peas."

John Nabors said: "If there is not too much sediment and it is running water, alfalfa will stand overflows of long duration, and especially so if the overflow is followed by light rains to clean off the sediment from the plants."

The alfalfa on the Koppe plantation is located about one mile from the river. The overflow of last summer completely covered this field for at least five days—the fence posts were almost entirely under. The alfalfa only died in poorly drained spots and where scalded by the sun.

It is quite evident from the experiences noted above that little danger is to be apprehended with alfalfa from winter overflows on well drained land that lies back from the river front. The very heavy deposit of sediment along the immediate river front makes such locations very undesirable. The deposit of sediment on alfalfa is most dangerous from summer overflows, because at that time it prevents the active growing functions of the plant which is being devoted to the formation of stalk and leaves. During the winter the plant is practically in a dormant stage, and is not so seriously injured. The scalding effect of hot suns following summer overflows is perhaps responsible for most of the injury.

RESULTS WITH ALFALFA.

During 1901 we received a package of alfalfa seed from Utah which was claimed to be especially valuable as a drouth resister. This seed was planted along with seed purchased of one of our Texas seed houses on March 20, 1091, both germinating evenly and to a good stand by April 1st. Two cuttings from each were secured from each planting the first year, the latter cutting being badly damaged by worms. There was practically no difference in the yield—the total for the two cuttings being 3165 pounds per acre with the former and 3175 pounds per acre with the latter. Five cuttings were secured last year, averaging in the case of the Utah seed more than one ton. The following table gives the date and yield of each cutting, showing a difference in favor of the Utah grown seed of 2071 pounds:

	Cuttings.					Total yield.	Value at $18.00 per ton.
	Apr. 26	May 26	July 21	Aug. 14	Nov. 15		
Utah seed	2268	4083	2722	928	1000	11001	$ 99 00
Ordinary	1561	3176	2268	1175	950	8930	80 37

Mr. Hal McFarland, of Tyler, Smith county, makes the following report:

"Alfalfa was planted on soil of only fair fertility, which averages about twenty bushels of corn per acre. It was previously cropped with oats and peas. Fall planting, October 15th, and spring planting, March 4th. Both plantings germinated in about fifteen days. The spring crop of 1901 withstood the severest drouth in this section for years. The fall crop was killed by the severe freezes of December 16th and 17th. I believe the effect of the freeze would have been

minimized if the land had been rolled. The ground was very loose and had had no rain to settle it. On a strip of rich sandy land, high and dry, and capable of producing forty bushels of corn per acre, alfalfa planted March 4, 1901, withstood a seventy-five days' drouth and gave its first cutting June 1st, second cutting July 15th, third cutting September 1st, and fourth cutting before frost. I am satisfied that on good land alfalfa will prove of great value to the farmers of this section. I have induced a number to plant alfalfa, and wherever good land was used a profitable crop has been secured. As you see, it is a mistaken idea as to alfalfa requiring a great deal of moisture. My crop was made, and a good one, too, with but little rain during the growing season."

An experimenter from Comfort, Kendall county, says: "Alfalfa was planted April 5th on dark sandy soil underlaid with gravel and only five or six feet to water. Germinated April 12th, first blooms June 2nd, last blooms September 25th. Made four cuttings of an average height of two feet. The season was hot and dry. In my opinion, it is a very profitable crop."

Mr. R. E. Delaney, of Garrison, Nacogdoches county, says: "Alfalfa was planted October 28th on rich hammock land six years in cultivation. 'Made' plot was used. Germinated middle of November. Only a few plants lived until the middle of April. Rainfall was normal. Dr. E. S. Adams planted alfalfa on very light sandy land with yellow porous subsoil. He fertilized the land well and has secured three or four cuttings."

Mr. Edward K. Carr, of Kerrville, Kerr county, Texas, says: "Alfalfa was planted March 6th on limestone soil and germinated to a fair stand about March 15th. Had plenty of rain and secured two cuttings the first year. The drouth, which was very severe during the following year, cut the growth of the alfalfa off short. It will undoubtedly prove valuable in this section for grazing horses and hogs, and during good seasons will make good yields of fine quality hay."

Mr. E. Schumm, of Runnels, Runnels county, Texas, says: "Alfalfa was planted November 1st on black sandy soil well broken during September and thoroughly harrowed before planting. Season was favorable towards germination, which took place November 13th. The entire crop was destroyed by the blizzard of December 13th."

Mr. R. H. Work, of Santo, Palo Pinto county, Texas, says: "Alfalfa was planted March 22nd on good upland soil which had been well pulverized by plowing and harrowing. Germinated April 3rd. Growth was poor on account of the very hot and dry weather. First bloom June 14th. Rainfall was below normal. The extreme heat killed the stand during July and August."

Mr. Chris Rumley, of Pigeon, Erath county, Texas, says: "Alfalfa was planted March 31st on sandy soil with clay subsoil. Germinated April 12th. May 18th it was three inches in height. Cut July 10th. July 28th, second growth was eight inches high, after which it grew very little. The hot, dry winds during the growing season injured the stand."

Mr. J. F. McCarty, of Floydada, Floyd county, Texas, says: "Alfalfa planted September 7th germinated September 13th. I am confident of its success here, and intend sowing ten or twenty acres."

Mr. B. F. Grantham, of Whitney, Hill county, Texas, says: "The alfalfa seed sent me was planted and came up to a good stand. It stood the drouth well. I have one and one-half acres of fine looking alfalfa."

Mr. Isaac Grindstoff, of Peaster, Parker county, says: "My alfalfa was planted in the drill and on a deep, sandy, well drained soil. Planted April 25th, it germinated June 4th. It made splendid growth. It grew right along during the drouth when nearly everything else was burning up. My experience leads me to believe that alfalfa will prove a profitable crop in many places in Parker county."

Mr. Jasper N. Haney, of Weatherford, Parker county, says: "The alfalfa seed sent me was planted March 17th, on sandy soil six inches deep underlaid with a stiff red clay subsoil. Fresh, last year corn, well broke and pulverized in November and rebroke and pulverized before planting. It is upland soil and well drained. Germinated to good stand by March 27th. Growth was fairly vigorous until retarded by drouth, which continued from April until July 24th. It made an average of twelve inches in growth, although grazed by turkeys and chickens, which seemed to be very fond of it. Reverting to an experiment twelve years ago on similar land, I am satisfied that alfalfa is a valuable grazing and hay crop for this section."

PEANUTS.

The peanut as a forage and pasture plant is rapidly, and deservedly, becoming popular with the Texas farmer. Being a legume, it exercises a beneficial effect on the soil, and at the same time furnishes a highly nitrogenous feed-stuff, greatly relished by stock as green feed or as hay. Peanuts are partial to loose soils of a light color. The land should be well drained and not too rich in vegetable matter. Barnyard manure should be used only in small quantities. Phosphoric acid and potash are the main elements of plant food required by the peanut for best results. Too much lime in the soil will result in a large per cent of unsalable nuts. Wood ashes, Kainit, cotton seed meal, acid phosphate and the manures will be found profitable applications when used judiciously. Dark soils have a tendency to produce dark-colored nuts, and light soils light-colored nuts, the latter having a higher commercial value, though for feeding purposes the vines and nuts are practically of the same value.

Peanuts should be planted early in the spring after all danger of frost, in rows three to three and one-half feet apart and eighteen inches to two feet apart in the drill. The land should be finely pulverized. For pasture and forage purposes the Spanish peanut is most generally used, as its habit of growth is more upright than the larger sorts, and consequently much easier harvested. The general method of flat cultivation given the corn crop will answer every purpose with the peanut. Keep the weeds down and stop the cultivation as soon as the nuts begin to form.

Peanuts should be harvested before frost, as the crop will suffer serious injury when subjected to such conditions. Bar off each row with bull-tongue, running once or twice to the row, care being exercised to avoid plowing into the nuts. The vines should then be pulled, nuts and all. After shaking off the dirt lay them beside the row to wilt. On a warm day the vines will be ready to stack in eight or nine hours. The usual method is to stack around a pole firmly set in the soil, and with a platform of some sort to keep the vines off the ground. The nuts should be placed on the inside of the stack, which should be loose enough to allow a free circulation of air.

Besides the manufacture of peanut oil, and the commercial value of the nuts for confectionery purposes, the peanut as a forage crop for hogs and cattle is rapidly forging to the front.

The Alabama Station investigated the relative value of pasturing hogs on peanuts, chufas, cowpeas, rape, sorghum and sweet potatoes, and found that the average amount of grain required in connection with the pasturage to make one pound of growth was 1.77 pound with peanuts, 2.30 pounds with chufas, 2.68 pounds with rape, 3.07 pounds with cowpeas, 3.13 pounds with sweet potatoes, and 3.70 pounds with sorghum. Seven pigs averaging in weight 28.10 pounds gained in six weeks on peanut pasture alone 503 pounds per acre grazed.

Mr. Robert T. Jaynes, of Bibb, Comanche county, Texas, says: "I planted the Spanish peanuts April 17th on well-drained sandy land that had been bedded and rebedded. Germinated April 25th and matured August 20th. The crop was harvested August 28th, yielding 2½ tons of hay and 30 to 35 bushels of nuts per acre. Rainfall was below normal; temperature, normal. An army worm appeared on the vines about July 20th and worked about fifteen days, doing considerable damage. Of the three varieties planted the Spanish nut proved the best drouth resister. I use a ten-inch turning plow with the wing off in harvesting, window and haul to the barn as soon as sufficiently dry. The value of the hay is about $8.00 per ton and the nuts about $1.00 per bushel."

Mr. E. Schumm, of Runnels, Runnels county, Texas, says: "The Spanish peanuts were planted April 15th, on high table black land with some sand. Germinated April 30th. The peanuts stood the drouth very well. I am pleased with the success of this nut, and will plant a good acreage next year for hog pasturage. It is a wonder to me that peanuts have not been planted in this section long before this, as all the varieties succeed very well."

VELVET BEANS.

The velvet bean will make a large yield of green forage per acre in nearly all sections of Texas. Its natural season of growth from germination to maturity, however, is so long that it will not mature seed except in the southern and southwestern portions of the State. The value of the velvet bean as a soil restorer is appreciated by a great many Texas farmers, but as green or dry forage for his stock he is not ready to discard the ordinary cowpea. Pound for pound the common cowpea is worth more as a feed stuff, either green or dry, but acre for acre the two are practically equal. The velvet bean will make a larger yield per acre than the cowpea. Stock are not partial to the velvet bean at the beginning, but can be accustomed to it. In this immediate section the velvet bean has been planted from early spring to early summer, and so far has always made splendid vine growth, but in each instance frosts have prevented the maturing of the beans. They should be planted three and one-half to four feet apart each way, and cultivated two or three times, or as long as it can be done without injuring the vines. The same methods of curing are used as with the cowpea, requiring, however, a slightly longer period. The vines grow close to the ground, making it troublesome to cut with a mower. In rich soils the runners will extend in every direction, sometimes covering the ground one and one-half to two feet with a dense growth of vines and leaves. Plowed under, the vines will add much to the fertility of the soil. The vines are splendid climbers, and properly trained make excellent porch runners.

W. H. Jones, of Bremond, Robertson county, Texas, says: "Planted velvet beans March 31st on rich, sandy loam soil, in rows four feet apart. Germinated to good stand. Growth was very rank, but stock did not seem to care much for it as green feed."

Mr. A. T. Spillman, of Selfs, Fannin county, Texas, says: "The velvet bean capped the climax here. Its growth was wonderful, with a magnificent foliage and large bunches of beans."

Mr. H. C. Kyle, of Nursery, Victoria county, Texas, says: "The velvet beans were planted in my peach orchard, where the trees are planted twenty-five feet apart each way. The beans were planted with hoe four feet apart each way, one bean to the hill. The ground was in good condition, mellow and clear of weeds and grass. Planted April 22nd, they germinated to a perfect stand April 29th. For several weeks they made good growth, then insects began to destroy them by eating the plant down to the ground, until only one dozen plants remained. Cultivated the beans three times with double stock and six-inch shovels. We had heavy rains on May 4th, July 11th and September 20th, with drouths intervening. First blooms appeared October 1st. They made rather a small amount of vine, probably due to the drouth. A great quantity of beans were formed, but only a few matured before the frost of December 1st, which killed the vines. If the beans had been planted twenty days earlier they would have matured a full crop of seed."

Mr. E. Schumm, of Runnels, Runnels county, Texas, says: "The velvet bean was planted April 15th on high table land which was previously cropped in cotton. Germinated to good stand April 28th. Stood the drouth very well. After the first ten days some of the leaves turned black like they were frostbitten, but recovered. Made slow growth during first month, after which they rapidly increased in vigor. They made an immense growth of vines, which I intend to plow under. Two clusters of beans matured."

MILLET.

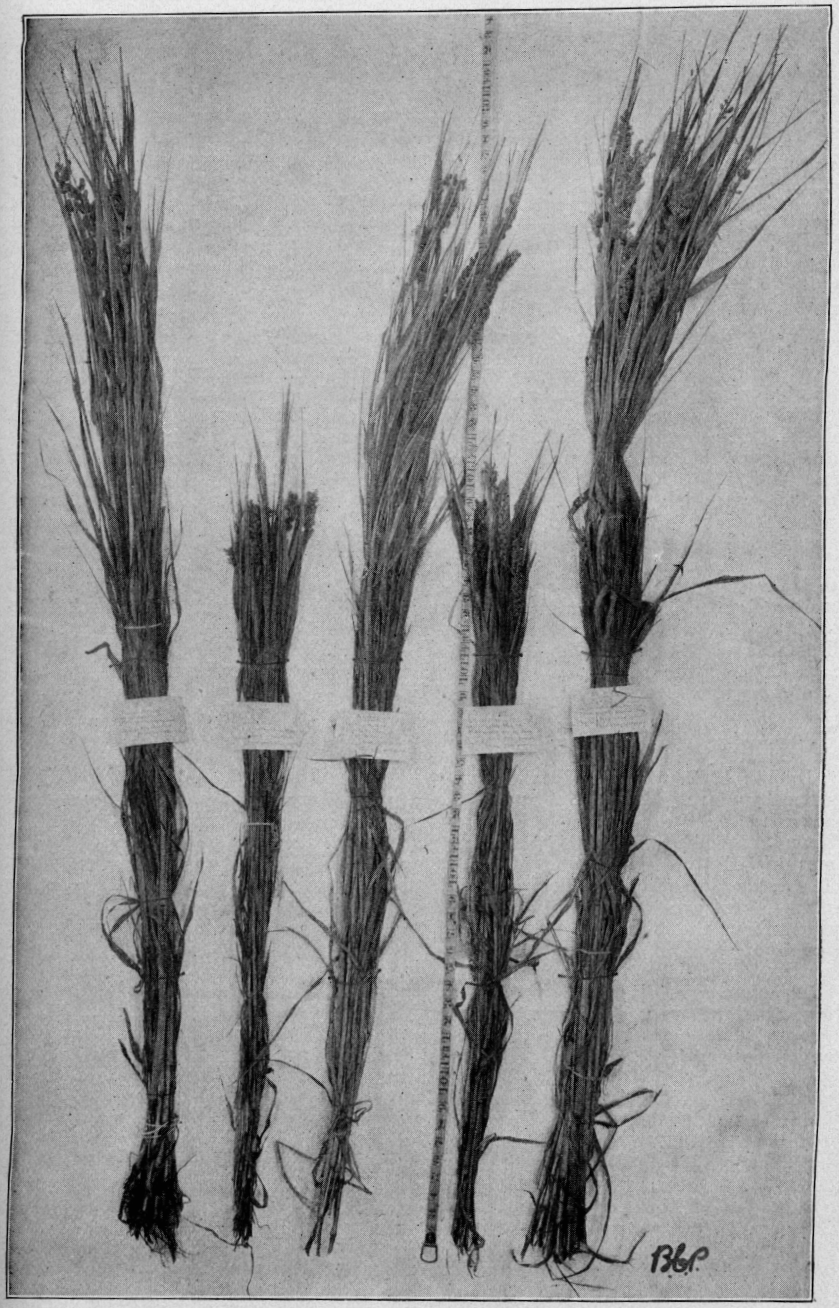
Of the two distinct types of millets, the foxtails and the cattails, the former is most generally grown because of the better quality of hay secured. To the foxtails belong the German, Common, Hungarian, Japanese and others, all of which make fair yields wherever corn can be profitably grown. Light soils are to be preferred, and the drainage should be good, as the millets are easily affected by cold and damp conditions. They should be planted after all danger of frost, either in drills or broadcast, preferably the former method. The usual methods of cultivating corn will answer for the millets. The German variety of the foxtails is the popular variety for heavy soils and the common for light soils in Texas. The cattail millets under favorable conditions make a much larger yield per acre than the foxtails, but where such conditions exist it is a problem to save the crop. Pencillaria, which has been so extensively advertised by seed men during the past year, is a cattail millet, botanically known as *Pennisetum spicatum*, or Pearl millet, Egyptian millet, Mand's Wonder Plant, etc. Opposite page 16 an illustration will be found which shows the growth of Pencillaria on the Station grounds.

Sample packages of millet seed were received by the Station from the United States Department of Agriculture, and the following numbers were planted in our grass garden May 17th (see illustrations opposite pages 14 and 18): Nos. 948, 949, 950, 951, and 952. All germinated to good stand by May 23rd. No. 948 was harvested September 4th, yielding, after heavy damage due to the English sparrow, at the rate of 1258 pounds seed and 8840 pounds dry forage per acre. No. 949 was harvested August 26th, yielding at the rate of 2722 pounds very clean, well-matured seed and 3708 pounds dry forage per acre. No. 950 was harvested August 20th, yielding at the rate of 2420 pounds very clean and well-matured seed and 2590 pounds dry forage per acre. No. 951 was harvested August 27th, yielding at the rate of 3536 pounds seed and 6122 pounds dry forage per acre. No. 952 was harvested September 4th, yielding at the rate of 1224 pounds clean seed and 7616 pounds dry forage per acre. The sparrows destroyed about one-half of this crop.

Mr. Herbert Taylor, of Monaville, Waller county, Texas, says about millet: "The seed sent me, which was imported from Russia, was planted May 27th, and germinated to good stand by June 5th. First bloom appeared August 9th; matured August 27th to September 10th; cut September 15th. It made a healthy and vigorous growth. Stalks about four feet high and of fine quality."

Mr. J. H. Bennett, of Henrietta, Clay county, Texas, says: "The Pearl millet sent me was planted April 20th and germinated to good stand. The growth was rapid. I cut the crop when it was about three feet high and before it bloomed. A few stalks were left to mature seed, but the grasshoppers practically destroyed them. Cut with corn knife July 16th. The millet was allowed to lie in small bunches until the next day. It was then bound in small bundles, set up in shock, and placed in barn July 18th. There was considerable attention required to prevent moulding in center of bundles. It stools enormously. Cattle are fond of it, but horses refused it for sorghum. First crop, which was cut July 16th, made a very satisfactory yield. The second crop, when about one and one-half feet high, began drying up and was immediately cut. The roots remained alive and continued putting out shoots until October. It proved more drouth resistant than Kaffir or sorghum, and especially so in putting out second growth."

Mr. Robert T. Jaynes, of Bibb, Comanche county, Texas, says: "I planted the Japanese barnyard millet April 10th on well-prepared sandy land. The season was below normal. It made a fine hay of good quality. My mules seemed to prefer it to oats. Yield one-half ton from one-half acre, which was cut June 25th. Value about $10 per ton."



No. 951 No. 950 No. 948 No. 949 No. 952

MILLETS.

(The heads were somewhat shattered before the photograph was taken.)

RAPE.

This plant which has proven of so much value to farmers and stock raisers in other States is comparatively unknown in Texas. It belongs to the same family of plants as the cabbage and turnip, and is botanically known as *Brassica napus.* Wherever potatoes, corn and turnips can be grown to advantage, rape can be depended on to make profitable returns. Soils rich in humus and the mineral elements of plant food will produce large yields of rape. Light sandy soils and stiff soils are not suited to its growth. Rape responds readily to applications of barnyard manure. Being a rank feeder, it should be planted in rotation with the legumes or crops of different feeding habits. It is distinctly a pasture and soiling crop and on fairly fertile soils can be depended on to yield from ten to twenty tons of green feed per acre. The general method of planting is in drills two to two and one-half feet apart and at the rate of two to three pounds of seed per acre. Cultivation should be frequent and shallow. Rape may be planted at any time from early spring to fall in Texas, which fact makes it valuable as a catch crop. The crop will be ready for pasturing in four to six weeks. Rape contains about 1.5 per cent protein, 8.1 per cent carbohydrates and 2 per cent. ether extract. A yield of 33,660 pounds per acre as made on our soil (not at all an unusual yield) would furnish 504.9 pounds of protein, 2,726 pounds of carbohydrates and 67.3 pounds of ether extract. The Iowa Experiment Station, in a series of experiments with hogs, demonstrated the fact that an average acre of rape is equal to 2,600 pounds mixed grain ration, and also that rape is exceedingly valuable as a preliminary feed to be followed by later pen feeding. Hogs pastured on rape should be confined to small spaces to prevent waste. Hogs should not be pastured solely on rape to begin with, but should be allowed to gradually accustom themselves to the feed. After once becoming used to rape they will eat it greedily. Sheep and cattle do well on rape, though the pasturing of cattle is attended with some danger of bloating. Judicious management of the herd will reduce this danger to a minimum.

The planting of March 20, 1901, germinated to good stand by April 1, making rapid growth until June 24th, at which time it was cut and weighed, making an estimate yield per acre of 25,689 pounds.

During 1902 we planted rape earlier—February 28th. It germinated to good stand by March 14th. This planting matured its crop by March 24th, and made an estimated yield of 33,660 pounds per acre.

On September 25, 1902, rape was planted in the Station grass gardens. It germinated to a good stand and grew vigorously throughout the entire winter. The coldest weather of our past winter seemed to have but little effect on the plants. Its growth was such as to afford grazing throughout the entire winter, until about the middle of March, at which time it was turned under to make way for other crops.

Mr. J. F. McCarthy, of Floydada, Floyd county, Texas, says: "Rape germinated a few days after the rain of June 3rd, withstood the drouth, and furnished an abundance of food relished by hogs, chickens and cattle. It withstood the drouth and cold until after Christmas, at which time cattle were turned in, and it was entirely devoured by them. I have ordered seed and will always plant rape, as last year demonstrated that it is a profitable crop for a stock farmer of the plains. I consider rape a splendid hog and chicken feed."

Mr. Isaac Grindstoff, of Peaster, Parker county, Texas, says: "Rape was planted April 29th on a piece of sandy soil which was previously cropped in sugar-cane. The soil was in poor condition. Germinated to good stand by June 5th. The very dry weather cut the yield short. During the early stages of its growth while there was good season in the soil the growth was rapid. Rainfall was below normal."

Mr. Robert Jaynes, of Bibb, Comanche county, Texas, says: "Rape was planted April 15th on well plowed and harrowed land. Germinated April 20th. It made fine pasture for hogs. Hogs should not be allowed to run on rape all the time. as it is easily tramped down. Will plant rape again next year."

Pencillaria zeaoides—Pennisetum spicatum—Maud's Wonder Plant—Pearl Millet.

Millets—Grown in Station Grass Garden.