

# SIXTH ANNUAL REPORT

—OF THE—

## Texas Agricultural Experiment Station

—FOR THE—

YEAR 1893.

*Agricultural and Mechanical College of Texas.*

POSTOFFICE,

COLLEGE STATION, BRAZOS CO, TEXAS.

All Bulletins from this Station are sent free to citizens of the State on application to  
J. H. CONNELL, DIRECTOR,  
P. O. College Station, Texas.



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# TEXAS AGRICULTURAL EXPERIMENT STATION.

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- J. H. FERGUSON,.....McKinney, Collin Co.
- J. W. PHILLIPS,.....Wichita Falls, Wichita Co.

\* Vice Geo. W. Curtis resigned June 30, 1893.

LETTER OF TRANSMITTAL.

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To His Excellency J. S. Hogg, Governor of Texas:

SIR:—I have the honor to transmit to you the Sixth Annual Report of the Texas Agricultural Experiment Station.

Very respectfully your obedient servant,

A. J. ROSE,

President of the Board of Control of Texas Agr'l. Exp't. Station.

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Hon. A. J. Rose, President of the Board of Control of the Texas Agricultural Experiment Station.

SIR:—I have the honor to submit the Sixth Annual Report of the Agricultural Experiment Station of Texas for the fiscal year ending June 30th, 1893 and including work under way to December 31st, 1893.

Very respectfully,

J. H. CONNELL,

Director of Station.

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## TEXAS AGRICULTURAL EXPERIMENT STATION.

## REPORT OF THE DIRECTOR.

On assuming the duties of Director of the Station in July last I found it impossible to begin new lines of work on the College Grounds in mid season and therefore that part of this report which covers the publications of bulletins relates to work planned by my predecessor, ably assisted by the members of the Station Staff. As soon as the fall rains made it possible to begin field work the seeding of small grains and grasses was begun promptly at this place and at others in the state.

The work of the Station for the past year was planned to cover a number of important lines; these have been pressed forward as rapidly as all conditions would allow, resulting in the publication of four bulletins, which were distributed to more than 6000 persons in this state. Letters received from many of these testified to the value of the work and encouraged the officers of the Station in the prosecution of their labors. The bulletins issued were the result of work which was done by the Agricultural, Chemical and Horticultural Departments upon the following subjects;

No. 26; "Cost of Cotton Production," by Agricultural department.

No. 27; "Steer Feeding," by Agricultural department.

No. 28; "Varieties of Sweet Potatoes," by Horticultural department.

No. 29; "Effect of Cotton Seed Meal on Fat," by Chemical department.

These publications speak for themselves upon each subject treated. A limited number of these are on hand for distribution. The mailing list has made a very pleasing gain within the past year necessitating the publication of one thousand more bulletins of each issue than were published for the preceding year.

In addition to the bulletins already noted several important contributions appear in this publication which are found in the Annual Report of the members of the Station Staff. Particular attention is asked to reports upon several interesting statements from the Horticultural department, to correspondence from the Chemical department, and to matter found below in my report, which has not been published before. Very much important work has been done for the state by the correspondence between the members of the Station Staff and the people; answering questions upon nearly all the subjects connected with the various farm interests of the state. This work is of so much importance in a new state that I think it is well worth the space it is given in the reproduction of a small part of it in this report. (See Reports of Departments.) The

number of subjects discussed with questions and answers is so great that an index is supplied at the end of this report to aid in the location of its subject matter. This index covers all important topics touched on in this report.

During the past few months it has been the privilege of some members of the Station Staff to meet with the people in public conventions and assist in discussion of questions of interest to all. Such conventions and farmer's institutes in the state should be increased in number and so opportunity would be allowed the people of the state to come in direct contact with the workers of the Station and the results would be manifest in the increased usefulness of the Station to those for whom it was established. Such meetings will tend to a better understanding of the needs of the people by the Station Staff and so increase the value of our work in the end. These institutes are now being conducted with the very best results in a number of other states, and in Texas where new conditions prevail it seems all the more necessary that we should have a free expression of opinion and experience among the farmers themselves for the instruction of all concerned.

#### SUB-STATIONS.

The Twenty-third Legislature provided the means necessary to conduct valuable experiments upon three of the soil sections of the state that could not be covered by the work done at this point. The great size of our territory, the variety of soil and climate afforded, call for a large amount of work to be done on each of these geological sections and its accompanying climatic conditions. The character of this work should be to test the adaptability of the several crops, and the variety of each, best suited to the natural conditions of that soil section. Other work is needed to be done with cotton, corn, small grains, grasses and other forage plants. Many of the well known varieties of the East and North are known to fail frequently under our peculiar conditions, and it is highly probable that many of the varieties now in general use in the state can be changed with advantage. Other questions arise relating to fertilizing and irrigation that are of the utmost importance in different sections of the state.

To indicate the character of the work now being done at the Sub-Stations that have been located I have had published in several of the papers of the state that 300 varieties of wheat are now under trial near McKinney in Collin county, and the same varieties are being tested at Wichita Falls, in Wichita county. As a repetition of the test these wheats have also been planted on the College grounds with the special intention of studying the individual qualities of each variety. At McKinney, Wichita Falls and here on the College grounds, forty varieties of forage plants and small grains were planted during the fall including oats, barley, rye, grasses and clovers. Some of these varieties it is expected will not survive the freezes but were planted to test the effect of climate upon them as well as for other purposes. All that may be killed will be replanted at the proper time in spring or summer. All known practical methods of increasing the yield of wheat by manures will be tested at both of the Sub-

Stations. This work is now in progress and we have completed the plans for other work at the Sub-Stations for the coming year, which will consist of a test of some seventy varieties of corn at both places and a large number of varieties of cotton at the Black Land Station. We have under way tests of different methods of cultivation and kinds of fertilizers for corn and cotton. Published results from this work cannot be expected until the coming fall season.

#### OTHER WORK NEEDED.

In some parts of the extreme Western prairies the conditions are unfavorable for the growth of the ordinary Texas crops of corn and cotton. Here the rainfall rarely averages more than 12 or 18 inches per annum and is precipitated in the greater part of this territory during the winter season. The altitude of this section above sea level is so great that the number of farm crops that will thrive upon these lands is of necessity limited. I have no doubt, however, that proper tests would develop a number of hardy cereals and forage plants with some garden crops and fruits, which would prove well suited to all of the present conditions.

Water, for irrigation purposes, can in many instances be had at moderate depth and where this is supplied in abundance through the dry summer months no other difficulty will be experienced. In many other states where such conditions as these prevail water is being raised in quantity from a depth of 50 to 150 feet by the use of wind mills. Without going to the expense of even this cheap equipment much can be done if rightly tried to improve the yield upon these high lands by the judicious selection of crops that make their growth early in the spring when the natural water supply is available. Some pressure is being brought to bear upon the Station officers for experiments conducted under irrigation conditions and there is no question of the wise expenditure of any money which would go for this purpose.

The more Eastern portions of the state are deeply interested in the commercial fertilizers, restorative crops and manures to which their lands respond very freely. Their wants are very natural under the conditions and at the earliest possible moment should be supplied. This is one of the older sections of the state and should not be neglected.

The Horticultural interests of the state have grown to such enormous proportions within the past ten years by the successful production of vegetables, large and small fruits and semi-tropical plants, that every effort should be made at an early day to establish a permanent horticultural Sub-Station upon ground which will be controlled entirely by the Board of Directors for experiments conducted in the behalf of this interest. A committee to put this work upon foot has been appointed and will very soon I hope have this sub-station in a growing condition. A number of years will be required to get full results in this line but much can be expected in a comparatively brief period.

It is to be hoped that with our present opportunities, and with the great need of the people for information standing before us, that no obstacle will be allowed to interfere with the work of the officers of the Station in the several lines to which each is devoting himself. Our facilities

appear to be ample for all work begun and much valuable work is being attempted which will find its way to the people within the next few months.

I am, very respectfully yours,

J. H. CONNELL, Director.

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### GRASS-HOPPERS IN CENTRAL TEXAS.

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In July of last summer I received several letters from parties in McLennan, Bosque, Hill and other central counties of the state giving accounts of destructive work of grass-hoppers in parts of those counties. These letters were answered, advising the use of certain poisons to kill the hoppers, since they were described as the local varieties of those neighborhoods which had multiplied to such number as to become pests. The remedies recommended were tried in a few cases, and the results were not altogether satisfactory. I then visited one of the sections most seriously attacked to use the remedies suggested and try other methods to protect vegetation.

There were no "Rocky Mountain" or "Kansas" grass-hoppers found in this section but as had been stated by letters the local varieties had increased to troublesome extent. Attacks were made on the crops of certain parts of the county and appeared to be most severe upon those fields which touched large pastures—and especially so when these pastures were grown up in mesquite timber. This was due to the fact that hoppers are partial to hard sod and gravel soil in which to lay their eggs. Such land is better drained near the surface and hard ground is helpful to the female in depositing her eggs.

On investigation I found that the damage had not been exaggerated. On one farm of 450 acres in cotton there were 220 acres entirely destroyed. A much larger proportion was destroyed on some of the smaller farms. In one case a party owning seventy acres in cotton had all but three acres destroyed, while some farms in their immediate neighborhood were not attacked at all by the hopper. Some lost both corn and cotton crops entirely and many whole orchards were killed soon after being attacked. The burning of sulphur or tar, and driving had only a temporary effect.

In most cases the corn was first attacked and all the young ears destroyed and blades eaten clean, then adjacent cotton was devoured. As a rule no sign of this crop was left above ground when seriously attacked although it was often waist high and loaded with bolls. In eating they advanced as an army, making their way into a crop on one side and passing over it in a few hours or days, depending upon the area to be eaten. During the early morning and late in the evening the hoppers were busy at their work of destruction; while in the heat of the day they shaded themselves under leaves and grass. Their method of attack in the form of an advancing wave, permits the successful use of poisons to check their advance upon a crop. Orchards of young and old trees are



quickly destroyed by them, the fruit being first eaten and then the leaves and bark until the trees are completely killed. We practiced several *methods of successful treatment* found in the following applications: Paris Green applied dry to the cotton at the rate of 4 pounds per acre with a "Roach cotton worm destroying machine;" London Purple applied at the same rate in the same manner; White arsenic mixed with flour, one part of arsenic to two parts of flour, applied in the same manner; London Purple and flour mixed and applied as above; Calomel and flour mixed and applied in the same manner; sulphur and lime, in strong solution was sprayed on the crop in sufficient quantities to whiten the leaves; a strong solution of salt petre and a solution Barbadoes aloes, and solution of strychnine were all applied under favorable conditions. These were used in an effort to protect cotton either by rendering the leaf distasteful to the hopper or by poisoning their food. Besides this, applications were made of wheat bran, arsenic and sugar, placing this material where it would be eaten by the pest. This poison gave us the most satisfactory results in the protection of cotton. It was formed by mixing 6 pounds of wheatbran, one pound of white arsenic and one pound of sugar into a dough. This was applied just ahead of the advancing army of hoppers, placing a tablespoonful of the dough upon the ground every 6 or 10 feet, and again behind this dropping another row of the poisoned dough.

Where salt petre, sulphur and lime, and barbadoes aloes were used the hoppers ceased to eat and soon left the crops. Where dry arsenic was applied large numbers of the hoppers were destroyed but upon the whole this method did not prove so satisfactory as did the arsenic when mixed with a sweetened dough. We worked with an orchard which was being severely attacked and found that for *all orchard trees* kerosene emulsion of the following composition could be relied upon to drive the hoppers off and keep them away indefinitely. We used one pound soap, one pound of kerosene oil and twelve pounds of water in emulsion sprayed on trees in quantity. The application killed none of the pests, though they were often drenched in it, but in a few hours all would quit the trees and would not return to them for days. No bad effects were noticed from the application of the emulsion and its action in every way was satisfactory. We were invited over to conduct this test by Mr. G. L. Stone and he reported some weeks later upon the final results of the effects of poisons, etc. upon the hoppers. All that he says in the letter found below was clearly promised before I left the grounds. His letter is as follows:

"August 1st, 1893, will say relative to your test made on Mr. Linn's farm that the wheat bran, sugar and arsenic was a fine success. The application of dry arsenic on the cotton was only a partial success. I think it would have been more successful had there been dew on the cotton when applied. Paris Green, London Purple and Calomel proved a failure.

The spraying of those fruit trees with kerosene emulsion was a grand success, and where the barbadoes aloes mixture was applied on the peavines hoppers quit eating them; also where you sprayed the cotton with the sulphur and lime mixture the hoppers quit eating.

When I applied the strychnine the results were about the same as with dry arsenic. The hoppers have now about quit the crop. There are some few young ones but none of any consequence.

Some complaints have been made in the state papers against the use of arsenic in this manner to destroy the hoppers and rid the farm of the plague because poultry, birds, rabbits, and dogs were in some cases killed

after eating the dough which was put out as above described. Too much care cannot be exercised in the application of such deadly poisons, but with care no loss need result to poultry or other domestic animals. The killing of some birds, rabbits, etc. is unavoidable under the circumstances.

#### OTHER METHODS FOR PROTECTION.

In some cases parties whose crops were attacked planted cotton seed and other crops on the turn-rows to supply the pests with green food and so protect the main crop. This did not do any good in any of the cases that were reported to me. Others tried the burning off of pasture lands during the heat of the day that adjoined the fields, when the hoppers were shaded in the grass from the sun. In some cases this proved a very efficient remedy.

Whenever the attack from these pests approaches in severity, that of the Rocky Mountain locust or Kansas hopper, poisoning cannot be relied upon because of the numbers in the attacking army. Young trees under these circumstances are sometimes protected by wrapping with heavy paper for a few days until the pests have gone. Another method is to use the "hopperdozer" to trap quantities of the insects. This machine consists of a slide, driven in *front* of horses, which has extended wings on both sides covering a space of 15 or 20 feet front. These wings are covered by canvass and are sometimes three feet high. As these are driven over the ground upon which the hoppers have recently hatched the young hopper flies up before the machine and is knocked down by the canvas wing on a table or leaf and from there it is swept back into a sack to be killed.

Plowing the hatching ground in fall or winter is practiced in those states only in which the ravages of this insect are expected to occur annually. It is only in rare cases that trouble from the hopper is experienced in Texas. The pest of the past summer was due to mild winters which brought little rain and allowed all of the eggs deposited by the local species of hoppers, to hatch and grow. The past few winters have been remarkably mild ones. I am pleased to note that the present winter promises to put an end to the ravages of this pest for some years to come in the state. The past fall was so late and mild that eggs deposited during the summer were hatched by the encouraging weather and and it seems probable the recent freezes have almost entirely destroyed this crop. A recent letter from the neighborhood is here given as testimony:

"January 27th, 1894. The freezes of the past week has been a great blessing to the farmers of this state. It has killed millions of young grass-hoppers that have hatched before the freeze. On Harris Creek where the hopper was so bad last year they had hatched out in great numbers and if it had remained warm awhile longer they would have commenced their work of destruction but the freeze killed them out."

G. L. STONE.

It is very probable that the inefected section will not be troubled again with the pest but the same difficulties may occur in other portions of the state due to the same local causes which have already been discussed. In fact, any part of the United States is liable to suffer from an over pro-

duction of the local grass-hoppers, as is shown in their appearance in several of the Eastern States during recent years, where they inflicted as much damage as they have ever done in this state. I note that they occurred in Ohio in the summer of 1876 and again in Texas in the summer of 1888. In case they at any time in the future make their appearance in this state the records of facts which is here given will possibly prove of some value in protecting the farm interests which may be threatened.

J. H. CONNELL, Director.

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## GENERAL CORRESPONDENCE.

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### LIVE STOCK.

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#### FEEDING, SILOS, GRASS, ETC.

KIRKLAND, TEXAS.

Kindly tell me something as to your experience in dehorning cattle there—do you dehorn them at any age? If so how will it do to simply saw the horns off from cattle and if so how close to the head? How about dehorning milch cows? Will they be sick and if so how long? Also is there not an acid that could be used on young calves and if so what is it and how should it be used? Any information will be valued.

P. W. H.

We dehorn whenever we get ready to feed. We take up all of our cattle that we are going to feed for beef and pass them, in succession, one at a time through our dehorning chute. The neck and head are fastened immovably by a simple device and the horns are sawed off close to the head, even taking a little skin with them; using a butcher's saw. They will bleed some of course, but that does not seem to injure them any, and they rarely ever lose their appetites from the effects. We do not dehorn our dairy stock unless we get hold of a quarrelsome or vicious animal in which case she is dehorned. There are several kinds of so called chemical dehorners made, most of them are mainly potash. Ordinary stick potash thoroughly rubbed over the button in the young calf will prevent the horn growing for all time. You must be careful that you do not get it on your fingers, and you will need a little practice to tell when you have just the right amount to take off the button without injuring the calf.

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MARTIN SPRINGS, GRAYSON COUNTY, TEXAS.

Will you kindly settle for me a question in stock raising to wit: I have a fine registered Holstein cow which brought twin calves, a heifer and a bull. Now I have often heard and seen it stated in Agricultural papers that twin calves of different sex would not breed but are called freemartins. I would be pleased for you to decide this for me if there is anything in this, or, if it is an old fogy notion, as I can see no reason why this should be the case, I would like to keep mine for brood animals. H. T.

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FOOT NOTE:—All letters in this correspondence signed with three stars were written by Geo. W. Curtis.

It is a common idea that "Free-Martins", that is, all female twins when male and female are dropped at birth with cattle, will not breed. There are however a number of instances on record where such animals have bred very satisfactory. I have personally known of four or five cases which bred safely. They do not always breed, however, so that you run some chances and would not advise you to buy until such animal had proven a breeder. There has never been any complaint about a bull in such twin births, and you will have no trouble in case of the male.

\* \* \*

KYLE, TEXAS.

I would like to get any information you may have on the results of feeding ensilage and cotton seed meal. I am connected with the Kyle Cotton Oil Mills and contemplate building a silo 20x30x100 feet, which will hold about 1350 tons and feed 500 beeves 100 days. Dr. W. A. Oatman, Bastrop County, has the first silo in that section and feeds cattle on ensilage and cotton seed and is pleased with it. After ten years trial he first dug 16x20x100 under ground. It caved in and he has since built above ground and feeds from 525 to 400 steers each season.

D. M. C.

We send you today under separate cover our numbers, 6, 10, 11, 14 and 21, which give results of our feeding cotton seed and cotton seed meal with and without ensilage. If you are thinking of building a silo it might pay you to come down and see ours before you build.

\* \* \*

#### SILO.

[This correspondence appeared in Texas Farmer of Dallas, 12-21.92.]

If a round silo is best why not make one on the ground, wall it, cement it, and make it water proof? If one is best on top of the ground I hope some one will tell us how to build it from beginning to end, and how to prepare the corn; how to close the silo after it is filled, and how to open it to get ensilage out without letting in too much air.

P. R. R.

First, no one now attempts to build a silo under ground. It is altogether too expensive and too inconvenient, to say nothing of the usually greater loss by spoiling. It may be built wholly above ground, or mainly so with slight excavations.

The depth of the silo should not be less than 10 feet, better 18 or 20; the sets of outside horizontal timbers and consequent size of silo must be regulated by the number of cattle to be fed and the length and strength of timbers convenient to be used.

As a rule a cubic foot per day of good ensilage is all a good sized cow will eat. Very large cattle, with good appetites, will eat much more, but a cubic foot per day is more than an average quantity for each cow. In this country silage can be fed all winter with profit and even in the spring; so that 90 days is the shortest limit which can be counted on for steady feeding of ensilage to a dairy herd. A silo eighteen feet deep, fourteen feet long and ten feet wide, inside measurement, if filled to within two feet of the top when well settled, will feed twenty-five cows ninety days and will probably be found about the most convenient size, which an ordinary dairy farmer, with fifteen to twenty-five head of cows, can have.

It must be understood at the start that the silo must be under roof cover of some sort. A most convenient way being to place it in one end of the barn, and excavate to sufficient depth to give the required depth of silo. If your barn has sixteen foot posts excavate two feet, making it eighteen feet deep. If it has fourteen foot posts excavate four feet. I would not advise an excavation of more than four feet in clear, as it will be inconvenient to use out of at the last.

Bear in mind also that the cover to the silo is not for the purpose of making it air tight, as some people suppose, but simply to keep out the rain and sun. Supposing that excavation has been made of the required size, it should be walled up all around with a single brick wall eight inches thick, not as a basal support to the frame work, but to hold lower pressure, inward when empty outward when filled. The bottom of the excavation should be covered with a layer of brick bats and grouted with water cement. Around the base of the entire wall, on the outside should be laid a line of drain tile, having an outlet at the lowest corner to prevent the ground water continuously seeping into the silo. Of course the less the excavation, the less the necessity for this outside drainage and the less the cost for the brick wall. The brick bat floor grouted in water cement, will be a necessity, whether placed entirely above ground or with excavation, as stated.

The outer frame work of the silo above ground consists of sets of 2x8 rough lumber laid flat wise, edges to the silo, placing two pieces on each of the longer sides, and only one piece on each of the shorter sides bolted together with two bolts at each of the four corners. These sets of braces or outer frame work should be placed about three feet apart from the bottom to the top of the silo, beginning with one set right on top of the brick wall and so on until the top is reached. They are held in place by vertical supports, placed at the corners, and at intervals midway, according to the length of the timber, and the whole frame work is held plumb or vertical by strips nailed on the outside diagonally. Any carpenter will understand how to keep these sets of braces in place, and keep the lining well plumb.

The lining or wall of silo is made of 1x10 boxing surfaced on side placed vertically to inside to each set of horizontal braces. The dressed side is placed inward, and is covered with a painting of hot coal tar to prevent insect work and consequent destruction of the lumber. Over this is placed a complete lining, tacked on loosely to hold it in place, of tarred building paper, covering the entire wall of the silo. After the building paper is on, finish with a second lining of 1x10 boxing dressed on one side, which is placed inward and afterward painted with hot coal tar, placing the boards vertically so as to break joints with the first layer. It will thus be seen that we have for the wall of the silo two layers of 1x10 plank placed vertically, with tarred building paper, between the last layers, breaking joints with the first. The pressure applied from within, outward, will thus force the two layers of plank tightly against each other, and this pressure on the building paper make a vertical air tight wall. The bottoms of the boards should be butted squarely down to the grouted floor, just inside of the brick wall, and a little soft cement

should be forced up against the lower end, neatly to make a water tight as well as an air tight joint.

Let it always be remembered that the top of the silo has no lid or other cover to prevent access of air: only the roof which may be ten feet or more above the top of the silo, simply to prevent access of water from rain. It might be supposed that the only way to get into the silo was to climb over the top, and when it is filled it is, indeed, the only way; but as the ensilage is used down from the top, it becomes a question of convenience to have a means of ingress about on a level with the surface of the silage. To accomplish this, three planks, in each layer, are left out in the lining of the wall of silo on the end most convenient to the feeding place, and these planks are put together exactly as described for the wall of the silo, in two layers, with building paper between, except that they are not nailed to the outer frame work, and are cut in sections of a length exactly reaching from one set to the next above it or about three feet to each section. The ends of the planks are so cut as to lay over and under and thus with the building paper, which is allowed to project, make an air tight joint, and the same is true of the sides, the outer layer of planks being left exposed for about two inches on each side of the opening, and the inner layer of the door sections projecting to exactly fit and cover the margins thus left. The bottom section is of course put in first and as the silo is filled to a level with its top, the second section is put in and so on until the silo is completely filled. The green corn or sorghum or other material used for ensilage is run through a feed cutter and cut into pieces about one and one quarter to one and one-half inches long and carried over the top into the silo by a carrier, similar to that used for carrying straw with threshing machines. All feed cutters are provided with a carrier of this sort at a small additional expense. As the cut material falls into the silo it should be carefully spread and kept level, and the edges and corners should be thoroughly tramped. The cut fodder falling into the center of the silo will pack the center sufficiently without any assistance. The corners of the silo should not be square, there being a 1x5 or 1x6 strip placed edgewise in the corner for a brace, and supporting an offset in the silo wall, made by 1x10 boxing, double with paper and tin between, placed at 45 degrees across each corner. The joints at the corners should each have a strip of tin from top to bottom in addition to the building paper, placed between the two layers of plank, as it is impossible to make a tight corner joint in any other way. If the corners were left square there would be more friction in settling of the silage, and as a result it would not settle well in the corners, and more ensilage will be lost by spoiling.

Corn makes the best ensilage, and next to this is sorgum. The stage at which the corn is cut is one of the secrets of having good ensilage. Let the corn stand in the field until the ears get fairly well hardened, the later the better, provided the outer husks of the ear and the stalks and upper leaves are still green. The lower may even be dried up and the inner husks will doubtless be perfectly white but if the outer husks of the ear are still green and fresh and the stalks and upper leaves are also green you will have best results from cuttings in the field, carrying im-

mediately to the cutter and running at once through the machine and into the silo. If cut greener than this there will be more water contents, and it may be necessary to allow the corn to wilt somewhat, to get rid of the surplus moisture before cutting and putting into the silo.

Corn cut down in the morning may be hauled to the cutter and run into the silo in the afternoon. That cut down in the afternoon can be hauled and run into the silo the next day. If put in when too wet or green, excess of water will produce too much fermentation and what is known as sour ensilage, will result; sometimes so much acid and fermentation appearing as to spoil the ensilage. In case of the other extreme, that is, in allowing the corn to get too ripe and dry before putting into the pit, the fodder will be too hard and light in itself to settle well, and as a result air will enter and dry rot or "fire fanging" may result, often spoiling from one-fifth to practically all of the ensilage.

The middle ground of safety is not difficult to find, and the error had better be on cutting a little bit too dry than much too wet. Ensilage put in at the proper stage produces sweet ensilage, also called "Brown ensilage" which has a vinous smell and taste, and is of a brownish green color. This kind of silage is most relished by cattle, and we have found of most value in feeding. It is not necessary that the silo be filled continuously. It may be filled six or eight feet deep and allowed to settle a couple of days or even three or four days, and then another six feet and so on until filled. With a small cutter and ordinary farm force it will probably be best to fill continuously after starting. Not more than ten days actual time should be consumed in filling a silo of the dimensions above given. No weight should be placed on top after final filling. It is a very common belief that some weight is necessary to make the mass settle; but if proper care is taken in the corn at the right stage of ripeness it will settle sufficiently by its own weight. It is always well to place a layer of cut straw or hay on top of the mass for the reason that it will preserve just that much more ensilage. The access of air on top generally spoils the silage to a depth of a foot to sixteen inches, and the layer of cut straw or hay on top may reduce this to only five or six inches.

After putting in, the mass of course gets very hot, so hot indeed that one would hardly like to hold his hands in the center of the pit if it were possible to get at the center. This heat is the necessary result of the fermenting process which it has to undergo at first, until the air contained within the mass is entirely exhausted. The product of decomposition is Carbonic acid gas and this being heavier than air will occupy the inner spaces of the ensilage mass preventing access of air from above, and there being no further air to use decay ceases and the ensilage is then preserved for an indefinite period. The heat will gradually diminish but even at six or seven months from filling the ensilage will be yet warm as removed. In using out, the silage, as already mentioned should be taken from the upper surface, and not from the sides, by undermining. The reason for this is obvious. Air must not be permitted to replace the Carbonic acid gas, which being heavier always sinks.

Ensilage should not be fed as an exclusive food, and cows should always have a little hay as well as wheat bran, cotton seed or other

ground stuff. Bran and cotton seed meal make about the best bye-fodder to use with ensilage in the dairy.

In the construction be sure that nothing but sound, all heart lumber is used. Sappy boards will rot out in one or two years. Another point of special importance is in placing the boards in lining silo. Most carpenters will attempt to place the edges close together, but a little thought will convince one that such a proceeding would be disastrous. The parts being dry when put on will absorb moisture and expand quite materially from the effect of the heat and the moisture of the silo. As a result, if placed too close together, they will soon warp and spring out of place and thus make crevices through which the air can enter and destroy the silage. The edges of the boxing should not be placed closer together than one-fourth to one-half inch, and carpenters should be instructed to follow this point exactly. The cost of a silo of the size named exclusive of roof, will be about \$140.00 to \$150.00. More if the excavation is deep; less if shallow.

A round silo is thought by some to be superior to the form described above but in practical use has not proven so satisfactory with a majority of feeders.

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PRAIRIE LEA, Caldwell County, Texas.

I send you a sample of our silage by express. For the last two years it has been nearly a complete failure. In 1891 we used cane to fill our silo and in 1892 corn. Our silage in 1891 was worse in the center and at the bottom than near the sides. It was black, wet, rotten looking stuff and had a sour taste. The cows ate it but not with a relish. I thought that we filled them too fast in 1891 and that it did not heat sufficiently. In 1892 we gave it plenty of time to heat up but had no better results. In 1892 we covered our corn over with about a foot of cut cane. In filling we kept our man in the silo, leveling and tramping around the edges. Our silos are built in the barn and our sills are about eight inches from the ground. We have a shed all around the barn. When we put in the silos we nailed a twelve inch board on the bottom of the sills and we banked the earth from the center of the silo around the walls about eight inches high. Our silos are 19x24 feet and 16 feet deep. The walls have two layers of twelve inch boards with tarred paper between. We used no weight on silo. Do you think we need concrete floors and weights on silage? We had a considerable that was mouldy around the walls. Any information that you can give me that would lead to better results will be very much appreciated. Also tell me if you think that I could use Preservaline in my cream in summer time and not churn on Sundays? Is the Preservaline harmless?

A. R. H.

I send you by mail a small package of sorghum ensilage taken from the pit we are now using. It is not as good now as when first taken out of pit but it is still pretty fair and it will give you an idea how sorghum ensilage ought to look. The trouble with your silage is that there is not any cement bottom to your pit and the juice of the sorghum leaks out and leaves it so dry as to spoil. By all means put in a cement bottom. Write Texas Farmer, Dallas, Texas, for late issue containing my article on silos.

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FARMERSVILLE, TEXAS.

I want to make some inquiries about "Alfalfa." The land to be sown is the ordinary black land in a very good state of cultivation in corn last year and now in wheat with a fair stand. W. P. B.

If your wheat is not too thick on the ground it is very probable that



you can get a tolerably fair stand of Alfalfa by sowing in the wheat as early as possible to avoid danger from frost.

There have been no direct experiments tried, at least in my knowledge, but I see no reason why the experiment should not succeed. Be careful and get good seed to start with. Seed over one year old is very unreliable and I would suggest a little heavier sowing than ordinary; say 35 pounds per acre. It will probably damage the wheat some to sow in as you suggest, but I think the damage will be more in appearance than effect.

On land naturally sub-irrigated within four or five feet of the surface, alfalfa will do very nicely with very little rainfall. It sends its roots very deep and when water is furnished at the depth mentioned it will thrive through the hardest drouth.

By surface scratching and top dressing, alfalfa will do well six or seven years in succession, but if allowed to sod-bind four or five years will be the outside limit.

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## THORNTON, TEXAS.

I have a small plot of sod land adjacent to my cowpen that I thought of planting in Lucerne or alfalfa. Will it grow on black land as a first crop? What time ought it be planted and how should it be put in? Will it stand a drouth as well as cotton? I write to you because I supposed the station has had some experience with this plant. \* \* \*

Alfalfa will do on any well drained rich land, where it can get moisture. When once well set it stands moisture remarkably well. It is subject to exactly the same trouble that produces cotton blight or root rot, dying in spots. \* \* . (See our No. 22 Bulletin, sent under separate cover herewith.) It requires about 25 to 30 pounds seed per acre broadcast, and the land should be finely prepared beforehand. Sow either in fall or spring.

\* \* \*

## HICO, TEXAS.

Mr. Fisher gave me your name as a man who could inform me when to sow alfalfa seed and how much per acre, and how deep it should be planted. Please give me some information. And if you have some reports that you have published about the culture of other seeds and the soil best adapted. \* \*

You will have better satisfaction, I think, to sow alfalfa in the spring, unless you should happen to have an unusually severe summer drouth, in which case it would probably be better to sow in the fall. For fall, the earlier the better, September the best month. If in the spring sow as soon as the danger of frost is over. Sow 25 pounds to the acre. Unless the land is finely prepared 30 pounds would be better. Cover as shallow as possible, simply brushing in, and if the land is fairly dry run over with a roller.

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## LOGAN, UTAH.

You kindly sent me a grass called "Colorado Bottom Grass." I do not have at hand a description of it, please inform me who the producer was, its technical name, and if you have it, its composition. Also state its general character, whether good hay or good grazing crop, and the general region of its growth, etc. J. W.

The Colorado Bottom grass is the *Panicum-texanum* of botanists, and its name indicates, a native of the state. It is an annual, growing in all of the rich bottom lands, and is especially abundant in the bottoms of the Colorado river basin, from which it gets its local name. We have not its analysis at hand, nor do I at present know where you can obtain it. It is of considerable economic importance, producing "volunteer" hay crop in much the same manner as crab grass does in other localities. The hay for practical feeding seems to be of fully equal value with millet.

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 EULOGY, BOSQUE CO., TEXAS.

I find Johnson grass is making serious inroads on the farm portion of this magnificent property, and have you ever found a remedy either for its destruction or arrest of its spreading? It occurs to me the proper department of your great school could do no greater service to Texas than to address itself to a thorough investigation of this important subject. I beg to assure you from my limited experience with this grass, there is but little of greater moment to the agricultural interests of many counties of the state than the growing danger of this pest. Have you anything to suggest, and if so, what is it? Can you place me in correspondence with anyone for light upon this subject? It occurs to me the A. & M. would be the proper source to apply for intelligent information.

C. S. M.

The eradication of Johnson grass we have been working on for the last five or six years, and in course of another year we will have something on it to publish. I may say in brief for your benefit that the most satisfactory way is to keep the land in cotton, and thoroughly cultivate it so no Johnson grass can seed. Two years of this with constant using of the hoe will kill out from 75 to 90 per cent. of the grass. The scattering bunches you can then kill by liberal use of any substance poisonous to plant growth, such as salt and kerosene, chloride of lime and of bleaching powder, etc. We use salt with kerosene sometimes and sometimes without kerosene. It takes a large quantity, to make the ground thoroughly white, and it must be applied when the roots are just sprouting out in the spring—not more than six or eight inches high. Arsenical solution will also kill the grass but as it is poisonous to stock I consider it dangerous to use. Of course you will understand that it is much more difficult to kill on rich land than on poor land. The same methods of procedure will apply in both cases, rich land simply taking more care and steadier application.

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 WACO, TEXAS,

We should like very much to get your bulletins that may bear upon the feeding of cotton seed hulls and meal to milch cows. I have been feeding my cows hulls bran and cotton seed meal with some crushed corn and straw but they are not giving the milk that they should, although in splendid condition. Can you make any suggestions. If so I would very much appreciate them. I think they need an entire change. I took them off the meal and gave them oats instead but they did not seem to do any good. do you think hay would be better than the hulls? I am now feeding four pounds cotton seed meal, six pounds bran and six pounds corn meal, fifteen to twenty pounds of hulls to each cow per day and four or five pounds of oat straw. They prefer it wet. Do you think it is any better for them that way? Would boiled corn be any improvement? They seem to eat with relish. I should perhaps add that they have plenty of good fresh water, warm comfortable stables and I salted the feed part of the time.

\* \* \*

I take pleasure in recommending that you change the feed of your cows so that cotton seed meal will form one half of the grain ration, say five pounds to each head per day, and add five pounds by giving wheat bran and corn meal, equal parts of each. Omit feeding hulls entirely now for best results, as they are more heating and fattening than anything you can now feed. The change to oats was in the right direction, but the cotton seed meal should not have been decreased as much as you probably cut off. The hay is decidedly better than hulls for milch cows. The oat straw is very heating, and if you wish to reduce the condition of your cows somewhat you may leave that entirely out.

Do not feed any of your grain wet. It is not so well digested as when fed dry, and they will eat all of the grain dry that they can possibly digest. Boiled corn would add nothing to your cows at present.

To give a little variety to the ration here recommended I would suggest a little crushed oats., say two pounds per day to be used every third week with the herd.

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WACO, TEXAS,

I wish to thank you for your early reply of December 20th. I acted on your suggestion and found my cows improved very much when I put them on sorghum hay especially. I am now making arrangements for a carload of alfalfa, and as I see by the United States' bulletin that it contains a large amount of protein and to a certain extent does away with the necessity of using bran and cotton seed meal but requires corn and straw to make an economical ration. I should be very glad to have some fuller advise from you, if not asking too much. Do you think it would be advisable to feed it alone to my fatted cows now giving a limited amount of milk, and if not do you think hulls could be used in place of straw?

Please give me best formula for greatest amount of milk for fresh cows using hulls, alfalfa and cotton seed meal as the principal ingredient? Any further suggestion you may see fit to give will be thankfully received. I dislike to ask too much, but I am satisfied had I written to you several months ago I should not have only saved considerable expense but cows that are now nearly dry would be giving me nice returns. I suspicioned that the trouble was due to hulls but my neighbor said not. J. D. F.

Replying to your question as to the use of alfalfa, cotton seed hulls and meal, bran, etc. I suggest that at the price you probably paid for alfalfa hay it is more expensive than any other forage that you can buy. We, here, cannot lay down alfalfa for less than \$17.50 per ton, in the early fall season, when prairie hay sells at \$9.08, Timothy at \$14.00, cotton seed hulls at \$3.00 and \$4.00. Without knowing the actual cost of these materials with you I cannot give absolute advice.

For milk cows intended for beef you will do well to substitute cotton seed hulls instead of straw, as it will prove cheaper. At the figures we purchased the feed stuffs mentioned (hulls, alfalfa and cotton seed meal), I would advise the following ration for best results with cows. The ration to be composed of six pounds corn meal and two pounds wheat bran. Total grain ration per day for each head ten pounds, (average). To this ration add equal parts of alfalfa and cotton seed hulls fed as a fodder ration.

I would suggest that you investigate the question of silage for your cattle, and if you are so placed that it can be grown at an average cost you will be pleased with it upon the whole.

SAN ANGELO.

The information contained in your bulletin number 27 is of special value to this section and people are beginning to give their attention to steer feeding. Corn is not a safe crop this far west and we will have to depend on cotton seed and sorghum or Johnson grass hay. Please give me your opinion on such a ration.

I gather from your experiments that if cotton seed is used without corn it will have to be either boiled or roasted so that steers could eat more of it to make up for the lack of corn. S. S.

I recommend that where green cotton seed is fed as a half grain ration with sorghum as a fodder the results will prove satisfactory. You will get very good results from four to five pounds of cotton seed per day and all the sorghum that the cattle will eat clean. I have fed cattle satisfactorily with Johnson grass hay for several years, and although when fed alone it will not fatten so rapidly as when a half ration of cotton seed is used, the results are entirely satisfactory as a hay. It is not expensive to boil the seed—in fact it is economical to do so if you will arrange and generate steam in some way (with the farm boiler) and steam the seed instead of boiling them. This can be done by throwing several buckets of water on top of a large box of seed and putting a jet of steam in at the bottom of the seed. Fifteen or twenty minutes is sufficient to steam any quantity of seed.

Steers will not fatten so rapidly upon raw seed as upon steamed or boiled seed. They do not have sufficient appetite for the raw seed, and this is the point referred to in the bulletin. Still they do fairly well upon raw seed if they have plenty of forage to accompany it.

AUSTIN, TEXAS.

It is claimed by parties that live here, that several lots of beeves, shipped from here to northern markets this winter were fattened on cotton seed meal and hulls went blind, some before they were shipped and others after they got to market. Is it possible that it can be charged to that kind of feed? I will give you names of persons, etc., who have made the assertions if you wish it, that handled the cattle. S. H. C.

It is an established fact in some of the eastern gulf states that the continued feeding of hulls and cotton seed meal to fat cattle will cause loss of sight and other troubles, sometimes leading to death of the beeves. It is a safe rule to discontinue the use of hulls and meal when the vulvus of the heifers in the herd begin to swell freely. Just what the causes are which lead up to these results, I am not able to say but I am inclined to refer it to a constipation, and over crowding tendency of the diet which is supplied the cattle. All trouble is found, I have no doubt, in the weakening constitution due to mal-nutrition—because of the excess of fat and carbohydrates in the foods. These are in too great supply over the albuminoid material contained in the food, as commonly fed.

BURNETT, TEXAS.

Please give me your views as to the relative value of cotton seed meal and shelled corn for fattening sheep and cattle for market. We have the corn. Would it pay to sell it and buy the meal? The meal and corn are same in price per ton. Some say the meal is the cheapest. I am slow to believe anything superior to corn but I am open to conviction. D. G. S.

With the price you have on corn meal and cotton seed meal for fattening sheep and cattle the cotton seed meal is the more valuable per pound than

the corn grain or corn meal. I cannot advise as to the amount of each to be fed per day for each one thousand pounds live weight, without knowing what fodder or roughness you intend feeding in company with the grain. It is possible that the greatest economy would be found in feeding a ration composed of a part of cotton seed meal and part corn meal. I cannot determine this without knowing the hay or fodder used with the stock.

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SAN ANGELO, TEXAS.

Please state the relative values of Alfalfa and Johnson grass hay for feeding for beef and mutton.

J. T.

Relative to the fattening qualities of Johnson grass and alfalfa will state that the stage of growth of the two grasses materially determines their relative fattening values. The water present in the two grasses varies with the age and is most excessive in the Johnson grass. The alfalfa—in bloom—has in it fifteen pounds Nitrogenous matter in a hundred pounds of dry matter; and six pounds of water in a hundred pounds of hay; seventy pounds of fattening material in the one hundred pounds of dry matter. Johnson grass has eleven pounds Nitrogen in one hundred pounds of dry matter, fourteen pounds of water in the one hundred pounds of ordinary hay and sixty-six pounds of fattening material in the one hundred pounds of dry matter, which shows that Johnson grass is not commonly the equal of alfalfa. The word Nitrogen indicates the amount of lean meat producing food in the two hays.

If an animal is fed *adlibitum* on either of the two grasses we find that Johnson grass will fatten more readily than the one fed on alfalfa. While the alfalfa is best for work animals, and for the production of milk for the dairy.

To produce fat in cattle or sheep the Johnson grass is probably superior to alfalfa when fed with corn, or almost any other grain. Pound for pound milo-maize does not equal corn in fattening value.

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SAN ANTONIO, TEXAS.

I enclose you a sample of food stuff designated chops and ask if you will inform me as to its value for "butter producing cows" and also for the proportion for a feed consisting of chops, wheat bran, rice and cotton seed meal.

I may add that my herd consists of thirty-three cows which produce twenty-eight pounds of butter each day, but of these, ten are going dry, and give only five pounds of butter, leaving twenty-three pounds for twenty-three cows. There is no grass whatever, in the fields neither are they fed any kind of hay. Twelve pounds of prickly pear chopped fine and mixed with twenty-one pounds of cotton seed hulls is given to each cow once daily. The grain ration consists of cotton seed meal, wheat bran and chops.

The cows are turned out and then perhaps eat more prickly pear. Some become very bloated and I would be glad to know if this is due to feeding prickly pear.

G. D.

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I recommend the following mixture which you can prepare yourself of corn chops, wheat bran, rice bran and cotton seed meal:

To one hundred pounds of cotton seed meal add twenty-five pounds of wheat bran, twenty-five pounds of rice bran, and twenty-five pounds of

corn chops. This will produce a large amount of butter if eight or ten pounds of this grain food be given each cow per day.

This is not a fattening food which I have recommended but is for the production of milk. You cannot improve on the hay ration which you are now feeding of prickly pear and cotton seed hulls. Do not increase the amount of cotton seed hulls if it is possible to continue the feeding of the prickly pear to a great extent.

The "Bloat" comes from the prickly pear but is not apt to cause any serious trouble.

DALLAS, TEXAS.

On our Ranch in Johnson county out of about ninety cows, ranging in age from four to nine years, we have ten head that have gotten in very bad condition. The first bad symptom to show on them is a stiffness in one fore shoulder; after it makes its appearance about the second or third day they get stiff in both shoulders, and the shoulder blades draw up and they get very stiff. When they are first attacked they are in very fair condition, but after the stiffness gets in shoulders they rapidly lose flesh. The cattle are on very good grass, and for the past six weeks or two months have had very good deep well water; before that time they had water from tanks. Our men can assign no reason for the complaint other than what is called the third party flies, which are very bad in the pasture.

S. BROS.

From the symptoms you give I am not able to name the cause of your trouble with absolute certainty, but I am of the opinion that a fly causes the trouble. I have known them to kill yearlings where no remedies were used.

A few samples of the flies sent in alcohol with notice of their number, habits, etc. will assist in locating the cause. If there is no breaking out on the shoulders or other parts and no difference in feeding it is almost sure to be caused by flies.

DALLAS, TEXAS.

As requested in your favor of the 25th, ult. we today express you some of the flies that have been giving our cattle trouble. Our man reports that they congregate more especially on the front shoulders, and that they are sometimes as thick as 250 to 300 flies on a cow. As yet we have lost no cows from the complaint we wrote you about, but can notice very little, if any, improvement in them. If you could suggest some remedy for the complaint it would be a favor.

S. BROS.

The flies are on hand. I find them to be the Horn fly. They are very troublesome to handle. Nothing known is so good as a mixture of "train oil" and Pine tar. Use one pound of tar to 10 pounds of the oil and apply with a brush or mop on the shoulders and back. The one application will remain good from four to eight days. It keeps flies off, does not kill. Kerosene emulsion is endorsed by some, but I know from experience that it is not reliable. There is no easy method of eradication or protection, but damage can be prevented by the above remedies. Stock troubled by flies fall off in condition, and young stock are often killed in small numbers. The animals stop licking the hair where the pest is severe and soon grow poor.

It has been suggested that lime placed in the droppings will kill the young flies and eggs and prevent the new swarm. The eggs are found in the manure but it is impossible to apply lime, or anything else to all or nearly all of the droppings. Other methods must be relied upon.

OAKWOODS, TEXAS.

I am just in receipt of bulletin number 27 and have given attention to the subject of steer feeding. Will ask a few questions on the subject, in this lot of steers you dehorned them all? Was this done to prevent them from damaging each other in feeding pen or was it considered an advantage to their taking on flesh? I have a lot of work steers with large troublesome horns both in handling and feeding. Would it, in your judgment, be to the advantage of the oxen to dehorn them. If so will a common hand saw do to perform the work with if they were made secure? How close to the head would you advise to take them off? Would it matter to leave one or two inches of the horns, as they are fully grown? Will be obliged for an answer.

F. F. T.

The steers fed in the experiment were dehorned for three purposes: to save shed room in feeding, since taking of the horns allows crowding together of the steers so that where fifty animals fed with horns have been accommodated, seventy-five may as easily be fed after dehorning.

The second advantage gained, is in the greater tendency to quiet all the animals by removing the horns, thus making them better feeders.

Third advantage is found in preventing constant hooking of one steer by another, which causes pain, which during the season's feeding amounts to much more than a few minutes pain caused by the saw. The greater number of cattle now fed for beef in sheds are dehorned.

You may easily remove the horns of old work steers by using a sharp carpenter's saw, and sawing off so close to the head that one-eighth or one-fourth of an inch of skin will be removed with each horn. It has been well proven that the closer the horn is cut to the head the sooner the wound heals, the bleeding is less and the appearance of the animal is much improved over one with horns sawed several inches from the skull. The horns of the old and well grown animals may be safely removed if the above directions are followed.

Nothing is gained by using searing irons, dusting, medicines or any application to stop the bleeding. Precaution must be taken at the season of the year (summer) when flies may trouble and cause maggots to infest the wound. But in case worms are found in the wound they may be removed by daily application of turpentine or chloroform to the inner parts of the wound. Tar will effectually prevent the deposit of eggs if smeared upon the hair and other parts about the wound.

ENNIS, TEXAS.

Will you kindly inform me as to the composition of cotton seed and hulls for feeding purposes. What is digestible of albuminoids, carbohydrates, and fats contained if any? Also enter my name for bulletins as issued.

W. B. D.

Replying to your favor of 9th, inst. I take pleasure in furnishing number of pounds of Protein, Fat and other Carbohydrates which are found digestible in one-hundred pounds of dry cotton seed and cotton seed hulls, as requested.

Cotton seed raw contains 11.81 Protein; 20.46 Fat; 33.73 other Carbohydrates. Total digestible pounds 66.09. Cotton seed hulls contain .42 Protein; 3.91 Fat and other Carbohydrates 34.27: total digestible matter to the one-hundred pounds of dry feed is 39.50.

This is given in dry matter which means all water has been driven off

from the materials by subjecting them to a heat of 212 degrees for twenty-four hours. Water has no food value and therefore should be eliminated.

PRAIRIE LEA, TEXAS.

Please give us the benefit of your experience. Bran is worth \$21.00 per ton; cotton seed meal \$23.00 per ton; corn meal \$24.00 per ton; hulls are worth \$7.50 per ton. We are feeding to our herd six-hundred pounds of grain and eight hundred pounds cotton seed hulls; we also burn some peas for them. Would you advise us to use 200 pounds of cotton seed meal; 200 pounds corn meal and 200 pounds of wheat bran or 200 pounds cotton seed meal and 400 pounds bran together with the hulls and peas.

H. & L. BROS.

I take pleasure in replying to your favor of October 11th, in regard to the foods mentioned, at the prices given. I would recommend for you to use for your herd an average grain ration of 8½ to 9½ pounds per day, using a larger amount when the proportion of the bran is increased.

If your market does not come down on price of butter when made from cotton seed meal fed herd, I would advise an increase in the amount of the cotton seed meal compared with wheat bran and increase the peas instead of increasing the corn. You do not give price of peas, so that I cannot indicate how much of this should be used. You do not state what your feed of peas per head has been or whether cattle got grass or other attention.

The hulls at \$7.50 are expensive and I would advise an increase in grain ration rather than a too liberal feeding of hulls, as forage. Wheat-bran makes a fair partial substitute for this purpose. You will have no difficulty in getting the herd to eat all the grain which I have recommended, if judgement is used in supplying it to those cows that have the best appetite.

CLAUDE, TEXAS.

Please give me your opinion of wheat-bran as a feed on which to fatten sheep with run on grass and stalk field.

J. T. K.

Replying to your favor of Oct. 18th, I will say that my opinion based on my knowledge of wheat-bran is that with or without shorts it will hardly prove a profitable feed in fattening when sheep run on grass or stalk fields. An additional grain is needed here of an oily or starchy nature, such as cotton seed meal, corn, cotton seed, etc., to make the best fattening ration. I have not fed sheep under these conditions but am reasonably sure of the above conclusions.

CALVERT, TEXAS.

What is the relative value of rich bran and corn meal? Can get corn and oats ground together for 12½c per bushel. Is it necessary to grind the oats before feeding? Please advise me. B. F. C.

First taking corn as a standard value at \$1.11 per hundred pounds. What wheat bran is worth \$1.01 per hundred pounds if of best quality unadulterated. Rice bran is worth 66 cents per hundred pounds. If



corn meal is worth \$1.11) rice meal worth \$1.16, cotton seed meal worth \$2.30 per hundred pounds. These values are calculated on the amount of digestible feeding material contained in each. Rice bran, like corn meal is fattening in its effect upon the animal system, and therefore can be most profitably fed in connection with cotton seed meal or wheat bran which are known to be non-fattening foods. The cost of grinding the corn and oats together at 12 1-2 cents per bushel is expensive and will render the cost of the mixture higher than the market price of other feeds of equal value. It is not economical to feed oats or corn without crushing to cattle unless they are followed by hogs to utilize the undigested grain in the droppings. In your case use the grain without grinding and follow with hogs or use some other feed stuff.

CORSICANA, TEXAS.

Would be glad if you would give me some information of practical benefit on the subject of sorghum and corn and how hogs and cattle (cows or calves) will thrive on same running on small pasture, or no pasture at all. Will hogs eat sorghum as their principal food with perhaps some corn? What do you sow and how do you prepare the soil for sorghum and corn, also when do you cut and gather sorghum and corn? Which is the best way to cure sorghum? Do you know how to make money out of hogs in Texas? For a permanent hog and cow pasture which grass do you consider best? I have thought that bermuda was hard to beat.

V. L. B.

Hogs and cows thrive on green sorghum if fed cut or when grazed, and wind colic prevented by slowly allowing the stock to get accustomed to the food and not allowing them to eat it when heavy with dew or rain. Many animals are killed by green sorghum, when unaccustomed to it and eating greedily of same or when allowed to eat it wet. It is rarely a safe food for young calves or colts. Hogs thrive upon it during all the summer and fall months, when fed upon sorghum alone, but do especially well if some milk is added to the food.

The ground for sorghum should be prepared in April, by deep plowing and thorough harrowing and the seed planted upon fresh land, thick enough to leave one stalk every six inches in the drill, in rows three and one-half feet apart, or it may be sown broad cast upon well prepared land and grazed off. The largest yield per acre can be obtained by cultivation in the manner first suggested. No hoeing and two or three plowings when the sorghum is young is all that is necessary. It can be cut for feed from the time the head appears until it dries out on the ground. If it is wanted for feed for winter use it can be cut and shocked in field, as corn, and when dry haul to barn and feed during the early winter months.

To cut corn and shock it the seed should be well glazed and the fodder be a little over ripe for pulling. To cure sorghum broadcast it should be cut and wilted and piled in shocks where it is allowed to heat, and then exposed to sun from two to four hours before hauling to the barn. Two to three days is required for its proper curing according to its yield per acre. If cultivated in drills it must be cured in shocks or fed from the hill.

We have made pork raising profitable at this place by keeping a large lot of graded pigs in dry lots and feeding dairy slops and a small amount

of grain and green food. Have had no disease to break out among the hogs. We produce pork at a very low rate. We know that to raise hogs profitably in Texas is to furnish them either grazing or slops ten months in the year and add to this such grain as we find cheapest. This must be done by the use of bermuda and rye or by using cow-peas and crab-grass to combine with other grasses. Bermuda can be relied upon as the best summer grass but in late fall and early spring something else is needed in addition.

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HOUSTON, TEXAS.

Will you please tell me the relative value of wheat bran and cotton seed meal for feeding milch cows and work oxen. Bran is worth here 95 cents and cotton seed meal \$1.25. M. W. C.

I take pleasure in stating that cotton seed meal is worth double the price per ton that a ton of bran is worth—both for milk, butter and work oxen.

Cotton seed meal is one of the most concentrated food stuffs used in feeding live stock. It contains but 7 per cent of water and all of its other ingredients are easily digested.

Wheat bran contains 11 per cent of water, is more light and chaffy in its nature, partaking somewhat in its nature of hay in its effect upon the animal. May be used as a part substitute for hay when desired. The effect of cotton seed meal upon the butter product of a herd of cows is well understood to cause the butter to be firm and lose somewhat in flavor, and in some parts of the country these facts render the use of cotton seed meal for butter production somewhat limited, but where milk is sold it makes no difference with the consumer whether cotton seed meal or wheat bran is used in the feeding.

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FORT WORTH, TEXAS.

Some years ago I saw a report of experiments made in the making and feeding of ensilage. At that time the report was favorable. Will you kindly furnish me with some information now on the subject? In other words are you still making and using ensilage? If so I will be glad to get a full report as to manner of making the silo and putting up the ensilage. Respectfully,

S. O. M.

I take pleasure in commending to you the growth of ensilage upon all lands where a yield of ten to twenty tons of green forage per acre can be obtained. The system consists of growing corn or sorghum or heavy grain crops in early spring and storing these crops in an air tight building, called a silo, and feeding this out during a period of drouth, when range is scant, or holding until winter and feeding then. It is a food much relished by stock and can be economically grown as above directed.

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WESTERVILLE, OHIO, 12-17-93.

I again take the liberty of addressing you upon the subject of grasses for the Gulf district. I am moving to Texas to engage in the dairy, hog, poultry and fruit interest in a small way to start on. I ask your advice as to grasses for those interests adapted to that section. I also wish to "monkey" with the bees. I am also interested in the silo. What month do you advise filling the silo? I have been recommended sweet corn, common corn and sorghum. In what stage do you consider best to store the above? S. F. M.

You will experience very little trouble in finding a number of grasses in the Gulf district in peas paspalums, bermuda crab grass, and a number of other species will thrive with you. Cow peas will flourish and make a heavy yield and is recommended for its fodder and grain. Melilotus alba, white clover and native wild flowers will furnish an abundance of honey for the bees. Indeed this section of the state is probably better suited for bee raising than any other portion of the United States.

The month in which to fill the silo in this state is the latter part of June or the 1st of July. Ordinary corn is generally used with sorghum as a substitute in the dry localities. Ordinary corn should be put in the silo after the corn becomes too hard for table use. After six hours the cut fodder should be put in the silo—sorghum is ready to cut when the seed have just turned dark, Kaffir corn Teosinte, prickly pear and a large number of other feed stuffs are valuable to the stock growers in this section of the state. I am not able to say from personal experience whether or not red clover will thrive in the Coast district. This is a matter that we will determine at an early date with the experiments which we have now under way in that section of the state. I have grown it very profitably in Mississippi, having about the same latitude that we have here. The success of its growth is rather a question of soil fertility and mechanical conditions rather than a question of latitude and climate.

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NEW YORK, N. Y.

What has been your experience with narrow deep silos? Will a silo pit 4x4 feet, more than the ordinary height give good results, and so permit the feeding of a few cows each day upon silage? What success have you had in siloing cow-peas, cut and uncut? Do you prefer an underground silo to one built above ground? Have you used earth successfully with which to fill between the walls to aid in the exclusion of the air?

R. P. Co.

I have had a very general experience with silos and silage, and can say that in my opinion a pit four feet wide, of any depth would not be economical for silage, as there will be some waste from the sides, which will amount to a large amount of the silage when a pit is so narrow. I can see no necessity for packing earth between the walls of the silo. A dry airy space would be preferable in my opinion. I have attempted the ensilaging of crab grass, but have never made a success, because I would not exclude the air sufficiently well—this was cut. I have stored green chicken corn (sorghum, Vulgare) in an open field without an excavation, and added some earth on the top to protect it from the rain. The stalks were in this pile laid parallel and closely tramped and no weights were used. This feed kept perfectly good for two or three months. In the fall of 1889 we had three silos holding 250 tons burned at the Mississippi A. and M. College. This food had been stored in June and July, and was left exposed after the fire. It remained in good condition for several weeks until fed up. One of these stacks of silage leaned to one side and one-third of it tumbled off. After it had fallen it remained sweet and good in the mass. These facts have never before been published.

I have seen cow peas ensilaged with but little success when put in

whole. If cut they can be properly handled. It is one of those variety of plants which is difficult to drive out the air, in putting in silo, sufficiently well to insure preservation.

Any under ground silo is in great danger of surface water running in and destroying its contents, unless covered by a roof and protected also on the sides by tile drains, set at some depth in the soil. The same results may be obtained by cemented bottom and sides of pit. I have seen earth used to fill in between the walls of any above ground silo—expecting it to exclude all air. (No tarred paper was used) and the entire mass of good silage rotted.

FORT WORTH, TEXAS.

I will esteem it a favor if you can send me a report of the value of grasses, especially Johnson grass. How have you tested it?  
S. O. M.

Your inquiry received concerning Johnson grass. I take pleasure in saying that I have had many years of experience with it and am satisfied that its feeding qualities are very high, and that it is a very vigorous grower on all moist, rich lands. The yield per acre is unsurpassed by any grass.

There are two serious objections to its use, viz: It is a great pest to cultivated fields, being difficult to kill or to eradicate when once established, and it renders the sale of the hay somewhat difficult and it is not quoted per ton. Much Johnson grass hay, however, is used in spite of these facts. It is largely used on many farms for the support of stock raised there.

\* Inquires come to me regularly from the farmers of this state concerning the success of silage, and to answer these satisfactorily I would be pleased if you would write me a letter stating your success or failure with the silo, and explaining your system of management in full.

Please notice the following points, if you do kindly reply to this:

- 1st. What are the dimensions of your silo and when was it constructed?
- 2nd. How is it built?
- 3rd. What is the yield per acre?
- 4th. What per cent of silage did spoil?
- 5th. Is it palatable to your stock?
- 6th. What does it cost you per ton to put it in the silo?

We have successfully handled the silo at this place for a number of years, and this year it has again proven an entire success. I will have a verbatim copy of your letter sent to those who may desire this information. I have already received some replies to letters of this nature. Will you please give this your early attention?

Editor Texas Farm and Ranch:

Herewith I mail you a copy of correspondence relating to the silo, which I esteem as of much value, giving as it does, the practical experience of men in this state, with the several styles of construction and different foods used in filling. These letters set at rest all question of the practical value of ensilage in this state, and should encourage every stock owner to investigate the claims that are made for this system of feeding.

For a number of years I have used silage with the best results, and

\* This letter was sent to a number of parties in the state who were known to use the silo.

can say that my experience and observation has been repeated in the letters which have been so kindly furnished by the writers. With best wishes.

J. H. CONNELL,  
Director Ex. Station.

FROM W. E. HUGHES.

In reply to your letter asking that I state my success or failure with the silo, I would say I have been using the silos for six or seven years. I think well of them, especially for dairy cattle, but to reply directly to your questions, I would say:

1 and 2. I constructed in 1886, I think it was, two small silos in my barn. They were about 10x12 feet, but not high enough, as they were constructed in the lower story only nine feet high. The next season I built in an independant wooden building four. They were each 12x30 feet, and 16 feet high. The frame or studding was placed upright on 12x14 pine sills bedded in gravel. Sills were tied at each end with cross sills of same size firmly bolted at the corners; also two iron rod ties, each ten feet from the end; top plates of 2x14 pine, all double boarded on inside with inch lumber, and tarred building paper between.

The past season I rebuilt my silos the same size as before, but on a different site, placing the studding horizontal, using the same material, but I put two of my 2x14 together, bolting them to the end pieces, placing the ties about three feet apart. My last silos are 22 feet high.

3. My silos have always cost more to build than they should, I think the plan of the silo sketched and published by Prof. Curtis, of your college, last year, in the Texas Farmer, is better than mine. His outside frame is of 2x8, placed horizontally. I think it important that the frame work go around the silo, like hoops around a barrel. I use dirt or gravel floor, making it a little higher than the outside ground.

5. The yield per acre on my land of sorghum is, I think, about eight tons per acre. The per cent spoiled is about the same as that upon a stack of well put up hay. I would say, perhaps, 5 per cent off the top.

6. I think the cost of putting my crop in silo, not including the cost of the building, is less than \$1 per ton. All stock, cattle, horses, calves and pigs eat it well.

Dallas, Texas.

FROM W. G. KINGSBURY.

Replying to your inquiry as to success with silos, would say that I am now on my second year in feeding ensilage with very satisfactory results. I have two silos; one was constructed in the spring of last year and the other this. The one constructed last year is round like a large tub; it is twelve feet in diameter and sixteen feet in height, standing on a rock floor and holds close on to fifty tons when well packed in. The other is square with rounded corners and will hold 500 tons; it is 20x40 and 27½ feet high. I have not fed from this last one as yet. The round one is a simple matter. I took good sound pine flooring and stood them on end one after another nailing on the hoops of ceiling lumber to hold them together until I got round. I made the hoops three thicknesses and put them 2½ feet apart, put a roof over it and was done with the addition of two small windows to get the stuff out. The lumber cost me \$25 and I built it with farm hands in three days. I did not line it with tarred paper or paint it, and the ensilage kept perfectly. My other is a large frame with rounded corners ceiled with inch boards 1x12, covered with tarred paper and that covered with another ceiling of 1x12 boards, a roof and windows and it was done.

The yield depends upon the season and cultivation, but you may safely count on from 15 to 25 tons of green corn to the acre.

A cubic foot of ensilage will weigh just about 40 pounds and is a full ration for a grown animal 24 hours. Beeves being fattened for market should be encouraged by the addition of a little bran sprinkled over the ensilage and they will lay on from 2½ to 3 pounds of flesh every day. Farmers, there is nothing for us equal to a silo.

With the 18 inch cutter and 5-horse power engine I have now, I can pay my neighbor \$15 per acre for his corn (if fairly good) delivered, and put it in my silo at \$1 per ton, and if I raise the corn on my own land it will be considerably less.

I covered them with some weeds and put a few rocks on it, and although a little of the top was slightly soured, my milch cows ate the last bit of it and there was no loss.

There is nothing known to me that stock prefer to ensilage; they will simply devour it.

I am a great believer in silos and had I known as much about them ten years ago as I do now I might have had \$50,000 or \$80,000 in the bank instead of nothing as now. The fact is, it is the only

way to make any money out of Texas soil, and it is Hopson's choice with us poor farmers. My intention is to fatten beeves for the Chicago market. I intend to buy beeves at \$15, feed them from ninety to one hundred days on ensilage and sell them at from \$55 to \$60. Three acres of green corn will keep eight head of cattle rolling fat for six months if put into a silo. Everything eats it, cattle, horses, sheep and hogs. Old cows can be fattened on it rapidly and sheep can be made to nearly double themselves in sixty days. Cows will give a third more milk and a third richer. Young colts can be grown to make large horses at a very trifling cost. I give an estimate on fattening cows as follows: Cost of 200 cows, say \$1600; cost of silo, cutter and 5-horse power engine \$1000; cost of corn pens, etc., \$1000; extra feed, bran, cotton seed meal, etc., \$1000; shipping and commission \$1000; attendance \$100—a total of \$5700, which is at least \$1000 more than it could be done for. By sale of 200 fat cows, estimated to weigh 750 pounds each, at 5 cents per pound, \$6500 from which deduct the \$5700 and we have a net profit of \$1800. and we have the silo, engine, pens, etc., still on hand and good for many years to come. All this may be done on from twenty-five to forty acres of corn. Now what farmer in or out of Texas has ever made \$1800 out of his corn crop of forty acres? A crop of green corn just past the roasting stage is a valuable piece of property. why should we not gather it into a silo and make money out of it instead of letting it dry up blow away, only saving, after a lot of hard work, the kernels upon the ear.

Boerne, Kendall County, Texas.

Dear Sir: Thanks for your note of the 18th instant. If it will be of any benefit to you and others you may say that a week since I opened my silo on the second year and find my silage all that could be desired. The second day after commencing to feed one ration a day from it the milk was increased by several gallons and the separator brought out very nearly 10 per cent more cream.

Truly yours,

W. G. KINGSBURY.

FROM H. P. JOURDAN.

I built a silo several years ago and operated three years successfully. I used sorghum principally, but find for all kinds of stock, corn to be the best. I used sorghum on account of the good yield, and for cattle seems as good as corn after they get used to it. Horses and mules will not eat sorghum ensilage. My silo is built on a new plan. It is 100 feet in circumference, and 20 feet high. To build it, I took 3x4 scantlings 22 feet long, planted them in the ground where I wanted my silo, two feet deep in a circle, about five feet apart, braced them well from the inside, from posts planted for the purpose. Now take lathing, 1x3 inches; as long as can be gotten conveniently. Nail on one foot from the ground all around, to the 20 foot posts, then nail another on this, and so on, until you get the hoop four laths thick, which makes a strong hoop. Then two feet above the first make another hoop just the same as the first. In nailing on the slats be sure to break the joints when the ends meet. After you get near the top you can make the hoops three feet apart. Now you have the hoops for your barrel silo, the strongest silo made, and for less cost than any silo ever made.

Now commence inside and nail 1x10 inch plank 20 feet long to the hoops. As you come to the 3x4 posts knock them out, as they are only temporary for holding the hoops until the lining is in. After you get all the 1x10 in and nailed to the hoops, then put on matched flooring or ceiling 5 inches wide and break the joints of the 1x10 plank. If they were all matched plank it would be better. In putting on the lining leave a place two feet wide all the way up at one place to get the ensilage out. Have short doors well fitted inside so they can be taken out as you feed out the ensilage. By having a center pole to support the roof you can make any kind of roof you may want. I use flat roof—tin or iron.

I commence cutting as soon as the corn is in the dough state, also the sorghum. I use the Ross cutter and elevator, made by Messrs. Ross & Co. They furnish a tread power I do not like. They recommended me to order a horse power from Chicago. I find it the best and cheapest I ever used. My Ross cutter is as good as new. I have used it three years, cut 400 tons each year.

I think the sorghum will yield in fair land 30 tons per acre in two cuttings; corn about 20 per acre. I use about half ration of cotton seed meal, say four pounds to the beef. I feed my beeves 30 pounds each day of ensilage. I find it cheap, nice to feed, easily handled. I find my barrel silos to cost about one-half of estimates of silos I received from the North. There is no bulging out and cracks in the barrel silos. When the wet ensilage is well tramped in, it requires a very strong house to hold it. According to the amount of lumber in a barrel it is stronger than any house. If a small silo is built the stuff for the hoops should be well soaked in water, to make them bend well. I use clay floor, and find it good; much better than wood, and a great deal cheaper. \* \* \*

I worked about ten hands and put up twenty tons per day of silage: One man in the silo to level and tramp, two to feed the cutter, one to drive the cutter team; three two horse wagons to draw the

sorghum, one in the field to help load the wagons and two to cut. We would sometimes get behind and would have an extra hand to help load or cut, as was wanted.

I think the ensilage costs about 40 cents per ton or less. I have no way of knowing, but think two pounds and a-half worth one pound of good hay. I like it as a feed much better than hay for bees. I feed my ensilage entirely to fatten bees. I use half ration of cotton seed meal. My bees do well. I see no difference between the corn and sorghum ensilage. I first cut into the silo about five feet of corn and then on top of that I filled up with sorghum. My bees ate the sorghum, but the horses and mules would not eat much of it, but just as soon as we fed down to the corn ensilage they—the horses and mules ate it ravenously. It looked as though they could not get enough of it. For feeding bees I would rather put up sorghum ensilage, as you can raise more to the acre, and a surer crop. But for horses and mules would not put up anything but corn or millet.

I think I would have saved money by giving my horses a full ration of cotton seed meal, cotton seed hulls are so high now it would pay to put up ensilage and feed instead of hulls.

The barrel silos are so cheap and easily constructed, I hope to see feeders use ensilage and meal instead of meal and hulls.

If I can serve you in any way do not hesitate to call on me.

Victoria, Texas.

FROM A. R. HARWOOD.

In reply to your inquiry will say: Our ensilage has been partially a failure. We have filled our silos three times, twice with corn and once with sorghum. The first time I filled them was with corn, and the silage was better than it has ever been since. We cut the corn with a No. 14 Smalley cutter and engine. The machine did fine work. We filled three days consecutively, stopped two days, and then filled two days more. We kept one man in the silo all the time leveling. It is 19x20 feet and 16 feet deep. It was built in the barn by nailing two courses of 1x12 boxing to the studding with tarred paper between. When we got through we covered the silage with plank, and then put about eighteen inches of cotton seed on top. It was fine, but it wasted some after it was opened. I think a silo ought to be deep. The next thing we filled corn in, and in the center and towards the bottom it was a wet, soggy, black mass, and very sour. I thought, perhaps, we filled that time too fast, but we had two silos that year the same size as the one the first year, and we would run one day into one silo and the next day into the other. That year we did not cover, excepting the silage to make its own covering. The silage was better at the top after we got about a foot down than it was at the bottom. The third year we filled with corn with pretty much the same experience as the second. Our barn and silos were burned last spring. We have rebuilt the barn but will not put in a silo at present at least. It took from twenty to twenty-five acres of either cane or corn to fill one of our silos. We generally feed the silage in winter about twenty five pounds per cow in two feeds. Our cows were fed hay in the pasture at noon.

Prairie Lea, Caldwell County, Texas.

KERVILLE, TEXAS.

Recent articles in our county papers concerning "Silos" have set our better class of farmers to thinking. A number have spoken to me lately concerning silos and silage and wishing to do the community some good, I will trouble you again for circulars stating cost and preparation of silo and silage respectively, also machinery for same, such as horse powers, cutters, etc, and will you give me the names of a few responsible dealers who keep such machinery in stock?

B. C. P.

Answered by referring him to the experience of those just quoted.

KINKLER, TEXAS.

Can you give me any information that would help me secure some seed of the new (in this country) forage plant spurry, said to be very highly prized in Europe. Would be very glad to get some clover or grass that would make good pasture or forage in our dry climate. Will be glad to receive a copy of experiments on grasses, etc.

H. T. C.

Concerning the value of spurry I will say that it is highly prized in Europe but it has proven itself of very little value in this country.

Where I have grown it it is not a valuable forage plant, and I suspect the same to be true of Texas. In none of the northern states has it proven itself of such value as to be recommended for general use.

The *Melilotus alba*, a clover, will thrive with you and produce good crops of fair forage without impoverishing the soil. It is bi-ennial. *Bromus inermis* has been tried successfully upon semi-arid lands of Kansas and has proven itself successful in other parts of the United States.

We now have under test some plants of foreign forage plants known as *Polygonum-sachalinense*, common name Saghalien knot weed, whose value we will prove upon the semi-arid and elevated plateau regions of this state during the present year.

For spurry write Jas. Thorburn, 15 John St., New York City.

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AUSTIN, TEXAS.

I have a ranch in Castro county which I am anxious to convert into a stock farm where I can raise feed for cattle. It is difficult to raise any feed on the plains because of the altitude and drouth. The elevation of my ranch is 3900 feet. Average rainfall 12 to 20 inches. What can I raise best for forage or grain, as the most certain crop?

W. A. B.

Concerning the use of your farm in Castro county, and in reply suggest that the two conditions of light rainfall and elevation, under which you labor, eliminate necessarily a large part of the ordinary farm plants as possibilities upon your farm.

I have reports of success with alfalfa where it has been irrigated partially the first year; also success with Jerusalem corn, Kaffir corn and *Melilotus alba* and a few non-saccharine sorghums without irrigation.

Let me suggest that the ordinary method of preparing soil for the crop in your section of the state is altogether too light to afford best results for the crop. The land is not broken to a sufficient depth to hold your light rain-fall and conserve it to best advantage. I would advise the use of *Melilotus-alba* as the most certain crop with you.

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AUSTIN, TEXAS.

Your favor of the 20th instant duly received. I appreciate your suggestion. I wish you would give the address of party from whom I can purchase *Melilotus alba* seed. You would give me directions for planting, as I know nothing of this plant—at least not by that name. What is it, grass, hay, forage or grain? I tried Jerusalem corn and made a failure. Have had three crops of sorghum cane, neither crop was of much value, and yet the cane seemed to have exhausted the soil.

The past year my field was well plowed with heavy sulky plows and large teams of good mules, plowing deep. The cane did best and stood the drouth best at the end of row, where plowing was shallow and land tramped. I have been thinking of seeding down most of the field this year in Johnson grass. I do not like it, yet it may be the best I can do. What do you think of Johnson grass for that section? Last year, at one place where they had a good rain, a fine crop of Johnson grass was raised.

W. A. B.

I herewith give you the name of party who can supply you with *Melilotus* seed. Be careful and order these seeds after inquiring about freight rates to your point, otherwise rates may prove excessive.

The *Melilotus* is clover and produces no grain, and the hay is not seen upon the market yet, because it is practically a new thing. In this respect it resembles Johnson grass very much, but will stand the drouth of your section better than that grass.



Was your failure to get good results from breaking the land due in any case to the fact that you broke land and did not receive heavy rains to wet the land in time for seeding and cultivation? Or did you break early in fall? I would not recommend deep breaking in your section in the spring, with what little I know of your conditions. I am of the opinion that Johnson grass will not be profitable to you unless good rains or sufficient water in some other form is assured.

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STAFFORD, FORT BEND COUNTY.

I am a new comer in this state and write to ask you what grasses to sow for hay and permanent pasture. The soil is black loam and unbroken prairie. Could it be harrowed and seed sown on it without breaking? If so, what seed would you advise sowing? The land is in Harris County, thirteen miles southwest of Houston.

C. H. B.

I can recommend for early spring use, burr clover, rescue grass, alfalfa and melilotus. For summer grazing, you will find bermuda and crab grass the most valuable varieties for your section. Lespedeza will thrive with you, but I do not know that this is a demonstrated fact. Any of the seeds mentioned will grow upon land prepared as suggested, but none of them will thrive and reach their maximum value. Seed of the above varieties can be obtained from Texas Seed and Floral Company, Dallas, Texas.

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To W. B. M., Huntsville, Texas.

\* Mr. ——— tells me that you want us to recommend to you a forage plant for badly worn lime lands, to produce hay or pasturage. I suppose that this lime is in the form of carbonate of lime, and recommend that you use upon it a clover known as Melilotus alba, which will grow upon the most barren lime soil, if sown in February. To seed land, put one-half bushel of Melilotus seed per acre upon it. This seed may be had at reasonable rates, absolutely free from Johnson grass, upon timely application to ———.

The effect of clover upon your land will be to fertilize it sufficiently in the course of three or four years to make it return good crops of corn and hay. I know its practical value in renewing poor soil. Melilotus is an excellent hay crop and pasture plant.

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KOPPERL, TEXAS.

I refer to Johnson grass. Can you give me any reliable method for exterminating it? Would like something that you have personally, or through the experiment station, tried.

Is it a fact that Johnson grass and the Little amber cane are of the same genus or species, and do you believe that, by continuous cultivation or sowing in sorghum, the grass will be absorbed or exterminated by the sorghum? I would like your opinion on different methods claimed to kill it—continuous plowing and sowing in oats, killing with kerosine, salt, etc.

I beg to assure you that any information you may give on this subject will be highly appreciated, not only by my father and myself, but also by a great many in our section.

F. F.

I have tried some mixtures which have proven entirely satisfactory

\*No letter of inquiry was written by this party.

when applied to Johnson grass on a small area. Arsenic is the active factor in the compound.

Johnson grass cannot be crossed on amber cane or any other sweet sorghum, as it is a non-saccharine variety of sorghum, and only in the rarest cases will cross-breed. I have tried different methods of killing the grass for several years, and find that by diligent effort it can be exterminated upon ground to which it is well suited by double bedding of same in winter and spring and planting corn, and working very thoroughly (when the land is dry) with sweeps run at a shallow depth, to kill the grass in the middles. It will require several extra plowings each season to prove successful, and the work will be accomplished in the course of two seasons if the drill is kept thoroughly worked with the hoe, as the middle has been with the plow.

Salt, applied at the rate of four tons per acre, will in most cases kill the grass, but will render the land non-productive for some while, and the expense is excessive. Kerosene will have much the same effect as salt, but it, too, is expensive. Experiments with arsenicals are being tried here.

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BRENHAM, TEXAS.

I take the liberty to ask you a few questions, hoping you will answer.

I am troubled with Johnson grass and cannot get rid of it. Have sowed in oats this winter, but it won't make much. The land is black for from ten to twelve inches; next comes the clay. Could I grow anything after the oats are harvested?

H. C. H.

Concerning the use of land occupied by Johnson grass, I would suggest that, if you do not need the hay from Johnson grass following the oat crop, you can break the land and plant millet successfully, or sorghum sown broadcast will do well, especially the amber variety; or cow peas may produce well upon land of this nature.

If the land has Johnson grass only in spots, a formula can be given which will probably destroy the grass with economy. No regular or full time crop can be produced properly upon good Johnson grass land when the land is well occupied by the pest. In this case the grass can be used for hay, but it must be mixed with something else to use for this purpose.

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WACO, TEXAS.

Will you kindly inform me if you know of a grass or forage plant that will supersede the "native cane" that grows in some of the river bottoms of Texas, and more especially for the Indian Nation, that would answer for holding the soil and for forage.

W. E. A.

I can recommend the growth of alfalfa upon bottom lands in your section, from Waco south and east, if it has proper attention the first year. It will not stand overflow, however, but delights in moist soils if it has plenty of under drainage.

I have sent some packages of seed, for trial in your section, of Melilotus, sweet clover, Lespedeza or Japan clover, reports from which will be available this year. The Melilotus alba will thrive without ques-

tion in the lands of the Indian Nation. This seed costs about \$2.50 per bushel, and requires one-half bushel per acre upon land poorly prepared. The plant is a bi-ennial, making its best crop the second year. It grows regardless of drouth.

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BOWIE, TEX.

I would like to inquire if you have experimented with Kaffir corn. If so, have you a bulletin of same, giving its food value? If not, would you like to try it next season? I am told it is fine for feed; also, that it stands dry weather remarkably well.

S. P. B.

I find no record of experiments here with "Kaffir corn." I send you a bulletin which treats of Millo maize, which grows to a greater height. The food value of Kaffir corn per acre compares favorably with the sweet sorghums, when grown under *moist* conditions. Where the soil is very dry, my experience with the Kaffir corn is that it produces more food per acre than the sweet sorghum.

The non-saccharine sorghums differ from the sweet sorghums in having less sugar and more wood fiber in them, fattening stock not so quickly, but being, on the whole, more healthy for such purposes.

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WINSBORO, TEX.

Some of our customers are wanting a fertilizer adapted to this land. You are familiar with the character of our soil here, which is the same sandy land generally found in East Texas. What they want is a fertilizer actually "offered on the market." If you can give us any information on this subject (or will refer this to any one who can), you will confer a favor that will be more than personal.

M. & M.

You request a fertilizer adapted to your land and one which is actually on the market. You must remember fertilizers are supposed to be more adapted to crops grown than to the land on which planted. If you will write me specifically regarding crops you desire to grow, and the nature and kind of native growth of timber in your locality, I will then advise you as to the fertilizers most likely to give you good results.

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WINSBORO, TEX.

We want a fertilizer for cotton. As we have said before, our soil is sandy. Red oak, post oak, hickory and black jack grow abundantly and to large size. We have some other growths in timber, but the ones mentioned are the leading ones. Back in the old States, as you know, they have several "makes" on the market, and we want to buy the one best adapted.

M. & M.

With land you mention, I suggest an equivalent for Furman's formula, which will be as good an application as you can have for cotton. Furman's formula, as you doubtless know, is made by using cotton seed in connection with mineral fertilizers, using about 800 to 1,000 pounds of seed, 800 to 1,000 pounds of acid phosphate and 200 pounds of Kainit. We prefer using the cotton seed meal instead of the cotton seed, mixing it up about in the following proportions:

Cotton seed meal, 800 pounds; acid phosphate, 1,000 pounds; Kainit,

200 pounds. Of this mixture, you will probably get best results from an application of 400 to 600 pounds per acre, scattered on the drill after planting and very lightly mixed with surface soil by the use of a light harrow.

Another formula, which is made without cotton seed meal, is made as follows :

Kainit, 800 pounds; acid phosphate (containing 16 per cent. of phosphoric acid), 800 pounds; Chili salt petre or nitrate of soda (containing about 15 or 20 cent. of nitrogen) 400 pounds. Of this, use about 200 to 300 pounds per acre. I prefer the first mixture, and am sure that it will give you much better results. Bear in mind that you cannot get too much vegetable stuff in the soil for cotton, and to that end, use all the barnyard manure you can secure. You may find it profitable, as we have found it, to make a heavier application, and only once in two or three years. Very little of the fertilizing matter will be washed or leached out of soil such as you describe. If you want a specially prepared "make" of fertilizer for cotton ready mixed, write to Standard Guano Manufacturing Company, New Orleans La., and ask them for their special cotton fertilizer. You must remember, however, that all these special makes are mixed in accordance with well known principles as to needs of the plant, and you can mix them as well as they can, probably saving yourself money.

The Oil, Glue and Tanning Company, Dallas, Tex., puts out a very good fertilizer, which is refuse from their glue works evaporated to dryness and ground. I think you can obtain it in carload lots at from \$18 to \$20 per ton, and we have found it of considerable value for both cotton and corn, especially in connection with barnyard manure.

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DALLAS, TEX.

Will you kindly give me what information you can as to the proper mode of cultivating artichokes, and your opinion as to their being a desirable hog food. Would like to be informed as to the proper manner of cultivating them, if your report is favorable.

J. P. B.

Artichokes are of considerable value for hogs, but I do not advise its extensive planting for several reasons.

1. They spread with great rapidity and are not easily eradicated when once started.

2. I believe that we can make better and cheaper pork by growing something that will make a larger yield per acre and carrying it to the hogs. You know, in artichokes, the hogs are generally turned into the fields and allowed to dig for themselves.

They are planted in drills wide enough apart for cultivation and cultivated about as you would Irish potatoes, thinning to from six to eight inches in the drill. Cultivate once or twice only.

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DICKINSON, TEX.

Will you kindly send me an analysis of cotton seed meal and also of the hulls, and what their value

is for fertilizer compared with manure from cattle fed on those two articles only. Will you also please advise me what element of plant food the prairie lands between Houston and Galveston are most deficient in?  
J. H. E.

I hand you (under separate cover) a copy of our first Annual Report, marked, and also Bulletin No. 13, in which you will find information asked in regard to composition of cotton seed meal and cotton seed hulls.

The manure value of the meal is very high. The value of manure from cattle fed on cotton seed meal and hulls is also very high. I think, although no exact experiments have been made in this direction, it is probable that at least 50 per cent. of the manure value of meal and hulls will be saved in the manure, if kept under cover, in ordinarily careful meal and hull feeding. I could hardly advise you as to the elements wanting in the soil between Houston and Galveston. It is probable that, if the lands are well drained and well cultivated, they will be enormously productive without any fertilizer at present. As you know, the water line comes close to the surface in the locality you mention, and one must therefore pay attention to drainage before he can expect best results.

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GAINESVILLE, TEX.

Should rotten sweet potatoes be applied to land as a fertilizer? Should sweet potatoes be planted on land where sweet potatoes had rotted before harvesting the previous year?

Have you an opinion to offer in regard to the efficacy of "lintless cotton seed" in this latitude?

G. H. R.

The answer to your question depends on what caused the rot in the sweet potato. If it was simply ordinary decay of vegetable matter, there would be no harm in applying it to the land. If, however, the rot was caused prematurely by *ozonium*, or cotton and alfalfa root fungus, the case would be different, and sweet potatoes should certainly not be replanted succeeding year on the same land, nor should the *ozonium* or infected potatoes be applied to land where other crops which it can affect are to be grown.

You are perfectly welcome to my opinion regarding the value of "lintless" cotton seed in this latitude or any other. We have grown the plant here as a curiosity, and have been very much amused at the great number and character of testimonials published in its behalf. The idea that so many people can be so easily gulled is as ridiculous as it is deplorable. When you consider that but very little more seed per acre will be yielded by lintless cotton than the ordinary kind; and when you also consider that, as the bolls open, the seeds are extremely liable to drop out and many of them be lost, unless great care and time be devoted to their picking, and that you get no return at all from lint, as with ordinary cotton, you will readily see that I could not advise the culture of lintless cotton as a field crop.

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BEEVILLE, TEX.

In the report of the Secretary of Agriculture, for 1890, we have seen mentioned that the common Chinese tea can be grown in the Southern States for family use, and that the Department of Agri-

culture has distributed in different localities plants of tea, and also of coffee. Now, will you please tell where you can get plants of both tea and coffee; and if at some Experiment Station, on what terms, etc.? We have also seen in the Texas Stockman and Farmer, published at San Antonio, about a new kind of coffee, which has been successfully grown in Callahan County, Tex. It is called the German coffee and is an annual. We have not been able to get any more information about it, or where it could be procured. If you know about it, we will be very thankful if you will tell us. We have heard that you send Bulletins to such as apply, and if you can, please send us some now and then, as it interests us very much to know of the work and the discoveries of the Stations.

P. S.—Also, please tell if you could furnish some seeds of Jones' improved and Truitt's improved cotton, and of the Red Liberian cane; and if so, about prices, etc.

J. V. D.

The so called German coffee is nothing more or less than a variety of Soja bean. It should be planted in drills wide enough apart for cultivation, and thinned to six or eight inches in the drill. I have tried it as a substitute for coffee, and would say in regard to its being used that I presume it is much a matter of taste. I prefer the genuine coffee and presume you will also. We have neither Jones' improved nor Truitt's improved cotton, nor have we the Liberian sorghum.

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CROCKETT, TEX. 1893.

Since the establishment of an oil mill here our farmers are very much concerned to know how the meal can be applied as fertilizer to corn and cotton. Thinking it likely that the professors of the A. & M., or some of them, had been experimenting in this line, and that I could get for publication the more reliable, and at the same time scientific data, I write you to request that you hand this to the proper officials of the A. & M., with the request that it be answered. You will greatly oblige me by doing so.

W. B. P.

Relative to the application of cotton seed meal as a fertilizer, I will say that, if the land does not leach, it is best to apply the cotton seed meal broadcast at the time of planting, or immediately thereafter, both in cases of cotton and corn. No appreciable amount of cotton seed meal must come in contact with the soil before germination, as it causes decomposition. Cotton seed meal applied broadcast will be available in reach of the plants at a much earlier period than is commonly thought. The roots of corn, when the plant is knee high, meet in middle of the rows (three and one-half feet). Same is true of cotton, and unless the fertilizing material is washed off by heavy rains over the soil, or leached by heavy rains into the sub-soil beneath (out of reach of the roots of the plants), broadcast method or application is best. Upon land that leaches, or where heavy rains are expected, I would advise that cotton seed meal be scattered on one side of the row, six inches from the ridge, very soon after planting has been done. If larger applications are made in the drill (more than 400 pounds per acre), much of the fertilizing material is not used by the crop that season. The heavier application the greater is the reason for broadcasting the meal. A light cultivation soon after its application would lessen the chances of loss by washing, as it would become incorporated into the soil without loss.

## DAYTON, TEX.

My land is light, sandy loam, originally magnolia and wild peach land; has been in cultivation about fifteen years to corn and cotton, with peas in corn; yields from three-fourths to one bale of cotton to the acre; with plenty of barnyard manure, have made 300 bushels Irish potatoes per acre; but I have not the manure for a fall crop. Can get special potato fertilizer or Peruvian Guano for about \$50 per ton; Bat Guano for \$30. I wish to know if you have ever made an analysis of Bat Guano and whether it would be a good fertilizer for potatoes.

R. B.

I can recommend the use of bat guano as good for your soil. If you can get it near you, add to this 200 pounds of acid phosphate per acre, where 400 pounds of bat guano has been used.

Much of the guano sold on the market in this state is almost worthless, having scarcely any nitrogen in it, which is the valuable element it is supposed to contain. In case you purchase I advise you to demand chemical analysis of the company selling you guano.

## BEAUMONT, TEX.

I have a large quantity of pine ashes, mixed with charcoal. My land is "piney woods" land and produces well. Can I use the ashes well for corn, Irish potatoes, cabbage, etc., in connection with cotton seed meal or nitrate of soda. I use plenty of barn manure, and grow cow peas to plow in.

J. P.

I take pleasure in recommending the use of pine ashes for all garden crops in your section, and suggest that acid phosphate, used with cotton seed meal and a small portion of the ashes per acre, will be the fertilizer wanted for your corn—say, 200 pounds acid phosphate, 100 pounds cotton seed meal and 100 pounds of ashes distributed broadcast at time of planting. Nitrate of soda is an expensive form of nitrogen, and I recommend cotton seed instead of barnyard manure, all of which furnish nitrogen.

## SANTA ANNA, TEX.

Have you experimented any with the long staple cotton? If so, with what success? As this is becoming quite a cotton country, I would like to experiment with it (if found a success any where in the State.) Have you tried Jerusalem corn? I see that from Garden City Kan., Station it is recommended for dry countries. Can you cite me where I can get seeds?

J. W. C.

Upon all low alluvial and fertile soils, where moisture is assured, the long lint cottons thrive most and give the largest returns per acre for labor expended. Upon dry upland soils the short lint cottons do best, having a clustering tendency and staple not longer than three-fourths of an inch. For your purpose, if ground is suitable, I recommend the Southern Hope, the Cherry long staple, the Allen long staple, the Cook's long staple, all of which may be had from seed houses in this State.

This letter was written as a report upon two varieties of Egyptian cotton sent the writer from the Department of Agriculture at Washington:

## ROCKHOUSE, AUSTIN COUNTY, TEX.

DEAR SIR—I received on the 28th—— the two varieties of Egyptian cotton which you supplied, and planted them the next day, side by side. The soil and cultivation were similar in all respects.

The land was fresh and the seed came up at once and grew off rapidly. These varieties were not injured by the early drouth which followed, as was ordinary cotton. It grew five or six feet high when ordinary cotton died in many places. It bloomed early, but bolls are small and divided into three parts.

The Affi variety grew much superior to the Bamiah variety, but I hardly think that the quality was superior. The Affi yielded a double amount of lint over the Bamiah and gave fully as much as the ordinary cotton plant.

I find the picking tedious, since I cannot gather more than one-third or one-fourth as much per day as in handling ordinary cotton. It requires three bolls of the Egyptian varieties to hold as much cotton as is supplied by one boll of ordinary cotton.

In Brenham I was informed that Egyptian cotton usually sold on the market for one cent per pound more than ordinary cotton. We decided not to plant any more of the Egyptian varieties, because the one cent additional on the price did not cover extra labor of picking.

If this cotton is to be much planted, it must bring more per pound than is now offered.

C. I.

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HOCKHEIM, TEX.

Kindly inform me of the surest method of poisoning the cotton worm, if known to you. I have tried dry Paris green, at the rate of one pound per acre, in former years and killed the worm, but could not do it this year; beside, it is more expensive. Think the Paris green must have been adulterated. I poisoned yesterday with arsenic, at the rate of three ounces of arsenic boiled in soda to a barrel of water, but find the worms alive today, it being twenty-four hours since I sprayed the solution.

A. H. M.

I am familiar with all the methods of treating cotton worms, and can say that you should never fail to kill the worm on cotton when one pound of dry Paris green per acre is applied early in the morning or late in the evening, or at night. It is possible that your green was adulterated. I have applied (dry) successfully one pound white arsenic with one pound of lime to the acre, which mixture does not burn cotton. For small areas, Leggett's powder gun is used best, and for large fields, it pays to buy Roach's poisoning machine or the Brown machine. These last cost about \$50, freight to be added. The first costs some \$8. The large machines will apply to forty acres per day. Dry arsenic does not burn the plant, as does the solution, and is more economically applied.

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HOCKHEIM, TEX.

Your kind and explicit inquiry in regard to poisoning cotton worms, came to hand. Thank you for the information; shall put in practice when the worms reappear. No doubt the Paris green I have been using had been adulterated, and of the white arsenic I perhaps did not use enough to the barrel, as there are plenty of cotton millers. No doubt by full moon the worms will be here again, and as we have been at last favored with rains, we will have to do our best to keep off the worms, which not one farmer in sixty has been able to do this year in a range of twenty miles.

Please let me know where I can secure Leggett's powder gun; also the price? I have but forty acres in cotton and think it will be eight or ten days before the worms will make their appearance.

Thank you very kindly for your offer of the Roach machine, but as Shiner is my nearest railroad station, I believe it would take longer than three days to return it. Grasshoppers in the valley are eating corn pretty badly. Is there anything to poison them? I tried dry Paris green last year, but failed. They not only eat leaves, but squares and blooms as well.

A. H. M.

See answer in reply to the next.

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GAY HILL, TEX.

Enclosed is a clipping in regard to grasshoppers and cost of cotton production. I am interested and would be pleased to have a copy of your Bulletin. I have lost a considerable part of my crop



this season by grasshoppers. Have tried Paris green, arsenic, etc., in the way of poisons, but the hoppers absolutely refuse to eat poison in every shape that I have tried. If you have discovered a plan to destroy them, you will confer a lasting favor by giving such information. The only plan of success in their destruction, so far as my opinion goes, is to build small fires and drive them into same.

W. C. D.

I have found no trouble in killing grasshoppers with the following mixture:

To six pounds of wheat bran add one pound of sugar or molasses and one pound of white arsenic; use enough of water to make a thick dough and put down in three rows, six feet apart, ahead of hoppers, a tablespoonful of poison every six feet. This should begin say, at 5 p. m., and at 5 a. m. put another three rows in the same manner, and pick up in the afternoon of the second day the first poison that was put down. Wet this, rework, and it is as good as any.

I have also been successful in the application of one pound of white arsenic, dry, per acre. This was applied with the Roach poisoning machine, at a rate of about forty acres per day, using it only very early in the morning and late in the evening. As much as two pounds of white arsenic per acre did not injure the cotton, when applied dry.

For the protection of peach trees and other fruits, I find that kerosene emulsion, consisting of one part oil and twelve parts water, is an unqualified success.

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GALVESTON, TEX.

Will you kindly favor me by referring me to some one from whom I can obtain reliable and full information upon the subject of cultivating pecans. I should like to know in what soil and climate they thrive best, the season for planting, the best method of planting, cultivating, etc.; the length of time in which the trees bear and their yield. In fact, as above stated, full and correct information upon the subject will be much appreciated.

C. S. V.

Concerning the growth and management of pecan trees in Texas, I take pleasure in answering some of your questions and referring others to a certain source of information.

The pleasant Texas climate, from this latitude south, is the ideal one for the growth of pecans. We note that they do best where the soil has a deep, moist, alluvial deposit and abundance of humus, with an open sub-soil beneath. From the early fall season until the last of January is the time best suited to transplant. The young trees should not be set with the collar well down in the soil, but should be somewhat raised, and the same care should be taken too in removing roots as in transplanting other trees. If the sub-soil is very tight, care should be taken not to dig a hole of considerable depth under the tree, unless lateral drainage is furnished to carry off the water from this portion of the ground.

The best method of cultivating the trees is to put a crop of the cultivated kind, which will not decrease the fertility of the soil, among the trees, and exercise care not to break the trees or to plow too near the roots. The trees should have some forty feet distance. You may expect a growth of tops of about one foot in height each season. A full crop from the orchard need not be expected within ten or twelve years; often

trees live as long as twenty years before bearing. The crop, at best, is very small, not more than one bushel per tree, for the first few years of bearing, may be expected.

You may see from the above that the great time required to bring the trees in bearing has rendered it difficult to gather much data upon the subject from successful orcharding. Little attention was paid the matter until after the war.

For further information of reliable character, from a man who has observed the small fruit interest of the State with great good judgment, I will name — — — — —, as one willing to assist in all matters of this nature.

FORT WORTH, TEX.

Supplementing my former letter, I want to mention the subject of grasses, having in view some variety of tame grass that can endure our long, dry and hot summers.

I see, from report of the State Agricultural Department of Alabama, that Japan clover grows luxuriantly on the old, worn-out and abandoned fields of that State, and to such an extent that, by plowing and turning under the clover, the land is loosened, fertilized and its old fertility restored; but I think this clover may not grow in our dryer and hotter climate as well as in the moister climate of Alabama.

Have you any recommendations about tame grasses? I am also writing our Congressman at Washington.  
S. M. S.

I enclose you a small sample of oats grown by our Superintendent of Sub-station at McKinney, Tex. He says that he has grown the corn for the past three years and it has averaged thirty bushels per acre. The seed originally came from the Collin Company. The rust proof oats, which he has grown since 1888, have given an average yield of thirty-five to forty bushels per acre, but you know this is upon land that has deep surface soil and which conserves its moisture better than does upland of that section. From observation and other sources of information, I am persuaded that the proper preparation of land in this semi-arid section will greatly increase the crops. With this end in view, I have prepared land here and at McKinney with sub-soil plow, and hope, within two seasons, to get beneficial results from this extra labor.

From my experience with Northern grown corn, I can hope but very little for the Minnesota varieties, and in fact, believe that the small-eared varieties will produce greater yields than any large-eared, late-maturing sort.

Concerning forage plants, we will make an extensive test at Wichita Falls of different materials. I have ordered from France seeds of polygonum sacchalinese, which is recommended to grow an entire season and thrive without rain. The non-saccharine sorghums, such as Kaffir corn, pearl millet and Jerusalem corn and Milo maize, will doubtless give good results upon these lands. The saccharine sorghums require more moisture than non-saccharine varieties.

Concerning the growth of Japan clover, with which I was familiar in Mississippi, will say that I expect little of it in the Panhandle, as it does not begin to grow until May or June, and thus the drouth will probably catch it in that section and it will hardly mature seed. It is not a very

vigorous rooted plant. The *Melilotus alba*, which is grown profitably upon the soil of Mississippi and Alabama, and which is an early spring forage plant, will doubtless thrive.

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SAN ANTONIO, TEX.

I thank you most heartily for your valued letter of the 30th. I have read the pamphlet describing the culture of jute, for which I thank you. I return it herewith, as you request.

Your courtesy in this instance has emboldened me to trouble you still further. Have you any information relative to the culture of the tuber canaigre? It is grown, so I am told, quite extensively in the Pecos Valley and neighboring sections. It is valued for its tannic properties.

I will await your annual report with much interest, and again thanking you, I remain,

H. K. C.

Replying to your favor of February 9, I take pleasure in giving you such information as I have at hand upon the Canaigre plant.

This plant produces an oblong tuber, very much in the shape of a sweet potato, three to twelve of which are found under each plant, at a depth varying from two to eighteen inches beneath the surface. The tubers weigh one pound or less and are not edible, but are sometimes used for medicinal purposes. They contain, however, a large percentage of tannic acid, which is being very freely used in the tanneries of the Eastern States and in foreign countries. The Pecos Valley furnished a large number of acres of natural growth, and upon all the drier beds of streams on second bottom lands in the warmer portions of this State, Arizona and Mexico, the plant flourishes. The tops attain a height of some eighteen inches and are seen to cover the entire surface of the ground, where the land is of a sandy gravel nature and moisture during the winter season is in abundance.

As indicated above, the plant is used for its tannic properties and is now being cultivated largely in some districts of Arizona. Within the past two seasons, the Southern Pacific Railroad Company has transported some 370 carloads of evaporated roots to points East, most of these roots finding their way to Glasgow, Scotland, and Vienna, Austria, at which places they sell on the market for from \$45 to \$65 per ton. Three tons of the natural root in its green state, if sliced and dried, is reduced to one ton, and this material contains an average of 30 per cent. tannic acid. It is thought that ten tons is a good yield per acre cultivated in this crop. It is adapted to low lands, sandy gravel soils, which are supplied with water freely during the winter season, either by rainfall, irrigation or overflow. The plant, however, is so very hardy that it will maintain itself upon close, compact soils that are not supplied with the proper amount of moisture, and upon such lands it can be profitably cultivated. The roots live in the ground from season to season, without decreasing in tannic properties until the parent plant is destroyed. It is propagated successfully only from the roots, which throw out eyes from near the point of attachment to the parent plant. The roots, when planted to produce a new crop, do not die and decompose, but remain in the ground, the percentage of tannic acid increasing within the next twelve months. The value per acre of this crop has not yet been very

clearly determined, when raised under the irrigation system, but if it were possible to realize one-half of the market value of the product at the nearest railway points, it would prove a very profitable investment. Thus, ten tons per acre are yielding three and one-third tons of dry roots, containing 30 per cent. of tannic acid; they are worth \$40 per ton, making the yield of an acre worth \$133, of which more than half is now used to pay cost of transportation to the market.

This plant has been cultivated such a short while that little is known practically of the best methods to handle it, but it is thought best to plant as Irish potatoes and irrigate and cultivate alternately during the winter season, and then dig by machine, such as is used in digging the large Irish potato crops of the Eastern States. Though this plant will exist and reproduce itself under most severe conditions, yet it will appreciate all the attention that can be given it through securing moisture, fertility and a deep, loose soil.

The value of this plant first became known in Texas, where it is a natural growth, and it now seems that it will be a matter of short while before capital will locate the necessary slicing factories and distilleries for extracting the tannin within the borders of this State. The field is certainly promising, since the raw material for the production of leather is in the greatest abundance in this State. Nowhere else in the union can leather be made so cheap as in this State, where cheap tannin and cheap hides are found at the very gates of the tannery. Tannic acid is usually extracted from oak and hemlock, found largely in the Eastern and North-eastern States.

I am indebted to Bulletin No. 7, of the Tucson (Ariz.) Experiment Station, for all of the above information, and suggest that you write them for such publication and ask them such questions as you deem proper.

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GAINESVILLE, TEX.

Mr. ——— suggests that sweet potatoes impoverish the soil. Is he correct?

Would you advise underdraining rolling upland of clayey character, where the rainfall ranges from twenty inches to forty-five inches per annum? Have you a geological section of the formation on the College Farm?

G. H. R.

Replying to your question of whether or not it would pay to drain rolling upland of clayey character, would advise that you should not practice tile drainage upon this soil unless you intend to cultivate it upon a more intensive plan than is commonly adopted with ordinary soils. The reason for this is that the addition of tile to soil increases the cost of the land per acre from 100 to 250 per cent. in the South, and unless greater effort is made to utilize the acre, by manuring freely and cropping heavy, the investment of money in tile will not give satisfactory results.

I regret that we have not a geological section of the land on the College Farm, but I can state that the first seven inches is sandy loam, underlaid by very tenacious blue clay, which reaches to a depth of ten to fifteen feet.

In regard to the draught upon the soil with the sweet potato crop, I

would state, as an opinion, that sweet potatoes do not draw so heavily upon the plant food contained in the soil as do many of the grains, such as corn, wheat, oats, etc. In order that you may compare these crops for yourself, I supply you with the proportions of the essential manural elements found in the tuber of the sweet potato compared to the grain of corn:

Corn contains 1.82 of nitrogen, 0.7 of phosphoric acid and 0.40 of potash. Sweet potatoes contain 0.24 of nitrogen, 0.08 of phosphoric acid and 0.27 of potash. (Figures represent per cent.)

Estimating an average yield of sweet potatoes to be 200 bushels per acre (of fifty pounds to the acre), a total crop of 10,000 pounds gross, we see that it removes from the soil 24 pounds of nitrogen, 8 pounds of phosphoric acid and 3 pounds of potash: while the corn crop of 40 bushels (56 pounds to the bushel) per acre, removes 40.7 pounds of nitrogen, 15.68 pounds of phosphoric acid and 8.96 pounds of potash, in the grain alone. I have not considered the fertilizing elements removed, either by tops of potatoes or stalks of corn, since these are, or may be, returned to the land.

I hope you have sent for Farm and Ranch, of the 10th instant, containing articles on silos.

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SAN ANTONIO, TEX.

Will you be kind enough to send me any literature you may have bearing upon the cultivation of alfalfa and the ramie plant? I am much interested in these two plants, and any expense attached to this request I will cheerfully meet.

A. C. R.

I take pleasure in forwarding you a small pamphlet on jute culture and its manufacture, published by the Weatherford Native Jute Rope Manufacturing Company, Weatherford, Tex. Write Prof. Felix Fremeroy, Galveston, Tex., for publications concerning the manufacture of Ramie.

The growth of alfalfa can be assured upon any soil into which the roots can easily penetrate, by protecting from weeds the first year (cultivating), and supplying the necessary moisture. This plant is well adapted to much of the semi-arid soil of the "great West," because it thrives under dry conditions where other plants fail. Prepare the land well and sow in early fall or early spring, in drills eighteen inches apart, fifteen pounds of seed per acre. Cultivate lightly the first season and the crop will thrive upon the land described.

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BERLIN, WIS.

We are interested in Southern Texas, Velasco and vicinity particularly, and want information regarding dairying—both cheese making and creamery butter making.

Are there any factories making a good quality of cheese or butter, by separator process, in Southern Texas? Are there any climatic difficulties in the way of making a good quality of cheese and butter there?

At what price can cows for dairy purposes be procured? How good are they? What are usual prices for both butter and cheese throughout the year? At what cost per pound can creamery (separator process) butter be produced? Here it costs about two and one-half cents per pound to make,

butter bringing sixteen cents in summer and thirty cents in winter. It is a very profitable line of farming here. Our town markets the product of thirty-five cheese factories. Texas consumes large quantities of Northern butter and cheese, and as we are working for the interests of Velasco, we are anxious to get reliable information as to the prospect for dairying down there. An early reply will be considered a great favor to us.

W. & T.

There is very little climatic difficulty in the way of making butter or cheese in this State. Your main difficulty will be in obtaining cows that will be profitable yielders of milk. Furthermore, you will have to depend very largely on your own herd, as you will doubtless have no success, for a few years, in trying to operate joint stock or co-operative creamery, either for butter or for cheese.

We have a creamery here at the College which we have used for butter four or five years, most of our product being consumed at the students' boarding hall, but when sold on the market it readily commands thirty cents per pound on yearly contracts.

The Velasco country is a good country. Of course, at present it is rather classed in the category of boom lands, but, if properly developed, will be very productive. Some parts of this territory are subject to overflow from the Brazos River, and must, therefore, be leveed to prevent such disaster. The soil is remarkably rich and, when not overflowed, yields largely of cotton and is fair for sugar cane, sorghum, corn and all kinds of root crops. The natural grasses you cannot depend on for dairy purposes, and must, therefore, grow some soiling crop, such as sorghum and cow peas, for summer feeding and put up ensilage for winter.

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MADISON, WIS.

I enclose herewith a number of questions relative to the conduct of your College creamery, which I wish you would answer as best you can:

1. Number of years creamery has been in operation?
2. Do you make butter, cheese, or both?
3. About how much milk is received daily during the summer?
4. How much milk is received daily during the winter?
5. How far from the creamery do the furthest patrons live?
6. Does the creamery pay for drawing the milk, or the patrons?
7. Does each patron bring his own milk, or do groups of them combine, paying a common carrier?
8. Does the College buy the milk, or work on the co-operative plan?
9. If it buys the milk, about what price is paid at different seasons?
10. If the College makes up for so much a hundred, what price is charged for making butter?
11. What price for making cheese?

W. A. H.

The questions which you have submitted and the information you really desire are for strict commercial creameries.

Our own, in which we are now prepared for instruction in both butter and cheese making, is entirely a private affair of the College and Station. When first started, we attempted the outside patronage work, but for our conditions here, with scattered and comparatively few cows, found this unsatisfactory and narrowed down to our own herd. We run from 800 to 1,200 pounds of milk daily, and the work is done entirely by our students as instructive labor, under the supervision of myself or my assistant.

Our creamery has been in operation four years as a butter creamery ; our cheese building attached to the butter factory has recently been completed. From my own personal experience in butter and cheese factories in the West, before coming to Texas, I would state, without hesitation, that if I were starting your creamery for the purposes you have so plainly stated, I would start it on the test plan, paying for milk on a fat basis, both for butter and cheese, as I believe that it will prove more satisfactory to all concerned. As to matters of instruction, your superintendent or assistant will have to keep a careful watch in order to keep up the commercial quality of the butter, and I presume you will find it necessary to have a smaller concern attached, in which you can handle the milk from your own herd primarily for instructive and experimental uses. This is why I am so well satisfied to run our own work of this character solely with milk from our own herd. We keep our fresh cows evenly distributed throughout the year, and keep constantly in milk from forty to eighty cows.

\* \* \*

HOUSTON, TEX.

Some time since the Station tried some experiments with sweet milk and pepsin, and will you kindly let me know the results? That is, what is the best method of making that style of butter?

I am well fixed for that kind of butter, as I run two wagons per day in this city and could only deliver that butter for immediate use daily. I understand that butter color is used to color cooking butter. I think I can sell just lots of it daily at fifteen cents per pound, for cooking.

T. C. W.

Yours of the 17th inst., inquiring about black pepsin, received. Will state that we have not used this material in any form at the Station. The material has been blacklisted by all who appreciate the claim that it makes, namely, "brings more butter out of milk than exists in it," and it is now stamped as one of the lowest frauds practiced on the people of the United States. I would regret very much to see purchases made of this material with the intention of selling the stuff for butter, as it is a clear case of food adulteration and is punishable as such. Nevertheless, many people throughout the United States, appreciating this fact, have attempted to defraud their customers, and have only succeeded in being defrauded by the company which manufactures and sells this preparation.

SAN ANTONIO, TEX.

Will you tell me how to preserve milk sweet, and so enable me to carry milk over from day to day without feeding it as slop. Am in the milk selling business and the waste is considerable. Boiling will keep it, but gives it a bad taste.

I have a friend who would be pleased to put a sterilizing plant in a centrally located town of Texas. What chemicals would be used and what would be needed to establish such a plant?

T. C. W.

The first requisite for the success of your friend in this enterprise is to determine what profitable amount of milk can be sold within easy reach of his establishment. This point fixed, the cost of plant must be considered. This item is not a heavy one and consists of cans, refrigerators and milk aerators, etc. The only principle now used in the sterilizing

of milk is what is known as the Pasteurizing system, in which the fresh milk is heated to a temperature of 165° Fahr., and remains at this temperature for some five minutes, and is immediately afterward refrigerated to a point as low as 40°. This leaves the milk free from the boiled taste and guarantees its remaining sweet triple the length of time it would under the same atmospheric conditions without treatment. No chemicals can be safely used in milk which is being treated for human consumption, and it is not attempted by any reliable firm. Pasteurized milk is safely used for infants, invalids and general city consumption, as above described, being marketed in half-pint and half gallon, hermetically sealed jars.

Having only recently come to this State, I am unable to advise you which is the best location for such a plant as contemplated. The only conditions necessary are city markets and proper advertisement of the milk so prepared. Cost of plant, not to exceed \$1,000, including machinery and house. The labor of handling milk, cost of ice and fuel and freight rates on shipments would be the items for running expenses.

If you have any further definite questions to ask regarding the business, I will be pleased to reply promptly.

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CARLISLE, ARK.

Can you give me any information about hand cream separators? I am thinking of buying one, if they will do as well as the manufacturers say they do. I am told by one man that he thinks it impossible to run the machine fast enough to get all the cream. If you know them to be good, will you please tell me which you think is the best, and give the address of all the makers of hand separators?

T. H. S.

I have worked the DeLaval hand separator for several years, and it does just as perfect work as the power machine. You can rely on all the manufacturers say concerning it. Their address is No. 74 Cortlandt street, New York city.

Another machine which is highly recommended, but with which I am not familiar, is the United States hand separator, manufactured by the Vermont Farm and Machine Company, Bellows Falls, Vt. You will find in these machines a great saving of the cream, which you have been wasting by the setting process (a necessity in your latitude). Of the two styles of machine made by the DeLaval Separator Company, I prefer the "horizontal" to the "vertical."

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OVERTON, TEX.

I milk fifteen cows and save the milk for butter. I read that all of the butter cannot be secured from the milk by the common method of setting to raise the cream. Will it pay me to buy a hand separator for fifteen cows? What is the best make and will they do reliable work?

I. D.

I take pleasure in recommending to you the DeLaval Alpha as a hand separator for handling the milk of fifteen cows. You will find that it will save you a great deal of labor and waste at the churn, which means money. This is the greatest improvement in the hand separator and is guaranteed to do satisfactory work. Write DeLaval Separator Company, 74 Cortlandt street, New York city, for prices and circular.



## REPORT OF THE CHEMIST.

Prof. J. H. Connell, Director.

DEAR SIR:—Herewith I present my Annual Report. In Bulletin No. 29 we have published results of work upon butter and other animal fats. We have done considerable work in miscellaneous analyses, including soils, marls, fertilizers, minerals and mineral waters, that will appear later in bulletin form.

We are just beginning a systematic examination of cotton seed oil, and will report upon this later in separate bulletin form.

In connection with Mr. J. W. Carson, I beg leave to submit notes upon an investigation of remedies for "cotton root rot" or "cotton blight," which we have together conducted. Some of the correspondence relating to this, in answer to inquiries made by us, is likely to prove of public interest and is therefore presented:—Mr. H. C. Moore, of Black Jack Springs, writes, "I thought I would give you the experience of myself and some of my neighbors, in regard to cotton dying. I have one acre of ground on which cotton all died every year. I manured half of it heavily from my cow pen in the fall, at the same time plowed it in deep. The next year the cotton died on the unfertilized land early as usual, before the bolls were half grown; while that on the manured land remained green until it matured about two-thirds of a crop.

I have a five acre piece on which cotton dies tolerably bad. Five or six years ago, when the cotton was about half thigh high, I commenced to plow it over, and plowed one day with a sweep, and the following night there came a heavy rain, and it was several days before I could finish plowing the piece. Just as far as I plowed that day the cotton died much worse than on the rest of the piece.

One of my neighbors once planted four rows of sweet potatoes through his field; the next year he planted the potato land and on either side in cotton. That on the potato rows nearly all died while in early bloom, while the rest of the field was comparatively green.

Another neighbor had a small piece of land on which the cotton all died before maturing any bolls. He planted it in sorghum two years in succession and the next year it produced a fine crop of cotton, none of it dying.

Cotton does not die on new land; it is generally the third or fourth year before it dies to amount to anything. If old land is thrown out three or four years, cotton will not die on it then the first year. Land planted in oats or corn two or three years in succession helps the cause considerably."

Mr. G. T. Schattenberg, of Boerne, says:—"I have something over twenty acres in cotton this year on some ground where I had it last year,

and a large percentage of it died last season with cotton root rot. It is just now again beginning to die (30th of June), and strange to me, some old stalks that did not die last year, and sprouted again from the root, have made big stalks full of squares and half grown bolls by this time, are now dying. I have also several bearing apple, cherry and plum trees that died this spring at, and after blossoming, with what I believe to be the same disease."

Hon. Jo Abbott, of Hillsboro, says:—"I beg leave to give the result of a single experiment I made several years ago. Near my residence I had a small piece of ground which I had designed for a vegetable garden. I soon found that potatoes, especially sweet potatoes, as well as other root vegetables would die, and when dead would be covered with a white mould. Not knowing the ground was unfit for trees, I concluded to substitute an orchard in place of a garden. I planted the apple, pear and cherry on this particular part where root crops had died, the greater number died the first year, the balance the next. I had observed that the trees, as well as the root crops, as a rule would die during summer when the weather was hot, and the blight seemed to strike them one or two days after a rain. To ascertain the cause I had a dozen or more holes bored in the ground to the full depth of the shaft of an ordinary six inch ground auger. This was immediately after a heavy summer shower. Water rose in these holes which soon became covered with a black looking scum. By means of an iron spoon, I removed the scum, which I heated on a stove and to which I touched a match. It burnt well leaving nothing but a black cinder, the fumes were those of crude petroleum. I therefore concluded that there was a small quantity of crude oil in the earth, from which a gas produced by summer heat was probably continuously escaping through the cracks in the earth in dry, hot weather, and which are temporarily closed up by the rain; hence plants and trees died worse then than at other times. The ground is of a black, waxy nature and cracks badly in very dry weather. Deep openings or under drainage will to a great extent cure the land of this poisonous gas."

Mr. A. H. Eck, of Bluff, Texas, says: "The disease is not every year alike. Sudden changes of the weather, a dry period followed by a hot one, is more apt to increase or produce the disease. The soil we cultivate is of a black color, hog wallow, black sand, mixed with shells, and some parts with pebbles, but the underground is everywhere the same. Yellow white clay mixed with clay, and the clay limestone. In 1884 my entire crop was destroyed by hail storm. I replanted on the last week of May; that year no cotton died. "I tried all remedies that are recommended as preventatives. I manured the land but it increased the disease. I drew no center furrow in bedding the ground, but did not prove beneficial. The only remedy I found is late planting; say from 15th to 20th of May; and to leave no loose ground and decayed and vegetable matters around the plants after the squares have made their appearance. It is my belief that an excess of "alkali" in the ground is the principal cause of the disease."

Mr. G. L. Stone, of McGregor, says: "I have experimented with salt

in the drill for three years, and have had good results. First tried on a piece of ground where all the cotton had died the year before, lost with salt about ten per cent; the second year with use of salt, about five per cent; the third year about two per cent."

Mr. Stone also gives the experience of Mr. R. F. Moore, of Oglesby, Texas: "Had one acre of land on which the cotton all died; in December of that year he sowed salt broadcast, about like a big morning frost, and turned the land over. The next year only about five per cent of the cotton died. He sowed it in salt the following fall and the succeeding year, lost no cotton at all from blight."

The results which we here attain are so far negative and may be summarized as follows:

1st. Cotton seed hulls and meal in water furrow and land bedded on same in spring before planting first of April. Later on barn yard manure applied on each side six inches from drill.

2d. Raw Bone superphosphate was applied in spring as No. 1, and cotton seed meal put in later as in No. 1.

3d. *Kainit* harrowed in near the drill in spring; same with common salt.

No appreciable benefit from any of the above tests. Conducted at Navasota, Texas.

At McGregor and at Forney, tests were made on the black lands: Lime and wheat straw and chaff were applied in early spring at Forney, beneath the surface. At McGregor, lime, cotton seed, subsoiling, green wheat and salt mixed, green wheat alone, and rotted straw in the drill, were all tried on separate plats. All of these, compared to soil cultivated in the regular way, without any application, gave same benefit. Green wheat and salt mixed, giving the best results. It being estimated that about one thirtieth of the cotton died. While on plat cultivated in regular manner, it was estimated that about one half of the cotton died.

At Forney, the results were all negative.

From our observations and investigation up to the present, we believe:

1st. That the disease is not caused by any abnormal constituent of the soil, such as "alkali", iron in the Ferrus state, too much lime, or presence of sulphuric acid; which have from time to time been presented in explanation of the disease. But that it is caused by a microscopic organism, as set forth in Bulletin No. 4, this station.

2d. That rotation of crops, especially where cotton is left off for two years, will greatly aid in removing the trouble.

3d. It is doubtful if fertilizers in general, give any real benefit, except perhaps to induce a stronger and more vigorous plant, better able to resist disease. At the same time, making it mature earlier, or shortening the time of growth.

4th. Fungicides, or antiseptics, harmless to plant life are likely to give better results than ordinary fertilizers. Common salt may prove beneficial in this direction, but of course the continued application of common salt to a soil must be attended with the utmost care; as it is, itself, in time sure to injure the soil if it accumulates in any great quantity.

Respectfully Submitted,

H. H. HARRINGTON, Chemist.

## REPORT OF THE VETERINARIAN.

COLLEGE STATION, TEXAS, FEB. 12, 1894.

J. H. CONNELL, Director of Experiment Station.

SIR:—I hereby present the following report of the Veterinary Department for 1893.

The work of the past year has been of a varied character and embraces the following lines of work:

- 1st. A study of the effects of Mallien on horses affected with glanders.
- 2d. The effect of Iodide of Potash on cattle affected with Actini-nycosis, or lumpy jaw.
- 3d. A review of the parasites of our domestic animals with reference to their geographical distribution.
- 4th. Some experiments on the relation of the cattle tick to Texas fever of cattle.
- 5th. A study of the methods of destroying ticks. The above is now in manuscript and will be presented for publication at once.

I am Yours,

M. FRANCIS, Veterinarian.

## VETERINARY CORRESPONDENCE.

### DISEASES OF ANIMALS AND TREATMENT.

HARTLEY, TEXAS.

The colt that Mr. Jarrett wrote you about some time since is better. He followed your treatment by poulticing and then lancing. We are now having trouble with cattle. The first symptom is running at the nose, a yellowish discharge, in considerable quantities, about twenty-four hours after the disease appears to notice, the grown cattle seem to be crazy, wont notice you at all, and travel around in a circle, will neither eat nor drink, on or about the seventh day they die, and never seem to get better during their sickness but gradually grow worse, until they die. The calves you will notice the discharge as with the grown cattle, but they seem to be crazy in about two hours after you notice that they are affected, and seem wild from the beginning of the disease and grow worse until they are perfectly crazy, and run around and throw their heads back, fall down and tremble and bawl, and die with a fit, similar to a dog that dies with strychnine, and die in twenty-four hours of appearance of disease.

Some parties claim that the disease is brought on from ticks being in the ears. It is a fact that the cattle here have ticks in their ears. Others claim that the disease is brought on from eating "Loco," a weed that grows in this country.

Please give us your views and all the information you can. If you cannot decide what the disease is please suggest some treatment that we can experiment with.

If you have a treatment for "Loco" kindly tell us what it is, as we often have saddle horses affected.

Would be pleased to hear from you as soon as possible, as we now have cattle affected, and if you can consistently do so give us an article in the Farm and Ranch, as it will be of untold value to the Panhandle.

Hoping to hear from you at once, I am yours respectfully,

S. V. MEEC.

P. S. Since writing the above, I went out and opened cows' heads that died this morning affected as above described, and found the brain filled with water, and parties with me thought the brain more rotten than in ordinary cattle. I think there was at least a teacup full of pure water in and around the brain.

S. V. M.

DUBLIN, TEXAS.

I have a fine heifer that had something like a fatty tuber to come in her juglar vein that I had to cut out in September. It has been there four months and weighed about two pounds. It got worms in it after it was cut out and I got them out of it and it was nearly all healed up. It then puffed again. It has three holes in it the size of your little finger that a white pus comes out, and when she rubs it the sore seems to be full of little worms or little holes full of pus or matter. The sore is as large as the palm of your hand, and I am unable to get it to heal. Have not found anyone who can tell what it was at first. Please give this your early attention, and if there is something that will cure it I want it.

T. E. D.

From your letter I am inclined to think you have what is known as the "Big Jaw." I would suggest that you try Iodine of Potash. Get two ounces of Iodine of Potash at a drug store and divide it into twelve doses. Give one dose night and morning in water with a bottle, by way of the mouth. In several days you will probably notice running from the nose, eyes and mouth. I think you may need to repeat the treatment in three or four weeks. I would not give the tuber local treatment.

DUBLIN, TEXAS.

The sore is on the upper side of her jaw between her lower jaw on the fleshy part. It is not on the side of her head. She is heavy with calf and is "springing." Would it be safe to give the medicine you spoke of? She is in good health in every other way and seems to be hardy, and the sore does not seem to hurt her, only when she is eating she seems to swallow hard. This is not like the Big Jaw. She stays in fine condition all the time. When I cut it out it was as pure fat as I ever saw.

T. E. D.

In your former letter you spoke of your Jersey as being a heifer. So I took it to mean that she is not a calf, but since in your last, you state that she is heavy in calf, I must say that it would not be safe to give the Iodine of Potash while in that condition. I would try injections of carbolic acid into the abscess and wait developments, or try the compound tincture of Iodine in the same manner.

ABERFOYLE, TEXAS.

In bulletin No. 24 on the "Cattle Tick" you speak of having tried Cannon's, Hayward's and Little's Sheep Dip.

I have some stock horses in timber bottom pasture that have millions of ticks on them, they have killed two colts. I have tried Lowe's Sheep Dip. It is Crysilic preparation. The directions say not to use more than ten pounds to fifty gallons of water. but I have used it stronger, 'til it dried it stuck together like molasses and it don't kill many. I have not tried it long enough to test it sufficiently. I wish to know if the other sheep dips are Crysilic preparations, and if you can suggest any remedy for the pest. The horses are covered, so that you could not stick a pin to the hide without piercing a tick. Some of them are as large as the end of your finger when full. Under them a layer about the size and length of wheat grains.

I visited Hon. Robert Kleberg's ranch and saw his dipper in operation. It is a success, costs about \$75 if made of cypress or cheaper if made of pine. He used a dip made by C. H. Michallis (Cor. P. O. and Tremont Sts. Galveston,) cost about 60 cents per gallon in gallon lots, F. O. B. \*This is to be mixed with water one to sixty-five, which makes this solution cost one cent per gallon. I suppose any of the standard sheep dips will do. Do not use lime and sulphur. Mr. Kleberg tried it and killed 150 head of cattle.

COLUMBUS, TEXAS.

Please tell me a remedy for hooks in the eyes of horses.

There are two diseases called hooks in Texas. First, whenever you see the spasms of the muscles of the eye ball, as in Tetanus or lock jaw, we notice. I do not suppose you have Tetanus to contend with.

Second, in catarrhal conditions of the eye we notice matter in the inner corner of the eye, and inflammation and swelling of the parts causing a protusion of the jaw. I presume this is what you have.

I have had good results with a lotion of Morphine, two grains to the ounce of rain water, washed twice or use Muriate of Cocaine.

FARMERSVILLE, TEXAS.

Yours of the 8th, asking further information in regard to cause of the lameness in my mare is received. The disease no doubt has been acting for some time, and I think from the time she was pulled out of a bog, which probably strained the muscles of her back, but at the time she showed no signs of lameness whatever. She only favored that limb very little, hardly perceptible at first, but has been growing worse all the time until she is in a precarious condition. Her last colt is about eight or probably nine months old, and I thought her with foal until about ten days ago. It cannot be the disease so often called Sweeney because there has been no chance for inactivity of the muscles of the limb—no lameness before this set in, to my knowledge. She has been on the range for four months or more therefore having chance for plenty of exercise, and she could not have been lame for more than one or two days before she was brought to the lot, because she among the balance are seen every day or so. I see no other cause and the way it effects the mare was described in the previous writing. Any remedy offered will be applied and your trouble will receive compensation if you require it.

P. S. She bogged twice and freed herself by her own efforts, which tried every nerve in her, so a man from the ranch tells me.

W. F. P.

I would suggest a mild liniment applied to the hip and sweenied muscles, viz:

Spirits of Camphor .....	12 OZ.
Spirits of Lavender, camp.....	4 drachms.
Chloroform.....	2 OZ.
Pulverized Cantharides.....	1 drachm.

Mixed, applied once a week.

Combine good feeding tonic, say:

Sulphate of Iron.....	2 OZ.
Pulverized Nux Vomica.....	1 OZ.
Pulverized Gentian root.....	8 OZ.
Pulverized Ginger root.....	8 OZ.
"Fenugreek" seed.....	1 OZ.

Mix and give a teaspoonful twice a day for a month.

GRANBURY, TEXAS.

We have a registered Jersey cow that her youngest calf is now over three years old. Have had her with a number of bulls. Please give cause and remedy and oblige?

H. H. G.

What is the remedy for blind tooth after it has broke and formed a sore?

Sterility is rather common among cows, and our object is to ascertain the cause and remove it. You are very well aware that the hybrids and monstrosities are, as a rule, permanently sterile, and female calves calved with males usually are.

In the case you mention it seems that there is some obstructions to the opening of the uterus.

Since you mention that the cow is very fat it is possible that there may be fatty degeneration of the ovaries. This of course will prevent conception. There may be also morbid secretion from the mucus membrane of the reproductive organs that destroy the vitality of the male element. In the case you describe, I would suggest the following:

First. Reduce the cow in flesh to ordinary breeding condition.

Second. Spring being the natural season for cattle to breed, will be the best time to attempt the treatment.

Third. When you notice the bull following the cow rope her and introduce your hand and dilate the opening to the uterus with your fingers. There are instruments made for the purpose but I believe the fingers are by far the best. The so-called "impregnators" advertised in stock journals are humbugs.

Fourth. Then allow the bull to serve her. I believe you will be most likely to succeed if you let a vigorous young bull run with her constantly. I have succeeded in a number of cases with cows that were reported as hopeless. I beg to add that it would not be wise to use any perfumed soap on the arm, as I have noticed that sometimes the bull will refuse to serve her if there is an unnatural odor to the parts. I think plain vasiline or oil the best to lubricate the arm. In case these fail or you do not notice seasons of bulling I would try the Fluid Extract of Damiana to stimulate the sexual organs, or perhaps Cantharides or Phosphorus but I think you will hardly find it necessary to resort to such drugs.

Please let me hear how you succeed. In regard to the blind tooth will say that you don't state which tooth it is, whether in the upper or lower jaw, or the age of the horse, or my answer must be a general one. In the majority of cases which I have seen it is caries of the root of the third or fourth tooth in the upper jaw, about one-half way from the eye to the nostrils, and in horses about three or four years old. I know of nothing except to remove the tooth. To do this you make a hole in the flesh about the size of a twenty-five cent piece over the root of the tooth to the bone, with the probe following the opening and note its directions. Then bore a hole in the bone 1-16 or 3-4 of an inch in diameter to the root of the tooth. Then take a punch or bolt, place it on the tooth and one or two smart taps with a mallet will drive it out into the mouth. Be sure to keep one hand in the mouth to secure the loosened tooth, as there is danger of the animal swallowing it. Wash out the hole daily for a week. You will probably find it necessary to use a stick the size of a lead pencil to push food out of the cavity before using the syringe.

Also keep your finger over the hole when the animal drinks water, as some horses have great difficulty in drinking for several days. It is probably well to use something in the water you used in their syringe. I use Permanganate of Potash. One half drachm to one bucket of water. It has been found satisfactory with me.



## REPORT OF THE HORTICULTURIST.

COLLEGE STATION, TEXAS, JAN. 31, 1894.

J. H. CONNELL, Director.

DEAR SIR:—In accordance with your request I present herewith the report of the department of Horticulture, Botany and Entomology for the year 1893.

The work has been pushed in the above mentioned subjects during the past year as far as the force and the equipment permitted.

## HORTICULTURE.

Notwithstanding the unfavorable season last year the orchards and vineyards have made good growth and are now in very fair condition.

Eighty-nine varieties of peaches fruited for the first time in the peach orchard and we now have full notes upon them awaiting publication. Below is given a list of twelve of the most promising varieties tested so far. They are arranged in the order of their ripening: Mamie Ross (free), Lady Ingold (free), Family Favorite (half-free), Foster (free), Chinese Cling, Spottswood (free), Picquett's Free (free), Ford's No. 2 (free), Price's Free (free), Lord Palmerston (free) and Smock (free).

Thirty-six varieties of plums fruited during the year upon which we also have full notes. The following list includes some of the most promising. They are arranged in the order of ripening: Caddo Chief, Transparent, Lone Star, Coeletta, Munson, Wild Goose, Marianna, Botan, Hattankin and Paris Bell.

The Herbemont and the Le Noir grapes are all that are promising which have so far fruited.

We have thought it desirable to test the new hybrids originated in this state by T. V. Munson, many of which are very promising, and therefore have set a new vineyard including his entire list and seventy-nine other varieties from Bush & Son and Meisner, making in all two hundred and three varieties. They have been arranged according to Mr. Munson's system of classification. The original wild species were placed first in the rows and followed immediately by their respective hybrids so that botanical comparisons of fruit and vine can readily be made.

Twenty varieties of pears have been added to the pear orchards.

A new pear orchard of three acres has been set to produce fruit for the Mess Hall.

A new peach orchard has been set to test the longevity and fruit bearing qualities of trees grown from seed planted in the orchard where the

trees are to remain and their entire root system left undisturbed, and trees budded and transplanted into the orchard in the usual manner.

During the year we have tested three hundred varieties of vegetables, comprising tomatoes, cauliflower, cabbage, sweet potatoes, onions, beans, peas, and radishes.

The results of the test of sweet potatoes are published in bulletin No. 28, together with botanical classification of varieties.

#### A NEW METHOD OF BUDDING.

By a method we have used here during the past year we were enabled to bud trees and cuttings successfully during the winter when the sap is said to be dormant. The method is simply to cut a slice of bark down stock, leaving it still attached to the stock at the lower end to help hold the bud. Part of the loose slip is then cut off and the bud fitted over the cut place with the lower end being held firmly by the part of the slip left. A piece of raffia is then tied around the bud to hold it firmly. On last January the 15th, we budded fifty young seedling peach trees, by the above method. On January 24th, they were examined and were found to have "knit" firmly to the stock. Of the fifty buds attached only one failed to make a shoot in the spring and it was accidentally killed. By this method one year's growth is gained over the old method. We also budded trees and kept them in sphagnum moss like regular grafted trees are kept.

#### BOTANY.

A collection of four hundred injurious species of fungi, neatly mounted, has been added to the herbarium which greatly aids us in our work with plant diseases.

Specimens of grasses and forage plants are also continually being added to the herbarium.

By request we sent a small collection of grasses to the World's Fair.

A number of grasses have been sent to us for identification by farmers of the state.

The bulletin issued by this department on the Black Rot of the Grape with treatment is being used, with some of the cuts, by an author in revising one of our text books on grape culture.

An experiment upon pear blight has been planned and is now under way. Through the kindness of Dr. Thos. C. Foster, of Navasota, we were permitted to carry on this experiment upon his orchard.

#### ENTOMOLOGY.

The Plum Curculio made a serious attack late in the summer upon the plum and peach orchards. In some instances where we had not sprayed, it destroyed almost the entire crop. Where we had sprayed with three ounces of London Purple with every twenty-five gallons of Bordeaux mixture, as high as 90 per cent. of the fruit was saved, while in other instances as low as 50 per cent. was lost.

While we will try other methods of combatting this serious pest this year, we think it best to plant only those varieties which are most resis-

tant to the insect, such as Marianna, Paris Bell, Munson and Transparent plums and those peaches which have a heavy down.

We have tested the effects of several substances upon weevils injurious to stored grain and seeds, also their effect upon the germination of seed, the results of which are about ready for publication.

#### INSTITUTES.

The head of this department was sent as a delegate to the meeting of the State Horticultural Society at Rockport in June. The leading horticulturists of the State were at the meeting, which lasted three days. A paper was read upon plant diseases and their treatment. A request was received to attend a Farmers' Institute on August 4th, at Bowie and also to attend one at Georgetown, August 31st, and deliver addresses.

#### CORRESPONDENCE.

The correspondence of this department during the past year was heavy. In looking over the letters now on file from parties in different parts of the State, we find a wide range of subjects embraced. In some cases it required careful research and investigation before the desired information could be given. Below are a few letters of a more general nature together with the reply:

PILOT POINT, TEXAS.

Your answer to the following will greatly aid us in supplying the needed information:

- 1st. Do you apply fertilizers to your orchard? If so what kinds do you use and what results follow?
- 2nd. Do you prefer broadcasting the manure or do you apply it close to the trees?
- 3rd. Do you regard cultivation necessary to produce the best results in fruit growing? If so, what kind of culture do you give your trees?
- 4th. Are you troubled with insects, such as the borer, caterpillar, codlin moth, curculio, etc., and what methods and remedies have you found most effective in their destruction?
- 5th. Have you any experience with the use of copper salts, in the form of Bordeaux mixture, etc., in testing rot on the peach, apple, pear, etc? If so, are you encouraged to hope for success in preventing the serious damage heretofore sustained from those pungous diseases?
- 6th. What would you do with a blighted pear tree?

A. M. R.

1. I find well composted barnyard manure to be excellent when spread around young orchard trees. Ashes and chip dirt have also given good results. In the orchard here nothing has been usual except to turn under, last summer, a crop of cow peas. This I consider one of the best and cheapest fertilizers for our orchards in the south. For all purposes I don't consider cotton seed meal the best because its high per cent. of nitrogen is apt to keep up growth too late in the fall and prevent the wood from ripening well to the detriment of the fruit.

2. While the trees are young I prefer to apply the fertilizer around the trees in a radius of six to eight feet, and mix it with the soil. If trees are of considerable age, or if an old orchard is to be renovated I prefer the fertilizer broadcasted. We never put fertilizer in the hole where the tree is to be set.

3. I regard cultivation necessary to grow the finest trees, and therefore indirectly to the production of the finest fruit.

Of course a great deal may be meant by cultivation, and it must be done judiciously. We can control fruiting to a considerable extent by

cultivating. The object of a tree, of course, in producing fruit is to reproduce itself and nature always makes the greatest effort when the life of the tree is threatened. We take advantage of this natural law when our trees have reached the age when they should bear fruit and the growth still goes to wood, by ceasing to cultivate and to apply ferterlizers.

Our trees are young and our object has been to produce wood. As they are reaching the period at which we think they should bear, we cease to cultivate in July, so that fruit buds may mature.

4. We are troubled but little with borers. Other places where they were serious I have used a paint successfully on trees to prevent them. This paint prevented at the same time injury from mice and rabbits. The cost did not exceed one and one-half cents per tree. It consisted of white lead with a little arsenic stirred into it. The ground was taken away from the tree about two inches down, and all borers taken out and the tree was painted up the trunk about eighteen inches, and the dirt put back around it.

A thrifty growing tree will burst this paint in a short time and necessitate repainting again, about every two years. Of course young trees, before they are set in the orchard can be painted with much less cost.

The curculio attacked our peaches here last summer and did more injury than I had ever known it to do on the peach before. As such an attack in our experience was unusual we had not sprayed the peaches. We saved about ninety per cent of all the plums except the Kelsey, which was injured about two-thirds. We used three ounces of London Purple to twenty-five gallons of the Bordeaux mixture, which preparation we were using for fungous diseases. Since all the drupaceous fruits are more susceptible to injury by use of the arsenical poisons than the pomaceous fruits, they will seldom stand a preparation as strong as one pound of the arsenical poison to two hundred gallons of water, except when used with the Bordeaux. The jaring method has been used with success in some instances in checking the ravages of the curculio. In spraying for the codlin moth the poison should be put on when the bloom is ready to fall.

5. Yes, I have used the copper salts during the past four years in combating injurious fungi. I am led to believe the Bordeaux preparation the best for general use. In the case of black rot of the grape I have saved as high as 95 per cent. of the fruit from its attack. I have used it successfully in preventing many other diseases, and don't think the successful horticulturist can afford not to spray in the future.

6. No successful remedy or preventive for pear blight has ever been discovered. Cutting off the diseased limbs four inches below the attack and burning them has given good results in some instances. Spraying with the Bordeaux has prevented the attack to some extent upon the foliage. We began a series of experiments upon the pear blight in a large orchard last summer but no results have yet been reached. Some have thought unripened wood which is suddenly frozen in the fall conducive to blight, however, it is best for other considerations not to cultivate late in the fall in order that growth may cease and the wood ripen before winter.

Quite a number of letters have been received in regard to growing grapes on the coast of the State and at Rockport in particular. The answer to the following letter gives suggestions in regard to growing grapes on the "coast region" anywhere in the State:

SAN ANTONIO, TEXAS.

\*\*\* From the investigations which I have been able to make it seems very reasonable that the raising of table grapes for the early markets could be successfully and profitably carried on on the sub-irrigated lands about Rockport. \*\*\* I would be glad to have such information as you can conveniently give me upon the following inquiries:

1. What are the special reasons, if any, why this grape growing industry could be carried on more successfully at Rockport than at any other section and what if any other section offers equal advantages for that industry? What if any obstacles or difficulties exist at Rockport rendering doubtful the successful carrying on of the industry?
2. What particular land in and around Rockport is best adapted to this purpose and why?
3. What is your opinion from the investigations you have made of the subject as to what variety of grapes will thrive at Rockport and what varieties will not thrive?
4. What is your opinion from the investigations you have made as to whether the industry of production of early grapes for fruit could be successfully and profitably carried on at Rockport on a large scale?
5. If from your investigations your opinion is that this industry could be carried on at Rockport successfully, what would be the likelihood of finding profitable remunerative markets for the fruit and what if any advantages would the grape grower at Rockport have in the way of a market over the grape growers of other sections?

C. W. O.

1. The Vinifera varieties grow much better at Rockport than they do further north in the State. I think this due to the peculiar conditions of the soil and the climate there. With sub-irrigation and the loose sandy condition of the soil, a continuous supply of moisture is found near the surface during the driest weather. Rainfall is slight therefore making the conditions unfavorable to the growth of fungous diseases. Of course near the Gulf the atmosphere is saturated with moisture all the time. The California system of training is used successfully there, consequently the cost of trellising is not incurred. Grapes ripen earlier there than in California consequently they reach the market first. There is one obstacle, however, which has just presented itself and which the present growers have made little preparation to combat. It is the Black Rot. It remains to be seen how serious it may become there. I think, however,

2. That if land is selected a mile and a half away from the coast where the atmosphere is not so humid and so salty, and with careful spraying the Black Rot can be held in check.

3. Of the vinifera family the Malaga, Muscat of Alexander, Chasselas, and Zinfandle do well. Of the Aestivalis family, the Herbamont and Le Nore do very well. I would not plant many of the Labrusca family since they are rather risky and besides you would have all the table and wine grapes you would desire in the above varieties.

5. I believe growing early grapes for market on a large scale could be carried on profitably. Marketing facilities are not the best now, but would of course improve with the growth of the business. Much of the best land has a thick growth of brush upon it and would require a considerable outlay to have it taken off. I am informed that land companies there would sell land for such a purpose very reasonably.

5. I think there would be no trouble in finding a market even in this state for a large quantity of early grapes, since they would come in the market ahead of others. I believe this answers about all your questions, I might state further, however, that it might pay you to visit Mr. M. Kaltenbeach's vineyard at Rockport. I send you also a copy of my bulletin on Black Rot, in the back part of which you will find full instructions for treating Black Rot, which directions will also apply to many other grape diseases.

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By today's express I send you two hundred apple trees in the same bale, marked lot "A" and lot "B". One represents the short piece-root method of grafting the apple, and the trees in this lot are two to three years old as you will doubtless conclude. The other represents what is known as the whole root method, that is they were crown grafted on six to eight inches of not less than No. 1 seedling stock, these trees are one year old. In sending these trees to you and to more than a dozen other first class Horticulturalists and asking your candid opinions of the merits and comparative value of the two sets of trees, I assure you it is not for the purpose of aiding me or the firm of Stell & Clark in the sale of a few thousand trees. No such aid is needed or desired. I do it in the best interests of Horticulture.

W. W. S.

After further correspondence in regard to the history of the trees the following reply was sent:

The apple trees you sent to us February 11, have been received in good condition. Without giving any further information in regard to the conditions under which they grew further than to state that one lot was one year, whole root grafted stock, you simply ask me to give my "candid opinion of the merits and comparative value of the two sets of trees." In answer to the above without asking any questions and to simply take the trees as they are presented to the eye I do not hesitate to say that the whole root grafted stock is much better. I wish also to state that it appears that the piece root grafted trees grew in much less favorable soil and that they were scarcely set deep enough to take root from the scion. This opinion is given after careful notes were taken on the trees. We have started an experiment here to study the question further.

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#### GENERAL STATEMENTS.

The time of the head of this department is about equally divided between College and Station work. As stated in our former report, since this department is made to include the subject of Entomology our work necessarily covers a broader field than can be carried on with the present force in justice to the subjects of Horticulture and Botany.

We have felt the need of better equipments for work in the laboratory and in the field.

Until a green house is built for this department it will be greatly handicapped in testing seeds, vegetables and in the propagation of fruits.

Since the chief of the weather bureau at Washington has agreed to send through our request the weather predictions to this Station, we hope to save many of our plants in the spring when warned of an approaching "norther".

I have been greatly aided in the work during the year by Mr. H. Ness, the assistant in this department.

Yours very truly,  
R. H. PRICE,  
Professor Horticulture and Botany.

## REPORT OF METEOROLOGIST.

PROF. J. H. CONNELL, Director.

DEAR SIR:—In accordance with your request I present annual report of work in Meteorology for the past year.

No change has been made in our manner of taking observations, and the work has progressed in the same manner as indicated in previous reports.

I submit two brief tables, No. 1 a summary of observations for 1893, and No. 2 a comparison of the temperature and rain fall for the past five years.

TABLE NO. 1.

1893.	Barometer.	TEMPERATURE (FAHR.).			Rainfall.	Prevailing wind.
	Height in inches.	Mean.	Max.	Min.		
January .....	29.796	49.08	80.00	25.00	0.80	N
February .....	29.783	52.21	80.00	27.00	1.24	
March .....	29.795	58.42	90.00	33.00	2.17	
April .....	29.634	70.05	94.00	43.00	1.41	
May .....	29.593	72.43	99.00	50.00	9.10	
June.....	29.611	77.73	100.00	63.00	3.50	
July.....	29.667	82.32	106.00	70.00	0.45	
August.....	20.621	79.11	107.00	41.00	1.85	
September.....	29.651	80.00	104.00	63.00	1.75	
October.....	29.733	68.03	100.00	42.00	0.17	
November.....	29.739	56.71	83.00	29.00	5.59	
December.....	29.818	55.20	76.00	28.00	1.73	
Total .....	356.391	801.29	1119.30	515.00	29.76	
Average .....	29.699	66.77	93.25	42.92	2.48	S

TABLE NO. 2.

YEAR.	TEMPERATURE (FAHR.)			Rainfall.
	Mean.	Max.	Min.	
1889	66.04	89.30	46.79	50.58
1890	66.97	91.17	43.50	40.44
1891	66.13	91.33	43.08	42.28
1892	65.72	93.33	41.91	43.86
1893	66.77	93.25	42.92	29.76

During the fall a change was made in the position of the thermometers that will give more uniform readings of the temperature.

The "Weather Bureau" has agreed to send us daily forecasts in return



for the full weekly, monthly and annual reports we send in to them, but so far they have come in so irregularly that they have done little good. I would recommend that, unless we get the daily forecasts regularly, this work be dropped, for it is the only benefit we derive from it.

Respectfully submitted,

DUNCAN ADRIANCE, Meteorologist.

## FINANCIAL STATEMENT.

1892-93.

Texas Agricultural Experiment Station in account with United States Treasury Department for the year ending June 30, 1893.

To Cash United States Appropriation.....	\$15,000 00	
" Sundry receipts, earnings turned in to Station Treasury Fund.....	3168 95	
" Balance July 1, 1892, turned in to Station Treasury Fund.....	170 69	
By Cash Salaries.....		\$7894 96
" Chemical Department of Station.....		550 00
" Cheese Factory Building.....		374 60
" Cheese Factory Equipment.....		437 14
" Collecting soils etc., for World's Fair Co-operative Exhibit.....		169 73
" Expenses Delegates, Station meeting at New Orleans, Nov. 1892...		82 35
" Part expenses Carson and Curtis to visit cheese factories and study same.....		100 00
" Part expenses Harrington to meeting of Station Chemists.....		33 33
" General expenses of Station including Agricultural Department proper of Station as per items below:		
Labor.....		2790 45
Office Supplies.....		135 24
Printing Bulletin and Reports.....		898 42
Investigation Plant Diseases.....		9 00
Investigation Animal Diseases.....		52 11
Seeds and Plants.....		5 95
Equipments.....		37 30
Expense.....		500 72
Live Stock.....		224 00
Freight and Express.....		325 77
Grain and Feed.....		1362 16
By Balance Held as reserve in Station Treasury Fund by order of the Governing Board.....		2356 41
	<u>\$18339 64</u>	<u>\$18339 64</u>

Correct—E. &amp; O. E.

GEO. W. CURTIS, Director.

We the undersigned Finance Committee of the Board of Directors of the Agricultural and Mechanical College of Texas, and Governing Board of the Texas Agricultural Experiment Station, do hereby certify that we have examined the books and accounts of said Station for the Fiscal year ending June 30, 1893, that we have found same correctly kept and classified as required by law, the receipts and disbursements agreeing with stubs and vouchers on file in the Treasurer's office and found correct.

JOHN ADRIANCE,  
JOHN E. HOLLINGSWORTH,  
Finance Committee.

I certify that the foregoing statement is a true copy from the books of the Texas Agricultural Experiment Station.

L. S. ROSS, Treasurer.

The station was established during the winter of 1887-8, in accordance with

THE HATCH ACT,

an act of the Congress of the United States, approved by the President, as follows :

AN ACT to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established, under direction of the college or colleges or agricultural departments of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an act approved July second, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," or any of the supplements to said act, a department to be known and designated as an "agricultural experiment station;" *Provided,* That in any State or Territory in which two such colleges have been or may be established the appropriation hereinafter made to such State and Territory shall be equally divided between such colleges, unless the legislature of such State or Territory shall otherwise direct.

SEC. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical combination of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories.

SEC. 3. That in order to secure, as far as practicable, uniformity of methods and results in the work of said station, it shall be the duty of the United States Commissioner of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate, from time to time, such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as

will best promote the purposes of this act. It shall be the duty of each of said stations, annually, on or before the first day of February, to make the governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States.

SEC. 4. The bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same, and as far as the means of the stations will permit. Such bulletins or reports and the annual reports of said stations shall be transmitted in the mails of the United States free of charge for postage, under such regulations as the Postmaster-General may, from time to time, prescribe.

SEC. 5. That for the purpose of paying the necessary expenses of conducting investigations and experiments, and printing and distributing the results as hereinbefore prescribed, the sum of fifteen thousand dollars per annum is hereby appropriated to each State, to be specially provided for by Congress in the appropriations from year to year, and to each Territory entitled under the provisions of section eight of this act, out of any money in the treasury proceeding from the sales of public lands, to be paid in equal quarterly payments, on the first days of January, April, July and October in each year, to the treasurer or other officer duly appointed by the governing boards of said colleges to receive the same, the first payment to be made on the first day of October, eighteen hundred and eighty-seven; *Provided, however,* That out of the first annual appropriation so received by any station an amount not exceeding one-fifth may be expended in the erection, enlargement or repair of a building or buildings necessary for carrying on the work of such station; and thereafter an amount not exceeding five per centum of such annual appropriation may be so expended.

SEC. 6. That whenever it shall appear to the Secretary of the Treasury from the annual statement of receipts and expenditures of any of said stations that a portion of the preceding annual appropriation remains unexpended, such amount shall be deducted from the next succeeding annual appropriation to such station, in order that the amount of money appropriated to any station shall not exceed the amount actually and necessarily required for its maintenance and support.

SEC. 7. That nothing in this act shall be construed to impair or modify the legal relation existing between any of the said colleges and the government of the States or Territories in which they are respectively located.

SEC. 8. That in States having colleges entitled under this section to the benefits of this act and having also agricultural experiment stations established by law separate from said colleges, such State shall be authorized to apply such benefits to experiments at station so established by such States; and in case any State shall have established under the pro-

visions of said act of July second aforesaid, an agricultural department or experimental station, in connection with any university, college or institution not distinctively an agricultural college or school, which shall have connected therewith an experimental farm or station, the legislature of such state may apply in whole or in part the appropriation by this act made, to such separate agricultural college or school, and no legislature shall by contract, express or implied, disable itself from so doing.

SEC. 9. That the grants of money authorized by this act are made subject to the legislative assent of the several States and Territories to the purposes of said grants; *Provided*, That payment of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof duly certified to the Secretary of the Treasury.

SEC. 10. Nothing in this act shall be held or construed as binding the United States to continue any payments from the Treasury to any or all the States or institutions mentioned in this act, but Congress may at any time amend, suspend, or repeal any or all the provisions of this act.

Approved March 2, 1887.

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See also the following supplemental acts to make operative the provisions of the foregoing:

[Fiftieth Congress, first session, Chapter 5, Statutes of the United States, Vol. 25, Page 32.]

AN ACT making an appropriation to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several states under the provisions of an act approved July second, eighteen hundred and sixty-two, and of acts supplementary thereto."

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States, under the provisions of act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto," the sum of five hundred and eighty-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending June thirtieth, eighteen hundred and eighty-eight.

Approved February 1, 1888.

[Fiftieth Congress, first session, Statutes of the United States, Vol. 25, Page 176.]

Chapter 373. An act to amend an act entitled "An act to establish agricultural stations in connection with the colleges established in the several states under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto."

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the grant of money authorized by the act of Congress entitled, "An act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of acts supplementary thereto," are subject, as therein provided, to the legislative assent of the States and Territories to be affected thereby; but as to such installments of the appropriations as may be now due or may hereafter become due when the legislature may not be in session, the Governor of said State or Territory may make the assent therein provided, and, upon a duly certified copy thereof to the Secretary of the Treasury, he shall cause the same to be paid in the manner provided in the act of which this is amendatory until the termination of the next regular session of the Legislature of such State or Territory.

Approved June 7, 1888.

See also following extract from rulings of the Treasury Department as to the Construction of the Act of Congress of March 2, 1887, establishing Agricultural Experiment Stations. Sections 1 and 8. February 15, 1888:

(1.) When an agricultural college or station has been established under the act of July 2, 1862, each college is entitled to the benefits of the provisions of said act, (*i. e.*, of March 2, 1887.)

(2.) In a State where an agricultural college has been established under the act of July 2, 1862, or by State authority, before March 2, 1887, the Legislature of such State may determine which one of said institutions, or how many of them, shall receive the benefits of the act of March 2, 1887.

(3.) If the Legislature of any State in which an agricultural college has been established under the act of July 2, 1862, desires to establish an agricultural station which shall be entitled to the benefits of said act, it must establish such station in connection with said college.

The Twentieth Legislature of the State of Texas accepted the provisions of the Hatch act, as shown by the following transcript from the General Laws of Texas, Twentieth Legislature, 1887:

#### AGRICULTURAL EXPERIMENT STATIONS.

SEC. 1. Assenting to purposes of grant by Congress.

SEC. 2. Emergency clause.

CHAP. 121. [S. B. No. 349.] An act to give the assent of the State of Texas to the purposes of a grant of money authorized and appropriated by an act of Congress of the United States, approved March 2nd, A. D. 1887, and entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July 2nd, A. D. 1862, and of the acts supplementary thereto."

Whereas, The Congress of the United States, by an act approved March 2, 1887, and entitled "An act to establish agricultural experiment stations in connection with colleges established in the several States un-

der the provisions of an act approved July 2, 1862, and of the acts supplementary thereto," has granted to each of the States and Territories of the United States an appropriation of fifteen thousand dollars for the purposes indicated in the title of said act, and fully set forth in the body thereof; and whereas, said act, in section 9 thereof, provides that the grants of money therein authorized are made subject to the legislative assent of the several States and Territories to the purposes of said grant; therefore,

SEC. 1. *Be it enacted by the Legislature of the State of Texas, That the State of Texas does hereby assent to the purposes of said grant.*

SEC. 2. That the near approach of the close of the present session of the Legislature renders it impracticable to read this bill on three several days, and the importance of the subject matter hereof, creates an imperative public necessity demanding the suspension of the constitutional rule requiring bills to be read on three several days, and the same is accordingly so suspended.

Approved April 2, 1887.

An amendment to the foregoing passed by the Twenty-first Legislature of the State of Texas designated the place of location of the Texas Agricultural Experiment Station, as shown by the following transcript from the General laws of Texas—Twenty-first Legislature, 1889.

#### AGRICULTURAL EXPERIMENT STATIONS.

SEC. 1. Assent of the State.

SEC. 2. Emergency clause.

CHAP. 58. [H. B. No. 520.] An Act to amend an act to give the assent of the State of Texas to the purpose of a grant of money authorized and appropriated by an act of the Congress of the United States, approved March 2nd, A. D. 1887, and entitled "An Act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July 2nd, A. D. 1862, and of the acts supplementary thereto."

Whereas, The Congress of the United States, by an act approved March 2nd, A. D. 1887, and entitled "An Act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July 2, 1862, and of the acts supplementary thereto, has granted to each of the States and Territories of the United States an appropriation of fifteen thousand dollars for the purposes indicated in the title of said act and fully set forth in the body thereof; and whereas, said act, in section thereof, provides that the grants of money therein authorized are made subject to the legislative assent of the several States and Territories to the purpose of said grants; therefore,

SEC. 1. *Be it enacted by the Legislature of the State of Texas, That the State of Texas does hereby assent to the purposes of said grant, and designate the Agricultural and Mechanical College of Texas as such Station.*

Sec. 2. The fact that no further benefit from the grant made by Congress to the several States for experiments in agriculture can be had un-

til the State designates the beneficiary of such grant in this State, creates an imperative necessity requiring the suspension of the constitutional rule requiring bills to be read on three several days, and that this bill take effect from and after its passage, and it is so enacted.

NOTE.—The foregoing act originated in the House, and passed the same March 19, A. D. 1889; and passed the Senate by a vote of 26 yeas, no nays.

Approved April 3, 1889.



## LIST OF PUBLICATIONS TO MARCH, 1893.

*Bulletins issued since receiving benefit of Hatch Fund.*

Mailed free on Application.

- BULLETIN NO. 1. March, 1888.—Plan of organization. (A number on hand.)
- BULLETIN NO. 2. May, 1888.—Cattle feeding; value of cob and shuck in feeding corn, cob and shuck ground together. Analyses of food-stuffs and fertilizers. Statements of Director, Horticulturalist and Meteorologist. (A number on hand.)
- BULLETIN NO. 3. October, 1888.—Grasses and forage plants; descriptive notes. (Edition exhausted.)
- BULLETIN NO. 4. December, 1888.—Root rot of cotton, or "Cotton blight;" preliminary Bulletin. (Edition exhausted.)
- BULLETIN NO. 5. March, 1889.—Creameries for Texas, plans and specifications in full for cheap and effective creamery building and outfit. Some points in butter making. (A number on hand.)
- BULLETIN NO. 6. June, 1889.—Cattle feeding; effects of dehorning, shelter and different rations. Analysis of ensilage. (A number on hand.)
- BULLETIN NO. 7. November, 1889.—Cotton root rot (cotton blight), concluded from Bulletin No. 4. (A large number on hand.)
- BULLETIN NO. 8. December, 1889.—Diseases of grapes. Notes on varieties: grapes, strawberries, blackberries and grasses. Best varieties of fruits for the different sections of the state. List of fruits grown on Experiment Grounds. (A number on hand.)
- BULLETIN NO. 9. May, 1890.—Pear stocks. Illustrations showing manner of growth and union of scion and stock. Some parasitic fungi of Texas. (Edition exhausted.)
- BULLETIN NO. 10. May, 1890.—Cattle feeding: comparison of different rations for profitable feeding. Continuation of the work reported in No. 6. (A number yet on hand.)
- BULLETIN NO. 11. August, 1890.—Effect of cotton seed and cotton seed meal on butter product. Quality of sweet cream butter as compared with butter made from acid cream. (Edition exhausted.)
- BULLETIN NO. 12. September, 1890.—The screw worm; life-history, description and illustrations of the insect in all stages, and treatment for wounds. (A number on hand.)

- BULLETIN No. 13. December, 1890.—Sorghum for forage; digestibility, different varieties, analyses at different stages of growth, etc. Teosinte, Miscellaneous analyses. (A number on hand.)
- BULLETIN No. 14. March, 1891.—Effect of cotton seed and cotton seed meal in the dairy ration on gravity and centrifugal creaming of milk. (A number on hand.)
- BULLETIN No. 15. May, 1891.—Influence of climate on composition of corn. Digestibility of Southern food-stuffs, as cotton seed hulls and corn fodder. Analysis of ash and of roasted cotton seed. (Edition exhausted.)
- BULLETIN No. 16. June, 1891.—Drainage experiments with cabbage, Irish potatoes, and strawberries. Forest trees succeeding in this section of the state. (Edition exhausted.)
- BULLETIN No. 17. August, 1891.—General information. Laws authorizing establishment. Organization and officers. Results to date. Inventory of property. (A large number on hand.)
- BULLETIN No. 18. October, 1891.—Liver flukes. The common fluke; a new species. Life history and treatment. Preventive measures. (A limited number on hand.)
- BULLETIN No. 19. December, 1891.—Corn Fodder; method of saving; cost. Digestibility and value. Economic study of corn fodder. (A limited number on hand.)
- BULLETIN No. 20. March, 1892.—Grasses and Forage Plants. A study of composition and value. Texas grains discussed from scientific and economic stand-points, showing ash analyses of grasses and grains. (A number on hand.)
- BULLETIN No. 21. June, 1892.—Effect of cotton seed and cotton seed meal in feeding hogs. Their value as food stuffs. Causes of death from cotton seed. Report of Veterinarian. (A number on hand.)
- BULLETIN No. 22. September, 1892.—Alfalfa Root Rot. Report of correspondents, and methods for remedy discussed. (A large number on hand.)
- BULLETIN No. 23. November, 1892.—Black Rot of the grape; life history; treatment. Plates of the disease; (magnified;) applications used in treatment. (A large number on hand.)
- BULLETIN No. 24. December, 1892.—The Cattle Tick. Biology: Preventive measures. Plates showing male and female. Ticks as factors in Texas fever. (A large number on hand.)
- BULLETIN No. 25. December, 1892.—Texas soils: A study of chemical composition, analyses of samples from several geological formations of the State. Alkali spots. (A large number on hand.)

- BULLETIN NO. 26. March, 1893.—Cost of cotton production and profit per acre. Results of economic tests by successful farmers of Texas. Reports of fertilizer tests by Station. (A large number on hand.)
- BULLETIN NO. 27. Steer Feeding. Report of a feeding test of cotton seed raw, roasted and boiled, corn, cotton seed meal, cotton hulls, silage and hay in combination. List of publications to date.
- BULLETIN NO. 28. September, 1893.—Sweet Potato Varieties. Report of a field test of 31 varieties, showing yield per acre and chemical analysis of roots and tops (leaf and stem). Illustrated.
- BULLETIN NO. 29. December, 1893.—Effect of Cotton Seed and Cotton Seed Meal on Butter, Beef Tallow, Lard and Sheep Suet. A study of the melting points of the fats in cotton seed fed animals and the chemical tests of fat.

NOTE.—The "Old Series" of Bulletins issued by the Agricultural Department of the College prior to the establishment of the Experiment Station in 1888, comprises: No. 1, Preliminary statements; No. 2, Pig feeding, tests of age and breed, dairy tests; No. 3, Effect of salt in pig feeding, notes on grasses; No. 4, Acclimating cattle (Texas fever); No. 5, Acclimating cattle, fertilizer tests, feeding cooked vs. uncooked food for cows and hogs.

Of these Nos. 2 and 4 are practically exhausted, but there is yet on hand a limited number, each, of Nos. 1, 3 and 5—*copies of which will be mailed on receipt of postage—one cent for each copy requested.*

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