Mairs

TEXAS AGRICULTURAL EXPERIMENT STATION.

# BULLETIN No. 37.

DECEMBER, 1895.

# SUNDRY BRIEF ARTICLES,

COMPILED

FROM "PRESS NOTES" PUBLISHED DURING THE YEARS 1894 AND 1895.

## INDEX.

POSTOFFICE:

COLLEGE STATION, BRAZOS CO., TEXAS.

All Reports from this Station are sent free to farmers 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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*To the Public:*

The matter presented in these pages has before been published in the in the form of "Press Notes," and sent to all of the newspapers of the State quarterly during the past two years, with the request that they reproduce such of the matter as, in their judgment, would prove interesting to their readers. We are pleased to know that some 200 papers have used this matter as intended. In this manner the results of our experiments have been scattered broadcast throughout the State, and hundreds of farmers who have before been ignorant of the experimental work done in their behalf, have written us for the regular reports.

Believing that a compilation of the more important matter in all these Press Notes would prove a contribution to Texas agricultural literature of some value, we present this miscellaneous matter, as prepared by the several departments of the Experiment Station. These articles are of two kinds, (1) those relating directly to results of experiments, and (2) a small number of letters written in reply to actual letters of inquiry upon all the varied subjects embraced in the term "Texas Agriculture."

An index to this matter is added at the close of this Bulletin to assist in locating the special subjects treated in its pages.

J. H. CONNELL,
Director Texas Experiment Station.

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J. W. Carson, B. S., Assistant.

BY J. H. CONNELL.

## STOCK FEEDING.

### A GOOD GRAIN RATION FOR COLTS.

DALLAS, TEXAS.

DEAR SIR—I would like a well balanced ration for fine colts, to produce the greatest growth and muscular development. Would like to use wheat straw (cut fine), bran, ship stuff, and cotton seed meal, in proper proportions. Can you give me a correct ration composed of these ingredients? H. E.

ANSWER.

Replying to your favor of November 16 asking for ration for growth and muscle development in colts, I am pleased to suggest the following combination of the feed stuffs mentioned: To 100 pounds of wheat straw add 50 pounds of bran, 20 pounds of ship stuff, 40 pounds of crushed oats, and 20 pounds of cotton seed meal. By feeding the grains here mentioned mixed, it is possible that your colts will eat the cotton seed meal with the other material, but in many cases it is very difficult to force horse stock to eat cotton seed meal in any form or combination. Should you not be able to bring your colts to eat the cotton seed meal here suggested, it will be necessary to increase the amount of bran or ship stuff to 20 pounds.

A good grain ration can not be made for a young colt of bran, cotton seed meal, and ship stuff, or of ship stuff and bran. Oats or corn meal are necessary to add to this, preferably oats. To give you some more definite idea of this ration as formed, I herewith give you the digestible nutrients and the nutritive ratio of each food, and the estimated value per 100 pounds for each, calculated on the basis of red clover at $15 per ton.

In this analysis "albuminoid" represents the muscle formers; the "car-

bohydrates'' form one division of the fat formers, while ''fat'' forms the other. One element of fat here applied is worth two and one-half times as much as any one element of the carbohydrates mentioned. ''Nutritive ratio'' is a measure of the total fattening or lean producing tendency of the food. If the figures read 1 to 7 or 8, this is fattening, while if they read from 1 to 2 or 3, the general tendency of the food is to flesh (muscle) production:

| | Albuminoid. | Carbohydrates. | Fat. | Nutritive ratio. | Value. |
|---|---|---|---|---|---|
| Bran | 10.0 | 48.5 | 3.1 | 1:5.6 | $1 01 |
| Ship stuff | 8.7 | 54.5 | 2.5 | 1:7 | 97 |
| Crushed oats | 9.0 | 43.3 | 4.7 | 1:6.1 | 98 |
| Cotton seed meal | 33.2 | 17.6 | 8.0 | 1:1 | 2 30 |
| Wheat straw | 0.85 | 37.7 | 0.5 | 1:45 | 39 |

The values given above are on the 100 pounds. You will note that cotton seed meal is especially non-fattening (muscle forming), while bran holds an intermediate position; ship stuff slightly more fattening. The wheat straw excessively fattening, because of its large carbohydrate material. You will note according to valuation the cotton seed meal is the most concentrated of the grains discussed, while wheat straw as a hay is least concentrated; very nearly equal in value to oat straw. These are both worth one-half as much of an equal weight of real good hay. Wheat bran is filling in its nature, because it is light (not concentrated), and it has little water in it and a high per cent of albuminoid matter and fats, rendering it of great value altogether as a food for young horses.

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## SOTOL AS A STOCK FOOD.

DULL'S RANCH, TEXAS.

DEAR SIR—I was through Val Verde county and was impressed with the great quantity of sotol growing in that region. No one there could give me any idea as to the chemical analysis, but all agreed it was a fine fattening food, particularly for sheep. As the sheep business is about finished in Texas, it occurred to me that sotol might be used for feeding cattle. A cutter could be arranged that would cut not only the heads, but also the leaves. Can you give me any information in regard to this plant, and the analysis of the head and of the leaves after they are far enough for the head to become green? Some years ago I took up the cactus (prickly pear) and brought it to the attention of the Department at Washington, when it was found to be very fine fattening food when fed with meal.

Very truly yours, A. J. D.

### ANSWER.

In reply to your favor, I must say I feel very much interested in the development of sotol as a stock food for the arid regions of our State, but must confess that I have no information of value upon this point,

and have been unable to collect any within the past few days.* There is no chemical analysis within my reach, but suggest that samples of it sent to this Experiment Station would be analyzed if you think it necessary to determine its food value. It must be borne in mind, however, that chemical analysis can not determine its actual value, since there are many noxious weeds, that are not eaten by stock under any conditions, that according to chemical analysis contain much valuable stock food, but because of some objectionable principle they are rendered worthless.

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## GRAZING CATTLE ON GREEN SORGHUM.

CALVERT, TEXAS.

DEAR SIR—I have a four-acre plat in amber cane, sorghum last spring broadcast. Land being rather poor, I got a short crop first cutting. Having had several good rains since, I hope to get a second crop, but find it will not pay to cut again, as it is very scattering and heading at 12 to 30 inches.

Will it be safe to graze young cattle on this second growth of cane? This question has been asked several times through agricultural papers and answered, some positively asserting that the second crop (even before frost) would kill cattle, even if only allowed to graze on it a few hours, while others positively assert that they graze their cows on second growth sorghum, allowing them to remain on it almost continuously without any bad results.

Your opinion on this subject will be appreciated, and if you think it advisable I will commence grazing as soon as I hear from you. I enclose stamp. B. F. C.

### ANSWER.

Replying to your favor, I must say that second crop sorghum sometimes kills cows. In every case coming under my observation death has occurred when the cow's stomach was unaccustomed to such feed. A small amount of this crop swallowed quickly into the paunch may produce a vast quantity of expansive gas, which in many cases ruptures the diaphragm of the stomach, causing death. I do not allow hungry cows to stay on such feed more than fifteen minutes the first time they are turned in. After this increase the time until they can stay on all day if wanted. It is hasty eating, apparently, that harms. Calves can not be trusted on such feed, at all, without danger. Much judgment and some attention is required. I will graze twenty-five acres of this character of sorghum this season with steers.

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*Any information that can be given the Station authorities upon this plant will be gratefully acknowledged. J. H. C.

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## SORGHUM FOR MILK COWS.

DALLAS, TEXAS.

DEAR SIR—I have been informed that the continuous feeding of sorghum to a milk cow has a tendency to dry her up, my neighbors telling me that that is what is the matter with my fine Jersey cow.

I would be pleased to know if the experience of the College demonstrates this to be a fact, and whether really sorghum fed to a milk cow has a tendency to dry her up.

Yours truly, M. L. R.

### ANSWER.

Referring to your inquiry of February 4, to our Professor of Chemistry, recently handed me, I am pleased to say that the judicious feeding of sorghum to milk cattle will not decrease their flow of milk. It is not practical to feed sorghum alone to such cattle, but it should be accompanied by some other hay and a good ration of grain, consisting of cotton seed, cotton seed meal or wheat bran. These are the only grains permissible when sorghum is fed largely as a forage under the conditions existing in this State.

We use sorghum very largely in feeding our College herd of milk cattle and value it highly, but do not expect to support our herd without considerable aid from other sources.

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## TROUBLE WITH BUTTER.

SULPHUR SPRINGS, TEXAS.

You may remember when you were here you prescribed grass or hay for the cow, which we fed to her in quantities all the winter. She thrived and yielded milk in abundance, and does yet, but the butter is soft. Does the feeding of wheat bran do it? We feed bran, corn, and cotton seed meal, but dropped the hay after the grass rose. Mrs. W., a particular friend of mine, has requested me to ask you or the proper authority, what to give her cow to prevent the milk, after being churned, from turning to whey or curds. You gave me the receipt, but I trusted to memory, as in many other instances. Have sold $60 worth of butter from our cow since fall. MRS. J. L. W.

### ANSWER.

Be careful to set your milk in a cool place to ripen. If nothing better offers, buy a "cooley" can and submerge in cistern. To prevent soft butter, churn your cream when only slightly sour and add water of proper temperature to bring it to 65 degrees. Do not continue to churn after the butter has come to the size of a bird shot. Draw off the buttermilk, wash the butter while in the churn in several lots of clear water to remove the buttermilk completely. In the ordinary dasher churn this is easily performed if a hole is bored in the side of the churn at the bottom, at which buttermilk and water may be drawn off. Cold water will wash out the milk more quickly from the butter than will warm water. These

directions should be followed in churning all the time. You can make your butter firmer by increasing the amount of cotton seed meal and decreasing the corn meal fed. While following the above rules for churning do not work the butter to death—all working softens. Salt it after it is washed thoroughly and then work it lightly just to mix the salt and press out some of the water. Salt drives out water if butter is laid away for a few days.

One of several causes may produce the too early wheying of buttermilk. Cows advance in milk, churning of over-sour cream, putting the milk in vessels once used for milk without washing, setting milk "to cream" in hot places, etc. If none of these now cause the trouble of your friend, you can stop the wheying somewhat by the addition to fresh buttermilk of one teaspoonful of sal soda to two gallons of milk.

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## VALUE OF COTTON SEED AND HULLS.

ENNIS, TEXAS.

DEAR SIR—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.

### ANSWER.

Replying to your favor of 9th instant, I take pleasure in furnishing number of pounds of protein, fat, and other corbohydrates which are found digestible in 100 pounds of dry cotton seed and cotton seed hulls, as requested.

Cotton seed raw contain 11.91 protein, 20.46 fat, 33.73 other carbohydrates. Total digestible pounds, 66.09. Cotton seed hulls contain .42 protein, 3.81 fat, and other carbohydrates 35.27; total digestible matter to the 100 pounds of dry feed is 39.50.

This is given in dry matter, which means that 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.

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## FEEDING COTTON SEED TO MILK COWS.

WACO, TEXAS.

Bulletin No. 29 I have carefully read, but do not understand the statement that the melting point of butter should be 41.4 degrees made from the milk of cattle fed on cotton seed and hulls alone. That can not be Fahrenheit; what thermometer was it?

I have owned dairy cattle ever since 1881, and found out long ago that the melting point of butter made from milk from cows fed on cotton seed or cotton seed meal as the mean grain ration, was several degrees higher than from cows fed on no cotton seed products. I also found out that when I fed cotton seed products to the dairy cattle I could churn the cream successfully at a temperature of 70 degrees or above (a little), and

that the butter grained nicely. But I have also found out that the feeding of cotton seed meal and hulls freely and continuously will ruin a dairy herd. The cows under such conditions fail to breed, and if they do breed the calves will come weakly and some of them blind, and the cows will get in the latter condition sooner or later. That is my experience with cotton seed products, yet it seems to me that when I feed cotton seed raw, about one-half the grain ration of cotton seed, say about eight pounds daily, and about six and one-half pounds of corn meal, and balance bran (in two feeds) with plenty of hay and pasture, that my cattle did best, and I had no trouble with their breeding, or with their going blind.

As soon as I began feeding cotton seed meal and hulls freely the trouble spoken of above commenced. J. T. F.

ANSWER.

Referring to your letter of the 16th ult., I must say that in Bulletin 29, where the melting point of butter is mentioned at 41.4 degrees, that the thermometer used is the Centigrade and not the Fahrenheit. The difference is that the Fahrenheit registers freezing water at 32 degrees and boiling water at 212 degrees above zero, while the Centigrade registers freezing water at zero and boiling water at 100. The bulletin published upon this subject of cotton seed meal and cotton seed fed to live stock is more technical than practical, and many of the discussions contained therein are couched in technical terms little understood by the masses of our people.

With regard to the bad effects of cotton seed meal and hulls upon dairy cattle, my experience in feeding large herds is similar to that you expressed in your letter of recent date, that the use of cotton seed or meal fed *alone* continuously as grain ration from season to season has a very injurious effect upon the system of the cow. This is due to the fact that it is impossible to so proportion cotton seed and hulls that the food elements found in the material will meet the wants of the animal. The bad effects are encouraged during hot weather and are in direct proportion to the amount or material fed and to the height of the mercury. These facts could have come to light long since were it not for the fact that the extensive use of cotton seed and cotton seed meal for feeding purposes is a new practice. If fed in moderation my experience teaches me that cotton seed and meal are the cheapest foods for Southern cattle for the production of butter and beef. If used persistently and without moderation much damage will result to the digestive system.

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## COTTON SEED AND SALT INJURIOUS TO HOGS.

EAGLE LAKE, TEXAS.

Is salt injurious to hogs when mixed with food? They are fond of it, so they are liable to eat an excess of it. I have been feeding a lot of hogs on roasted cotton seed, corn and other things, mixed with molasses, and for some time have been mixing salt with this feed. Lately some of the hogs have died very suddenly.

Your early answer to this will be highly appreciated. W. D.

ANSWER.

DEAR SIR—Replying to your inquiry of the 5th instant, I must say that salt will certainly kill hogs if fed to them in sufficient quantity; but since you are mixing the salt with cotton seed and other things, it may be possible that the cotton seed is causing the trouble. My own observation has never shown that cotton seed will kill hogs, but I have testimonials from a number of other parties saying, in substance, that they have had hogs killed by its use. The experiments at this Station go to prove that this is true. We are conducting other experiments on hogs to more fully test this matter. In opinions reported by other parties it seems that the hogs have done well until they died suddenly from a trouble resembling heaves.

The peculiar fact concerning them, so it is claimed, is that if the ears or tail be cut off there will be no blood resulting from the wound, in case the death is caused by cotton seed meal.

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## BUILDING A SILO.

FARMERSVILLE, TEXAS.

I would ask of you some information as regards the building of a silo for storing ensilage for cattle food. Some say build them round, and some square and 20 feet high. They do not vary so much as to height. The different views of the authors of these articles not only differ in construction, but in the cost of building and material. I wish to know the cheapest and best method of building silos of medium capacity, the shape, the approximate cost, with what it should be covered, and when covered after filling with food stuff? With what it should be lined so as to prevent the acid which is formed by the fermentation of the green ensilage destroying the lining. It is claimed that the acid thus formed will soon destroy wood, and if so, what is best? Should it be comparatively air tight? It is also claimed that mules and horses will not eat it very readily. This and any other information you may wish to advance will be highly appreciated, and will place me under obligations to yourself.

W. F. P.

ANSWER.

I take pleasure in forwarding you some literature upon the subject of silos, which I hope will give you much of the information asked for. Briefly allow me to suggest that the latest plan of the approved silos, some of which have been constructed in this State and are in practical use, are formed upon the following plan:

Height not less than 18 feet, diameter of one compartment usually not larger than 20 feet, circular in form, made of 1x4 or 1x6 all heart flooring stood on ends to form a single wall, the edge to be matched; when it becomes wet it makes it air tight. To keep these pieces of flooring in their right place they are banded together by nailing on the outside a strip 1x4 or 1x6 every four feet. These strips are reinforced to a depth of three or four pieces so placed that they break joints with one another and are nailed directly to the side composed of flooring, of which the

silo is made. This is a light, strong structure, and will resist all the inside pressure, keep out air, and will permit the use of windows or doors in the side from bottom to top, so that silage may be readily emptied from this compartment without the labor of handling over the top of the silo at each feeding time. It is better to have bottom grouted or cemented, using brickbats or stone, to prevent the loss of juice of corn or sorghum which may be in the silo, and protect the entire compartment from damage by rats. The diameter of the silo to be constructed is determined by the number of head of cattle to be fed from it at one feeding.

It is necessary to consider this matter in removing the silage from the top. A fresh surface should be exposed daily to the action of the air, and this in its turn be fed to the stock inside of thirty-six hours, before it has time to mould or sour. A cubic foot weighing forty pounds is a very heavy feed for one animal of 1000 pounds weight, per day. In order that we may be safe in building a silo of ordinary diameter it is well to estimate a feed of twenty pounds of silage per head per day of one-half cubic foot, and in this way determine what the diameter should be. If constructed as I indicate, and cheap labor be employed, as it can be done in this form of silo, since there is no nice work to do in joining heavy timbers, and that all the work consists in sawing, placing together and nailing, the silo can be constructed for $1 per ton capacity for cost of all, including roof.

Before filling the silo a coat of coal tar should be applied each year to the inside walls to protect the wood from the acid juice mentioned in your letter. This is very cheaply done. It is also well in constructing a silo to paint the matched edges of the flooring to protect them from rot by this juice, and so lengthen the life of the building. When the silo has been filled with good silage it is economical to put some poor quality of hay over top of this to a depth of ten or twelve inches and so protect the silage from spoiling, and this is all the covering needed. No weights are necessary other than a few planks laid around carelessly on the top of this hay to settle the hay down on the silage. The steam arising from below will mould or rot the hay which has been placed on top, and will seal the silage beneath and preserve it.

We will take pleasure in sending you our annual report, now in the printers' hands, which contains much written matter upon this subject, and hope that you will find it instructive.

Any definite question which you may choose to ask will receive prompt attention.

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## HOW TO FILL A SILO.

San Antonio, Texas.

I wish to ask some questions. Last year, in connection with a friend, we built a very large silo for corn. We selected a small knoll well drained, and dug down eight feet and found very firm and well set chalky ground. This we tramped down well with some clay. On this we erected two silos, connected by a partition same as outside walls, each 20x20x20 ground level, which makes each one a net depth of 28 feet. We used two pieces of 2x8 spiked together as girders running parallel to

ground every five feet. The corners were cross arched and made secure with iron bolts. On the inside of these girders we nailed 1x12 plank, and then lined with thick tar felt paper, and then placed another layer of 1x12 plank. The partition was built in same way; the sides of excavation we also boarded out to bottom.

Last season we failed in corn crops, but this year we have a magnificent stand as to stalks, blades and ears. Our cutter and elevator, operated by steam, has a capacity of from five to eight tons per hour. Should we fill continuously? How short should we cut? Is it necessary to brace sides to prevent bulging out? My judgment is that ensilage in settling has no side pressure, as does grain. We propose to feed to steers, cows, and sheep as an experiment. The silo is well roofed and well ventilated at the top. We constructed these on a large scale to satisfy ourselves whether corn ensilage, put up in large silos, will cure successfully or not. If it does you can depend on our being the "Silo Kings" of Texas before another year passes. Yet if successful we will not bear our honors alone, for others are just watching us to see how wise we are or what big fools we are.

Any information you may give or suggestions to offer we will gladly receive, and will report to you on the result, and also give you a detailed statement of what we did and how we did it. L. W. M.

ANSWER.

Replying to your favor of June 26th, concerning matter of filling silos, I would say that my experience for the past eight or nine years in a Southern State on this subject indicates that the filling should not be done continuously. Fill two or three days and wait one or two days. Do not scatter the silage in the silo until you begin again after your period of rest, when the silage which is usually found heaped in the center of the silo is thoroughly heated. When thrown to the edge of the silo and tramped, it warms the sides of the building and the fermentation continues, driving out much of the air by the fumes of carbonic acid gas, which settles and takes the place of air in the interstices of the silage.

Silage need not be cut shorter than two inches. You will find it necessary to brace the sides of your building with post braces to prevent severe bulging. Side pressure upon such building is immense when filled with good silage. The pressure is greater the shorter the stuff is cut. The point of greatest pressure is one-third of the height of the silo, measuring from the bottom of the mass, just as it is in vessels containing water. These points must be braced all around particularly well. You will find that corn silage put into large silos has less waste than when put in small buildings, provided you feed out from the top of the mass fast enough to prevent mold or decay on the surface which is exposed to the air from day to day, after the silo has been opened.

## TROUBLE WITH A SILO.

AUSTIN, TEXAS.

DEAR SIR—Coming to this institution February last, I found a silo only partially filled with ensilage, which was not in a satisfactory condition, as quite a quantity of the top strata was decayed, and continued to do so as it was removed. This, I understand, has been the condition of it for a year or two—or since its erection—and on that account it has not been satisfactory. Dr. S. would esteem it a kindness if you would give your views about it, and also directions as to how and at what stage to prepare the following forage for it, and which of them you think preferable: Corn, sorghum, alfalfa, or millet; and, in short, would be pleased to have you give us such information as you may think would enable us to properly fill it out of this crop.

Very respectfully, H. W. W.

### ANSWER.

The trouble with your corn silage is probably found in the fact that you fed out the material too slowly during the winter months. I do not know the surface exposure of your silo, nor the number of cattle fed daily, nor the ration per head. But sufficient food must be used from each silo to consume one inch of silage daily, and thus expose a fresh portion of the food to the atmosphere, which must in its turn be fed up before exposure to air will spoil it. The amount of silage which rots upon the surface may be decreased somewhat if, in filling, the last layer of material added consists of some coarse, green stuff, which will spoil on the surface, and thus save a layer of good corn. A little water thrown upon the surface of dried hay may be used instead of green stuff in finishing off.

If I had definite information as to how your silo was constructed, I would be better able to determine whether or not there is a fault in construction or whether the fault is in filling. We have no trouble of this kind with the two silos in use at this place.

The best time to cut a corn crop is just when it has passed out of roasting-ear and before the lower leaves of the corn sunburn considerably. The best time to cut a sorghum crop is when the seed are in the dough, and before they harden. Alfalfa should be cut when the first blooms appear, and before full bloom is reached. Millet should be cut when the seed are in the milk, and before they pass to the dough state, or otherwise much of the seed will be passed undigested in feeding. Of the four crops mentioned above I prefer corn and sorghum for silage, because these fit in better with the cotton seed or cotton seed meal ration than will alfalfa or millet. I prefer alfalfa to millet. Alfalfa is now being used largely as a silage crop in some parts of the country. In filling the silo with the material, whether it be corn or sorghum, we practice cutting the food and letting it sun from four to eight hours, hauling to the barn and cutting into one to two inch lengths, tramping the edges of the silo every time a layer two feet thick has been added. If the walls are air-tight the silage will keep in perfect condition.

# AGRICULTURAL INSECTS.

## GRASSHOPPER PEST.

GAY HILL, TEXAS.

DEAR SIR—So much depends upon my success in fighting grasshoppers this season that I fear I shall tax your generosity. The hoppers are hatching now by the millions on my plantation, and I desire to try poisoning while they are young. As your report giving particulars of experiments in this direction is not ready to send out, I should like to correspond with Mr. G. L. Stone and Mr. Lynn, on whose places the experiments were made. Will you be kind enough to give me the address of the above named gentlemen? I have lost several crops by grasshoppers, therefore I hope that you will excuse me for troubling you so often.

Very truly yours, W. C. D.

### ANSWER.

Replying to your favor of the 19th inst., I am pleased to say that we protected cotton absolutely from damage by use of poisons made of wheat bran, sugar, and arsenic; taking 6 pounds bran and mixed with 1 pound of sugar, and then adding enough of water to make a stiff dough; then one pound of common white arsenic was well mixed with the dough and the mixture was complete. Sugar is added for two reasons—to make the dough palatable to the hopper and to cause the arsenic, which is insoluble in water, to adhere to the dough. We put a tablespoonful of this dough down (just in front of the armies of hoppers) and every 7 feet in two rows, laying the dough in the shade of the cotton stalks. This is best done at 5 o'clock p. m. The hoppers eat it freely, and in a few minutes feel sick and eat nothing more—die in about 24 hours by the millions.

A heavy solution of sulphur and lime sprayed on the cotton protected the crop, but did not kill the hoppers. A solution of 1 pound of Barbadoes (aloes) to 5 gallons of water sprayed heavily on cotton protected the crop entirely, but did not kill. For orchard trees we used kerosene oil—emulsion of 1 part of oil to 14 parts water—sprayed on peach and plum trees, and this entirely protected these trees without injuring them in the least. We did not try this on cotton. A strong solution of Paris green in water (not a true solution) gave good results. Spraying with London purple was not so successful. These two applied by dusting did not give good results because there was no dew at any time on the crop. Strychnine gave good results when mixed with bran, but was too expensive. This is a fairly full statement of our results, and if any other light is wanted on this subject I shall be pleased to answer you to the best of my ability. Mr. Stone says that the danger to crops in McLennan county has about past because of winter freezes and recent rains. I hope that these same conditions will bring about the destruction of the pest with you also. Have any of your neighbors suffered severely?

## HOW TO KILL GRASSHOPPERS.

Our Experiment Station sent a representative over into some of the middle counties to look into the grasshoppers which were destroying a large acreage of corn and cotton during the past summer. In many places the corn was damaged so much that it was worthless in blocks of 40 to 90 acres, and cotton waist high was eaten to the ground in fields of 10 to 150 acres. In many cases no sign of a cotton crop was left on the land.

We tried the following named materials to prevent the eating of cotton and fruit trees: Strychnine; arsenic and wheat bran; sulphur and lime; asafetida solution; salt petre solution; Barbadoes aloes solution; white arsenic and flour, dry; Paris green and flour, dry; London purple and flour, dry; calomel and flour, dry; Paris green, dry; kerosene emulsion.

A number of these gave good results by making the plant distasteful to the hoppers or by killing those who ate the poisons applied. The results are best given in a letter from Mr. G. L. Stone, of the neighborhood who had invited us over to make the experiments.

AUGUST 1, 1893.

"Will say relative to your test made at Mr. Linn's, the results are as follows, to-wit:

"The wheat bran, sugar and arsenic was a success. The application of dry arsenic on the cotton was only a partial success. I think it would have been more successful if there had been dew on the cotton when applied. Paris green, London purple, and the calomel were failures.

"The spraying of the fruit trees with kerosene emulsion was a grand success. Where the Barbadoes aloes emulsion was applied on the pea vines, the hoppers quit eating it, and also where you sprayed the cotton with the sulphur mixture the hoppers quit eating it.

"Where I applied the strychnine the result was about the same as the arsenic. The hoppers have about quit the crop. There are some few young hoppers, but none of any consequence.

"G. L. STONE."

On the whole, arsenic and wheat bran proved best and cheapest to kill all hoppers in cotton. As poultry will eat this mixture, care must be used to keep all such away from places on which poison is applied. Full particulars of this test will be published in the Annual Report of the Experiment Station, which is sent free to all residents of the State.

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## CHINCH BUGS IN CORN.

TEHUACANA, TEXAS.

DEAR SIR—The chinch bugs are invading our farms in such numbers as threaten damage to our corn crops and such other crops of wheat, rye, etc., as may be sown this coming fall. The Kansas Experiment Station claims to have secured a parasitic fungus through the dissemination of which the chinch bug may be largely checkmated in his operation, if not exterminated altogether. If the claims set up be true, I would suppose that the facts in this case would have been generally recognized and made

useful throughout the States, but strange as it may seem I see no notice of this remedy being suggested in any of the Experimental Records or Farmer's Bulletins issued by the Agricultural Bureau at Washington.

Notwithstanding all of this negative testimony you may have the bugs on hand ready for distribution upon application. If you have, please send some to me without delay, for the bugs are staring me in the face with an impudence that suggests the necessity of instituting some means of defense if it be available. C. M. B.

ANSWER.

I have your favor of July 6, asking for relief and information concerning the chinch bugs, which are now beginning to take your corn crops. I have had one other similar request from your section of the State within the last ten days. My information of the Snow chinch bug fungus is that it is a somewhat uncertain remedy; however, in many cases it gives positive and satisfactory results. Whether or not it works successfully, depends largely upon the moisture in the atmosphere.

Unskilled applications of this disease among the chinch bugs of the infested district often give no results at all. Some training is required on the part of the operator, even if the conditions required are just right. I would suggest that you apply to Prof. F. H. Snow, of Lawrence, Kansas, the originator of this system for chinch bug prevention; and if you desire, send this letter as explanatory of your request; but I doubt very much whether good results will follow without some assistance from scientific men in the application of the disease.

Should the chinch bugs of your section of the State become so serious as to threaten the large areas of corn, it would become the duty of this Experiment Station to locate an infection station in such a community, in order that the bugs might be successfully combated. If the disease was more prevalent in the State we would constantly keep on hand at this place infected chinch bugs for distribution throughout the State whenever chinch bugs should become serious factors in the production of our crops. Thus far we hear of trouble only from isolated districts in the "Black Lands." If we can be of any service to you, or if we do not have the proper conception of the chinch bug ravages in your part of the State, I would be pleased to hear from you further, in order that we may be of real help to this interest in your section.

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## THE WEEVIL IN CORN.

The bad results of weevil in corn can most certainly be avoided if the following points be carefully noted:

First. Gather the corn just as soon as it is dry enough to pull from the stalk. Delay in this respect gives opportunity for the early weevils to eat the corn while in the field and hatch a large number of eggs under the very best conditions. Second. In storing the corn it must be either put away in a partially wet state or the crib must be so arranged as to permit the use of carbon bisulphide or napthaline to protect the grain while in the crib from the weevil.

It has been clearly demonstrated by repeated trials that the storing of wet corn prevents injurious effects from the weevil by reason of the fer-

mentation and heat in the crib. A great many farmers take the trouble to haul water and sprinkle upon their corn after every few wagon loads they have hauled. If the corn is gathered in wet weather there is no necessity for taking this extra trouble. I know of some farmers who leave their corn in the crib exposed to rainfall during the early fall and winter season to prevent injuries from weevil. Of course in all of this there is constant danger that some corn will be lost from rot, but usually the per cent of loss from this cause is very small and much lighter than would be felt were weevil allowed to attack the crop.

If carbon bisulphide or naphthaline are to be used in corn, the best results will be obtained by shucking the corn before putting it in the crib, and while filling leave two troughs made of 1x4 stuff running at right angles across the crib about one-third of the distance from the top. These troughs must not be nailed perfectly tight or the fumes from the material used will not escape from them readily. When the weevil first appears in the corn saturate a piece of cotton with carbon bisulphide and push it toward the middle of the troughs and leave it in the trough to evaporate. Small balls containing naphthaline can be pushed into the mass of corn in this manner without trouble, and the odor will prevent damage by weevil, and will protect grain from rats to a large extent. Upon the whole carbon bisulphide will be found more satisfactory for treatment of corn. It can be bought of any prominent druggist in the liquid form. It is well known through the entire State as "high life," and as such is used successfully for killing red ants, prairie dogs, etc. With our present knowledge of the weevil and similar insect pests there is no cause for any considerable loss in our grain crops after that crop has been grown in the field. The large corn crop of the State makes this matter more important than it has ever been.

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## MORE ABOUT WEEVILS.

SANDY POINT, TEXAS.

DEAR SIR—I see a statement in an agricultural journal that weevil can be exterminated from corn cribs by using bisulphide of carbon. What amount is to be used for crib containing 500 bushels? How make the application? Is it too expensive to use? How near the crib would light torch be to cause danger? How long after placing in crib before safe to go around with torch or fire?

Respectfully, J. G. S.

### ANSWER.

I take pleasure in enclosing you an article published upon the use of bisulphide of carbon as an exterminator of weevil in corn and other grain. The amount to be applied depends more particularly upon the depth of the crib or bin than upon the number of bushels to be treated. The deeper the grain the less amount of carbon bisulphide is required per bushel. The evaporating fumes from the carbon are heavier than air, and therefore tend to sink to the lowest levels, and in passing off through the grain in bulk it presses out the air and all the insects are smothered in consequence of the air being excluded. It is not highly explosive ten

or twenty feet away from matches, cigars, etc., unless the wind should be blowing from the open receptacle toward the fire. The time after its application when fire can be brought in close proximity to the corn or grain will depend largely on how nearly air tight the receptacle or bin is. If it is fairly open the fumes will disappear after 24 or 36 hours.

If corn, peas, or beans be put in a perfectly tight can or barrel and a large quantity of carbon bisulphide be used to kill the weevil, and its fumes are allowed to stay in the barrel or can for a long period, the germ will be killed and the seeds will be unfit for planting. Corn treated in this manner with an excess of carbon bisulphide is good for food purposes.

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## HOW TO KILL CORN WEEVILS.

The fall of 1893 we made applications of carbon bisulphide to corn in shuck and to corn with shuck taken off to kill the large number of weevils that were in the corn at the time.

This material is a foul smelling liquid that evaporates at ordinary temperatures and is highly explosive and inflammable. We placed a pint of this fluid every three feet in the several bins of corn on November 11, late in the evening, to reduce the danger from fire.

On December 10 we opened the corn and found all the weevils dead that were in the shucked corn, all the liquid evaporated from the cans. The corn in the shuck still had a few living weevils in it, but by far the greater part were then dead. On February 10 following we again inspected the corn and found all weevils dead in both kinds of corn. No fresh weevils had entered, and thousands of dead ones testified to the efficient method of treatment. This material can be bought of any wholesale druggist at 10 to 15 cents per pound in five and ten gallon cans. It is now being peddled under different names in this State, and sold at double its market value.

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## IS WEEVIL-TREATED CORN INJURIOUS?

BREMOND, TEXAS.

Having read how you kill weevils with carbon bisulphide, I write to know if corn having had the weevils disposed of in this way will poison or injure stock. E. H. Y.

### ANSWER.

In replying to your favor of recent date concerning bisulphide carbon, I will state that it is not poisonous to live stock when they are fed on the grain which has been treated. The action of this poison upon the weevil is not due to any active poisonous agency, but to the fact that the gas takes the place of the air surrounding the weevils, and they are smothered because no air is allowed to reach the sufferer. You need only to be careful of fire in handling this material. The fumes are suffocating and inflammable.

## DAIRYING.

### PLAN OF ICE STORAGE.

MANOR, TEXAS.

Can you furnish me with plan and directions for building small ice house, and how to fill with machine ice so as to preserve it perfectly? Also the best way to build a small cooling room. Any information will be thankfully received. I. J.

ANSWER.

Replying to your favor of June 19th, I regret to say that all efforts I have made or seen made in latitude corresponding to this in the South have failed to keep ice economically in lots of car load amounts, or greater, during the protracted heat of summer. The best conditions under which I have seen it tried, was the storage of ice in a brick basement eight feet under the ground, the walls of the house being built especially for storage purposes of double brick, having a four-inch dead air space between walls properly ventilated; and the ice room built of 1x12 pine boards, with corrugated iron sidings, giving dead air space between for ventilation.

This experiment was not a financial success, though the summer was not an unusually warm one. The thermometer in the shade rarely ever reached 93 Fahrenheit.

### BUTTER IN COLD STORAGE.

Many dairymen sell butter at a sacrifice during the summer season, when dairy products are very low priced. Various methods have been adopted to preserve this "summer butter" and carry it forward to a fall market, when prices are always remunerative for good butter. Much butter has been lost in this effort to keep it over for sixty or ninety days. We have had uniform failures in our efforts to keep butter more than thirty days during the summer, unless ice was used. With the assistance of the cold storage companies, which are to be found in all of the large towns and cities of the South, we can succeed in tiding over the low prices of summer and carry much of our products to a good fall market.

Our first experience in this matter was gained several years since in another Southern State. We were making some 500 pounds of gilt edge butter per month, for which we had no regular demand. Some of this butter was placed upon the open market through commission merchants, and sold at 12 to 14 cents per pound. We tried various markets and found that the summer "glut" placed the producer entirely at the mercy of the consumer and commission man. We then determined to ship this butter to a cold storage firm in Birmingham, Ala., and hold for better prices. Shipments were made during July and August, and the butter was removed from storage during October and sold for 26 cents per pound. The storage charges were 3 cents per pound.

During the past summer we shipped 1026 pounds of butter in ash tubs to the Houston Cold Storage and Refrigerator Company. Shipments were begun July 11, and stopped August 5. The following letter gives their rate of charges:

"HOUSTON, TEXAS, June 13, 1895.

"Prof. J. H. Connell, College Station, Texas:

"DEAR SIR—We received your favor of June 12, and have noted contents. Although our general cold storage is somewhat limited, we will store this butter for you and will make you the cheap charge of 20 cents per tub (of 60 pounds) per month, provided you leave it all summer.

"Ordinarily the temperature in our storage vault ranges from 38 to 40 degrees, but we can store it in the meat room for you, where the temperature is 28 to 30 degrees, whichever you prefer.

"We have one separate compartment vacant at present; the dimension of this room is 10x10x10, to which you could get your own lock and key, and if you have a large quantity of butter this would be the cheaper plan, as we would judge it to hold over 300 tubs, and the charge would be only $25 per month. Figuring the cost of storing for three months only it would be 1 cent per pound in general storage and less than ½c. in compartment room. Awaiting an early reply, we remain,

"Yours truly,

"HOUSTON COLD STORAGE AND REFRIGERATOR COMPANY."

We preferred to store at a temperature of 28 to 30 degrees. Removals from storage were begun September 15 and continued until October 6. All of the butter was in prime condition when removed. The butter that remained longest in storage happened to be the best when withdrawn. The following letter was written us by one of our customers after having used this butter:

"FORT CLARKE, TEXAS, October 8, 1895.

"Prof. J. H. Connell, College Station, Texas:

"DEAR SIR—It is unnecessary for me to say how much we appreciate your butter, and I voice the sentiments of many of my friends when I say that it is the best that can be gotten. We one and all thank you sincerely for your kindness in letting us have it, as it has been a great favor to us. Very sincerely,

"B. C. M."

This same butter sold readily on the fall market at 25 cents net, but when offered in open market in July and August it was worth but 11 cents. The cost of storage was but 1 cent per pound for the season.

Great care must be exercised to pack the butter in new tubs that have been sterilized by boiling or steaming. The tubs must be air tight, and a layer of cloth covered with one-half inch of salt should fill the tub completely to the top, in order that no air space may be left in the package. After having been on ice for so long the butter will not keep long when exposed to summer temperature.

From former experience in this matter, we think it advisable to ship to a cold storage plant located in the town where butter is to be sold, or as near to the final market as can be arranged. This will save shipping expenses.

## FIELD CROPS, FORAGE PLANTS, AND MANURES.

### SORGHUM.

CALVERT, TEXAS.

I have four acres of amber sugar cane sown broadcast on medium quality of upland, seeded two bushels to the acre, put in good shape, and have a good stand. Please inform me at what stage to cut it for hay, and how to cure it. If I can bale it without danger of moulding, much prefer to do so. For this information I will thank you in advance.

If you have issued Bulletin on the methods of keeping, cultivating and propagating sweet potatoes, please mail me one. B. F. C.

ANSWER.

Replying to your favor concerning sorghum, I take pleasure in saying that you can save amber sorghum without loss in the following manner: After mowing allow the sorghum to lay upon the ground sufficiently long to dry out at the end of blades. If the crop is thick it should be turned over upon the ground to expose the bottom portion of the crop to the sun for a short time; usually one full day's sun is required to dry it sufficiently to allow it to be put into the "cock." These hay cocks may be 5 feet high and 4 in diameter, of the shape of an old fashioned bee hive. All of the hay that is put up in this manner should be well settled as it is laid on the pile.

After having constructed it the proper height rake the loose sorghum away from the sides, leaving a neat pile of hay that will turn water in case it should rain. Allow it to remain in this shape for two or three days for fermentation to take place, which is evidenced by the "heating," and the deposit of dew upon the interior parts of the cock. When thoroughly warm, and before the hay loses its natural color, open the cocks and expose the hay to four or six hours' sun, according to the weight of the crop per acre and the size of stacks; then the hay is ready to haul to the barn or be placed in stacks, where it may safely be expected to remain without molding or heating further. If the hay is allowed to remain in the cocks too long the fermentation proceeds too far, and the hay sours and then rots in the field. It will remain longer in the cocks without damage the less of water or sap it contains when put up. It is almost impossible to get best quality of sorghum hay in any other way than by following these directions. Use no salt or other applications to preserve the hay. The hay may be baled safely if given six or ten hours sun from the cock, depending on the size of stalks. We have not issued a Bulletin on the keeping or propagation of sweet potatoes, and will not until the close of the present season.*

*Bulletin 36 has since been published upon these and other horticultural subjects.

## GROWING COW PEAS.

SILVER VALLEY, TEXAS.

DEAR SIR—I want to raise feed for cattle this summer. I have 150 acres to plant, 50 in cotton and the balance in cane, millet, and probably peas.

Would it be advisable to plant peas, stack and bale; and which is the best way to plant, in drills or broadcast? What kind of pea is the best for this purpose? and please state where they may be obtained and what prices.

Very truly, B. E. S.

### ANSWER.

Replying to your favor of the 4th inst., I take pleasure in saying that under your conditions I think it likely that planting the cow peas in the drill will give best results, because they will withstand the drouth better under cultivation than they would be able to do if planted broadcast. The yield of vines will be greater per acre if planted broadcast (under proper moisture conditions), but the yield of seed peas will be greater planted in drill and cultivated. I consider the Louisiana Clay pea as one of the very best for general use in this State. We grow them here successfully.

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## DEVELOPMENT OF CANAIGRE INDUSTRY.

BOWIE, TEXAS.

I write to you for information of the plant called canaigre, the roots of which are used in tanning, and the address of any house in Memphis or Chicago that handles canaigre, so that I can find a market for it by corresponding with them. B. B. L.

### ANSWER.

Replying to your favor of last month with no date, I must say that the development of the canaigre industry is now so little advanced that there is no stable demand for canaigre extract in any of the towns in Texas. Some of the tanners in this State have been using the extract with much satisfaction because it is cheaper than the oak, and much of the extract is now shipped to the eastern cities in large quantities. There is no Texas firm who handles this as commission men.

At Hockley, Harris county, this State, an extract factory is to be erected, and the farmers are being induced to plant and raise canaigre, the extract company to pay them a certain amount per ton for their product, and encourage its production to supply their factory with the necessary amount of crude product. In this way the business is being established here, in Arizona and New Mexico.

I can place you in correspondence with parties who are engaged in the production of the canaigre plant in this State and west of us, and can furnish you the addresses of men if you so desire.

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## A NEW INDUSTRY FOR TEXAS.

SAN ANTONIO, TEXAS.

MY DEAR SIR—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. C. K.

ANSWER.

Replying to your favor of February 9th, 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 of the shape of the sweet potato, of which 3 to 12 are found under each plant at a depth varying from 2 to 18 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 United States and in foreign countries.

The Pecos valley furnished a large number of acres of natural growth, and upon all of the drier beds of the 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 18 inches, and are seen to cover the entire surface of the ground, where the land is 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 cars of evaporated roots to points east—the most of these roots finding their way to Glassgow, Scotland, and Vienna, Austria, at which points they are paid for at the rate of $40 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 and 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, and the percentage of tannic acid increases 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, yielding 3½ tons of dry roots containing 30 per cent of tannic acid, worth at factory $40 per ton, makes 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, by 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 tanning within the borders of this State. The field is certainly promising, since the raw material for the production of leather is in the greatest of abundance in the 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 Northeastern States.

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

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## FORAGE PLANTS FOR THE "PAN HANDLE."

FORT WORTH, TEXAS.

DEAR SIR—In the spring of 1894 you sent me Melilotus alba, named Bokhara clover. I sent some to ———, of Archer City, and some to ———, of Henrietta. Both report that it grew vigorously and withstood the dry fall and still dryer spring, and that stock ate it well, and they wish they had a good sized field of it.

You remember it has a strong smell—even the seed, and at first they said, "That stinking stuff is nothing but common wayside white clover, and is no good; and if it does grow, it smells so strong that nothing will eat it." We also tried Japan clover and Bromus inermis, neither of which grew, and the place they were seeded can't be found. Have you heard any other reports from the Melilotus alba? Where can I get a few bushels of the seed? Yours,

S. M. S.

### ANSWER.

I have your esteemed favor of June 24, and am pleased to know that our early observations concerning the adaptability of Melilotus or Bokhara clover to the northwestern section of the State have been verified by the farmers who have given it a trial through your kindness. See

what we say of this in Annual Report, a copy of which is sent you. See index, "Melilotus." Also what is said in Bulletin No. 34 of this Station upon that subject, page 557.

I regret very much that Japan clover and Bromus inermis did not thrive. But this experience was also verified by our sub-station at Wichita Falls. You can obtain melilotus seed from Holloway & Co., of Dallas. There is much danger of buying Johnson grass with all melilotus seed purchased.

Am glad to know that Mr. Piersol is preparing something for publication on the subject of melilotus.

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## GRASSES FOR THE COAST COUNTRY.

North Galveston, Texas.

Dear Sir—Will you please advise me what you know of the following grasses, and if they or any will do well in this section and pay to cultivate for hay, viz.: Bermuda, red top (Agrostis vulgaris), English rye grass, Texas panic grass (Panicum texanum), and German millet. I am informed that Bermuda is too short, and too hard when cured for good hay; also when used for permanent pasture is hard to eradicate. Please advise me as to this, and write me fully as convenient as to the other grasses named.

Very truly yours, C. S. V.

### ANSWER.

Replying to your favor of June 14th and another more recent letter inquiring further concerning grass in your section, I must say that the tame grass which is likely to give you best results in your section is the Concho or Colorado bottom grass (Panicum texanum). German millet will do well. These two belong to the same family. The Colorado bottom grass thrives throughout all the western portion of the State, and succeeds well on the coast, from Victoria south beyond Corpus Christi, and I am quite sure that it will do well upon your land. Still I have never seen the grass tried upon lands near Galveston. Our experiments here with English rye grass and red top did not give them first place. Bermuda is always good. The hay is of best quality, and can be cured without much expense in such a way that it is not hard or short. Many people prefer it to timothy or to Forney hay. It requires rich soil to make sufficient growth to warrant its cutting for hay.

Alfalfa is not expensive or difficult to cure properly if grown upon land to which it is adapted. It is well to bear in mind the fact that curing hay can be more safely done at points far removed from the coast, because they have less rainfall during the summer season than you have. We cure alfalfa here at this place without any difficulty, and count it one of our best cultivated crops.

Sorghum sown broadcast should not be overlooked by you, as many people in your section would buy it in preference to any other hay.

I take pleasure in sending you some bulletins, which I hope may be of interest to you along these lines.

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## GRASSES.

College Station, Texas.

Dear Sir—Enclosed you will find specimens of grasses. Please define them for me. Thanking you in advance for your kindness, I am, respectfully,

R. R. R.

ANSWER.

I have the samples of grasses you sent, and take pleasure in saying that the one which has the seed head somewhat resembling oats is known as rescue grass, its scientific name being "Bromus unioloidies." This grass grows to a height of one to three feet, according to conditions; has a heavy leaf or blade, and the large seed head is arranged somewhat like that of oats, except that the seeds are in compressed or flattened groups. This grass, though not a native of Texas, is so well adapted to the conditions of Texas soil that wherever moisture is commonly found during the winter season it thrives and grows upon the open land without cultivation, and reseeds itself in spite of the hardest frosts and freezes of this latitude without injury to it. Any quantity of the seed may be obtained from seedmen at a reasonable rate, and land well prepared will soon give good winter grazing if sown at the rate of one bushel of seed per acre and the seed harrowed in lightly. You can obtain seed of the Texas Seed and Floral Company, Dallas, Texas, and plant during early fall, or when the first rain comes. It is especially liked by all kinds of stock, and if mowed early it will come again and supply a second mowing before the grass dies down in May. It is now seeding freely at this writing, April 26, but in a few weeks more will disappear.

The other grass you sent resembles timothy, and is known as canary grass, and is a natural product of the Gulf States. It is also known as California timothy, Stewart's canary grass, Gilbert's relief grass, etc. This season it is a volunteer in this immediate neighborhood, growing to a height of 18 inches, and produces little leaf, and therefore will not stand close grazing, yet in some sections of the State it produces an abundance of forage early in the spring, and is well adapted to Texas conditions. It has been tested successfully in Louisiana and Mississippi for a number of years, and the very best results have been claimed for it. The seed of this grass forms into a head or spike, varying in length from one to two and one-half inches, and in diameter from one-third to two-thirds of an inch.

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## CAN JOHNSON GRASS BE KILLED?

Dallas, Texas.

Dear Sir—The object of this inquiry is to ascertain whether your institution has made any satisfactory experiment in the direction of killing Johnson grass, that would enable you to issue any authoritative statement upon the subject. Please give me what information you can upon this subject.

H. A. K.

ANSWER.

I take pleasure in mailing you under another cover the published results of some experiments conducted by us here, using cultural methods for the destruction of Johnson grass and poisonous chemicals for its eradication. Upon lands that do not stick to the roots, close cultural methods, if industriously followed, can be relied upon to destroy the grass where it does not have a strong hold upon the land. If very well set in large patches, the cost of eradication either by intensive culture or by the application of poisons, brings the cost up to such a figure that it is not to be advised. This is by way of explanation of the printed report sent out from this Station to all of the papers of the State for republication in what we term our "Press Notes."

In any case, much depends on the farmer as to whether or not Johnson grass can be eradicated by any known method. Intelligence, perseverance, and the use of some money is absolutely necessary under all circumstances. It is almost sure that under present conditions, in spite of the two remedies that have been offered to the public from our experiments here, Johnson grass in the course of twenty-five years will be much more widely distributed throughout the State than it now is unless some legislation is enacted that will prevent the sale of seed or its use as a hay. There is no doubt that such a law would operate very hardly against the farmers of the State now having Johnson grass. But it is equally true that the insidious pest (which makes a good hay) will sooner or later reduce the clean cultivated lands of the State to a minimum.

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GROWING FLAX IN TEXAS—BROOM CORN.

DAYTON, TEXAS.

DEAR SIR—Please advise me on the subject of flax, raised for seed; also, German millet for seed and hay, and upon the subject of broom corn.

Yours truly, B. H. C.

ANSWER.

In reply to your favor, I must say that the best thing you can use upon your sod land would be either a crop of flax, rice or broom corn. I do not know that German millet will succeed under such conditions. Write Plant Seed Company of St. Louis for prices on flax seed. If they haven't them in stock the firm can readily procure them. The Evergreen broom corn is the variety best suited to our Southern conditions. These seed can be had of Holloway & Co., Dallas, Texas. Of them also you may buy millet. I advise that you buy these seed from the nearest possible dealer.

As to a probable market for flax seed, I am unable to make an accurate suggestion of values, since the crop, so far as my information extends, has never been grown on a practical basis in this State, nor in the extreme South. Enough has been done, however, to show that it is quite successful upon fresh sod lands.

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## ROOT-ROT.

FATE, TEXAS.

DEAR SIR—I would respectfully ask if you find anything to prevent root-rot or dying of alfalfa? Please let us on the black lands know it at as early a day as possible, as that is deterring some from planting it.

Yours, W. Y.

### ANSWER.

As to your inquiry for root-rot, must say that it can only be prevented by occasional rotation of some grass plant, such as small grain, sorghum, etc. The disease is a fungus trouble, and lives only upon certain plants, grasses not being one of them. I send you our Annual Report, which you will find bears upon this subject in part.

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## TURNING UNDER GREEN CROPS.

NEW YORK.

We find this advice sometimes given by Southern agricultural writers: "Never plow under a green crop while *green*, as it will sour the ground." This is applied to the South. It is claimed that in that warm climate a mass of green stuff plowed directly in will acidify the soil too much. Is this sound advice? If so, the practice of plowing under two green crops in one season is wrong. Would lime or cotton hull ashes added to the green crops prevent souring? Yours truly, H. W. C.

### ANSWER.

Replying to your favor of March 15, I take pleasure in saying that the advice frequently given "never plow under green crop while *green*, as it will sour the ground," is too general to be true. It is a fact that during the heat of summer, on some close, sticky land, which lacks the proper amount of air incorporated with the soil, and where moisture is in over supply, the plowing under of a very green crop has frequently caused ascetic fermentation in the crop turned under and the results have been injurious to plants under such conditions. If any one of these three conditions is lacking, that is, high temperature, absence of air or an excess of water, *if any of these three is lacking*, no damage will result to crops turned under green in the South or elsewhere. The trouble is one which has been greatly over-estimated, and during the spring season little or no danger need be feared of bad results from green manuring. We have very much land in the South which is entirely deficient in organic matter, and for this reason suffers severely from hot sun by baking, and from the drouth by easily yielding up all its water. But these lands can very largely be restored to their former state of fertility by turning under crops of green stuff, such as melilotus clover, cow peas, red clover, sojar beans, and some others. Crab grass is not so good for the purpose of green manuring as are some other grasses that have more woody fibre present in them. The addition of any form of ashes or of lime would largely prevent the souring of land in turning under green crops. I am satisfied that the same results can be accomplished by turning under in dry weather or in cool weather without this extra expense.

## A CHEAP CANE HARVESTER.

CHICAGO, ILLINOIS.

DEAR SIR—In a late number of the Farm and Ranch I noticed an interesting article from you relative to new farm implements, in which you describe a machine for cutting corn. About one of them I wish to ask some questions. I refer to the one where the cutters are attached to a sled. I notice the sled is $2\frac{1}{2}$x$4\frac{1}{2}$ feet. Would the sled ride steadier if it was made six or seven feet long? Has it been used long enough to prove it practical? Do the cutters have to be ground often? I have three or four hundred acres to be cut this fall in the Pecos valley, and have been thinking of this machine. Can I get it made in your locality under your direction, and if so, what will it cost?

Yours respectfully, J. E. Y.

ANSWER.

I have your favor of July 6, and in reply beg leave to say that we have no carpenters in this community who are expert in constructing the corn harvester to which I referred in a recent issue of the Farm and Ranch. I suggest that you supply yourself with machines from the manufacturer's address, McDonald Manufacturing Company, Bellefontaine, Ohio.

I take pleasure in saying that the harvester that we are using has given satisfactory work for the past two seasons. We are now running over some sixty acres of corn and sorghum with the machine and it cuts at the rate of ten acres per day, as soon as the men get accustomed to handling the crop. Only two men are required. I hope that the address herewith furnished you will be of value.

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## THE PLANT FOOD IN SOUTH TEXAS SOILS.

For the purpose of cultivation we may consider that all soils are classed according to their mechanical composition into sands, clays, and vegetable (or alluvial). The vegetable (or alluvial) soils are most fertile, while the clays are ranked second in order. These combine into sandy clays, etc. In studying the plant food needed by crops, as supplied by the soils, we class them according to their most prominent chemical elements into lime soils, nitrogenous soils, potash soils, etc. All soils contain some nitrogen, lime, potash, phosphoric acid, soda, and chlorine.

We know that 95 per cent of the soil is never used or even intended for plant food. Poor soils are rich in all but the first four named substances, nitrogen, lime, phosphoric acid, and potash. If a soil lacks fertility it is safe to say that it is deficient in one or more of these four substances, or these may be present in an insoluble form and the plant can not use the material for some time to come. Plants drink up these substances through their roots after the water of the soil has dissolved them. By chemical analysis we can discover the exact amount of fertilizing elements a soil actually contains, but this work will prove misleading unless we bear in mind the fact that probably one-half of one of these elements

is not of any value to this year's crop, because it is insoluble and therefore unavailable. However much of the potash or the lime is found by analysis, it can only roughly indicate the need of the soil. If upon examination the chemist fails to find these necessary substances, then it is a sure indication of infertility.

With this explanation I now present some analyses of soils from near Alvin and Hitchcock, which were made by Professors Harrington and Adriance, of the Experiment Station:

| | Hitchcock surface soil. | Hitchcock subsoil. | College Station. | Brazos bottom, chocolate loam. |
|---|---|---|---|---|
| Organic matter (contains the nitrogen) | 3.54 | .95 | 3.94 | 3.09 |
| Lime | .40 | .66 | .60 | 1.66 |
| Phosphoric acid | .03 | .02 | .08 | .13 |
| Potash | .52 | .29 | .80 | 1.09 |

Hitchcock soil is from the orchard of Hon. R. T. Wheeler. These results are published in Report 35 from the Experiment Station, and distributed free.

Compare these with the analysis of the soils on the Agricultural and Mechanical College farm, and we see that there is but little practical difference in their composition.

### FIELD EXPERIMENTS.

A more certain way in which to test the lacking fertility of soils is by actual field trials of the various substances. Add them separately to a soil and note their effects. Some one will increase the yield slightly, while another will cause a marked increase. In the last case we conclude that the substance is lacking in the soil, and if its first cost does not equal the value of the increased product, we can then afford to buy that material and use it in paying quantities only.

In order that the nature of the fresh South Texas soils might be investigated, some experiments with fertilizers were made upon fresh sod land at College Station and at Beeville. The results are interesting in that they show that such soils are not lacking in plant food—are in reality rich, but unproductive. The reason why such soils do not yield well the first year will be discussed in the second part of this address. The soils respond somewhat to the addition of phosphoric acid, and, in fact, we would expect this from an examination of the table analysis of these soils which has been given.

*Fertilizer Test—Yield of Corn on Fresh Land.*

| Application. | Beeville. | College Station. |
|---|---|---|
| Nothing (no manure) | 10.0 | 10.4 |
| Phosphoric acid (400 pounds acid phosphate) | 13.9 | 19.3 |
| Potash (400 pounds kainit) | 10.0 | 9.1 |
| Nitrogen (400 pounds cotton seed meal) | 11.9 | 13.6 |
| Nitrogen (1000 pounds cotton seed meal) | 10.0 | .... |

CONCLUSIONS.

All of these facts indicate that the upland soils of the coast country of South Texas can be benefited now somewhat by the application of the phosphoric acid in all cases where a maximum crop is expected.

In the course of a few years' cultivation nitrogen (vegetable matter) is also likely to disappear from the lighter lands, and must be replaced in the form of barnyard manure, cotton seed meal, or cotton seed, though these materials contain small amounts of potash and phosphoric acid also.

These analyses and experiments further indicate that these soils are generally well supplied with potash, and we must conclude that the purchase of ashes, kainit, potash, etc., will only prove profitable in rare instances.

The foregoing conclusions are but general deductions, and can only be applied to the coast country in the most general way. It often happens that two parts of a single field will vary in their needs as to manurial elements. Nothing but an actual trial will give positive results, and these private experiments have often misled the farmer when he was not prepared to apply the fertilizers in a scientific manner.

The next session of our State Legislature should be asked to pass a law for the protection of those in this section who buy these commercial fertilizers upon the market. Without a guaranteed analysis the farmer or gardener has no assurance that the claims of the seller are approximately accurate. The farmers of other Southern States have been thus protected in purchases of fertilizers, and their fast increasing use in this State demands that a similar law be passed for Texas.

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## SOIL FOR GROWING PUMPKINS.

INGERSOLL, TEXAS.

DEAR SIR—Please find in this mail a phial of earth, which if you will tell me what it needs for the successful raising of field pumpkins you would greatly oblige and benefit me. C. C. I.

ANSWER.

Replying to your favor of the 7th instant concerning the soils sent for examination, I must say that it does not grow pumpkins because it is almost entirely lacking in organic matter in the form of "humus," which

is partially decomposed vegetable matter. The soil you sent seems to be a yellowish-white sand, of very fine mechanical texture, lacking in clay and almost entirely without vegetable matter of any kind. To render this soil fertile for the growth of pumpkins, several crops of cow peas or other green manure must be given to the soil to make it fertile.

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## FERTILIZERS FOR COAST COUNTRY.

LIVERPOOL, TEXAS.

DEAR SIR—I am about to enter into contract with the German Kali works of New York to conduct some experiments here on black, sticky prairie soils, using their fertilizers on ribbon cane and corn. Any information you can give me, or any suggestion you can make, I will be thankful for. Yours truly, J. H. R.

### ANSWER.

I have your esteemed favor of the 21st inst., concerning experiments to be made in the use of Kainit on the land of your farm, and note with interest your remarks concerning your success upon such lands. I have mailed you to-day a copy of our Annual Report for the year 1892, in which you will see a discussion of soils. I suppose your black lands are the peach ridge soil spoken of in connection with the discussion of Brazos bottom land. Should the description indicate that your land is of this character, you will find analyses of surface and subsoil quoted therein. See page 271. You will note that in the chocolate loam of the Brazos bottom the potash is in great abundance, and phosphoric acid is in sufficient supply, while lime and organic matter, containing nitrogen, are abundant both in surface and subsoil. But in the discussion of the peach ridge land of Brazos bottom you will see that phosphoric acid is lacking, showing only a trace. One-half per cent of potash, if readily available, is sufficient to make a soil highly fertile, while the per cent of organic matter in both surface and subsoil is shown to be a maximum—more than 9 per cent and 4 per cent for surface and subsoils respectively. Unless there is some shell formation in your land visible upon the surface, it is more than apt to be deficient in phosphoric acid rather than potash.

Our lands at this place do not give good results from the application of potash in any form, while the phosphoric acid and nitrogen have responded freely. In planning your experiment I would advise that you should not take a very large acreage for a single plot to be tested. Lay off a number of rows of sufficient length to equal one-fifth of an acre for each plot. Upon the first plot apply nothing.

No. 2. Kainit, 500 pounds per acre.

No. 3. Wood ashes, 1000 pounds per acre.

No. 4. Apply nothing.

No. 5. Apply kainit, 250 pounds; nitrogen in the form of cotton seed meal, 250 pounds per acre.

No. 6. Five hundred pounds cotton seed meal.

No. 7. Nothing.

No. 8. Two hundred and fifty pounds kainit, 250 phosphoric acid or bone meal.

No. 9. Five hundred pounds phosphoric acid or bone meal.

No. 10. Nothing.

No. 11. Two hundred pounds phosphoric acid or bone meal, 200 pounds cotton seed meal, 100 pounds kainit.

No. 12. Two hundred and fifty pounds phosphoric acid, 250 pounds cotton seed meal.

No. 13. Ten loads manure.

No. 14. Nothing.

All of these fertilizers can be obtained from the Standard Guano and Chemical Fertilizer Company, of New Orleans, La. Such an experiment would not be expensive for one living near Galveston. If bone meal is not to be purchased, old bones can be gathered and broken down by rotting them in ashes and securing phosphoric acid in this manner. But it will be, in each case, combined with potash of ashes.

Break all of the land at once at every cultivation. Cultivate thorough, without allowing rain to interrupt, so that all parts of the experimental field will receive the same treatment under the same conditions. Gather all crops at once, and weigh or measure under exactly the same conditions, or otherwise the results may be misleading. The blank or check plots which I have suggested above are absolutely essential to the safety of the experiment. Do not leave them out, because they are the test of the available fertility of your ground.

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## SALT AS A FERTILIZER ON WHEAT.

Beginning April 5, 1893, an experiment was conducted at McGregor, McLennan county, in this State, to test the effect of salt upon wheat crop. Two hundred pounds of ordinary salt was sown per acre, and the yield was increased in every case by the application. The difference was an average increase of three bushels per acre on the sixteen plots tested. The soil was hog wallow prairie underlaid by lime.*

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## BEST MANURE FOR TEXAS SOILS.

A very general idea prevails among our people that fertilizer experiments conducted here or upon the black lands fail in their object unless a mammoth yield is secured for a certainty, or are failures unless a great number of the plots show a profit above cost of applications. Neither of these two views are necessarily correct. The value of experiments of this kind can not be measured by the general success of the plots as a whole when judged either by excessive yields or by number of plots that show profit on application. A large experiment is expected to show a heavy per cent of failures, but the few successes are thereby made only the more apparent. As a rule experimental plots do not show mammoth yields, because it is the constant aim of those in control of the work to select average soils, and other conditions, that the results may prove of

*These results can not be expected to follow such treatment of all black land soils of the State. J. H. C.

the greatest value. In fact, there is very little to be learned from an experiment that is planned on the assumption that the greatest yield per acre is the thing of most importance. It is of far more importance to learn how the greatest profit per acre can be obtained. It is often true that the application of manure or fertilizing matter will increase the yield largely, but will entirely fail to give profit. It is therefore foolish to select those things which will increase the yield per acre without giving any profit to the farmer.

The results of some experimental work with fertilizing land for *wheat, corn and cotton* have been written up in Bulletin 34 of the Texas Station, and all of the conditions were as fairly stated as could be given. Contrary to our expectations, application of both rotten and fresh manure to wheat land gave a profit over the cost of the manure, estimating the manure to be worth 50 cents per load. There was a slight advantage in favor of the fresh manure as compared to rotted manure. The rotted manure caused a yield of 22⅓ bushels per acre. The fresh manure caused a yield of about 22¾ bushels per acre, and an unmanured plot between these two yielded only 19⅔ bushels per acre. If the wheat be valued at 50 cents per bushel the *increased yield* from the rotted manure land was worth $1.23. Subtracting from this amount the cost of two loads of manure which were applied, a profit of 23 cents on the application remains. Similarly the fresh manure increased the yield to the value of $1.58, but this application costs $1, which should be subtracted, leaving a credit of 58 cents, representing the profit on the application of the fresh manure. No doubt the beneficial results of the application of the manure will last for more than one season.

The lands of the Wichita river bottoms in the extreme northern portion of the State responded more freely to the application of stable manure in growing wheat than did the black land soils further south. There were no other manures used profitably upon either the Wichita Falls land, or of McKinney, Collin county, soils, in growing wheat. In this matter we must be careful to note that the profit will not depend entirely upon the increase of the yield per acre, but the price of the crop per bushel is a prominent factor in determining loss or gain.

When corn is rated at 40 cents per bushel and the increased yields of that crop are considered in connection with the cost of fertilizers, it is noticed that there was no profit in the use of fertilizers or manure of any kind on Collin county land for the year 1894. The increase of the yields of the several plots to which fertilizers were applied were very small. Both the rotted and the fresh manure increased the yield one and two bushels; cotton seed meal and acid phosphate from two to six bushels; but none of these were used profitably. It is likely, however, that had cotton seed meal been combined with acid phosphate that some slight profit would have resulted. It is also likely that the dry, hot winds on the first of July injured the growth of the corn crop and prevented its normal development, and so interfered with the nutritive effect of some of the fertilizers which were used. From the experiments it would appear that acid phosphate, cotton seed meal, and common manure are most likely to prove beneficial to the corn crop upon the black lands.

In the face of the low price of cotton some profit was made in the use of commercial fertilizers and fresh manure upon the black lands of Collin county for the season of 1894. It is evident that a large number of

different fertilizers increased the yield, but only some form of *phosphate or nitrogen seem profitable.* The largest profit was obtained from the use of 400 pounds of cotton seed hull ashes per acre, giving a net profit of $1.80. The largest increased yield noted was from the application of 500 pounds of bone black (a phosphate) per acre, which gave 290 pounds of seed cotton increase, but the cost of the material is very high and reduced the profit on the acre to only 80 cents. It is likely that a proper combination of acid phosphate and cotton seed hull ashes upon the black lands would prove profitable in growing cotton and wheat, but the materials must be purchased at reasonable rates.

I do not look upon the fertilizer experiments conducted at *McKinney and Wichita Falls* as being in any way conclusive, because they were continued but for one season, and these experiments should be conducted through a series of five or ten years before absolutely certain results can be obtained. However the year's work has proven very consistent and harmonious, from an experimental standpoint, and we may fairly draw some safe conclusions from the experiment. There are many practical and experimental questions that can only be touched upon in one year's work in testing lands for plant food.

A close inspection of experiments with fertilizers at the *Beeville Sub-Station* indicates that phosphoric acid is primarily lacking in the soils of that neighborhood. It is evident that there is an abundance of potash in that soil, since the application of kainit and wood ashes really reduced the yield of corn upon that land. From observations in different parts of the coast country and from experiments at this place (College Station), it is quite evident that the lack of these lands is phosphoric acid, and some of them lack nitrogen, but potash is in abundant supply usually. This is not only true of growing the corn crop, but of all field crops, so far as I am now able to judge, including cotton, sweet and Irish potatoes, and small grains.

In considering what manure is the best to be applied to land, it is always well to first learn the deficiency that may exist in the soil. If any essential plant food elements are lacking, it will be necessary to replace that deficiency for the particular crop to be grown. Secondarily we should understand the wants or demands of certain crops. They have peculiarities which must be studied. These peculiarities are affected somewhat by moisture or heat, but it is safe to say that all grain crops are especially fond of nitrogen and phosphoric acid, that all garden crops require large amounts of nitrogen and potash, and that trees require a well "balanced soil," fairly fertile in all forms of essential plant food. So far as we have studied the soils of this State by field tests, we have found none that were conspicuously lacking in potash. We have found, however, that some were lacking conspicuously in nitrogen, but all the worn soils appear to be lacking phosphoric acid to some extent. These are the three important forms of plant food that we must constantly keep before us.

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## FARMERS' INSTITUTES.

The season of the year for holding Farmers' Institutes in Texas has just opened. We know that some of the institutes of certain counties have arranged their programs and have selected their speakers for the

occasion. A number of Experiment Station workers have consented to attend some of these meetings and discuss certain topics with those present. There is now little doubt of the great value to be derived from the Farmers' Institutes that are held in several counties of the State.

While the last Legislature refused to create a Farmers' Institute Bureau or organization for Texas, there is no reason why a large number of institutes should not be held during the coming season. Every community has in it some man who is especially fitted to discuss some agricultural or horticultural subject to the benefit of his neighbors. In fact the Farmers' Institute system is based upon the idea that there is no one who is so well informed upon agricultural matters that he may not learn something from an ordinary gathering of farmers, where free discussion takes place. As a rule the men who make success in certain lines of work are usually willing to tell how they succeeded or how they failed, and give advice to their brother farmers upon these subjects, when invited to do so. Besides these men in the local communities there are prominent agricultural and horticultural speakers and writers in this State who cheerfully attend these meetings if their railroad expenses are paid. They are large-hearted, public workers who give their time to the development of our great agricultural resources. In addition to these men the officers of the Agricultural Experiment Station, located near Bryan, may always be relied upon to furnish one or more speakers to the institute if consulted sufficiently early to arrange their work for the meeting.

It is now a very favorable time for institutes to be founded in communities where there have been none up to this time. The rise in the price of live stock, the rapid growth of vegetable and fruit interests of the State, the many clearly defined facts that have been recently discovered upon farm and garden work in their different phases, seem to invite the inauguration of Farmers' Institutes in every progressive community in the State of Texas.

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## HOW FARMERS CAN EXPERIMENT.

Reports have been printed in all of the State papers giving the good results of recent experiments at San Angelo, in this State, that were conducted to test the fattening value of milo maize, for the benefit of the farmers of the semi-arid West. This experiment is one which should have been conducted, and it gives pleasure to all who are interested in the advancement of agriculture in the State to know that private enterprise has adopted the methods of our Experiment Stations, and seek to know something more definite of the feed crops, fertilizers, forage plants and new varieties of all kinds that have been lately introduced into the United States.

Recent letters from several parties ask for a simple method of testing their land to learn whether or not it would pay to use commercial fertilizers, stable manure, and other kinds upon it. We take pleasure in giving all such information as promptly as we can, and we here present one of the plans for soil testing to prove whether or not it is deficient in certain kinds of plant food.

In planning an experiment it is advisable to make plots rather small in size, in order that they may all be treated exactly alike. If a large

field is devoted to one system of experiments, it is impossible to so manage them that the results will be reliable. Plots of one-fifth or one-tenth acre are usually to be preferred. The size of the plot can be determined by the number required for any given experiment. Where ten or fifteen plots are in use the size should be about one-fifth or one-quarter acre. Lay off the number of rows to give the exact size of the plot desired. If a fifth-acre size is chosen, apply the following manures at the rate given below:

Plot No. 1. Apply nothing (check).

Plot No. 2. Kainit 100 pounds.

Plot No. 3. Wood ashes 200 pounds.

Plot No. 4. Apply nothing (check).

Plot No. 5. Combination of kainit 50 pounds (potash), cotton seed meal, 50 pounds (nitrogen).

Plot No. 6. 100 pounds of cotton seed meal.

Plot No. 7. Apply nothing (check).

Plot No. 8. 50 pounds of kainit (potash); bone meal or phosphoric acid, 50 pounds.

Plot No. 9. Bone meal, phosphoric acid or bone black, 100 pounds.

Plot No. 10. Apply nothing (check).

Plot No. 11. Phosphoric acid or bone meal, 40 pounds; cotton seed meal, 40 pounds; kainit, 20 pounds.

Plot No. 12. Phosphoric acid, 50 pounds; cotton seed meal, 50 pounds.

Plot No. 13. Two loads of stable manure.

Plot No. 14. Apply nothing (check).

All of the above materials suggested for fertilizing purposes can be bought of the Standard Guano and Chemical Manufacturing Company, New Orleans, Louisiana, excepting wood ashes, cotton seed meal and manure. For garden experiments in testing fertilizers or manures the size of the plots is ordinarily much smaller than is here suggested.

Through the co-operation of the Department of Agriculture a large list of seeds was distributed in this State last year by this Experiment Station to prominent farmers in all parts of the State. A great many of these have sent us the results of their experiments with grasses, clover, corn and garden vegetables. All of these results will be published at the close of the fall season and distributed free to the farmers of Texas.

We get inquiries sometimes asking whether or not a certain variety of corn or of cotton is well suited to the writer's particular farm, and in most cases we are able to make some suggestions upon this subject, but much more valuable information could be had by the farmer selecting some of the most promising varieties of corn or cotton and plant this upon his farm in small plots or areas. The land selected for these tests must be of very uniform character and fertility. The plots must lay near together, and the outside experimental plots should be protected by other corn or cotton to render them of value. In the middle of the field and near the outside edges there should be "check plots" (planted in one particular variety) to test the conditions of fertility in the land. Then the yields of all other plots may be compared with these check plots to determine the value of the several varieties. This is more accurate and reliable than to compare the experimental varieties with each other. Unless this precautionary method is adopted it is certain that the results obtained on the average farm will not only be worthless, but will

be misleading and harmful in the extreme. For this reason many of the experiments conducted by farmers of all parts of the world have proved themselves unreliable.

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## BOOKS FOR FARMERS.

BEEVILLE, TEXAS.

DEAR SIR—If you have any literature on hand that you send out to farmers I would like to get it. I am a young man just started out, and I have selected farming and stockraising for an occupation, and I want all the information I can get along that line. I would like to have any reports on agriculture or bulletins on stock feeding, especially in stock feeding, for I want to feed next winter.

Yours truly, S. S.

### ANSWER.

I have your inquiry, and in reply beg leave to say that we have placed your name upon our mailing list for receipt of our free publications in future, and mail you copies of Nos. 33 and 34, recently published from this office. I would suggest that it would be worth your while to buy some books on the subject of stock feeding, such as "Feeding Animals" by Stewart. It would also be well for you to understand something of the different breeds of stock, and I recommend for this purpose "Horses, Cattle and Swine," by Curtis. You will find much instructive matter in the two volumes of "Storer's Agriculture," which is an expensive work. A cheaper one is "How Crops Feed," by Johnson. You will find something of particular value on grasses by reading "Grasses and Forage Plants of the South," by Phares. I can refer you to books on sorghum growing, wheat growing, corn growing, potato growing, etc., should you not find in this list the probable information wanted.

# CHEMICAL DEPARTMENT.

H. H. Harrington, M. S. C., Chemist.
D. Adriance, M. S., Assistant.
P. S. Tilson, M. S., Assistant.

BY H. H. HARRINGTON, CHEMIST.

## MISCELLANEOUS.

### THE INFLUENCE OF FEED ON BUTTER.

It has been pretty clearly proven by chemists and dairymen in the last few years, that the proportional quantity of butter fat in milk is not materially influenced by the kind or quality of feed eaten by the cow. But it has also been shown, first at my laboratory in the winter of 1888–1889, and subsequently by Dr. Wiley, of the Department of Agriculture at Washington, that the quality is materially influenced by the kind of feed. It had been believed, even by chemists, that all properly made butter possessed the same chemical composition, except as to the amount of water. Tabulated analyses were given to show just what a chemist might expect in submitting a sample of butter to analysis. But on examining butter from cows fed on cotton seed or cotton seed meal, I found the results to vary widely from published reports of butter from other feeds. It was discovered that the effect of this feed is to make the butter firmer and harder, and at the same time to increase its melting point. Although it should be remembered that the relation between the melting point and actual hardness or firmness of butter is not always the same.

Butter from any feed is chiefly a mixture of three oils, olein, stearin, and palmatin, the last two being solids at ordinary temperature, and the first a liquid. As cotton seed oil is itself a liquid containing an excess of olein, we would naturally expect that a feed of cotton seed or meal would give a butter with a greater excess of olein—a butter of lower melting point. But just the reverse seems to be true, as shown by chemical analysis, and as appears to be further shown (under claim) by expert tasters, who complain of cotton seed butter "sticking to their palate"—an excess of palmatin or stearin. The practical benefits of this influence in our warm climate are at once apparent. It is by a difference of 8 or 10 degrees easier to keep such butter for market. It not only does not melt so quickly, but it is not so liable to become rancid. On the other hand, if a full feed of cotton seed or meal is fed to the cow, the taste of the butter becomes so impaired that what is gained in one direction is more than lost in another.

The question then becomes: How much of cotton seed meal or cotton seed can we afford to feed, and still not materially influence its flavor, while at the same time we increase its melting point? In a bulletin published some time ago we undertook to answer that question from the chemical and practical side. We found that by feeding two pounds of cotton seed meal, two pounds of wheat bran, two pounds of corn meal, and ten to sixteen pounds of silage per day, we increased the melting point of butter three to four degrees without impairing its flavor. Other feeds might of course be substituted for any of the above to go with the meal, or this may be replaced by hulls and meal, or boiled cotton seed in the proper proportion, depending upon what is available to the feeder. But of course the meal or meal and hulls, when they can be obtained, are always preferable to the whole seed, owing to the large amount of oil which these contain.

So much for the effects of cotton seed and its products on butter. In Bulletin No. 13 of New Hampshire Station an experiment was undertaken primarily to test the relative influence of corn meal and its by-product gluten meal, on the character of butter from each.

Ensilage, hay, corn meal, middlings, and gluten made up the feed; the corn meal and gluten so varied as to test the influence of each; the other feeds remaining constant. It was found that the substitution of gluten, either wholly or in part, for corn meal had the effect of softening the butter. While in a test with hay and silage, the hay "apparently produced" a harder butter. Again, when cotton seed were substituted for gluten meal, the increased hardness of the butter was very marked.

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## THE SALE OF COTTON SEED.

Since the time when cotton seed oil mills were safely established the price of the seed has been an annual theme of discussion between the farmer and mill men.

With the farmer the question should be, "At what price can I afford to sell my cotton seed?" and not, "What price can the mill man afford to pay?" since the latter question is beyond his control.

It is not likely that any discussion in the press, or otherwise, will materially influence the majority of farmers in the disposal of their cotton seed. Whether the price is $14 or $4 per ton, the seed will be sold just the same—reluctantly, perhaps, but none the less steadily. The farmer is too prone to look upon the sale of the seed as so much saved, regardless of the price, but I believe there are some who, if clearly reminded of the farm value of the seed, will *demand* a certain price of the mill men, or use the seed at home upon the farm. Especially should this be done by the farmers living upon the poorer lands of the State—land that is not sufficiently fertile to begin with, and that will rapidly grow poorer as each annual crop of cotton is sold and nothing returned. Upon richer land of the State, like the black waxy and the alluvial river bottoms, the seed is of less importance; but even there they have a great feeding value that should not be thoughtlessly disregarded.

THE SEED MEAL AS A FERTILIZER.

A ton of cotton seed, on an average, yields approximately 1090 pounds of meats, 800 pounds of hulls, and 20 pounds of lint. The meats yield about 800 pounds of meal and 290 pounds, or thirty-nine gallons, of oil.

At this time the seed are worth about $6 at the mill, the meal $16, and the hulls $2 at the same place; the oil 22 cents per gallon, and the lint 3 cents per pound. The mill man, therefore, converts $6 for the seed into $16.47 for its product, a difference of $10.47, even at the very low present price for oil and meal.

The average composition of a ton of the seed in fertilizing material is 60.6 pounds of nitrogen, 23.2 pounds of phosphoric acid and 25.1 pounds of potash. The money value of a ton of meal is $16, and at that price is the cheapest all-purpose fertilizer which the farmer can buy. Add $2 to this for hauling home, and price becomes $18 per ton. But how does its price compare with the price of the seed at $6 a ton? The average fertilizer composition of a ton of the meal is 132.8 pounds of nitrogen, 53.6 pounds of phosphoric acid and 35.85 pounds of potash. This would make about the following valuation per pound of the above ingredients: Nitrogen 10 cents, phosphoric acid 6 cents, potash 4 cents. These prices would give a money valuation to cotton seed themselves of $8.45. So when the farmer sells seed at $6 per ton and buys meal at $16 per ton he is losing about two and a half dollars, not counting the cost of hauling the seed to the mill or nearest market. This estimate is based on the fertilizer value alone. But to apply raw seed or meal is the most wasteful way to use them for a fertilizer, since their feed value is thereby lost. Let us compare

THE FEED COMPOSITION OF THE TWO.

The seed contains per ton 374 pounds of protein, or nitrogenous material, 514.8 pounds of nitrogen free extract, including starch, sugar, resins, etc., 414.8 pounds of oil. The meal contains per ton 846 pounds of protein, 472 pounds of nitrogen free extract, 262 pounds of oil. It is difficult to place anything like a correct money value on the above ingredients. But they show the seed are richer in oil—too rich, as is well known—and in nitrogen free extract, than is the meal. But the meal contains two and one-half times the amount of protein in the seed. Therefore, so far as chemical composition is concerned, two and a half tons of seed used would more than compensate for one of meal. But the meal costs the farmer $18 and he receives $15 for the seed, a loss of $3. It may be said that the meal is a better feed than the seed practically, regardless of chemical composition. In some respects it is better, but can no more be fed without roughness or coarse fodder of some kind than can the seed.

In an extensive feeding experiment covering two winters it was shown by Professors Gully and Carson (Bulletin No. 6), at this Station, "that for different cattle foods, a ration made up of cotton hulls and cotton meal is equal, if not superior, to a ration of any other two feedstuffs used for fattening cattle, but a cheaper ration may be compounded of silage and cotton seed, or of corn, hay, and cotton seed at the prices given, namely: Forty cents a bushel for corn, $20 a ton for cotton seed

meal, silage at $2 per ton, $3 per ton for hulls, and $7 per ton for cotton seed."

I conclude, therefore, that if the farmer wishes to make a choice between seed and meal for fertilizer purposes only, at the present prices, he loses about $2.50 per ton if he decides in favor of the meal. If for feeding purposes, he loses about $3 per ton. That is, if we assume the manure from a ton of seed and a ton of meal to be worth the same, or nothing. But since that from the meal is worth a little more, it would bring the loss in either case to about the same—$2.50 for every ton bought and sold. The only excuse for such a practice is, then, 1st, the land is so rich it needs no fertillzer; 2d, one owns more seed than he can feed. And it is doubtful whether a farmer is ever justified in having more cotton seed at this price than he has cattle to eat them.

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## "ALKALI."

The term "alkali," as ordinarily used, when applied to water or soil, conveys very little accurate information as to its nature, unless one has learned from experience what to expect. Usually, a water that tastes "bitter" (acrid) or salty is called an "alkali;" while a soil that will not grow crops is denominated an "alkali" soil.

There are considerable quantities of both of these in this State, and samples of each have frequently been subjected to analysis in this laboratory. The most common form of this alkali is sodium chloride, common salt, at the same time a very dangerous form for plant life. The Pecos river water contains so much of it that along the smaller ditches and flats that catch the overflow from these, where the water is allowed to slowly evaporate and sink into the soil, a white sediment of salt is left in such quantities as to be easily scraped from the surface. It frequently gives rise to "alkali spots" in a field, especially in the western part of the State.

It can not be elminated from a soil by treating with chemical substances, but there are certain plants that absorb very large quantities of it—notably, beets and sorghum, and much of it can be removed by successive crops of these. When irrigation water can be had it may frequently be partially washed out of the soil by heavy floodings—allowing all the water to drain away. Next to common salt, sodium carbonate, "soda," is perhaps the most common "alkali;" it is more injurious than the chloride, quantity for quantity, but can be destroyed by application of gypsum or plaster to the soil. This salt is really alkaline, "caustic," in its character, and is especially destructive to young plants.

If applied to the soil in solution, by irrigation, its influence is only quicker. My attention has been called to the existence of this "alkali soil" even as far east as Brazos (this) county. But it is also most common in the western part of the State. But in Texas these soils or waters do not exist to the extent found farther west—Colorado, New Mexico, Arizona, California, Utah, Dakotas and Nevada, all have large areas of alkali soils, over which are found alkali waters in greater or less quantities.

Magnesium chloride, borate of soda (borax), and calcium chloride also sometimes add in small quantity to the existence of alkali soils or waters.

BY P. S. TILSON, ASSISTANT CHEMIST.

## THE USE OF FERTILIZERS.

That some of the once fertile soils of this State now require care in order to restore production, is proved by the increasing correspondence on the subject that is addressed to this Station.

The object of this article is to put in print, for general information, what can be stated in a general way on this subject—leaving individual cases that will require special consideration on account of peculiar condition of soil, location, or alkali for direct communication.

In all civilized countries the continual strain that is brought to bear upon the land, due to the growth of crops, even in proper rotation, is very great year after year. But whether fertilization will pay or not, clearly depends directly upon the particular requirements of each soil.

The fact that some of our small fruit growers, as well as others, have realized high returns from a judicious use of fertilizers, has dispelled the silly claim that "fertilizing is too costly and will never pay." The reason why our soils require the addition of fertilizers will be apparent, for "profitable farming necessitates the maintenance of the land in an increasing, rather than decreasing, state of fertility."

Who will deny the sovereign truth that nothing pays worse than poor crops upon large areas, of which the cultivation cost just as much as if it were yielding high returns? It must be evident to all that to use fertilizers (artificial or natural) on a soil which does not require them, or to add fertilizers in excess, is so much waste of money.

Unlike soils that have been for ages cultivated and require a "complete fertilizer" (which contains nitrogen, phosphoric acid and potash), our soils have had for the most part only a *one-sided wear*, and require a partial fertilizer. It is desirable for profitable, and also economic, farming to know (1) the quantity of mineral and nitrogenous matter our soil contains, (2) whether these mineral substances are in such a form as to be readily taken up by the crop, (3) what ingredients are extracted by the crop. In short, for a planter to use intelligently a fertilizer, he should know what his soil lacks to produce a paying crop, and the composition of the fertilizer at his disposal. Before any mineral ingredient is absorbed by a living plant it must be in solution. There is no such thing as the roots of plants absorbing solid matter. A soil may contain an abundance of potash, phosphoric acid, lime, etc., and yet be almost barren, all because these substances exist as insoluble compounds. It must be remembered that if a soil is deficient or wanting in just one of the mineral ingredients found in the plant we wish to grow upon it, the yield will be small.

A virgin soil usually contains an abundant supply of plant food, as the elements taken from the soil by the plant are returned to it again when the plant decays. As soon as the land is brought into cultivation, however, the vegetation is taken from it. Sooner or later under this drain the land becomes impoverished. Hence the use of adding natural and artificial fertilizers.

The chemical analyses of soils in the majority of cases yield little value to the agriculturist, because the acids used in the laboratory are more powerful than those at the command of the roots of the plants.

As regards water used for irrigation, the information so obtained is positive.

The farmer's only safeguards as to the kind and quality of fertilizers to be used are through direct and repeated trials and chemical analysis. Generally speaking, the elements, iron, sulphur, lime, and magnesium, are found in abundance to supply a maximum crop. If so, then the principal fertilizing elements to be looked to are nitrogen, phosphoric acid and potassium.

These elements in an analysis of a fertilizer are generally spoken of in combination with oxygen. It has long since been found by chemical analysis that all the elements necessary to the proper subsistence or growth of plants are generally present in the soil in sufficient quantity, except nitrogen, phosphorous, and potash.

Now, let us inquire how we may replenish our cultivated lands with these, and for this purpose we will consider in the main some of the more recent analyses of fertilizers made in this laboratory. Before giving the reader the benefit of these, some of which are typical fertilizers, we should understand in what form the plant food herein contained is valuable to plant nutrition, and whence our source, to a limited extent.

Nitrogen in commercial fertilizer is the most expensive and at the same time the easiest to be washed out of the soil. Its ordinary measure in soils is the vegetable mold or humus, the presence of which we can easily measure by the more or less blackish tint when wetted, except our "red soils."

It is well to say just here, that from the analyses of over forty different soils in this State (the chemical analysis can be found in Bulletin No. 25), we found in nearly every instance that they contained a sufficient amount of humus.

This important ingredient (nitrogen) can in most cases be replenished by a farmyard fertilizer, when proper care is exercised. This is regarded by the average farmer as a typical fertilizer. It must be understood that its composition varies considerably, and that it is far from being a perfect fertilizer. A still better source for nitrogen near at hand to the Southern farmer is cotton seed meal, which contains about $6\frac{1}{2}$ per cent of nitrogen.

The most convenient source of nitrogen through a commercial fertilizer, as well as the most available, is chili saltpeter (sodium nitrate). As will be seen from the following analysis, it contains about 14 per cent of nitrogen.

Bat guano, of which a great amount is found in this State, is another source, containing over 10 per cent of nitrogen, the analysis of which will be found under the heading "Phosphoric Acid Fertilizers."

Still another source we have is sulphate of ammonia, which from the analysis shows it to contain nearly 20 per cent of nitrogen.

Bone black and bone meal contain nitrogen, and their analyses are also to be found under the discussion of phosphoric acid.

ANALYSES.

Barnyard Manure, from Experiment Station. (No. 152):

| | |
|---|---|
| Moisture | 10.542 per cent. |
| Phosphoric acid | 1.436 per cent. |
| Organic matter | 45.350 per cent. |
| Potash | 0.786 per cent. |
| Nitrogen | 2.065 per cent. |

Chili Saltpeter (sodium nitrate). (No. 145):

| | |
|---|---|
| Nitrogen | 14.420 per cent. |
| Equivalent to— | |
| Ammonia | 17.510 per cent. |
| Moisture | 1.700 per cent. |

Sulphate of Ammonia. (No. 147):

| | |
|---|---|
| Nitrogen | 19.810 per cent. |
| Equivalent to— | |
| Ammonia | 24.056 per cent. |
| Moisture | 2.070 per cent. |

PHOSPHORIC ACID FERTILIZERS.

The phosphatic fertilizers usually contain their phosphoric acid in different forms, and to this fact must the purchaser direct his attention when procuring a commercial fertilizer. It should be present in all compound commercial fertilizers, being next in importance to nitrogen. Phosphoric acid in commercial fertilizers exists in three forms, viz., water soluble, citrate soluble, and acid soluble.

The water soluble and citrate soluble are usually taken together and called "available phosphoric acid."

These two forms of phosphoric acid are usually given the same value in a commercial fertilizer. They are both readily available as a plant food, with a preference always for the water soluble when buying.

The insoluble phosphoric acid is only slowly, if at all, available to plants.

Bat guano contains all three of the chief essential ingredients of a complete fertilizer, though the quantities of each are frequently not well proportioned.

Below we give the analyses of a few commercial, as well as natural, fertilizers, under the above classification.

BAT GUANO. (TEXAS.)

| Number. | Citrate soluble. Phosphoric acid. Per cent. | Water soluble. Phosphoric acid. Per cent. | Insoluble. Phosphoric acid. Per cent. | Total nitrogen. Per cent. | Total nitrogen Equal to Am. Per cent. | Moisture. Per cent. | Potash. Per cent. |
|---|---|---|---|---|---|---|---|
| 120 | 3.157 | 1.544 | 0.139 | 10.970 | 13.321 | 13.41 | 0.389 |
| 143 | 1.860 | 2.240 | 0.54 | 10.060 | 12.219 | 12.81 | N. E. |

BAT GUANO ASH.

| Number. | Citrate soluble. Phosphoric acid. Per cent. | Water soluble. Phosphoric acid. Per cent. | Insoluble. Phosphoric acid. Per cent. | Potash. Per cent. | Lime. Per cent. | Magnesia. Per cent. | Total acid. Phosphoric. Per cent. |
|---|---|---|---|---|---|---|---|
| 122 | N. E. | N. E. | N. E. | 0.901 | 33.500 | N. E. | 23.850 |
| 126 | 11.231 | 0.464 | 5.008 | 0.646 | 22.731 | 2.696 | 16.703 |

Acid Phosphate. (No. 149):

| | |
|---|---|
| Soluble phosphoric acid | 13.060 per cent. |
| Citrate soluble phosphoric acid | 2.250 per cent. |
| Insoluble phosphoric acid | 1.690 per cent. |
| Total | 17.000 per cent. |
| Moisture | 7.79 per cent. |

As will be seen from No. 149, acid phosphate contains only one constituent of value, and that is phosphoric acid in three forms, showing the amount of available phosphoric acid in the above samples to be large and readily assimilable by plants.

Bone Black. (No. 144):

| | |
|---|---|
| Total phosphoric acid | 32.150 per cent. |
| Nitrogen | 1.350 per cent. |
| Moisture | 2.82 per cent. |

Bone black is obtained by heating bones in suitable retorts, out of contact with air.

Our principal source is either to prepare it ourselves or obtain it from sugar refineries, where it is employed as a decolorizing agent.

Bone Meal. (No. 150):

| | |
|---|---|
| Total phosphoric acid | 21.360 per cent. |
| Total nitrogen | 3.580 per cent. |
| Moisture | 11.410 per cent. |

It has been mentioned above that bone meal is valued not only for the phosphoric acid which it contains, but also for its nitrogen. The bone meal can be much improved as a fertilizer if the bones are steamed before grinding. This steaming process must not be carried too far, else some of the nitrogen will be lost.

POTASH

Ranks next to phosphoric acid as a valuable plant food. The ashes of all plants contain potash in considerable quantities, and it can be obtained from the ash by a suitable leaching process. Plants vary largely as to their demand for this element. It is formed by the direct decomposition of the mineral feldspar, which contains from 10 to 15 per cent of potash. Other sources are, sulphate of potash, muriate of potash and kainit.

Kainit. (No. 146):

| | |
|---|---|
| Potash | 11.810 per cent. |
| Moisture | 9.430 per cent. |

# VETERINARY DEPARTMENT.

BY M. FRANCIS, VETERINARIAN.

## DISEASES OF LIVESTOCK.

### REMARKS ON TICKS.

We have recently received so many appeals for remedies to destroy ticks on horses, mules, and cattle, that it has become a burden to answer each one personally. In order that the results of our experiments in this line may come before those interested on the subject, the following remarks have been prepared for publication at this season. A more detailed account of our successful and unsuccessful attempts will appear when our work shall have been completed.

It may be of interest to remark that several varieties of ticks infest our domestic animals. Those that have come to our notice in Texas are the following:

1. Boophilus bovis, the common cattle tick; very abundant on cattle during the summer and fall months; less frequent on horses.

2. Amblyomma unipunctata, the "Lone Star Tick," occurs especially on horses, mules, and dogs during spring and early summer; not so numerous as the first variety; found also on cattle, but not in abundance.

4. Dermacentor Americanus.

5. Rynchopori an spinosum (Mark); occurred in the ears of cattle in Menard county.

6. Argas Americanus, the chicken tick, reported from San Marcos, Austin and Lampasas.

Where the term "tick" appears hereafter, it will be understood that the first and second varieties given above are the ones in question. Nothing of the biology of ticks or their relation to Texas fever is given here, except to note one fatal case of the disease in a Jersey bull near Navasota, about May 2, 1895. The animal harbored quite a number of the Lone Star variety (Amblyomma unipunctata) only. This is the only one instance that has come under our observation in which the evidence was sufficient to warrant a statement of its probable relation to the disease.

The substances employed by us to destroy the ticks may be considered in four groups:

1. The tobacco decoctions and manufactured tobacco sheep dips were tried and discarded because of its inefficiency.

2. The creoline and creosote-alkali-rosin emulsions, when sufficiently

concentrated to destroy the ticks, are too severe on the cattle. They deteriorate rapidly in the vat.

3. The arsenical solutions employed were quite stable, and do not burn or poison the cattle, but are slow in their action, and require long exposure to destroy the adult ticks.

4. The oils have given us the best results. For dairy cows, oxen, horses and mules we use a mixture of the following:

Cotton seed oil, 100 parts; dead oil, 10 parts; pine tar, 10 parts.

Warm the cotton seed oil over a slow fire to about 125 F., add the dead oil, and finally the pine tar. Stir frequently while cooling.

The warming of the cotton seed oil is to cause the other ingredients to mix readily. If the cotton seed oil be raised to a high temperature, the pine tar will boil over and cause much annoyance. This mixture is most conveniently applied with a wide paint brush. It is not essential that the exact proportions of the ingredients be observed.

For ordinary use we mix as follows: To one-half gallon cotton seed oil, in a suitable vessel, over a slow fire, add an ordinary drinking tumbler full of dead oil and of tar. When the tar is melted remove from the fire and allow to cool.

The dead oil used in the above is the so-called crude carbolic acid of the drug store. It is black, sinks in water, and costs about 30 cents per gallon in five gallon lots.

If this mixture be thoroughly applied, every tick will be hard, black, brittle, and dead in 24 hours. If the ticks be not dead it indicates that a sufficient quantity has not been applied. Little practice will enable any one to determine the proper quantity to use.

For range cattle we apply a similar mixture by swimming them through a large vat, containing about 4000 gallons of water, and having a layer of the oil about an inch thick floating on the surface. This arrangement is similar to that employed in dipping sheep, with the exception as to size. The cattle vat is described in Bulletin No. 30 of the Texas Experimental Station, and those interested in its construction are referred to the Bulletin for the plan and dimensions.

Our most recent experiment with the oil consisted of cotton seed oil, 100 gallons; dead oil, 15 gallons; pine tar, 5 gallons.

It is important that the oils be mixed in a barrel, or other suitable vessel, before pouring them on the water in the vat. Twenty-two cattle were forced to swim through the vat. In twenty-four hours after, each animal was caught and examined thoroughly, and less than twenty ticks were found alive. It is probable that we will be able to kill every tick by one dipping. No injury whatever occurs to the cattle.

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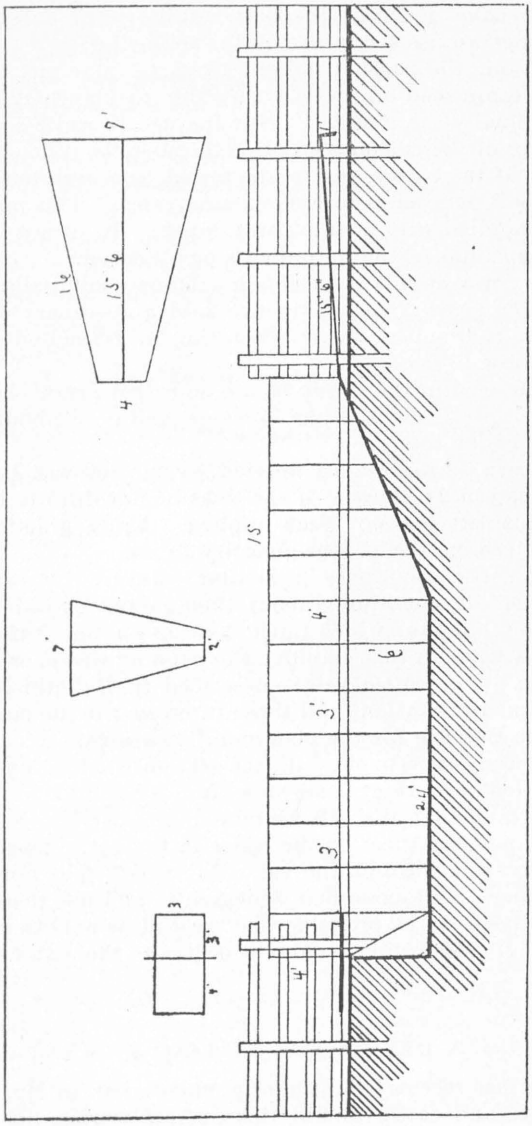
## A DEVICE FOR KILLING TICKS.

The Station has recently built a large vat similar to Mr. Kleburg's for dipping horses and cattle to kill ticks, screw worms, lice, mange, ring worms, etc. It consists of a V-shaped vat, 24 feet long and 6 feet deep, and has a capacity of about 5000 gallons. The cattle are driven through a narrow chute and on a trap door, which is balanced on the edge of the vat in such a manner that when the animal comes on it, it tilts, thus compelling the animal to slide into the vat. This device we believe to be

the only practical means, so far suggested, for destroying the ticks on a large scale.

The Station intends to work along this line the coming summer. The cost of the vat was about $100.



## TETANUS OF HORSE (LOCKJAW).

December 15 a horse was presented for treatment that showed general stiffness, rigidity of the muscles, tail elevated and trembling, straddling of the hind legs, etc.

Inquiry revealed that some week or ten days previous the animal had cut his withers on some sharp object while rolling in the lot. This had healed and had been almost forgotten. The case was a plain one of tetanus, though in a mild degree. The horse was put in a dark box stall and not disturbed. When quiet he was able to eat, and in fact the power to swallow was not seriously impaired.

Treatment consisted in bromide of potash in doses of two drachms twice a day. This was continued several weeks. The horse recovered.

Some investigations in Europe, I understand, have succeeded in combatting this disease by inoculation with serum from a horse that had been rendered immune by successive inoculation of the virus. The day is probably near when this remedy will be available all over the country for this usually fatal disease.

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## GLANDERS.

On January 13 a horse was presented having a discharge from both nostrils, sub-maxillary lymphatic enlarged; in ordinary condition as to flesh, but somewhat drawn in the flanks. Had been in this condition three or four months. No sores on the body, but a scar on the inside of the thigh. There were no chancres visible.

Suspicions of glanders were entertained. The horse received 1 c c Mallein, which caused the temperature to rise to 105.2 degrees F. This was regarded as confirming the diagnosis of glanders.

This subject of glanders will be treated somewhat fuller in a bulletin now in manuscript, and soon to be issued from the Experiment Station. Those interested in the subject can be supplied with copies free of cost.

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## OBSTRUCTION IN MOUTH OF HORSE.

On September 27th a horse was brought to the College that was unable to eat. Had been in this condition several days. Owner said that the animal could drink water without difficulty. An examination of the mouth revealed the presence of a corn cob, tightly wedged between the teeth of the upper jaw. The action of the case was interesting. The horse would bite grass off and then spit it out, being unable to swallow it. It will be noticed from the above that the fact of the horse being able to drink eliminated the possibility of the trouble being either paralysis of the throat or of obstruction to the esophagus. In all such cases it is wise to examine the mouth carefully for foreign substances.

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## CONTAGIOUS SORE MOUTH OF HORSES.

During November and December numerous cases were presented of contagious sore mouth of horses. As this trouble is probably wide spread over the State, it may be of interest to notice them somewhat in detail.

The first symptom noticed is profuse slobbering. This continues several days. On examination of the mouth, showed a great many blisters on the tongue, lips, and jaws, the size of peas. These contained a clear fluid. In a few days these burst, leaving many bright ulcers of various sizes.

The animal showed considerable difficulty in eating. This condition of affairs continued a week or ten days and was followed by perfect recovery. On examination the blisters showed the presence of a fungus, but the relation of the latter to the disease was not studied. Treatment consisted of soft food and washing the mouth daily with chlorate of potash, alum, borax or permanganate of potash.

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## ENTERO UMBILICAL FISTULA.

January 24 a three-year-old gray mule was brought to the College for treatment, having an opening just behind the navel which extended forward and upward into the bowels. This had been caused by screw worms last summer. The tube was about the diameter of a lead pencil. It seemed to cause no inconvenience to the mule, except when sudden exertion was made considerable food would escape through the opening. The animal was confined to a very limited diet for two days, then tied down and turned on his back. The opening was carefully probed to the depth of twelve inches or more. A piece of lunar caustic (silver nitrate) was introduced, and this allowed to scald the walls of the tract. After a few minutes he was released and returned to his stall and kept on limited diet for a week. The walls healed promptly and kindly; no discharge was noticed, and February 27 the mule was regarded as cured and was sent home.

# HORTICULTURAL DEPARTMENT.

BY R. H. PRICE, HORTICULTURIST.

## VEGETABLES.

### HARVESTING AND STORING SWEET POTATOES.

To keep sweet potatoes well they must first be properly harvested. If the crop be intended for stock food it is much cheaper to let the stock harvest it. Cattle may be turned on first to eat the tops and vines, afterwards hogs may be turned on to harvest the tubers. In this way nearly all the crop may be saved at a minimum cost. If the potatoes are to be dug it is important to know when to dig them. The crop should not be dug when the sap is active in the vines. If, when a tuber is cut, the cut place partially heals over and becomes dry, the crop is usually ready to be harvested. But if the cut place turns greenish black the crop is not ready to be harvested.

Vines are a great nuisance in harvesting sweet potatoes. There are two different ways of getting rid of them. One is to graze them off, and the other is to cut them off. We have used a sharp rolling cutter on the beam of a turning plow, just in front of the plow point, successfully. This rolling cutter cut the vines on each side of the row, while some dirt was thrown away from the row at the same time. The third time the turning plow was run in the center of the rows and the potatoes thrown out. The tubers were then gathered and sacked. Care must be taken not to bruise them, as the soft rot is apt to start at all bruised places. All bruised tubers should be sorted out and fed at once before storing.

We have tried fositite, Bordeaux mixture, lime and sand in keeping sweet potatoes, but neither one proved effectual in preventing the spread of black rot. We have obtained good results by letting the tubers remain in the ground where they grew until wanted. By throwing dirt over the rows with a turning plow it will prevent them from freezing in this climate. Further work, which is now in progress, is necessary along this line before positive recommendations can be given as to the best method to prevent injury by black rot. If the potatoes are to be stored away they must be dried first, and those which decay from soft rot must be taken out frequently. In about two weeks after digging they will be dry and the soft rot will stop. The potato house we have used in keeping potatoes, both sweet and Irish, is shown in a Bulletin now in press. It consists of two outer walls with a dead air space between. Also two doors, a double floor and a ventilator. The ventilator may be opened and closed at will. During warm days in the fall the doors are left

open for further ventilation. Inside are upright pieces which project from the floor to the ceiling. Strips reach from these across to the walls, and on these planks are laid lengthwise, which are nailed also against the sides of the posts, thus forming long boxes. The potatoes are stored in these and dry road sand mixed with them. Mice can not go through dry sand. Potatoes kept well in this house last winter when the temperature went down as low as 7 degrees F., and not 1 per cent was injured by freezing.

The sand must be changed every year for sweet potatoes, because it is very apt to contain spores of diseases which will infect the next crop. Where we did not change the sand nearly all the crop was lost from black rot. The potatoes that have kept best are Brazilian, Bronze, Canal, Shanghai, and Southern Queen. The purple skin varieties have resisted the diseases best.

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## TEST OF SWEET POTATOES—VARIETIES.

During 1894 thirty-one varieties of sweet potatoes were tested upon the Station's grounds. The test was made in reference to yield per acre, character of tubers, length of vines, and table quality when baked. The most productive are given in the following order: Shanghai, Vineless, and Nansemond. As to table quality the following are among the best: Vineless, Sugar Yam, and Nansemond. Those that show the highest content of sugar are given in the following order: Norton, Yellow Yam, Southern Queen, and Vineless. Full results of the tests, including a chemical analysis of nearly all of the varieties, with a botanical classification, are published in Bulletin No. 28.

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## CABBAGE—TWO CROPS IN ONE YEAR.

During the past year twenty-four varieties of early cabbage were grown on the Station grounds.

The experiments proved that several varieties were well adapted to this soil and climate, while several other standard varieties proved to be entire failures. Many of the best varieties produced edible heads 19th of May. We began to cut heads from the first winter cabbage we had ever grown 30th of December, and continued cutting until all were killed by a very sudden freeze on January 23.

Seed for this second crop was sown the 25th of July, and were shaded from the hot sun until ready to set out. The plants were set out in the ground last of September. The cabbage worm then made a serious attack upon them, and threatened to destroy the entire crop. This insect can be easily killed by dusting over the plants pyrethrum or Persian Insect Powder. This powder is usually sold in the drug stores of the State under the name of flea powder, and often it has been kept so long that it has lost its strength and will not kill. Care should be taken to procure a fresh article. From these experiments briefly mentioned it is safe to conclude that two crops of cabbage can be grown here in one year. It would not be difficult at all where irrigation can be had; in fact, the winter crop seems to be of more value than the summer crop.

VARIETIES.

The best early cabbage under test was a strain of the Wakefield, known as Taits' Early Jersey Wakefield. The heads were firm and of good quality. This cabbage will ship well. It may safely be relied upon for main crop. Other promising early varieties are Taits' Extra Early Pilot, Newark, Early Flat Dutch, Burpee's All-head Early.

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## TOMATOES.

During the summer of 1893, sixty varieties of tomatoes were tested upon the Station's grounds. In the test were included about all the new varieties and several of the old standard varieties for comparison. While the season was very dry, and cut the crop of fruit very short on all the varieties, yet some yielded over five pounds of good fruit per vine, and stood the drouth fairly well. Critical notes can not be given in this newspaper article on the varieties, but the more important points brought out in the test are here given. The culture of this vegetable is becoming an important market crop in some parts of the State where it grows to perfection. In a few places canning factories are putting up large quantities.

VARIETIES.

Perhaps the most important thing necessary to success is a good variety. When in the Houston market the 18th of last June I found one man who sold his tomatoes very rapidly and realized about 25 per cent more for them than the others. On close examination I found he had a variety none of the others knew anything about. It was the Acme, which seemed to grow to perfection there. I have grown as high as 17 pounds of fruit per vine with this variety. The foliage is sparse, and it sets so full of fruit that they are liable to sun scald. The drouth cut it short here last year. Early Ruby was one of the most promising varieties. It was profitable; fruit large, round, light red. After testing the Tree tomato several years and in widely different localities, I think it has no promise whatever. But the Dwarf Champion, which has the same upright habit of growth and seldom needs staking, was perhaps the most promising early variety in the whole test. Fruit very smooth, medium size, solid, purplish red; will stand shipping well. It stood the drouth best of any.

GROWING THE PLANTS.

For earliness and productiveness it is important to have good stocky plants to go into the field. After growing them in the hotbeds till they get 4 to 5 inches high, they should be transplanted into a cold frame so that the stalk may grow heavier and secure a greater mass of roots. The plantlet is much better then prepared to withstand the vicissitudes of climate. The stem will set roots as far up as it is placed into the ground. They may be easily set in the field by throwing open a furrow with a turning plow and laying the plants along the straight side of the furrow and then bringing dirt back over the roots with a hoe, and then pressing

it firmly with the foot. One man in this way can set several thousand plants with ease in a day. The plants may be kept from wilting much by carrying them in a bucket containing some water and dropping them in the fresh furrow and covering immediately.

### FALL CROP.

After our plants had stood all summer and were almost dead, apparently, the 1st of September we cut the old tops off near the ground, and when the fall rain came new branches started up and grew thriftily and bore a heavy crop again till frost. If the season be good, branches can be cut off the vines and stuck into the ground and will grow off and bear like the parent vine. Thus a continuous crop can be grown from early summer till frost in the fall from the same plants, which is a very important thing for canneries. A light dressing of straw placed over the ground before the plants fall and begin to run serves to keep the fruit clean and helps to hold the moisture in the soil.

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## LIMA BEANS.

Five varieties of so-called Lima beans were grown upon the Station grounds here during the past year to test their productiveness, hardiness and habits of growth. Notes upon them are given below:

Thornburn's Dwarf Lima is a true bush lima. It is rather weak, but is prolific with good culture. Texas Speckled Lima is a small running variety, but hardy and prolific. Dwarf Lima is a true bush lima bean. It is small but early and prolific, and one of the most desirable of the kind. Small White Lima is inclined to produce runners; beans are small and white. It is rather late, but prolific. Large White Lima is a running variety with very large beans. It is a true lima variety, and is very hardy.

As lima beans are rather tender and easily injured by cold they should not be planted until all danger of frost is over. The soils should be made rich by adding barn-yard manure, and then be thoroughly cultivated. Seed may be obtained of any reliable seedmen.

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## AN EXCELLENT RADISH.

An early, crisp, and pleasant flavored radish is something to be appreciated upon the table most any time of the year. We have been testing a large number of varieties for several years, with the hope of finding one suitable for outdoor culture, and at the same time be of high table quality. We have had in our test about all the American varieties and many others from England and France, which were imported direct. The radish that has come nearest to perfection, in my opinion, of all the varieties that I have tested, is the Rose Colored China. This radish is often sold as a winter radish, and I have grown it here to perfection in December, but it is a medium early radish when grown in early spring or summer. It is of good size, oblong, slightly conical, light carmine color. It remains edible a long time without becoming pithy or strong, and does not run to seed early.

## CELERY—VARIETIES—TWO CROPS IN ONE YEAR.

During the past two years we have carried on experiments with celery, the objects being to find some variety and method by which this important vegetable could be grown in the State nearly all the year successfully. It is a well-known fact that much of our celery comes all the way from Michigan, and any knowledge which would encourage the growth of this vegetable in the State would mean dollars kept at home.

We have grown celery here both in the spring and in the fall with fair success even on a rather poor, dry upland soil. The seed was sown in trays January 25th, and the plants were set in the field April 25th for the spring crop.

The following brief notes are given on varieties we have had under test:

Boston Market.—Grew 12 inches high; was not diseased; color dull green; hard to blanch.

Giant Paschal.—The largest variety; slightly diseased; blanches easily; best of the large varieties.

Golden Dwarf.—Grew rather large; blanches easily; affected slightly by rust; a good variety.

Golden Self-Blanching.—Grew 12 inches high; free from disease; easily blanched and is very beautiful.

Giant White Solid.—Grew 15 inches high; affected some by rust; hard to blanch; nothing to recommend it save its size.

Henderson's Perfected White Plume.—Medium size; affected some by rust; blanches fairly well.

Henderson's Dwarf White.—Very small; blanches fairly well; affected some by rust; color dull greenish white; can be planted very close.

Henderson's New Rose.—Grew 12 inches high; not diseased; has a beautiful purple color; blanches easily and is desirable.

Henderson's Half Dwarf.—About the same as Henderson's Dwarf White.

London Red.—About the same as Henderson's New Rose.

Sandringham Dwarf White.—Very dwarf; affected some by rust; not recommended.

There was not much difference in the time of edible maturity of the varieties, and celery from all was pulled July 9th. Two methods of blanching were tried. One method was to grow the celery on the ground, about six inches apart each way, to see if it would not spindle up and blanch itself. This method was a failure here. The intense heat and light kept the plants small and green. The weeds were difficult to keep out when grown so close. The other method was the old one of keeping the dirt up around the plants as they grew. This method proved fairly successful.

The fall crop, which was nearly all gathered last December 24th, was much better than the spring crop, though it should be stated that irrigation was used on this crop. The seed for this crop was sown first of August, in trays, and covered lightly with sphagnum moss until it germinated. The trays were kept slightly moist after being placed in the shade. I have always grown more thrifty plants by potting them in 2½ inch rose pots than by letting them grow entirely in the bed. Several insects attacked the young plants, and it was found necessary to spray them with three ounces of London purple stirred into 25 gallons of

water. Considering our results here, and observations at other places, it seems safe to conclude that celery growing can be made a paying industry in the State. The vegetable requires a rather moist, rich soil, but with irrigation and manures, it can be grown successfully on a rather indifferent soil. The best varieties tested here are Giant Paschal, Henderson's New Rose, and Golden Self-Blanching.

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## AN EXPERIMENT IN GROWING ONIONS FROM BLACK SEED—VARIETIES.

Forty varieties of onions were tested upon the Station grounds here during the past year.

The objects of the experiments were to see if onions could be grown here successfully from the seed and to test the various varieties in regard to earliness, size, color, etc. Two ways of culture were tried. One was to sow the seed early in January in trays, and force them in hot beds until the plants were some larger than knitting needles, and then set them out in the ground like other plants. The other method was to drill them into the ground with a Planet Jr. drill early in the spring. While a bulletin can not be published upon this subject at this time, the more important points brought out by the experiment are mentioned in this newspaper article, so that those who wish to may have the results of our experiments this year in time to plant seed.

### THE TRANSPLANTING METHOD.

This method has attracted wide attention in the United States during the past few yours, especially in the North. By it some have grown as high as 800 bushels per acre. Of course the labor of setting in the usual way is great. We have set them successfully by using a small hand turning plow to throw open a furrow, and then lay the onion plants along in the row against the straight side of the furrow and bring the dirt back with the hoe and press it firmly with the foot. Of course the plants leaned over, but they soon straightened up again and grew off. Care must be taken that they are not set too deep, so that the bulb will form under ground. It should always form on top. Only two varieties grown this way beat those grown from seed sown in early spring. They were the Giant Rocca and the Prize Taker. These grew very large and produced onions which would weigh from five to eight ounces every four or five inches in the row. We hardly think this method will pay when onions grow so readily here from seed drilled into the ground. Several of the varieties produced edible onions when sown 16th of February, fully as early as those transplanted from seed sown 8th of January in trays. None produced onions as large, with the exception of the two above mentioned varieties.

Red Bermuda was the earliest onion in the test. It produced edible onions 72 days after the seed were sown. It is a small, round red onion, not desirable for a general crop on account of its small size. The Queen was the next in earliness. This is a rather small, round, white, flat variety. It produced edible onions in 89 days from seed.

Of the white varieties the following seemed very desirable for a gen-

eral crop: Southport, White Globe, Large White Globe, and White Bermuda. Of the yellow varieties: Prize Taker and Giant Yellow Rocca. Of the red varieties: Giant Rocca, Red Flat Bermuda, Large Red Wethersfield, and Large Red Globe.

The seed bed was thoroughly prepared. It had a good dressing of well composted barnyard manure mixed with wood ashes, and thoroughly mixed with the soil by cultivation. After the soil was well cultivated it was made compact by a roller. The seeds were all sown in the plats with a Planet Jr. drill, and the plants were afterward cultivated by the same drill with its attachments. From the experiment briefly mentioned above, and our experience at other places, we think it safe to conclude that onions can be grown profitably from the black seed, and there is no necessity of using the "costly sets." The main points to be remembered are good seed, a thoroughly prepared seed bed and to sow them early.

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## JAPAN PERSIMMONS.

The Japan persimmon is a new fruit, which seems well adapted to the South. It is comparatively free from the attacks of insect enemies and injurious fungi. The native wild persimmon, in Texas, grows mostly along rivers or ravines, but the Japan persimmon has been growing successfully here on dry upland for six years. The long tap root grows deep down into the soil, and the tree is thus enabled to stand drouth well. The young trees should be transplanted when small, so as to not interfere much with the growth of the tap root. The native wild persimmon makes good stock upon which to bud the Japan persimmon. This seed germinates more readily than peach seed. The Japan fruit ripens the latter part of September, when the plum, peach, pear and grape have nearly all ripened their fruit. This fruit is of good size, and when fully ripe has a very pleasant flavor. The skin is very tough and the fruit ripens slowly, so that it would stand shipping well. Some fruit from several varieties was pulled just when it had begun to color, and carried into the office, where it ripened well in two and three weeks.

The most prolific, largest, earliest and best flavored variety which has fruited here yet is the Hachiya. Not much of this fruit is seen upon the markets, owing to its scarceness. No doubt the demand for it will be great when the attention of the public is called to it.

Full notes will appear in a bulletin which is now in preparation upon plums, apricots, and Japan persimmons.*

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## APPLICATION OF FERTILIZERS TO THE SWEET POTATO CROP.

During the summer of 1894 one part of our work with sweet potatoes was to test the effects of several fertilizers, when used singly and in combination, upon the yield of this vegetable. It may be of interest to growers to know the effect these fertilizers had upon the yield here last year. The soil upon which the crop grew is rather stiff clay loam of medium fertility. Rows were made four feet apart and the fertilizers

* Since published in Bulletin No. 32.

broadcasted over them and raked in before the plants were set. Plants of the vineless variety were set every 14 inches in the rows. The usual cultivation was given. The latter part of the season was very favorable to the growth.

FERTILIZERS USED PER ACRE.

| No. of Plot. | | Calculated yield per acre. |
|---|---|---|
| 1 | 460 pounds sodium nitrate | 128.33 |
| 2 | 150 pounds muriate of potash | 146.47 |
| 3 | 300 pounds bone black | 207.66 |
| 4 | 200 pounds sulphate of potash | 208.89 |
| 5 | Nothing | 201.17 |
| 6 | 500 pounds cotton seed meal | 194.67 |
| 7 | 20,000 pounds barnyard manure and wood ashes | 179.85 |
| 8 | 600 pounds special sweet potato fertilizer | 222.50 |
| 9 | Nothing | 219.71 |
| 10 | 460 pounds sodium of nitrate, 200 pounds sulphate of potash | 166.87 |
| 11 | 460 pounds sodium of nitrate, 150 pounds muriate of potash | 170.77 |
| 12 | 460 pounds sodium of nitrate, 300 pounds of bone black | 208.76 |
| 13 | 300 pounds of bone black, 200 pounds sulphate of potash | 255.50 |
| 14 | 460 pounds sodium of nitrate, 300 pounds bone black, 200 pounds potassium sulphate | 173.36 |
| 15 | Nothing | 170.58 |
| 16 | 4360 pounds slaked lime | 250.14 |

While it is not safe to draw conclusions from one year's fertilizing, because reliable results can only be reached through several years of such work, yet it would seem that the results reached so far point in favor of bone black and sulphate of potash for this crop on this soil.

It will be seen from the table if the yields from the three check plots be added together and divided by three the average for each is 197.15 bushels. Wherever muriate of potash was used it lowered the yield below the average, and nitrate of potash only increased the yield in one instance. The special sweet potato fertilizer contained a high per cent of phosphoric acid; 300 pounds of bone black and 200 pounds of sulphate of potash per acre gave the highest yield; slaked lime gave the next highest yield. This work will be carried on again during the coming season.

## INJURIOUS INSECTS.

### HOW TO PROTECT TRUNKS OF TREES FROM RABBITS AND INSECTS.

Take one gallon of the ordinary white lead paint and stir into it one spoonful of Paris green or London purple. After scraping the dirt away from around the trunk down an inch or two, take a brush and put the paint on up about eighteen inches. Scrape the dirt back around the tree and it will be safe from injury by rabbits and borers for two years.

The following letter has just been received from one who followed these instructions: "I am now ready to make my report to you in regard to the paint during the last snow. I killed five jack rabbits in sight of my orchard, and have seen rabbits in my orchard, but they do not bite my trees. I am convinced that rabbits will not bite fruit trees

that have been painted with your preparation. My trees have gone into the winter in fine shape, and the absence of insects is noticeable. I will use the paint next year again, and will report to you the result.

"A. B. C.

"Teepe City, Texas."

If young trees be painted in this way just before they are set out the cost is much less. This paint will not kill borers which are already in the tree; they must first be taken out with a knife or killed by thrusting a wire through their burrows.

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## WINTER BUDDING.

In experimenting with various methods of propagating fruits upon the Station grounds during the past year, it was proven that budding could be done successfully during the winter time, when the sap is said to be dormant. The method used was simply to cut a piece of bark off the stock and fit a bud over the cut place and tie with a piece of raffia or piece of corn shuck. Further details of the experiments are published in the Annual Report for 1893, which will soon be sent out to the people of the State free of cost.

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## BLACK ROT OF THE GRAPE.

This disease is caused by the growth of a very small plant. It can only be seen with a microscope. It belongs to the group of plants known as fungi. Its growth starts from a spore which corresponds to seed in higher plants. These spores germinate early in the spring, when the leaves start to grow, and upon them it usually makes its first appearance in small brownish spots. Its next appearance will be upon the fruit. It can be prevented by spraying early with the Bordeaux mixture, which preparation has been used successfully in preventing diseases upon many other fruits.

A full discussion of the life history of black rot in the grape, methods of preparing and applying the Bordeaux mixture, and also where to buy good spraying machinery are given in illustrated Bulletin No. 23.

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## A NEW SWEET POTATO ENEMY IN THE STATE—DESCRIPTION AND TREATMENT.

LIVERPOOL, TEXAS.

DEAR SIR—I mail to your address a small sweet potato infested with worms. Can you suggest a preventive? These worms are getting all over the coast country, and it is only a question of short time until sweet potato growing here will be a thing of the past. During the year I have been trying to study the habits of these worms, but so far have learned but little. I can say that changing the seed does no good, as I brought a lot of seed here last spring from Washington county clear of worms. These are now as badly infested as any I have. Last spring one year

ago I brought seed from Grimes county clear of worms, and the same thing occurred. The worm turns to a small black bug resembling the ordinary corn weevil. These bugs are evidently migratory and attack the potato in the ground. Thousands of dollars damage will be done by this insect in this section this year. Potatoes infested by these worms are refused by all kinds of stock; not even a hog will eat them. If you notice, the potato has a peculiar smell. J. H. R.

ANSWER.

The insect you refer to is what is known as "Sweet Potato Root Borer," and its scientific name is "*Cylas formicarius.*" So far as I can learn, the insect appeared on the coast of the State at Matagorda Island some ten years ago, and has been working its way further up in the State each year. Last year I found a few in our experimental work here. It has been sent to me several times during the past two years, and I regard it as a very threatening enemy to sweet potato culture in all the "coast country." It remains to be seen how far up in the State it will go. The insect is supposed to have come from Cuba. It was found in Florida in 1878 and in Louisiana in 1890. The insect is rather oblong, and in shape reminds one of the common corn weevil. Nearly all of the insect is bluish black, except the central portion of the thorax, which is reddish brown. The female deposits her eggs on the vines near the ground. They soon hatch out into small whitish larvae (worms), which bore down into and tunnel the sweet potato, producing that peculiar odor mentioned. In about thirty-five days from the time the eggs were laid the full grown beetles come out. The eggs are also deposited in the cut places of the tubers after digging. A figure showing all stages of the insect will appear in a bulletin now in press.

The insect is hard to destroy, as it lives most of its life inside the potato. Some have put the infested potatoes in barrels, and after pouring a few spoonfuls of carbon bisulphide into the barrels they are covered up. Some good results have been reported from this treatment. All infested potatoes should be burned, instead of being left on the ground to decay. No potatoes that are infested should be planted. It is best to plant the crop on a new piece of ground each year. If the insect is not checked in its onward movements in the State by these precautions it would be best to suspend the growing of sweet potatoes in infested localities for a year or two and destroy all plants that come up voluntarily over the fields. Unless the growers of potatoes themselves take hold of this matter, sweet potato growing in infested localities will be greatly injured.

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## HOW TO KILL THE RED ANT.

The red ant which occurs in gardens, orchards and fields, destroying all small vegetation for several yards around a colony, is very annoying. Stock do not care to graze close to a colony. Their sting is almost as severe as that of a bee. Children are frequently stung by them when a colony occurs near the dwelling house. For some time we have been experimenting with different things to find a cheap and effective remedy.

We have tried London purple, Paris green, Persian insect powder, kerosene emulsion, carbon bisulphide, and a preparation sold under the name of "Ant Killer." None did much good except the carbon bisulphide. The best way we have found to apply it is to pour two or three spoonfuls into the colony early in the morning while the ants are nearly all in, and wait a minute or two for the fumes to get down into the ground thoroughly, then stick a lighted match to the colony and the fumes will burn with a very hot invisible flame, killing all the ants and their eggs. If the wind is blowing, the deadly fumes will kill the grass or wheat for several yards. Fire should be kept a safe distance away from a vessel containing the material, as it readily takes fire and explodes. When treated as above directed it is seldom necessary to repeat the application.

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## THE HORN FLY.

The Horn Fly, known in some parts of the State as the "Third Party Fly," made its appearance in several sections of Texas the first time during last summer. This fly, which appeared in New Jersey in 1887, has been gradually coming south, and may be expected to occur in more abundance upon cattle during this coming summer. It resembles very much the common house fly in color, but it is smaller. The wings assume a peculiar semi-erect position when the fly bites. The name "Horn Fly" has been given it from its peculiar habit of resting on the horns. When feeding they occur in large numbers on the under side of the abdomen, just behind the fore shoulders, and on the back of cattle. I have used kerosene emulsion successfully to kill them on a small dairy herd. Kerosene emulsion may be prepared in two ways. The milk emulsion is made by mixing thoroughly one part of slightly sour milk with two parts of kerosene. Another may be made by dissolving one-half pound of soap in one gallon of hot water and then pouring this into two gallons of kerosene oil and stirring vigorously until it appears somewhat like buttermilk. Before applying either one it must be diluted with water from ten to twelve times. The best way to apply the emulsion is with a knapsack sprayer. Other methods of combating this insect have been recommended. Two parts of crude cotton seed oil mixed with one part of pine tar and put on the cattle with a common paint brush, have given good results in driving them away by its odor. Also common "gnat oil" has given good results in the same manner. Since the fly deposits its eggs in the fresh excrement of cattle, and hatches and lives to maturity there, it may be destroyed by sprinkling lime or plaster over the excrement.

## GRASSES.

### TEXAS BLUE GRASS.

CURTIS, TEXAS.

I take the privilege of sending you a sample of grass found growing here. The first I noticed was in January. It has a vigorous growth, withstanding the cold weather remarkably well. It grows wild and attains a height of from 8 to 20 inches. It is now in full head. I think it would do well for winter pasture and would probably be valuable for hay. Would like to know the name and whether it has been tested and grown successfully. J. H. B.

ANSWER.

DEAR SIR—Your letter of the 9th inst., together with sample of grass, addressed to Prof. Connell, has been referred to me for reply. I have to state that the grass proved to be the "Texas Blue Grass" (*Poa arachnifera*). This grass has been found growing wild in several parts of the State during the past few years. For the Southern States it bids fair to rival the famous "Kentucky Blue Grass" (*Poa pratensis*), its very near relative of the northern States. I have reasons to believe it is better adapted to Texas soils. It is, as you suppose, an excellent winter grass, and I hope you will try it for hay and let us know how it does.

### RESCUE GRASS.

MARYSVILLE, TEXAS.

Enclosed find specimen of grass which I find growing on my place of late years. You will please inform me what kind of grass it is and give particulars pertaining to it, and oblige, S. J. M.

ANSWER.

Your letter and enclosed sample of grass, sent on April 26th, I have received. In reply will say that the sample of grass sent is "rescue grass" (*Bromus unioloides*). It is an annual winter grass. It starts very early in the spring and grows rapidly, and when cut down or grazed off will come up again. It is very sweet and tender. Stock eat it greedily when young. Since grass is usually scarce in Western Texas during February and March, this grass would come in and fill an important gap. It would not interfere with the native mesquite grass which comes later on. Since it "catches" easily, it could be sown in early fall and a harrow run over the ground to give it a slight covering, and the fall rains would bring it on for winter and early spring pasture. It will reseed itself if allowed to mature seed.

# AGRICULTURAL DEPARTMENT.

James Clayton, Agriculturist.
A. M. Soule, B. S. A., Assistant.

BY JAS. CLAYTON, AGRICULTURIST.

## LIVE STOCK.

### REMOVING HORNS FROM CATTLE.

The question is often asked, "Why do we dehorn cattle? It must be painful to the animal, and therefore very cruel," and so I thought until I had practical experience in this matter with a herd of about 250 head of cattle. Now I think it is the most humane act one can do for them. It is not my object, however, to enter into any discussion as to the merits or demerits of dehorning. With many who have tried dehorning, the advantages are settled facts, and to all such the subject needs no recommendation.

The following brief outline of some work in dehorning cattle in January, February and March on the Texas Experiment Station is given, hoping that it may be of interest and value to some one. The implements used were Leavitt's Improved Dehorning Clipper, and a small, very fine toothed (No. 11) hand saw and a butcher's saw. For comparison, the clipper was used in taking off the right horn and the saws in taking off the left. The pain caused by the use of these tools was of course severe, but of short duration. The clipper is preferred for dehorning cattle under 3 years old. The cut is made by it through the horn with ease and rapidity, and being so much quicker than the saw, and without friction, must give less pain to the animal.

However, as it is now constructed, the power of the clipper is insufficient to cut the hard bone in the horns of old cattle. Where it had been tried on some of them and failed, the saw had to be used. The horns were taken off as closely to the head as possible, removing from one-fourth to one-half inch of skin with each horn. Nothing in the way of hot irons or other cruelties were applied to the fresh wound, which can only give pain to the animal. If maggots get into the horn cavity apply a little chloroform, carbolic acid or cresylic ointment.

Chemical dehorners were used on 30 calves in March. The dehorners are chemical fluids, and it is claimed by the manufacturers that the application of a few drops to the embryo horn will destroy it. The work at this Station was done on calves from one to four months old, and most satisfactory results obtained with the younger calves. As soon as the

little horn begins to grow scrape or cut the surface until it is tender, but do not make it bleed. Apply the fluid to the horn button with a swab, which is made by tying a small rag securely to the end of a stick. The application of the fluid is easily and simply made, and seems to give very little pain to the calf. It is claimed by the North Carolina Experiment Station that caustic potash or caustic soda will answer the same purpose.

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## GREEN FOOD FOR STOCK.

With the progressive farmer the manner of feeding and caring for stock has so changed within the past few years that conditions are each year growing more and more artificial and difficult. Natural pasturage, and some of the crops and feedstuffs which were looked upon with favor only a few years ago, are almost entirely abandoned to-day. We are gratified, however, to note from a widespread correspondence over the State, that one of these old time ideas, viz., turning cattle on to pasture with an occasional salting, is fast becoming obsolete in the better settled parts of the State, and giving place to the more humane and modern soiling crop ideas.

This Experiment Station is doing some valuable work in this line, by trying to increase the interest of stockmen over the State in silos and soiling crops, by ascertaining from the farmers themselves the kind of silos used, the cost of same, what crops are most used for ensilage, the cost of ensilage per ton in silo, the amount required for each cow per day, and they all agree that there is very little excuse for not having plenty of nutritious food always on hand. Much of this valuable information will appear soon in the sixth Annual Report from this Station, which will be sent to all persons in the State who request it.

No progressive stockman of to-day can afford to depend on pasturage or grass alone for his cattle, either in summer or winter, but must supplement these with soiling crops and grain. For early spring and summer no green food is better than corn and sorghum. For winter use drilled barley, drilled rye, or ensilage made of whole corn crop, sorghum, rye or cow peas, put up green in summer and fed out fresh in winter or summer. Fifteen to twenty tons per acre of green corn or sorghum is a fair yield under favorable conditions. On one of our southern Experiment Stations during January and February, 1890, the writer cut 21,392 pounds of green rye from one acre, which had been planted in September in rows two feet wide.

These are some of the facts and conditions that surround us, all of which are of economic value, and sure methods of supplying an abundance of food, and as lands increase in value in Texas, he is wisest who finds first, before they become too high, if it is not possible to keep a cow a year on something less than five acres of good land.

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## HEAVY GRAIN FEEDS FOR MILK COWS.

How much grain can be consumed by cows in milk, is a question often asked by dairymen, and of interest to others. Some feeding experiments to test this were carried on during January and February last by the

Texas Experimental Station, soon to be published in Bulletin form.* This report will contain interesting data on this subject, and while we do not wish to anticipate the subject matter of this Bulletin, it will do no harm to bring out a few of the prominent facts.

The test continued for four weeks. The grain feeds given were cotton seed meal, corn meal, singly and in combination, and cotton seed boiled. For forage the cows were fed alfalfa, cotton seed hulls, silage and common hay. The experiment was begun by feeding a limited ration, which was continued until the end of the first seven days, after which time there was a gradual increase in the feeds given until the capacity of the largest eater in the several groups was ascertained, then all were fed this amount twice daily, the waste taken out and accurately weighed once daily.

The following amounts (limited) of feeds were given daily average for the first period of seven days:

Group 1—9 cows; 8 pounds cotton seed meal and $6\frac{1}{4}$ pounds forage.

Group 2—3 cows; 10 pounds corn meal and $6\frac{1}{2}$ pounds forage.

Group 3—8 cows; 8 pounds cotton seed meal and corn meal mixed, and $7\frac{1}{8}$ pounds forage.

Group 4—3 cows; 10 pounds cotton seed boiled and $7\frac{3}{4}$ pounds forage.

The following amounts of food (not limited) were the daily average consumed for the last period of the test:

Group 1—9 cows; $10\frac{1}{2}$ pounds cotton seed meal and $7\frac{1}{2}$ pounds forage.

Group 2—3 cows; $19\frac{1}{8}$ pounds corn meal and $7\frac{1}{2}$ pounds forage.

Group 3—8 cows; $18\frac{1}{4}$ pounds cotton seed meal and corn meal mixed and $7\frac{3}{4}$ pounds forage.

Group 4—3 cows; $9\frac{7}{8}$ pounds cotton seed boiled and $5\frac{1}{2}$ pounds forage.

It is an interesting fact to note that the increase of the feed demanded by the cows consisted in the grain alone. All of the feed was consumed without any bad results to the cows. There was practically no increase in the amount of the forage consumed. It must be borne in mind that the above amounts are the averages consumed daily for seven days. The largest amount of cotton seed meal consumed in one day by any one cow was 14 pounds, of corn meal 22 pounds, and of cotton seed meal and corn meal mixed, half each, 28 pounds. Startling as these figures may be, they are correct.

This feeding test was not made with a view of ascertaining the cost of butter and milk from a given quantity of feed, but to try to find out, if possible, what effect these different feeds given in large quantities would have on the amount of milk and butter produced, and upon the health of the cows.

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* Since published as Bulletin No. 33.

# FIELD CROPS.

## NORTHERN GROWN SEED.

STEEDMAN, TEXAS.

DEAR SIR—Will northern grown corn mature earlier in this latitude than native seed? It is believed by some it will do so, and partial experiments seem to confirm it.

Have you any data on this subject?

Yours, etc., S. D. S.

### ANSWER.

In reply to the above inquiry, I beg to say I have found from a practical experience of twenty years planting corn in another State, that when seed corn is procured a few hundred miles north of one locality and planted, the northern grown seed will mature from a week to ten days earlier than the corn grown from seed which had been planted in the more southern locality a few years. When we consider the short growing season of a northern climate, and the long one of the southern climate, it is most natural that such conditions should develop. I have no statistical data upon which to base my opinion. I can only state in a general way that I am convinced that it is a fact. The test of varieties of corn made the present season on the grounds of the Texas Experiment Station was so badly injured by the hot winds which came about July 1, that no reliable data can be given on this point beyond the roasting ear stage of maturity. It must also be borne in mind that this is only one year's test, and can not be taken as conclusive.

The results given below are from two varieties of corn obtained from each of the localities named:

Texas, average date first roasting ear June 30.

Kansas, average date first roasting ear June 12.

Alabama, average date first roasting ear June 26.

Virginia, average date first roasting ear June 19.

All the varieties were field corn, planted and cultivated under as nearly like condition as it was possible to get them.

## PECULIAR HABITS OF CERTAIN VARIETIES OF COTTON.

The facts given below are some of the conclusions that can be gathered from results of experiments with varieties of cotton the past two seasons on the grounds of Texas Experiment Station.

The yield from all of the limbed cluster varieties, such as Peerless, Peterkin, Sure Fruit, Tyler, and others of the same type, is usually large; and while the bolls are small, the cotton is easily picked, provided it is done before rain falls upon the open bolls. The greatest objection to these varieties is the fact that the cotton falls out so badly; the gath-

ering is oftentimes seriously interfered with, and the loss from rain considerable.

The cluster or short limbed varieties, such as Boyd, Cochran, Hawkins, and Wellborn, are early and prolific, but fail more readily from the effects of a dry, hot spell than the long limbed cluster kinds; the bolls being so near each other are easily covered with trash, and troublesome to pick.

The large boll varieties, such as Texas Storm Proof, Bohemian, and others, are vigorous growers, and the plant continues green long after many other varieties have dropped most of their leaves. The bolls are very large and easy to pick, and owing to the peculiar deep shape of the burr, the cotton does not fall out easily, and the foliage remaining green, trash from dead leaves is never very troublesome. None of these varieties are prolific, the seed are larger and the per cent of lint small.

All the long staple varieties, such as Allen, Matthews, Southern Hope, and others, have made good yields and fair staples.

Tennessee Gold Dust and King's Improved are the earliest that we have tested thus far.

Among the new varieties tested we mention as promising Dickson's Early Cluster, Keno, Ladde, and Texas Oak; and as worthless, the Japan.

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## MACHINE TO CUT SORGHUM.

GEORGETOWN, TEXAS.

Will you kindly tell me at what time sorghum should be cut for hay? What machine do you recommend to cut with?

Please give me your method of handling the sorghum for hay. I have a fine crop growing and am anxious to make the best hay possible out of it. J. H. F.

### ANSWER.

In reply to your favor of July 10th, all heavy grain producing plants, such as corn, sorghum, oats, cow peas, etc., if used for hay should be cut when the grain is in the dough state. The plant at this age contains the largest amount of nutriment, while the amount of moisture is not so great as if it is cut at an earlier state.

If your crop is planted in the drill a corn harvester run by two men and one mule is a cheap and satisfactory machine for this work. Should the weather be favorable the sorghum can remain on the ground as it is piled from the machine, and when it is sufficiently cured it should be stacked, but if the weather is threatening it will be better to shock it as fast as it is cut, and the shocks should be secured near the top with a cord or band of sorghum stalks.

The machine used at this place is manufactured by the McDonald Manufacturing Company of Bellefontaine, Ohio, in two styles. Can be had of any hardware dealer or can be ordered from the factory. Cost $20 to $25.

If planted broadcast, cut with a mower and let the sorghum remain spread on the ground until sufficiently cured to keep when stacked. It

should then be put into piles with a hay rake and stacked. It takes sometime for the stalk of the sorghum plant to cure, and for that reason it is best to stack it and let it remain until dry before placing in the barn.

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### WONDERFUL PEA.

INTERLACHEN, FLORIDA.

Will you kindly give us your opinion of the Wonderful Peas as tried by you this season, and oblige. H. G. H. & Co.

ANSWER.

In reply to your favor of the 14th, I have this to say: Thirty varieties of cow peas were tested on the grounds of this Experiment Station the past season. I can conscientiously recommend the Wonderful Pea as being one of the best. It is a vigorous grower, making an abundance of vine; not as prolific as some, though the yield was satisfactory, ripening about the middle of September. But it is not a new pea as is claimed for it by some. My work with it here has confirmed my experiments with it in another State. It is the Unknown Pea with a different name. The Unknown Pea has been grown for several years past all over the South.

In the test of thirty varieties, made here, there are some new ones and some old varieties with new names. The old Tory is called "Everlasting," advertised and sold by that name last winter. The Sixty Day Bunch or Poor Man's Friend is called "Granite."

The crowders have all done well. The conch pea has made a wonderful growth of vine, but has not bloomed yet. As a novelty I call your attention to the Pearson Bean. It looks something like the "Sword Long Pod," but is much more vigorous and prolific and the bean is magnificent in appearance.

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## VEGETABLES.

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### FOR THE KITCHEN GARDEN.

My one year's experience with the Texas Agricultural and Mechanical College Mess Hall garden and some of the lessons taught by being placed in personal contact with the things grown here, may be of value to those interested in selecting varieties for planting the garden the coming season.

The varieties of vegetables grown below are those which have given best results at this place, and most of them are friends of long standing.

Beans—Dwarf, Improved Valentine, and Dwarf Butter Wax (pole), Fat Horse, or Crease Back (Lima), the Speckled.

Cabbage—Early Flat Dutch, Improved Early Summer, and Drumhead Savoy.

Carrots—Early Scarlet Horn and Half Long Scarlet French.
Corn—Adam's Early and Hundred Day.
Cucumbers—Long Green, New Orleans Market, and Early Cluster.
Egg Plant—Large Purple.
Lettuce—Early Cabbage, Brown Dutch, and Improved Large Passion.
Melons—Pineapple Cantaloupe, Jones' Improved Watermelon.
Okra—White Velvet.
Onions—Creole, White Queen, Yellow Danvers, and Virginia Potato.
Parsley—Double Curled.
Peas—Early May and Champion of England.
Pepper—Sweet Spanish, Ruby King, and Long Red Cayenne.
Potatoes—Early Triumph and Burbank Seedling.
Radishes—Early Scarlet Turnip and Scarlet Half Long French.
Squashes—Early Bush and Summer Crooked Neck.
Tomatoes—Dwarf Champion, Acme, and Paragon.
Turnips—Purple Top, Large White Globe, and Improved Rutabaga.

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## EXPERIMENT IN KEEPING IRISH POTATOES.

A small crop of Burbank seedling potatoes was planted on the grounds of the Texas Experiment Station the past season to make a test of some different methods of keeping.

The land was prepared, fertilized and planted and cultivated in the usual crop method. The potatoes were dug on June 26th, just as the vines were beginning to turn yellow. For the keeping test, 130 pounds average sized tubers were selected, and on June 29th placed in bins of 26 pounds each, and treated as follows, and allowed to remain undisturbed (except the removal of the rotten potatoes at intervals by hand picking) until October 3.

No. 1.—Sprinkled potatoes with slacked lime. From this bin seven rotten potatoes were removed at intervals, and when weigned on October 3, 73 per cent were sound and in very good condition, though a little shriveled.

No. 2.—Sprinkled with two pounds flour sulphur; nine potatoes lost by rot; 69.2 per cent sound October 3, but soft and shriveled.

No. 3.—Sprinkled with six pounds of road sand; eight rotten potatoes; 74.2 per cent sound October 3; very good condition, though a little shriveled.

No. 4.—Nothing was applied; 65.3 per cent sound October 3; very soft and shriveled.

No. 5.—Spread in hot sun 1½ hours June 29; eight rotten potatoes removed at intervals; 67.3 per cent sound October 3; very soft and badly shriveled.

For a number of years I have kept my crop of potatoes successfully in another Southern State by digging early, before the ground gets very hot, spreading them on the floor of a cool, dark, airy room, and covering them lightly with slacked lime.

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## CANTALOUPES.

For this test a plot one twenty-sixth of an acre of new land which had been broken early in the season, was selected. On March 26 the rows were run off four feet apart. An application of equal parts of cotton seed meal and Dallas tankage at the rate of 600 pounds per acre was made in the layoff furrow, which was followed by a bull tongue to thoroughly incorporate the fertilizers with the soil. The plot was then bedded out with turn plow. The beds were harrowed and opened. Six to ten seed were dropped about one foot apart in the drill. The pineapple variety was planted and a perfect stand was obtained. Not more than two plants were allowed to grow from each hill. The first ripe melons were gathered June 20, and at the rate of 13,000 saleable melons were grown per acre.

This delicious melon does not receive the attention it should at the hands of the Southern farmer.

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BY J. M. CARSON, ASSISTANT AGRICULTURIST.*

## HOW TO KILL JOHNSON GRASS.

We are trying to solve this much repeated question. This grass is valuable as a hay crop, but it is looked upon by many as a curse to the community in which it is grown. If once started it will in time infest the whole community, appearing in patches more or less widely scattered over the cultivated lands.

On the 15th of July, 1893, a plat of land was selected in a low, wet soil on the College farm, which was very favorable to the growth of Johnson grass. At this time there was a luxuriant growth of grass about three feet high on each plat. The land was divided into small plats 10x10 feet, containing 100 square feet. The Johnson grass was cut off even with the surface of the ground on all plats, after which the following applications were made:

Plat 1 received 80 pounds salt and 6 gallons kerosene oil.

Plat 2 received 100 pounds of dry salt.

Plat 3 received 50 pounds dry salt and 4 gallons kerosene oil.

Plat 4 received 1 pound arsenic and 2 pounds sal soda solution in 5 gallons of water.

Plat 5 received 2 pounds arsenic and 4 pounds sal soda solution in 5 gallons of water.

Plat 6 received $\frac{1}{4}$ pound corrosive sublimate solution in 5 gallons of water.

Plat 7 received 2 pounds concentrated lye solution in 5 gallons of water.

Plat 8 received 3 pounds sulphur and 3 pounds lime solution in 5 gallons of water.

Plat 9 received 5 pounds bluestone (copper sulphate) solution in 5 gallons of water.

Plat 10 received 2 pounds of calomel, dry.

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*Resigned June, 1894.

Another piece of richer land was selected in the Brazos bottom for the purpose of testing the effect of these agents on deep alluvial soils as compared with the upland post oak loam. August 20 this piece of land was divided into plats of 100 square feet each, and the following was applied:

Plat 1 received 120 pounds salt and 6 gallons of kerosene oil.

Plat 2 received 120 pounds salt, dry.

Plat 3 received 40 pounds salt and 4 gallons of kerosene oil.

Plat 4 received 3 pounds arsenic and 6 pounds sal soda solution in 6 gallons of water.

Plat 5 received 6 pounds arsenic and 12 pounds sal soda solution in 12 gallons of water.

Plat 6 received 1 pound corrosive sublimate solution in 5 gallons of water.

Plat 7 received 4 pounds concentrated lye solution in 10 gallons of water.

Plat 8 received 10 pounds bluestone (copper sulphate) solution in 10 gallons of water.

Plat 9 received 1 gallon sulphur and 2 gallons lime, by measure, in 10 gallons of water.

Plat 10 received 4 pounds calomel, applied dry.

### EFFECT OF APPLICATION ON GRASS.

Notes were taken about two weeks after the several mixtures were tried, during which time there had been no rain. On every plat where the arsenical mixture was used, the grass was all killed. The grass was also perfectly dead where the salt and kerosene oil were applied. Where salt alone was used the grass was still growing, but not vigorous; after the first rain the salt was dissolved and the grass all died in a few days. The effect of the corrosive sublimate, concentrated lye and copper sulphate (bluestone) solutions were about the same, viz., killed about one-half of the grass down to the surface of the ground. The calomel had no appreciable effect at any time after application.

Notes taken in December, about two weeks after a fine rain, showed all the grass dead on plats where arsenical mixture had been applied, as well as salt and kerosene oil, and where salt alone had been used. All other plats showed very little effect from application compared with grass contiguous to plats where nothing had been used.

Notes taken in April, 1894, on Brazos bottom plats, when the grass growing near to them was about two feet in height, showed on plats Nos. 1, 2, 4, and 5 no grass of any kind. It will be remembered that on plat No. 1 was a heavy application of salt and oil, and on No. 2 was salt alone, same amount as was applied to No. 1. No. 4 contained arsenical mixture, and No. 5 also arsenical mixture, but twice the quantity applied to No. 4. On all of these plats it was found upon digging down several inches under the surface that the roots were decayed. On plat No. 3 (a light application of salt and oil) we found two shoots of Johnson grass, but the roots were not vigorous, nor were the tops. On the other plats in the bottoms the grass was growing as well as upon that which had not been poisoned.

Notes taken in the spring at the College show no Johnson grass growing on plats Nos. 1, 2, and 3, but on plats Nos. 5 and 6, upon which the

arsenical mixture had been applied, a few shoots of grass were found, possibly due to the fact that where these plats were located the winter rains washed over the surface badly.

### COST OF APPLICATION.

Calculating upon the basis of 7 cents per pound for arsenic and 3 cents per pound for sal soda, the arsenical mixture necessary to kill 100 square feet of the grass, thickly set, as was applied to the plats in the Brazos bottoms, will cost 39 cents; the salt, at ½ cent per pound, will cost 60 cents; the salt and kerosene oil, rating the oil at 12½ cents per gallon, will cost about $1.

To kill one acre of grass, the arsenical mixture will cost $169, the salt $261, and the salt and kerosene oil $435. From the above statement it appears that there is no economical way of killing the grass by application of poisons to large fields. The arsenical mixture costing much less than the salt, or than salt and kerosene oil, we would recommend its use on patches about over the farm, in connection with close cultivation. In this way we believe the grass can be controlled, and entirely destroyed if taken in time. We are continuing the experiments here reported, and have begun others, and feel satisfied that we will soon be able to improve upon the methods now recommended to kill this grass.

These applications will destroy the productiveness of the soil for a time, but for how long has not yet been determined by us.

### PREPARATION AND MANNER OF APPLICATION.

The arsenic is, of course, the active principle in killing the grass, but it is insoluble in either cold or boiling water, and has little or no effect when applied dry. The sal soda was used as a resolvent in the proportion of about 2 pounds of sal soda to 1 pound of arsenic mixed and boiled for one hour in 5 gallons of water. The mixture was then allowed to cool and applied to the surface of the ground with a galvanized iron sprinkling pot made for the purpose. The arsenical mixture will attack tin vessels. So we recommend a galvanized iron vessel in which to boil the mixture. For convenience it can be transferred to a barrel having a rubber hose attached, with a sprinkler on the end and a stop-cock on the hose near the barrel. A simple device of this kind can be hauled from place to place and mixture applied without danger to clothes, shoes, etc.

The salt was sprinkled over the surface by hand, and where the kerosene oil was used it was applied with an ordinary flower pot.

The corrosive sublimate, as well as the bluestone, was easily soluble in cold water, and on account of their corroding properties to most metals, a glass carboy was used. It was found by this experiment that these two chemicals were of no economical value in destroying the grass, hence we can not recommend their use.

The sulphur and lime readily combined upon boiling in water for about 20 minutes, and was applied to the surface.

The concentrated lye was sprinkled on the surface with a flower pot. The sulphur, lime, and concentrated lye solution gave no better result than did the solutions of corrosive sublimate and copper sulphate. Therefore we will not discuss them further.

### HOW TO KILL JOHNSON GRASS ON UPLAND SOILS.

On the College farm a tract of about 10 acres was sown to Johnson grass seven or eight years ago for the purpose of obtaining a permanent meadow, and, notwithstanding manure was applied, it did not make a good yield. This soil is light, sandy loam, varying in depth from 5 to 10 inches, with a stiff, impervious clay sub-soil, into which the roots do not penetrate, which accounts for the poor growth. As usual the grass did not fail to scatter its seeds over the entire farm, soon becoming a serious nuisance. It was decided to get rid of the grass if possible by close cultivation. This meadow was broken broadcast in the early fall with a turning plow, and immediately harrowed thoroughly with a spring-tooth harrow; was at this time very dry and warm. Nothing more was done until about the first of February, when it was again broken broadcast with turning plow and harrowed with spring-tooth harrow, thoroughly pulverizing the soil so as to admit of easy surface cultivation with sweep. It was prepared for late planting of cotton; about the 1st of May by working broadcast and bedding with solid sweep once to the row, at which time the soil was in excellent tilth. Cotton was planted immediately; came up in a few days, and grew off nicely. It was given frequent shallow cultivation with buzzard wing sweeps. The cultivation was continued until about the 15th of August.

The following fall when picking cotton, only a few sprigs of the grass could be found, and these, for the most part, appeared on the "sandy mounds" where the clay subsoil does not come near the surface. The following spring this land was put to corn, but was not so carefully cultivated. It was followed by cotton this year, closely cultivated with sweep. This spring only a few bunches of Johnson grass can be seen (1894.)

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## DAIRYING.

BY A. M. SOULE, ASSISTANT AGRICULTURIST.

### SELECTING A DAIRY COW.

MINERAL WELLS, TEXAS.

I have recently come to this State and made some investments here, and hope soon to engage in the dairy business. You will oblige me by giving me the essential points of a good dairy cow, and whether or not these points vary with different breeds. Also, in your experience, what breed is best suited for dairy purposes? J. B. B.

ANSWER.

In selecting a dairy cow, first of all inquire into her pedigree, and ascertain what has been the record of her ancestors in the dairy. Next look into her own actual performance at the pail and test her milk with the Babcock machine. Some claim that the use of the tester is all that is needed, but the Babcock test does not tell anything of constitution, of

the nervous force of the animal, the prolonged or deep milking qualities, or whether she will be a desirable animal to breed from. Last of all, it is not always possible to have a tester at hand, especially in a country where dairying is not generally pursued.

The following points will be found to form an index for the guidance of the inexperienced breeder, being based on careful observation and some experience in the handling of dairy stock. A model dairy cow should possess the following characteristics very strikingly:

I. In general outline: She should be rather fine in the head, neck and crops, wide in the chest, large in the barrel, and large development in the hind quarters.

II. The triple wedge-shaped formation is considered essential in a dairy animal. It implies:

1. Increasing width from the withers downward.
2. Increasing width towards the rear parts.
3. Decreasing width from the top of the hind quarters downward.

III. The head is medium to fine, longer and more dished and tapering somewhat more than in the beefing breeds.

IV. The neck should be fine, fairly long and tapering and the throat clean.

V. The body should be capacious, broad and deep and medium in length.

VI. The udder should be long, broad, deep, extending well forward and well up behind, and rather evenly quartered.

VII. The milk veins should be large and tortuous, abundant on the udder, and the orifices large where they enter the body.

VIII. The escutcheon should be well developed from the perineum to the udder and should extend well outward at the thighs.

IX. The legs should be medium to short, with bone of medium size.

X. The skin should be medium to fine, elastic and mellow, hair plentiful and soft, and the skin a rich yellow color.

These points will be found to vary but slightly in the essentially dairy breeds, i. e., making due allowance for the fine points of distinction between the different breeds. We have had some experience with several breeds and are not prepared to discriminate in favor of any one.

All the dairy breeds have their strong points and their weak points; it is impossible to state which is best for your purpose, as many of our fine dairy herds are composed of grades.

"A good cow is a good cow all the world over, no matter what breed she belongs to."

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## NEW FEEDS FOR DAIRY COWS.

The discussion of new feeds is always an interesting subject to the dairyman, as his success is largely dependent upon having the right kind of feed. Careful experiment has long since proved that the best results are obtained from feeding a liberal supply of succulent food well supplemented by a grain ration. The best ration for a dairy cow being one of protein to six or seven of carbohydrates. Texas has been highly favored with respect to good dairy foods. Corn, rye and sorghum all flourish, producing magnificent yields for feed, either as soiling crops or for en-

silage, and the two latter make splendid pastures or hay crops. In cotton seed meal is found a concentrated food produced at a minimum cost, which can be used to form the meal portion of the ration. But it is objectionable for dairy cows and should only be fed in limited quantities, as it makes the butter viscid, and in a large measure destroys the color, flavor and aroma. Hence if we are going to compete with northern dairymen it is necessary to cast about for a food that can be produced as cheap as cotton seed meal and can be substituted for a portion of it in the ration. In the north they have clover and roots, but as they do not take kindly to our southern soil and climate, other substitues must be sought. Prof. Robertson has been working for several seasons endeavoring to obtain a balanced ration for the dairy cow from the natural products of the soil, and has in a large measure succeeded. It consists of corn, English horse beans and sunflowers. These are cut green and made into silage or cured as hay. This is looked upon with favor in the north, and as corn, beans and sunflowers find a natural habitat here, it would seem that it would be worthy of the dairyman's attention in this State.

Oats and Canadian field peas sown together at the rate of one-third peas to two-thirds oats, in all at the rate of two bushels per acre, forms another valuable food for this purpose, either for ensilage, soiling, or curing for hay. The peas and vines are both very rich in protein, thus together with oats forming a well balanced ration that needs little if any meal fed with it. The Canadian field pea is as yet a stranger in the land, but it is hoped another season it will find a place on our Station farm. Vetches are not unknown here, and when grown in connection with oats are about equal in feeding value to oats and peas. These two mixtures last mentioned are good for both sheep and horses as well. They should be cut in the milk stages, and if intended for hay, left to wilt in the sun for a few hours, and then made into shocks and left to sweat for a time, when they can be hauled to the barn or stack. The attention of the dairyman is respectfully called to the above fodders. It is to be hoped that they may be given a trial on the Station grounds another season, and in the meantime some progressive dairyman may see fit to give some of these fodders a trial elsewhere in this State next season. The pea, bean, and vetch all belong to the legumes, and have the power of absorbing atmospheric nitrogen by means of their root tubercles, so that they leave the soil very rich in this substance; another strong point in their favor.

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## THE EFFECT OF FOOD ON THE QUALITY AND QUANTITY OF MILK.

During the summer some interesting observations were made along this line. The cows of the herd were all carefully tested, during the period indicated, and the food and milk of each animal accurately weighed and recorded.

Most of the cows were in the advanced period of lactation, though some were fresh when the tests were made, and, although it was at the heighth of the drouth which prevailed during the summer months, and when the pastures were almost eaten bare, strange to say, the cows not only held up wonderfully in milk flow, but the per cent of fat in the

milk increased, and the animals laid on flesh, as demonstrated by actual tests and weighings made.

The only supplementary feed used was four pounds of wheat bran per day; one-half of that had been the ration before they were turned on the pasture. This seems very strange when complaint has generally been made about the poor quality of milk produced the past season, and the falling off of flesh in herds in various parts of the country. This has been charged largely to the account of the flies, but there were plenty of flies in this instance as well.

The pastures consisted essentially of blue grass, which makes but very little seed, and thus as it becomes older and shorter it contains an equal or greater amount of nutritive matter, but owing to its dry nature would not supply a large milk flow, which again shows the necessity of having and feeding a liberal supply of succulent foods to dairy cows. Manifestly then if the food was more concentrated the animals would naturally lay on flesh, but as the quality of milk is fixed by individuality, the increase in per cent of fat could not be accounted for in that way. Testing the cow from the beginning to the end of the milking period has shown that as the period of lactation advances the milk increases in per cent of fat.

Again, may a cow not have the capacity to give 6 per cent of fat and yet from poor feeding and improper management give only 4 per cent of fat; and yet when properly treated and fed, run up to her maximum of 6 per cent fixed by individuality? This seems to be a reasonable way of explaining this vexed question.

Later in the season the cows were turned on a new pasture containing a large per cent of clover, and as a result the fresh cows made a rapid gain in flow for a short time. About this time the grain ration was doubled, with little effect on quantity but showing slightly better quality. This again indicates the usefulness of green fodder to increase the milk yield as compared with concentrated food, and illustrates the difficulty of increasing the flow permanently when once it has become diminished from any cause.

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## DAIRYING IN THE SOUTH.

How to successfully and economically contend with the intense heat of our climate is one of the dairy problems that is not easily solved. Since ice can not be had naturally, and the manufactured article is too expensive, some other means must be devised to meet this exigency.

Many machines have been invented for this purpose, and among them a class of machines known as "evaporators," for, although there are many styles, they all work on the same principle—namely, that of surrounding the vessels containing the milk with wet cloths, so arranged that either automatically or by capillary attraction they will remain moist during the setting period, and thus cool the milk by evaporation, the water being supplied from a reservoir conveniently arranged.

During the present summer we have tested two of these machines, with the result that we find an average temperature of from 74 degrees to 78 degrees F. can be secured by this method. This temperature, however, is too high to give satisfaction, as the difference in temperature of the

milk when drawn fresh from the cow and after setting fifteen hours is not great enough to permit of a complete separation of the fat from the milk, causing a serious loss.

It is claimed, however, by the advocates of these machines, that they are infinitely superior to nothing (which is very true), and that in cases where only one or two cows are kept for family use, these machines, being so cheap, form a very desirable addition to such a home. Especially is this true of certain styles, which are so arranged that they may also be used as refrigerators.

For this purpose the evaporator may have a place, but when as many as five or more cows are kept a separator is desirable. This, used in connection with a Cooley Creamer, for holding and ripening the cream, or a Boyd vat, forms the ideal method of dairying under present circumstances. And if a sufficient number of cows are kept to enable churning to be done every day, and the butter is delivered as soon as made, the difficulties of handling and caring for the products of the dairy are greatly simplified.

In the case of small herds where a separator is considered too costly, we would advocate the use of the Cooley Creamer, rather than the evaporator, as the results will be found more satisfactory. It is true the former cost much more, but a good thing was never yet purchased for nothing, and our motto on this question is, start right when you go into any business. It may cost more in the beginning, but it will prove by far the cheapest in the end.

# MISCELLANEOUS.

## THE FAIR.

The Texas Experiment Station has a fine exhibit at the fair, in charge of Prof. Clayton, Agriculturist of the Station, assisted by Mr. A. M. Ferguson, a post graduate of the Agricultural and Mechanical College. The exhibit embraces: Cotton, 34 variteies; corn, 63 varieties; sorghum, 15 varieties; field peas, 30 varieties; wheat, 81 varieties; oats, 56 varieties; rye, 4 varieties; barley, 7 varieties; cultivated grasses and forage plants, 104 varieties; native grasses, 50 varieties; sweet potatoes, 50 varieties; Irish potatoes, 50 varieties; onions, 20 varieties; millets, Kaffir corn, Jerusalem corn, broom corn, and hundreds of other products. These exhibits are not shown as samples of successful farming, but to illustrate the effects of different processes of fertilizing and cultivation. The cotton is shown in the stalk with open bolls, neatly mounted and framed. The grains and grasses are shown in the entire plant, mounted, and separately in the seed. The effect of fertilizers on potatoes is shown in graphic diagrams, placing the results before the eye of the inspector in easily comprehended shape. There is also a collection of injurious insects in glass, and insecticides used in destroying them, with a collection of fungicides used in spraying and otherwise treating trees, vines and vegetables. There is also an exhibit of the chemical analyses of a pound each of corn, cotton seed, pea vines, and meadow hay, showing the carbohydrates, protein, fat, fiber, and ash of each respectively, separately in glass.

No amount of theoretical composition can bring the facts so plainly to the mind as the constituents of the various feed stuffs separated so they may be separately seen, weighed, and compared. Persons interested in stock feeding should study this collection and take the facts home with them.—*Texas Farm and Ranch, Oct. 26, 1895.*

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## THE TEXAS EXPERIMENTAL STATION.

Texas Experiment Station has a very handsome exhibit at the State Fair, located in Exposition Hall, in charge of Mr. James Clayton, Agriculturist of the Station, assisted by Mr. A. M. Ferguson, a post graduate of the Agricultural and Mechanical College. Both of these gentlemen take pleasure in showing visitors through the exhibit, and explaining all the details connected with the experimental work, some of the results of which are shown at the fair. Results of these experiments are of great value to the farmers of Texas, and we trust that every man interested in farming will spend a part of his time at the fair examining the specimens shown.

In the exhibits are to be found products from the departments of agri-

culture, horticulture, chemistry, and veterinary science. From the agricultural department we find valuable results in field experiments with varieties of corn, cotton, wheat, oats, field peas, sorghum, milo maize, Jerusalem corn, kaffir corn, broom corn, cultivated grasses, and forage plants.

From the department of horticulture are to be seen the results of experiments with sweet potatoes and Irish potatoes. The effect of fertilizers on potatoes is shown in a diagram, giving a very clear idea of the needs of the soil. There are twenty injurious insects, with insecticides, and a large number of native grasses mounted in frames and correctly named.

The chemical department has an exhibit of the different elements contained in one pound each of corn, cotton seed meal, cow pea vines, and prairie hay, which should be of great value to the farmers and cattlemen of our State.

The veterinary department has on exhibition a model of a dipping vat such as is now being used at the Experiment Station for dipping cattle.

The Experiment Station is supported by an appropriation from the United States government, and its object is scientific investigation in agriculture and kindred subjects. Bulletins giving results of these investigations are issued quarterly from the Experiment Station, and are free to farmers on application to J. H. Connell, director, College Station, Texas. A synopsis of all the bulletins published since the organization of the Station and some of the recent issues are being distributed from the exhibit, and by leaving your name and postoffice address the future bulletins will be sent from the Experiment Station.—*Fair, Field and Farm, October 31, 1895.*

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Not much can be said of the Dallas Fair from the standpoint of the horticulturist. The horticulturists are not in it, but it is largely their own fault. The exhibit of the Texas Experiment Station deserves special notice. It was tastefully yet systematically arranged, and so skillfully placed as to easily impart difficult lessons. For illustration, take one of many examples: To give a tangible, conceivable idea of the chemical constituents and feeding value of several feedstuffs, the various ingredients of corn, wheat, cotton seed meal, pea vine hay, etc., are bottled and set in line, showing at a glance and in a way which indelibly impresses the memory that cotton seed meal and pea vine hay contain a remarkable amount of protein, while corn contains an equally remarkably amount of carbohydrates, demonstrating at once that neither alone can be a perfect food.

If the farmers and stock men who visited the fair made a careful study of the Experiment Station exhibit, their eyes are open to the great value of the Station's investigations, and there will be less criticism in the future. But we don't think they gave the exhibit the attention it deserved. Don't for a moment imagine that we have harped on the only string in tune. We don't say that all are in tune; many were not. There is room for improvement and always will be, but there is more room for improvement in the pupil than in the teacher. How many of you learned the lessons taught by the array of corn and potatoes of both

kinds? Did any of you study the fertilizer chart? It taught as important lessons as the illustration of food analyses. How many of you saw it? If you didn't see any of these things, you had better reserve your criticisms of the Station until you have had time to look into them. We are in no way connected with the Station, and are under no obligations to it which you are not under.—*Texas Stockman and Farmer, Nov. 13, 1895.*

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At the recent Texas State Fair held at Dallas, the Texas Experiment Station made an exhibit that will be of immense benefit to the State through its educational effect upon farmers who visited the fair.

From the agricultural department of the Station there were shown the results of some valuable experiments in field work, with varieties of corn, cotton, wheat, oats, field peas, sorghum, milo maize, Kaffir corn, broom corn, cultivated grasses, and forage plants. From the department of horticulture were shown the results of experiments with varieties of both sweet and Irish potatoes, and a test made with fertilizers on both; also a variety test of onions, and a large number of native grasses, correctly named. There were twenty injurious insects with insectcides and fungicides. The chemical department showed the different elements contained in one pound each of corn, cotton seed meal, pea vines, and prairie hay. The veterinary department had on exhibition a model of a dipping vat, such as is now being used by the veterinarian in which to dip cattle to kill ticks. Recent issues of Bulletins, and a synopsis of all the Bulletins published since the organization of the Experiment Station, were distributed to the farmers. Mr. James Clayton, agriculturist of the Station, was in charge of the exhibit.—*Southern States, November, 1895.*

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## AGRICULTURAL AND MECHANICAL EXHIBIT.

The exhibit of the Agricultural and Mechanical Experiment Station, of which Assistant Professor James Clayton has charge, was ready yesterday. It is very large and is partially illustrative of the work of the Station for the last two years. Of sweet potatoes there is a large collection, with their yields and a graphical diagram of the fertilizer work. Red Bermuda, General Grant, Shanghai, (California) Early Golden, and Barbadoes gave the largest yields, with Bunch Yam, Cavitt's Early Florida Yam, Georgia Yam, Hall Hayman, Negro Choker, and Norton Old Vineless close seconds. Phosphoric acid fertilizers, potassium, sulphate and barnyard manure compost gave best results in the order named. Nitrate of soda and all compounds with it decreased the yield, and cotton seed meal affected a slight decrease.

Specimens of common injurious insects are shown, and the remedies given. Samples of the more useful insecticides, such as carbon bisulphide or "high life," Paris green, naphthalene, hellebore, Persian insect powder, together with the most common fungicides, are shown.

A collection of the more important grasses and sedges is shown. They are neatly mounted and labeled with their botanical and common names.

Most of the above subjects are elaborately treated in bulletin board cards, which will soon be out and will be sent free to farmers on application.

In its entirety the exhibit is an illustrated lecture to farmers, horticulturists, and stockmen, and all interested should not fail to call on the gentlemen in charge. They have a limited quantity of Station publications for distribution to farmers, and also catalogues of the Agricultural and Mechanical College.

The exhibit includes sixty-three varieties of corn, with the growth of stalk, section of ear, length of grain, size of cob, and one peck of ears showing the main characteristics.

Thirty-four varieties of cotton, exhibiting the stalk, lint, and seed.

Thirty varieties of field peas in glass jars.

Fifteen varieties of sorghum in the stalk.

Kaffir, Jerusalem, and broom corn.

Cat tail and German millet, red and white milo maize.

Eighty-one samples of wheat, showing stalk and head of both bearded and smooth varieties.

Fifty-six samples of oats, including many new varieties.

Four varieties of rye.

Eleven samples of barley.

Forty-six samples of cultivated grass and clover seeds.

Fifty-two varieties of cultivated grasses and forage plants.

Fifty varieties of native grasses, all named.

Fifty varieties of Irish potatoes, showing yield per acre and keeping qualities.

Fifty varieties of sweet potatoes, showing yield per acre.

Twenty-five varieties of onions, showing yield per acre and keeping qualities.

Samples of standard fungicides and insecticides.

Two very unique drawings showing results of fertilizers applied to Irish potatoes and sweet potatoes.

A frame containing thirty-two cotton seed with the lint worked out, so as to give the length and quality of staple on each.

Twenty injurious insects, in alcohol.

In the chemical department is found an analysis of a pound each of corn, cotton seed meal, pea vines, and meadow hay, showing the amount of crude fiber, carbohydrates, protein, fat, water and ash contained in each.—*Dallas News, October 23, 1895.*

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## EXPERIMENT STATION EXHIBIT.

The Texas Experiment Station exhibit at the State Fair, located in Exposition Hall, is highly praised, and on it the officers of the Experiment Station have been complimented. From the agricultural department is to be found the results of some valuable experiments in field work with varieties of corn, cotton, wheat, oats, field peas, sorghum, milo maize, Kaffir corn, broom corn, cultivated grasses, and forage plants. From the department of horticulture is shown the results of experiments with varieties of both sweet and Irish potatoes, and a test made with fertilizers on both, also a variety test of onions, a large number

of native grasses, correctly named. There are twenty injurious insects with insecticides and fungicides. The chemical department shows the different elements contained in one pound of corn, cotton seed meal, pea vines, and prairie hay. The veterinary department has on exhibition a model of a dipping vat such as is now being used by the veterinarian in which to dip the cattle to kill ticks. Recent issues of Bulletins and a synopsis of all the Bulletins published since the organization of the Experiment Station are being distributed to the farmers. The entire work is for their benefit, and these reports can be had free by applying to J. H. Connell, Director, College Station, Texas. Mr. James Clayton, agriculturist of the Station, is in charge, and takes pleasure in showing visitors through the exhibit.—*Dallas News, October 27, 1895.*

# INDEX.