TEXAS AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 2,

MAY, 1888.

EXPERIMENTS STARTED.
EXPERIMENT IN CATTLE FEEDING.
ANALYSES OF FERTILIZERS AND ORES.
HORTICULTURAL DEPARTMENT.
METEOROLOGICAL DEPARTMENT.

Agricultural and Mechanical College.

COLLEGE STATION, BRAZOS CO.,

TEXAS.

GALVESTON:
Clarke & Courts, Stationers and Printers.
1888.

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THE EXPERIMENT STATION.

The work of the station was started the first week in March, not much being done, however, until the last week in the month. The several departments of the station are equipped and officered, and have commenced work, with the exception of the veterinary branch. A skilled veterinarian will be added to the station staff during the summer, and he will give special attention to the prevention and treatment of diseases of stock.

The report of the several members of the station staff will indicate the line of proposed work. Attention will be given, mainly, to questions that are thought to be of most importance to farmers and stockmen in the state.

Arrangements are being made to have the diseases that affect cotton, "rust," "blight," etc., carefully studied during the present year, preparatory to making experiments in the way of discovering preventives and remedies.

Recognizing the importance of the cattle feeding question, feeding tests will be started in the fall, with lots of steers, each lot to have a different ration, to test the comparative value of cotton seed, cotton seed meal, cotton seed hulls, ensilage, (corn, sorghum and cow-pea-vine), corn, corn fodder, and several varieties of hay common to the state. Ensilage crops are growing, and silos are being built to enable us to make experiments in ensilage feeding and also to illustrate this method of making cheap stock food, which would seem specially adapted to considerable areas in the state.

Experiments looking to increase of crop have been started in the application of barn-yard manure, commercial fertilizers, special chemical compounds, renovating crops, rotation of crops, different methods of cultivation and drainage.

Plats of land are being drained with tile, and they will be planted to farm and garden crops, fruits and trees, to compare with the same plants on undrained land, to determine the value of tile drainage.

The farmers of Illinois and other states north of us find it profitable to construct thousands of miles of tile drains. It seems desirable therefore to test this system of drainage in Texas, and, should it be found of sufficient advantage, encourage tile makers to start tile factories in the state.

Our tile are shipped from St. Louis, and the freight exceeds the cost of the tile at the factory.

Experiments in agriculture require time. Our work for the first year will be largely of a preparatory kind, equipping and getting ready for future investigations.

Bulletins will be issued whenever we have matters of interest to publish, and sent to the address of any farmer in Texas who will apply for them.

We have received many valuable suggestions from correspondents and from visitors, and we will at all times be pleased to hear from those who are interested in the agricultural development of the state. F. A. GULLEY, Director.

REPORT OF THE AGRICULTURIST,

TO TEST THE VALUE OF COB AND SHUCK, IN CATTLE FEEDING; CORN, COB AND SHUCK, BEING GROUND TOGETHER.

An experiment designed to test the value of cob and shuck meal, which has been carried out by students of the second class under the immediate supervision of assistant professor Duggar.

Six head of steers, each coming two years old the present spring, were selected and divided into two lots of three each, as shown in annexed tables.

To LOT I was fed shelled corn ground coarsely; an amount which was entirely eaten up was fed twice daily, each steer in the lot receiving the same amount.

To LOT II was fed an amount of corn, cob and shuck ground coarsely together, which contained a weight of clear corn equaling the amount fed to LOT I; or since shelled corn weighs 56 lbs. per bushel, and corn in ear with shuck attached averages 72 lbs. per bushel, the amount fed to LOT II was always compared with amount fed to LOT I, in the ratio of 72 to 56, or as 9 to 7, by weight. By this means it was possible to ascertain (subject to individual variation) the effect of the *cob* and *shuck in excess* of the effect of clear corn as "chops." All the steers in each lot were allowed grass freely, running out in pasture day time and were taken up for feeding at night, a fact which may account in part for the only slight difference observed in favor of the cob and shuck. Another fact which doubtless worked against a greater gain from feeding cob and shuck ground with the corn, is the impossibility of grinding it fine enough with an ordinary sweep mill.

With all of the steers in each lot there was given a preliminary feeding period of six days, before taking the first weights on Feb. 18th.

LOT I.

Date of Weighing at close of each week.	Fed on Coarsely Ground Shelled Corn—'Chops.'							
	No. 1		No. 2		No. 3		Food consumed each week by the three steers.	Gain made each week by the three steers.
	Weight lbs.	Gain lbs	Weight lbs.	Gain lbs.	Weight lbs.	Gain lbs.		
1888								
February 18	495	.....	510	.....	300	.....	.....	.....
25	510	15	512½	2½	305	5	158	22½
March 3	510	.....	515	2½	320	15	158	17½
10	532½	22½	527	12	334	14	198	48½
17	551	18½	556	29	350	16	210	63½
24	573	22	558	2	358	8	210	32
31	590	17	575	17	375	17	210	51
April 7	610	20	601	26	377	2	165	48
14	640	30	626	25	397	20	195	75
21	670	30	635	9	417	20	180	59
28	675	5	670	35	425	8	180	48
Total for 70 days	....	180	....	160	.....	125	1864	465
Ratio of gain to feed	1 to 3.45		1 to 3.88		1 to 4.97		1 to 4.008	
Gain in per cent. of live weight.	36%		31%		41⅔%		36⅔%	

LOT II.

Date of Weighing at close of each week.	Fed on Crushed Corn, Cob and Shuck—Amount given being always as 72 to 56 (or as 9 to 7) compared with amount fed Lot I.							
	No. 4		No. 5		No. 6		Food consumed each week by the three steers.	Gain made each week by the three steers.
	Weight lbs.	Gain lbs.	Weight lbs.	Gain lbs.	Weight lbs.	Gain lbs.		
1888								
February 18	450	.....	465	.....	427½	.....	.....	.....
25	472½	22½	480	15	425	−2½	203	35
March 3	450	−22½	495	15	435	10	203	2⅛
10	465	15	515	20	450	15	254	50
17	488	23	525	10	462	12	270	45
24	513	25	530	5	483	21	270	51
31	530	17	543	13	510	27	270	57
April 7	540	10	555	12	520	10	212	32
14	570	30	580	25	547	27	251	82
21	600	30	606	26	573	26	231	82
28	618	18	613	7	592	19	231	44
Total for 70 days	.....	168	.....	148	.....	164½	2395	480½
Ratio of gain of feed	1 to 4.75		1 to 5.39		1 to 4.85		.....	.....
Ratio of gain to clear corn in feed	1 to 3.69		1 to 4.19		1 to 3.77		1 to 3.883	
Gain in per cent. of live weight	37%		32%		38%		35⅜%	

Considering the foregoing, in brief, it is found that the lot fed on "chops" alone made a gain in 70 days of 465 pounds, an average gain of 2.21 pounds per day and head, and requiring 4.008 pounds of feed to produce one pound of gain.

The lot fed on an equal amount of "chops," with the cob and shuck added, as already noted, made a gain in seventy days of 480½ pounds, an average of 2.29 pounds per day and head, and requiring but 3.883 pounds of "chops," with cob and shuck added, to produce one pound of gain. The excess, although slight, shows in favor of a certain value in the cob and shuck, but it is a question as to whether the gain observed will pay for the extra time and power required to grind corn, cob and shuck together, at least when the small sweep mills are used.

There are at present in progress on the college farm, experiments to test the value of some twenty different mixtures of commercial fertilizers as compared with farm yard manure in varying quantities per acre, and with unmanured land.

The crops represented in these tests are corn, both for dry and ensilage use; sorghum, millet, cow-peas, Johnson grass, mellilotus or sweet clover, Japan clover and cotton.

In addition to the above, started the present spring, there is the series of consecutive tests started five years ago on half acre plots to ascertain the lasting qualities of several different kinds of commercial and home made manures, in the peculiar soil of this locality, and their effects each year on yield of corn as compared with yield on unmanured land of same original value.

The creamery is now about ready for operation, and with its opening will be started an extensive series of experiments looking to the furtherance of the dairy interests in our state.

GEO. W. CURTIS,
Agriculturist.

REPORT OF THE CHEMIST.

The work consists of the examination of some commercial fertilizers being used the present season on the station farm; of the analyses of certain ores sent in by the citizens of the state to the station; and of two grasses now growing on the college campus —No. 324, *Phalaris Intermedia*, Canary grass, cut when in bloom and cured as for hay; No. 325, *Aristida Oligantha*, cut when six to eight inches high, right for grazing, and cured in same manner

as No. 324. The Canary grass is a native of the Southern states, well adapted for winter and spring grazing, as well as for hay. Stock are exceedingly fond of it. Its analysis shows it to be a grass comparing favorably with others well known for their nutritive value. The *Aristida*, No. 325, is a small wire grass, coming up late in the spring, and not much relished by stock. Its analysis is such as to commend it if stock can be induced to eat it.

EXPLANATION OF ANALYSES. FERTILIZERS.

In the determination of the commercial value of a fertilizer only the total *nitrogen*, its equivalent in *ammonia*, the *potash*, and the *phosphoric acid* are considered. Three *phosphoric acid* determinations are made, in order to further test the value of this ingredient.

"*The water soluble*," has reference to that phosphoric acid which is readily soluble in cold water, and which the plant can therefore at once assimilate.

"*The citrate soluble*," is that part of the *phosphate* soluble in a perfectly neutral (neither acid nor alkaline) solution of ammonium citrate of a definite sp. gr. This part of the *phosphate* is supposed to have been once soluble, but which has reverted, or gone back into a state less soluble than the "soluble phosphoric," but which the plant can take up within a short time.

To "*the citrate insoluble*" is referred that amount of the phosphate that is undissolved by the above "ammonium citrate solution." It is believed to be generally of little immediate value as plant food, and is not accorded a commercial valuation.

The "*total phosphoric*" of course means the whole amount of phosphoric acid present; while the "*total available*" is the sum of the citrate soluble, or reverted, and the water soluble.

The "*potash*" is what the chemist knows as *oxide* of *potassium;* and is the valuable fertilizing ingredient in all potash salts, such as muriate, sulphate, etc. "*Nitrogen*" is the most valuable ingredient in commerce, belonging to the fertilizer. In 14 parts it is equal to 17 parts ammonia.

FEED STUFFS.

The manner in which the *feed stuffs* are reported, will be noticed. A fodder or hay is never so dry, however it may seemingly be, but that considerable moisture can be extracted when dried at 212° F. (boiling water) for 4 to 5 hours. This loss is

indicated as "moisture." If a fodder is burnt over a low flame until most of the organic matter is driven off, a semi-white substance consisting of mineral matter (ashes) is left behind. It contains, beside, a little unburned carbon. This mass is *"crude ash."* *"Crude cellulose"* is that part of a plant, or of vegetable matter, that is insoluble at a boiling temperature in very dilute acids and alkalis It is *non* nitrogenous, and is what remains of a plant after all the more soluble portion has been taken away. *"Ether Extract,"* or *crude fat*, includes every thing which can be extracted from the dry fodder, by means of absolute ether,—oils, fats, chlorophyl, etc. *"Nitrogen free extract,"* or *carbhydrates*, means starch and sugar usually, though small amounts of gum and pectin substances are also present. *"Albuminoids"* may consist of a variety of substances chemically. They include all the nitrogenous part of the plant. The total quantity of albuminoids is obtained by multiplying the nitrogen found by $6\frac{1}{4}$, a calculation based on the fact that all the albuminoids contain about 16% nitrogen. ($16 \times 6\frac{1}{4} = 100\%$) This method is not absolutely accurate, but it is sufficiently so for practical purposes.

VALUATION OF A FERTILIZER.

The commercial value of a fertilizer means the market value of its fertilizing ingredients. It is usually calculated on the amount of *potash*, *available phosphoric acid*, and *nitrogen* which it contains. Though there are obviously some fertilizers that have not a value assigned to them in this way, their price depending upon local conditions. Such are gypsum, bone meal, cotton seed meal, ashes, barn-yard manure, etc.

Available phosphoric acid is worth in the market about 8 cts. per pound, *nitrogen* about 18 cts. per pound and *Potash* about 5 cts. per pound. In some fertilizers the available phosphoric acid may be small, and the fertilizer still of great value because of the large amount of total phosphoric acid present; for example, cotton seed meal, and bone meal. But in these cases, the organic matter soon decays, and leaves the phosphoric acid as available. But in the case of bone meal, the total quantity of phosphoric acid, is, at this station, estimated at 5 cts. per pound. The same for cotton seed, cotton seed meal, and cotton hull ashes.

ANALYSES.

No. 318.—COTTON SEED HULL ASHES.

	Per Cent.	Lbs. per Ton
Water soluble phosphoric acid	0.52	10.4
Citrate soluble phosphoric acid	0.15	3.0
Citrate insoluble phosphoric acid	8.20	165.8
Total phosphoric acid	8.96	179.2
Potash	24.14	482.8

Valuation of ton, 2000 pounds.

Total phosphoric acid at 5 cts per pound	$8.96
Potash at 5 cts. per pound	24.14
Total value	$33.10

No. 319—COTTON SEED.

With a view of determining the amount of hull and kernel in the whole seed, the two parts were carefully separated by hand, and the following *per cents* found:

	Per Cent.	Lbs. per Ton.
Hulls	45.2	904.0
Kernels	54.8	1096.0

ANALYSIS OF WHOLE SEED.

	Per Cent.	Lbs. per Ton.
Total phosphoric acid	1.37	27.40
Potash	1.23	24.60
Nitrogen	2.45	49.00
Equivalent to ammonia	3.96	79.20

Valuation of ton, 2000 pounds.

Total phosphoric acid at 5 cts. per pound	$1.37
Potash at 5 cts. per pound	1.23
Nitrogen at 18 cts. per pound	8.82
Total valuation	$11.42

No. 320—ACID PHOSPHATE.

	Per Cent.	Lbs. per Ton.
Water soluble phosphoric acid	14.09	281.8
Citrate soluble phosphoric acid	0.76	15.2
Citrate insoluble phosphoric acid	2.31	46.2
Total phosphoric acid	17.16	343.2
Total *available* phosphoric acid	14.85	297.0

Valuation of ton, 2000 pounds.

Total available phosphoric acid, at 8 cts. per pound	$23.76

NO. 321—MURIATE OF POTASH.

	Per Cent.	Lbs. per Ton
Potassium chloride	78.46	1569.2
Equivalent to potash	49.56	991.2
Undetermined	21.54	430.8

Valuation of ton, 2000 pounds.

Potash at 5 cents per pound $49.56

NO. 322—BONE MEAL.

	Per Cent.	Lbs. per Ton.
Total phosphoric acid	23.71	474.2
Equivalent to phosphate of lime	51.76	1035.2
Nitrogen	4.09	81.8
Equivalent to ammonia	4.95	99.

Valuation of ton, 2000 pounds.

Total phosphoric acid at 5 cts. per pound	$23.71
Nitrogen at 18 cts. pound	14.72
Total value	$38.43

NO. 323—GYPSUM PLASTER.

	Per Cent.	Lbs. per Ton.
Undetermined and insoluble matter	22.90	458.
Total Sulphate of lime	77.10	1542.
Sulphuric acid (anhydrous)	45.36	907.2
Lime (calcium oxide)	31.74	634.8

Valuation of ton, 2000 pounds, cost in New Orleans, $12.00 per ton.

NO. 326—COTTON SEED MEAL.

	Per Cent.	Lbs. per Ton.
Total phosphoric acid	2.6	52.
Potash	2.5	50.
Nitrogen	6.56	131.2
Equivalent to ammonia	7.95	159.

Valuation of ton, 2000 pounds.

Total phosphoric acid at 5 cts. per pound	$ 2.60
Nitrogen at 18 cts. per pound	23.61
Potash at 5 cts. per pound	2.50
Total value	$28.71

IRON ORE—BLANCO COUNTY.

The laboratory has determined the per cent. of iron in the following ores:

	Nos. 327	328	329	330	331
Metallic iron, per cent	50.67	38.69	51.92	68.95	60.

No. 331 is from Johnson county. All of these ores contain a trace of phosphorous, but no manganese. They are good workable ores, some of them excellent. As a rule an iron ore containing less than 35% of iron is not worked in this country.

NO. 322—COPPER ORE.

This ore is from El Paso, "Center mine," and may be classed as a rich ore. The mine is at present being worked.

Copper 40%
Silver ..... Dist. trace.

GRASSES.

NAME.	Moisture.	Dry Matter.	Crude Ash.	Crude Cellulose	Crude Fat.	Albuminoid.	Nitrogen-Free Ext.
No. 324—*Phalaris Intermedia*	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
—Canary Grass	13.25	86.75	10.20	38.69	3.09	10.21	24.55
No. 325—*Aristida Oligantha*	9.47	90.53	6.15	45.81	2.05	9.87	26.65

H. H. HARRINGTON, Chemist.

REPORT OF HORTICULTURIST.

As this department was opened at the beginning of the present school year, and as the work of the experiment station lately established here under the Hatch bill did not begin till March last, the experimental work of this department is necessarily in its incipient stages. It was thought best however to make a brief statement to the public concerning the steps taken this spring, and what is desired of those interested, to make the department of service and benefit to the general public.

The testing of varieties of fruits and vegetables will be an important part of the horticultural work of this station, and we desire to state that it will be so conducted as to be of service and value to originators and to the general public. We desire to receive varieties from originators and report on them from time to time. Thus originators will be aided in testing their productions, while the public will have the advantage of early knowledge concerning new varieties. No variety is desired unless thought to have special merit, as the station cannot undertake to test long lists of seedlings for the simple purpose of sift-

ing out the undesirable varieties for the benefit of individuals. No variety is wanted unless it is likely to be disseminated, and thus become of public interest. Care should be taken in sending new varieties to label the packages distinctly, name or number of variety, and name of sender, together with postoffice address. A letter or card should also be sent at the same time, giving full particulars as to origin and parentage, if known, and such other facts as may be of interest. In order the more quickly and accurately to arrive at results, some of the newer varieties of fruits and vegetables will be sent to growers in different parts of the state for trial. Blanks will be sent in each case in order to insure uniformity and completeness in the reports. It is not contemplated, however, to send plants and seeds to applicants indiscriminately. The desire is to secure co-operation of specialists in the different lines of fruit growing and vegetable culture, and to furnish facilities for the thorough testing of special crops to those who are best qualified for the work, or have a better adapted soil than is afforded on the grounds here, and have a desire to undertake it. Those who wish to undertake work of this kind can learn what is required by correspondence with the Station.

The work done this spring is of necessity largely preparatory to future work, by way of getting the soil in a state of average fertility, dividing the grounds into proper plots, locating orchards, vineyards, and small fruit testing grounds, etc. In the vineyard fifty-four varieties of grapes have been planted with the view of testing them in this climate and soil, of treating whatever diseases that may appear, and to apply the several modes of training to ascertain which is the most profitable for the several varieties. We give the list below in order to show what varieties are not in our collection that may have originated in Texas, and others that should be added to the list this coming fall. We shall make several additions by purchase this fall, but shall receive any varieties, new or old, that anyone desires to have tested under the limitation and directions given above. The list of grapes below are given in families just as they are planted, with proper room left for additions to be made to each. In the table B stands for black, A for amber, and W for white.

MUSCADINE FAMILY.—Vitis Rotundifolia, Scuppernong, Flowers, Tenderpulp, Thomas.

LABRUSCA FAMILY.—*Hybrids, Black*—Highland, Black Eagle, Barry, Wilder, Merrimack. *Amber*—Agawam, Brighton, Lindley, Salem. *White*—Goethe, Duchess, Triumph.

LABRUSCA CROSSES—Jefferson A, Lady Washington W, Niagara W.

SEEDLINGS.—*Black*—Early Victor, Moore's Early, Worden, Cottage, Hartford, Isabella, Ives. *Amber*—Vergennes, Iona, Diana, Catawba. *White*—Pocklington, Lady Martha, Prentiss, Perkins.

RIPARIA FAMILY.—*Hybrids*—Othello B, Cornucopia B, Brant B, Naomi W, Delaware A.

SEEDLINGS.—*Black*—Clinton, Bacchus, Black Pearl, Montefiore, Amber A. *White*—Elvira, Etta, Noah, Transparent, Pearl, Uhland.

ÆSTIVALIS FAMILY.—Herbemont, Cunningham, Louisiana, Black Spanish, Cynthiana, Norton's Va., Elsinburg, Hermann—all black.

T. L. BRUNK,
Horticulturist.

REPORT OF THE METEOROLOGIST.

In the department of meteorology we have not yet gotten to work, but the station has just received all the instruments necessary for making observations on the weather, and they will be set up and used in a short time.

The instruments include a barometer, a wet and dry bulb hygrometer, two sets of maximum and minimum thermometers, two rain gauges, two exposure thermometers, a Robinson's anemometer, and a wind vane. A set of soil thermometers will be obtained during the summer.

It is hoped that the farmers throughout the state will take an active interest in this important department of the Experiment Station, and that some of them will show their interest by becoming voluntary observers for the Station, and aid in establishing a state weather service.

Each voluntary observer would be asked to furnish himself with at least the following instruments, viz:

One thermometer and one rain gauge.

These instruments can be obtained at a cost of from six to ten dollars.

The duties of the voluntary observer will be to take a reading of the thermometer at 7 a. m., 2 p. m., and 9 p. m., every day. At the same time he will make a note of the condition of the weather, and if possible, the direction and approximate velocity of the wind; specifying whether the wind is light, brisk, strong, very strong, &c.

A record of these observations will be kept from day to day.

The date, duration and amount of each rain-fall should be kept. At the end of the month a complete copy of the record must be sent to the head office, at College Station, where it will be worked up and the results published.

The thermometer from which the readings for temperature are taken should be placed in some position where it will be sheltered from the direct rays of the sun, but where the air will have free and easy circulation about it. If placed on a building it should be suspended on the north side, and be several inches from the wall. It should be covered by a hood to protect it from the rays of the sun.

The rain gauge should be placed on the ground in a clear open space, away from any buildings or trees that might in any way shelter it.

J. H. KINEALY,
Meteorologist.