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The Composition of Texas Cottonseed Meal.

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The Composition of Texas Cottonseed Meal.

H. H. HARRINGTON, M. S. Chemist.

G. S. FRAPS, Ph. D., Assistant Chemist.

Work in the chemical laboratory for several years past in the investigation of some other topic where cottonseed meal had to be examined, has indicated that the Texas meals are richer in nitrogen than the American average, and that exporters of Texas meals, when selling by the American average, did not get value received for their goods. Believing this to be probable, we have undertaken to study in a systematic and thoroughly reliable way, the composition of Texas meals, and our work goes to show that Texas mill-men should demand more for their goods than they now receive from their export trade.

VALUE OF COTTONSEED PRODUCTS.

The manufacture of cottonseed oil and other products from cottonseed now constitutes an industry of great value. The products obtained are lint, hulls, oil, and meal. The importance of the industry may be seen by reference to statistical figures from the U. S. Census. During the year ending June 30, 1900, the cotton seed crop was 4,668,346 tons. Fifty-three per cent. of this crop was manufactured, producing 93,325,729 gallons of oil, 845,299 tons of meal, about 30,000 tons of lint, and about 1,160,000 tons of hulls.

Estimating the oil at 30 cents a gallon, the meal at $20 a ton, and the hulls at $4.00 a ton, the value of these products would be in round numbers $28,000,000 for oil, $16,900,000 for meal and $4,600,000 for hulls, or a total of $49,500,000 without counting the lint.

The cotton crop of Texas for the years 1899–1900 was 2,438,555 bales; making a seed crop of about 1,200,000 tons, and if half of it were manufactured, the value of the manufactured products would be about $13,000,000. These figures give some idea of the importance of the cotton seed industry in Texas..

According to the U. S. Census, the average price per ton of cottonseed in 1889-1890 was $8.54. In 1899-1900 the average price was found to be $11.55 per ton, and in 1900-1901 $16.00 per ton. The increase in price to the farmer followed a development of the industry and a recognition of the value of the products.

DRAFT OF COTTON ON THE SOIL.

In the growth of a plant, a certain amount of plant food must be taken from the soil. The average amount of the more important forms of plant food taken up by the leaves, roots, stems, bolls, seed and lint in a cotton crop producing 100 pounds of lint per acre, ac-

cording to McBride, Tenn. Station Bulletin, Vol. IV, No. 5, is as follows:

Nitrogen.....20.7 pounds
Phosphoric acid....8.2 pounds
Potash.....13.1 pounds

Lime, magnesia, iron, sulphur, and some other constituents are also removed by the crop, but the above are the most important. A considerable part of this plant food is found in the seed, as follows:

Nitrogen.....6.8 pounds
Phosphoric acid....2.8 pounds
Potash.....2.6 pounds

If the entire plant is removed from an acre producing 300 pounds of lint, the soil loses about 62 pounds nitrogen, 24 pounds phosphoric acid, and 13 pounds of potash.

Since, however, only the lint and seed are removed, as a rule, and the remainder of the plant is returned to the soil, the loss is not so great.

Plant food removed by 300 pounds lint and 654 pounds seed:

Nitrogen.....21.5 pounds
Phosphoric acid....8.6 pounds
Potash.....9.0 pounds

If the plant is dried and then burned, most of the nitrogen (about 60 pounds) is lost, while the potash and phosphoric acid remain behind in the ashes, and are returned to the soil.

The amount of plant food removed by an average crop of oats and corn per acre is as follows, according to McBride, Tenn. Station Bulletin, Vol. IV, No. 5:

	Nitrogen	Potash	Phosphoric acid
Oats, 30 bushels.....	17.5	6.0	5.3
Straw, 1515 pounds...	9.0	3.0	31.3
Total	26.5	9.0	36.6
Corn, 20 bushels.....	16.5	6.8	5.3
Straw, 1634 pounds...	13.3	2.7	25.1
Total	29 8	9.5	30.4

Oats or corn remove more plant food than a crop of cotton, (lint and seed) unless the plant is burned, when the loss of nitrogen is much larger for cotton.

The above figures do not represent the entire amount of plant food lost while growing a crop of cotton, corn or oats. A certain amount is washed out of the soil by the rain water which passes through the soil. How much this will be depends upon the amount of rain, the nature of the soil, etc., but it is often considerable. Further, clean cultivation of the soil causes the vegetable matter in it to decay more rapidly, and a decreased amount of vegetable matter is the result.

The chief draft of cotton is upon the nitrogen of the soil. If plant food goes from the soil every year and none is returned, it is

plain that the soil must inevitably decrease in crop-producing power. To discuss the fertilization of cotton is not, however, in the province of this bulletin.

PRODUCTS FROM COTTON SEED.

The products obtained from cotton seed are lint, oil, hulls and meal.

The *lint* comes from the fuzzy coating of short lint on the seed as it comes to the mill. About 70 pounds of lint per ton adheres to the seed, and about 30 pounds per ton are recovered on reginning the seed in the mill.

The *hulls* are separated from the meats of the seeds by hulling machines, which cut the seed to pieces and screen the hulls from the meats. In the early years of the industry the hulls were used almost entirely for fuel, but they are now used for feeding purposes. The value of hulls for feeding will be discussed in another section.

The *oil* is extracted from the meats by pressure, after they have been cooked. It is used as a salad oil, to make compound lard, in the manufacture of soap and for other purposes.

Cottonseed meal, finally, is obtained by grinding the *cake*, which is left behind when the oil is pressed out. Its chief uses are as a feed and as a fertilizer, both of which will be discussed below. Occasionally it happens that the meal is damaged by heating it too hot during the cooking; in such cases it can be used as a fertilizer.

The average amount of meal, hulls, lint and oil obtained from a ton of 2,000 pounds of cotton seed is as follows:

Meal	713 lbs
Oil	282 lbs
Lint	30 lbs
Hulls	975 lbs

GRADES OF MEAL.

The following definitions were adopted by the cottonseed oil producers at a convention in New Orleans in 1901:

"Cottonseed meal shall be classed and graded as follows:

18. Choice. Must be the product from choice cottonseed cake when finely ground, must be perfectly sound, sweet and light yellow color (canary), free from excess of lint and hulls. By analysis must contain at least 8 per cent. of ammonia.

19. Prime. Must be made from prime cake, finely ground, sweet odor, reasonably bright in color, yellow, not brown or reddish, and free from excess of lint or hulls, and by analysis must contain at least 8 per cent. of ammonia.

20. Off. Any cottonseed meal, which is distinctly deficient in any of the requirements of prime quality, either in color, odor, texture or analysis, or all."

FERTILIZING VALUE OF COTTONSEED MEAL.

The plant food in cottonseed meal is chiefly nitrogen, so that its fertilizing value depends mainly upon the quantity of *nitrogen* in it. In other words, it is a nitrogenous fertilizer. It contains, however, an appreciable quantity of potash and phosphoric acid.

The average of 204 analyses, [The Cotton Plant, (U. S. Department Agriculture),] is as follows:

Nitrogen	6.79 per cent
Phosphoric acid	2.88 per cent
Potash	1.77 per cent

The trade valuation for these constituents in Texas for the fertilizer season of 1903-1904 is, nitrogen 13 cents, phosphoric acid 7 cents, potash 6 cents. At these figures, the fertilizer valuation of a ton of cottonseed meal of the average composition would be:

Nitrogen	$17.65
Phosphoric acid	3.93
Potash	2.12
Total	$23.70

It will be noticed that over three-fourths of the above valuation is credited to nitrogen.

The above average is the average of 204 analyses made from meal from different parts of the country. It will be seen from what will be said in succeeding pages that Texas cottonseed meal is above the average. Prime Texas cottonseed meal should contain about 7.50 per cent. nitrogen, which, at the prevailing prices for nitrogen, would make the value $19.50 per ton for the nitrogen, nearly $2.00 more than the first valuation given.

In using cottonseed meal as a fertilizer, the fact should be borne in mind that it is a one-sided fertilizer, a nitrogenous fertilizer. If the soil needs nitrogen, it will be beneficial, but if the soil needs phosphoric acid or potash, applications of fertilizers containing more of these ingredients than cottonseed meal does, would prove more profitable.

It is evident that the chief value of cotton seed meal as a fertilizer depends upon the amount of nitrogen contained in it.

FEEDING VALUE OF COTTONSEED MEAL.

The feeding value of cottonseed meal depends chiefly upon the amount of protein and oil contained in it.

Protein is the flesh-forming constituent of a feeding stuff, and is usually the most expensive constituent. As it contains on an average 16 per cent. of nitrogen, the percentage of nitrogen in a feeding stuff multiplied by 6.25 gives the amount of protein present. In other words, the amount of nitrogen is a measure for the amount of protein present, so that both the fertilizing and the feeding value of cotton-

seed meal depends most largely upon its nitrogen content. Lean meat and the white of an egg are composed almost entirely of protein and water.

Fats or oils are concentrated foods. They belong to a class of substances, which produce heat to keep the animal warm, which are consumed when the animal moves, and which are deposited in the animal body in the form of fat. The other members of this class are *nitrogen-free extract and crude fiber.* The woody part of hays and straws is composed largely of crude fiber, and as it is not readily digested, it is not of much value. Starch, sugar, etc. are contained in the nitrogen-free extract. The higher value of fats compared with crude fiber or nitrogen-free extract is recognized when we say that a pound of digested fat is equal in value to two and one-fourth pounds of digested nitrogen-free extract or crude fiber.

The nitrogen-free extract in cottonseed meal or other concentrated foods, is, however, of considerable value.

The other constituents of cotton seed meal in addition to protein, fat, nitrogen-free extract and crude fiber, are ash, or mineral matters, and water.

The average composition of cottonseed meal (400 analyses) is as follows:

	Per cent.
Water	8.52
Ash	7.02
Protein	43.26
Crude fiber	5.44
Nitrogen-free extract	22.31
Fat	13.45

If we calculate the fat to terms of nitrogen-free extract or crude fiber, we find its value to be 30.28 per cent., or more than equal to the sum of the crude fiber and nitrogen-free extract. It is thus plain, as has been stated, that the feeding value of cottonseed meal depends chiefly upon the protein (or nitrogen) and fat contained in it.

Cottonseed meal is a *concentrated feeding stuff.* That is to say, it contains a high percentage of digestible nutrients. "Roughage" contains much lower percentages of digestible nutrients, chiefly owing to the presence of a larger quantity of undigestible crude fiber and nitrogen-free extract.

Rational feeding depends on feeding proper amounts of flesh-forming nutrients (protein) and heating nutrients (fats, nitrogen-free extract and crude fiber) in a bulk suitable to the animal. The stomachs of cows, sheep, etc. require a certain bulk of food to perform their functions with entire satisfaction to the animal and the feeder.

MANURIAL VALUE OF COTTONSEED MEAL.

The manure from animals fed cottonseed meal, provided it is properly saved, has fertilizing value almost equal to the cottonseed meal. That is to say, that while a small part of the plant food in the meal, the nitrogen, potash and phosphoric acid, remains in the animal body, the greater part passes into the urine and excrement. The ma-

nure from a ton of cottonseed meal, properly cared for, should be worth $10 to $15. A great part of the plant food is in the urine, and if the urine is lost, probably ⅔ of the fertilizing value of the manure is lost. If the manure is exposed to rain, a considerable part of the plant food will be washed out.

Probably the most economical method of saving the manure would be to pen and feed the animals upon the land to be manured.

COTTONSEED HULLS.

The average amount of fertilizing ingredients in cottonseed hulls is as follows:

	Per cent.
Nitrogen	0.69
Phosphoric acid	.25
Potash	1.02

The fertilizing value of the hulls per ton would average $3.35.

The average composition of cottonseed hulls is as follows:

	Per cent.
Water	11.36
Ash	2.73
Protein	4.18
Fiber	45.32
Nitrogen-free extract	34.19
Fat	2.22

The hulls are poor in protein and fat, and contain a large quantity of crude fiber. Cottonseed hulls are not a concentrated food.

COTTON OIL MILLS IN TEXAS.

There are about 500 cotton oil mills in the United States, of which about 150 are in Texas. A complete list of the Texas mills is presented in the following table, which is correct to Jan 1, 1903.

Annona Cotton Oil Co	Annona
Planters C. M. Co	Alvarado
Austin O. Mfg. Co	Austin
Arlington C. O. Co	Arlington
Abilene C. O. Co	Abilene
Athens C. O. Co	Athens
Belcher C. O. Co	Belcherville
Belton C. O. Co	Belton
Planters C. O. Co	Bonham
Bowie C. S. O. Co	Bowie
Brenham C. O. & Mfg. Co	Brenham
Brownwood Oil Mill	Brownwood
Blooming Grove C. O. Co	Blooming Grove
Bryan C. S. O. Co	Bryan
Powell O. M. Co	Bastrop
Bartlett O. M. Co	Bartlett
Burton C. O. Co	Burton
Blossom O. & C. Co	Blossom
Farmers C. O. Co	Brandon
Caldwell O. M. Co	Caldwell
Gibson Gin & Oil Co	Calvert
Cisco O. M	Cisco
Clarksville C. O. Co	Clarksville
Milam Co. O. M. Co	Cameron
Pittman O. Mill	Cleburne
Corsicana C. O. Co	Corsicana
Navarro C. O. Co	Corsicana
Houston Co. O. M. & Mfg. Co	Crockett
Cuero C. O. & Mfg. Co	Cuero
Celeste O. & C. Co	Celeste
Cooper C. O. Co	Cooper
Dawson C. O. Co	Dawson
Decatur C. S. O. Co	Decatur

Trinity C. O. Co.....Dallas
National C. O. Co.....Denison
Denton C. O. & M. Co.....Denton
Dublin C. O. Co.....Dublin
Dallas Oil & Refining Co.....Dallas
Detroit O. & Cotton Co.....Detroit
Dodd City O. M. Co.....Dodd City
Dangerfield C. O. & Gin Co.....Dangerfield

Ennis C. O. & Ginning Co.....Ennis
Delta Co. C. O. Co.....Enloe

Farmers C. O. Co.....Farmersville
Flatonia C. O. Co.....Flatonia
Floresville O. M. Mfg. Co.....Floresville
Fort Worth C. O. Co.....Fort Worth
Farmers and Merchants C. O. Co.....Frost

Gainsville C. S. O. M.....Gainsville
Georgetown O. M.....Georgetown
Grandview O.M.....Grandview
Greenville O. & C. Co.....Greenville
Goliad O. M. & Gin Co.....Goliad
Gonzales C. O. & Mfg. Co.....Gonzales
Gatesville O. & C.Co.....Gatesville
Giddings C. O. Co.....Giddings

Henderson C. O. & Gin Co.....Henderson
National C. O. Co.....Hearne
Hempstead C. O. Co.....Hempstead
Hillsboro O. Co.....Hillsboro
Lavaca O. Co.....Hallettsville
Honey Grove C. O. Co.....Honey Grove
National C. O. Co.....Houston
Consumers C. O. Co.....Houston
Southern C. O. Co.....Houston
Houston Cotton O. Co.....Houston
Hubbard City C. O. & Gin Co.....Hubbard City
Hico C. O. Co.....Hico
Planters O. Co.....Hearne

Itasca C. S. O. M. Co.....Itasca
Italy C. O. Co.....Italy

Jacksonville C. O. Co.....Jacksonville
Jefferson C. O. & Refining Co.....Jefferson
Jacksboro C. O. Co.....Jacksboro

Kaufman C. O. Co.....Kaufman
Kyle O. Co.....Kyle
Kerens C. O. Co.....Kerens

Ladonia C. O. Co.....Ladonia
Lockhart C. O. Co.....Lockhart
LaGrange C. O. Co.....LaGrange
Longview C. S. O. M. Co.....Longview
Luling C. O. Co.....Luling
Leonard C. O. Co.....Leonard
Lancaster C. O. Co.....Lancaster
Luling C. & Mfg. Co.....Luling
Lone Oak C. O. & Gin Co.....Lone Oak

Marlin O. Co.....Marlin
McGregor C. O. Co.....McGregor
Moulton Gin & Oil Co.....Moulton
McKinney C. O. M. Co.....McKinney

Farmers & Mer.C.O. & Mfg. Co...Mt. Pleasant
Mt. Calm C. S. O. Co.....Mt. Calm
Midlothian C. O. Co.....Midlothian
Munger Oil & Cotton Co.....Mexia
Mertens Co-operative Gin & Mfg. Co..Mertens
Morgan C. S. & O. Co.....Morgan

H. Schumacher Oil Works.....Navasota
Merchants & Farmers C. O. Co..Nacogdoches
Landa C. O. Co.....New Braunfels
Bowie Co. C. O. Co.....New Boston

Omaha C. O. Co.....Omaha

Palestine C. S. O. Co.....Palestine
Paris C. & O. Co.....Paris
Pilot Point C. O. M.....Pilot Point
Lamar C. O. Co.....Paris
Pittsburg C. O. Co.....Pittsburg
Planters C. S. O. Co.....Petty
Pecan Gap C. O. Co.....Pecan Gap

Rosebud C. O. Co.....Rosebud
Rockdale C. O. Co.....Rockdale
Roxton C. O. Co.....Roxton
Rockwall C. O. Co.....Rockwall
Royce O. & C. Co.....Royce City

Stephenville C. O.Co.....Stephenville
San Antonio Oil Works.....San Antonio
San Marcos O. & Gin Co.....San Marcos
National C. O. Co.....Seguin
Sherman O. & C. Co.....Sherman
Schulenberg O. M.....Schulenberg
Farmers & Ginners C. O.Co....Sulphur Springs
Tex. & Ind. Ter. O. & C. Co.....Sherman
Shiner O. M. & Mfg. Co.....Shiner
Smithville O. M. Co.....Smithville

Taylor C. O. Co.....Taylor
Empire M. Co.....Temple
Texarkana C. O. & Fertilizing Co... Texarkana
Terrell C. O. Co.....Terrell
Central Texas C. O. Co.....Temple
Taylor C.O. Works.....Taylor
Tyler C.O. Co.....Tyler

Victoria C. O. Co.....Victoria
Valley Mills C. O. Co.....Valley Mills
Van Alstyne C. O. M.....Van Alstyne

National C. O. Co.....Waco
Consumers C. O. Co.....Waco
Wharton Gin & Milling Co.....Wharton
Wills Point C. O. Co.....Wills Point
Waxahachie C. O. Co.....Waxahachie
Planters Oil Co.....Weatherford
Weimar O. Co.....Weimar
Wortham C. O. Co.....Wortham
Whitewright O. Co.....Whitewright
Hunt Co. Oil Co.....Wolfe City
West C. O. Co.....West
Winsboro C. O. Co.....Winsboro
Planters Oil Co.....Waxahachie

Yoakum O. & Mfg. Co.....Yoakum
Yorktown C. O. & Mfg. Co.....Yorktown

Map Showing Location of Cottonseed Oil Mills in Texas
Each Circle Indicates a Mill.

DISTRIBUTION OF THE MILLS.

The map on page 10 shows the distribution by counties of the oil mills in Texas, no attempt being made to indicate the exact location of the mill in the county. The mills are distributed through a comparatively limited area, and do not occur in West Texas, and hardly at all in South-east Texas.

COMPOSITION OF TEXAS MEALS.

The samples of meals were received partly from the mills, partly

from Jockusch, Davison & Co., of Galveston, to whom our acknowledgment is hereby made for their courtesy. The samples of meals received from the mills were in response to the following letter:

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS,
CHEMICAL DEPARTMENT.

College Station, Texas, Nov. 20, 1903

Dear Sir—I am making a systematic study of cottonseed meals of the state, with particular reference to their content of oil and nitrogen I want to show that the Texas meals are of superior composition. Will you aid me in this work by sending me a carefully selected one pound sample of your PRIME meal—such as represents the average run of your mill from good seed. I do not want choice meal nor a grade inferior to that of prime meal. Results will be sent you after completion and publication. Thanking you in advance for your trouble,

Yours truly,
H. H. HARRINGTON,
Chief Chemist to Experiment Station.

The samples received were probably slightly above the average of the meals sold throughout Texas—that is to say, they did not include any low-grade or inferior meals. At the same time, the samples must represent fairly well the run of prime Texas cottonseed meal.

Certain of the samples received from Galveston were *bolted* meal—meal from which the hulls had been sifted by bolting cloth. Since hulls contain comparatively low percentages of fat and nitrogen, bolted meal should be more valuable than unbolted. In the best grade of meal, however, comparatively little hulls are found.

RESULTS OF ANALYSIS.

The most important constituents of cottonseed meal are nitrogen and fat, for the reasons set forth in the preceding pages. The analyses were confined to a determination of these constituents.

The table below presents the results of the analyses. Where the name of the oil mill is not given, the sample was received from Galveston.

COMPOSITION OF COTTON SEED MEALS.

No	NAME	LOCATION	FAT	NITROGEN
1	.....	Caldwell	13.17	7.52
5	Bryan Cotton Seed Oil Co.....	Bryan.....	10.39	7.75
8	Brenham Oil & Manufacturing Co.....	Brenham	12.24	7.74
9	Terrell Cotton Oil Co.....	Terrell	8.53	7.68
10	Lavaca Oil Co.....	Hallettsville.....	13.36	7.70
11	Corsicana Cotton Oil Co.....	Corsicana	7.51	8.12
12	Ennis Cotton Oil Ginning Co.....	Ennis	10.15	8.00
13	.....	.....		7.54
14*	.....	Hallettsville.....	11.26	7.63
15*	.....	San Antonio.....	10.34	7.90
16	.....	Cameron	10.58	7.86
17	.....	Hico	7.23	8.15
18	.....	Dublin	7.13	7.93
19	.....	Alvarado		8.09
20	.....	Waxahachie.....	8.77	7.96
21	.....	Annona.....	8.56	7.00
22	.....	Caldwell.....		8.03
23	.....	New Boston.....	7.93	7.33
24	.....	Fort Worth.....	9.34	7.93
25	.....	Brownwood.....	7.17	8.64
26	.....	Clarksville	5.02	7.79
27*	.....	Houston.....	8.99	7.25
28	.....	Shiner.....	10.97	7.40
29*	.....	New Braunfels.....	8.79	8.03
30*	.....	Waco	10.23	7.34
31*	.....	Temple	13.42	8.12
32	Cuero Cotton Oil Mills.....	Cuero	10.72	7.50
33	Wharton O. & C. Co.....	Wharton	16.83	7.05
34	Alvarado Mills.....	Alvarado	11.34	8.14
35	Pittsburg Cotton Oil Co.....	Pittsburg.	7.79	7.86
36	Belton Cotton Oil Co.	Belton.....	7.57	7.66
50	Tyler Cotton Oil Mills.....	Tyler.....	11.04	7.21
51	Valley Mills Cotton Oil Co.....	Valley Mills.....	14.15	7.65
52	Wills Point Cotton Oil Co.....	Wills Point.....	6.93	7.08
53	Athens Cotton Oil Co.....	Athens	9.11	7.08
54	Weimar Oil Mill.....	Weimar	18.16	7.06
55	Austin Oil Co.....	Austin.....	13.81	8.57
56	Bartlett Oil Mill.....	Bartlett.....	13.16	7.55
57	Paris Oil & Cotton Co.....	Paris.....	8.32	7.88
58	Kyle O. & G. Co.....	Kyle.....	14.07	7.54
59	Georgetown Oil Mill.....	Georgetown	17.72	7.26
60	Powell O. M. Co.....	Bastrop	10.41	7.66
61	LaGrange O. M. Co.....	LaGrange	10.00	7.47
62	Farmers & Ginners C. O. Co.....	Sulphur Springs.....	11.64	7.77
65	Lancaster C. O. Co.....	Lancaster	8.88	7.80
66	Merchants & Farmers C. O. Co.....	Nacogdoches	9.10	7.30

*Bolted.

DISCUSSION OF RESULTS.

Forty-six samples were examined representing 43 mills, and 34 counties.

The samples may be divided into three groups, as follows:

Above 7.9 per cent. nitrogen.....	14
Between 7.5–7.9 per cent "	19
Between 7–7.5 per cent "	13
Total number.....	46

It will be observed that 14 of the above samples contain more than 7.9 per cent. of nitrogen. Of 410 analyses of cottonseed meal, tabulated in The Cotton Plant, Bulletin No. 33, Office of Experiment Stations, U. S. D. A., only 18 contain more than 7.9 per cent. of nitrogen, or only a few more than was found in the 46 samples of Texas meals.

Further, we have tabulated the analyses of cottonseed meal made in a number of states for purposes of inspection, during the years

1902-1903. In a total of 9 states, 151 samples of meal were examined. Of these samples not one was found to contain over 7.9 per cent. of nitrogen; only 8 contained more than 7.5 per cent. Compare with the 14 Texas meals containing over 7.9 per cent., and a total of 33 containing over 7.5 per cent of nitrogen.

These figures prove definitely that Texas cottonseed meals are richer in nitrogen than cottonseed meals from other sections.

RECENT ANALYSES OF COTTONSEED MEAL (NITROGEN.)

STATE	DATE OF REPORT	NO. OF SAMPLES	MAXIMUM	ABOVE 7.5	BETWEEN 7 & 7.5	BELOW 7.0
New York	September, 1903	15	7.4	0	5	7
Rhode Island	June, 1903	9	7.5	1	4	10
New Hampshire	February, 1903	8	7.7	1	1	6
Maryland	November, 1903	7	7.5	1	4	2
New Jersey	June, 1903	13	7.5	1	9	3
Connecticut	October, 1902	12	7.6	1	5	6
North Carolina	July, 1903	54	7.2	0	10	44
Vermont	September, 1903	22	?	2	11	9
Pennsylvania	Janaury, 1903	11	7.5	1	5	5
Total		151		8	54	92
Texas		46	8.62	33	13	0

Of course it may be objected that the samples sent in by the mills were of a higher grade than the market samples collected by the states cited in the table. But when we consider that out of total of 151 samples only 8 contained over 7.5 per cent. of nitrogen, while 33 out of 46 samples of Texas meals contained over 7.5 per cent. nitrogen, the conclusion is certainly justified that Texas meals are richer in nitrogen.

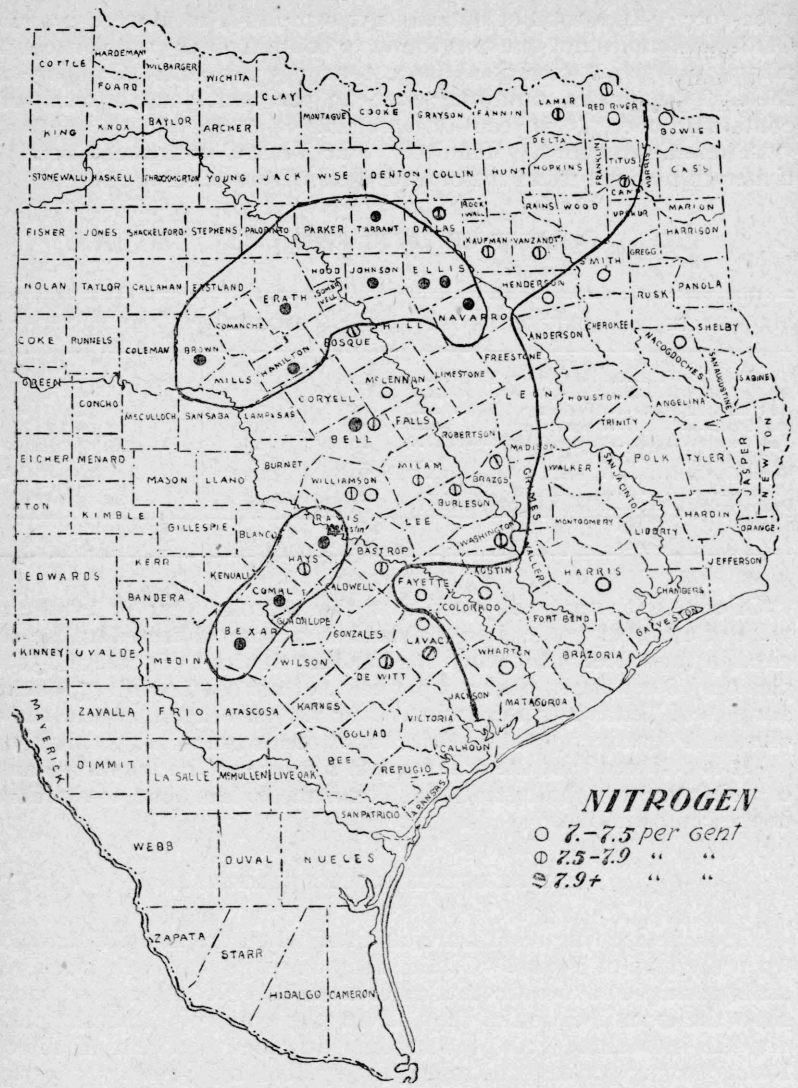
It is believed that the difference is not due to the northern samples containing more hulls, and the Texas meals less, but to a difference in the composition of seeds.

DISTRIBUTION OF THE SAMPLES.

Some interesting results are obtained when the samples are plotted upon the map of Texas. On the map on page 14, each circle represents a sample of meal from a different mill. No attempt is made to show the exact location of the mill in the county. The samples are divided into three groups according to their content of nitrogen. From 7 to 7.5 per cent. nitrogen, the symbol is (); from 7.5 to 7.9 per cent., (l); and above 7.9 per cent., ●. Every sample was of good quality.

The samples are observed to be grouped in four areas. The meals lower in nitrogen come chiefly from the eastern part of the state, the medium grades from the center, while the highest grade of meal comes from two western areas. These four areas are indicated on the map.

While it is recognized that samples of meal from the same mill may vary to a certain extent, and bearing in mind the fact that only one sample from each mill, as a rule, was subjected to analysis, yet we feel justified in thinking that the distribution of samples as shown in the map, is not accidental, but is due to causes which influence the composition of the cotton seed, as regards its nitrogen content.



Map Showing Distribution of Cottonseed Meals

CAUSES OF THE DIFFERENCE.

The difference in the composition of the cotton seed may be due to differences in the soil, in the rainfall, or other factors.

If we compare the map showing the composition of Texas meals, with a rain chart of Texas, we will find that the meals richest in nitrogen are from a section with a low rain-fall; the medium meals from a section where the rainfall is greater, and the meals with lowest amounts of nitrogen from the section of greatest rainfall.

Whether the difference in composition is indeed due to the difference in the atmospheric precipitation is a matter which could only be decided after several years of study, but the relation seems so striking that it seems at least very possible. The study of such a question would involve the comparison of meterological data for a number of years with the results of chemical analysis, since the precipitation during the crop season varies from year to year.

FAT IN TEXAS MEALS.

The amount of fat varies considerably, from 6.93 to 18.16 per cent. No general conclusion can be deduced from the data.

SUMMARY.

(1) The feeding value of cottonseed meal depends chiefly upon the amount of nitrogen and fat which it contains, nitrogen in protein being a flesh-forming food, and fat serving for fuel and to be stored up as fat.

(2) The fertilizing value of cottonseed meal depends chiefly upon the amount of nitrogen which it contains.

(3) Of 46 samples of Texas meals tested, 33 contained over 7.5 per cent. of nitrogen, while of 151 samples of meal examined in 9 other states, only 8 contained over 7.5 per cent. nitrogen.

(4) Texas cottonseed meals on the average are richer in nitrogen than meal from other sections, and therefore should have a higher commercial value.

(5) The meals richest in nitrogen come from the western part of the state; those lowest in nitrogen from the east, and the medium grades from the central cotton-growing region.

A map shows the distribution of the meals.

(6) There is very possibly a relation between the rainfall and the nitrogen content of cotton seed, the seed being richer in more arid sections. This difference may, however, be due to other causes.