

TEXAS AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 225

MARCH, 1918

DIVISION OF ANIMAL HUSBANDRY

COCOANUT MEAL VS. COTTON SEED MEAL FOR DAIRY COWS



B. YOUNGBLOOD, DIRECTOR
COLLEGE STATION, BRAZOS COUNTY, TEXAS.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

W. B. BIZZELL, A. M., D. C. L., President

TEXAS AGRICULTURAL EXPERIMENT STATION BOARD OF DIRECTORS

JOHN I. GUION, Ballinger, <i>President</i>	Term expires 1919
L. J. HART, San Antonio, <i>Vice-President</i>	Term expires 1919
E. H. ASTIN, Bryan.....	Term expires 1919
J. R. KUBENA, Fayetteville.....	Term expires 1921
A. B. DAVIDSON, Cuero.....	Term expires 1921
WILL A. MILLER, JR., Amarillo.....	Term expires 1921
JOHN T. DICKSON, Paris.....	Term expires 1923
H. A. BREIHAN, Bartlett.....	Term expires 1923
F. M. LAW, Houston.....	Term expires 1923

MAIN STATION COMMITTEE

L. J. HART, *Chairman*

WILL A. MILLER, JR.

GOVERNING BOARD, STATE SUBSTATIONS

P. L. DOWNS, Temple, <i>President</i>	Term expires 1919
CHARLES ROGAN, Austin, <i>Vice-President</i>	Term expires 1923
J. E. BOOG-SCOTT, Coleman.....	Term expires 1923
W. A. JOHNSON, Memphis.....	Term expires 1918

*STATION STAFF

ADMINISTRATION

B. YOUNGBLOOD, M. S., *Director*
 A. B. CONNER, B. S., *Vice Director*
 CHAS. A. FELKER, *Chief Clerk*
 A. S. WARE, *Secretary*
 W. T. BRINK, B. S., *Executive Assistant in Charge Library and Publication*
 EDITH H. PHILLIPS, B. S., *Technical Assistant*

DIVISION OF VETERINARY SCIENCE

**M. FRANCIS, D. V. S., *Veterinarian in Charge*
 H. SCHMIDT, D. V. M., *Veterinarian*
 D. H. BENNETT, V. M. D., *Assistant Veterinarian*

DIVISION OF CHEMISTRY

G. S. FRAPS, Ph. D., *Chemist in Charge; State Chemist*
 T. B. LEITH, B. A., *Assistant Chemist*
 SCOTT POWELL, B. S., *Assistant Chemist*
 E. SEICK, B. S., *Assistant Chemist*

DIVISION OF HORTICULTURE

H. NESS, M. S., *Horticulturist in Charge*
 W. S. HOTCHKISS, *Horticulturist*

DIVISION OF ANIMAL HUSBANDRY

J. C. BURNS, B. S., *Animal Husbandman, Feeding Investigations*
 J. M. JONES, A. M., *Animal Husbandman, Breeding Investigations*
 P. V. EWING, M. S., *Animal Husbandman in Charge Swine Investigations*

**L. B. BURK, B. S., *Collaborating Animal Husbandman, Swine Investigations*

DIVISION OF ENTOMOLOGY

F. B. PADDOCK, M. S., *Entomologist in Charge; State Entomologist*
 H. J. REINHARD, B. S., *Assistant Entomologist*
 W. E. JACKSON, M. S., *Assistant Entomologist*

County Apilary Inspectors
 R. C. Abernathy, Ladonia; William Atchley, Mathis; J. W. E. Basham, Barstow; T. W. Burleson, Waxahachie; W. C. Collier, Goliad; E. W. Cothran, Roxton; G. F. Davidson, Pleasanton; John Donegan, Seguin; A. R. Graham, Milano; J. B. King, Batesville; N. G. LeGear, Waco; R. A. Little, Pearsall; S. H. Stephens, Uvalde; M. B. Tally, Victoria; R. E. Watson, Heidenheimer; F. C. Belt, Ysleta; R. A. Nestor, Buffalo; J. E. Bush, San Antonio; H. A. Jones, Oakville; T. A. Bowdon, Palestine; E. R. Jones, Beeville.

DIVISION OF AGRONOMY

A. B. CONNER, B. S., *Agronomist in Charge*
 A. H. LEIDIGH, B. S., *Agronomist*
 ***H. H. JOBSON, B. S., *Agronomist*
 LOUIS WERMELSKIRCHEN, B. S., *Agronomist*

DIVISION OF PLANT PATHOLOGY AND PHYSIOLOGY

J. J. TAUBENHAUS, Ph. D., *Plant Pathologist and Physiologist in Charge*

DIVISION OF POULTRY HUSBANDRY

R. N. HARVEY, B. S., *Poultryman in Charge*

DIVISION OF FORESTRY

J. H. FOSTER, M. F., *Forester in Charge, State Forester*

DIVISION OF PLANT BREEDING

E. P. HUMBERT, Ph. D., *Plant Breeder in Charge*

DIVISION OF DAIRYING

W. A. DOUBT, *Dairyman*

****SOIL SURVEY

T. H. BENTON, *Soil Surveyor*
 J. F. STROUD, *Soil Surveyor*

DIVISION OF FEED CONTROL SERVICE

F. D. FULLER, M. S., *Chief*
 JAMES SULLIVAN, *Executive Secretary*
 J. H. ROGERS, *Inspector*
 W. H. WOOD, *Inspector*
 S. D. PEARCE, *Inspector*
 W. M. WICKES, *Inspector*
 W. F. CHRISTIAN, *Inspector*
 J. W. SNELL, *Inspector*
 J. J. KELLY, *Inspector*
 W. I. HAMPSTON, *Inspector*

SUBSTATION NO. 1: Beeville, Bee County

I. E. COWART, M. S., *Superintendent*

SUBSTATION NO. 2: Troup, Smith County

W. S. HOTCHKISS, *Superintendent*

SUBSTATION NO. 3: Angleton, Brazoria County

N. E. WINTERS, B. S., *Superintendent*

SUBSTATION NO. 4: Beaumont, Jefferson County

H. H. LAUDE, B. S., *Superintendent*

SUBSTATION NO. 5: Temple, Bell County

G. PURVIS, *Scientific Assistant*

SUBSTATION NO. 6: Denton, Denton County

D. T. KILLOUGH, B. S., *Superintendent*

SUBSTATION NO. 7: Spur, Dickens County

C. H. McDOWELL, B. S., *Superintendent*

SUBSTATION NO. 8: Lubbock, Lubbock County

R. E. KARPEN, B. S., *Superintendent*

SUBSTATION NO. 9: Pecos, Reeves County

J. W. JACKSON, B. S., *Superintendent*

SUBSTATION NO. 10: (Feeding and Breeding Substation), College Station, Brazos County

V. E. SPENCE, B. S., *Animal Husbandman, in Charge of Farm.*

G. C. WARE, *Scientific Assistant*

SUBSTATION NO. 11: Nacogdoches, Nacogdoches County

G. T. McNESS, *Superintendent*

SUBSTATION NO. 12: Chillicothe, Hardeman County

****R. W. EDWARDS, B. S., *Superintendent*

V. E. HAFNER, B. S., *Scientific Assistant*

SUBSTATION NO. 14, Sonora, Sutton County

E. M. PETERS, B. S., *Acting Superintendent*

CLERICAL ASSISTANTS

DAISY LEE, *Registration Clerk*
 C. L. DURST, *Mailing Clerk*
 R. C. FRANKS, *Stenographer*
 W. L. HEARN, *Stenographer*

MAE BELLE EVANS, *Stenographer*
 IRENE PEVERLEY, *Copyist*
 RUTH CAMPBELL, *Stenographer*
 MARGARET SHELDON, *Stenographer*

J. B. FRANKS, *Copyist*
 RUTH LORD, *Stenographer*
 EMMA CAMPBELL, *Stenographer*
 H. L. FRAZIER, *Stenographer*

*As of March 1, 1918.

**In cooperation with A. & M. College of Texas.

***On leave.

****In cooperation with United States Department of Agriculture.

CONTENTS

	PAGE.
Analysis of cocoanut meal.....	6
Digestible nutrients	6
Prevailing prices	7
Records of lots.....	7
Feed cost of production.....	8
Conclusion	9

[Blank Page in Original Bulletin]

COCOANUT MEAL VS. COTTONSEED MEAL FOR DAIRY COWS

P. V. EWING, ANIMAL HUSBANDMAN

AND

E. R. SPENCE, ANIMAL HUSBANDMAN

This report covers an experiment made to compare the relative feeding values for dairy cows of cocoanut and cottonseed meals. Ten cows from the Experiment Station herd were grouped into two lots after due consideration had been given to their previous feeding and performance. The feeding began October 14, 1917. The experiment was on a seven-day basis and continued for sixteen weeks. This time was divided into five periods. The rations consisted of 25 pounds of silage and a variable quantity of straw as the roughage, plus a quantity of concentrate consisting of three parts wheat bran and two parts peanut meal, plus a supplemental concentrate consisting of either cocoanut meal, cottonseed meal, or a mixture of equal parts of these, according to the feeding schedule, which was as follows:

Table 1.—Feeding schedule. Explanation—"C. N. M."=cocoanut meal, "C. S. M."=cottonseed meal, "Conc."=concentrates, "X"=check showing whether or not feed indicated at top of column was fed on date mentioned.

Weeks.	Dates.	Lot 1.					Lot 2.				
		Silage.	Straw.	Conc.	C. N. M.	C. S. M.	Silage.	Straw.	Conc.	C. N. M.	C. S. M.
1	Oct. 14 to Oct. 21.....	X	X	X	X	X	X	X	X	X	X
2	Oct. 21 to Oct. 28.....	X	X	X	X	X	X	X	X	X	X
3	Oct. 28 to Nov. 4.....	X	X	X	X		X	X	X	X	X
4	Nov. 4 to Nov. 11.....	X	X	X	X		X	X	X		X
5	Nov. 11 to Nov. 18.....	X	X	X	X		X	X	X		X
6	Nov. 18 to Nov. 25.....	X	X	X	X		X	X	X		X
7	Nov. 25 to Dec. 2.....	X	X	X	X		X	X	X		X
8	Dec. 2 to Dec. 9.....	X	X	X	X	X	X	X	X	X	X
9	Dec. 9 to Dec. 16.....	X	X	X	X	X	X	X	X	X	X
10	Dec. 16 to Dec. 23.....	X	X	X		X	X	X	X	X	
11	Dec. 23 to Dec. 30.....	X	X	X		X	X	X	X	X	
12	Dec. 30 to Jan. 6.....	X	X	X		X	X	X	X	X	
13	Jan. 6 to Jan. 13.....	X	X	X		X	X	X	X	X	
14	Jan. 13 to Jan. 20.....	X	X	X		X	X	X	X	X	
15	Jan. 20 to Jan. 27.....	X	X	X	X	X	X	X	X	X	X
16	Jan. 27 to Feb. 3.....	X	X	X	X	X	X	X	X	X	X

Each lot was fed on the basis of an average ration for each cow of that lot. The cows within the lots were fed according to production,

but the total feed for the two lots remained practically stationary. This necessitated an individual feeding schedule for each cow, as well as individual production records. Only the summaries and totals by lots are included in this report.

Analysis of Coconut Meal

The analysis of the coconut meal fed, as compared with the average analysis of coconut meals, as given by Henry and Morrison, was as follows:

Table 2.—Analysis of coconut meal.

Nutrients.	Sample.	H. & M.
Protein.....	20.94	20.90
Fat.....	6.35	8.10
Crude fiber.....	10.86	11.20
Nitrogen-free extract.....	47.19	45.30
Water.....	7.98	9.60
Ash.....	6.68	4.90

The similarity of the two analyses shows plainly that the figures as given by Henry and Morrison are entirely applicable in calculating the adequacy of this feed in the ration in supplying its quota of total digestible crude protein and total digestible nutrients.

Digestible Nutrients

Table 3.—Probable digestible crude protein and total digestible nutrients per 100 pounds of feed.

Feed.	Crude protein.	Total digestible nutrients.
Wheat straw.....	0.7	36.9
Silage (immature).....	1.0	13.3
Wheat bran.....	12.5	60.9
Peanut meal.....	20.2	58.7
Coconut meal.....	18.8	79.0
Cottonseed meal.....	37.0	78.2

By the use of these figures the adequacy of each ration fed was calculated. In this connection it should be noted that the coconut meal and cottonseed meal were compared on the basis of their total digestible nutrients and not in proportion to or on the basis of their digestible crude protein. This was advisable from several standpoints. The coconut meal is not capable of being fed in sufficient quantity to supply the bulk of the required protein and in the ration as planned an adequacy of protein was guaranteed, so that any excess of nutrients went for production. Since the coconut meal and cottonseed meal approximated each other closely in total digestible nutrients (79.0 and 78.2) they were arranged in the test on the pound-for-pound basis.

Prevailing Prices

The prices obtaining for the feeds used at the time of starting this test are given in the following table:

Table 4.—Prices of feeds used.

Feed.	Per ton.	Per pound.
Silage.....	\$ 5.00	\$0.0025
Straw.....	8.00	.0040
Bran.....	38.00	.0190
Peanut meal.....	40.00	.0200
Cottonseed meal.....	52.00	.0260
Cocoanut meal.....	39.00	.0195

Records of Lots

The following table shows the weekly record for each lot during the test. It is from this table that we obtain the data upon which conclusions are drawn.

Table 5.—Weekly record of each lot during test.

Lot.	Silage.	Straw.	Conc.	C.N.M.	C.S.M.	Milk.	Per cent fat.	Lbs. fat.	Weights.
1.....	875	201	182	52.5	52.5	549.5	5.65	31.08	3902
1.....	875	201	182	52.5	52.5	525.8	5.43	28.57	3945
1.....	875	198	182	105.0	.....	533.8	5.69	30.37	
1.....	875	218	220	83.5	.....	441.8	6.53	28.86	
1.....	875	231	238	70.0	.....	463.0	5.76	26.67	
1.....	875	195	238	70.0	.....	441.4	5.96	26.31	
1.....	875	206	238	70.0	.....	511.5	5.79	29.59	
1.....	875	220	238	35.0	35.0	508.6	5.54	28.18	4235
2.....	875	450	238	35.0	35.0	397.2	6.39	25.40	4125
2.....	875	410	238	70.0	.....	376.0	6.28	23.61	
2.....	875	365	238	70.0	.....	359.5	6.08	21.85	
2.....	875	380	218.5	64.5	.....	354.7	6.43	22.81	
2.....	875	390	238	70.0	.....	339.7	6.32	21.47	
2.....	875	390	207	60.0	.....	321.2	6.46	20.75	4150
2.....	875	390	238	35.0	35.0	325.6	6.33	20.62	
2.....	875	400	238	35.0	35.0	332.8	6.27	20.86	4065
2.....	875	201	182	52.5	52.5	549.7	5.54	30.48	3935
2.....	875	201	182	52.5	52.5	498.7	5.63	28.06	3975
2.....	875	198	182	.....	105	504.7	5.85	29.51	
2.....	875	218	225.5	.....	87.5	446.1	6.23	27.78	
2.....	875	231	238	.....	70.0	412.5	5.53	23.81	
2.....	875	195	238	.....	70.0	400.7	6.29	25.21	
2.....	875	206	238	.....	70.0	446.7	5.75	25.78	
2.....	875	220	238	35.0	35.0	452.4	5.75	26.056	4125
1.....	875	450	238	35.0	35.0	444.6	6.09	27.07	4235
1.....	875	410	238	.....	70.0	446.9	5.76	25.75	
1.....	875	365	238	.....	70.0	437.3	5.99	26.19	
1.....	875	380	238	.....	70.0	448.2	5.98	26.81	
1.....	875	390	238	.....	70.0	423.0	5.96	25.22	
1.....	875	390	238	.....	70.0	429.2	5.79	25.84	3990
1.....	875	390	238	35.0	35.0	416.7	6.06	25.26	
1.....	875	400	238	35.0	35.0	425.1	6.15	26.15	3845

From Table 5 we procure the figures for Table 6, which shows the average food consumption on the cocoanut meal ration, on the cottonseed meal ration and on the mixture of the two.

Table 6.—Total and average records per lot of five cows, according to supplemental concentrate.

	Silage.	Straw.	Conc.	C. N. M.	C. S. M.	Milk.	Per cent fat.	Lbs. fat.	Cost of feed.
10 weeks C. N. M.	8750	2983	2255.5	733	.....	4142.6	6.09	252.29	\$ 91.858
10 weeks C. S. M.	8750	2983	2311.5	.....	752.5	4395.3	5.96	261.90	98.215
12 weeks both	10500	3724	2632	490	490	5426.7	5.86	317.79	114.502
1 week C. N. M.	875	2983	225.55	73.3	.....	414.26	6.09	25.23	9.1858
1 week C. S. M.	875	2983	231.15	.....	75.25	439.53	5.96	26.19	9.8215
1 week both	875	3103	219.3	40.8	40.8	452.22	5.86	26.48	9.5418

Feed Cost of Production

From these tables it is possible to calculate the feed cost per pound of milk and per pound of butter fat. We find that for the cocoanut meal, cottonseed meal, and mixed rations, the feed cost per pound of milk is \$0.0222, \$0.0223, and \$0.0211, respectively, and for pounds of butter fat, \$0.364, \$0.375, and \$0.360, respectively.

From these results it is apparent that so far as economy of production was concerned there was not a great deal of difference between the three kinds of rations compared. The ration containing both cocoanut and cottonseed meals proved the most economical, while the milk produced on the cottonseed meal ration was slightly more expensive than that produced on cocoanut meal. So far as the feed cost of a pound of butter fat was concerned, on the cocoanut meal ration the cost per pound was over one cent less than on the cottonseed meal ration, while the cost was least on the mixed ration.

So far as percentages of butter fat were concerned, here again the cocoanut meal feeding produced on the average through the entire experiment about .2 per cent. more of butter fat, averaging 6.1 per cent, while both the cottonseed meal and mixed ration yielded on the average of 5.9 per cent. of butter fat. Thus from the standpoint of production the rations containing both cocoanut meal and cottonseed meal proved most economical.

The weights of the cows remained practically constant from start to finish, each lot weighing at the close of the experiment within a few pounds of the weight at the beginning. We can, therefore, consider any gain or loss in weights as negligible.

Conclusions

In general, our results correspond with previous experiments conducted to test the feeding value of cocoanut meal. Of this feed, Henry and Morrison* have the following to say:

"Cocoanut Meal.—The residue from the manufacture of oil from the cocoanut, *Cocos Nucifera*, known as cocoanut meal, is lower in crude protein than the oil meals previously discussed but it contains somewhat more crude protein than wheat bran and much more fat and has a higher feeding value. It is used to some extent by the dairy-men in the Pacific Coast States and produces butter of good quality and firmness, therefore being well adapted to summer feeding. European experience shows that cocoanut meal may be fed with success to horses, sheep, and swine. On account of its tendency to turn rancid it can be kept but a few weeks in warm weather."

This last point, rancidity, was a decidedly noticeable factor. Some sacks were sweet and palatable, while others were decidedly rancid and unpalatable, the cows frequently refusing to eat the feed containing the meal. The worst difficulty met in conducting the experiment was to get the cows to eat the required amounts of cocoanut meals, which caused a change from the original plans.

As a general conclusion, it seems as though some cocoanut meal can profitably be added to dairy rations in the place of a part of the cottonseed meal, but, owing to lack of palatability, two pounds per head per day is probably the extent of substitution possible.

*Feeds and Feeding, p. 179.