GROUND SOY BEAN HAY FOR MILK PRODUCTION.

Minor Thesis in Dairy Husbandry prepared by

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CONTENTS.

GROUND SOY BEAN HAY FOR MILK PRODUCTION.

Importance of Protein in Dairy Rations. It is important that every dairy farmer feed the most economical ration available. This is usually his personal problem to determine: whether he can most economically use home grown feeds entirely, or whether he shall supplement these feeds with a few purchased protein concentrates. The question cannot be answered the same way on any two farms, there are so many variable factors that enter into the problem, but each farmer can decide that he must feed his cows a liberal supply of protein if he expects them to maintain their normal milk flow. The importance of protein in feeding dairy animals has been shown by experiments conducted at several experiment stations.

Atwater and Phelps (1) believe that experimental evidence clearly indicates that liberal protein consumption and narrow rations tend to increase the milk flow and to retard the shrinkage due to advancing lactation, and that to some extent they may tend to increase the total solid and fat percentages, bovine individuality being the controlling factor in this latter respect.

Eckles (2) states that "the experiences of skillful feeders alone is sufficient evidence that a very high protein content is necessary to the sustained production of rich milk."

Hart and Humphrey (3) at the end of a nitrogen balance trial in which clover hay was fed together with linseed meal as a supplement, added casein to the ration, narrowing the N.R. from 1:8.3 to 1:5. Increased milk and total solid yields resulted. The authors state that, "the peculiar stimulating effect of liberal protein feeding on mammary activity was strikingly shown. - - - - The

maintenance of milk flow - - - - - is very probably secured by - - - - - high protein feeding."

Hart and Humphrey (4) held that it is impossible to furnish enough protein from a ration of clover hay, silage, ground corn, oats and (or) barley to enable a high producing cow to maintain her yield: and state that the rapid decline in milk production during lactation is often due to the low production values of the protein used and the low plane of protein intake.

Ellett and Holdaway (5) found that cows fed a high protein and low energy ration secreted more fat than they received, thus tending to confirm previous observations that such rations promote the formation of milk fat from carbohydrates or protein. Their experience indicates that when a cow begins her lactation with a deficiency of digestible protein in her ration, with enough or more of energy, her digestion coefficients

fall, her live weight drops, her yield diminishes at first rapidly and then more slowly, until finally, near the end of the period, her digestion coefficients rise again, and she puts on weight, but does not increase in yield.

J.L.Hills (6) in summarizing the results of data secured during 10 years with nearly 500 cows, finds the following facts concerning the digestible protein: a 3 per cent increase or decrease in digestible protein intake was without effect upon production; a 10 per cent increase or decrease was accompanied by a corresponding change in yield; amounting to 2 or 3 per cent; and a 20 to 25 per cent increase or decrease by a corresponding change, amounting to 4 or 5 per cent.

Legume Roughage the Most Economical Source of Protein.

Since protein, then, is of such importance in milk production, the final economy of the entire ration often

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alfalfa hay to maintain the nitrogen balance, a home grown ration composed of equal parts of corn, and oats maintained milk production as well as a ration composed of corn 39%, oats 39%, linseed meal 11%, and cotton-seed meal 11%.

They conclude that "when cows have plenty of choice alfalfa hay, there is no need of purchasing expensive protein rich concentrates to keep up good production. - - - - - For cows forced to maximum production - - - - - it is undoubtedly desirable to increase the amount of protein in the ration by the use of protein rich concentrates.

Hart and Humphrey (8) fed alfalfa hay against corn meal, balancing the rations so the total consumption of all nutrients in each ration was essentially alike. The nitrogen of the alfalfa hay proved as effective a milk maker as that in the corn kernel.

Experiments Showing Value of Soy Bean Hay as a Legume Roughage. Despite the increasing interest shown by dairy farmers in soy bean hay, comparatively little work has been done in determining its value for milk production.

Caldwell (19) found in two trials that a ration of corn silage, soy bean hay, and a grain mixture of 6 parts corn meal and 1 part cottonseed meal, was equal in milk production to a ration of corn silage, corn stover, and a grain mixture of equal parts corn meal, wheat bran, and cottonseed meal. In the first trial, the soy bean hay group consumed 113.36 pounds of dry matter per 100 pounds milk, while the other group consumed 109.51 pounds of dry matter. In the second trial, the soy bean hay group consumed 111.19 pounds dry matter per 100 pounds milk, while the other group consumed 106.72 pounds.

Hunziker and Caldwell (10) compared an alfalfa hay and grain ration with N.R. of 1:7.8 with a soy bean hay and grain ration of 1:6.9 N.R. When on the alfalfa hay ration, the cows averaged to give 7 per cent more milk and 1 per cent more fat than they did when fed on the narrower soy bean hay ration.

Price (11) compared soy bean hay and alfalfa hay in combination with corn silage and corn cob meal for milk production. Each lot of cows consisted of 4 Jerseys, and the test lasted through three periods of 30 days each. At the conclusion of the test, the results showed that the lot fed soy bean hay produced 245 pounds more of milk and 20.5 pounds more of fat than did the lot receiving the alfalfa hay.

Anthony and Henderson (12) found that 20 cows fed on soy bean hay along with a basal ration for 21 days produced 64.6 pounds of milk and 5.42 pounds of

fat more than did the same group fed for the same length of time on alfalfa hay and the same basal ration. The soy bean hay cows gained a total of 150 pounds in weight, while the same cows fed alfalfa hay lost a total of 22 pounds in weight.

These experiments show that soy bean hay is at least equal to alfalfa hay as a milk producer, if not slightly superior to it. But, as far as the author is aware, no experiments have been conducted that would show a direct substitution of ground soy bean hay for part of the grain in a dairy ration; nor has there been any work showing the actual value of grinding soy bean hay for milk production.

Object of the Experiment. The object of this experiment has been twofold:

1. To determine the value of ground soy bean hay as compared with the whole hay for milk production.

This work is reported in Feeding Trial No. I.

2. To determine the value of ground soy bean hay as a substitute for grain in a dairy ration. This work is reported in Feeding Trials No. II and III.

Factors Considered in Planning the Experiment. Before planning this experiment, a thorough study was made of all available literature discussing the factors that must be considered in a feeding experiment. For the sake of brevity, these factors are described below in outline form:

I. Object of feeding experiments.

   A. The only means of determining the application to farm practice of the results of fundamental feeding experiments.

   B. To use actual trials with the kind of animals the farmer has to feed, under the conditions prevailing on his farm.

II. Uncontrollable factors.

   A. Feeding capacity.

B. Productive capacity.

C. Physiological peculiarities.

1. Improper ration may limit production or deflect production from milk to body fat.

2. Length of lactation varies with different animals and with the same animal in different years.

3. Decrease in production and rate of decrease varies in the same animal from year to year.

a. Period of gestation; fall in milk begins 9 - 12 weeks after conception.

b. Plane of nutrition.

III. Controllable factors.

A. Kind and quantity of ration.

B. Method and time of feeding.

C. Care and management of the animals.

IV. Systems of feeding.

A. Alternation system.

1. Competitive rations are fed to same group of cows in successive periods.
    a. Eliminates errors due to individuality and groups of unequal production.
    b. Necessitates a short feeding period.
    c. Residual effect of ration may cause error.
    d. Any change in ration is often followed by a temporary increase.

B. Continuous system.

1. Competitive rations are fed to two groups continuously.
    a. Selection and balancing of animals and groups is of prime importance.
    b. Disadvantage of the short feeding period and residual effects of ration are obviated.

C. The combined continuous and alternation system.

1. To one group the basal ration is fed continuously; to the second group, the trial ration is fed continuously; the third group is alternated on the two rations.
   a. Inferior to the simple alternation system if only a small number of animals are available.

V. Considerations in selecting and grouping the individual cows.

A. History and previous treatment.

1. Diseases, as tuberculosis, abortion, shy breeders, mammitis.

B. Age.

C. Stage of lactation.

D. Breed and type.

E. Productive capacity.

1. Previous lactation a poor guide.

2. Best judged by a trial period in the same lactation period as, but directly preceding, the experimental period.

FEEDING TRIAL NO. I.

OBJECT OF THE TRIAL.

To determine the economy of using ground soy bean hay as compared with the whole hay for milk production.

PLAN OF THE TRIAL.

The Animal Used. Only one animal was available for this trial. She was a large Holstein cow, 10 years old, with plenty of capacity for milk production and feed consumption. She calved on October 31, 1924 and was bred on December 19, 1924.

The System of Feeding. The alternation system was used. The trial was started on December 7, 1924, and was divided

into four twenty day feeding periods, with a transition period of ten days between each feeding period. These ten day periods were not considered in the results.

The Rations Fed. Through the entire trial, corn silage and a basal grain ration were fed. In the first and fourth periods, the silage and grain constituted the entire ration; in the second period, approximately 6 pounds of whole soy bean hay were substituted for 10 pounds of the grain ration; in the third period, ground soy bean hay was similarly substituted instead of the whole hay.

The grain ration analyzed 20.2% protein in Periods I and II as shown in Table V, page 25, and 20.7% in Periods III and IV, as shown in Table X, page 32. This is probably as good as the best proprietary grain rations on the market, and can be mixed at home.

The soy bean hay was a mixture of several varieties, and in Periods I and II was of better quality

than that in Periods III and IV. The former is designated in the analyses as Soy Bean Hay #I, and that used in Periods III and IV as Soy Bean Hay #2.

Feeding and Management of the Cow. The milking and feeding were done twice daily. The ground hay was mixed with the grain when fed, and silage was fed after the hay and grain had been consumed. The whole hay was offered before feeding the grain and silage, and that refused was left in front of the cow 12 hours each day.

Except in the whole hay period, the cow was kept in an open front shed between milkings, having free access to water and salt. In the whole hay period she was stanchioned for 6 hours after each feeding, with the whole hay in front of her, and kept in the shed the remainder of the time.

Weighing and Sampling. The cow was weighed each day just before the afternoon feeding. Composite samples of both the milk and feed were kept.

Analysis of Feeds and Milk. The milk was tested for butter fat by the Babcock method at the end of each ten days.

All the feed was analyzed by the author, as shown in Table I.

TABLE I

ANALYSES OF FOOD STUFFS in per cent of original substance (analyzed by the author)

DIGESTIBLE NUTRIENTS in the food stuffs using Henry & Morrison's coefficients

FOOD	Dry Matter	Crude Protein	Fat	Crude Fiber	Ash	N-free Extract	Crude Protein	Fat	Fiber	N-free Extract	Total Digestible Nutrients
Wheat Bran	92.46	16.81	5.41	10.11	6.24	53.89	13.11	3.68	3.13	38.80	63.32
Ground Oats	90.12	10.98	5.56	10.00	3.92	59.66	8.56	4.84	3.50	48.32	71.27
Corn Meal	89.29	9.80	3.51	2.38	1.51	72.09	7.25	3.26	1.36	67.76	83.71
Corn & Cob Meal	86.79	12.75	3.23	4.11	1.66	65.04	6.63	2.71	1.85	57.24	71.82
Cottonseed Meal	92.18	33.16	6.18	3.79	6.37	49.50	29.85	5.87	1.40	37.13	79.59
Linseed Meal (O.P.)	91.75	33.36	5.35	9.05	5.54	38.45	29.69	4.76	5.16	29.99	75.55
Peanut Meal	93.99	39.51	10.76	20.00	7.22	20.50	35.55	9.68	1.80	13.86	72.99
Soy Bean Hay #1	89.43	16.50	3.87	23.44	6.79	33.86	12.05	1.70	13.36	21.65	50.89
Soy Bean Hay #2	89.06	11.43	3.53	24.27	7.89	36.94	8.34	1.55	13.83	23.64	49.30
Corn Silage	24.29	3.11	0.62	5.36	1.26	13.94	1.59	0.51	3.48	9.90	16.12

FEEDING TRIAL NO. I. TABLE II.

DAILY BODY WEIGHTS by 20 DAY PERIODS

FIG. 1

DAILY RATION—

Period I		Period II		Period III		Period IV	
Silage	50 pounds	Silage	50 pounds	Silage	50 pounds	Silage	50 pounds
Grain	16 "	Grain	6.6 "	Grain	6.6 "	Grain	13 "
		Whole Hay	14.6 "	Ground Hay	14.6 "		

Body Weights in Pounds

1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260

MILK PRODUCTION by 20 DAY PERIODS

FIG. 2

Pounds Milk Produced

950
925
900
875
850
825
800
775
750
725
700
675

Estimated Normal MILK Production

Actual Production

TABLE III.
RESULTS OF FEEDING TRIAL NO. I
in periods of 20 DAYS

PERIOD I					PERIOD II					PERIOD III					PERIOD IV				
Basal					Whole Hay					Ground Hay					Basal				
Feed Consumption			Production		Feed Consumption			Production		Feed Consumption			Production		Feed Consumption			Production	
silage lbs.	grain lbs.	hay lbs	milk lbs.	fat lbs.	silage lbs	grain lbs.	hay lbs	milk lbs.	fat lbs.	silage lbs	grain lbs	hay lbs.	milk lbs.	fat lbs.	silage lbs.	grain lbs.	hay lbs.	milk lbs.	fat lbs
1000	320	—	945	31.7	1000	132	292*	722	26.0	1000	132	292	753	25.6	1000	260	—	685	20.9

*91 lbs. of this hay were wasted

DISCUSSION OF RESULTS.

As shown in Table III, the cow produced 31 pounds more milk in 20 days when fed ground soy bean hay than when fed the whole hay. She consumed exactly the same amount of silage and grain and was offered the same amount of hay in both Periods II and III, but she refused to eat 91 pounds of the whole hay in Period II. The 91 pounds of whole hay that she refused to eat represented an absolute loss.

By grinding 300 pounds hay, 31 pounds more milk was produced than when the same amount of hay was fed whole. The value, then, of grinding 300 pounds hay was 31 pounds milk - of grinding 1000 pounds hay would be 105.4 pounds milk. With the milk at 3 cents a pound the value of grinding the hay increased production would be $3.16

The coarse stalks and pods were the portions of the whole hay that were wasted, and were unpalatable when offered in the whole state. Evidently by not consuming these coarser portions of her ration, she failed to consume enough digestible nutrients to keep her milk flow up to normal, but by consuming these portions when ground she tended to keep her milk flow at a higher level.

As shown in Table II, Fig. 1 the ground hay ration maintained body weight better than the other rations.

CONCLUSIONS.

1. The coarse stalks and pods of soy bean hay will be consumed when fed ground, but will be wasted if fed whole.

2. The coarse portions of the hay are valuable

for milk production, and if not consumed represent an actual waste in feed, and cause a lowered milk production.

3. By grinding the hay, 4.3% more milk was produced than when the same amount of hay was fed whole.

4. The increased production due to grinding the hay is equivalent to 105.4 pounds milk for every 1000 pounds ground hay fed.

FEEDING TRIAL NO. 2.

OBJECT OF THE TRIAL.

To determine the value of ground soy bean hay as a substitute for part of the grain in a dairy ration.

PLAN OF THE TRIAL.

The Animals Used. Eight Holsteins cows were used in this trial. Data on these cows is given in Table IV and their division into two groups of four cows each (A and B) is indicated.

Balancing the Groups. All the cows were fed the Basal Ration during the preliminary period of 20 days before the Experimental Period. They received daily approximately 4 pounds silage for each 100 pounds of body weight

and 1 pound of grain for each 3 pounds of milk produced daily.

Using the last 10 days of this preliminary period as a basis, the cows were divided into 2 groups of 4 cows each, that were as nearly equal in milk production, body weight, and age as possible. Data on this preliminary feeding period is given in Table IV

FEEDING TRIAL NO. II. TABLE IV

data from 10 days preliminary feeding period

Group	Cow No.	Age yrs.-mos.-dys.	Date of freshening mo.-dy.-yr.	Date of breeding mo.-dy.-yr.	Feed daily consumption: Grain pounds	Feed daily consumption: Silage pounds	Production (total): Milk pounds	Production (total): Fat pounds	Body weight pounds
A	1	6-3-12	10-2-24	4-13-25	10.5	50	428.6	11.79	930
	2	5-10-11	10-12-24	1-20-25	10.5	45	325.6	10.26	997
	3	2-7-23	8-27-24	10-11-24	6.0	40	141.1	4.79	924
	4	2-9-9	10-28-24	12-18-24	11.0	45	292.5	12.08	976
					38.0	180	1187.8	38.92	957
B	5	8-9-10	9-17-24	12-24-24	15.0	50	472.4	13.23	1148
	6	2-7-25	8-26-24	12-20-24	7.0	50	188.6	5.89	885
	7	2-8-0	6-15-24	9-21-24	7.0	40	177.9	6.40	979
	8	4-8-1	9-24-24	11-7-24	12.0	45	354.7	12.24	904
					41.0	185	1193.6	37.71	979

The Rations Fed. Corn silage and a basal grain ration were fed through the entire trial. In the experimental periods, approximately 10 pounds of ground soy bean hay were substituted for 6½ pounds of the grain ration.

The composition and analysis of the grain ration are shown in Table V.

GRAIN RATION - TABLE V

Amount pounds	Grain	Protein pounds	Fat pounds	Fiber pounds	N-free Extract pounds	Market Price per Ton	Market Price Net
200	Bran	33.62	10.82	20.22	107.78	$31.00	$3.10
300	Ground Oats	32.94	16.68	30.00	178.98	42.18	6.33
200	Corn Meal	19.60	7.02	4.76	144.18	51.70	5.17
100	Linseed M.	33.36	5.35	9.05	38.45	49.90	2.49
175	Cottonseed M.	58.03	10.81	6.63	86.62	40.75	3.55
100	Peanut M	39.51	10.76	20.00	20.50	44.70	2.23
1075	TOTAL	217.06	61.44	90.66	576.51	42.54	22.87
	per cent	20.2	5.7	8.4	53.6		

The System of Feeding. The alternation system was used. The trial was divided into two feeding periods, the first being 20 days and the second being 10 days. There was a transition period of 10 days between the feeding periods. These transition periods were not considered in the results. The division into periods is shown in Table VI.

PLAN OF PERIODS IN FEEDING TRIAL NO. II. TABLE VI.

No. of Period	Length of Period (days)	Rations Fed		Purpose of Period
		Group A	Group B	
1.	10	Basal	Basal	To Balance Groups
2.	10	Basal	Hay	Transition
3.	20	Basal	Hay	Feeding Trial
4.	10	Hay	Basal	Transition
5.	10	Hay	Basal	Feeding Trial

Feeding and Management of the Cows. The milking and feeding were done at the same time twice daily. The ground hay was mixed with the grain when fed, and silage was fed after the hay

and grain had been consumed. As some of the cows, when receiving the hay, did not eat their feed up immediately they were stanchioned for 6 hours after each feeding. This was done because it was thought that if given time, they would consume more roughage.

No trouble was experienced in getting the cows to eat the ground hay after the preliminary period. They soon developed a taste for it, and consumed it in preference to the coarser portions of the silage.

The cows were kept in an open front shed between each feeding, having free access to water and salt.

Weighing and Sampling. The cows were weighed each day just before the afternoon feeding. Composite samples of both the milk and feed were kept.

Analysis of Feeds and Milk. The milk was tested for butter fat by the Babcock method at the end of each 10 days.

The feed was analyzed by the author as shown in Table I, page 18.

FEEDING TRIAL NO. II. TABLE VII

DAILY BODY WEIGHTS BY PERIODS

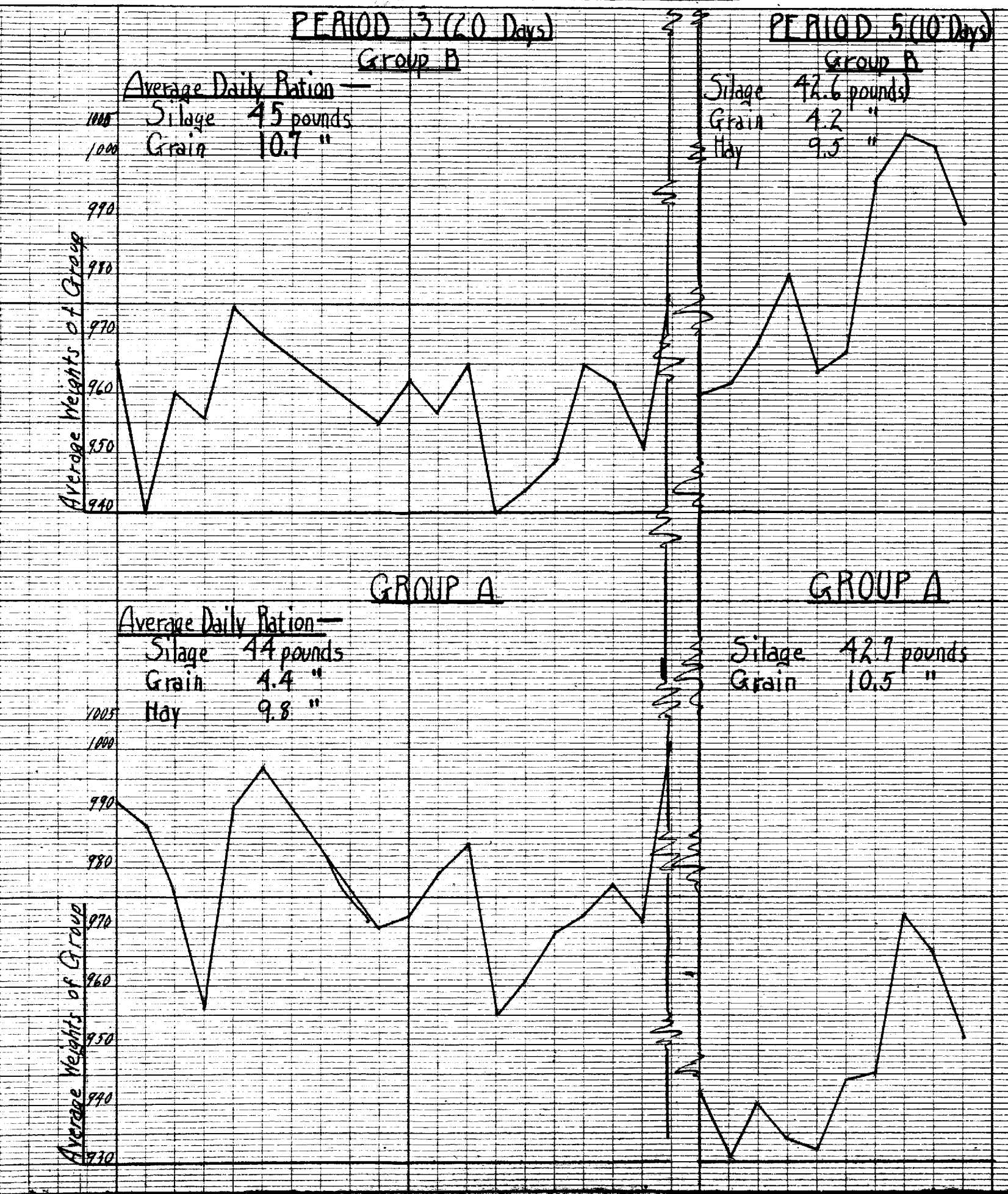


TABLE VIII

Production and Feed Consumption in Feeding Trial No. II

		Basal Period					Ground Hay Period					
Group	Cow no.	Production			Feed Consumed		Production			Feed Consumed		
		milk	fat	% fat	Silage	Grain	milk	fat	% fat	Silage	Grain	Hay
A	1	356.5	10.70	3.0	360	144	824.9	25.58	3.0	810	123	273
	2	292.8	9.08	3.1	450	118	633.1	20.58	3.2	900	100	220
	3	149.7	5.54	3.7	450	56	276.5	10.02	3.6	900	40	92
	4	239.2	8.61	3.6	450	104	537.8	20.75	3.8	900	92	200
	Total	1038.2	33.93	3.3	1710	422	2272.3	76.93	3.4	3510	355	785
B	5	900.7	27.93	3.1	1000	340	380.4	12.27	3.2	450	63	150
	6	374.0	12.52	3.3	800	136	168.2	6.06	3.6	400	28	64
	7	337.6	12.99	3.8	900	132	172.1	6.59	3.8	450	26	60
	8	580.7	22.37	3.8	900	252	279.3	10.61	3.8	405	53	106
	Total	2193.0	75.81	3.5	3600	860	1000.0	35.48	3.5	1705	170	380
Total of Groups		3231.2	109.74	3.4	5310	1282	3272.3	112.41	3.4	5215	525	1165

Discussion of Results. As shown in Table VIII, 41 pounds or 1.2% more milk was produced in the Ground Hay Periods than in the Basal Periods. Approximately the same amount of silage was consumed in both periods. In the Ground Hay Period, 1165 pounds of the ground soy bean hay replaced 757 pounds of the grain fed in the Basal Periods.

The cows increased slightly in body weight during the Hay Periods, as shown in Table VII.

Conclusions. It may be stated that in Feeding Trial No. 2 by replacing 59% of the grain ration with Ground Soy Bean Hay in the proportion of 153 pounds of hay for every 100 pounds of grain replaced, 1.2% more milk was produced, and body weights were maintained.

FEEDING TRIAL NO. 3.

OBJECT OF THE TRIAL.

To determine the value of ground soy bean hay as a substitute for part of the grain in a dairy ration.

PLAN OF THE TRIAL.

The Animals Used. The same eight cows were used in this trial as in Trial No. 2

Balancing the Groups. All the cows were fed the silage, grain, and ground soy bean hay for 20 days before the Experimental Period. They received daily approximately 4 pounds silage for each 100 pounds of body weight; for each 3 pounds of milk produced daily they received ½ pounds grain and 1 pound soy bean hay.

Using the last 10 days of this preliminary period as a basis the cows were divided into 2 groups of 4 cows each, that were as nearly equal in milk production, body weight, and age as possible. Data on this preliminary feeding period is given in Table IX.

TABLE IX

Data from 10 Days Preliminary Feeding Period

Group	Cow No.	Age	Date of Freshening	Date of Breeding	Daily Feed Consumption			Total Production		Body Weight
		yrs-mos-days	mo-dy-year	mo-dy-year	Grain pounds	Hay pounds	Silage pounds	Milk pounds	Fat pounds	pounds
C	1	6-3-12	10-2-24	A-13-25				357.1	11.94	952
	8	A-8-1	9-24-24	11-7-24				257.7	10.30	888
	3	2-7-23	8-27-24	10-11-24				135.6	5.52	904
	4	2-9-9	10-28-24	12-18-24				228.6	8.69	941
								979.0	36.45	921
D	5	8-9-10	9-17-24	12-24-24				370.2	11.85	1102
	6	2-7-25	8-26-24	12-20-24				163.1	5.55	874
	7	2-8-8	6-15-24	9-21-24				156.1	5.93	981
	2	5-10-11	10-12-24	1-20-25				281.5	9.57	1021
								970.9	32.90	994

The Rations Fed. Corn silage and a basal grain ration were fed through the entire trial as in Feeding Trial No. 2. However, since the soy bean hay used in this trial was of a poorer quality than that used in Trial No. 2., and since corn and cob meal was used in the grain ration instead of corn meal, only about 5 pounds of this grain ration were replaced by 10 pounds of the ground soy bean hay. The composition and analysis of the grain ration are shown in Table X.

GRAIN RATION - TABLE X

Amount pounds	Grain	Protein pounds	Fat pounds	Fiber pounds	N-free Extract pounds	Market Price per Ton	Net
200	Bran	33.62	10.82	20.22	107.78	$31.00	$3.10
300	Ground Oats	32.94	16.68	30.00	178.98	42.18	6.33
200	Corn & Cob Meal	25.50	6.46	8.22	130.08	45.00	4.50
100	Linseed M.	33.36	5.35	9.05	38.45	49.90	2.49
175	Cottonseed M.	58.03	10.81	6.63	86.62	40.75	3.55
100	Peanut M	39.51	10.76	20.00	20.50	44.70	2.23
1075	TOTAL	217.06	61.44	90.66	576.51	41.30	22.20
	per cent	20.2	5.7	8.4	53.6		

The System of Feeding. The same system was used as in Feeding Trial No. 2 (see page 26)

The division into periods is shown in Table XI.

PLAN OF PERIODS IN FEEDING TRIAL NO. III TABLE XI.

No. of Period	Length of Period (days)	Rations Fed		Purpose of Period
		Group A	Group B	
1	20	Hay	Hay	To Balance Groups
2	10	Basal	Hay	Transition
3	20	Basal	Hay	Feeding Trial
4	10	Hay	Basal	Transition
5	20	Hay	Basal	Feeding Trial

Feeding and Management of the Cows. The same as in Feeding Trial No. 2, (see page 26)

Weighing and Sampling. The same as in Feeding Trial No. 2 (see page 27)

Analysis of Feeds and Milk. The same as in Feeding Trial No. 2. (page 27)

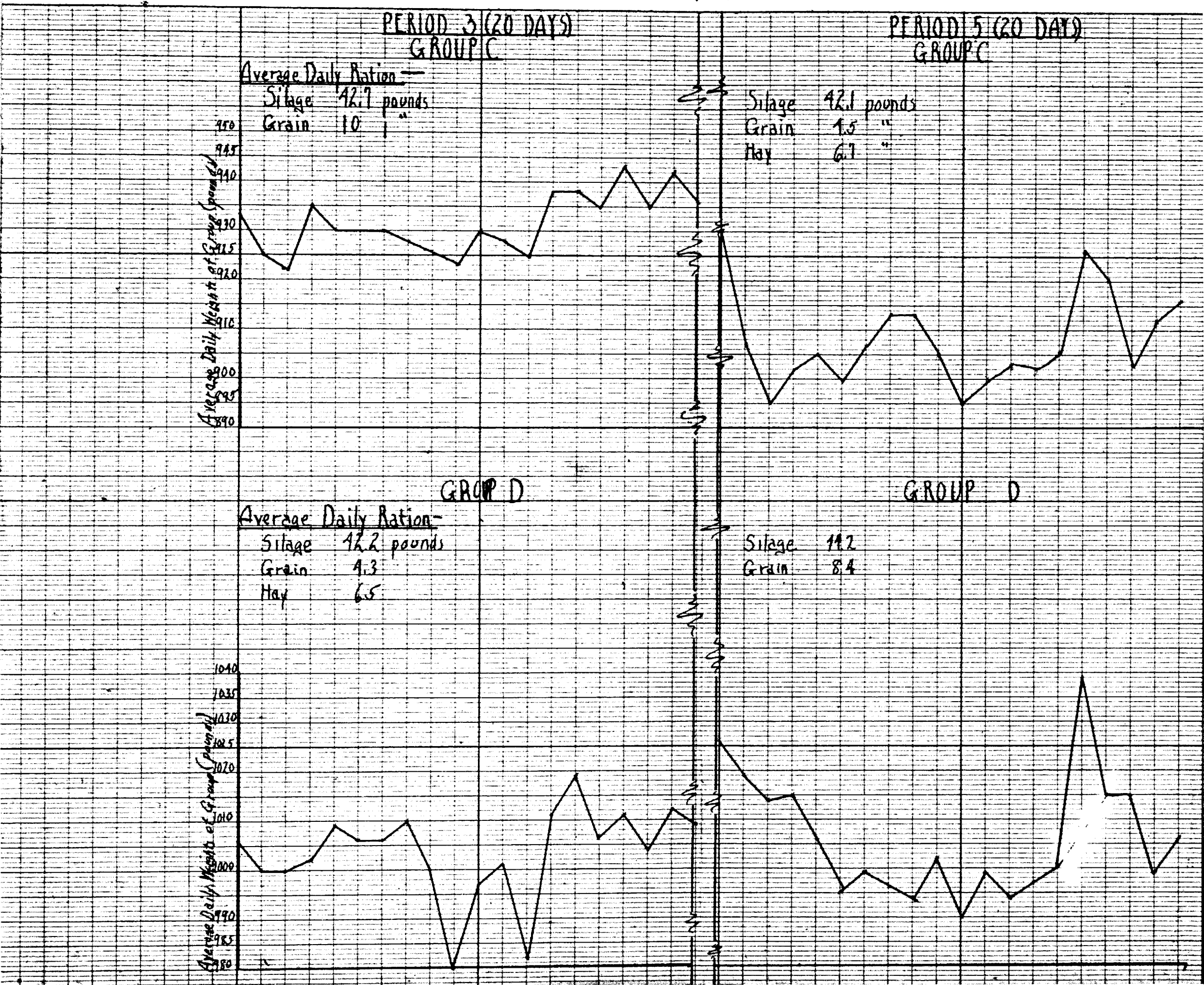
The feed was analyzed by the author as shown in Table I, page 18.

TABLE XII

Production and Feed Consumption in Feeding Trial No. III.

		Basal Period					Ground Hay Period					
		Production			Feed Consumed		Production			Feed Consumed		
Group	Cow no.	milk	fat	% fat	silage	grain	milk	fat	% fat	silage	grain	hay
C	1	708.6	19.44	2.7	880	236	725.9	22.14	3.0	863	120	176
	8	441.2	14.54	3.3	800	172	502.9	17.09	3.6	796	100	148
	3	aborted					242.2	8.83	3.1	878	52	76
	4	437.8	14.67	3.3	880	192	432.9	15.16	3.5	830	88	140
	Total	1587.6	48.65	3.1	2560	600	1903.9	63.22	3.3	3367	360	540
D												
	5	729.9	19.73	2.7	938	256	643.7	19.95	3.1	832	128	192
	6	347.3	11.27	3.2	796	108	289.6	10.43	3.6	775	56	88
	7	288.2	10.37	3.6	851	112	249.2	9.46	3.8	859	60	88
	2	572.8	17.75	3.1	954	200	536.6	16.91	3.0	914	100	152
	Total	1938.2	59.12	3.1	3539	676	1719.1	56.75	3.3	3380	344	520
Total of Groups		3525.8	107.77	3.1	6099	1276	3623.0	119.97	3.3	6747	704	1060

FEEDING TRIAL NO. III. TABLE XIII.
DAILY BODY WEIGHTS BY PERIODS.



Discussion of Results. As shown in Table XII, 97 pounds or 2.7% more milk were produced in the Ground Hay Periods than in the Basal Periods. 648 pounds less of silage were consumed in the Hay Periods than in the Basal. In the Hay Periods, 1060 pounds of the ground soy bean hay replaced 572 pounds of the grain fed in the Basal Periods.

The cows increased slightly in body weight during the hay periods, as shown in Table XIII.

Conclusions. In Feeding Trial No. 3, by replacing 45% of the grain ration with the ground soy bean hay in the proportion of 185 pounds of hay for every 100 pounds of grain replaced, 2.7% more milk was produced, and body weights were maintained.

FEEDING TRIALS 2 and 3 TABLE XIV.

SUMMARY PRODUCTION and CONSUMPTION

GROUP	Basal Periods				Ground Hay Periods				
	Production		Feed Consumed		Production		Feed Consumed		
	milk pounds	fat pounds	Silage pounds	Grain pounds	milk pounds	fat pounds	Silage pounds	Grain pounds	Hay pounds
A	1038.2	33.93	1710	422	2272.3	76.93	3510	355	785
B	2193.0	75.81	3600	860	1000.0	35.48	1705	170	380
C	1587.6	48.65	2560	600	1903.9	63.22	3367	360	540
D	1938.2	59.12	3539	676	1719.1	56.75	3380	344	520
Total	6757.0	217.51	11409	2558	6895.3	232.38	11962	1229	2225
Difference					138.3	14.87	553	1529	
Per cent Difference					2.04	6.8	4.8	59.7	

FEED CONSUMED PER UNIT OF PRODUCT

Average of Trials 2 and 3 TABLE XV

RATION	FEED CONSUMED per 100 POUNDS OF MILK			FEED CONSUMED per POUND OF FAT			
	Silage	Grain	Hay	Silage	Grain	Hay	
Grain and Silage	168.8	37.8	—	52.4	11.7	—	
Grain, Hay and Silage	173.4	17.8	32.2	51.5	5.3	9.6	
difference (pounds)	4.6	20.0	32.2	0.9	6.4	9.6	
difference (per cent)	2.7	11.2		1.7	12.1		

SUMMARY OF FEEDING TRIALS 2 AND 3.

1. As shown in Table XIV, a 2% increase in milk and 6.8% increase in fat were produced when 59.7% of the grain ration was replaced with ground soy bean hay in the proportion of 145 pounds of the hay for every 100 pounds of grain replaced. Body weights were consistently higher during the hay feeding periods than when the basal ration was fed.

2. As shown in Table XV, in producing 100 pounds of milk, a saving of 11.2% of the grain fed was produced by replacing, 100 pounds of grain with 160 pounds of ground soy bean hay.

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