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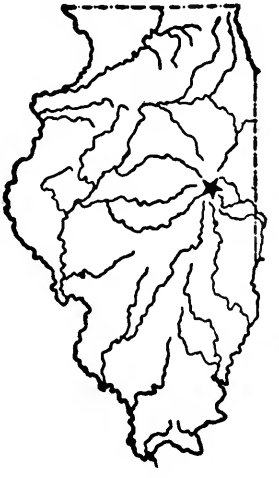
MAINTENANCE RATIONS FOR BEEF BREEDING COWS

By HERBERT W. MUMFORD



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Summary

1. The development of the range country changed the center of production of feeding cattle from the corn belt to the west. In view of the present agricultural development of the range renewed interest attaches to the breeding cow and her offspring and methods for feeding them in the corn belt. Page 325.

2. The object of this experiment was to compare feeds readily available on Illinois farms for maintaining beef breeding cows during the winter season. Page 326.

3. Silage, shock corn, and corn stover, respectively, proved to be economical feeds for the maintenance of cows when fed in connection with clover hay and oat straw. Pages 328 and 329.

4. The average daily gain per cow in lot 1 was 1.07 pounds. The average daily ration per cow consisted of corn silage, 16.64 pounds; clover hay 3.5 pounds; and oat straw, 9.56 pounds. Pages 329 and 330.

5. The average daily gain per cow in lot 2 was .758 of a pound. The average daily ration per cow was shock corn, 8.7 pounds ; clover hay, 3.5 pounds; and oat straw, 10.83 pounds. Pages 329 and 330.

6. The average daily gain per cow in lot 3 was .41 of a pound. The average daily ration per cow in this lot during the time the cows were confined to stover and oat stray, was corn stover, 21.67 pounds; oat straw, 5.15 pounds; and when clover hay was used, stover, 10.28 pounds; clover hay, 1.56 pounds; and oat straw, 8.19 pounds. Pages 329 and 330.

7. Under the conditions of this experiment, silage produced 41 percent greater gain in live weight than an equal acreage of shock corn. Page 329.

8. The cows in this test would not eat as much shredded stover as unshredded, and clearly preferred the latter. Page 331.

9. The yield of crops used in this test was 57.9 bushels corn and two tons stover per acre; and for crops purchased, viz., clover hay and oat straw, yields of 1¾ and one ton respectively were assumed. Page 331.

10. On the above basis approximately one acre of land is sufficient to produce the crops necessary to support a breeding cow 140 days in winter, and this acreage should produce a considerable amount of grain in addition to that necessary for the maintenance of one cow. Page 332.

11. The product of one-third acre of land is sufficient to maintain a cow 140 days in winter, if we regard the surplus grain produced as offsetting an acreage proportionate to its market value. Page 333.

MAINTENANCE RATIONS FOR BEEF BREEDING COWS

By HERBERT W. MUMFORD, Chief in Animal Husbandry

Introduction

The question of the economical maintenance of beef breeding cows has received but little attention by live stock investigators. The exact place of the corn belt cattleman as a factor in producing the world's future supply of beef is a matter of conjecture only.

Formerly Illinois farms were well stocked with high grade beef cows from which were produced the feeding cattle that were subsequently fattened to furnish a profitable outlet for the large acreages of corn grown. This was when land and corn were cheap. As land became more valuable and corn was used for other purposes than making meat it was found that there was but small profit, if any, in keeping a cow a year for the beef calf she would produce. During this transition period extensive breeding herds were formed on the western ranges. The breeding of feeding cattle as a common practice on high priced lands has passed at least temporarily. The supply of feeding cattle has come more and more largely from localities where land is cheaper. Range-bred feeding cattle are becoming yearly a large factor in corn belt feed lots.

The passing of the range and its extensive herds of cattle has been freely predicted and no doubt will eventually take place; that vast acreages of range country are being transformed into farms is a matter of common knowledge. That the southwestern cattleman is becoming more familiar with the value of his available feeds for fattening cattle is evident, which no doubt will result in more feeding or finishing of cattle in that section of the country. Notwithstanding these facts, there is more or less uncertainty surrounding the extent and the nature of the future cattle business on the numerous farms resulting from the subdivision of the extensive ranges.

The question of where the future supply of feeding cattle will be bred and reared is a pertinent one. Many predict that ultimately a much larger proportion of cattle fattened in the corn belt will be bred there. It is not our present purpose to discuss this question, but enough has been said to suggest to the reader the reasons for investigating the subject in hand, namely, that this has been a neglected question among investigators, and some conditions point to

more universal interest in this subject in the future. The breeding of beef cattle on high priced land presupposes the economical maintenance of the cows from which such stock is bred.

OBJECT

The object of this experiment was to compare cheap feeds readily available on Illinois farms for maintaining beef breeding cows during the winter season. In the selection of the feeds to be fed, an effort was made to use such as are not looked upon as cash crops of the farm but more in the nature of by-products of low commercial value. Also, to study the effect of these various rations upon the general thrift of the cows, in order to determine to what extent such feeds may be used, observations were made of birth weight and gains of offspring calved during the progress of the test. The corn plant in some form was used as the basal part of the rations fed.

In this connection it might be stated that the author's interpretation of maintaining a pregnant cow is to have her gain sufficiently to account for the growth of the fœtus, which at birth weighs fifty to ninety pounds.

PLAN OF THE EXPERIMENT

Thirty grade Aberdeen-Angus cows, similar in size, conformation, and breeding were secured for this experiment. In breeding they were from one-half to three-fourths Aberdeen-Angus blood, and in age from three to six years. The cows were the result of one or two crosses of choice Aberdeen-Angus bulls on native Missouri cows which contained varying quantities of Short-Horn blood.

They arrived at the Experiment Station farm December 20, 1904. These cows had nursed their calves during the summer and having but recently weaned them, they were thin in flesh, yet thrifty, and by no means emaciated. Perhaps a better idea of their condition may be secured from a reference to Plate 1 from a photograph which was taken of one of the lots at the beginning of the test. From the time they arrived until the experiment began all received the same feed; namely, corn stover.

The thirty cows were divided into three lots of ten each a few days after their arrival at the farm. Great care was exercised to make the lots fully comparable in age, condition, conformation, and size, to insure that whatever differences occurred would be directly referable to the differences in the rations fed. The cows in lot 1, received ear label numbers from 471 to 480 inclusive, those in lot 2 from 481 to 490 inclusive, and those in lot 3, from 491 to 500 in-

clusive. Corn silage, shock corn, corn stover, clover hay, and oat straw were the feeds used. These were charged to the cows at the following rates:

Corn silage	$3.34 per ton.
Shock corn	5.59 per ton.
Corn stover	2.25 per ton.
Shredded stover	2.25 per ton
Clover hay	8.00 per ton.
Oat straw	1.50 per ton.

Each lot was fed a ration made up of the following feeds:

Lot 1.—Corn silage, clover hay, and oat straw.
Lot 2.—Shock corn, clover hay, and oat straw.
Lot 3.—Corn stover and oat straw, (to March 8, 1905), corn stover, oat straw, and clover hay, (March 8 to May 16, 1905.)

In order to determine whether or not siloing the corn made the corn plant more valuable for wintering these cows, the amount of corn and its accompanying roughage fed in each instance was the same. This calculation was made on the basis of the amount of corn in a given amount of silage and shock corn respectively. The silage was 28.09 percent, and the shock corn 53.68 percent ear corn. Oat straw was used for bedding the cows and since this roughage constituted a portion of their feed some precaution was necessary to prevent the cows consuming straw of which no record could be secured. This point was guarded by keeping good fresh oat straw where the cows could eat it at will. The rejected portions only were used for bedding.

The amount of corn stover fed was regulated by carefully noting the amount the cows would clean up well without material waste. The corn stover reserved for feeding lot 3 was all used by February 7 and it was necessary to substitute in its place some shredded stover. The shredded stover available at the time was apparently too dry when shredded, and as a consequence the cows did not relish it as well as they did the natural stover. However, the cows in lot 3 were fed shredded stover and oat straw until March 8. By this time they would not consume to exceed four or five pounds of stover each daily. This was not sufficient to maintain them, so in order to prevent them from losing in weight three pounds of clover hay per cow per day were added to the ration. March 15 an excellent lot of shredded corn stover was secured. This was liked better by the cows in lot 3, but there was no mistaking the fact that the cows preferred the stover in its natural rather than its shredded form.

The quality of the silage, shock-corn, and straw was choice;

the clover hay, only medium. The larger part of the stover was choice, but the shredded stover fed from February 7 to March 15 was of poor quality.

From the beginning of the test until January 28, salt was fed each lot at regular intervals after which time it was kept before them at all times in order to determine the relative amounts the different lots would consume.

SHELTER AND FEED LOTS

Each lot of cows was provided with the same sized feed lot and open shed. The lots were paved with brick except under the sheds which were open their whole length to the south. These sheds were 12x36 feet. The feeding was done in racks or bunks outside except the straw which was fed in a manger under the shed to prevent it from getting wet and thus unfitting for bedding what was not eaten. The sheds were bedded daily so that the cows always had a clean dry place on which to lie. Each lot had access to clean water at all times except the night before weighing when the water was shut away from them.

Each lot was fed twice daily, during the winter months at 7 a. m. and 4 p. m., but in the spring earlier in the morning and at 5 p. m. The clover hay in each instance was fed at night. All other feeds were divided equally between the two feedings. The silage-fed cows were started upon ten pounds per cow per day. This was increased at the rate of one pound per cow every other day until the daily ration of each cow reached twenty pounds. The amounts fed were varied from time to time in an effort to feed enough and not too much to maintain the cows.

The cows were weighed at intervals of one week. They were weighed before being fed in the morning and the water was withheld for twelve hours previous to taking the weights. The initial and final weights were secured by taking the average weights on three consecutive days at the beginning and end of the test, respectively.

The table shows that the silage-fed cows did much the best. Since the cows were weighed individually as well as by groups it was determined that, aside from the cows which calved there were three cows in lot 3 that actually lost in live weight,—one losing as much as one hundred pounds. Another cow in this lot gained as much as one hundred thirty-six pounds. In lots 1 and 2 no cows lost in weight except those which calved before the end of the test.

WEIGHT OF COWS AT BEGINNING AND END OF TEST

Lot 1, silage-fed

Average weight of each cow at the beginning	860.33 lb.
Average weight of each cow at the end	1010.43 lb.
Average gain of each cow for 140 days	150.10 lb.
Average daily gain of each cow for 140 days	1.07 lb.

Lot 2, shock corn-fed

Average weight of each cow at the beginning	858.50 lb.
Average weight of each cow at the end	964.69 lb.
Average gain of each cow for 140 days	106.19 lb.
Average daily gain of each cow for 140 days	.758 lb.

Lot 3, corn stover-fed

Average weight of each cow at the beginning	859.83 lb.
Average weight of each cow at the end	916.36 lb.
Average gain of each cow for 140 days	57.53 lb.
Average daily gain of each cow for 140 days	41 lb.

From these records it will be seen that the average daily gain for each cow in the various lots is as follows:

Lot 1, silage-fed	1.070 lb.
Lot 2, shock corn-fed	.758 lb.
Lot 3, corn stover-fed	.410 lb.

As the experiment progressed even a casual observer could see that the cows in lots 1 and 2 were in much better thrift and spirits than those in lot 3. The staring coats of the cows in lot 3 indicated that they were "out of condition," while the hair of the cows in lots 1 and 2 was as sleek and as glossy as could be desired. There was a dull sluggishness about the cows in lot 3 that did not exist at all in the other lots. As to the consistency of the droppings of the cows in lot 3, we quote the feeder,—"The droppings from the corn-stover cows were very irregular, especially before the clover was added, it often being the case that from one cow they would be very dry and offensive, while that of another cow might be of such a thin consistency that it could almost be properly designated as scours." This showed that the feed which lot 3 was receiving was not ideal to keep the digestive tract in order. The digestion of the cows in lots 1 and 2, judging from the droppings, seemed to be in excellent condition throughout the trial.

FEED CONSUMED BY EACH LOT

Lot 1, silage-fed.

Feed eaten daily per cow (average for the whole time)

Silage	16.65 lb.
Clover hay	3.50 lb.
Oat straw	9.56 lb.

Lot 2, shock corn-fed.

Feed eaten daily per cow.

Shock corn	8.70 lb.
Clover hay	3.50 lb.
Oat straw	10.83 lb.

Lot 3, corn stover-fed.

Feed eaten daily per cow.

Corn stover (first 42 days)	21.67 lb.
Corn stover, shredded, (last 98 days)	10.29 lb.
Clover hay (average for 140 days)	1.56 lb.
Oat straw	8.19 lb.

The average amount of ear corn fed each cow in lots 1 and 2 was 654.14 pounds, or in other words the cows in lot 1 were fed the same amount of corn per cow as were those in lot 2, the difference being in the method of preparation. The cows in these two lots also received the same average amount of clover hay, namely, 3.5 pounds per cow daily. Since lots 1 and 2 received practically the same amounts of corn and clover hay, they must necessarily have consumed the products from equal acreages of these feeds as it is known that the yield of corn and hay, respectively, was the same in each instance.

As elsewhere stated, the cows in each lot were permitted to consume as much straw as they wished. It soon developed that the different lots of cows consumed unequal amounts of straw. In lot 1, silage-fed, the average amount of straw consumed daily was 9.56 pounds; in lot 2, shock corn-fed, 10.83 pounds; and in lot 3, corn stover-fed, 8.19 pounds.

It will be noted that more oat straw was consumed by lot 2 than by lot 1. This seems explainable from the fact that there was practically no waste of any part of the corn plant where it was fed in the form of silage, while there was considerable waste of stalk where shock corn was fed. Stated in exact terms, 1290 pounds of the coarse stalks of the stover were left uneaten by lot 2 while there was no waste of silage in lot 1. Silage may be fed liberally enough to cause some waste but it was not done in this case. Lot 2 consumed 1466 pounds of oat straw more than did lot 1. Thus it will

be seen that the extra amount of oat straw practically took the place of the wasted stover. The two lots therefore consumed practically the same amounts of feed. There was, however, a very important difference in effect, namely, that the feed fed lot 1 produced in 140 days an average of 44 pounds gain per cow more than did the feed fed lot 2. This warrants the conclusion that the mere act of siloing the corn plant increases to a considerable extent its value for wintering cows.

During the period in which lot 3 received only corn stover and oat straw,—the first forty-two days of the experiment,—the cows in this lot consumed an average of 21.67 pounds of corn stover and 5.15 pounds oat straw daily. Upon this ration the cows made an average daily gain of close to .7 of a pound each. When the shredded stover of poor quality was substituted, the cows ate less of it and more of oat straw. Notwithstanding the latter however, it was soon necessary to add three pounds of clover hay to the ration to secure satisfactory results. The total amount of oat straw consumed by this lot was less than that consumed by either lot 1 or lot 2.

SALT

From February 18 to the end of the test all the cows were allowed free and constant access to loose salt and a record kept of the amount consumed by each. The average daily consumption of salt per cow in the various lots was as follows: Lot 1, .08 of a pound; Lot 2, .12; and Lot 3, .10.

COMPARISON OF ACREAGES

In order to make a further comparison of the three rations used in this test, we may calculate the number of acres required to winter cows by each of the three methods used. The exact acreages of silage, shock corn, and corn stover used were known. As indicated on page 330, lots 1 and 2 received equal acreages of corn in the form of silage and shock corn respectively. The corn crop yielded 57.86 bushels of corn and two tons stover (cured basis) per acre. Since the other crops used were purchased on the market it is necessary to assume the yield of each. We may assume that the yield of oat straw was one ton per acre, and that of clover hay 1¾ tons, which are believed to be in keeping with the yield of corn mentioned above. Expressing the average amounts of feed consumed per head (page 330) in terms of the acreages required to produce these feeds, we have the following:

ACREAGE CONSUMED PER COW

	Tons consumed.	Yield per acre, tons.	Acreage consumed.
Lot 1.			
Silage	1.165	8.109	.1436
Clover hay	.245	1.750	.1400
Oat straw	.669	1.000	.6692*
Total No. acres			.9528
Lot 2.			
Shock corn	.609	4.327	.1407
Clover hay	.245	1.750	.1400
Oat straw	.758	1.000	.7581*
Total No. acres.			1.0388
Lot 3.			
Stover	1.009	2.000	.5045*
Clover hay	.109	1.750	.0624
Oat straw	.573	1.000	.5733*
Total No. acres.			1.1402

*The grain produced in addition is not here considered.

The above total acreages, however, are not a criterion of the relative efficiency of the three rations, because the areas which produced the oat straw and corn stover fed yielded also a certain amount of grain. In order to express the acreages of oat straw in terms comparable with the acreages of other crops used, we may reduce the straw and oats to their money values, determine the percentage which the value of the straw constitutes, based on the total value of both straw and oats, and regard this percentage as the proportion of the acreage of oats which is represented by the straw grown thereon.

Thus assuming a yield of fifty bushels per acre of oats, at 32 cents per bushel, the value of oats per acre is $16.00; value of one ton straw, $1.50 (page 327). The straw, then, makes up 8.908 per cent of the value of the crop, and that percentage of the acreages of straw indicated in the above table may be considered as representing the amount of land actually chargeable to the straw which the cows consumed.

Similarly, our records show that the corn crop yielded 57.86 bushels of grain and two tons stover per acre. Calculating the corn at 35c per bushel and the stover at $2.25 per ton, we find the value of corn to be $20.25 and stover $4.50 per acre, from which we determine that 18.18 percent of the value of the crop consists of stover. Computing the percentages of straw and stover thus deter-

mined, upon the acreages given below, we have the following comparable results:

	Acreage consumed.
Lot 1.	
Silage	.1436
Clover hay	.1400
Oat straw	.0592
Total	.3428*
Lot 2.	
Shock corn	.1407
Clover hay	.1400
Oat straw	.0668
Total	.3475*
Lot 3.	
Stover	.0917
Clover hay	.0624
Oat straw	.0505
Total	.2046*

*For actual amount of land involved see statement on p. 332.

RECORD OF THE COWS THAT CALVED

Cows about to calve were removed from their respective lots, usually a few days prior to calving and individual records kept both of the feed consumed and the increase or decrease in weight of cows and calves. As the oldest calf at the end of the test was only seventy days old the calves in no case received any feed other than the milk of their dams. It is true that some of the calves began to pick at the bedding when no more than a week old but what they consumed was so slight that this factor was immaterial.

When a cow was removed, her ration was made up of the same kind of feeds to which she had previously been accustomed. Soon after calving the amounts were greatly increased in order to insure a good flow of milk for the calf and not permit the cow to run down in condition to any great extent.

The accompanying tables present the important data concerning gains and losses in weight, feed consumed, and cost of feeds:

WEIGHT, GAIN, AND COST OF FEED

No. cow.	Wt. cow after birth calf, lb.	Wt. cow May 16 1905, lb.	Birth weight calf, lb.	Wt. calf May 16, lb.	Total gain calf, lb.	Daily gain calf lb.	Length test days, or age calf.	Daily cost of feed per cow, cents.	Cost 1 lb. gain on calf, cents.
486 (lot 2)	935	835	58	170	112	1.69	66	6.831	4.044
487 (lot 2)	945	848	72	200	128	1.83	70	6.843	3.731
478 (lot 1)	920	893	66	191	125	1.98	63	7.489	3.789
471 (lot 1)	945	885	74	165	91	1.49	61	7.630	5.121

FEED EATEN DAILY PER COW

No. cow.	Corn silage, lb.	Shock corn, lb.	Clover, lb.	Oat straw, lb.
486 (lot 2)		17.0	4.79	2.23
487 (lot 2)		16.9	4.90	2.12
478 (lot 1)	32.5		4.83	1.73
471 (lot 1)	32.8		4.85	2.83

Notwithstanding the fact that the cows were fed much more after calving than before, they fell off very materially in weight. This loss of weight was not as marked with the cows in lot 1, where silage was fed as it was in lot 2 where shock-corn was fed. Obviously the data are not available to determine whether this difference was due largely to the difference in the rations fed or whether it was due to the varying quantities of milk produced by the individual cows involved. If the amount left by the calves for a time after calving be taken as an indication of milking qualities, it would seem that in general the shock corn-fed cows were naturally heavier milkers than the silage-fed cows.

Other things being equal, it would be expected that the calves from cows giving the largest flow of milk would make the most rapid gains. If so, and if the shock corn-fed cows gave more milk than the silage-fed ones, why did the calf or cow number 478 (silage-fed) gain most and the cow suffer the least loss in live weight? In order to determine this matter accurately it would require that the cows be milked and a careful record kept of the yield. Enough is already known to satisfy the writer that if the cows in lot 1 (sil-

age-fed) did not give as much milk as the cows in lot 2 (shock corn-fed) it was because of a non-milking tendency in the silage-fed cows for which the ration was in no way responsible.

The feed of each cow, as soon as she calved, was increased a third from what had been found approximately a maintenance ration when she was dry. This amount, however, was inadequate to maintain the cow while suckling a calf. The amount was therefore quite rapidly increased until the shock corn-fed cows received twenty pounds shock corn and five pounds clover hay, and the silage-fed cows received a daily allowance of thirty-eight pounds of silage and five pounds of clover hay. This amount seemed about right to keep the cows from shrinking in weight while nursing their calves and was approximately twice the amount necessary to maintain the same cows while dry. It might be added that none of these cows were heavy milkers.

The cost of feed for the shock corn-fed cows was not as great as for the silage-fed cows. Reference to the table will show that cost of gains on calves was also computed. The high priced gains on the calf of cow number 471 were apparently due to the fact that this cow was a poor milker, apparently never giving milk enough for the calf.

It has been stated elsewhere that there was but little difference in the thrift of the cows in lots 1 and 2 before calving. A few days after calving, however, it was manifest that there was a marked difference between the cows wintered on silage and those wintered on shock-corn. The former ration was clearly superior.

The data derived from this experiment are of value also in adding weight to the evidence which has been accumulating the last few years, that the German maintenance standard should be revised.

The table shows that in no case was the amount of protein fed as large as the German standard calls for to maintain a one thousand pound animal, but as far as the general appearance of the cows in lots 1 and 2 were concerned no one would doubt that they were sufficiently supplied with all the nutrients. It is again interesting to note in this connection that, although lot 1 received a smaller ration per cow throughout the test, they made larger average daily gains than did the animals in lot 2. The different results which these two rations produced can be ascribed only to some indefinite property which one contained that the other did not; we might call this the difference in palatability of the two feeds. The silage-fed lot received feed which was more palatable than that given to lot 2, which had shock corn.

DIGESTIBLE NUTRIENTS, CALORIES, AND NUTRITIVE RATIOS

	Ave. weight, cows.	Ave. daily gain.	Dry matter per 1000 lb., live wt.	Digestible nutrients per 1000 lb., live wt.			Energy per 1000 lb. live wt., calories.	Nutritive ratio.
				Protein.	Carbohydrates.	Ether extract.		
Lot 1,— Silage	930	1.07	16.2	.567	7.44	.27	16047	1:14.2
Lot 2,— Shock corn	910	.75	19.2	.631	9.05	.25	19054	1:15.3
Lot 3,— Stover (42 days)	880	.95	17.8	.456	9.74	.18	19716	1:22.1
Lot 3,— Shredded stover (69 days)	895	.29	17.8	.557	8.54	.21	17837	1:16.2
Wolff's standard.	1000	.00	18.0	.700	8.00	.10	16000	1:11.7

FINANCIAL STATEMENT

The following statement forms an interesting study. The corn involved in the rations of the cows in lots 1 and 2 is figured at 35c, 40c, 45c, and 50c per bushel. No account is taken of the labor involved in the care of the cattle nor the fertilizer produced.

LOT 1, (Silage-fed.)

Price of corn	$ .35	$ .40	$ .45	$ .50
Average cost of keeping one cow for 140 days	6.873	7.263	7.679	8.095
Average cost of keeping one cow one month	1.470	1.556	1.646	1.735
Average cost of keeping one cow one day	.049	.052	.055	.058

LOT 2, (Shock corn-fed.)

Price of corn	$ .35	$ .40	$ .45	$ .50
Average cost of keeping one cow for 140 days	6.504	6.911	7.318	7.725
Average cost of keeping one cow one month	1.390	1.481	1.568	1.655
Average cost of keeping one cow one day	.046	.049	.052	.055

As no corn was fed in lot 3, no statement involving variation in price of corn is possible. The stover, straw, and clover hay used throughout the test are figured at the one price stated in the early pages of the bulletin without any reference to the change in price of corn.

In lot 3 the total average cost of keeping one cow for 140 days was $4.374, the average cost of keeping one cow for one month was $0.937, and the cost of keeping one cow for one day was $0.031.

By referring to the data given it will be seen that figuring corn at 35 cents per bushel, it cost practically 37 cents more to keep a cow on silage for 140 days than it did to keep one on shock corn, the same supplements being used in both instances. Since the silage-fed cows gained in this 140 days 150.10 pounds to the shock corn-fed cows, 106.19 pounds, it strikingly emphasizes the superiority of silage for this purpose.

CONCLUSIONS

1. It is assumed that the maintenance ration of a pregnant breeding cow should be regarded as the ration necessary to permit of sufficient gain in weight to account for the weight of the fœtus.

2. Breeding cows of the beef type may be wintered without grain provided they are given all of the corn stover and oat straw they will consume during the early part and supplemented with a small amount of clover hay during the latter part of the season. While the cows in lot 3 used in this test were so fed, and while they weighed 57.53 pounds more per head at the end than at the beginning of the test, this method is not recommended because the cows so fed lacked thrift at the end of the test.

3. The corn plant fed either in the form of shock corn or silage supplemented with a limited amount of clover hay proved satisfactory rations for wintering beef breeding cows.

4. Although the rations fed the cows receiving silage were smaller than those given the ones receiving shock corn, the gains were larger.

5. Before calving the general condition of the cows in lots 1 and 2, the lots receiving silage and shock corn respectively, was about the same; however, those cows in lot 1 which gave birth to calves during the experiment showed more thrift than did those of lot 2 under like conditions.

6. The amounts of feed consumed in terms of the acreages involved in producing these feeds were as follows: Lot 1 (silage fed), .9528 acre; lot 2 (shock corn), 1.0388 acres; lot 3 (corn stover), 1.1402 acres.

7. A comparison of the three rations in terms of relative efficiency of the acreages involved by taking into consideration the money value of the grain grown on the acreages involved but not fed the cows, is as follows: Lot 1, (silage), .3428 acre; lot 2, (shock corn), .3475; lot 3, (corn stover), .2046.

8. Figuring corn at 35 cents a bushel, clover hay $8.00, shock corn $5.59, corn stover $2.25 and oat straw $1.50 per ton, it cost 4.9 cents a day per head, or $1.47 a month or $6.873 for 140 days to maintain lot 1 (silage fed); $.046 a day or $1.390 a month or $6.504 for 140 days to maintain lot 2 (shock corn fed); $.031 a day or $.937 a month, or $4.374 for 140 days to maintain lot 3 (corn stover fed).

9. It cost 37 cents more to winter a cow fed silage for 140 days than it did one fed shock corn. However, the cows fed silage, lot 1, gained 150.10 pounds while those in lot 2 gained but 106.19.

10. In this test it took approximately twice as much feed to maintain a cow when suckling a calf as it did during her pregnancy.

11. The average daily cost of keeping the cows that calved in lot 1 was 7.56 cents while the average in lot 2 was 6.84 cents. Before calving the average daily cost of keeping a cow in these lots was 5.8 cents and 5.5 cents, respectively.

12. The data with reference to the relative efficiency of rations fed lots 1 and 2 for the maintenance of cows and gains on calves after calving, are not based on a sufficient number of animals to eliminate individuality, hence should not be regarded as conclusive.

13. The cows in lot 1, (silage-fed) ate less oat straw than did either of the other two lots which may be accounted for by the fact that they were eating the whole of the corn plant. That is to say there was practically no waste.

14. Corn plant fed in the form of silage is more palatable than if fed in the form of shock corn, which may be the cause of its being more efficient for the maintenance of beef breeding cows.

15. The amount of feed required for maintenance is apparently less than that given in the German standards.

16. The experimental data presented will materially aid in a study of the practicability of raising calves and producing our own feeding cattle in the corn belt.

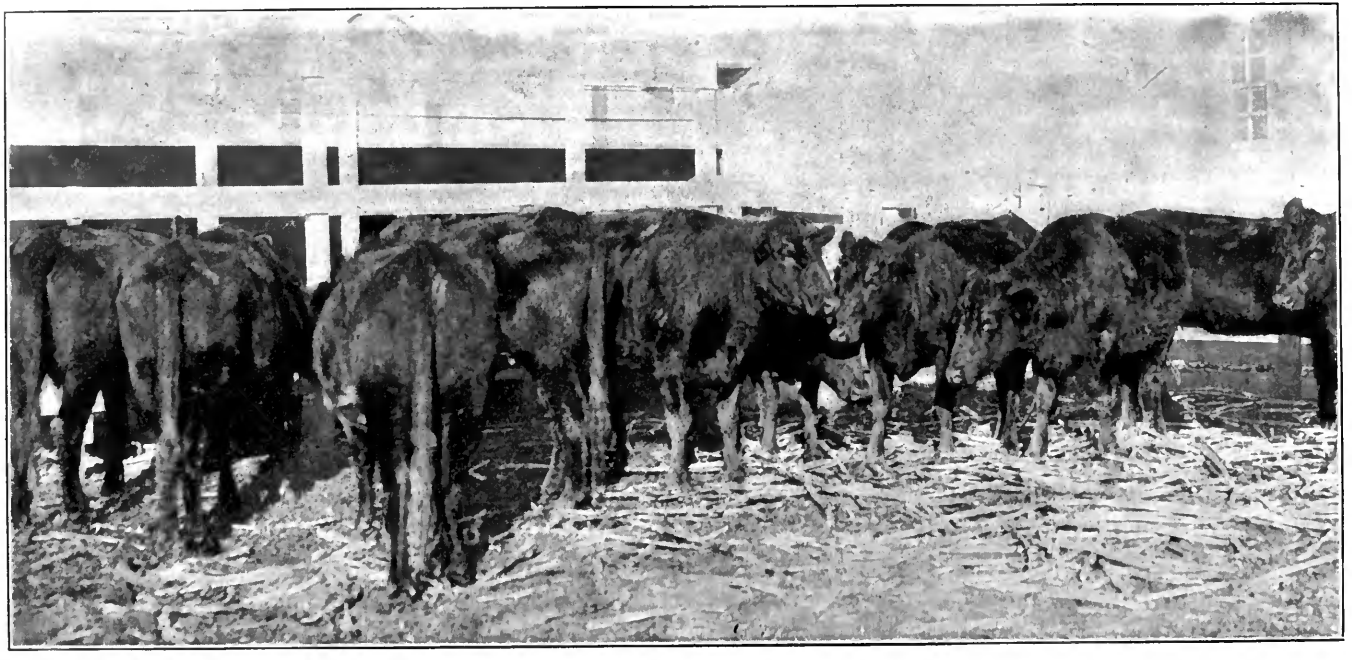

PLATE 1. LOT 1.—AT THE BEGINNING OF THE TEST. ILLUSTRATING THE QUALITY AND CONDITION OF THE CATTLE USED.

PLATE 2. LOT 1.—AS THE COWS IN THIS LOT APPEARED AT THE END OF THE TEST.

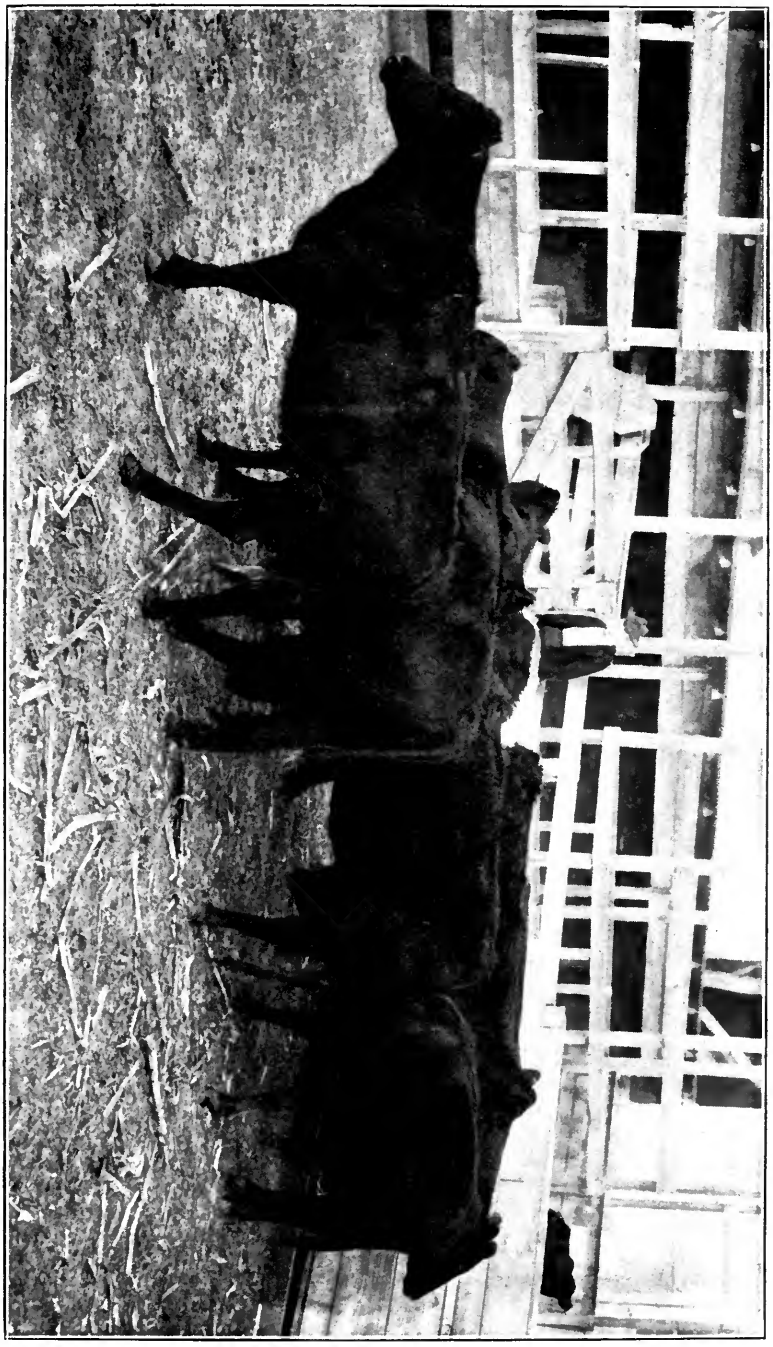

PLATE 3. LOT 2.—AS THE COWS IN THIS LOT APPEARED AT THE END OF THE TEST.

PLATE 4. LOT 3.—AS THE COWS IN THIS LOT APPEARED AT THE END OF THE TEST.