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THE RELATIVE VALUE OF REGULAR
CORN SILAGE, GRAINLESS-CORN
SILAGE AND EAR-CORN SILAGE
IN THE DAIRY RATION

Thesis for the Degree of M. S.
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Kenneth M. Dunn

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THESIS

This is to certify that the
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"The Relative Value of Regular Corn
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Kenneth M. Dunn

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AND EAR-CORN SILAGE IN THE DAIRY RATION**

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A THESIS

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TABLE OF CONTENTS

INTRODUCTION

REVIEW OF LITERATURE

Comparative Feeding Value of Corn Silage and Hay in Livestock Rations	1
Varieties of Corn and Feeding Value of Silage	3
Early vs. late maturing varieties for milk production	3
Hybrid Corn for Silage	5
Feeding Value of Grainless-Corn Silage	6
Feeding Value of Ear-Corn Silage	9
Losses During Storage and Feeding of Corn Silage	9
Storage losses	9
Feeding losses	10
Digestion Trials with Corn Silage	11
Factors affecting digestibility	11
Results of digestion trial	12
Summary of Review of Literature	14

OBJECT

EXPERIMENTAL PROCEDURE

Methods of Calculating Yield of Corn Silage and Ear to Stalk Ratio	15
Care and Storage of Ear-Corn	17
Animals Used for Milk Production Studies	17
Animals Used for Digestion Trials	17
Chemical Composition of Feeds Fed	17

Digestibility of Feeds Fed	18
Feeding Trial Methods	20
RESULTS	22
Relative Feeding Value of the Total Digestible Nutrients in Clover Hay, Grainless-Corn Silage and Ground Corn Grain for Milk Production	22
Relative Feeding Value of Regular Corn Silage and Grainless- Corn Silage Plus Corn-and-Cob Meal	22
Relative Feeding Value of the Total Digestible Nutrients in Clover Hay, Ear-Corn Silage and Corn Grain for Milk Production	23
DISCUSSION OF RESULTS	34
SUMMARY	37
LITERATURE CITED	39
APPENDIX	44

INTRODUCTION

The term "silo" was used by the Greeks as a place for storage of dry grains during years of plenty for use during years of famine. The use of the silo was taken from Greece into Spain and later passed into France. The early silos used for storage of grain were built above ground and filled from the top. The grain was carried up steps and dumped in the top and removed from doors at the bottom of the silo. The silos were sealed with grass and straw to prevent surface spoilage of the grain. The use of silos for storage of green material was demonstrated in Germany and Hungary when hay was used for ensiling. This silage was made in the pit type silo and was described as "sour" or "brown" hay (1).

Johnston (2) in 1843 was the first worker to give a detailed description of the process of making silage from green forage.

The building of the first tower silo in the United States is credited to Fred L. Hatch of McHenry County, Illinois in 1873 (3). In 1882 there were 92 silos in the United States and since that time the advancement of the silo has been very rapid. By 1920 the use of the silo and feeding of silage had become an accepted practice. Many green crops have been used for making of silage, such as corn, alfalfa, grasses, potatoes, sugar beets and tops, soybeans, sunflowers, sorghum and weeds. Of the above mentioned, corn is the most common crop used for silage in the United States.

The United States Department of Agriculture (4) reported that in 1944 the United States harvested 4,661,000 acres of corn for silage which produced 36,294,000 tons of silage. The same year Michigan harvested 288,000 acres of corn for silage and produced 2,014,000 tons of silage.

Many Michigan Farmers harvest their corn crop with a corn picker and leave the stalks in the field. The common belief is that the stalks have very little feeding value and are not worth harvesting. The average yield of corn silage in Michigan is estimated at 7 tons per acre. If the ears were removed and the stalks ensiled as stover silage, the average yield of stalk silage would be 4.2 tons per acre. One acre of this silage would produce 1,140 pounds of total digestible nutrients which would be equal to 2.2 tons of alfalfa hay.

Another farm problem in Michigan is the care and storage of frosted corn grain. Usually the silo is not large enough to hold the entire corn crop. There is a possibility, however, that immature ears may be conserved in the silo as ear-corn silage.

It is the purpose of this investigation to determine the relative feeding value of the total digestible nutrients in clover hay and grainless-corn silage for milk production; also, the relative feeding value of corn grain in the silo and ground corn-and-cob meal, and the relative feeding value of the total digestible nutrients in clover hay, ear-corn silage and corn-and-cob meal.

REVIEW OF LITERATURE

Comparative Feeding Value of Corn Silage and Hay in Livestock Rations

Early experiments with corn silage, that followed the introduction of the silo in the United States, indicated an increase in milk production through the use of corn silage in the dairy ration. Bartlett (5) reported in 1889 that a pound of digestible matter from corn silage produced slightly more rapid growth in dairy heifers than a pound of digestible matter from timothy hay. The previous data which were collected from a limited number of feeding trials contributed a great deal toward the advancement of silage making in this country. Christi (6 & 7) in 1916-17 stated that corn silage was the most economical feed for both dairy and beef cattle. Haecker (8) reported an increase in milk production when 14 pounds of timothy hay replaced 55 pounds of silage. A basal ration was fed containing 7 pounds of wheat bran, 4 pounds of corn, and 3 pounds of oil meal. The animals on the hay ration gained weight during the experiment.

In 1925 Fairchild and Wilbur (9) using dairy cows, investigated the value of corn silage using 28-day periods. A change from silage to a non-silage ration caused a decrease of 26 pounds of milk per cow over a 28-day feeding period. When silage was added to the ration there was a 16 pound increase in milk production for a 28-day period. The animals were fed grain with both rations. Animals on the silage ration maintained their body weight much better than the animals on a nonsilage ration. These investigators concluded that the best winter ration must include a succulent feed.

Carroll (10) in 1924 compared alfalfa hay with corn silage and found that one ton of alfalfa hay was equal to 2.5 to 3.0 tons of corn silage for

milk production. Converse (11) in 1928 reported that a small amount of corn silage added to the ration of good alfalfa hay and grain mixture gave no increase in milk production. The experiment was designed to show the value of silage in an experimental ration and was not intended to show the replacement value of corn silage and alfalfa hay.

A great deal of the early work showed results in favor of a corn silage ration; however, many workers have shown very little, if any, favorable results for the use of corn silage in the ration. Snyder (12) reported a 2 percent greater milk production on a nonsilage ration. Williams and Cunningham (13) compared a ration containing 30 pounds of alfalfa hay with a ration containing 20 pounds of hay and 35 pounds of corn silage. The cows fed hay alone produced 2 per cent more milk than the cows fed hay and corn silage ration. No grain was used in this experiment. Foster (14) and co-workers reported an increase in milk production when alfalfa hay replaced corn silage in the ration, but there was a slight increase in total digestible nutrients when hay was fed.

Stadler (15) et al. reported that for maximum milk production succulent roughage in some form is indispensable. The succulent feeds were more palatable and seemed to act as a laxative in keeping the digestive tract in order. These workers reported that while silage was an excellent feed for dairy cattle it is not a complete ration within itself and must be supplemented with dry roughage and grain. Beef cattle, sheep, and horses showed favorable results when fed a ration containing some silage. Zeasman (16) reported that corn silage is the cheapest winter feed available, and that winter milk production can be kept at a higher level through the use of a silo.

White and Pratt (17) compared a heavy corn silage ration with a light corn silage ration. During three trials one group of cows received

5 pounds of silage per 100 pounds of body weight. Another group received 1.5 pounds of silage per 100 pounds of body weight. The animals were fed hay ad libitum. The animals in the light silage group ate more hay and maintained their milk flow and body weight as well as the animals on the heavy silage ration

Gupta (18) reported that in India, due to the high cost of making silage, a low level of silage feeding was advisable.

In an experiment with beef cattle and beef calves McCampbell and Winchester (19) reported that beef cattle fattened on high quality corn silage dressed out as high a percentage as did cattle on a corn-grain ration. Beef calves when fed corn silage and cottonseed meal made 44 percent greater daily growth than did calves fed alfalfa hay rations.

Jacobs and Duncan (20) concluded that the use of the silo was the most economical method of preserving the corn crop for fattening cattle. Net returns per acre from feeding silage were three times greater than from feeding shock corn or ear corn.

Varieties of Corn and Feeding Value of Silage

Early vs. late maturing varieties for milk production

Jordan (21) in 1894 made some of the earliest studies on the comparative feeding value of silage made from various varieties of corn. During a five-year period two varieties of corn were studied, Maine field corn and a southern variety of corn. In 7 trials over the five-year period the Maine field corn produced a yield of 4,224 pounds of dry matter per acre, while the southern variety averaged 5,036 pounds of dry matter per acre. The Maine variety produced 3,076 pounds while the southern variety produced 3,251 pounds of digestible dry matter per acre. Jordan concluded that the

early maturing Maine variety was the most economical variety to raise for silage in Maine, because the pounds of digestible matter per acre were about the same with less green material to handle in case of the ear-corn variety.

White et al. (22) studied the comparative yields of milk per acre of various varieties of corn for silage. Bureka, Leaming and Pride of the North were studied. These workers concluded that Pride of the North, an early maturing corn, produced just about as much milk per acre as the larger growing late maturing varieties with less green material to handle. Slate and co-workers (23) repeated the above work and concluded that 0.77 acre of medium maturing and 0.82 acre of late maturing silage would be required to produce the same amount of milk as one acre of early maturing silage. The amount of extra labor and equipment would have to be calculated in order to compare the economical values of the various varieties.

Odland and Knoblanch (24) reported that late maturing varieties of corn produced larger quantities of green material, but the dry matter yield was about equal to medium maturing varieties. Early maturing corn did not produce enough dry matter per acre to warrant its use for silage. The author concluded that the best corn to use for corn silage was one that will, on the average, reach the dough stage of maturity by silage cutting time. The following table was taken from Odland's report.

Average Yield of Nutrients per Acre of Varieties
of Corn Harvested for Silage 1931-1934

Variety	Yield in pounds per acre					
	: Dry	: Matter	: Ash	: Protein	: Fat	: Fiber
	: N-free	: extract				
Bureka	7,607	445	437	143	2,394	4,488
West Branch Sweepstakes	7,372	370	446	166	1,804	4,586
Burr Leaming	7,308	410	375	125	1,932	4,466
Lancaster Sure Crop	7,286	386	423	149	1,952	4,376
Canada Leaming	6,987	384	445	157	1,623	4,378
Rhode Island White Flint	6,807	432	448	162	1,483	4,282
Golden Nugget	6,631	383	382	143	1,682	4,041
Cornell 11	6,337	293	293	153	1,443	4,055

Nevens (25) concluded that early maturing grain varieties were superior to late maturing varieties for silage purposes. The late maturing varieties yielded a greater weight of silage corn per acre than the grain varieties but yield of dry matter per acre was highest for the grain varieties. These data were true for the soils, growing conditions, and corn varieties used in the experiment but might not hold true in other locations or when using other corn varieties.

Hybrid corn for silage

With the rapid increase in amount of hybrid corn planted for both silage and grain, the question arises as to the feeding value and yield of silage per acre of the hybrid varieties. Nevens and associates (26) compared hybrid corn varieties with open-pollinated corn. In these investiga-

tions hybrid varieties out-yielded open-pollinated varieties in both pounds of dry matter per acre and digestible matter per acre. The hybrid silage was of better quality with greater nutritive value. According to Nevens the best quality of silage should contain 30 percent dry matter. Roberts and Jones (27) reported that western hybrid varieties out-yielded open-pollinated Connecticut varieties and southern types grown for corn silage in that state.

Wisconsin workers (28,29,30) report the hybrid and open-pollinated varieties of corn silage showed no difference in chemical analyses. The hybrid varieties tended to out-yield open-pollinated types, and hybrids that yielded the most corn per acre tended to yield the most silage. The hybrid varieties stood up better for cutting than did the open-pollinated varieties.

Feeding Value of Grainless-Corn Silage

A limited amount of information is available on the feeding value of grainless or stalk silage. Eekles (31) reported that one ton of good corn silage contained 5 bushels of corn. Corn and cob compose about 40 percent of the silage, leaving 60 percent stalks. One ton of regular silage was equal to 2,700 pounds of grainless silage. To winter a 1,000 pound cow (dry) without loss of weight would require 35 pounds of regular silage and 2 pounds of alfalfa hay or 0.75 pound of linseed meal per day. It would require 50 pounds of grainless silage with 4 pounds of alfalfa hay and 4.5 pounds of linseed meal per day to replace the regular silage ration. The author concluded that the feeding of grainless-corn silage could be justified when used as a maintenance ration but not for production of beef or milk.

Jacobs and Duncanson (32) made a very complete study of comparative feeding value of regular corn silage and grainless-corn silage for beef production. The grainless silage was made by snapping the ears from the stalks in the field

and letting the ears dry on the ground until ready to be husked and stored in a crib. The stalks were ensiled as grainless silage. There was a decrease in feeding value of the ear corn due to weathering and heating. The following table gives comparative yields per acre of regular silage and grainless silage.

Yield of Silage and Corn per Acre

Year	: : Silage :	: : Acreage : in silo	:Yield per: : acre from: : silo tons	:Yield of: : corn per: : acre bu.	:Bu. of : corn per: : T. silage	:Percentage : yield of : silage
First (one silo di- vided	Normal	3.15	7.7	31.0	4.0	100
	Grain- less	4.45	5.5	31.0	-	71
Second	Normal	9.3	6.2	38.0	6.2	100
	Grain- less	14.0(est.)	4.0(est.)	-	-	63
Third	Normal	7.73	7.5	52.2	7.0	100
	Grain- less	10.51	4.7	52.2	-	63

Jacobs et al. (32) also reported that steers fed grainless-corn silage gained 75.9 percent as fast as those fed normal corn silage. The steers fed normal silage showed better market finish and sold for one dollar per hundredweight more than the steers fed grainless silage. These investigators concluded that the making of grainless silage could be of value only when corn grain was needed for other farm animals and the grainless silage was to be fed as a maintenance ration or where a premium was not paid for highly finished steers.

Livesay and co-workers (33) studied the relative feeding value of the dry matter from regular silage, grainless silage and ear-corn silage for yearling steers. The steers made the highest gains per pound of dry matter for

ear-corn silage followed by regular corn silage, while grainless corn silage gave the poorest gains. The workers reported that 34.4 percent of the green weight, 46.2 percent of the dry matter, and 52.7 percent of the total digestible nutrients were contained in the ears.

Rusk and Snapp (34) conducted test to compare normal corn silage and green stover silage for wintering beef calves that were to be on pasture the following summer. Two lots of 24 calves each were selected that were uniform in age, size, and weight. In addition each calf received 1 pound of cottonseed meal and 2 pounds of mixed hay a day. The stover silage was inferior to normal corn silage for wintering calves. Although the green stover silage was fresh and palatable and was eaten by the calves in generous quantity it was not nutritious enough for the calves to grow at a normal rate. The calves fed the regular corn silage gained 154.5 pounds during the 133-day feeding period while the green stover silage fed calves gained but 86.9 pounds. The green stover silage fed calves were thinner in flesh at the close of the test than they were when put in the feed lot the previous fall. On the other hand, the normal silage fed steers improved in condition as the feeding period progressed.

Hamilton and Rusk (35) reported that stover silage has about 85 percent as much total digestible nutrients as the same weight of regular corn silage. However, experimental feeding trials indicate that in practical feeding stover silage is only about two-thirds as valuable as normal silage. The authors reported less loss of material from exposure to rain and wind, an increased palatability and a much greater ultimate utilization of the nutrients of the corn crop as stover silage than when the stover is fed from the shock or as pastured in the field. The ensiling of corn stover offers a method of utilizing the byproducts of corn culture in an effective

and economical way without limiting the utilization of the main product, the grain.

Feeding Value of Ear-Corn Silage

Rusk and Snapp (36) reported that green corn fed as ear-corn silage was as good as sound, well-matured corn fed as corn-and-cob meal, both from the standpoint of the gains made by each steer and the total gains made from an acre of corn. The steers fed ear-corn silage sold for a higher price, thereby paying a considerably more for each bushel of corn fed.

Livesay et al. (33) studied the digestibility of ear-corn silage, using Hereford yearling steers. He reported a total digestible nutrient value of 32.2 for the ear-corn silage as compared to 15.1 for stover silage.

Losses during Storage and Feeding

Storage Losses

Turner (37) states that the dry matter loss in corn silage during storage was 16 percent, while with corn stover the loss was 20 percent.

Perkins (38) reported a loss of protein during the storage of corn silage. When no juice was lost from the silo there was a slight increase in nitrogen. The protein loss from the kernel was found in the juice not as true protein but as products of protein hydrolysis.

Ragsdale and Turner (39) reported nutrient losses from 54 silos and 16 shocks of corn over a period of four years. Loss of nutrients in the silos averaged as follows: dry matter, 7.59 percent; protein, 5.44 percent; ether extract, a gain of 18.04 percent; ash, a gain of 5.94 percent; crude fiber, a loss of 1.95 percent, and nitrogen free-extract a loss of 10.29 percent. Nutrient average losses of the corn shocks in the field were as follows: dry matter, 15.12 percent; protein, 0.34 percent; fat, a gain of 3.82

percent, and nitrogen free-extract, a loss of 22.51 percent. The loss of nitrogen free-extract and dry matter was about twice as great for the field cured fodder as for the corn stored as corn silage.

Eckles (31) found that the loss in feeding value was 6 to 10 percent in corn silage and 20 to 25 percent in corn fodder shocked in the field. There was also a loss of 2 percent for corn grain stored in a crib.

The total loss in weight of corn silage while in storage was reported by Ragsdale and Turner (40). Two silos were filled with Leaming corn October 8. One was weighed out February 18 and the other May 9. The two silos lost 4.84 percent and 7.4 percent respectively of weight or an average of 6.08 percent. Two other silos were filled with corn stover from Leaming corn on October 2. One was weighed out February 18 and the other June 2. The two silos lost an average of 4.38 percent during storage.

Stadler et al. (41) reported a dry matter loss of 7.59 percent in corn silage and a 15.12 percent in corn fodder.

Storage losses in corn silage have been reported by Shaw and associates (42). Dry matter loss was 10 percent, crude fiber 6.34 percent, and some loss in total nitrogen. There was a slight increase in ether extract.

Ohio workers (43) found that the dry matter content of corn silage in the early milk stage was only 16.7 percent and the loss in weight due to seepage would easily amount to 40 or 50 percent of the green weight. Wilting tends to reduce the loss of green weight in the silo, while pressure as obtained at the bottom of the silo increased the loss of juice. Cutting corn fine resulted in a more compact silage which increased the loss of juice though the more mature corn kept better when finely cut.

Feeding losses

Becker and Galup (44) reported that 8.47 percent by weight of the

corn kernels of corn silage were voided in the feces when the cows were fed a ration of 30 pounds of corn silage and 10 pounds of alfalfa hay per 1,000 pounds live weight. Of the whole kernels in the silage only 4.36 percent were recovered as whole kernels from the feces. Analyses of the corn kernels of the silage that passed through the cow's digestive tract showed slight losses of protein, ether extract, and ash. The kernels voided in the feces were calculated to contain 5.22 percent of the digestive crude protein and 5.26 percent of the total digestible nutrients in the corn silage.

Digestion Trials with Corn Silage

Factors affecting digestibility

Jordan and Janters (45) in 1897 made a study of the effect of the plane of nutrition and the digestibility of the silage. In their work they fed a ration containing corn silage at two different levels to sheep. The results showed that the higher levels of nutrition the digestibilities were lower than at the lower levels.

Watson et al. (46) made a very complete study of the effect of the plane of nutrition on digestibility of corn silage, using steers. Their first experiment was designed to study digestibility of corn silage as a sole ration at five levels of silage intake, 8 kilos, 14 kilos, 20 kilos, 26 kilos, and ad libitum per animal per day. As the plane of nutrition increased there was a progressive decrease in the digestibility of the dry matter, organic matter, crude fiber, and nitrogen free-extract. The digestibility of nitrogen and ether extract tended to increase as the plane of nutrition increased. There was a loss of from 6 to 8 percent in digestible organic matter when on the higher plane of nutrition. A second trial was set up to study the effect of plane of nutrition on digestibility when the

plane of nutrition of both alfalfa hay and corn silage was increased. The results showed slight drop in digestibility values for animal on the higher plane of nutrition. Watson et al. (47) reported in earlier work that plane of nutrition had no effect on the digestibility of alfalfa hay. The slight drop in digestibility with increasing plane of nutrition was thought to be the results of the silage with no drop resulting from the hay. In the third experiment, increasing quantities of corn silage were added to a basal ration of 4.0 kilograms of hay and the digestibility of the resulting rations determined. It was determined that in the case of dry matter, organic matter, crude fiber, and nitrogen-free extract, the digestibility of corn silage decreased as the plane of nutrition increased. These data indicate that when the plane of nutrition is increased by feeding corn silage there will be a decrease in digestibility of the nutrients.

Christensen and Hepper (48) reported that a pound of corn silage produced less digestible crude protein but a much higher yield of total digestible nutrients than did sweet clover silage on the dry matter basis. Corn silage was about equal to sunflower silage in digestible crude protein but much higher in total digestible nutrients on a dry matter basis.

Results of digestion trials

The following table gives the coefficients of digestibility of corn silage as reported in the literature.

Digestion Coefficients for Corn Silage

Type of Silage	: :Protein: : %	: : Fat : %	: : Fiber : %	:N-free :extract: : %	:Organic: :matter : %	:Total dig.: :nutrients : %	:No. :tri- :als
Corn, dent, well matured All analyses (49)	54.0	74.0	66.0	69.0	-	18.7	85
Corn, dent, immature, be- fore dough stage (49)	52.0	73.0	67.0	66.0	-	13.3	41
Regular corn silage, low plane of nutrition (46)	57.5	64.5	49.7	71.6	62.8	-	6
Regular corn silage, medium plane of nutrition (46)	58.1	60.5	48.7	71.9	62.5	-	6
Regular corn silage, high plane of nutrition (46)	60.3	66.2	48.6	71.1	62.3	-	6
Regular corn silage, aver- age of all analyses (46)	58.6	63.7	49.0	71.5	62.8	-	18
Corn, all experiments (50)	45.0	70.0	64.0	69.0	67.0	15.2	119
Corn, milk stage (50)	44.0	76.0	71.0	72.0	70.0	14.9	4
Corn, mature (50)	66.0	82.0	74.0	72.0	73.0	16.7	2
Regular corn silage (Sheep) (48)	69.1	82.0	70.4	79.6	76.0	17.8	3
Regular corn silage (Steers) (48)	49.0	80.8	61.2	74.6	68.9	20.4	29
Corn stover silage (ears removed) (49)	56.0	66.0	67.0	67.0	-	13.6	8
Corn stover silage (ears removed) (50)	38.0	60.0	67.0	56.0	59.0	14.6	-
Ear-corn silage (49)	-	-	-	-	-	36.3	5
Ear-corn silage (50)	54.0	80.0	34.0	80.0	72.0	32.1	8

Summary of Review of Literature

Corn silage is the cheapest succulent feed available for dairy and beef production. An acre of corn fed as silage will produce more feed nutrients per acre than by any other method of curing and feeding. Corn silage is not necessary in the dairy ration for maximum milk production. The feeding of corn silage in the ration of dairy and beef cattle has increased feed consumption and general well being of the animals.

Experiments have shown that 250 to 300 pounds of good quality corn silage will replace 100 pounds of good quality alfalfa hay in feeding value for milk production. In experiments with beef cattle corn silage has shown a feeding value of 50 percent of alfalfa hay.

Hybrid corns produce silage of equal feeding value to open-pollinated varieties. The yield of silage per acre has been greater for hybrid varieties than for most open-pollinated varieties.

Corn stover silage has a lower feeding value per pound than regular corn silage. The corn and cob composes about 40 percent of the entire corn plant. One ton of regular corn silage was equal in feeding value to 2,700 pounds of corn stover silage for dairy cattle. In experiments with steers corn stover silage was 75.9 percent as efficient for beef production as regular corn silage.

Ear-corn silage was about equal to corn-and-cob meal on a pound of dry matter basis for beef cattle and dairy cattle. Ear-corn silage has a total digestible nutrient value of 32.2 percent as compared to 15.1 percent for stover silage. Soft corn, resulting from early frost, may be stored as ear-corn silage.

OBJECT

The objectives of this investigation were as follows:

- a. To study the relative feeding value of the total digestible nutrients in clover hay, grainless-corn silage and corn grain for milk production.
- b. To study the relative feeding value of regular corn silage and grainless-corn silage plus corn-and-cob meal for milk production.
- c. To study the relative feeding value of the total digestible nutrients in clover hay, ear-corn silage and corn-and-cob meal for milk production.

EXPERIMENTAL PROCEDURE

Methods of Calculating Yield of Corn Silage and Ear to Stalk Ratio

The yield of corn silage was calculated in the field by a method advised by Dexter (51) whereby one thousandth of an acre of corn was cut from ten different areas of the field by a definite plan agreed upon before starting the sampling. Samples were taken diagonally across the field cutting 12 feet 6 inches out of every twentieth row. The rows were 42 inches apart; this gave 1/100 of an acre. Weights were made of the entire corn plant sampled and the yield of silage per acre calculated. The corn was husked from the stalks and the yield of stalks and yield of ears were calculated per acre and the ratio of stalks to ears determined. Smaller samples of stalks and ears were taken for moisture determinations. The samples were placed in a drying rack in the Michigan State College Experimental Farm Crops barn. Table 1

shows the yields of silage, ear corn and stalks, and the ear stalk ratio of the corn used in this experiment.

Table 1. Yield of Silage per Acre

Green basis (lbs.)				
Total	Ears	Stalks	% Ears	% Stalks
10,510	3,660	6,850	34.3	65.2
Dry matter basis (lbs.)				
3,094	1,430	1,664	46.2	53.8

Ear-stalk Ratio - 1 lb. of silage contains .348 lbs.
ears, wet basis.

It was the plan of the experiment to put part of the corn in the silo as regular corn silage and the rest in as grainless silage. This was done by husking the corn from the stalks of alternate strips and storing the ear corn which will be discussed later. Part of the grainless silage was made by snapping the ears from the stalks and throwing them into a wagon for ensiling as ear-corn silage.

The corn was cut with a corn binder, hauled to the silo and run through a conventional silo filler set to cut 1/2 inch lengths. One silo was used for the regular silage and another for the stalk silage. The ear-corn silage made from the snapped ears was run through the filler and placed in the bottom of the silo which was later used to store the grainless silage.

Alternate strips of corn were used for the regular silage. The corn was cut and put in the silo a day ahead of the grainless silage. This made it possible to run wagons along the strips for removal of the husked and snapped corn.

Care and Storage of Ear Corn

The corn used in this phase of the experiment was of the King Cross variety and in the early dent stage. It is doubtful if the corn would have kept under crib storage. In view of this fact the corn was placed in a drier until the moisture content was reduced to about 10 percent. The corn was then bagged and stored in a feed storage room. The corn grain was not of very good quality because of its immaturity.

Animals Used for Milk Production Studies

The animals used for the milk production trials were selected from the Michigan State College experimental herd and included representatives of the Holstein and the Brown Swiss breeds. Animals were selected that had been milking for at least two months and had leveled off to a normal milk production. All animals were put on clover hay alone for eighteen days before the trials started.

Animals Used in Digestion Trials

The animals used in digestion trials were selected from the Michigan State College experimental herd. Four Holstein heifers approximately twenty months of age and weighing about 900 pounds each were used.

Chemical Composition of Feeds Fed

Samples of all feeds fed were taken during the feeding trials and chemical analyses were made by the Michigan State College Agricultural Chemistry Department. The silage samples were taken once a week and the results have been averaged and reported in Table 2 along with clover hay and corn-and-cob meal. The clover hay varied in quality from 100 percent clover to a mix-

ture of clover and grass. Therefore, samples were taken from several bales in different areas of the barn. These samples were run through a hammer mill and the chopped hay well mixed before the samples were taken for analyses. Silage samples were taken from the silo by digging down at least one foot under the surface before sampling, thus preventing the sampling of silage that had been exposed to the air.

Table 2. Chemical Analyses of Feeds Fed

Feed	Moisture %	Crude Fiber %	Ash %	Nitrogen %	Ether Extract %	N-free Extract %	P %	Ca %
Regular corn silage	67.79	6.54	1.68	0.513	0.99	19.80	.078	.119
Grainless-corn silage	69.59	8.30	2.33	.468	1.01	15.64	.051	.235
Ear-corn silage	63.92	4.55	0.76	.552	1.20	26.12	.100	.009
Glover hay	11.69	29.32	5.15	1.59	1.44	42.46	.142	.785
Corn-and-cob meal	13.55	7.42	1.50	1.44	2.19	66.34	.222	.023

Digestibility of Feeds Fed

The digestion trials included determinations of digestibility of the various feeds fed. The trials were 10 days in length with a preliminary period of 7 days. The purpose of the preliminary period was to allow the animals to become used to the digestion stalls and to determine the amount of feed the animals would clean up, thus preventing weigh-backs during the period of the digestion trials.

The digestion stalls were the mechanical type with an endless belt running under the stall removing the feces and depositing them in a basket in the basement. The urine was separated by a trough running along the edge

of the bait. The weight of the animal, weight of feces and feed consumption were recorded each morning. Two percent of the feces were taken each day and composited for a ten-day period for chemical analyses. The feces were preserved with concentrated hydrochloric acid.

Table 3 reports digestibility of the clover hay fed in the experiments while Tables 4 and 5 report the digestibility of the grainless-corn silage and the regular corn silage.

Table 3. Digestion Trials with Clover Hay

Animal: No.	Coefficient of Digestibility						Digestible Protein	Total Digestible Nutrients
	Nitrogen	Fat	Fiber	Extract	Dry Matter			
	%	%	%	%	%	%	%	%
A 54	49.19	54.49	51.12	61.34	55.80		4.89	47.69
A 55	46.79	49.35	53.23	60.64	54.44		4.65	47.60
Average	47.99	51.92	52.17	60.99	55.12		4.77	47.64

Table 4. Digestion Trials with Grainless-Corn Silage

Animal: No.	Coefficient of Digestibility						Digestible Protein	Total Digestible Nutrients
	Nitrogen	Fat	Fiber	Extract	Dry Matter			
	%	%	%	%	%	%	%	%
A 54	54.74	68.71	72.36	71.25	67.95		1.61	19.59
A 55	53.12	67.69	68.32	70.87	66.56		1.56	19.45
476	51.97	68.72	72.21	70.84	66.84		1.52	19.43
477	51.30	65.06	67.90	71.13	66.25		1.52	19.99
Average	52.93	67.54	70.19	71.04	66.85		1.55	19.62

Table 5. Digestion Trials with Regular Corn Silage

Animal: No.	Coefficient of Digestibility						Total Digestible Nutrients
	Nitrogen:	Fat	Fiber	N-free Extract:	Dry Matter:	Digestible Protein	
	%	%	%	%	%	%	%
A 54	50.36	71.51	59.56	71.72	65.49	1.62	20.41
A 55	51.25	72.66	66.69	75.01	68.91	1.65	21.57
476	53.07	74.46	67.55	76.09	70.05	1.70	21.92
477	51.80	62.86	68.66	75.23	69.36	1.66	21.66
Average	51.62	70.32	65.62	74.51	68.45	1.66	21.39

Feeding Trial Methods

The method used in this investigation for determining relative feeding values of total digestible nutrients of various feeds was designed by Huffman (52). The animals were depleted on hay alone after freshening. This is considered as the point where the animal levels off in milk production. A certain amount of total digestible nutrients are replaced by the same amount of total digestible nutrients in the feed or feeds to be tested. Clover hay of the 1945 crop was used in this work. The hay which was of fair quality was cut in medium to late bloom stage. The corn-and-cob meal used was the corn husked from the stalks in the field.

Daily milk and feed records were kept for all cows and three-day composite milk samples were saved for butterfat determinations. All milk records were recorded as three-day averages of four percent fat corrected milk. The animals were milked three times a day. They were turned into an exercise lot daily which was free from grass or any feed material. The animals had free access to water bowls. Salt was fed to all animals at the rate of 50 grams per day.

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Eight cows were used to study the relative feeding value of the total digestible nutrients in clover hay, grainless-corn silage, and ground corn grain for milk production. The animals were placed on 35 pounds of clover hay per day for a 15-day period. Twenty pounds of clover hay were then replaced by 55 pounds of grainless-corn silage for an 18-day period. The 20 pounds of hay and 55 pounds of grainless-corn silage each contained 10 pounds of total digestible nutrients according to Morrison (49). At the end of this period the grainless-corn silage was replaced with corn grain on a total digestible nutrient basis and an additional 18-day feeding trial was run.

Seven depleted cows were used to study the relative feeding value of regular corn silage and grainless-corn silage plus corn-and-cob meal for milk production. Feed replacements were made using the results of the ear to stalk ratio determined from field calculations. The animals were placed on 50 pounds of regular corn silage and 10 pounds of clover hay for 18 days. The regular silage was then replaced with 32.5 pounds of grainless-corn silage plus 7.5 pounds of corn-and-cob meal. The cows were left on this ration for another 18-day feeding trial at which time the ration was changed back to 50 pounds of regular silage and 10 pounds of clover hay.

At the conclusion of the above trials, six animals were selected to study the value of ear-corn silage and ground corn-and-cob meal as supplements to clover hay. Replacements were made on the total digestible nutrient basis as described previously. The feeding period was reduced to 15 days because of a shortage of hay and ear-corn silage. The animals were fed 35 pounds of clover hay for a period of 15 days at which time 25 pounds of ear-corn silage replaced 20 pounds of clover hay. At the end of 15 days on this ration the ear-corn silage was replaced by 9 pounds of corn-and-cob meal.

RESULTS

Relative Feeding Value of the Total Digestible Nutrients in Clover Hay, Grainless-Corn Silage and Ground Corn Grain for Milk Production

The results obtained from replacing part of the clover hay ration with grainless-corn silage or ground corn grain on a total digestible nutrient basis are presented in figure 1. The replacing of clover hay with grainless corn silage resulted in an increase in 4 percent fat-corrected milk. This increase reached its peak during the second three-day period with an average increase of 1.1 pounds per day. The replacing of grainless silage with ground corn grain resulted in a marked increase in 4 percent fat-corrected milk. This increase reached its peak during the fifth three-day period with the average increase of 2.5 pounds per day. Milk production declined slightly during the last six days of the trial which was probably due to the fact that several cows were nearing the end of their lactation. The marked increase in production, therefore, appears very significant.

Table 6 shows the individual average daily milk production, body weight, total digestible nutrients received and required and feeds fed for each experimental period. Table 7 shows the average daily (by three-day periods) body weight, milk production and feed consumption of animal A 37.

Relative Value of Regular Corn Silage and Grainless-Corn Silage Plus Corn-and-Cob Meal for Milk Production

The results obtained from replacing regular corn silage with grainless corn silage plus corn-and-cob meal are presented in figure 2. The replacing of regular corn silage with grainless-corn silage plus corn-and-cob

meal resulted in no significant change in milk production. All animals continued their normal decline in milk production, resulting from increased duration of lactation. The same results were again noted when the grainless-corn silage plus corn-and-cob meal were replaced with regular corn silage.

Table 8 shows the individual average milk production, body weight, total digestible nutrients received and required and feeds fed for each experimental period. It is of interest to note that even though the replacement of regular corn silage with grainless-corn silage and corn-and-cob meal was made from field calculations, the calculated total digestible nutrient intake was approximately the same. Table 9 shows the average daily (by three-day periods) body weight, milk production and feed consumption of Animal No. 426.

Relative Feeding Value of the Total Digestible Nutrients in Clover Hay,
Ear-Corn Silage and Corn-and-Cob Meal for Milk Production

The results obtained from replacing part of the clover hay ration with ear-corn silage or corn-and-cob meal on a total digestible nutrient basis are presented in figure 3. The replacing of clover hay with ear-corn silage resulted in a marked increase in 4 percent fat-corrected milk. This increase reached its peak during the fifth three-day period with an average increase of 4.7 pounds per day. The replacing of the ear-corn silage with corn-and-cob meal resulted in no significant change in milk production. The production remained at the higher level resulting from feeding of ear-corn silage.

Table 10 shows the individual average daily milk production, body weight, total digestible nutrients received and required and feeds fed for

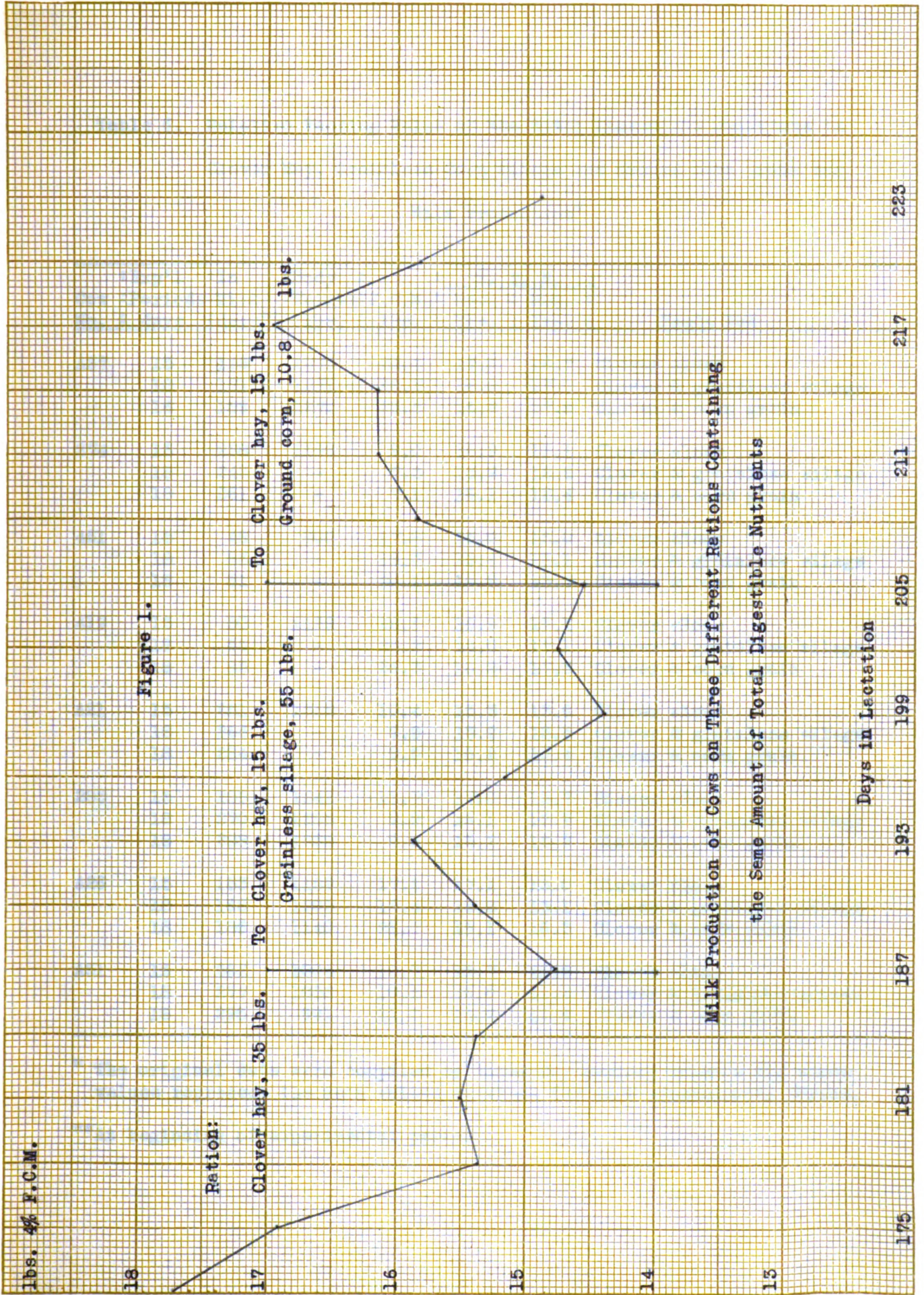


Table 6. Relative Feeding Value of the Total Digestible Nutrients in
Clover Hay, Grainless-Corn Silage and Ground Corn Grain for
Milk Production*

Cow No.	Exp'l	In	Body	T. D. N.			Feeds Fed
	Periods	Milk	Weight	F.C.M.	Rec.	Req.	
	days	days**	lbs.	lbs.	lbs.	lbs.	
A57	15	156	1290	20.4	17.3	16.7	Clover alone
	18	171	1271	20.7	16.0	17.0	Clover & grainless silage
	18	189	1271	23.2	16.2	17.6	Clover & corn grain
274	15	228	1196	9.0	16.9	13.1	Clover alone
	18	243	-	7.3	15.9	12.6	Clover & grainless silage
	18	261	-	7.1	16.1	12.4	Clover & corn grain
461	15	48	900	17.8	15.0	13.0	Clover alone
	18	65	-	18.3	15.4	13.1	Clover & grainless silage
	18	81	-	20.1	15.8	13.7	Clover & corn grain
419	15	50	1129	26.2	16.9	17.1	Clover alone
	18	65	-	26.2	16.0	17.1	Clover & grainless silage
	18	83	-	26.3	16.2	17.3	Clover & corn grain
A21	15	251	1318	10.4	15.3	13.6	Clover alone
	18	266	-	9.9	15.9	13.5	Clover & grainless silage
	18	284	-	9.5	16.2	13.4	Clover & corn grain
285	15	255	1241	11.7	17.0	13.7	Clover alone
	18	270	1255	9.9	16.1	13.2	Clover & grainless silage
	18	288	1238	9.0	16.2	12.9	Clover & corn grain
A26	15	153	1189	17.1	17.1	15.0	Clover alone
	18	168	1203	17.4	15.8	15.1	Clover & grainless silage
	18	186	1140	21.7	16.1	16.5	Clover & corn grain
A31	15	262	1004	10.9	15.7	11.5	Clover alone
	18	277	1032	10.5	16.0	11.4	Clover & grainless silage
	18	295	991	11.0	15.9	11.5	Clover & corn grain

* The original data were compiled by three-day periods whereas the above values represent the mean values obtained for each experimental period.

**At beginning of experimental period.

**Table 7. Effect of Replacing 20 pounds Clover Hay with 55 pounds
Grainless-Corn Silage or 10.8 pounds Ground Corn Grain**

Cow A37								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F.C.M.* lbs.	Hay lbs.	Grainless- Corn Silage lbs.	Corn Grain lbs.
156	1288	25.4	3.1	0.79	22.0	35.0	-	-
159	1241	21.4	2.9	.62	17.9	35.0	-	-
162	1321	24.1	3.3	.80	21.6	35.0	-	-
165	1296	22.4	3.3	.74	20.0	35.0	-	-
168	1305	22.0	3.5	.77	20.4	34.7	-	-
Average	1290	23.1	3.4	.74	20.4	34.5	-	-
171	1273	23.8	3.4	.81	21.7	15.0	55.0	-
174	1292	24.8	3.4	.84	22.6	14.7	55.0	-
177	1315	23.5	3.2	.75	20.7	15.0	55.0	-
180	1230	22.7	3.2	.73	20.0	14.7	55.0	-
183	1250	21.8	3.2	.70	19.2	15.0	55.0	-
186	1267	23.1	3.1	.72	20.0	15.0	55.0	-
Average	1271	23.3	3.3	.76	20.7	14.9	55.0	-
189	1217	26.1	3.2	.84	23.0	15.0	-	10.8
192	1158	27.0	3.4	.92	24.6	15.0	-	10.8
195	1148	25.4	3.5	.89	23.5	15.0	-	10.8
198	1179	26.2	3.4	.89	23.8	15.0	-	10.8
201	1165	26.0	3.2	.83	22.9	15.0	-	10.8
204	1159	25.0	3.1	.79	21.6	15.0	-	10.8
Average	1171	26.0	3.3	.86	23.2	15.0	-	10.8

*4% fat-corrected milk

lbs. 4% F.C.M.

Figure 2.

Ration:

Regular corn silage	50 lbs.	To Grainless-corn silage	32.5 lbs.	To Regular corn silage	50 lbs.
Clover hay	15 lbs.	Corn-and-cob meal	7.5 lbs.	Clover hay	15 lbs.
		Clover hay	15.0 lbs.		

Milk Production of a Regular Silage Ration as Compared to Grainless-Corn
Silage and Corn-and-Cob Meal

Days in Lactation

149	155	161	167	173	179	185	191	197
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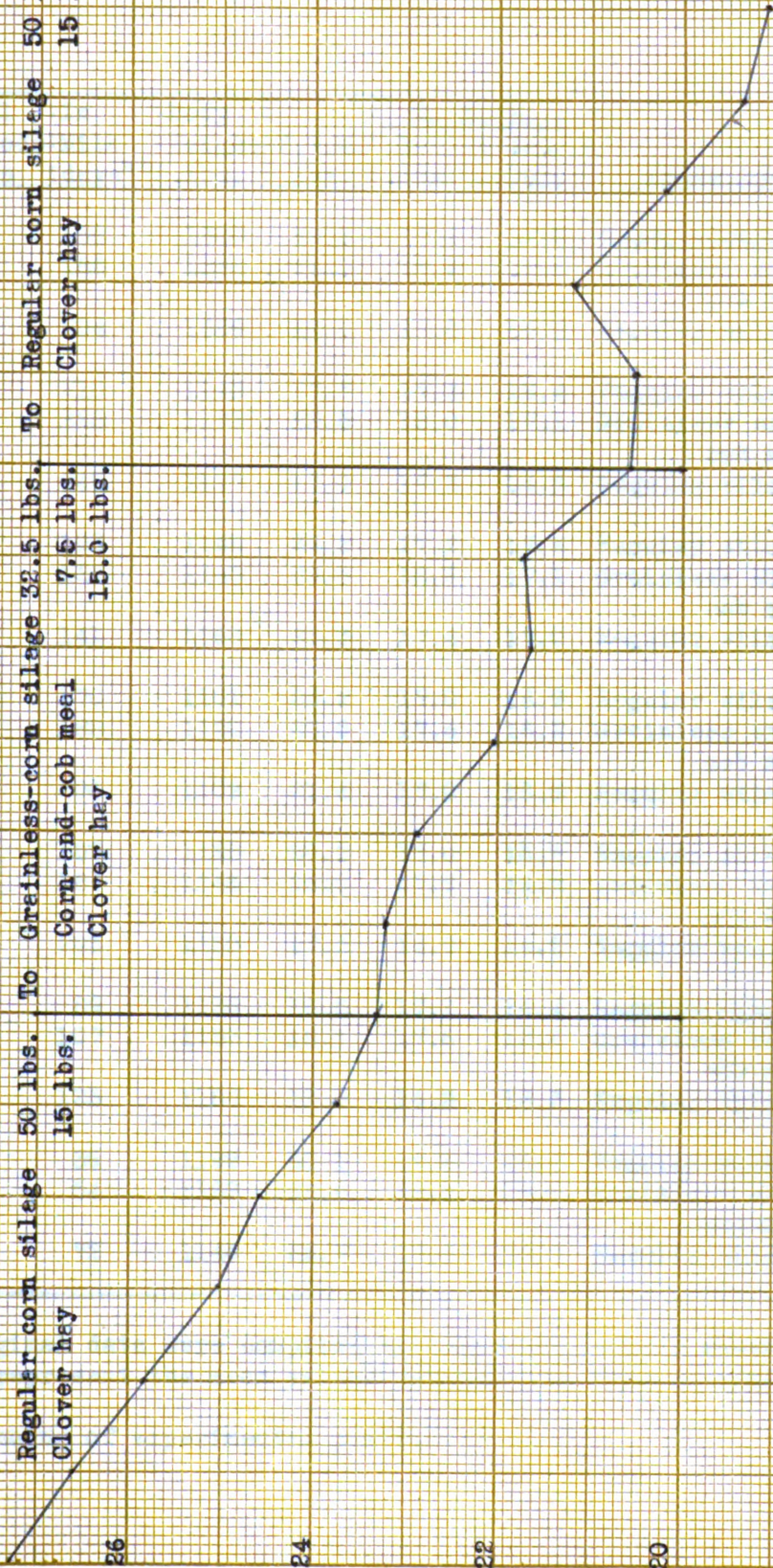


Table 8. Relative Feeding Value of Regular Corn Silage and Grainless-Corn Silage plus Corn-and-Cob Meal for Milk Production*

Cow No.	Exp'l Periods days	In Milk days**	Body Weight lbs.	T. D. M.			Feeds Fed
				F.C.M.	Rec.	Req.	
A32	18	168	1320	26.2	17.3	18.9	Regular silage
	18	186	1326	21.9	17.9	17.6	Grainless silage & corn-and-cob meal
	18	204	1329	19.6	17.5	16.8	Regular silage
A27	18	210	1145	27.7	17.3	18.4	Regular silage
	18	228	1173	23.8	18.0	17.1	Grainless silage & corn-and-cob meal
	18	246	1177	17.0	17.3	14.9	Regular silage
412	18	105	1148	24.2	17.2	17.2	Regular silage
	18	123	1148	23.8	18.6	17.1	Grainless silage & corn-and-cob meal
	18	141	1160	23.3	17.4	17.0	Regular silage
460	18	170	1101	25.2	17.0	16.9	Regular silage
	18	188	1120	23.0	17.6	16.2	Grainless silage & corn-and-cob meal
	18	206	1109	21.4	17.0	15.8	Regular silage
337	18	169	1125	20.2	17.0	15.5	Regular silage
	18	187	1146	18.0	17.9	14.8	Grainless silage & corn-and-cob meal
	18	205	1135	17.3	14.9	14.5	Regular silage
338	18	89	1136	16.8	17.1	14.4	Regular silage
	18	107	1153	15.1	17.6	13.8	Grainless silage & corn-and-cob meal
	18	125	1107	13.5	14.8	13.3	Regular silage
426	18	36	1198	41.3	16.8	22.7	Regular silage
	18	54	1168	31.8	18.0	19.7	Grainless silage & corn-and-cob meal
	18	72	1146	28.7	17.2	18.7	Regular silage

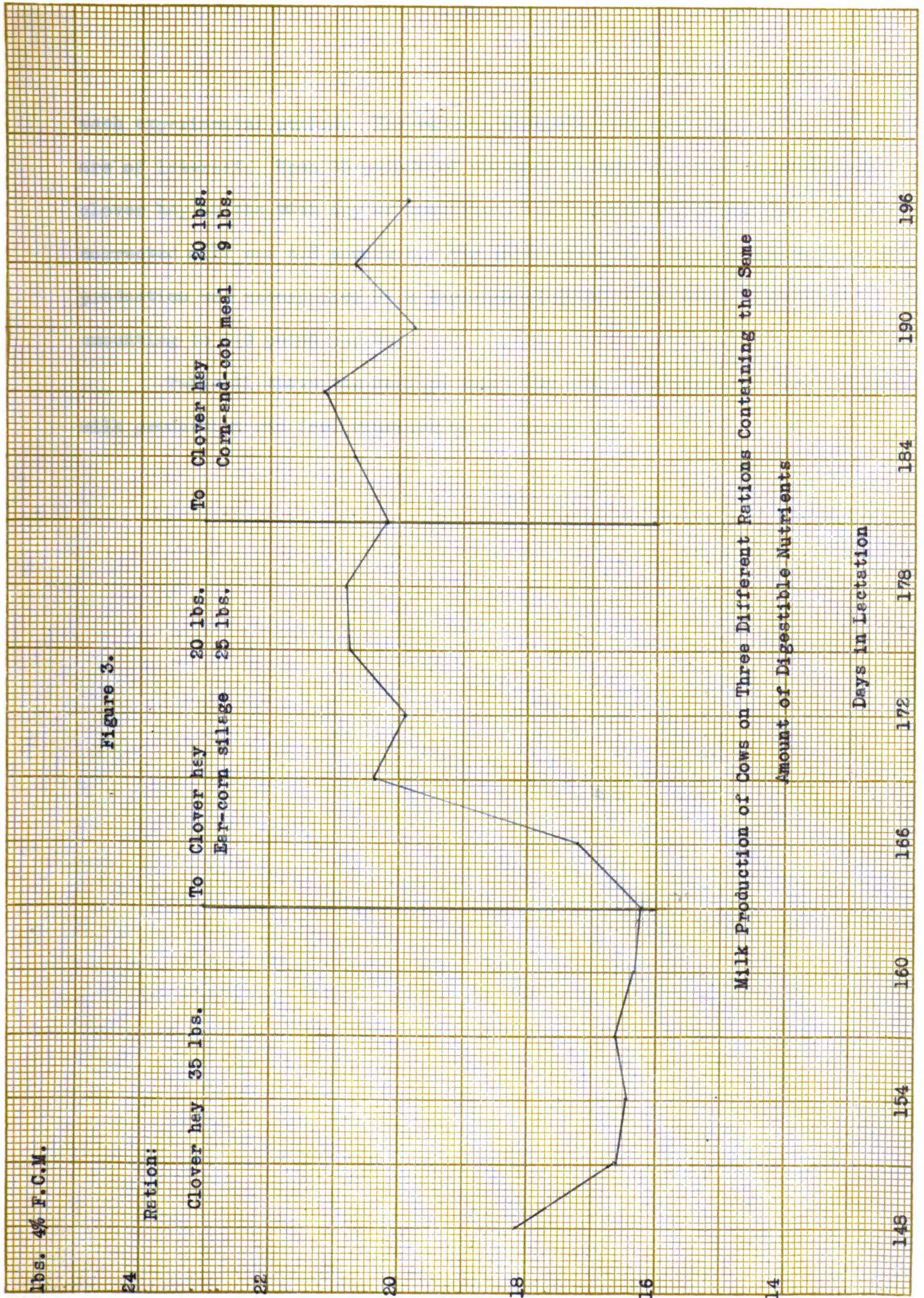
* The original data were compiled by three-day periods whereas the above values represent the mean values obtained for each experimental period.

**At beginning of experimental period.

Table 9. Effect of Replacing 50 pounds Regular Corn Silage with 32.5 pounds Grainless-Corn Silage plus 7.5 pounds Corn-and-Cob Meal

Cow A32								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Hay lbs.	Regular Silage lbs.	Corn-and- Cob Meal lbs.
168	1262	29.1	3.4	0.99	26.5	15.0	50.0	-
171	1359	27.5	3.4	.94	25.0	15.0	50.0	-
174	1329	25.6	3.4	.87	23.3	15.0	50.0	-
177	1332	24.9	3.7	.92	23.8	11.0	50.0	-
180	1340	24.2	3.8	.92	23.5	15.0	50.0	-
183	1311	23.8	3.8	.90	23.1	15.0	50.0	-
Average	1320	26.0	3.6	.92	24.2	14.3	50.0	-
Grainless Silage								
186	1325	24.4	3.6	.88	22.9	13.7	32.5	7.5
189	1322	23.4	3.6	.84	22.0	15.0	32.5	7.5
192	1367	23.7	3.9	.92	23.3	12.3	32.5	7.5
195	1310	22.7	3.8	.86	22.0	15.0	32.5	7.5
198	1315	21.6	3.8	.82	21.0	15.0	32.5	7.5
201	1316	20.3	3.9	.79	20.0	15.0	32.5	7.5
Average	1326	22.7	3.8	.85	21.9	14.3	32.5	7.5
Regular Silage								
204	1302	19.4	4.1	.80	19.7	14.0	50.0	-
207	1339	20.7	3.8	.79	20.1	15.0	50.0	-
201	1314	21.8	4.1	.89	22.1	14.0	50.0	-
213	1353	18.2	4.0	.73	18.2	15.0	50.0	-
216	1352	18.3	3.9	.71	18.0	12.7	50.0	-
219	1317	17.9	4.1	.73	18.2	15.0	50.0	-
Average	1329	19.6	4.0	.78	19.6	14.3	50.0	-

*4% fat-corrected milk



each experimental period. The results obtained with Cow 461 in Table 10 are of interest. When 25 pounds of ear-corn silage replaced 15 pounds of clover hay on the 90th day of lactation, the average daily increase in fat-corrected milk was 4.8 pounds for the 18-day period. This increase in milk production was accompanied by a decrease in total digestible nutrients amounting to 0.9 pound per day.

Table 11 shows the average daily (by three-day periods) body weight, milk production and feed consumption of Animal 426.

Table 10. Relative Feeding Value of the Total Digestible Nutrients in
Clover Hay, Ear-Corn Silage and Corn-and-Cob Meal for Milk
Production*

Cow No.	Exp'l	In	Body	T. D. N.			Feeds Fed
	Periods	Milk	Weight	F.C.M.	Rec.	Req.	
	days	Days**	lbs.	lbs.	lbs.	lbs.	
426	15	90	1155	22.0	17.0	15.7	Clover alone
	18	105	1150	25.3	16.5	16.8	Clover & ear-corn silage
	15	123	1148	25.7	16.8	16.9	Clover & corn-and-cob meal
461	15	99	-	16.1	17.2	12.7	Clover alone
	18	114	948	20.9	16.3	14.2	Clover & ear-corn silage
	15	132	920	21.7	16.8	14.5	Clover & corn-and-cob meal
460	15	218	1142	14.1	17.3	13.6	Clover alone
	18	233	1130	18.2	16.8	14.9	Clover & ear-corn silage
	15	251	1120	16.8	16.7	14.5	Clover & corn-and-cob meal
337	15	223	1167	14.5	16.0	13.8	Clover alone
	18	238	1135	17.0	16.3	14.6	Clover & ear-corn silage
	15	256	1131	18.2	15.7	15.0	Clover & corn-and-cob meal
338	15	143	1153	12.2	15.2	13.0	Clover alone
	18	158	1122	13.4	16.8	13.5	Clover & ear-corn silage
	15	176	1125	14.6	16.6	13.8	Clover & corn-and-cob meal
419	15	101	1069	21.1	17.4	15.6	Clover alone
	18	116	1067	24.4	16.8	16.6	Clover & ear-corn silage
	15	134	1056	25.2	16.6	16.9	Clover & corn-and-cob meal

* The original data were compiled by three-day periods as the above values represent the mean values obtained for each experimental period.

**At beginning of experimental period.

Table 11. Effect of Replacing 15 pounds of Clover Hay with 25 pounds
Ear-Corn Silage or 9 pounds Corn-and-Cob Meal

Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and- Cob Meal lbs.
90	1123	29.7	3.0	0.89	25.2	32.3	-	-
93	1120	27.5	3.1	.85	23.8	35.0	-	-
96	1147	23.9	3.5	.84	22.1	35.0	-	-
99	1192	22.6	3.1	.70	19.5	33.0	-	-
102	1191	22.2	3.1	.69	19.2	35.0	-	-
Average	1155	25.2	3.2	.79	22.0	34.1	-	-
105	1166	26.4	3.1	.82	22.8	18.7	25.0	-
108	1155	30.1	3.2	.96	26.5	20.0	25.0	-
111	1139	31.0	2.9	.90	25.9	18.3	25.0	-
114	1126	29.9	2.8	.84	24.5	20.0	25.0	-
117	1160	30.0	3.1	.93	25.9	20.0	25.0	-
120	1155	28.5	3.4	.97	25.9	18.7	25.0	-
Average	1150	29.3	3.1	.90	25.3	19.3	25.0	-
123	1160	29.1	3.0	.87	24.7	20.0	-	9.0
126	1154	32.0	3.0	.96	27.2	20.0	-	9.0
129	1125	29.9	3.1	.90	25.4	20.9	-	9.0
132	1105	28.8	3.1	.89	24.9	20.0	-	9.0
135	1095	28.6	3.5	1.00	26.4	20.0	-	9.0
Average	1143	29.7	3.1	.92	25.7	20.0	-	9.0

* $\frac{4}{100}$ fat-corrected milk

DISCUSSION OF RESULTS

The results of the digestion trials with grainless and regular corn silage are presented in Tables 4 and 5 respectively. The total digestible nutrient value obtained on a dry matter basis for regular corn silage check very closely with that reported by Christensen and Hopper (48) and Morrison (49) but was 2 percent higher than that reported by Schnieder (50). On a dry matter basis, the grainless-corn silage carried 64.5 percent total digestible nutrients. Morrison (49) reported that the total digestible nutrients of grainless-corn silage were 60.2 percent on a dry matter basis.

The experimental results indicate that a pound of digestible nutrients in grainless silage is slightly superior to a pound of digestible nutrients in clover hay cut during late bloom stage for milk production. These results are not too conclusive, however, because the corn used for silage was of a very uneven quality. The summer of 1946 was a very poor growing season due to a severe drouth. Some of the corn developed fairly normally while some failed to develop until after the fall rains. Therefore, at harvesting time most of the stalks were mature and the grain well developed while some of the stalks that had come on after the fall rains were young shoots.

Corn grain has an unknown milk producing factor which has been reported by Huffman et al. (53). This factor may have been in the stalks not producing grain, thus increasing the value of the total digestible nutrients of the grainless silage.

It has been reported by Jacobs et al. (32) that grainless-corn silage had a lower feeding value per pound than regular corn silage. Ekles (31) reported that grainless-corn silage could be used effectively for win-

tering beef cattle. The results of this investigation indicate that grainless-corn silage is equal pound per pound of total digestible nutrients to clover hay cut during late bloom stage. When grain is fed to livestock the practice of making and feeding grainless-corn silage would be of questionable value. It is an accepted fact that some grain should be included in the ration for good milk production. Corn grain in the silage would partially fulfill this requirement.

It is evident that when corn grain replaced the grainless corn silage, total digestible nutrients remaining the same, there was a marked increase in milk production. These data indicate that corn grain carries some unknown factor or factors that stimulate milk production. These data also show that the total digestible nutrients from corn grain are superior to total digestible nutrients from clover hay cut in the late bloom stage.

The clover hay used in this study appeared to be low in these unknown factors. Unpublished data of the Michigan Agricultural Experiment Station (54) indicate that alfalfa, brome grass and timothy cut in the late bloom stage are poor in these factors. The grainless-corn silage used in this investigation carried a small amount of this factor or factors.

The percentage of stalks and ears and the ear stalk ratio check very closely to those reported by Livesay (33), and Eckles (31). The stalks made up to 64 percent of the silage while the ears accounted for 36 percent of the green weight.

It is evident that when regular silage was replaced by grainless-corn silage plus corn-and-cob meal there was no significant change in milk production. These data indicate that a pound of dry matter in corn grain in silage was equal to a pound of dry matter in ground corn-and-cob meal for

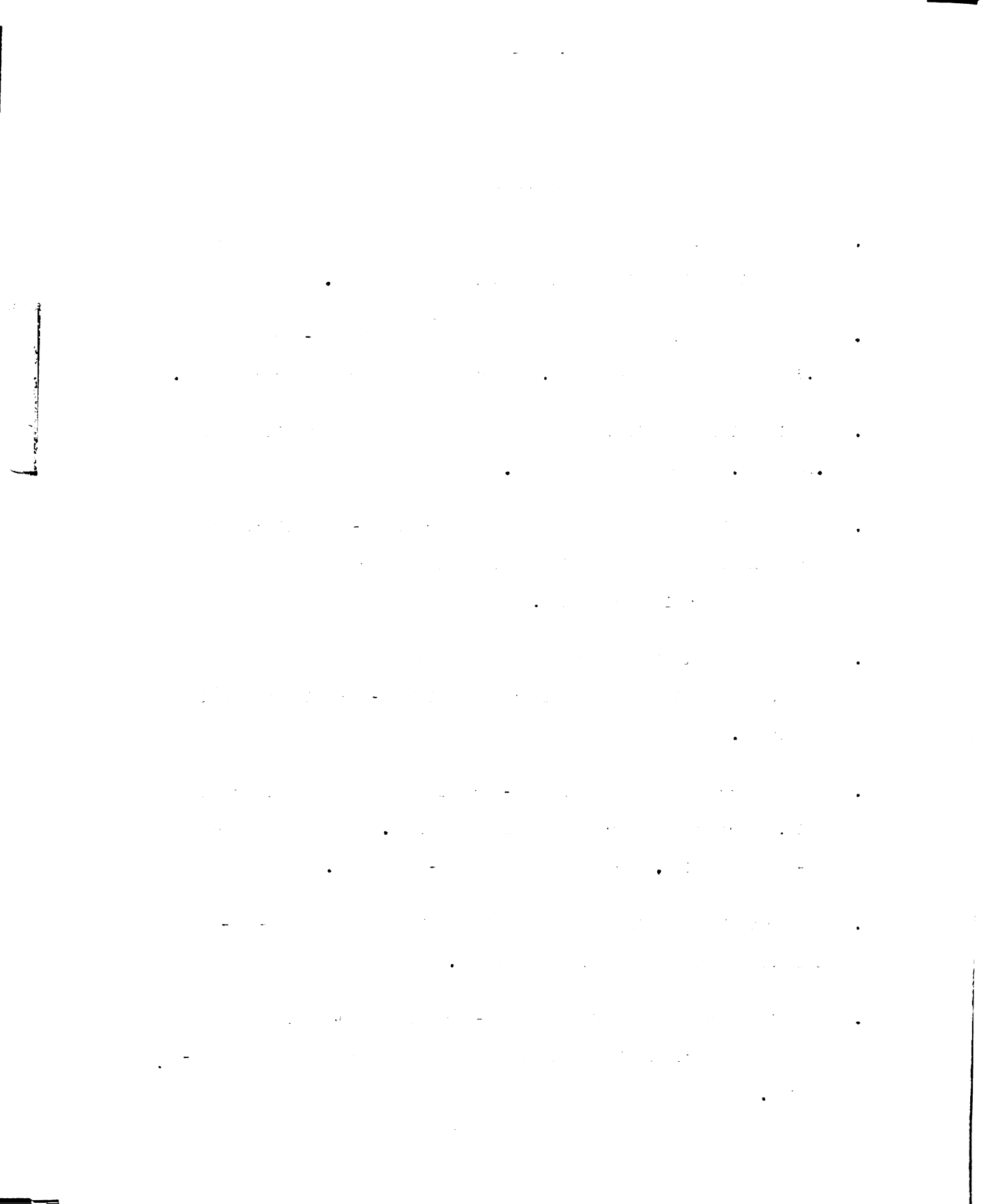
milk production. Rusk and Snapp (36) reported that corn grain in silage was of value in wintering beef calves.

When ear-corn silage replaced clover hay on the total digestible nutrient basis, there was a marked increase in milk production which gave further evidence that the corn grain furnished some unknown factor or factors that stimulate milk production. It was also of interest to note that when corn-and-cob meal replaced ear-corn silage, milk production remained at the higher level. Rusk and Snapp (36) report that ear-corn silage was equal to corn-and-cob meal on a dry matter basis for beef production.

The use of ear-corn silage is of questionable value. The labor required for this practice would be very costly. In case of an early frost and limited silo space the silo could answer as a storage for immature grain. The practice would save the grain that might otherwise be lost by spoilage if left in the field or stored in a crib.

SUMMARY

1. Fifteen lactating dairy cows depleted of unknown lactation factors and four growing dairy heifers were used in these studies.
2. The average total digestible nutrients of the grainless-corn silage was 19.6 percent as compared to 21.39 percent for the regular corn silage.
3. The digestible protein of the grainless and regular corn silage was 1.55 and 1.66 percent respectively.
4. A pound of total digestible nutrients in grainless-corn silage was equal to a pound of total digestible nutrients in clover hay cut during late bloom stage for milk production.
5. A pound of total digestible nutrients in corn grain was superior to a pound of total digestible nutrients in grainless-corn silage for milk production.
6. When corn grain replaced grainless-corn silage on a total digestible basis, there was an average daily increase of 2.5 pounds of 4 percent fat-corrected milk, during the fifth three-day period.
7. Corn grain in corn silage was equal in feeding value to corn-and-cob meal pound for pound for milk production.
8. The total digestible nutrients of ear-corn silage had a higher feeding value than the total digestible nutrients of clover hay for milk production.



9. When ear-corn silage replaced clover hay on a total digestible nutrient basis, there was an average increase of 4.7 pounds of 4 percent fat-corrected milk during the fifth three-day period.
10. Ear-corn silage was equal to corn-and-cob meal on a total digestible nutrient basis for milk production.
11. Corn grain and ear-corn silage carried some unknown factor or factors that stimulated milk production. The clover hay used in this study appeared to be low in these unknown factors.

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2. The second part of the document focuses on the role of communication in achieving organizational goals. It highlights that effective communication is not just about conveying information but also about listening and understanding the needs and concerns of others. The text suggests that regular communication can help build trust, foster collaboration, and resolve conflicts more efficiently.

5. The fifth and final part of the document provides a summary of the key points discussed. It reiterates the importance of record-keeping, communication, time management, and continuous learning. The text concludes by expressing confidence that the reader will be able to apply these principles effectively in their own work and achieve their desired outcomes.

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A P P E N D I X

Table 1. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow 461						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
48	-	22.2	2.9	0.64	18.5	35.0	-	-
51	-	20.3	3.0	.61	17.3	35.0	-	-
54	-	21.5	3.0	.65	18.3	23.3	-	-
57	-	21.7	3.0	.65	18.4	30.0	-	-
60	-	19.2	3.1	.60	16.6	26.0	-	-
Average	-	21.0	3.0	.63	17.8	29.9	-	-
63	-	20.7	3.1	.64	17.9	15.0	55.0	-
66	-	21.4	3.0	.64	18.2	9.0	55.0	-
69	-	21.9	3.2	.69	19.1	15.0	55.0	-
72	-	20.2	3.2	.65	17.8	12.7	55.0	-
75	-	20.9	3.3	.69	18.7	15.0	55.0	-
78	-	19.9	3.3	.66	17.8	15.0	55.0	-
Average	-	20.8	3.2	.66	18.3	13.6	55.0	-
81	-	22.3	3.2	.71	19.6	10.0	-	10.8
84	-	24.7	3.0	.74	21.0	15.0	-	10.8
87	-	23.4	2.9	.68	19.5	15.0	-	10.8
90	-	25.3	3.0	.76	21.5	15.0	-	10.8
93	-	23.5	3.0	.71	20.0	15.0	-	10.8
96	-	23.0	2.9	.67	19.2	15.0	-	10.8
Average	-	24.0	3.0	.71	20.1	14.2	-	10.8

*4% fat-corrected milk.

Table 2. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow 419						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
50	1150	32.6	2.8	0.91	26.7	35.0	-	-
53	1119	32.1	2.8	.90	26.3	35.0	-	-
56	1114	29.6	2.8	.83	24.3	31.7	-	-
59	1158	29.2	3.2	1.11	28.3	35.0	-	-
62	1103	28.9	3.2	.92	25.4	32.3	-	-
Average	1129	30.5	3.1	.93	26.2	33.6	-	-
65	-	30.6	2.9	.89	25.6	15.0	55.0	-
68	-	32.3	3.1	1.00	27.9	14.3	55.0	-
71	-	32.4	3.0	.97	27.5	15.0	55.0	-
74	-	29.4	2.8	.82	24.1	14.3	55.0	-
77	-	30.1	3.2	.96	26.5	15.0	55.0	-
80	-	29.9	3.0	.90	25.4	15.0	55.0	-
Average	-	30.8	3.0	.92	26.2	14.8	55.0	-
83	-	30.9	3.1	.96	26.7	15.0	-	10.6
86	-	29.5	2.8	.83	24.2	15.0	-	10.8
89	-	29.9	3.4	1.02	27.2	15.0	-	10.8
92	-	30.8	3.9	1.20	30.3	15.0	-	10.8
95	-	31.6	2.8	.89	26.1	15.0	-	10.8
98	-	30.3	2.9	.88	25.3	15.0	-	10.8
Average	-	30.5	3.2	.96	26.6	15.0	-	10.8

*% fat-corrected milk.

Table 3. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow A21						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
251	1313	13.6	3.3	0.46	12.4	35.0	-	-
254	1299	11.3	3.0	.34	9.6	35.0	-	-
257	1326	11.7	3.4	.40	10.6	25.7	-	-
260	1353	10.5	3.3	.35	9.4	30.0	-	-
263	1296	10.2	3.2	.39	9.9	27.3	-	-
Average	1318	11.5	3.4	.39	10.4	30.6	-	-
266	-	11.6	3.2	.37	10.2	15.0	55.0	-
269	-	12.8	2.8	.36	10.5	12.3	55.0	-
272	-	11.0	2.9	.32	9.2	15.0	55.0	-
275	-	11.3	3.2	.36	9.9	15.0	55.0	-
278	-	11.2	3.0	.34	9.5	15.0	55.0	-
281	-	11.6	3.1	.36	10.0	15.0	55.0	-
Average	-	11.6	3.0	.35	9.9	14.6	55.0	-
284	-	12.2	3.1	.38	10.6	15.0	-	10.8
287	-	12.3	3.2	.39	10.2	15.0	-	10.8
290	-	10.5	3.3	.35	9.4	15.0	-	10.8
293	-	10.1	3.4	.34	9.2	15.0	-	10.8
296	-	9.2	3.4	.31	8.4	15.0	-	10.8
299	-	9.6	3.5	.32	8.3	15.0	-	10.8
Average	-	10.6	3.3	.35	9.5	15.0	-	10.8

*4% fat-corrected milk.

Table 4. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow 285								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Grainless Corn silage lbs.	Corn-and-Cob Meal lbs.
255	1227	16.3	3.3	0.54	14.7	35.0	-	-
258	1220	14.0	3.0	.42	11.9	35.0	-	-
261	1256	12.7	3.3	.42	11.4	31.7	-	-
264	1255	11.8	3.2	.36	9.9	35.0	-	-
267	1246	11.6	3.5	.41	10.7	33.3	-	-
Average	1241	13.2	3.3	.43	11.7	34.0	-	-
270	1254	13.1	3.4	.45	11.9	15.0	55.0	-
273	1245	12.4	3.2	.40	10.9	14.7	53.7	-
276	1300	11.4	3.2	.36	10.0	15.0	55.0	-
279	1233	9.2	3.9	.36	9.1	15.0	55.0	-
282	1256	10.5	3.3	.35	9.4	15.0	55.0	-
285	1244	9.3	3.0	.28	7.9	15.0	55.0	-
Average	1255	11.0	3.3	.37	9.9	15.0	54.8	-
288	1259	9.8	3.2	.31	8.6	15.0	-	10.8
291	1231	10.7	3.4	.36	9.7	15.0	-	10.8
294	1230	9.6	3.6	.35	9.0	15.0	-	10.8
297	1265	9.2	3.8	.35	8.9	15.0	-	10.8
300	1238	9.9	3.5	.35	9.2	15.0	-	10.8
303	1238	8.8	3.8	.33	8.5	15.0	-	10.8
Average	1244	9.7	3.6	.34	9.0	15.0	-	10.8

*4% fat-corrected milk.

Table 5. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow A26						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
153	1221	20.6	3.2	0.66	18.1	35.0	-	-
156	1182	17.8	3.6	.64	16.7	35.0	-	-
159	1179	18.5	3.4	.63	16.8	32.7	-	-
162	1220	17.4	3.7	.64	16.6	35.0	-	-
165	1145	17.6	3.8	.67	17.1	32.7	-	-
Average	1189	18.4	3.5	.65	17.1	34.1	-	-
168	1215	18.8	3.4	.63	17.1	15.0	55.0	-
171	1230	18.2	3.7	.67	17.4	11.7	55.0	-
174	1257	19.2	3.4	.65	17.5	15.0	55.0	-
177	1173	18.1	3.5	.63	16.7	14.3	55.0	-
180	1155	19.0	3.6	.68	17.9	15.0	55.0	-
183	1189	18.8	3.6	.68	17.7	15.0	55.0	-
Average	1203	18.7	3.5	.66	17.4	14.3	55.0	-
186	1153	20.9	3.6	.75	19.6	14.0	-	10.8
189	1156	21.1	3.6	.76	19.9	15.0	-	10.8
192	1160	24.2	3.5	.85	22.4	15.0	-	10.8
195	1168	24.7	3.6	.89	23.2	15.0	-	10.8
198	1115	24.7	3.9	.96	24.3	15.0	-	10.8
201	1140	21.9	3.6	.79	20.6	15.0	-	10.8
Average	1149	22.9	3.6	.83	21.7	14.8	-	10.8

*% fat-corrected milk.

Table 6. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow A31						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
262	971	13.5	3.8	0.51	13.1	35.0	-	-
265	988	12.5	3.9	.49	12.3	35.0	-	-
268	1019	11.3	4.2	.47	11.6	25.0	-	-
271	1036	11.6	4.1	.48	11.8	35.0	-	-
274	1005	10.3	4.4	.45	10.9	26.7	-	-
Average	1004	11.8	4.1	.48	10.9	31.3	-	-
277	1025	11.3	3.8	.43	11.0	15.0	55.0	-
280	1025	11.8	4.0	.47	11.8	13.3	55.0	-
283	1075	10.4	3.8	.40	10.1	15.0	55.0	-
286	1025	10.5	3.7	.39	10.0	15.0	55.0	-
289	1019	9.8	4.0	.39	9.8	15.0	55.0	-
292	1025	10.5	4.0	.42	10.5	15.0	55.0	-
Average	1032	10.7	3.9	.42	10.5	14.7	55.0	-
295	1043	11.7	3.6	.42	11.0	13.3	-	10.8
298	971	11.6	4.2	.49	11.9	15.0	-	10.8
301	985	10.1	4.2	.42	10.4	13.0	-	10.8
304	987	10.2	4.2	.43	10.5	15.0	-	10.8
307	981	9.3	4.3	.40	9.7	15.0	-	10.8
310	977	8.6	4.1	.35	8.7	15.0	-	10.8
Average	991	10.3	4.1	.43	11.0	14.4	-	10.8

*4% fat-corrected milk.

Table 7. Effect of Partial Replacement of Clover Hay with Grainless Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Grainless Corn Silage lbs.	Corn-and-Cob Meal lbs.
228	1195	11.3	3.2	0.36	9.9	35.0	-	-
231	1177	11.8	3.3	.39	10.4	35.0	-	-
234	1198	10.8	3.3	.35	9.7	31.7	-	-
237	1219	8.9	3.6	.32	8.4	35.0	-	-
240	1191	7.6	3.3	.25	6.8	33.0	-	-
Average	1196	10.0	3.3	.33	9.0	33.9	-	-
245	-	8.4	3.3	.28	7.5	15.0	55.0	-
246	-	8.8	2.8	.25	7.2	12.3	55.0	-
249	-	9.0	3.0	.27	7.7	15.0	55.0	-
252	-	8.3	3.5	.29	7.7	15.0	55.0	-
255	-	8.5	3.0	.26	7.2	15.0	55.0	-
258	-	8.0	2.7	.22	6.4	15.0	55.0	-
Average	-	8.5	3.1	.26	7.3	14.6	55.0	-
261	-	8.8	2.7	.24	7.1	14.0	-	10.8
264	-	8.5	2.6	.22	6.7	15.0	-	10.8
267	-	8.4	3.0	.25	7.1	14.7	-	10.8
270	-	9.6	3.1	.30	8.3	15.0	-	10.8
273	-	8.3	2.8	.23	6.8	15.0	-	10.8
276	-	8.3	2.7	.22	6.7	15.0	-	10.8
Average	-	8.7	2.8	.24	7.1	14.8	-	10.8

*% fat-corrected milk.

Table 8. Effect of Replacement of Regular Corn Silage with Grainless-
Corn Silage Plus Corn-and-Cob Meal

Cow A27								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and- Cob Meal lbs.
210	1070	36.9	3.0	1.11	31.4	15.0	50.0	-
213	1157	31.8	3.1	.99	27.5	15.0	50.0	-
216	1162	30.7	3.2	.93	27.0	15.0	50.0	-
219	1168	31.3	3.2	1.00	27.5	11.7	50.0	-
222	1165	32.0	3.2	1.02	26.0	15.0	50.0	-
225	1148	29.6	3.3	.98	26.5	13.3	50.0	-
Average	1145	32.1	3.2	1.01	27.7	14.2	50.0	-
Grainless Corn Silage								
228	1150	28.7	3.2	.92	25.3	15.0	32.5	7.5
231	1180	29.2	3.2	.93	25.7	14.3	32.5	7.5
234	1215	27.8	3.3	.92	24.9	15.0	32.5	7.5
237	1155	26.7	3.1	.83	23.1	14.0	32.5	7.5
240	1153	23.9	3.3	.79	21.4	15.0	32.5	7.5
243	1182	25.1	3.3	.83	22.5	15.0	32.5	7.5
Average	1173	26.9	3.2	.87	23.8	14.7	32.5	7.5
Regular Corn Silage								
246	1173	20.7	3.6	.75	19.5	13.3	50.0	-
249	1184	19.7	3.5	.69	18.2	15.0	50.0	-
252	1175	19.4	3.7	.72	18.5	14.7	50.0	-
255	1202	17.4	3.6	.63	16.4	15.0	50.0	-
258	1176	16.4	3.6	.59	15.4	13.3	50.0	-
261	1154	15.1	3.6	.54	14.2	15.0	50.0	-
Average	1177	18.1	3.6	.63	17.0	14.4	50.0	-

*% fat-corrected milk.

Table 9. Effect of Replacement of Regular Corn Silage with Grainless-Corn Silage Plus Corn-and-Cob Meal

Cow 412								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and- Cob Meal lbs.
105	1210	25.5	3.5	0.89	23.6	15.0	50.0	-
108	1148	27.2	3.3	.90	24.3	15.0	50.0	-
111	1136	26.5	3.3	.87	23.7	15.0	50.0	-
114	1133	27.2	3.2	.87	23.9	12.5	50.0	-
117	1144	28.4	3.4	.97	25.8	15.0	50.0	-
120	1114	27.1	3.2	.87	23.3	11.7	50.0	-
Average	1148	27.0	3.3	.90	24.2	14.0	50.0	-
Grainless Corn Silage								
123	1133	27.7	3.2	.89	24.4	15.0	32.5	7.5
126	1131	28.0	3.3	.92	25.1	14.7	32.5	7.5
129	1203	26.4	3.3	.87	23.6	15.0	32.5	7.5
132	1130	25.5	3.3	.84	22.8	14.7	32.5	7.5
135	1150	25.9	3.3	.85	23.2	15.0	32.5	7.5
138	1142	26.0	3.4	.88	23.7	15.0	32.5	7.5
Average	1148	26.6	3.3	.88	23.8	14.9	32.5	7.5
Regular Corn Silage								
141	1153	25.1	3.5	.88	23.2	14.0	50.0	-
144	1156	25.4	3.2	.81	22.4	15.0	50.0	-
147	1150	25.3	3.7	.94	24.2	14.3	50.0	-
150	1173	24.6	3.7	.91	23.5	15.0	50.0	-
153	1157	25.8	3.4	.88	23.5	13.3	50.0	-
156	1171	25.1	3.5	.88	23.2	15.0	50.0	-
Average	1160	25.2	3.5	.88	23.3	14.4	50.0	-

*4% fat-corrected milk.

Table 10. Effect of Replacement of Regular Corn Silage with Grainless-Corn Silage Plus Corn-and-Cob Meal

Cow 460								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and- Cob Meal lbs.
170	1090	30.0	3.5	1.05	27.8	15.0	50.0	-
173	1094	28.2	3.7	1.04	26.9	15.0	50.0	-
176	1095	25.6	3.6	.92	24.4	15.0	50.0	-
179	1102	25.3	3.5	.89	23.4	15.0	36.7	-
182	1120	25.7	3.3	.98	24.9	15.0	50.0	-
185	1105	24.5	3.3	.93	23.8	15.0	43.3	-
Average	1101	26.6	3.7	.97	25.2	15.0	46.7	-
Grainless Corn Silage								
188	1110	24.1	3.3	.92	23.4	15.0	32.5	7.5
191	1110	24.5	3.6	.88	23.0	9.3	32.5	7.5
194	1164	23.8	3.9	.93	23.4	15.0	32.5	7.5
197	1113	23.3	3.6	.84	21.9	13.5	32.5	7.5
200	1111	24.3	3.6	.87	22.3	15.0	32.5	7.5
203	1109	23.6	3.9	.92	23.2	15.0	32.5	7.5
Average	1120	23.9	3.7	.89	23.0	13.8	32.5	7.5
Regular Corn Silage								
206	1110	20.8	4.4	.92	22.0	12.7	50.0	-
209	1113	19.0	4.6	.87	20.7	15.0	50.0	-
212	1100	22.0	4.2	.92	22.7	11.0	50.0	-
215	1110	21.6	4.2	.91	22.2	15.0	50.0	-
218	1120	21.2	4.0	.85	21.2	13.0	50.0	-
221	1100	18.7	4.3	.80	19.5	15.0	50.0	-
Average	1109	20.6	4.3	.88	21.4	13.6	50.0	-

*4% fat-corrected milk.

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Table 11. Effect of Replacement of Regular Corn Silage with Grainless-Corn Silage Plus Corn-and-Cob Meal

Cow 337								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and- Cob Meal lbs.
169	1132	22.1	3.9	0.26	22.4	15.0	50.0	-
172	1104	21.9	3.8	.83	21.3	15.0	50.0	-
175	1120	20.6	4.0	.82	20.6	15.0	50.0	-
178	1100	20.2	3.9	.77	19.6	15.0	36.7	-
181	1132	19.4	3.9	.76	19.1	15.0	50.0	-
184	1161	18.8	3.8	.71	18.2	15.0	42.7	-
Average	1125	20.5	3.9	.79	20.2	15.0	46.6	-
Grainless Corn Silage								
187	1125	18.9	3.8	.72	18.3	15.0	32.5	7.5
190	1149	19.4	3.6	.70	18.2	15.0	27.5	7.5
193	1192	19.1	3.8	.73	18.5	15.0	32.5	7.5
196	1150	18.9	3.3	.62	16.9	15.0	21.0	7.5
199	1131	18.6	4.0	.74	18.6	15.0	32.5	7.5
202	1128	18.2	3.8	.69	17.7	15.0	32.5	7.5
Average	1146	18.9	3.7	.70	18.0	15.0	29.8	7.5
Regular Corn Silage								
205	1121	17.1	4.0	.68	17.1	15.0	26.7	-
208	1134	17.5	3.9	.68	17.2	15.0	40.0	-
211	1120	18.1	4.0	.72	18.1	15.0	34.0	-
214	1146	17.6	4.2	.74	18.1	15.0	40.0	-
217	1159	17.0	4.0	.68	17.0	15.0	30.3	-
220	1127	16.2	4.0	.64	16.2	15.0	40.0	-
Average	1135	17.3	4.0	.69	17.3	15.0	35.1	-

*4% fat-corrected milk.

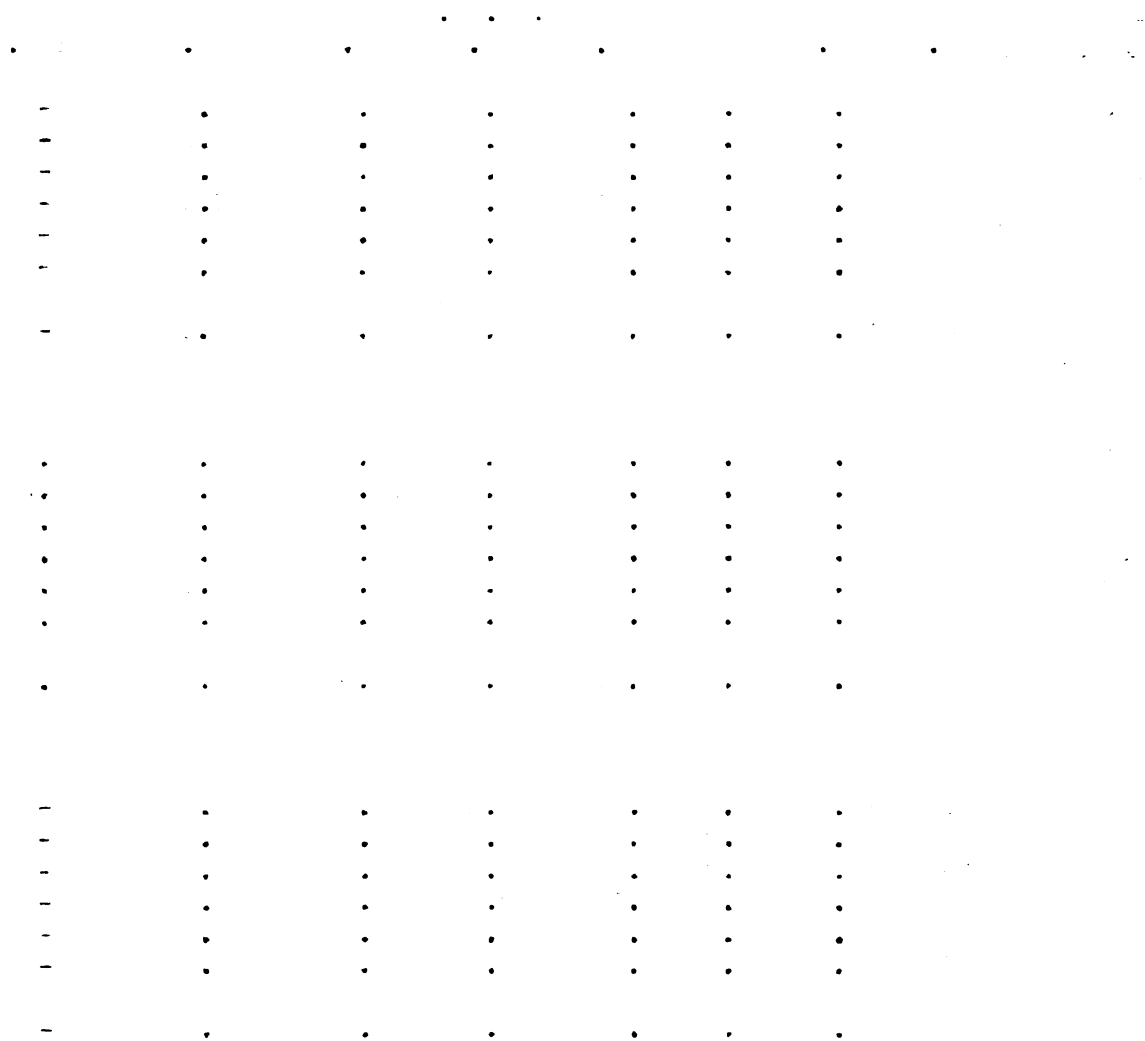


Table 12. Effect of Replacement of Regular Corn Silage with Grainless-Corn Silage Plus Corn-and-Cob Meal

Cow 358						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and- Cob Meal lbs.
89	1140	20.4	3.1	0.63	17.6	15.0	50.0	-
92	1140	20.0	3.0	.60	17.0	15.0	50.0	-
95	1107	19.2	3.1	.60	16.6	15.0	50.0	-
98	1132	19.4	3.1	.60	16.8	15.0	38.3	-
101	1143	19.2	3.1	.60	16.6	15.0	50.0	-
104	1152	18.1	3.3	.60	16.2	15.0	43.3	-
Average	1136	19.4	3.1	.61	16.8	15.0	46.9	-
						Grainless Corn Silage		
107	1146	17.4	3.2	.56	15.3	15.0	32.5	7.5
110	1144	18.0	3.3	.59	16.1	10.0	32.5	7.5
113	1200	17.3	3.1	.54	15.0	15.0	32.5	7.5
116	1144	17.4	2.9	.50	14.5	15.0	20.8	7.5
119	1138	16.7	3.2	.53	14.7	15.0	32.5	7.5
122	1143	17.2	3.2	.55	15.1	15.0	32.5	7.5
Average	1153	17.3	3.2	.55	15.1	14.2	30.6	7.5
						Regular Corn Silage		
125	1100	15.0	3.4	.51	13.7	15.0	28.3	-
128	1139	15.3	3.2	.49	13.5	15.0	40.0	-
131	1128	16.4	3.4	.56	14.9	15.0	29.0	-
134	1035	15.9	3.4	.54	14.5	15.0	40.0	-
137	1115	14.4	3.3	.48	12.9	15.0	30.0	-
140	1122	12.8	3.4	.44	11.6	15.0	40.0	-
Average	1107	15.0	3.4	.50	13.5	15.0	34.6	-

*4% fat-corrected milk.

Table 13. Effect of Replacement of Regular Corn Silage with Grainless-Corn Silage Plus Corn-and-Cob Meal

Cow 426								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Regular Corn Silage lbs.	Corn-and-Cob Meal lbs.
36	1254	43.0	3.7	1.59	41.1	15.0	50.0	-
39	1218	43.8	5.1	2.23	51.0	15.0	50.0	-
42	1192	41.2	4.6	1.90	44.9	15.0	50.0	-
45	1186	39.6	4.1	1.62	40.2	15.0	28.3	-
48	1180	37.5	3.8	1.43	36.4	15.0	50.0	-
51	1151	36.4	3.6	1.31	34.2	15.0	45.3	-
Average	1198	40.3	4.2	1.68	41.3	15.0	45.3	-
Grainless Corn Silage								
54	1161	36.3	3.5	1.27	33.6	15.0	32.5	7.5
57	1230	35.2	3.5	1.23	32.6	13.7	32.5	7.5
60	1185	33.8	3.6	1.22	31.8	15.0	32.5	7.5
63	1147	35.7	3.5	1.25	33.0	15.0	25.8	7.5
66	1144	33.3	3.3	1.10	29.8	15.0	32.5	7.5
69	1143	32.1	3.5	1.12	29.7	15.0	32.5	7.5
Average	1168	34.4	3.5	1.20	31.8	14.8	31.4	7.5
Regular Corn Silage								
72	1138	30.5	3.3	1.01	27.3	11.7	50.0	-
75	1137	32.9	3.6	1.18	30.9	15.0	50.0	-
78	1160	31.9	3.2	1.02	28.1	13.0	50.0	-
81	1145	31.9	3.2	1.02	28.1	15.0	50.0	-
84	1149	32.4	2.7	.87	26.1	15.0	46.3	-
87	1146	33.0	3.7	1.22	31.5	15.0	50.0	-
Average	1146	32.1	3.3	1.05	28.7	14.1	49.4	-

*~~4~~ fat-corrected milk.

Table 14. Effect of Partial Replacement of Clover Hay with Ear-Corn
Silage or Corn-and-Cob-Meal on a Total Digestible Nutrient
Basis

Cow 419								
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Ration Fed		
						Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and- Cob Meal lbs.
101	995	23.8	3.0	0.71	20.2	34.7	-	-
104	1103	23.4	3.1	.73	20.2	35.0	-	-
107	1082	24.0	3.3	.79	21.5	35.0	-	-
110	1100	25.4	3.3	.84	22.7	33.7	-	-
113	1063	24.3	3.0	.73	20.7	35.0	-	-
Average	1069	24.2	3.1	.76	21.1	34.7	-	-
116	1081	25.5	3.1	.79	20.6	19.7	25.0	-
119	1050	28.5	3.4	.97	25.9	20.0	25.0	-
122	1071	29.7	2.6	.77	23.5	20.0	25.0	-
125	1055	30.3	3.1	.94	26.2	20.0	25.0	-
128	1070	32.1	2.9	.93	26.8	20.0	25.0	-
131	1073	28.7	2.7	.77	23.1	19.3	25.0	-
Average	1067	29.1	3.0	.86	24.4	19.6	25.0	-
134	1075	30.4	3.2	.97	26.8	20.0	-	9.0
137	1020	29.3	2.7	.79	23.5	20.0	-	9.0
140	1064	27.9	3.0	.83	23.7	20.0	-	9.0
143	1050	29.5	3.1	.91	25.5	19.8	-	9.0
146	1070	31.3	3.0	.94	26.6	18.0	-	9.0
Average	1056	29.7	3.0	.89	25.2	19.6	-	9.0

*4% fat-corrected milk.

[illegible]

Table 15. Effect of Partial Replacement of Clover Hay with Ear-Corn
Silage or Corn-and-Cob Meal on a Total Digestible Nutrient
Basis

Cow 338						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and-Cob Meal lbs.
143	1112	14.4	3.4	0.49	13.1	23.3	-	-
146	1151	12.7	3.3	.42	11.4	35.0	-	-
149	1161	12.8	3.4	.44	11.6	35.0	-	-
152	1153	13.2	3.5	.46	12.2	23.3	-	-
155	1188	13.6	3.5	.48	12.6	35.0	-	-
Average	1153	13.3	3.4	.46	12.2	30.3	-	-
158	1174	13.8	3.4	.47	12.6	15.0	25.0	-
161	1148	15.1	3.4	.51	13.7	20.0	25.0	-
164	1100	15.4	3.2	.49	13.6	15.0	25.0	-
167	1100	15.9	2.8	.45	13.0	20.0	25.0	-
170	1100	16.5	3.0	.50	14.0	20.0	25.0	-
173	1110	15.6	3.1	.48	13.5	13.3	25.0	-
Average	1122	15.4	3.2	.48	13.4	17.2	25.0	-
176	1110	15.7	3.1	.49	13.6	20.0	-	9.0
179	1120	16.4	3.1	.50	14.1	20.0	-	9.0
182	1135	16.5	3.0	.49	14.0	20.0	-	9.0
185	1123	17.4	3.6	.61	16.3	19.8	-	9.0
188	1138	16.8	3.4	.57	15.2	18.0	-	9.0
Average	1125	16.6	3.2	.53	14.6	19.6	-	9.0

*4% fat-corrected milk.

10-30-57

Year	1980	1981	1982	1983	1984	1985
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
10	10	10	10	10	10	10
11	11	11	11	11	11	11
12	12	12	12	12	12	12
13	13	13	13	13	13	13
14	14	14	14	14	14	14
15	15	15	15	15	15	15
16	16	16	16	16	16	16
17	17	17	17	17	17	17
18	18	18	18	18	18	18
19	19	19	19	19	19	19
20	20	20	20	20	20	20
21	21	21	21	21	21	21
22	22	22	22	22	22	22
23	23	23	23	23	23	23
24	24	24	24	24	24	24
25	25	25	25	25	25	25
26	26	26	26	26	26	26
27	27	27	27	27	27	27
28	28	28	28	28	28	28
29	29	29	29	29	29	29
30	30	30	30	30	30	30
31	31	31	31	31	31	31
32	32	32	32	32	32	32
33	33	33	33	33	33	33
34	34	34	34	34	34	34
35	35	35	35	35	35	35
36	36	36	36	36	36	36
37	37	37	37	37	37	37
38	38	38	38	38	38	38
39	39	39	39	39	39	39
40	40	40	40	40	40	40
41	41	41	41	41	41	41
42	42	42	42	42	42	42
43	43	43	43	43	43	43
44	44	44	44	44	44	44
45	45	45	45	45	45	45
46	46	46	46	46	46	46
47	47	47	47	47	47	47
48	48	48	48	48	48	48
49	49	49	49	49	49	49
50	50	50	50	50	50	50
51	51	51	51	51	51	51
52	52	52	52	52	52	52
53	53	53	53	53	53	53
54	54	54	54	54	54	54
55	55	55	55	55	55	55
56	56	56	56	56	56	56
57	57	57	57	57	57	57
58	58	58	58	58	58	58
59	59	59	59	59	59	59
60	60	60	60	60	60	60
61	61	61	61	61	61	61
62	62	62	62	62	62	62
63	63	63	63	63	63	63
64	64	64	64	64	64	64
65	65	65	65			

Table 16. Effect of Partial Replacement of Clover Hay with Ear-Corn Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow 337						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and-Cob Meal lbs.
223	1133	15.3	3.9	0.60	15.1	34.3	-	-
226	1170	14.3	4.3	.61	14.9	35.0	-	-
229	1165	13.0	4.6	.60	14.2	35.0	-	-
232	1180	13.7	4.3	.59	14.3	20.3	-	-
235	1187	13.6	4.3	.58	14.2	35.0	-	-
Average	1167	14.0	4.3	.60	14.5	31.9	-	-
238	1159	14.0	4.0	.57	14.2	8.3	25.0	-
241	1145	17.0	3.7	.63	16.2	20.0	25.0	-
244	1150	17.5	3.9	.68	17.2	10.0	25.0	-
247	1120	19.0	3.7	.70	18.1	20.0	25.0	-
250	1115	19.4	3.6	.70	18.2	20.0	25.0	-
253	1120	18.6	3.8	.71	18.0	10.0	25.0	-
Average	1135	17.6	3.8	.67	17.0	14.7	25.0	9.0
256	1120	19.0	3.6	.68	17.9	20.0	-	9.0
259	1130	19.8	4.0	.79	19.8	18.0	-	9.0
262	1130	17.6	3.8	.66	17.0	18.0	-	9.0
265	1150	19.2	4.0	.76	19.2	13.3	-	9.0
268	1125	15.6	4.7	.73	17.2	20.0	-	9.0
Average	1151	18.2	4.0	.72	18.2	17.9	-	9.0

*~~4~~ fat-corrected milk.

Table 17. Effect of Partial Replacement of Clover Hay with Ear-Corn Silage or Corn-and-Cob Meal on a Total Digestible Nutrient Basis

Cow 461						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and-Cob Meal lbs.
99	-	21.1	2.9	0.61	17.6	32.3	-	-
102	-	18.9	3.1	.59	16.3	35.0	-	-
105	-	17.6	3.2	.56	15.5	35.0	-	-
108	-	16.8	3.4	.57	15.4	34.0	-	-
111	-	18.1	3.1	.56	15.7	35.0	-	-
Average	-	18.5	3.1	.58	16.1	34.3	-	-
114	981	19.9	3.4	.68	18.1	15.3	25.0	-
117	985	24.9	3.1	.77	21.5	20.0	25.0	-
120	935	25.4	2.8	.71	20.8	18.7	25.0	-
123	926	28.0	2.9	.81	23.4	20.0	25.0	-
126	930	24.8	2.9	.72	20.7	20.0	25.0	-
129	930	25.2	2.9	.73	21.0	18.7	25.0	-
Average	948	24.7	3.0	.74	20.9	18.8	25.0	-
132	932	25.5	2.9	.74	21.3	20.0	-	9.0
135	946	27.2	3.0	.81	23.1	20.0	-	9.0
138	900	25.4	3.0	.76	21.5	20.0	-	9.0
141	910	25.0	3.3	.82	22.3	20.0	-	9.0
144	912	23.7	3.1	.73	20.5	20.0	-	9.0
Average	920	25.4	3.1	.77	21.7	20.0	-	9.0

* $\frac{4}{100}$ fat-corrected milk.

134-107-011-2100

Table 18. Effect of Partial Replacement of Clover Hay with Ear-Corn
Silage or Corn-and-Cob Meal on a Total Digestible Nutrient
Basis

Cow 460						Ration Fed		
Days in Milk	Weight lbs.	Milk lbs.	Test %	Fat lbs.	F. C. M.* lbs.	Clover Hay lbs.	Ear-Corn Silage lbs.	Corn-and- Cob Meal lbs.
218	1086	14.7	5.1	0.75	17.1	34.5	-	-
221	1119	11.8	4.8	.57	13.2	35.0	-	-
224	1187	11.4	5.1	.58	13.3	35.0	-	-
227	1127	11.7	4.7	.55	12.9	35.0	-	-
230	1191	12.6	4.8	.60	14.1	35.0	-	-
Average	1142	12.4	4.9	.61	14.1	34.5	-	-
233	1141	13.7	4.7	.64	15.1	19.3	25.0	-
236	1120	17.5	4.4	.77	18.5	20.0	25.0	-
239	1120	18.1	3.9	.71	17.8	19.3	25.0	-
242	1135	20.4	3.7	.75	19.5	20.0	25.0	-
245	1130	19.6	3.8	.74	19.0	20.0	25.0	-
248	1132	19.3	3.9	.75	19.0	19.3	25.0	-
Average	1130	18.1	4.1	.73	18.2	19.7	25.0	-
251	1132	20.2	3.9	.79	19.9	20.0	-	9.0
254	1105	17.9	4.3	.76	18.7	20.0	-	9.0
257	1135	15.3	4.4	.67	16.2	20.0	-	9.0
260	1130	14.9	4.6	.68	16.2	19.3	-	9.0
263	1100	12.7	4.5	.57	13.6	20.0	-	9.0
Average	1120	16.2	4.3	.69	16.8	19.9	-	9.0

*4% fat-corrected milk.

[illegible]

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