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Corn silage is a highly palatable feed that fits well into many types of rations and feeding programs. Cattle fed rations which contain corn silage are easy to keep on feed and because of the moderate level of available energy in corn silage they perform better than cattle fed other forages. It is understood that corn silage does not contain sufficient amounts of crude protein, calcium, phosphorus and sodium chloride to meet the requirements of feedlot cattle. Thus, corn silage rations are routinely supplemented with these nutrients and few producers question the need for supplementation or the amount of nutrients that should be provided when rations that contain corn silage are fed. Of much more concern to cattle feeders is the influence of amount of corn silage on feedlot performance and economic returns. Especially since grain prices have increased and many acres have been harvested as silage due to the drought, cattle feeders have expressed an interest in feeding higher corn silage rations. However, cattle fed high corn silage rations gain slower and consequently they must be fed for longer periods than cattle fed high grain rations. This results in increased nonfeed costs. This paper will examine the influence of silage level, systems for feeding corn silage and drought-damaged corn silage on the performance and economic returns of feedlot cattle.

Influence Of Corn Silage Level On Feedlot Performance

Data from 17 university experiments that involved 878 steer calves were analyzed using regression techniques. The data were obtained from Ohio, South Dakota, Illinois, Michigan and Purdue feeders day reports. Feedlot performance at eight corn silage levels was predicted using the regression equations developed from the feeding trial data. The data which were predicted from the regression equations and economic calculations based on these data are presented in table 1.

1. Daily gain declined from 2.52 lb to 1.91 lb as silage level increased from 10 to 80% of the ration dry matter. The decline in daily gain for each 10 percentage units increase in corn silage level was greater at high silage intakes than at low corn silage intakes. For example, daily gain declined from 2.05 to 1.91 lb per day as the amount of silage was increased from 70 to 80%, but daily gain declined from 2.52 to 2.49 lb as the silage level increased from 10 to 20%.

2. Maximum dry matter intake occurred when the ration contained 40 to 50% corn silage dry matter.

3. Amounts of feed dry matter per 100 lb of gain increased 26 lb for each 10 percentage units increase in corn silage dry matter.

4. In an attempt to determine the corn price at which rations high in corn silage should be fed, the following calculations were made:

   a. Cost/ton of corn silage.

      Average corn silage contains about 50% corn grain dry matter. Thus, there are 6.7 bu of No. 2 corn per ton of silage at 68% moisture. Addition of $3 per ton to allow for added storage, handling and harvest costs results in the following equation:

      Cost/ton at 68% moisture = 6.7(X) + $3.00

      where X equals the cost per bushel of No. 2 corn grain.

   b. Value of corn silage.

      Feed efficiency and nonfeed cost data from table 1 were used to develop the following equation:

      Value/ton at 68% moisture = 9.48(X) - cost of 15.7 lb supplement DM - $1.35

      where X equals the cost per bushel of No. 2 corn grain.

      This equation was developed from amounts of corn silage, corn grain and supplement per 100 lb of gain and nonfeed costs per 100 lb for farmers that feed one lot per year when rations containing 10 or 80% corn silage were fed. If supplement is priced at $10/100 lb of dry matter, the equation becomes:

      Value/ton at 68% moisture = 9.48(X) - $1.57 - $1.35
      = 9.48(X) - $2.92

   c. The cost of corn silage was then set equal to the value of corn silage to determine the price at which the cost of corn silage equals the value of corn silage:

      6.7(X) + $3.00 = 9.48(X) - $2.92
      X = $2.13

   Thus, when corn grain costs less than $2.13 per bushel the <u>value</u> of corn silage is less than the <u>cost</u> of corn silage and farmers that feed one lot per year should feed high grain rations. Likewise, when corn grain costs more than $2.13 per bushel, high silage rations should be fed. This is illustrated by values presented in table 2.

These calculations are based on average nonfeed costs. Farmers with lower than average nonfeed costs should change from high grain to high silage rations at a corn price somewhat less than $2.13 per bushel. Also, farmers with high nonfeed costs should continue to feed high grain rations even though corn costs more than $2.13 per bushel. For example, if nonfeed costs are half those considered herein the point of change to high silage rations would be a corn grain price of $1.89 per bushel. If nonfeed costs are twice those considered herein, because of new facilities or higher than normal labor or interest costs, the point of change to high silage rations would be a corn grain price of $2.62 per bushel.

Another factor that may influence the corn grain price at which the ration should be changed from one composed largely of corn grain to one composed of large amounts of corn silage is the possibility that cattle fed high corn silage rations may need to be fed to heavier weights to grade Choice than cattle fed high grain rations. Goodrich and Meiske (1974) noted that Holstein steers fed high grain rations were fatter than steers fed high silage rations when the cattle were compared on an equal carcass weight basis. In contrast, others (Guenther et al., 1965; Berg and Butterfield, 1968; Winchester and Howe, 1955; Winchester and Ellis, 1956) have reported data which suggest that carcass composition is not greatly influenced by the energy content of the ration and that carcass weight has a greater influence on carcass composition than does age. If cattle fed high corn silage rations are fed to heavier weights, whether this is necessary or done because it is usual practice, the price of corn grain at which high corn silage rations should be fed would be considerably higher than $2.13 per bushel.

The rates of gain and feed efficiencies reported herein are based on shrunk final weights. Adjustments for differences in dressing percentages were not made because several studies did not report dressing percentage values. It is likely that cattle fed the higher corn silage rations had lower dressing percentages than cattle fed the higher grain rations. Thus, the rates of gain and feed efficiencies probably are more favorable for cattle fed the high silage rations than they should be. Dressing percentage adjustment of the data would likely result in a higher corn grain price at which the ration should be changed from high grain to high silage.

A final consideration is the influence of silage level on the date at which the cattle would be marketed. This is illustrated in table 3. The $2.13 per bushel corn price does not consider changes in market price which may occur between the time cattle fed high grain rations are marketed and the time that those fed high silage rations are marketed. If the market price were to drop $2.00 per 100 lb of live weight during the period that high grain and high silage cattle would be marketed, a ton of corn silage would need to be given an additional negative value of $3.74. This would result in a corn grain price of $3.47 at which the ration should be changed to high silage. Likewise, if the finished cattle price were to increase by $2.00 per 100 lb, corn silage would have an increased value. In this instance, the point of change from high grain to high silage rations would be $0.78 per bushel. Thus, it is obvious that one of the most important factors that influences the decision to feed high grain or high silage rations is the effect of ration on market date and the change in market price that may occur during the period when cattle fed high grain or high silage ration would be marketed.

Farmers who keep their lots full continuously should continue to feed high grain rations at higher corn grain prices than farmers who feed one lot per year. This is because nonfeed costs per animal are increased to a greater extent as silage level increases when cattle are fed continuously. Also, when gross margins are large and the profitability of cattle feeding increases, the corn grain price at which the ration should be changed from high grain to high silage increases. This is because total profit (profit per head times the number of head fed per year) will more likely be maximized by feeding more cattle (rapid turn-over rate) than by feeding fewer cattle at maximum profit per head. Thus, an indication of the corn grain price at which the ration should be changed from one based largely on grain to one based largely on silage can be stated only when one lot of cattle is fed per year.

Systems For Feeding Corn Silage

Most cattle feeders have feedlots with established animal capacities and limited corn silage storage facilities. Thus, when the corn silage facilities are filled and a given number of cattle are placed in the feedlot, the amount of corn silage that will be fed per animal has been set. The obvious question is then, what is the best system for feeding a given amount of corn silage to a given number of cattle?

The cattle could be fed a constant amount of corn silage for the entire feeding period; they could be fed a large amount during the growing phase and a small amount during the finishing phase (two-phase feeding); they could be fed a gradually decreasing amount of corn silage or they could be fed a ration with a constant corn silage:corn grain ratio (this results in a gradually increasing intake of corn silage since the cattle consume more corn silage as well as more corn grain as they get heavier). Two trials were conducted to compare these four systems for feeding equal total amounts of corn silage:

Treatment no.	Silage feeding program	Description of program
1	Constant amount	Corn silage at 15 lb/head daily during the entire 238-day feeding period.
2	Two-phase	Corn silage fed at 25 lb/head daily for the first 114 days, and at 5 lb/head daily during the last 114 days, with a 10-day period for the switch-over in the middle of the period.
3	Gradually decreasing	Corn silage fed at 25 lb/head daily for the first 2 weeks and then decreased 1.25 lb/head daily each 2 weeks during the next 15, 2-week periods. The final level of feeding was 5 lb/head daily.
4	Gradually increasing	Corn silage fed at 9 lb/head daily for the first 2 weeks and increased 0.75 lb/head daily every 2 weeks during the next 16, 2-week periods. The final level of feeding was 21 lb/head daily.

One pen of 7 head was fed each treatment in trial 1 and two pens of 7 head were fed each treatment in trial 2. In both trials the amount of corn silage was programmed to average 15 lb/head daily for a feeding period of 238 days. Thus, it was designed that each steer would consume 3570 lb of corn silage during the feeding period. During the early part of trial 2 cattle fed in the two-phase and gradually decreasing programs were unable to consume their assigned amount of corn silage. Thus, corn silage consumptions for cattle in these programs were slightly less than designed. Dry matter contents of the corn silage were 40.6% (trial 1) and 46.9% (trial 2). Feedlot data were adjusted to a dressing percentage of 61.43% to remove differences due to fill. Carcass traits were not adjusted to equal carcass weights since the program was to sell the cattle after 238 days of feeding regardless of weight.

Feedlot performance and carcass characteristics are presented in tables 4 and 5. Cattle fed corn silage in the constant amount, two-phase and gradually decreasing programs gained faster than those in the gradually increasing program. Cattle in the two-phase program were most efficient (688 lb of dry matter per 100 lb gain) in converting feed to gain, followed closely by those in the gradually decreasing program (710 lb dry matter/100 lb gain). Cattle in the constant amount program required 738 lb of dry matter/100 lb of gain and those in the gradually increasing program required 773 lb of dry matter/100 lb of gain.

Cattle fed the greatest amount of corn grain early in the feeding program (gradually increasing) had the highest marbling scores and carcass grades. These data also suggest that rations influence carcass characteristics. Cattle in the gradually increasing program had the highest marbling scores and carcass grades despite the fact that they had the lightest carcass weights.

These data suggest that cattle fed corn silage in a two-phase program will be more efficient and return more profit than cattle fed corn silage in other systems. Newland _et al_. (1972) also reported that cattle fed corn silage to 750 lb, followed by shelled corn to finishing, were more efficient (657 vs 764 lb of feed/100 lb of gain) than cattle fed corn silage plus 1% concentrates for the entire feeding period. Fox and Black (1975) have suggested three reasons why cattle fed in the two-phase program are more efficient than those fed corn silage in other systems. First, the efficiency by which the energy in the silage and grain portions of the ration is influenced by the composition of the ration. Vance _et al_. (1972) stated, "The NE_g content of corn grain decreased while that of corn silage increased as the increment of corn grain in the ration declined. The greatest change was found, however, when 61 to 83% corn grain (dry matter basis) was fed, indicating that average NE_g values may be appropriate when less than 60% corn grain dry matter is fed with corn silage and supplement. These data suggest that the NEm value of a feed remains constant with varying proportions in the ration; however the NE_g value will vary depending upon the proportion of the feed in the total ration". Byers _et al_. (1975) reported that energy values at maintenance as well as at _ad libitum_ feed intakes were influenced by corn silage:corn grain ratio.

Another reason for the improved efficiency of cattle fed in the two-phase program is the compensatory performance that results when cattle are changed from a high forage to a high grain diet. This results in more efficient use of dietary energy during the high grain phase (Fox et al., 1972).

The third explanation for the efficiency of cattle fed in the two-phase program is that average weights during the feeding period are lower when the cattle are fed for relatively slow rates of gain during the early part of the feeding period. Thus, they spend fewer days on feed when their body weights are heavy and their maintenance requirements are high. Therefore, a lower percentage of the feed consumed is required to meet maintenance requirements and more is available for gain and feed efficiencies are improved.

It therefore appears that cattle will utilize their corn silage and corn grain most efficiently if they are fed high silage rations followed by a high grain ration. The length of the high corn silage feeding period can be varied to allow for changes in the amount of corn silage that is to be fed.

Drought-Damaged Corn Silage

Because of the dry weather which has occurred in many areas of the Midwest, many acres of corn have been harvested as corn silage because of the low potential yield of grain. Naturally, producers are concerned about the nutritive value of this drought-damaged corn silage and they have asked many questions about proper supplementation of rations which contain drought-damaged corn silage.

Drought-damaged corn silage is likely to be higher in crude protein than normal corn silage. Thus, producers should have their corn silage analyzed for protein content and should feed only the amount of protein supplement which is needed to meet animal requirements. Even though less than normal amounts of protein supplement may be needed when drought-damaged corn silage is fed, data from the University of Nebraska (table 7) suggest that better performance will result if the protein supplement contains plant proteins rather than urea. Their data shows that supplementation of normal corn silage with urea greatly improved rates of gain (1.03 vs. 1.64) and amount of feed/lb of gain (11.9 vs. 8.3). Soybean meal resulted in slightly faster gains (1.81 lb/day) and improved feed efficiencies (7.7 lb DM/lb gain). When drought-damaged corn silage was fed, supplementation with urea resulted in little improvement in daily gain (1.08 lb/day for cattle fed no supplement vs. 1.18 lb/day for cattle fed urea) and only a slight reduction in the amount of feed required per pound of gain (12.4 lb for cattle fed no supplement and 11.9 lb for those fed urea). However, supplementation with soybean meal resulted in improved gains (1.47 lb/day) and efficiencies (9.8 lb/lb gain).

Krause et al. (1976) noted that utilization of the protein in corn silage may depend on the form in which it exists in the corn plant. The protein in the stalk and leaves may be more soluble than the protein in corn grain. Thus, being more soluble, it would be more completely degraded to ammonia in the rumen than protein from corn grain. Because of the large percentage of protein in drought-damaged corn which is in the stalk and leaves and because of the large amount of ammonia produced in the rumen from this protein, the feeding of supplements which contain large amounts of urea may result in poorer performance than the feeding of soybean meal.

Drought-damaged corn silage may contain greater than normal amounts of nitrates. Thus, toxic silo gases are often observed at silo filling time when drought silage is harvested (the toxic nitrogen oxide gases are produced from nitrates). Since nitrate levels may be high, producers should have a nitrate analysis conducted on their drought corn silage.

Shown in tables 6 and 7 are the results of three comparisons of normal and drought corn silages. Tolman and Woods (1971) summarized the data in table 6 by stating, "Performance of the cattle was comparable between silage sources. It appears that effective use can be made of drought-damaged corn silage. The large reduction in value appears to be in reduced tonnage per acre and increased harvesting cost per ton instead of reduced feeding value per unit of dry matter. The extensiveness of drought damage will probably modify the relationship to "good" corn silage".

The data in table 7 show a lower feeding value for drought corn silage than the data in table 6. Comparison of the performances of cattle fed the two corn silages supplemented with soybean meal shows that those fed drought corn silage gained 19% slower and required 27% more dry matter per pound of gain than those fed normal (irrigated) corn silage. This drought corn silage was harvested after about 60 days without rain and it contained about 10 bu of grain per acre. Thus, it appears that the value of drought corn silage may depend on the length and severity of the dry period. However, harvesting drought-damaged acres as silage results in partial salvage of the crop. Drought-stressed corn silage will likely have 75 to 95% of the value of normal corn silage. Even though it has a lower energy value than normal silage, drought-stressed corn silage can be used effectively in rations for growing and finishing cattle.

Corn Plant Maturity

In the northern part of the corn belt a killing frost often occurs before corn plants are fully mature. When such a frost occurs, questions arise as to the nutritive value of the silage which results from the frost-killed corn plants. If frost-killed corn plants are harvested for silage before the leaves are lost, the silage should be similar to that from non-frosted corn harvested at the same stage of maturity (a factor which may lower the value of frosted corn plants is the likelihood of high levels of nitrates). Thus, presented in this section are the results of a study which was conducted at Ohio State University (Johnson and McClure, 1968) to determine the value of corn silage which was produced by corn plants at various stages of maturity.

Maximum yields of corn silage dry matter were obtained from corn at the dent to glaze stages of kernel maturity. Maximum dry matter digestibilities were observed when the corn plants were harvested at milk-early dough to dough-dent stages of maturity (table 8). However, the decline in dry matter digestibility was not large (71.9% for dough-dent, 68.1% for glaze, 68.8% for flint and 69.0% for post-frost). Crude protein digestibility was maximum at the milk-early dough stage of maturity (77.5%) and declined as maturity advanced. Voluntary intake of dry matter increased from the blister to glaze stages of maturity, then declined at the flint and post-frost stages of maturity. The low dry matter contents of the immature silages no doubt contributed to the low intakes of these silages. Maximum dry matter intake occurred at the glaze stage when the silages contained 33.5 to 33.9% dry matter. This is probably near the optimum dry matter content of corn silage. Since maximum dry matter yields were obtained at dent to glaze stages of maturity and since maximum dry matter digestibility and intake were at or near these stages of maturity, it appears that corn silage should normally be harvested at these stages of maturity. The corn plants contained 27.5 to 33.9% dry matter at these stages (table 8).

In summary, when a killing frost stops the growth of corn plants at an immature stage of kernel development dry matter yields are reduced and dry matter intakes of the high moisture (low dry matter content) corn silages will be lower than normal. However, dry matter and crude protein digestibilities may be higher than the digestibilities for more mature corn silage. Thus, frosted corn should be allowed to field dry to 65 to 70% moisture (30 to 35% dry matter) before it is harvested for silage. This should improve dry matter intakes and the greatest effect of the frost would be to reduce dry matter yields.

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Table 1. Performance of Steer Calves Fed Various Levels of Corn Silage: A Summary of 17 University Experiments.

Item	Percent corn silage dry matter in the ration dry matter							
	10	20	30	40	50	60	70	80
Avg. daily gain, lb	2.52	2.49	2.43	2.36	2.28	2.17	2.05	1.91
Avg. daily feed, lb of dry matter								
Corn grain	12.9	11.7	10.3	8.8	7.2	5.5	3.8	2.1
Corn silage	1.5	3.1	4.8	6.4	8.1	9.6	10.9	12.1
Supplement	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
TOTAL	15.3	15.7	16.0	16.1	16.2	16.0	15.6	15.1
Daily silage intake at 32% DM, lb	4.7	9.7	15.0	20.0	25.3	30.0	34.1	37.8
Feed/100 lb gain, lb of dry matter								
Corn grain	512	470	424	373	316	253	185	110
Corn silage	61	126	197	274	355	442	533	631
Supplement	33	36	37	37	39	41	44	47
TOTAL	606	632	658	684	710	736	762	788
Feed/600 lb of gain, lb of dry matter								
Corn grain	3072	2820	2544	2238	1896	1518	1110	660
Corn silage	366	756	1182	1644	2130	2652	3198	3786
Supplement	198	216	222	222	234	246	264	282
TOTAL	3636	3792	3948	4104	4260	4416	4572	4728
Days for 600 lb gain	238	241	247	254	263	276	293	314
Nonfeed costs/head for 600 lb of gain, $								
One lot/year[a]	48.01	48.30	48.86	49.53	50.38	51.62	53.24	55.23
Continuous feeding[b]	42.89	43.29	44.10	45.04	46.24	47.98	50.26	53.08

[a] Average nonfeed costs for farmers that feed one lot of cattle per year calculated to be $25.40 plus $0.095 per day.

[b] Average nonfeed costs for farmers that keep their lots full at all times calculated to be $11.00 plus $0.134 per day.

Table 2. Cost and Value of Corn Silage.

Cost of corn grain, $/bu.	Cost of corn silage, $/ton	Value of corn silage, $/ton
1.00	9.70	6.56
1.50	13.05	11.30
2.00	16.40	16.04
2.50	19.75	20.78
3.00	23.10	25.52
3.50	26.45	30.26
4.00	29.80	35.00

Table 3. Influence of Silage Level on Marketing Date.

Corn silage level, % of ration dry matter	Marketing date[a]
10	July 14
20	July 16
30	July 23
40	July 30
50	August 8
60	August 24
70	September 7
80	September 28

Table 4. Two Year Summary of Performance Data of Finishing Steers Fed Rations Containing Corn Silage in Four Different Feeding Proframs.[f]

Item Treatment No.	Silage feeding program: Constant amount 1	Two-phase 2	Gradually decreasing 3	Gradually increasing 4
No. steers	20	21	20	21
Avg initial wt, lb[a]	469	465	471	469
Avg final wt, lb[b]	1047	1045	1042	1013
Avg daily gain, lb[c]	2.43	2.44	2.40	2.29
Avg daily feed, lb[d]				
Corn silage	14.94(6.68)[g]	14.60(6.53)	14.64(6.55)	15.00(6.72)
Shelled corn	11.66(10.35)	10.54(9.35)	10.76(9.54)	11.37(10.07)
Supplement	1.00(0.90)	1.00(0.90)	1.00(0.90)	1.00(0.90)
TOTAL	27.60(17.93)	26.14(16.78)	26.40(16.99)	27.37(17.69)
Feed/100 lb gain, lb[e]				
Corn silage	615 (275)	598 (268)	610 (274)	655 (293)
Shelled corn	480 (426)	432 (383)	448 (398)	497 (440)
Supplement	41 (37)	41 (37)	42 (38)	44 (40)
TOTAL	1136 (738)	1071 (688)	1100 (710)	1196 (773)

[a]Shrunk weight.
[b]Calculated from hot carcass weights and a dressing percentage of 61.43.
[c]Significant differences: cattle in treatments 1, 2 and 3 gained faster than those in treatment 4 ($P<.05$).
[d]Significant differences: cattle in treatment 1 consumed more feed than those in treatments 2 or 3 ($P<.01$); cattle in treatment 4 consumed more feed than those in treatment 2 ($P<.01$) or those in treatment 3 ($P<.05$).
[e]Cattle in treatment 4 required more feed/100 lb gain than those in treatment 2 ($P<.01$) or those in treatment 3 ($P<.05$); cattle in treatment 1 required more feed/100 lb gain than those in treatment 2 ($P<.05$).
[f]Dexheimer _et al_. (1971).
[g]Values in parenthesis are dry matter.

Table 5. Two Year Summary of Carcass Data of Finishing Steers Fed Rations Containing Corn Silage in Four Different Feeding Programs.[g]

	Silage feeding program			
Item Treatment No.	Constant amount 1	Two-phase 2	Gradually decreasing 3	Gradually increasing 4
Carcass wt, lb	643	642	640	623
Fat depth, in	0.66	0.63	0.71	0.63
Rib eye area, sq in	11.3	11.3	11.5	11.2
KHP, %[a]	3.10	3.10	3.09	3.04
Marbling score[b,c]	5.56	5.73	5.36	6.25
Conformation score[d]	13.4	13.8	13.7	13.3
Carcass grade[d,e]	12.3	12.4	11.8	13.0
Cutability[f]	48.4	48.6	48.4	48.7

[a]Kidney, heart and pelvic fat expressed as a percent of carcass weight.
[b]Marbling score: 5, small; 6, modest; 7, moderate.
[c]Significant differences: cattle in treatment 4 had a higher marbling score than cattle in treatment 3 ($P<.01$) or treatment 1 ($P<.05$).
[d]Conformation scores and carcass grades: 10, average good; 11, high good; 12, low choice; 13, average choice.
[e]Significant differences: cattle in treatment 4 graded higher than cattle in treatment 3 ($P<.01$).
[f]Calculated by the equation: percent of boneless retail cuts from trimmed chuck, rib, loin and round = 51.34 - (0.0093) (carcass wt, lb) - (0.462) (%KHP) - (5.78) (fat depth, in) + (0.74) (rib eye area, sq in).
[g]Dexheimer _et al_. (1971).

Table 6. Comparison of Drought-Damaged and Normal Corn Silages.[a]

Item	Drought silage: No corn	Drought silage: 6 lb corn/head daily	Normal silage: No corn	Normal silage: 6 lb corn/head daily
No. of steers				
1968-69[b]	24	24	24	24
1969[c]	20	20	20	20
TOTAL	44	44	44	44
Daily gain, lb				
1968-69[b]	1.52	1.70	1.46	1.87
1969[c]	2.24	3.01	2.65	2.80
Average	1.88	2.36	2.06	2.34
Feed/lb gain, lb of dry matter				
1968-69[b]	10.3	10.1	11.2	10.0
1969[c]	7.8	6.3	7.0	6.6
Average	9.0	8.2	9.1	8.3

[a]Tolman and Woods (1971).
[b]Calves fed 91 days.
[c]Light yearlings fed 63 days.

Table 7. Comparison of Drought-Damaged and Normal Corn Silages.[a]

Item	Drought silage: No protein	Drought silage: Urea	Drought silage: Soybean meal	Normal silage: No protein	Normal silage: Urea	Normal silage: Soybean meal
No. of steers[b]	28	28	28	9	9	9
Initial wt., lb	420	424	425	412	399	400
Daily gain, lb	1.08	1.18	1.47	1.03	1.64	1.81
Feed intake, lb of DM	13.2	14.0	14.4	12.3	13.6	13.9
Feed/lb gain, lb of DM	12.4	11.9	9.8	11.9	8.3	7.7

[a]Krause *et al.* (1976).
[b]Calves fed 190 days.

Table 8. Influence of Stage of Maturity of Corn Silage on Composition, Digestibility and Intake.[a]

Stage of maturity	Dry matter, %		Crude protein, %[b]		Dry matter digestibility, %		Crude protein digestibility, %		Voluntary intake, g DM/$W^{.75}$	
	1964	1965	1964	1965	1964	1965	1964	1965	1964	1965
Blister	20.9	21.3	12.0	11.4	65.3	71.0	74.7	76.7	42.9	51.0
Early milk	19.9	22.1	12.1	11.9	66.7	67.9	75.9	75.6	42.6	49.4
Milk-early dough	21.9	24.9	10.8	12.3	69.5	72.6	77.6	77.4	54.1	52.7
Dough-dent	27.5	27.9	10.4	11.4	71.9	71.9	76.3	75.6	55.6	59.3
Glaze	33.5	33.9	9.4	11.0	67.8	68.4	69.1	68.0	58.9	61.9
Flint	45.4	38.4	9.0	11.0	71.0	66.6	66.9	67.2	54.1	58.8
Post-frost	49.5[c]	46.7	8.7	10.5	69.8	68.2	64.8	66.3	54.0	52.4
Mature	----	71.7	----	10.9	----	68.6	----	59.4	----	52.7

[a]Johnson and McClure (1968).
[b]Dry matter basis.
[c]Water added at ensiling time.