UNIVERSITY OF IDAHO
College of Agriculture

Field Corn Production In Idaho

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Recommendations

1. Select a variety adapted for best maturity in your area.
2. Plant as early as possible. For the best production of mature silage or grain this should be approximately May 15 or before.
3. For best production, soil should be in good tilth and fertile. Under most conditions 80-120 pounds of available N per acre will produce satisfactory yields.
4. Maintain adequate soil moisture, especially at tasseling time and during ear development.
5. Harvest at the proper time. Corn for silage should be harvested at the stage when the kernels are firm and free of fluid upon crushing with the finger nail. Or, silage should be harvested immediately after first fall frost, which ever comes earliest.
6. Good ear corn must have well-matured ears with 20 percent or less grain moisture that shell readily. In most areas, harvest can be delayed until late fall or early winter.

COVER PHOTO — Part of the 1954 hybrid corn variety test at the Aberdeen Branch Station. Inspecting the corn is R. D. Ensign, at that time Aberdeen Branch Superintendent. The test included 35 different varieties of corn being grown for silage. Hybrid in the foreground is Wisconsin 313, a late maturing variety. This picture was taken on August 20.

Field Corn Production in Idaho

EDWARD W. OWENS and RONALD D. ENSIGN[1]

The main areas of field corn production in Idaho are along the Snake River Valley from Twin Falls down the river to Weiser. These areas contain the fertile soils of the Magic, Boise (Treasure) and Payette Valleys where there is ample irrigation water and a frost-free growing season long enough to produce both ear corn and high-quality silage. The important factors for satisfactory corn production largely involve the selection and early planting of adapted varieties.

Corn is grown mainly for silage in the Magic Valley and up the Snake River as far north as St. Anthony. This city is approximately 4,800 feet above sea level and has an average frost-free growing season of 98-100 days. Although these higher and cooler areas are marginal for satisfactory silage production, one grower near St. Anthony has produced and used corn silage in his feeding program for a number of years.

Good quality corn is in constant demand for beef, dairy, poultry and some sheep rations. Livestock feeders of the state have shown considerable interest in corn silage. The crop fits well in most rotation and farming plans and at the same time provides desirable roughage. Many ranchers appreciate the value of good corn silage. Thus they are not forced to depend upon alfalfa as their sole forage.

Considerable grain corn for livestock and poultry rations is shipped into the state each year. In 1958, Idaho imported more than 500 carloads of corn for that purpose. By the use of well-adapted varieties, more Idaho farmers are supplying some of this demand for high-quality grain.

The production of field corn for grain and silage has increased considerably in Idaho during the past several years. Approximately two-thirds of the total acreage of corn grown has been for silage. Table 1 gives the past 10-year (1949-59) corn acreage, yields per acre, and total production of corn harvested as grain and as silage. Statistics in this table exclude sweet corn grown for seed.

The yields per harvested acre as reported in Table 1 are statewide averages. These statistics show trends for increased yields of both grain and silage. Since these yields are statewide averages higher individual farm yields can be obtained with proper manage-

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Table 1.—Production of corn in Idaho for years 1949-58.*

Year	Acres harvested (1000)	Yield per harvested acre Bu.	Production (1000 Bu.)	Acres harvested (1000)	Yield per harvested acre (ton)	Production (1000 tons)
1949	13	54.5	708	12	11.7	140
50	12	53.5	642	12	11.5	138
51	12	55.5	666	14	12.0	168
52	12	58.0	696	24	12.5	300
53	13	55.5	722	26	13.5	351
1954	14	61.0	854	29	13.9	403
55	15	62.0	930	39	15.5	604
56	15	66.0	990	43	16.0	688
57	20	71.0	1,420	39	16.5	644
58	22	68.0	1,496	39	16.0	624

* Source: Crop Reporting Service, Boise, Idaho.

During the past 10 years acreage harvested for grain has increased about 40 percent and total production has more than doubled. In the 1958 harvest season, 22,000 acres averaged 68 bushels per acre. The acreage harvested for silage has more than tripled and total tons produced has increased about four and one-half times. Thirty-nine thousand harvested acres averaged 16 tons of silage per acre in the 1959 crop year.

ment. Yields of more than 110 bushels of shelled grain and 25 tons of good quality silage are not unreasonable expectations.

Successful corn production in Idaho involve several factors. These are discussed in some detail in this bulletin.

Selection of Varieties

The major climatic factor influencing the growth of corn in Idaho is the average daily temperature during the growing season. Corn grows very little at temperatures below 50° F. Because of the relatively cool nights, the average daily temperatures in Idaho are considerably lower than those in the major corn producing areas of the mid-western states. For this reason, the days-to-maturity system of rating corn is of little or no value in Idaho. In general, corn may be grown in Idaho in areas where the daily mean temperature (average of daily maximum and minimum temperatures) for the month of July is approximately 70° F. or higher.

For the purpose of recommending varieties in the proper maturity classifications, three general climatic zones have been considered. These zones are classified in accordance to length of growing season as well as the accumulated temperature during the growing seasons. The general location of these zones is shown in Figure 1. Factors such as elevation and tendencies of soils to warm quickly in the spring or to remain cold longer influence the response of corn to the season in each specific zone.

Table 2 gives a list of recommended varieties which have been tested in Idaho and the uses to which they appear to be best adapted. Table 3 shows their relation in terms of relative maturity.

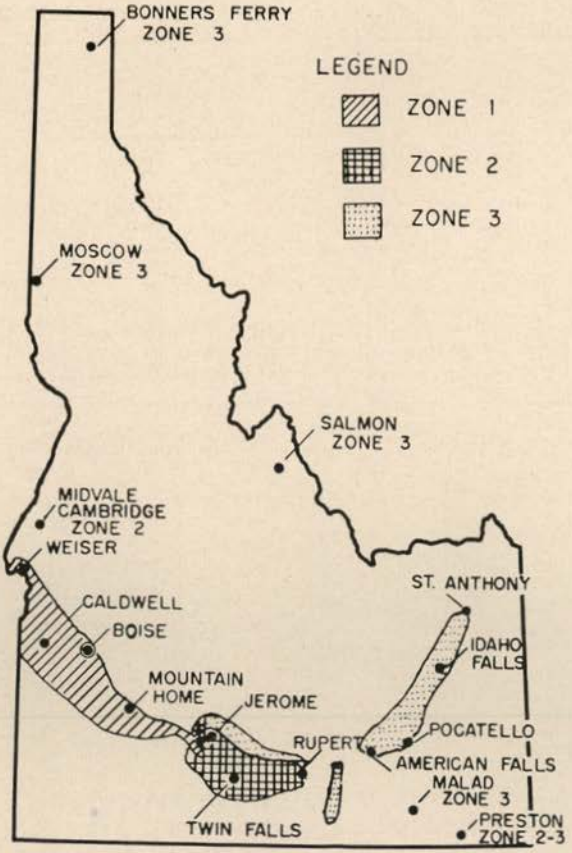

Fig. 1. Areas of adaptation for corn production in Idaho.

Since the hybrid seed corn industry is highly competitive and since there is a tendency for corn hybrids to show considerable local differences in response, recommendations on the basis of yields cannot be made accurately. In selecting a variety for use in Idaho, relative maturity should be the primary consideration. In corn grown for silage, observation of yields without taking maturity into consideration can be very misleading. In silage, only the solids, fats and oils are feedstuff—water is not. Figure 2 compares a late variety with an adapted variety under conditions of Zone 3. Note that in the case of the earliest planting date, the later maturing variety produced four-tenths of a ton more dry matter, but that in order to haul this small increment of yield to the silo, an extra five tons of water must also be hauled. Figure 3 shows an even later variety compared with the same adapted variety. It increased

the yield only in terms of more water content; yield of ears and thus the grain value was sharply reduced.

In production of silage as well as grain corn, sound, well-filled ears are of primary concern as a varietal criterion. Ears in silage of proper maturity will contribute more of the total dry weight than will any other part of the plant.

When recommended grain corn varieties are properly planted, research data indicate these varieties will produce grain as good in quality to corn grown in the mid-west. These recommended varie-

Table 2.—Recommended field corn hybrids listed according to brand numbers which are suitable for silage and grain production in the three corn growing zones of Idaho.

	Zone		
	1	2	3
Silage Hybrids			
Idahybrid	544, 680	216, 330, 544	216
Kingscrost	KT6	KS5, KS6	KE1
Western	110, 112	90, 101	85
DeKalb	252, 253	46, 58, 67	30
Pfister	234	62	28
Grain Hybrids			
Idahybrid	216, 544	216	—
Kingscrost	KS5, KS6	KE1	KN2*
Western	90, 101	85	—
DeKalb	67, 252	40	—
Pfister	62, 234	28	—
Oscar Will	——	—	A.E.S. 101*

* Will make grain in warmer areas of Zone 3, 80-90 bushels shelled grain probable maximum yield.

ties are listed in Table 2. Results of tests plots at the Parma Branch Experiment Station show that varieties reach the desired maturity for grain when the shelled grain have less than 20 percent moisture by early November harvest. These varieties usually have grain with the maximum (60 pounds) test weight. Varieties which produce grain with more than 20 percent moisture at harvest and have a test weight of less than 55-60 pounds are considered less well adapted. They have had their growth processes stopped by cool weather. For grain with maximum feeding value the farmer, therefore, must plant the best adapted variety early enough in the spring so that the grain of the ears will be fully developed with 20 percent or less moisture by early November harvest.

Table 3.—Relative maturity values of corn hybrids tested in Idaho. Position left to right shows relative maturity as compared to similar and competitive hybrids.

Agency	Very Early		Early	Medium						Late				Very Late	
DeKalb		30		40	46	56	58	59	67	251	252	253			
Idahybrid			216					330		544	680				
Keystone							No.3	No.5		No.6				44	38
Kingscrost	KN2		KE1			KS5		KS6				KT6			
Kitely							K5	K15							
Minnesota Agr. Exp. Sta.	AES 101	AES 203													
Oregon Agr. Exp. Sta.				325		252		150							
Pfister			28	44		55		58	62	234					
Western			85					90		101	112				

Planting Date

In Idaho it is important to plant corn early in the spring. This planting date is very important for production of grain or for the production of silage in the short-season areas. Planting dates by areas will vary but it is recommended that corn be planted during the first two weeks of May in most sections of Idaho. In the warmer areas of the state, where corn is grown for grain, it is probably safe to say that "a day in the spring is worth two in the fall for

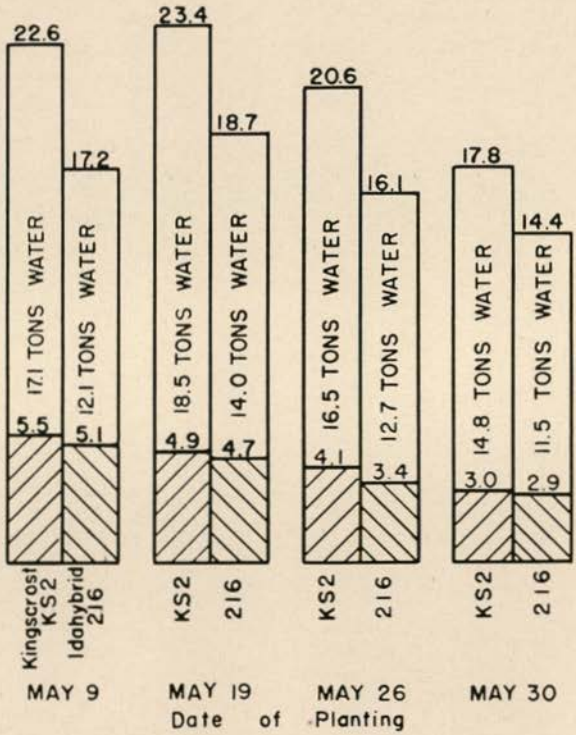

Fig. 2. Yields in tons per acre of two corn hybrids as influenced by relative varietal maturity and date of planting at Aberdeen in 1958. The shaded portion of each column represents yield of dry matter.

making good quality mature grain." In the shorter season areas, date of planting may have a profound influence on the quality and yields of silage.

Figure 2 shows the effect of planting dates on the yields of dry matter in corn silage at the Aberdeen Branch Experiment Station, located in Zone 3. The earliest planting date, May 9, was about 10 days before the last frost date and in some years corn would stand

some chance of being frosted after emergence. The increased yields, however, probably more than justify the risk. Furthermore, the chances are that late spring frosts will have no more effect than slightly delayed growth, since the growing point does not reach the surface of the ground until the plant is between 8 and 12 inches tall. Corn will continue to grow unless the ground is frozen, which seldom occurs in late spring frosts.

The main factor in advancing the planting date is seed treatment. Most corn seed sold in Idaho is treated with one or more fungicides and an insecticide before being placed on the market. Without treatment, seed is highly susceptible to attack by various decay organisms and insects. Planting untreated seed in the cold soil normally encountered with early planting dates may result in poor stands. In areas of Zone 1 and Zone 2, earlier planting will permit the grower to use varieties of later maturity and higher potential yield. Should the planting date be considerably delayed it would profit the grower to switch to a variety of earlier maturity.

In summation, the date of planting for best yield and maturity should be about a week to 10 days in advance of the last frost date. In most areas of the state this would be not later than May 15 in Zones 2 and 3, and May 1 to May 10 in Zone 1. In many situations it might be profitable to gamble on an earlier date, particularly in areas of light soil and where late spring frosts are light.

Planting Rate

Studies of the influence of planting rates on silage yields, have been conducted for five seasons at the Aberdeen Branch Experiment Station and data on grain yields have been taken for two seasons at the Parma Branch Experiment Station. Rates of planting have varied from 14,500 to 34,800 plants per acre.

Yields of silage are directly influenced by planting rates. Figure 3 shows the effect of three rates of planting on two corn hybrids. Note that while the later variety still shows an increase yield, there is almost no increase in that portion of the total yield attributable to ears. The earlier variety shows an increase in percentage of dry matter contributed by the ears commensurate with the total yield increase. Figure 4 shows the effect of planting rate on grain production in the case of two maturity extremes. It is apparent that the earlier hybrid shows the greatest response to high planting rates with the later variety showing no real response over the 22,000 plants per acre rate.

For silage or grain production, optimum planting rates for late varieties are in the neighborhood of 20,000 to 22,000 plants per acre (8-to-9-inch spacing between plants in 36-inch rows). For earlier

varieties plant approximately 25,000 to 28,000 plants per acre. The best yields of good mature grain can be expected by planting earlier-maturing varieties at plant spacings of one stalk every 8-9 inches within 36-inch rows or that equivalent.

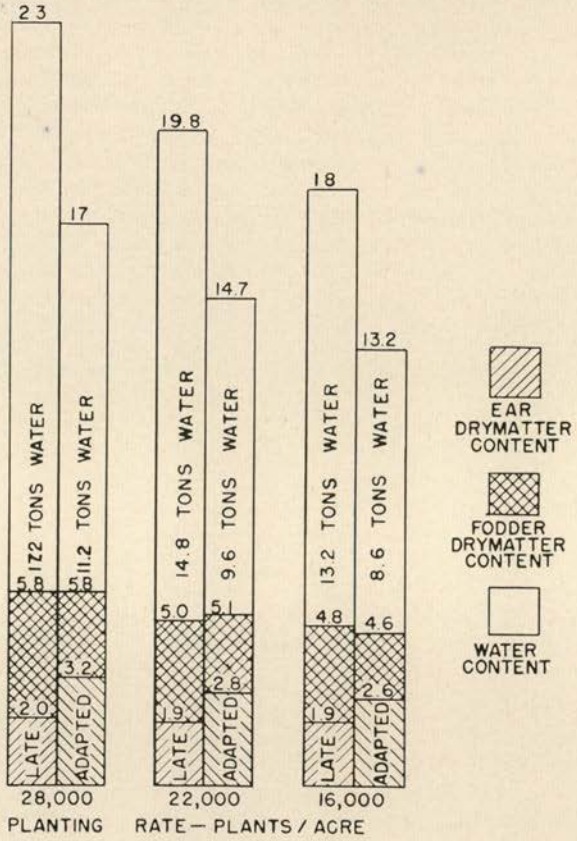

Fig. 3. The influence of planting rate on ensilage and ear corn yields in tons per acre of two corn hybrids, one late, the other adapted to the area. Grown at Aberdeen, Idaho in 1958.

Fertilizer Requirements, Rotations and Weed Control

Under Idaho conditions, available nitrogen is most likely to be the principal fertilizer required. If soil tests or crop responses tend to indicate phosphate shortages, phosphate should be added. Basic recommendations for nitrogen fertilization are: 120 pounds of actual nitrogen per acre for Zone 1; 100 pounds of actual nitrogen per

acre for Zone 2; and 80 pounds of actual nitrogen per acre for Zone 3. Applications of approximately 45 pounds of P_2O_5 (100 pounds treble superphosphate) per acre should satisfy requirements of corn where phosphate shortage is indicated.

Nitrogen need depends upon prior cropping history. For example, corn following grain may require more than the normal recommendation to compensate for the nitrogen tied up by the decomposition of straw stubble. Following heavily fertilized crops, such as potatoes, the grower may reduce the requirement because of residual nitrogen from the previous crop. There is less danger of damaging the corn crop by excess nitrogen than by deficiency. Nitrogen deficiency during the silking and grain development period can greatly reduce yields—both of grain and silage. When in doubt

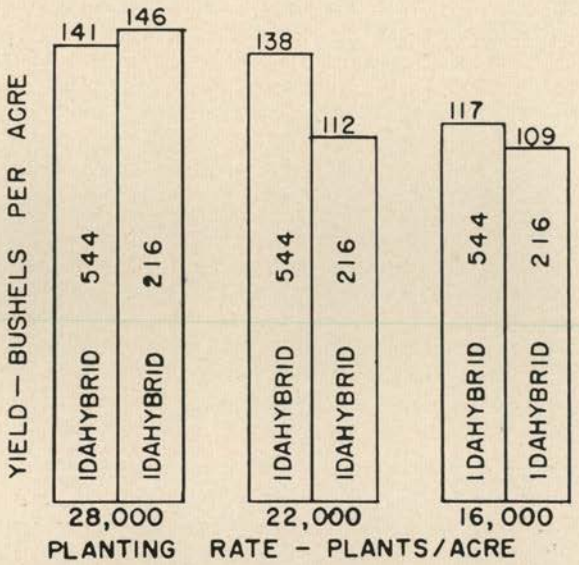

Fig. 4. The influence of planting rate on the yields of two corn hybrids in Parma, Idaho during the 1958 season. Idahybrid 544 is a standard variety grown in the area. Idahybrid 216 is a very early variety. Yields are given in bushels of shelled corn per acre at 15.5 percent moisture.

use liberal nitrogen fertilizer applications. The most characteristic plant symptom of nitrogen deficiency in corn is "firing" or dying of the lower leaves, starting with the lowest leaves and progressing upward. Usually by the time this is observed, however, it is too late for corrective action.

Normal weed control practices in corn involve spiketooth harrowing after emergence and one or two cultivations up to time

plants are about 24 inches high. This practice will usually be sufficient for good weed control. When perennial noxious weeds become a poblem, 2, 4-D may be used. Since there is considerable differences among various hybrids in their sensitivity to 2,4-D it is advisable to use relatively low rates (½ to 1 pound actual 2,4-D acid equivalent per acre) and to direct the spray in such a manner as to minimize the amount of the mixture actually coming in contact with the corn plants. Using low volatile ester or heavy ester forms will also reduce the risk of 2,4-D injury.

Irrigation

Irrigation requirements for corn may vary rather widely depending upon soil type and season. At the Aberdeen Branch Station it has been possible to grow a satisfactory silage crop with only two irrigations during the season, providing there was good soil moisture at planting time. Corn grown in the lower and warmer valleys of Idaho will require more irrigation. Excessive irrigation at Aberdeen has resulted in "firing" or dying of the lower leaves, presumably due to the leaching of nitrogen from the soil. Excessive irrigation, therefore, means one will need excessive amounts of nitrogen fertilizer.

The most critical time for irrigation is during the time from tasseling until the grain has reached the soft dough state. Water deficiency during this period may result in poor seed set and development, thus reducing yields. Water deficiency is noticed by rolling of the leaves and tassel "firing" followed by "firing" of the upper leaves. Such observable signs will result in a reduction in forage yield.

It is essential that irrigations be timed so that the soil is always moist. Allowing the soil to become too dry during maturation of the ear may result in increased stalk breakage. According to work done recently in the State of Washington[2] maintenance of soil moisture during the period of maturation had no influence on grain moisture but did reduce losses of grain due to stalk breakage. Recent trials by the University of Idaho revealed that when dates of last irrigation varied from August 12 to September 9, time of irrigation had no apparent influence on the moisture content of silage harvested.[3] Soil moisture during the period of maturation does not influence relative maturity but is necessary to prevent excessive desiccation and to effect normal maturation.

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[2] Nelson, C. E. Lodging of Field Corn as effected by Cultivation, Plant Population, Nitrogen, Fertilizer and Irrigation Treatment at the Irrigation Experiment Station, Prosser, Washington. Production Research Report No. 16 A.R.S., U.S.D.A. 1958.

[3] McMasters, G. L. Irrigation of field corn in Eastern Idaho. Unpublished data.

Fig. 5. An ear of field corn showing degree of denting which in most but not all hybrids is associated with optimum maturity fer ensiling. Note the foliage in background still appears succulent.

Harvesting

The harvesting of corn is most critical when it is grown for silage. For best silage, corn should be harvested as it approaches 70 percent moisture. This moisture level can be expected when the grain has reached the early dent to dent stage. The dented appearence of the grain is, however, an unreliable criteria.

It has been observed in corn tests in Idaho that some varieties will be well dented at about 80 percent moisture, while the actual

maturity condition of the grain is just past the milk stage. A better criterion is to break the grain open with the thumb nail and observe the interior condition of the kernel. When the kernel reaches a condition where the endosperm has a wet grainy texture, will crumble easily under pressure of the thumb nail and will show little free fluid, then the plant will be approaching 70 percent total moisture. Figure 5 shows a typical ear at about this stage of maturity.

With many hybrids, a secondary criterion for maturity is to examine the condition of the husk. At 70 percent moisture there will be a few (1 to 5 percent by count) ears in the field beginning to show browning of the husk. Under conditions where adequate nitrogen and water is available, there is little change in the moisture content of the fodder as the corn approaches proper maturity for silage. Most of the increase in dry matter occurs within the ear and in the grain.

Cutting the corn for silage before the proper maturity stage results in an inferior silage because of higher moisture content. In Idaho, well matured silage will have an excess of 50 percent of the total dry weight in the ears alone. The dry matter portion of corn is the sole source of feed value.

Corn should not be harvested for silage if the moisture content exceeds 72 percent of total weight. Corn, however, has a great moisture range at which it may be successfully ensiled. Palatable silage can be made of corn in the moisture range of 80 to 60 percent. At the lower moisture percentages more careful packing will be required to prevent spoilage. At the higher moisture contents the silage will tend to be sour and less palatable. The proportion of grain in the silage will lessen very rapidly when moisture content is in excess of 75 percent.

In the shorter season areas of Zone 3 climate it is advantageous to harvest as close to the first fall frost as possible and in many instances when the silage lacks desired maturity. Frost may improve the ensilage quality slightly by reducing the moisture content of the silage. It is, however, desirable to harvest within 48 hours after the frost.

The harvest time for grain is less critical than indicated for silage. It is desirable to harvest grain at the minimum moisture content. The corn may be harvested for cribbing with a fair margin of safety provided the grain moisture content is not more than 25 percent.

For harvesting as shelled grain the corn should not have more than 16-20 percent moisture unless drying facilities are available. Because of the critical moisture content for storing grain the need for drying facilities should be considered. The University of Idaho has considerable information on corn drying requirements for Idaho.

Moisture content at harvest time is highly contingent upon the variety planted, time of planting and the season. Ear corn harvest, if necessary, may be delayed until a convenient time in late fall or early winter. As time progresses, however, there is more tendency for ears to drop and stalks to lodge which may reduce the harvested yield. Corn stalks standing in the field will lose moisture at a fairly progressive rate. Under average conditions corn harvested in November will be much drier than if harvested in mid October.

Feeding Value

Numerous studies in Idaho and elsewhere have demonstrated the value of high-quality corn silage for livestock. With certain recommended beef cattle rations, high-quality corn silage has proven to be an efficient source of total digestible nutrients. The total digestible nutrient content of good corn silage will be about 18 to 19 percent, whereas good alfalfa hay has about 50 percent total digestible nutrients. Good corn silage in some rations has proven to be a more efficient cattle feed on a dry matter basis than has alfalfa hay. A ton of high-quality corn silage crop will produce about 9,000 pounds of total digestible nutrients per acre whereas a 6 ton per acre crop of alfalfa hay will produce about 6,000 pounds of TDN per acre.

It should be pointed out, however, that corn silage supplements and does not replace alfalfa hay in a beef feeding program. Good alfalfa hay is a source of protein in a feeding program and should always be included as a part of the feeding ration. Some livestock feeders favor a ration which includes corn silage because it is observed that there is less frequent bloat and similar gastric disturbances.

Corn as grain is a valuable ingredient in cattle or poultry rations. Corn grain is considered a top feed grain. Where corn grain is in demand, Idaho corn producers can produce high quality well developed ear corn by planting adapted varieties.