Adapted Corn Is Best For Silage Or Grain

By William Wiidakas[1]

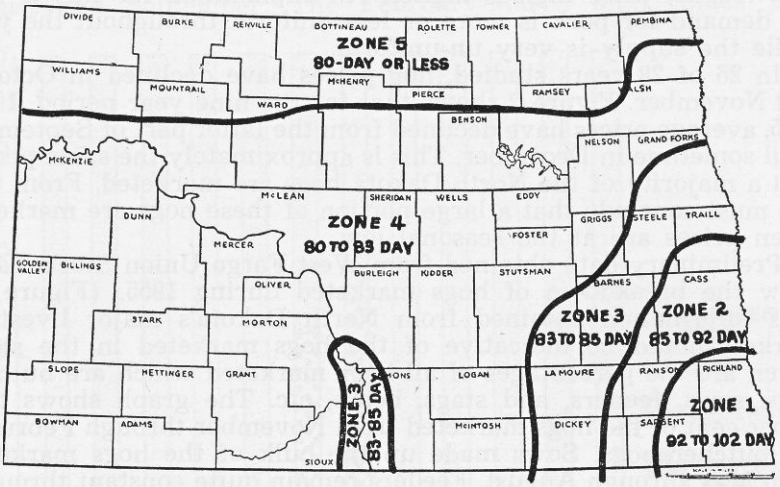

FIG. 1. - CORN MATURITY ZONES OF NORTH DAKOTA

This publication is a supplement to "Grow More Corn" in the Bimonthly Bulletin, Vol. 16, No. 4, 1954. Since that publication a large number of new hybrids has been tested in several areas of North Dakota. The seed of four new early maturing corn hybrids, Nodakhybrid 306, 305, AE101 (BC1210) and Morden 77, are now produced in adequate quantities and replace Nodakhybrid 203, 201, and 304. These new hybrids have been tested for grain yield from three to six years in several areas. The silage yields for the past two years also were obtained. The performance of new corn hybrids, developed by this experiment station, are here compared with the older standard hybrids and varieties. The foundation seed of four other new hybrids are now increased and will be released as soon as the hybrid seed is available through commercial channels. The commercial seedsmen's hybrids, together with the standard hybrids, were tested for grain yield in four maturity zones and are published yearly in the Hybrid Corn Field Trial Report.

More Corn Used for Silage

A notable change has been taking place in recent years in the use of North Dakota's corn crop. An ever-increasing portion of the corn is being put up as silage instead of fed as dry fodder. The U. S. Department of Agriculture's marketing service report for North Dakota in December, 1955, states that in the 10 year (1944-53)

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average, 19 per cent of North Dakota's corn crop was put into silos, 44 per cent was fed as dry fodder and 37 per cent harvested for grain. In 1955, the same source says, 38 per cent of the 1,396,000 North Dakota corn acres was harvested for silage, 25 per cent was used as dry fodder or pasture and 37 per cent was harvested for grain. This increase in harvesting for silage was brought about by several factors—wide use of the field forage chopper, inexpensive trench and temporary silos, more knowledge about this nutritious and good quality feed, and the "insurance" value of feed which has good storing qualities for several years if properly ensiled and cared for.

Although corn for silage is the principal objective in the western and northern parts of North Dakota, early maturing hybrids have matured and produced satisfactory yields of grain.

Corn Grain Production Profitable

Corn is grown for grain mainly in the eastern half of the state where growing conditions are more favorable. Many good hybrids of 83 to 100 day relative maturity have performed satisfactorily in eastern North Dakota. The increased availability of the seed of very early maturing hybrids, 75 to 80 day R.M., increases the dependability of corn produced for grain in the central, western and northeastern areas of the state.

FIGURE 2.—*Corn breeding nursery at Fargo where new corn inbred lines are developed by hand pollination, selfing, and selection. From* 15,000 *to* 20,000 *hand pollinations, by bagging method, are made yearly. A wide variation occurs in plant height, maturity, disease resistance, ear height, and other characters. Selected inbred lines are crossed. New crosses are tested at Fargo and several other areas in the state.*

The advantages of good early maturing hybrids in the western and northern areas are its ability to resist lodging and stalk rotting diseases which cause plant breakage. Early maturing hybrids also bear ears higher on the plant than old early maturing adapted open pollinated varieties. These agronomic qualities makes it possible to

harvest the corn with mechanical pickers without high field losses. The average income from corn compares favorably with other feed crops. Corn is a more dependable feed crop because its water requirement is lower than for most other grain crops.

Measuring Maturity

Corn maturity, or growth period, can be measured from emergence of seedlings to silking and/or physiologic maturity (denting or glazing stage). The proportion of moisture in ears or kernels at harvest is another fair indication of maturity. This, however, is influenced by the rapidity of drying and weather conditions after the corn is physiologically mature. The rate of drying is very rapid in most hybrids although slow in some and particularly slow in Falconer and Rainbow varieties, even though they are earlier maturing. Normally this is caused by the tight and closed husks.

Corn planted early attains maturity sooner than late planted fields. When corn is planted late, earlier maturing kinds must be used. High temperatures, adequate moisture and fertility hasten maturity. Hybrids and varieties in Tables II and III are listed in order of their comparative maturity. Figure 1, Corn Maturity Zones of North Dakota, shows where a given maturity corn is expected to mature in normal seasons.

Favorable seasons for corn maturity in the last four years may lead farmers to believe that such an expectation is normal. Very favorable conditions and high temperature during June, July, and August, which occurred in 1955, was the key to excellent corn maturity. An early fall frost is the greatest single hazard to corn production in North Dakota. In 1955 the first killing frost occurred September 11, but fortunately most corn was more advanced than usual. In the years with a cool growing season (1942, 1945, 1947, 1950, 1951) or early fall frost (1943, 1946) late maturing varieties were immature, low in yield and quality.

Measuring Yield

Yield of silage, tons per acre, at 70 per cent moisture and grain in bushels per acre at uniform 15 per cent of moisture are reported in Tables II and III. These yields are from a uniform stand, normally three plants per hill. Early maturing corn has smaller stalks and yields less per plant than the later maturing, tall growing kinds. When planted with the same number of plants per hill, row or acre, the early maturing kinds are placed at a disadvantage. The yield of these early maturing, smaller plant types, was increased by thicker planting (about four plants of early to three plants of late). Preliminary results at Fargo showed that when the field stand was increased from 13,000 to 16,000 plants per acre the yield was increased from 62.7 to 68.9 bushels in the very early 75 day relative maturity (R.M.) hybrid AES101, while in 83 to 95 day R.M. hybrid varieties there was actual reduction in grain yield when the number of plants per acre was increased.

Adequate stand is needed for high yield. But the benefits from the thicker plantings are governed by the availability of moisture, the availability of fertility, and the proper weed and disease control. Too thick a stand may have as adverse an effect on the yield as too thin a stand, depending on local conditions. Present information shows that thicker plantings have increased the grain and silage yields of the early maturing smaller-plant-type hybrids, but it has lowered the grain yields of late maturing, tall types. Thicker plantings usually produce higher yields of silage when moisture is adequate. Thinner planting is advisable for grain production in drier areas.

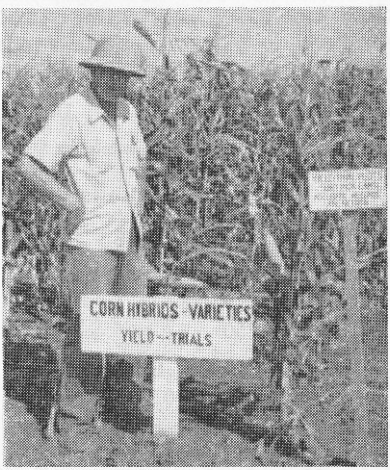


FIGURE 3. — *New corn hybrids are tested in comparison with standard hybrids and varieties currently grown in the state. Hybrids with adapted maturity, good yield, desirable resistance to lodging, and reasonable ear height are released to seedsmen for production of hybrid seed corn.*

Corn grown for silage must produce well dented or glazed kernels, as the ears constitute a high proportion of feed value in silage. Adapted corn that produced high yields of grain usually produced high yields and high quality silage. Since full maturity is not essential for silage corn, it can be about five days later in maturing than a corn grown in the same area for grain.

To produce the maximum yield of grain, corn must mature. Because the seasonal temperature and other growing conditions are different in the southeastern and the western parts of North Dakota, different maturity hybrids were better adapted than those proving best in other parts of the state. In the southeastern and east central areas, 85 to 100 day R.M. hybrids have been adapted while in the western and northern areas 75 to 83 R.M. often were more dependable and produced higher quality feed. Early maturing new yellow dent hybrid AES101 produced satisfactory yields in several tests in northern and western North Dakota in 1955.

Lodging and Ear Height

Lodging greatly affects the ease of harvesting and may determine the amount of actual grain yield gathered into the crib. Two kinds of lodging occur—stalk breakage and root lodging. Root lodging results from roots pulling loose when the soil is wet and soft. Sometimes such lodging is due to too close, late and deep cultivation. Most of the root lodging occurs before the corn is mature. When the upper part of the stalk straightens up an "elbowing" of the lower part results. Some root lodging occurs in the later stages of growth. In that case the plants may lean or

be flat on the ground. Stalk breakage results when the plant breaks between the ground and the ear node. Most of the stalk breakage occurs where the corn borer has entered the plant, leaving an opening for the disease organism to weaken it. Such breakage can take place at any time but usually it occurs from the time the corn is matured until harvest. Earlier maturing varieties stand unharvested longer after they have matured and may have more broken plants.

TABLE I.—**How commercial hybrids and varieties fit into North Dakota climatic zones.**

Zone	For Silage Hybrid varieties similar to	For Grain Hybrid varieties similar to
Zone 1	**105 to 95 day R.M.**	**90 to 95 day R.M.**
South-eastern area	Minhybrids 608, 607 Wis. 464A, 416, 341 Sokota 250	Sokota 220 Wis. 355, 341, 416 Minhybrid 608 Sokota 250
Zone 2	**100 to 90 day R.M.**	**83 to 92 day R.M.**
East Central area	Minhybrid 608 Wis. 416, 341, 355, 279 Sokota 220	Nodakhybrid 301, 306 Sokota 220 Wis. 355, 341
Zone 3	**90 to 85 day R.M.**	**82 to 85 day R.M.**
North-eastern and Central area	Sokota 220 Wis. 279 Rainbow (Mandan Strain) Nodakhybrids 301, 305, 306	AES101 (CB1210) Morden 77 Nodakhybrid 301, 305, 306 Minhybrid 802 Wis. 240, 279
Zone 4	**85 to 83 day R.M.**	**80 to 83 day R.M.**
Western and Central area	Wis. 279 Rainbow (Mandan strain) Nodakhybrids 208, 301, 305, 306 Morden 77 AES101	AES101 (CB1210) Morden 77, Wis. 240 Nodakhybrids 208, 301, 305, 306 Minhybrid 802
Zone 5	**83 to 80 day R.M.**	**80 day or less R.M.**
Northern area	Rainbow (early strain) Nodakhybrids 208, 301, 305, 306 Morden 77 Falconer, Northwestern AES101	AES101 Falconer, Northwestern Morden 77 Wis. 240 Nodakhybrids 208, 301, 305, 306

(Commercial hybrids of comparable maturity are satisfactory).

Comparative lodging and ear height are given in Tables II and III. Resistance to lodging, also adequate ear height, are essential in selecting hybrids for grain production. However, when the corn is cut for silage, while plants are yet green, the lodging tendency of Falconer, Rainbow, and Nodakhybrid 208 is not too objectionable if silage yields are high.

Yield Variations

Small differences in yield between varieties may not be significant. Weather, soil, and other variable conditions in any one location or year are apt to influence yield. Furthermore there may

TABLE II.—**Comparison of Corn Silage and Grain Yields in Southeastern and Eastern North Dakota.**[1]

Variety arranged in order of maturity	N.D. rel. maturity (R.M.)	Silage tons per acre[2] Av. 1954 - 1955		Grain bushels per acre[3]					Comparative[4]		
		Fargo 2 yrs.	Edgeley 2 yrs.	Richland 4 yrs.	Fargo 4 yrs.	Casselton 4 yrs.	Grand Forks 5 yrs.	Edgeley 3 yrs.	Av. Lodging %	Av. height inches	
										Plants	Ears
Falconer O. P.	80	8.42	6.87[a]	--	49.1	-----	36.2	33.6	42	68	15
Nodakhybrid 208	81	9.47	7.50		53.3	------	40.3	33.7	34	74	20
Wis. hybrid 240	82	----	7.90[a]		53.8	------	38.1	30.2[a]	22	77	23
Morden 77	82	----	----	--	54.8	------	36.1	33.4	27	79	24
Nodakhybrid 301	83	10.60	8.10	45.7	60.1	49.3	39.8	38.2	8	79	24
Nodakhybrid 306	83	11.86[a]	-----	47.6	61.7	48.6	43.1	40.5	11	80	25
Minhybrid 802	83	------	------	------	58.8	------	40.2[a]	40.2	15	80	24
Nodakhybrid 305	84	10.00	8.90	------	57.1	46.4	40.5	38.2	11	78	24
Minn. 13 (Honey) O. P.	85	------	------	41.6	53.3	43.3	36.5	----	20	79	25
Rainbow (Mandan) O. P.	85–90	10.50	6.47	40.3	53.8	43.9	36.8	42.7	33	70	17
Wis. hybrid 279	85	9.90	7.97	45.1	57.9	45.8	37.1	37.4	14	82	26
Sokota 220	89	10.54[a]	10.31[a]	47.4	61.2	50.0[a]	----		6	83	28
Wis. hybrid 355	95	------	------	48.4	59.0	48.8	------		6	88	29
Wis. hybrid 341	95	11.30	11.70	49.8	60.3	48.9	------	------	5	89	29
Minhybrid 608	100	12.30	9.20	52.9	64.1	52.5	------	------	2	91	32
Wis. hybrid 416	98	------	------	48.1	60.7	47.5	------	------	5	89	31
Wis. hybrid 464A	100	------	------	48.2	61.5	47.7	------	------	4	91	32

[1]Data from Edgeley: Miles White, superintendent.
[2]Silage yield adjusted to 70% moisture.
[3]Grain yield at 15% moisture.
[4]Four-year average at Fargo trials.
[a]Adjusted average, one year yield estimated.

TABLE III.—**Comparison of Corn Silage and Grain Yields in Western and Northern North Dakota.**[1]

Variety arranged in order of maturity	N.D. rel. maturity (R.M.)	Silage tons per acre[2]						Grain, bushels, per acre[3]			Comparative[4]		
		Minot 2 yrs.	Dickinson 2 yrs.	Williston Dry Land 2 yrs.	Williston Irrigation N-O 2 yrs.	Williston Irrigation N-1 2 yrs.	Langdon	Bismarck 6 yrs.	Minot 3 yrs.	Dickinson 3 yrs.	Lodging %	Av. height inches Plants	Av. height inches Ears
AES101 (CB1210)	78	----	------	†	†	†	†	----	----	†	10	73	19
Falconer O.P.	80	7.69	5.62	------	-------	-----	5.12	36.4	40.8	23.5	31	61	12
Northwestern O.P.	81	7.19*	------	------	------	----	4.62*	------	------	----	18	73	22
Nodakhybrid 208	81	6.47	6.27	7.57	11.94	13.34	2.08	39.5	39.4	29.1*	19	70	18
Wis. hybrid 240	82	7.17*	------	6.30	10.34	13.77	5.23	34.5	35.2*	24.0*	12	72	19
Morden 77	82	6.88*	4.39	----	----	-------	4.65*	35.8	37.3	24.6	6	74	20
Nodakhybrid 301	83	7.17*	5.86	6.37	10.47	13.94	4.87	37.4	36.6	26.7	5	74	20
Nodakhybrid 306	83	7.12*	6.09*	5.47*	10.41*	13.40*	------	39.2	36.6	29.5	5	75	21
Minhybrid 802	83	----	------	------	-------	------	----	35.4	36.0*	------	8	75	21
Nodakhybrid 305	84	6.57*	5.81	7.30	12.07	14.67	4.77	38.6	33.5	22.5	5	74	19
Rainbow (Mandan)	85–90	6.66	5.74	7.67	12.70	15.53	5.38	35.3	39.7	24.5	24	67	16
Wis. hybrid 279	85	6.95*	6.01					35.4		26.7	6	76	23

[1]Substation data from G. N. Geiszler, Minot; Thomas J. Conlon, Dickinson; H. M. Olson, Williston, and Victor Sturlaugson, Langdon.
[2]Silage yield adjusted to 70% moisture.
[3]Grain yield at 15% moisture.
N-O—Irrigated, no fertilizer.
N-1—Irrigated fertilizer 200 pounds/acre 33-0-0.
[4]Six year average at Bismarck Trial.
*—One year yield estimated.
†—High yield in 1955.

be considerable variation in yield due to the location of a variety in the testing field, even though variety plots are repeated three to four times to reduce differences in soil. The average yield from several years or areas is more dependable.

Frequently other desirable characters, such as earlier maturity, resistance to lodging, ear height, or ease of husking are as important as yield. When selecting a variety, first select one with a maturity rating adapted for the area to be planted. Next select a specific variety or hybrid with proven performance record rather than by a brand name alone.

Maturity requirements and hybrid suggestions for silage and grain production in different maturity zones of North Dakota are indicated by Figure 1 in connection with Table I.

Cultural Consideration

Corn grows best in sandy, fertile, and well aerated soil. In heavy clay soils corn following leguminous crops plowed under, or manuring, will find a soil well mellowed for satisfactory growth of the corn crop. The seed bed should be well prepared and early weed growth eliminated.

Planting should be done when the soil has warmed up to about 60 degrees. In a normal season this may be about the middle of May. Corn needs a long growing season, so planting as early as the season permits is advisable. When planting is delayed, earlier maturing varieties should be used.

On land that can be kept free of weeds, drilling of corn is satisfactory. In a weedy field, corn planted in check-rowed hills can be cross cultivated, giving better control of weeds. Clean corn fields produce higher yields. Clean corn land has produced good yields of grain the following season and also provides an excellent seedbed for establishing grasses and legumes.

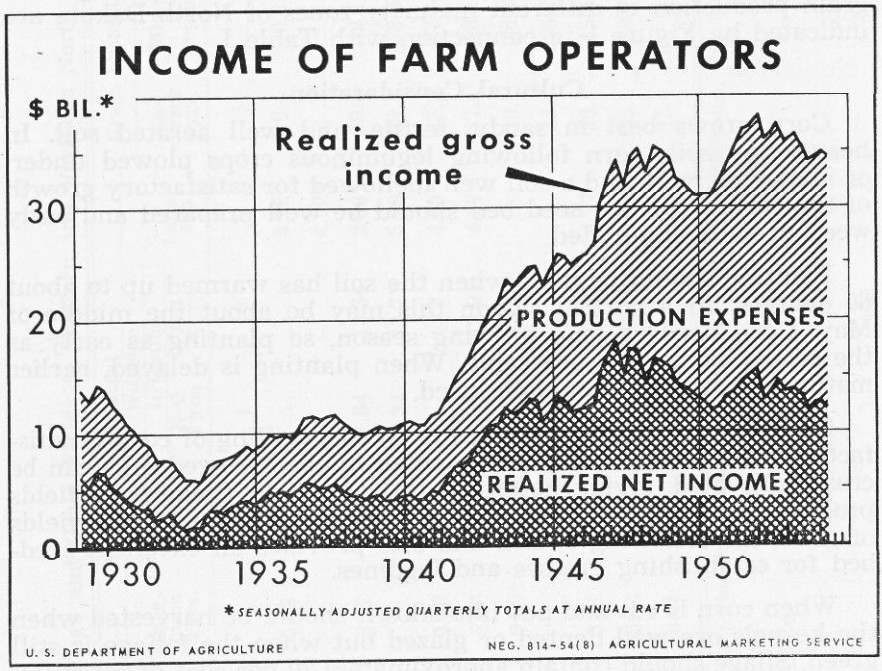
When corn is cut and put into silos it should be harvested when the kernels are well dented or glazed but when the foliage is still green. Silage should contain approximately 70 per cent of moisture, should be finely cut and well packed in the silo to assure keeping quality.

Harvesting corn for grain should be done as soon as the crop is ready. Early harvesting reduces field losses, the hazard of which increases rapidly as harvesting is delayed. Use of picker-sheller machines is increasing.

When ear corn is harvested early, or the picker-sheller used, it is necessary to dry the corn before storing, in order to reduce losses from heating. Plans for ear or grain driers are available. Some elevators have facilities for custom drying. Ear corn above 21 per cent moisture cannot be stored satisfactorily in wide cribs. Shelled corn above 14 per cent moisture may heat and spoil when stored in large bins.

Publications helpful in corn production, and obtainable from your county agent or the North Dakota Experiment Station, are:

1. **Grow More Corn for Silage, Feed Reserve, and Weed Control; Extension Circular A-206, 1954.**
2. **Corn Hybrids Suitable for North Dakota, North Dakota Agricultural Experiment Station Bimonthly Bulletin, Vol. 14, No. 4, pp. 151-156, 1952.**
3. **1955 Hybrid Corn Field Trials, Agron. Mineo, Circular 90, 1956.**
4. **Drying Shelled Corn and Small Grain with Unheated Air, U.S.D.A. Leaflet, No. 332.**
5. **Drying Ear Corn with Heated Air, U.S.D.A. Leaflet, No. 333.**
6. **The What and How of Hybrid Corn, U.S.D.A. Farmers, Bulletin, No. 1744.**



TWO-THIRDS OF TRACTORS, COMBINES BOUGHT FOR CASH

Agricultural economists at this station, making a 1955 study of farm equipment financing, learned that more than two-thirds of the tractors and combines purchased by farmers in this North Dakota sampling study were purchased for cash, while only one-fourth to a third of these purchases required financing.

Of 186 sampled farms reporting tractors the average was two tractors per farm, 53 per cent of them replacements and 46 per cent bought as additional farm power. Sixty-two per cent of the tractors were bought new, 38 per cent used; 73 per cent were bought for cash and 27 per cent with financing from banks, machinery dealers, individuals or other credit agencies.

Of the same 186 farms in this study, 89 per cent reported ownership of combines, 56 bought new and 44 bought as used machinery. Of the combines, 69 per cent were bought for cash and 31 per cent required financing.