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George Stewart

A. L. Wilson

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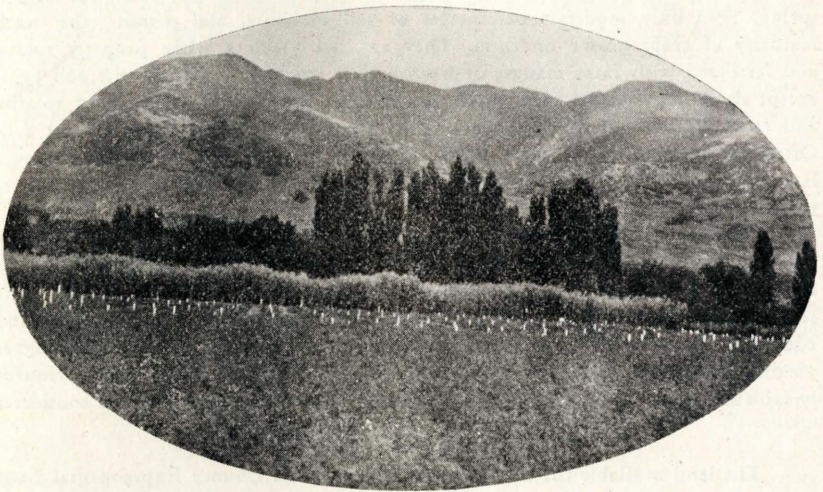


BULLETIN 211

JUNE, 1929

Silage Corn Varieties for Utah

GEORGE STEWART and A. L. WILSON



AGRICULTURAL EXPERIMENT STATION
UTAH STATE AGRICULTURAL COLLEGE
LOGAN, UTAH

Silage Corn Varieties for Utah

George Stewart and A. L. Wilson*

Utah is rapidly developing an important dairy industry. In addition to home-grown hay and grain, there must be some form of succulence. Pasturage is the common way of furnishing fresh feed in summer. In certain regions, silage and beet pulp are the winter forms. With a scarcity of beet pulp, silage corn is likely to be an important crop in the Great Salt Lake and Utah Lake Valleys, where corn does well. The data presented in this publication are related to the choice of a corn variety for ensilage.

CORN-GROWING CONDITIONS

Throughout the Great Salt Lake Valley and Utah Valley, the soils were laid down under the waters of old Lake Bonneville. Along the valley edges, near the canyon mouths, are large areas of gravelly, sandy, and sandy loam soils deposited along the lake margins. Farther out in the valley are silt loams and clay loams, with the heaviest soil types in the lowest and most central parts of the valleys. The more porous soils along the valley margins have good drainage, warm up early in spring, hold only moderate percentages of soil moisture, and permit the early maturity of crops grown on them. They are high-yielding when properly rotated and fertilized with farm manure and when well irrigated. The heavier soil types, except those impregnated with alkali, are likewise productive. They need rotation and farm manure but hold moisture much longer than do the more porous soils. Often the drainage is not good, often seeding is delayed, and always harvesting is later than on the lighter soils. Crops are taller, more stalky and more luxuriant on these heavier soils.

Formerly Australian White Flint corn was used throughout the area for grain. It yielded well, but when dairying brought a demand for silage, Improved Leaming came to be the commonly grown variety. In much of the territory, on the lighter soils, it matured for grain. Spring seeding was usually late in May. An examination of this condition suggested the possibility of finding a somewhat higher-yielding variety which would mature properly for silage but which might frequently fail fully to ripen the grain. The possibility of earlier seeding was also considered.

EXPERIMENTAL PROCEDURE

The land available for the tests was on the Davis County Experimental Farm, at Farmington, Utah. It was largely medium-coarse gravel intermixed with the dark loam characteristic of the territory. Since the soil was extremely heterogeneous, the experimental errors were bound to be large unless reasonable precautions were taken to reduce the variability. In order to accomplish this, it was decided to replicate the plats 4 times for early seeding and 4 times for late seeding. The experiment was continued for 6 years, although since the last year was really not a part of the experiment proper, it is more correct to say that the variety test was conducted for 5 years.

The plats were 100 feet long and 4 rows wide. The rows were 3 feet apart during the first two years and 3.5 feet apart afterward, with plants every 10 to 12 inches in the row. At harvest time notes on the degree of maturity were taken and the ears were pulled from two rows in each plat and weighed with the husks on.

*Agronomist and Superintendent, Davis County Experimental Farm, respectively.

This value was multiplied by 2 to get total weight of ears. The stalks on the rows were weighed and the percentage of ears calculated. The remainder of the plat was cut and weighed with the ears on. The sum of these weights gave the total yield for each plat from which the acre-yield was calculated for each plat and then for each variety. Yields for early seeding and late seeding were kept separate throughout.

Improved Leaming, the commonly grown variety, was the standard (check) variety and the others were compared with it. A white dent variety, locally much praised in southern Utah Valley, was obtained under the name, "Million Dollar". Five selections from the U. S. Department of Agriculture¹, were included in the test the first year (1921). Three of these were white dents (U.S.D.A. Selections Nos. 77, 119, and 182). One was a Yellow Flint (No. 193) and one was a Yellow Dent (Lancaster Surecrop). All except Selection No. 193 were somewhat later maturing than Improved Leaming. Stowell's Evergreen, grown for market sweet corn, was thought by some growers to produce abundant feed if allowed to stand after the early ears were marketed. It was, therefore, included during the first season. Since Stowell's Evergreen and Selection No. 193 were both low yielders, they were dropped from the test after the first season and Gerrick and Mexican June added. These proved to be too late, on which account the grain was unsatisfactory both as to yield and maturity. These were, therefore, dropped and others added. As time went on Boone County White, Reid's Yellow Dent, Golden Glow, Eureka, Pussey Cloud, Red Cob, Orange County Prolific, Pride of the North, Improved Mastodon, and Northwestern Dent were grown one or more years, with the results indicated in the discussion of experimental data.

EXPERIMENTAL RESULTS

The mean acre-yields for each variety are reported in Table 1, first for early

¹Grateful acknowledgement is here made to F. D. Richey (of the Office of Cereal Investigations, U. S. Bureau of Plant Industry) for seed of these selections each year.

Table 1. Total acre-yields, percentage ears, and maturity estimated in 2 figures—the first mature ears and the second somewhat too soft for good silage. (Grown during 1921 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage of Ears in Total Yield*	Acre-Yield of Ears (Lbs.)*	Maturity Percentage
EARLY PLANTING				
Improved Leaming	9.62 ± 0.43	33.2 ± 1.42	6,388	100—0
Lancaster Surecrop	11.53 ± 0.51	33.5 ± 1.43	7,725	95—5
U.S.D.A. No. 77	16.61 ± 0.79	35.0 ± 1.49	11,627	90—5
U.S.D.A. No. 119	15.02 ± 0.67	28.5 ± 1.22	8,561	90—5
U.S.D.A. No. 182	13.53 ± 0.60	35.1 ± 1.50	9,498	90—5
U.S.D.A. No. 193	8.43 ± 0.37	33.9 ± 1.45	5,716	100—0
Million Dollar	12.71 ± 0.66	39.9 ± 1.97	10,143	90—5
Stowell's Evergreen	6.78			
LATE PLANTING				
Improved Leaming	11.82 ± 0.53	36.0 ± 1.54	8,510	100—0
Lancaster Surecrop	14.13 ± 0.63	35.3 ± 1.51	9,976	95—5
U.S.D.A. No. 77	17.36 ± 0.77	34.7 ± 1.48	12,048	75—20
U.S.D.A. No. 119	15.98 ± 0.71	28.1 ± 1.20	8,981	50—40
U.S.D.A. No. 182	15.48 ± 0.69	33.6 ± 1.33	10,403	60—30
U.S.D.A. No. 193	10.44 ± 0.47	36.3 ± 1.54	7,579	100—0
Million Dollar	13.74 ± 0.71	36.8 ± 1.82	10,113	95—5
Stowell's Evergreen	8.06			

*"Ears" includes husks.

seeding and then for late seeding. The relative yields for the varieties are reported in Table 2. The yield of Improved Leaming is taken as 100 in all cases, both for total yield and for yield of ears.

Table 2. Relative acre-yields of total forage and of ears for early seeding and for late seeding of 8 varieties of silage corns. (Grown during 1921 at Farmington, Utah)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100.0	100.0	100.0	100.0
Lancaster Surecrop	119.6	119.9	117.2	114.9
U.S.D.A. No. 77	164.1	156.6	130.4	140.0
U.S.D.A. No. 119	132.9	156.2	114.1	133.5
U.S.D.A. No. 182	146.1	140.8	113.1	132.1
U.S.D.A. No. 193	89.0	87.8	86.5	85.4
Million Dollar	160.6	146.0	120.3	112.3
Stowell's Evergreen		70.5		

*"Ears" includes husks.

The 1921 data (Tables 1 and 2) showed Stowell's Evergreen too low in yielding ability to warrant consideration where feed is the chief factor. Selection No. 193 matured early but yielded poorly when compared with the other varieties. In the early-seeded plats Lancaster and Selections Nos. 77, 119, 182, and Million Dollar, all matured properly for silage, but none of them were mature enough for grain. Lancaster and Selections Nos. 77, 119, and 182, and Million Dollar yielded in the ratio of 120, 164, 133, 146, and 160, respectively, for total yield when Improved Leaming was 100. The yields of ears were 120, 157, 156, 141, and 146, which showed that in a general way not only was the total yield much higher but the proportion of ears in these varieties was roughly equal to that in Improved Leaming. In the late-seeded plats, Lancaster and Selection No. 77 barely matured for silage; Selections Nos. 119 and 182 were too soft. Early seeding produced considerably more nearly mature grain.

Stowell's Evergreen and Selection No. 193 were discontinued, and two long-seasoned varieties, Mexican June and Gerrick, were added for 1922, the data for which are presented in Tables 3 and 4.

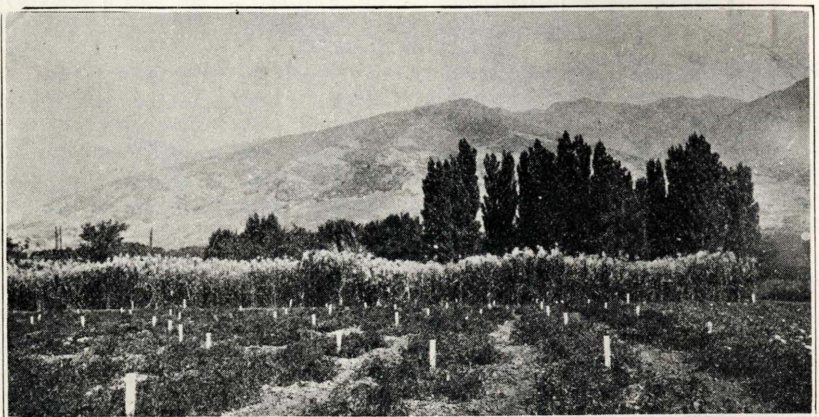


Fig. 1. Variety test plats of silage corn at College Farm.

Table 3. Total acre-yield, percentage ears, pounds of ears, and maturity estimated in 2 figures—the first mature ears and the second somewhat too soft for good silage. (Grown during 1922 at Farmington, Utah).

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears* (Lbs.)	Maturity Percentage
EARLY PLANTING				
Improved Leaming	15.53 ± 0.76	34.3 ± 0.99	10,654	100—0
Lancaster Surecrop	16.09 ± 0.78	34.7 ± 1.00	11,166	100—0
U.S.D.A. No. 77	19.99 ± 0.97	30.6 ± 0.89	12,234	100—0
U.S.D.A. No. 119	19.22 ± 0.94	32.9 ± 0.95	12,647	60—30
U.S.D.A. No. 182	19.37 ± 0.94	29.3 ± 0.85	11,351	50—40
Million Dollar	17.67 ± 0.86	33.2 ± 0.96	11,733	80—20
Gerrick	21.14 ± 1.22	18.9 ± 0.63	7,991	0—100
Mexican June	21.70 ± 0.98	13.7 ± 1.00	5,946	0—100
LATE PLANTING				
Improved Leaming	17.15 ± 0.83	31.5 ± 0.91	10,804	100—0
Lancaster Surecrop	17.58 ± 0.86	30.5 ± 0.88	10,724	100—0
U.S.D.A. No. 77	19.30 ± 0.94	28.4 ± 0.82	10,962	40—60
U.S.D.A. No. 119	21.55 ± 1.05	25.6 ± 0.74	11,034	50—40
U.S.D.A. No. 182	20.21 ± 0.98	27.2 ± 0.79	10,994	40—50
Million Dollar	16.68 ± 0.82	27.8 ± 0.83	9,274	75—20
Gerrick	22.91 ± 1.29	18.5 ± 0.62	8,477	0—100
Mexican June	18.84 ± 0.92	16.1 ± 0.47	6,066	0—100

*"Ears" includes husks.

Table 4. Relative acre-yields of total forage and of ears for early seeding and for late seeding of 8 varieties of silage corns. (Grown during 1922 at Farmington, Utah.)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100.0	100.0	100.0	100.0
Lancaster Surecrop	103.1	103.9	108.4	101.7
U.S.D.A. No. 77	128.7	115.2	119.0	103.1
U.S.D.A. No. 119	123.7	120.3	132.8	103.9
U.S.D.A. No. 182	124.7	106.0	124.5	104.2
Million Dollar	113.7	110.9	102.7	90.1
Gerrick	136.1	75.5	141.2	78.2
Mexican June	139.5	57.2	116.0	56.7

*"Ears" includes husks.

In the early-seeded plats Leaming, Lancaster, Selection No. 77 and Million Dollar reached satisfactory stage of maturity to make good silage. Selections Nos. 119 and 182 were too soft for first-class silage. Mexican June and Gerrick yielded abundantly in green matter but were still in the milk stage when frost came. In the late-seeded plats only Leaming and Lancaster reached satisfactory maturity, with Million Dollar almost ready. Selections Nos. 77, 119, and 182 were far too soft, while with Mexican June and Gerrick the kernels were just well-formed when the growing season came to an end.

In the early-seeded test Lancaster merely outyielded Leaming but Selections Nos. 77 and 119 and Million Dollar gave relative yields of 128, 124, and 114, respectively, for total yield and 115, 120, and 111 for yield of ears as compared with 100 for Improved Leaming. On account of being too long-seasoned for the region Mexican June and Gerrick were discarded without further trial.

It was particularly difficult to get seed of Selections Nos. 77, 119 and 182, and only through the courtesy of the Office of Corn Investigations, U. S. Depart-

ment of Agriculture, was enough obtained for the experimental plantings. An unsuccessful attempt was made to find a commercial source of Selection No. 77. Million Dollar, while locally grown and extremely satisfactory as a silage producer, was also difficult to obtain. Accordingly, a strain of Selection No. 77 was obtained through a seedhouse in Virginia, but when seeded experimentally and on farms did not mature as did the original Selection No. 77. More northern seed was sought unsuccessfully. Finally, Boone County White and Reid's Yellow Dent were introduced from the northern "corn belt" and Golden Glow from Wisconsin. At the request of the Extension agronomist of the Utah Agricultural College a variety of large yellow dent known as Eureka was also added. The 1923 yield data are shown in Tables 5 and 6.

Table 5. Total acre-yield, percentage ears, pounds of ears, and maturity estimated in 2 figures—the first as mature ears and the second as somewhat too soft for good silage. (Grown during 1923 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears* (Lbs.)	Maturity Percentage
EARLY PLANTING				
Improved Leaming	14.53 ± 0.59	28.5 ± 1.25	8,282	100—0
Lancaster Surecrop	15.91 ± 0.69	25.5 ± 1.12	8,114	100—0
U.S.D.A. No. 77	17.50 ± 0.71	32.2 ± 1.41	11,270	60—20
U.S.D.A. No. 119	20.45 ± 0.83	30.9 ± 1.36	12,638	70—15
U.S.D.A. No. 182	17.87 ± 0.72	33.5 ± 1.47	11,973	95—5
Million Dollar	17.21 ± 0.70	35.7 ± 1.57	12,288	90—10
Boone County White	18.90 ± 0.77	31.5 ± 1.38	11,907	90—10
Reid's Yellow Dent	13.37 ± 0.54	36.8 ± 1.62	9,840	90—10
Golden Glow	10.36 ± 0.42	34.4 ± 1.51	7,128	100—0
Eureka	22.24 ± 0.90	25.0 ± 1.10	11,121	60—20
LATE PLANTING				
Improved Leaming	16.12 ± 0.65	30.0 ± 1.32	9,672	100—0
Lancaster Surecrop	17.86 ± 0.72	34.8 ± 1.77	12,431	90—10
U.S.D.A. No. 77	21.22 ± 0.86	31.4 ± 1.38	13,326	75—10
U.S.D.A. No. 119	23.47 ± 0.95	29.7 ± 1.30	13,941	50—25
U.S.D.A. No. 182	21.06 ± 0.85	29.9 ± 1.31	12,594	85—10
Million Dollar	18.79 ± 0.76	32.2 ± 1.41	12,101	70—20
Boone County White	20.69 ± 0.84	31.0 ± 1.36	12,828	70—25
Reid's Yellow Dent	15.98 ± 0.65	37.9 ± 1.66	12,113	90—10
Golden Glow	10.71 ± 0.43	39.8 ± 1.75	8,525	90—10
Eureka	23.43 ± 0.95	24.1 ± 1.06	11,293	40—30

*"Ears" includes husks.

Table 6. Relative acre-yields of total forage and of ears for early seeding and for late seedings of 10 varieties of silage corns. (Grown during 1923 at Farmington, Utah.)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100.0	100.0	100.0	100.0
Lancaster Surecrop	109.5	104.3	110.7	112.4
U.S.D.A. No. 77	120.4	140.2	131.2	127.6
U.S.D.A. No. 119	140.7	157.7	145.5	145.1
U.S.D.A. No. 182	123.0	148.7	131.7	131.7
Million Dollar	118.5	153.3	114.8	123.0
Boone County White	130.0	146.2	127.6	131.8
Reid's Yellow Dent	92.0	122.1	98.8	125.9
Golden Glow	71.3	87.3	66.3	88.4
Eureka	153.0	137.0	145.2	117.0

*"Ears" includes husks.

All of the varieties seeded early reached a stage of maturity satisfactory for good silage, except Selections Nos. 77 and 118 and Eureka. Golden Glow was too small and matured far ahead of the requirements of the season. In the late seedings only Leaming, Lancaster, Golden Glow, and Boone County White matured properly.

In yields, Boone County White led by a decided margin the varieties that matured sufficiently. Its yield was 18.90 ± 0.77 tons of total forage with 31.5 ± 1.38 per cent ears as compared with Leaming which yielded 14.53 ± 0.59 tons of total forage with 28.5 ± 1.25 per cent ears. The yields of ears were 11,907 pounds to the acre for Boone County White and 8282 for Leaming. The difference is more than 4 times its probable error and appears to be significant. The difference in grain yield is about 6 times the probable error, that is, the odds are about 500 to 1 that the Boone County White is a higher yielder.

In relative production, Boone County White outyielded Leaming about 30 per cent in total forage and more than 40 per cent in ears—mature enough for first-class silage. In the late seedings, Boone County White was not as mature as required for good "hard" silage.

Eureka was discarded on account of failing to mature, Golden Glow on account of being too early and small, and Reid's Yellow Dent as being not greatly better than Improved Leaming. Two varieties—Pussey Cloud and Red Cob—were added for 1924. The actual yields with calculated probable errors are given in Table 7 and the relative yields in Table 8.

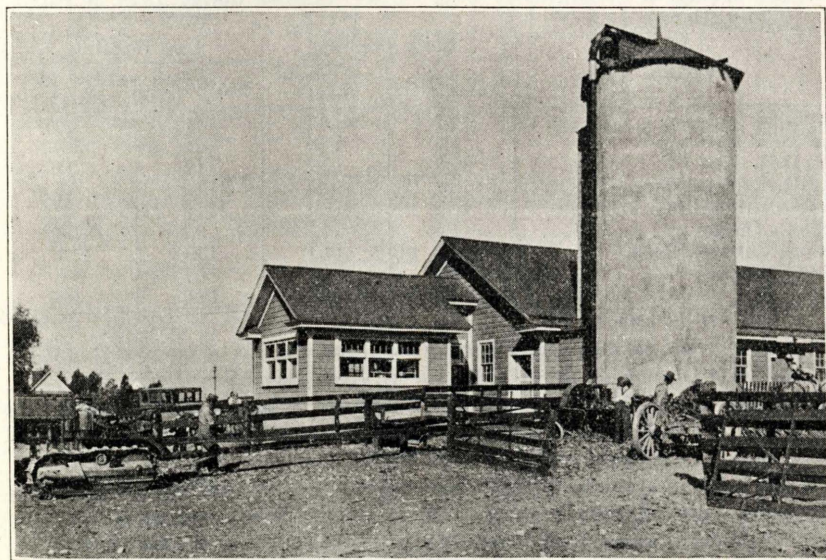


Fig. 2. Filling the silo at the College Dairy Barn. (Courtesy, D. W. Pittman)

Table 7. Total acre-yield, percentage ears, pounds of ears and maturity estimated in 2 figures—the first as mature ears and the second as somewhat too soft for good silage. (Grown during 1924 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears* (Lbs.)	Maturity Percentage
EARLY PLANTING				
Improved Leaming	15.30 ± 1.20	20.0 ± 1.58	6120	100—0
Lancaster Surecrop	13.54 ± 1.50	25.7 ± 2.62	6960	100—0
U.S.D.A. No. 77	16.34 ± 1.28	24.2 ± 1.74	7909	100—0
U.S.D.A. No. 119	16.10 ± 1.26	21.6 ± 1.55	6955	65—0
U.S.D.A. No. 182	14.37 ± 1.29	23.8 ± 1.98	6840	82—0
Million Dollar	15.77 ± 1.23	22.2 ± 1.60	7002	90—0
Boone County White	18.92 ± 1.32	19.8 ± 1.27	7492	100—0
Pussey Cloud	15.79 ± 1.23	19.0 ± 1.37	5989	100—0
Red Cob	15.76 ± 1.23	20.1 ± 1.44	6336	84—0
LATE PLANTING				
Improved Leaming	10.86 ± 0.85	25.7 ± 1.85	5582	100—0
Lancaster Surecrop	9.23 ± 0.72	27.9 ± 2.00	5150	100—0
U.S.D.A. No. 77	14.00 ± 1.09	22.5 ± 1.87	6300	100—0
U.S.D.A. No. 119	15.74 ± 1.09	25.5 ± 2.60	8027	90—0
U.S.D.A. No. 182	12.96 ± 1.17	28.8 ± 4.14	7465	95—0
Million Dollar	10.49 ± 0.94	20.8 ± 1.73	4364	100—0
Boone County White	12.08 ± 0.84	25.8 ± 1.88	6233	100—0
Pussey Cloud	9.31 ± 0.73	24.6 ± 1.77		100—0
Red Cob	14.47 ± 1.13	20.8 ± 1.50		100—0

*"Ears" includes husks.

Table 8. Relative acre-yields of total forage and of ears for early seedings and for late seedings of 9 varieties of silage corns. (Grown during 1924 at Farmington, Utah.)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100	100	100	100
Lancaster Surecrop	93	106	86	80
U.S.D.A. No. 77	125	129	118	94
U.S.D.A. No. 119	117	110	119	95
U.S.D.A. No. 182	121	120	115	95
Million Dollar	95	104	91	100
Boone County White	113	113	113	121
Pussey Cloud	91	101	92	76
Red Cob	110	101	132	94

*"Ears" includes husks.

In 1924 the autumn was unusually long and the late seedings remained in the field until October 10 to 14 uninjured by frost, whereas September 26 is the average frost date. On this account the late seedings indicate an unreliable stage of maturity. The early seedings are more accurate, as they were harvested September 24 to 28. On these dates the grain of Selections Nos. 119, 182 and of Red Cob were too soft to be satisfactory. Northern-grown seed of Selection No. 77 used this season, again matured properly. Boone County White was again the outstanding producer with a total forage yield of 18.92 ± 1.32 tons with 19.8 ± 1.27 per cent of ears as compared with 15.30 ± 1.20 tons of total forage for Leaming and 20.0 ± 1.58 per cent ears. The acre-yield of ears was 7492 pounds for Boone County White and 6120 pounds for Leaming. This is an increase in yield of more than 1350 pounds of ears over the yield of Leaming. Selection No. 77

yielded higher than Boone County White, but another attempt to get seed in commercial quantities failed. Selections Nos. 119 and 182 yielded heavily when left 20 days beyond the normal frost date, but the grain of both was much too soft at the normal harvest season. Selection No. 119 was dropped on account of failing to mature and Million Dollar on account of seed being inaccessible.

Table 9. Total acre-yield, percentage ears, pounds of ears, and maturity estimated in 2 figures—the first as mature ears and the second somewhat too soft for good silage. (Grown during 1925 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears* as Cut (Lbs.)	Acre-Yield Ears Air-Dry (Lbs.)
EARLY PLANTING				
Improved Leaming	10.90 ± 0.31	24.4 ± 1.40	5319	4446
Lancaster Surecrop	12.53 ± 0.74	18.5 ± 1.22	4636	3836
U.S.D.A. No. 77	15.42 ± 0.79	24.2 ± 1.39	7463	5939
U.S.D.A. No. 182	15.30 ± 0.78	28.0 ± 1.60	8568	7011
Boone County White	15.69 ± 0.83	30.6 ± 1.75	9602	7635
Pussey Cloud	13.50 ± 0.69	27.2 ± 1.56	7344	5550
Red Cob	18.06 ± 0.92	27.4 ± 1.57	9897	7296
Orange County Prolific	17.86 ± 0.92	24.6 ± 1.41	8787	6823
Pride of the North	9.22 ± 0.47	28.9 ± 1.66	5266	4655
Improved Mastodon	11.69 ± 0.60	30.4 ± 1.74	7108	5785
LATE PLANTING				
Improved Leaming	9.25 ± 0.47	32.9 ± 1.88	6086	5051
Lancaster Surecrop	10.86 ± 0.56	30.4 ± 1.74	6603	5435
U.S.D.A. No. 77	14.07 ± 0.72	32.3 ± 1.85	9089	7593
U.S.D.A. No. 182	13.65 ± 0.70	36.6 ± 2.10	9992	8103
Boone County White	13.88 ± 0.71	37.4 ± 2.14	10382	8931
Pussey Cloud	11.44 ± 0.58	37.2 ± 2.13	8511	6917
Red Cob	15.79 ± 0.81	35.5 ± 1.98	11211	8676
Orange County Prolific	16.30 ± 0.83	26.2 ± 1.50	8541	6637
Pride of the North	8.13 ± 0.42	34.9 ± 2.00	5675	4460
Improved Mastodon	11.20 ± 0.56	36.9 ± 2.11	8266	7016

*"Ears" includes husks.

Table 10. Relative acre-yields of total forage and of ears for early seedings and late seedings of 10 varieties of silage corns on field-harvest basis. (Grown during 1925 at Farmington, Utah.)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100	100	100	100
Lancaster Surecrop	115	84	117	107
U.S.D.A. No. 77	142	136	152	148
U.S.D.A. No. 182	140	154	147	163
Boone County White	144	174	150	201
Pussey Cloud	124	132	114	132
Red Cob	165	179	171	175
Orange County Prolific	164	159	176	137
Pride of the North	84	98	87	92
Improved Mastodon	107	129	119	133

*"Ears" includes husks.

In 1925, three new varieties were added—Orange County Prolific, Pride of the North, and Improved Mastodon. Since it was felt that the experiment was drawing to a close, an effort was made to secure more accurate yields of dry matter by obtaining air-dry weights. In Tables 9 and 10 are presented the ordinary field

weight data as for other years. In Tables 11 and 12 are given the actual and the relative yields on a dry-weight basis.

Table 11. Acre-yields of total forage and of ears for early seeding and late seeding of 10 varieties of silage corns on a dry-weight basis. (Grown during 1925 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears (Lbs.)
EARLY PLANTING			
Improved Leaming	7.18	27.9	4446
Lancaster Surecrop	7.65	25.2	3836
U.S.D.A. No. 77	9.21	31.4	5939
U.S.D.A. No. 182	9.15	38.5	7011
Boone County White	9.26	40.8	7635
Pussey Cloud	8.75	31.9	5550
Red Cob	10.53	35.0	7296
Orange County Prolific	10.84	32.0	6823
Pride of the North	6.88	34.5	4655
Improved Mastodon	7.05	40.9	5785
LATE PLANTING			
Improved Leaming	5.86	42.9	5051
Lancaster Surecrop	6.93	41.0	5435
U.S.D.A. No. 77	8.59	44.5	7593
U.S.D.A. No. 182	8.80	47.1	8103
Boone County White	8.53	43.2	8931
Pussey Cloud	6.72	51.7	6917
Red Cob	9.37	46.9	8676
Orange County Prolific	9.44	35.3	6637
Pride of the North	5.69	39.6	4460
Improved Mastodon	7.10	49.5	7016

*"Ears" includes husks.

Table 12. Relative acre-yields of total forage and of ears for early seeding and late seeding of 10 varieties of silage corn on a dry-weight basis. (Grown during 1925 at Farmington, Utah.)

Variety	Early Planting		Late Planting	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100	100	100	100
Lancaster Surecrop	106	87	118	107
U.S.D.A. No. 77	128	133	147	150
U.S.D.A. No. 182	127	158	150	110
Boone County White	129	171	146	177
Pussey Cloud	122	124	115	137
Red Cob	146	164	160	171
Orange County Prolific	151	153	161	131
Pride of the North	96	104	97	88
Improved Mastodon	98	130	121	139

*"Ears" includes husks.

Orange County Prolific and Red Cob did not reach the proper stage of maturity. Of the others, Boone County White, Selections Nos. 77 and 182 were essentially tied at yields of just more than 15 tons of total forage as compared with 11 tons for Leaming and 12.5 for Lancaster. Boone County White produced 30 per cent ears as compared with 24 and 28 per cent for Selections Nos. 77 and 182, respectively. Table 10 shows the relative yield of ears to be as follows:

Improved Leaming	100
Selection No. 77	136
Selection No. 182	154
Boone County White	174
Red Cob	179
Orange County Prolific	159
Improved Mastodon	129

However, when the dry weights are considered, the immaturity of Red Cob and Orange County Prolific permitted such enormous shrinkage, according to grain produced, as to cause a considerable readjustment in weighting.

On the dry basis the relative yields of ears were as follows:

Improved Leaming	100
Selection No. 77	133
Selection No. 182	158
Boone County White	171
Red Cob	164
Orange County Prolific	153
Improved Mastodon	130

Since these weights include cobs and husks as well as grain, Boone County White is entitled to a somewhat higher rating than the comparison with Red Cob and Orange County Prolific would show. The kernels of Boone County White were much less shrunken in the dried ears than were those of the other two. However, Boone County kernels were somewhat shrunken, whereas those of Leaming, Lancaster, Pussey Cloud, Pride of the North, and Improved Mastodon were practically mature. The yield of grain of Boone County White probably was somewhat more than 50 per cent greater than that of Leaming.

During 1926, the varieties were reduced to five—Improved Leaming, Lancaster, Boone County White, Red Cob, and Orange County Prolific. One plot of Northwestern Dent, an early grain corn, was included as a rough comparison. All varieties were seeded at a fairly early date and cut when ready for rather mature silage. Leaming was deemed ready on September 9, Lancaster on September 14, and the other three on September 28. A frost on September 24 stopped growth and reduced the yield of leaves materially. The average frost date is about October 1 in the region. The grain yields were not materially influenced by the frost. Dry-weight determinations were made again in 1926, except on the single plot of Northwestern Dent. The yield data, as cut and on the dry basis, are given in Tables 13 and 14 and the relative acre-yields in Table 15.

Table 13. Total acre-yield, percentage ears, pounds of ears, and maturity estimated in 2 figures—the first as mature ears and the second as somewhat too soft for good silage. (Grown during 1926 at Farmington, Utah.)

Variety	Early Planting			Maturity Percentage
	Total Acre-Yield (Tons)	Percentage Ears**	Acre-Yield Ears (lbs.)	
Improved Leaming	13.41±0.44	31.9±1.14	8556	100—0
Lancaster Surecrop	15.00±0.49	29.6±1.06	8880	100—0
Boone County White	*13.28±0.43	37.1±1.33	9854	90—10
Red Cob	*13.53±0.44	29.2±1.05	7902	90—10
Orange County Prolific	*15.96±0.52	20.1±0.72	6416	0—90
Northwestern Dent	7.79	33.4	5204	100—0

*Injured by a killing frost on September 24. Harvested on September 28. Leaming was harvested on September 9, Lancaster on September 14, and Northwestern Dent on August 25.

**"Ears" includes husks.

Table 14. Total acre-yield, percentage ears, and acre-yield of ears of 5 varieties of silage corns—dry basis. (Grown during 1926 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield of Ears* (Lbs.)
Improved Leaming	6.55	52.7	6912
Lancaster Surecrop	7.13	51.4	7326
Boone County White	7.58	51.4	7793
Red Cob	6.66	43.1	5737
Orange County Prolific	9.78	24.9	4866
Northwestern Dent	—	—	—

*“Ears” includes husks.

Table 15. Relative acre-yields of total forage and of ears of 5 varieties of silage corns on a harvest basis and on a dry-matter basis. (Grown during 1926 at Farmington, Utah.)

Variety	As Cut		Air-Dry	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100	100	100	100
Lancaster Surecrop	112	103	109	106
Boone County White	99	115	116	113
Red Cob	100	91	102	83
Orange County Prolific	118	74	149	70
Northwestern Dent	87	91	—	—

*“Ears” includes husks.

The somewhat early frost of September 24 reduced the total green-weight yield of Boone County White, of Red Cob, and of Orange County Prolific. Leaming harvested with all the leaves before the frost slightly outyielded Boone County White on a green-weight basis. However, on a dry-weight basis the yield was in favor of Boone County in the ratio 116 : 100. The yields of ears on the green basis were in the ratio of 115 : 100 and on the dry basis 113 : 100, all in favor of Boone County White. Lancaster, as usual, somewhat outyielded Leaming. Red Cob was approximately equal in total forage but fell behind in green-weight and dry-weight grain yields in the ratios of 91 : 100 and 83 : 100 for Red Cob and Leaming, respectively. Being mature on August 25, Northwestern Dent was too early to be a high yielder. Table 13 shows Leaming and Lancaster to be fully mature at harvest with Boone County White and Red Cob 90 per cent mature and Orange County Prolific much too soft, none of the grain being mature.

Table 16. Average acre-yields of total forage, percentage ears, and acre-yield of ears on a field basis for early seeding and for late seeding with maturity in 2 figures—one for mature ears and one for ears somewhat too soft for best silage. (Grown during 1921-1926 at Farmington, Utah.)

Variety	Total Acre-Yield (Tons)	Percentage Ears*	Acre-Yield Ears* (Lbs.)	Maturity Percentage
EARLY PLANTING				
Improved Leaming ^a	13.22±0.29	29.05±0.54	7555	100
Lancaster Surecrop ^a	14.10±0.35	27.9±0.65	7918	99—1
U.S.D.A. No. 77 ^b	16.61±0.41	29.2±0.63	10,101	88—6
U.S.D.A. No. 119 ^b	17.70±0.47	28.5±0.64	10,200	71—13
U.S.D.A. No. 182 ^b	16.09±0.40	29.9±0.68	9,646	79—13
U.S.D.A. No. 193 ^c	8.43±0.37	33.9±1.45	5,716	100—0
Million Dollar ^b	15.82±0.44	32.8±0.78	10,292	88—9
Boone County White ^d	16.70±0.45	29.8±0.72	9,713	95—5
Red Cob ^e	15.77±0.53	25.6±0.79	8,045	100—0
Pride of the North	9.22±0.47	28.9±1.66	5,266	100—0
Northwestern Dent	7.79	33.4	5,204	100—0

LATE PLANTING

Improved Leaming	13.04±0.31	31.2±0.69	8,131	100—0
Lancaster Surecrop	13.93±0.31	31.8±0.73	8,977	96—4
U.S.D.A. No. 77	17.19±0.40	29.9±0.68	10,345	72—22
U.S.D.A. No. 119	19.19±0.48	27.24±0.81	10,496	60—26
U.S.D.A. No. 182	16.67±0.40	30.7±1.01	10,290	70—22
U.S.D.A. No. 193	10.44±0.47	36.1±1.54	7,579	100—0
Million Dollar	14.92±0.41	29.6±0.75	8,963	85—11
Boone County White	15.53±0.46	31.4±1.05	9,814	85—12
Red Cob	15.13±0.69	27.7±1.25	8,615	100—0
Pride of the North	8.13±0.42	34.9±2.0	5,675	—
Northwestern Dent	—	—	—	—

a Grown six years, 1921-1926, incl.

b Grown five years, 1921-1925, incl.

c Grown in 1921 only.

d Grown four years, 1923-1926, incl.

e Grown three years, 1924-1926, incl.

f Grown one year only, 1926. Northwestern Dent grown only in a single plot.

**"Ears" includes husks.

Table 17. Average relative acre-yields of total forage and of ears for early and late seeding. (Grown during 1921-1926 at Farmington, Utah.)

Variety	Early		Late	
	Total Yield	Yield of Ears*	Total Yield	Yield of Ears*
Improved Leaming	100	100	100	100
Lancaster Surecrop	108.3	101.2	109.5	104.1
U.S.D.A. No. 77	134.7	135.0	132.9	127.1
U.S.D.A. No. 119	128.6	136.0	127.8	119.4
U.S.D.A. No. 182	130.3	137.9	130.2	122.7
U.S.D.A. No. 192	89.0	87.8	86.5	85.4
Million Dollar	121.9	128.5	107.2	106.4
Boone County White	123.0	143.8	130.5	148.9
Red Cob	130.2	133.7	141.2	130.7
Pride of the North	90.0	101.0	90.2	90.0
Northwestern Dent	87.0	91.0	—	—

**"Ears" includes husks.

Table 16 presents the average yields for the varieties (except Selection No. 193, Golden Glow, and Northwestern Dent, which were grown only one year each) that were grown three years or more. These three varieties are included in order to permit a rough comparison of the yielding ability of these small early-maturing grain corns. Average relative yields are given in Table 17. The figures

Table 18. Actual and relative average yields of ears when allowance is made for stage of maturity of eight varieties of silage corns grown three years or more, and of three early-maturing varieties of grain corns. (Grown during 1921-1926, incl., at Farmington, Utah.)

Variety	Early Seeding		Late Seeding	
	Acre-yield of Ears (Lbs.)	Relative Acre-yield	Acre-yield Ears* (Lbs.)	Relative Acre-yield
Improved Leaming	7555	100	8131	100
Lancaster Surecrop	7839	104	8618	106
U.S.D.A. Sel. No. 77	8889	118	7448	92
U.S.D.A. Sel. No. 119	7242	96	6298	77
U.S.D.A. Sel. No. 182	7620	101	7203	89
U.S.D.A. Sel. No. 193	5716	76	7579	93
Million Dollar	9057	120	7619	94
Boone County White	9227	122	8342	103
Red Cob	8045	106	8615	106
Pride of the North	5256	70	5675	70
Northwestern Dent	5204	69	—	—

**"Ears" includes husks.

in Tables 16 and 17 are not entirely accurate on account of differences in maturity. Unfortunately, dry-weights were determined only for the last two years. A somewhat rough approximation of the actual yields of ears can be obtained by multiplying the field harvest yields of ears by the percentage maturity. In the last analysis it is the grain yields that count most. When allowance for stage of maturity is made, the relative values of these figures are as presented in Table 18.

The summary of actual yields of the early seeding shown in Table 16 shows Improved Leaming to have produced an acre-yield of 13.22 tons of the total forage and 7555 pounds of ears, all of which every year were fully mature for hard silage. Lancaster Surecrop slightly outyielded Leaming and on the average was 99 per cent mature. Selections Nos. 77, 119, and 182 all yielded from 16.1 to 17.7 tons of total forage and around 10,000 pounds of ears to the acre. Maturity, however, was low; from 71 to 88 per cent of the ears were mature, the remainder being rather soft. The percentages of ears with milky kernels were 6, 16, and 8 per cent for Selections Nos. 77, 119, and 182, respectively. Million Dollar and Boone County White were also high-yielding varieties, producing to the acre 15.8 and 16.7 tons of total forage and 10,292 and 9814 pounds of ears, respectively. In Boone County White, 95 per cent of the ears bore mature grain and none was milky, whereas in Million Dollar 88 per cent were mature with 3 per cent milky. Red Cob too yielded well but not nearly so well as Boone County White or the other leading varieties. The early-maturing grain corns, all matured fully but produced too low a yield of total forage or of ears.

Table 17 compares the yields on a percentage basis. These figures differ slightly from what would be obtained by making the weightings entirely from Table 16, on account of the varieties differing somewhat in the years grown. In Table 17 Selections Nos. 77, 119, and 182, Boone County White and Red Cob show up well. All things considered, Boone County White has the best record, being superior especially in yield of ears. Roughly, Boone County White outyielded Leaming from 23 to 30 per cent in total forage and from 43 to 48 per cent in ears. The other varieties are shown to be somewhat inferior to Boone County White.

However, these figures are slightly too high for the higher-yielding varieties as they contained more moisture. In Table 18 the acre-yields of mature ears are given. This is obtained by multiplying the yield of ears as shown in Table 16 by the percentage maturity. The soft corn is neglected entirely in this set of figures, all of which are, therefore, too low, as the soft corn has considerable value. For the early-seeding, which is the more important, the leading varieties are:

Boone County White	122
Million Dollar	120
Selection No. 77	118
Red Cob	106
Leaming	100

In the late-seeding, Lancaster and Red Cob were highest with a relative yield of mature ears of 106.

The figures in Table 16 are too high and these too low in proportion to the moisture and the immature corn. It is probable that the actual values were not far from the following estimates corrected on the proportion of soft grain:

Boone County White	130
Selection No. 77	125
Million Dollar	124
Selection No. 182	120
Selection No. 119	115
Red Cob	115
Lancaster Surecrop	103
Improved Leaming (Check)	100

It seems that from the standpoint of yield and maturity Boone County White is the most satisfactory variety tested. After correcting for the somewhat greater moisture content, in grain yield it is about 30 per cent ahead of Leaming. To have been truly accurate the nutrients to the acre should have been obtained, but under the conditions surrounding the experiment these were not feasible. The figures given above, however, approximate the nutrient values within 2 or 3 per cent.

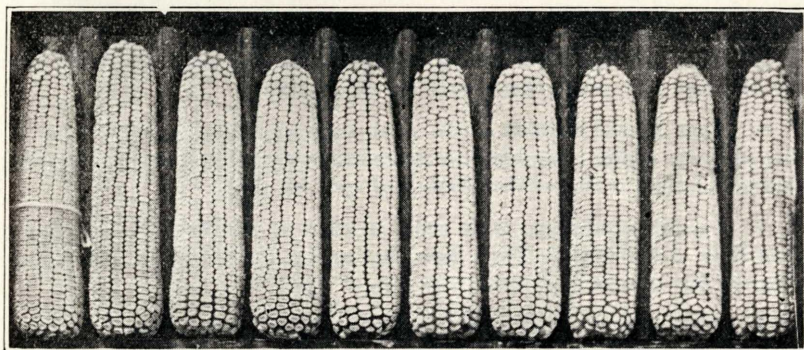


Fig. 3. A good sample of Boone County White Corn.

A comparison of the total yield of Boone County White with that of Leaming gives the following figures:

Boone County White	16.70±0.45 tons
Improved Leaming	13.22±0.29 tons
Increased Yield of Boone County White	3.48±0.54 tons

The difference is 6.6 times its probable error. So consistent, therefore, has been the better performance of Boone County White that the odds are many thousands to one that Boone County White will regularly outyield Improved Leaming under the conditions existing at Farmington.

Fortunately, there is available seed of the variety Boone County White, which is the variety recommended for the gravelly, sandy, and sandy-loam soils of the Great Salt Lake and Utah Lake Valleys.

There is not much doubt that the variety Improved Leaming is fully as good on the heavier soil since in a series of farmers' trials the larger varieties were all sufficiently delayed in ripening to reach a satisfactory degree of maturity in time to be safe from autumn frosts.

The fact that Boone County White is a white instead of a yellow corn is not against it. Though yellow corn is now known to contain a vitamin not found in white corn (fat-soluble A), which fact makes yellow corn more desirable in much of the "corn belt", its significance disappears entirely in the alfalfa region.

Steenbock and Gross² found vitamin A was supplied in sufficient quantities when only 5 per cent of the total ration was alfalfa or clover leaves and fine stems. When the other vitamins had also to come entirely from alfalfa or clover, these must constitute about 15 per cent of the total ration. Both these figures assume no vitamins whatever from other sources. Therefore, where even a small amount of alfalfa is fed regularly to livestock, white corn is entirely the equal of yellow.

SUMMARY

1. With the increasing importance of dairying in Utah, silage corn deserves increasing attention.
2. The seasons in Great Salt Lake Valley and in Utah Lake Valley are favorable for corn production.
3. Since this region is becoming very important as a dairy center, the possibility of silage corn production should not be overlooked.
4. From beyond Garland on the north to beyond Payson on the south is a rather extensive region comprising an agricultural-geographic, climatic unit where Improved Leaming is the standard variety of corn for silage.
5. Careful experiments, from 1921 to 1926 on the Davis County Experimental Farm at Farmington, Utah, show that seeding may be practiced with safety during the first days of May or the last days of April.
6. When seeding is done at this time, Boone County White may be grown on the lighter soils with great profit. However, on heavier soils the ripening period is so extended as to make it unwise to use a later variety than Improved Leaming.
7. On all the lighter soils (roughly, about half of the farming area) Boone County White outyields Improved Leaming not less than 25 per cent. The yield of mature grain is increased somewhat more than the forage yield.
8. Where as much as 15 per cent of the ration is alfalfa, the white grain of Boone County White is fully as satisfactory as the yellow grain of Improved Leaming or other yellow-grained varieties.

(College Series No. 269)

² Steenbock, H. and Gross, E. G. Fat-soluble vitamin IV. *Jour. Biol. Chem.*, 41:149-162 (1920). (The fat-soluble vitamin content of given plant tissues together with some observations on their water-soluble vitamin content.)