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Cultivar Test in South Dakota, 1990 Report: Alfalfa Yields

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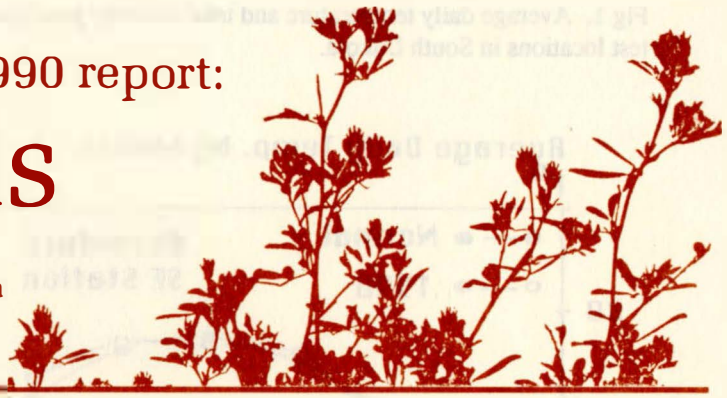

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New alfalfa cultivars come on the market every year. Selecting the right one for your situation takes a little study on your part. From the SDSU Alfalfa Cultivar Yield Tests you can compare the critical forage production characteristics--yield, winterhardiness, and disease resistance--for available cultivars and experimental lines at several locations in South Dakota.

Materials and methods

Experimental plots of alfalfa cultivars were established in 1987 and 1989 at the Southeast Research Station (Beresford) and the Central Crops and Soils Research Station (Highmore). Cultivars were planted in 1987, 1988, and 1990 at the Northeast Research Station (Watertown) and the SDSU Research Station (Brookings).

Alfalfa was planted between mid-April and late May into a firmly packed seedbed using a five-row planter with 6-inch row spacings. Seeding rate in 1987, 1988, and 1989 was 12 lb pure live seed (PLS)/A and in 1990 was 15 lb PLS/A. A pre-plant herbicide (Eptam[1] at 3 lb active ingredient/A) was used to aid establishment. The experimental design was a randomized complete block with four replicates. An experimental unit consisted of a 75-ft^2 (3 ft X 25 ft) plot. Plots were fertilized after planting with 50 lb P_2O_5/A or in accordance with SDSU soil test results for growth periods after the seeding year. Insect pests did not reach problem levels; no chemical control was used.

Harvesting was done by one of two flail-type forage plot harvesters with a harvest area of either 44 or 66 ft^2 per plot. Fresh herbage weights were taken for each plot immediately following herbage removal. Moisture samples were randomly taken from half of the entries in each replicate, dried at 100 F for 72 hours in a forced-air oven, and weighed to determine dry-matter (DM) concentration. Mean DM concentrations for each replicate were multiplied by fresh herbage weights for each experimental unit and then divided by harvest area to obtain forage DM production per unit area of harvest. These data were converted into tons of DM/A.

Data were analyzed by analysis of variance; DM yield differences among cultivars were tested by the least significant difference (LSD) procedure at the 0.05 level of probability. Relative performance among cultivars was calculated by dividing average total seasonal yield over years by the mean forage yield of a given location.

Stage of maturity at harvest was recorded for the Brookings cultivars. Ten shoots randomly selected from each plot were rated according to the Kalu and Fick (1983, Crop Science 23:1167-1172) mean-stage-by-count scheme (Table 1).

Plots were harvested up to three times each year; however, growth conditions at some locations often limited harvest frequencies.

Southeast Research Station, Beresford

Average daily temperatures were normal throughout the entire growing season (Fig 1). Precipitation fluctuated tremendously in the same period, being normal in April, about two times above normal in May, slightly above normal in June, and normal in July. The season ended with below normal precipitation during August and September. In fact, only about 1 inch of precipitation occurred in September.

The 1987 planting produced three harvests. Average total DM yield was 3.84 T/A, and no significant differences were detected among the 35 entries (Table 2).

Fig 1. Average daily temperature and total monthly precipitation during the 1990 growing season for four alfalfa cultivar test locations in South Dakota.

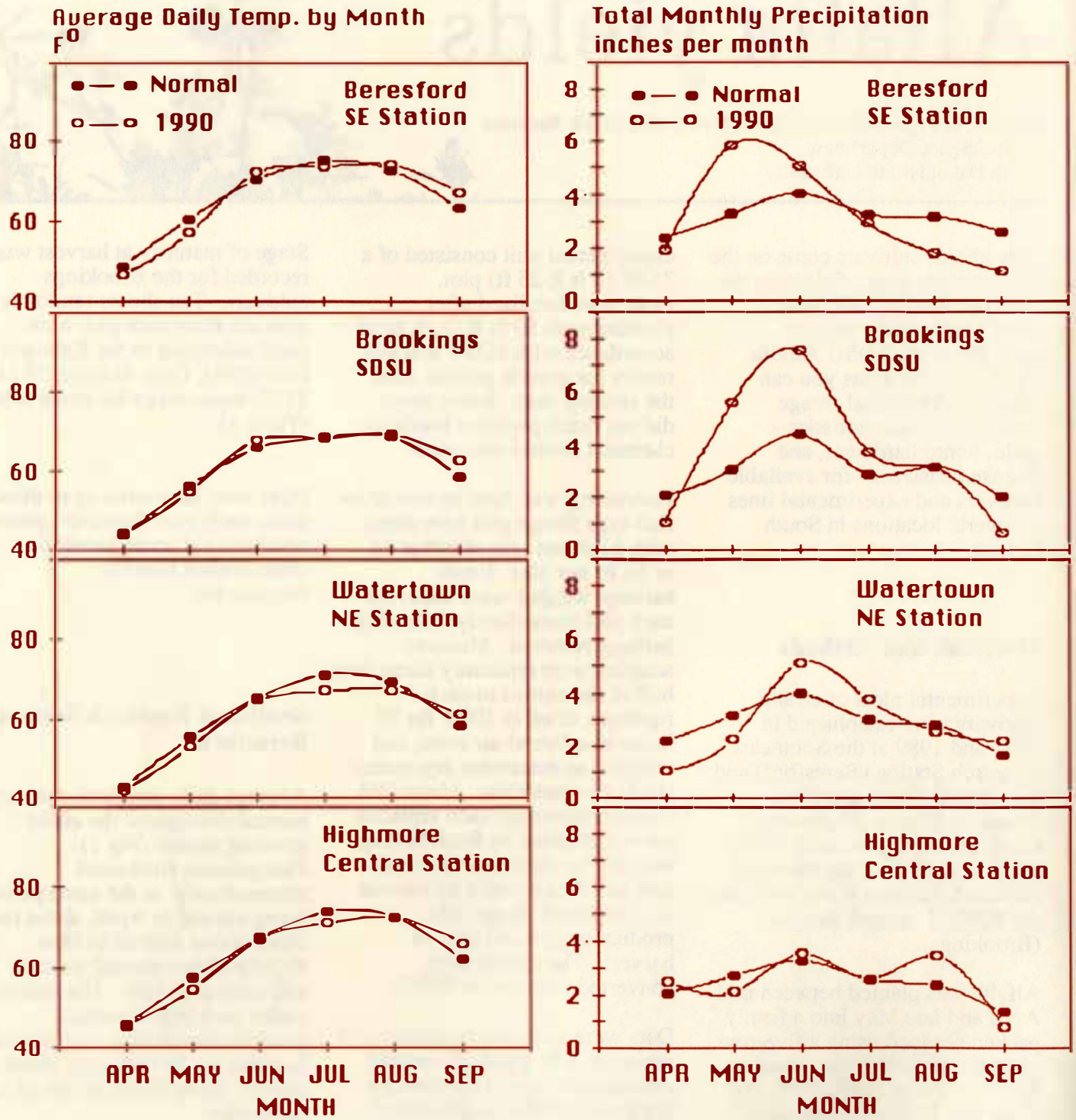

Table 1. Kalu and Fick[a] maturity index for phenological development of alfalfa.

Stage Number	Stage Name
0	Early Vegetative
1	Mid-vegetative
2	Late Vegetative
3	Early Bud
4	Late Bud
5	Early Flower
6	Late Flower
7	Early Seed Pod
8	Late Seed Pod
9	Ripe Seed Pod

[a]Kalu, B.A., and G.W. Fick. 1983. Quantifying morphological development of alfalfa for studies of herbage quality. Crop Sci 21:267-271.

Yields were relatively high for the first and second cuttings, 1.44 for first and 1.72 T/A for second, on average. The average yield of the third cutting was only 0.68 T/A; this was probably due to the below-normal precipitation in late summer.

The average total yield for 1990 was about a third higher than the 1989 average yield, presumably because of the higher early season rainfall this year. The 3-year average yield for this experiment was 3.30 T/A, with no significant differences among the cultivars even though there was a yield difference of 1 T/A between the best and worst yielding cultivars. Apparently, environmental conditions created enough variation that significant cultivar differences could not be easily detected.

The 1989 planting also produced three harvests. Average total DM yield was 4.46 T/A, and no significant differences were detected among the 40 entries (Table 3). Significant differences were found, however, among cultivars within the first and third cuttings.

Second cutting yields were very high (average yield of 2.21 T/A), more than a ton greater than either the first or third cutting.

SDSU Research Station, Brookings

Average daily temperatures were near normal during the entire growing season (Fig 1). Precipitation was slightly below normal in April, almost double the normal in May and June, and slightly above normal in July. In August precipitation was normal. September rainfall was less than one inch, well below normal.

The 1987 planting produced three harvests. Average total yield was 3.54 T/A with no significant differences among the 34 cultivars (Table 4). Yields during 1990 were almost double the yields of either 1988 or 1989. The above-normal precipitation in May, June, and July allowed three cuttings in 1990; only two cuttings were possible in 1988 and 1989.

Three-year average yields ranged from 2.13 to 2.70 T/A with no significant cultivar differences detected. Cultivars showed significant differences in maturity at the first harvest (Table 5). No differences in maturity were detected for either the second or third harvest. Maturity differences may influence forage quality.

Three harvests were obtained from the 1988 planting. Average total yield was 4.10 T/A with no significant differences among the 28 cultivars (Table 6). Yields from three cuttings in 1990 were about 1 T/A higher than in 1989 when three cuttings were also taken.

Two-year average yields ranged from 3.15 to 3.96 T/A with no significant cultivar differences found. No significant differences in maturity among the cultivars were detected for any of the three cuttings (Table 7). This indicates that maturity effects on the forage quality of these cultivars may be similar.

One harvest was obtained from the 1990 planting. Yields ranged from 1.06 to 1.39 T/A with some significant cultivar differences (Table 8). Significant differences were also detected among the cultivars for maturity, as these values ranged from 3.0 to 4.2.

Keep in mind that these are seeding year data. We normally recommend that you put more emphasis on data obtained from 2 or 3 years of production.

Northeast Research Station, Watertown

Average daily temperatures were near normal during the entire

Table 2. Forage yield of 35 alfalfa cultivars planted April 22, 1987, at the Southeastern Research Station, Beresford, S.D.

Cultivar	1987 1-Cut Total	1988 3-Cut Total	1989 3-Cut Total	1990 Cut 1 5/30	1990 Cut 2 7/16	1990 Cut 3 8/27	1990 3-Cut Total	3 Year Avg.[a]	Relative Performance[b]
	tons DM / acre								%
Arrow	0.69	3.79	3.08	1.62	1.98	0.78	4.38	3.75	114
SX 217	0.93	4.67	2.48	1.48	1.82	0.72	4.02	3.72	113
DK-135	1.03	4.36	2.77	1.40	1.79	0.80	3.99	3.71	112
120	0.76	4.10	2.60	1.56	1.89	0.73	4.18	3.63	110
MTO S82[c]	0.77	4.59	2.51	1.63	1.49	0.56	3.68	3.60	109
H-170[c]	0.79	4.11	2.64	1.33	1.87	0.78	3.98	3.58	108
Vernal	0.69	4.50	2.39	1.45	1.63	0.69	3.77	3.56	108
Dynasty	0.95	4.07	2.23	1.50	1.95	0.76	4.22	3.51	106
Saranac	0.80	4.32	2.39	1.53	1.60	0.67	3.80	3.50	106
Clipper	0.71	3.58	2.49	1.60	2.04	0.78	4.43	3.50	106
Commandor	0.77	3.94	2.60	1.41	1.65	0.71	3.77	3.44	104
Iroquois	0.62	4.11	2.41	1.64	1.54	0.57	3.76	3.43	104
Cimarron	0.78	3.96	2.40	1.49	1.76	0.66	3.91	3.42	104
636	0.71	4.00	2.29	1.60	1.73	0.64	3.97	3.42	104
GH737	0.87	4.15	2.14	1.26	1.87	0.80	3.93	3.41	103
Apollo Supreme	0.67	3.38	2.62	1.48	1.94	0.79	4.21	3.40	103
5432	0.64	3.70	2.38	1.52	1.83	0.77	4.12	3.40	103
H-172[c]	0.84	4.03	2.30	1.32	1.66	0.66	3.63	3.32	101
Dart	0.73	3.63	2.24	1.42	1.95	0.70	4.07	3.31	100
AF21	0.72	3.92	2.23	1.28	1.80	0.69	3.77	3.30	100
Mohawk	0.65	4.10	2.23	1.35	1.49	0.62	3.45	3.26	99
526	0.59	3.61	2.14	1.40	1.83	0.71	3.94	3.23	98
Blazer	0.79	3.71	2.14	1.46	1.67	0.71	3.84	3.23	98
SX 424	0.67	3.67	2.16	1.33	1.76	0.69	3.78	3.20	97
Fortress	0.97	3.64	2.14	1.47	1.63	0.65	3.74	3.17	96
Big 10	0.94	3.66	2.13	1.49	1.59	0.61	3.69	3.16	96
IH-171[c]	1.03	3.35	2.22	1.24	1.76	0.72	3.72	3.09	94
Salute	0.64	3.17	2.06	1.32	1.77	0.69	3.77	3.00	91
MTO N82[c]	0.52	3.68	2.08	1.41	1.38	0.39	3.18	2.98	90
532	0.62	3.08	2.11	1.41	1.64	0.68	3.72	2.97	90
H-174[c]	0.77	3.38	1.95	1.24	1.68	0.60	3.53	2.95	90
WL 225	0.88	3.03	1.99	1.51	1.55	0.65	3.70	2.91	88
Saranac AR	0.65	3.30	1.93	1.37	1.50	0.61	3.48	2.90	88
Magnum III	0.94	2.57	2.08	1.50	1.63	0.72	3.86	2.84	86
Endure	0.63	3.00	1.73	1.40	1.60	0.56	3.56	2.76	84
Average	0.76	3.77	2.29	1.44	1.72	0.68	3.84	3.30	
Maturity[d]				3.3	5.4	5.5			
LSD(0.05)	NS[e]	NS	NS	NS	0.30	0.17	NS	NS	

[a]Three-year average based on post-establishment year yields, 1988, 1989, and 1990.

[b]% relative performance = ratio of cultivar 3-yr average to 3-yr average of all cultivars.

[c]Experimental line, not currently marketed.

[d]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[e]Cultivars not significantly different at the 0.05 level of probability.

growing season, except for July when they were slightly above normal (Fig 1). Precipitation was below normal in April and May and above normal in June and July. Normal precipitation occurred in August and September.

The 1987 planting produced three harvests. Average total yields ranged from 2.17 to 3.99 T/A with some significant differences detected among the cultivars (Table 9). Yields in 1990 were similar to those reported in 1989 and slightly less than those of 1988. Three-year average yields ranged from 2.95 to 3.88 T/A with some significant cultivar differences. In 1990, significant differences among the cultivars were found at each cutting.

These yield differences were probably caused by extensive plant mortality in the test plots during the 1989-90 winter. Snow cover was slight, December was extremely cold, and false spring temperatures occurred in February and March.

In late April, plots were rated visually for damage on a scale that ranged from 1 (extreme damage) to 10 (no damage). This revealed significant differences among the cultivars for winter damage (Table 9). Visual ratings were compared with the fall dormancy rating given to each cultivar (Appendix). The correlation coefficient was -0.59. The correlation coefficient between winter injury and first-cut yields was 0.93.

These values suggest that cultivars suffering the most winter damage had the lowest first-cut yields. Fortress and Eagle, for example, had a large amount of winter damage and also produced the lowest first-cut yields of 0.34 and 0.33 T/A,

Table 3. Forage yield of 40 alfalfa cultivars planted April 20, 1989, at the Southeastern Research Station, Beresford, S.D.

	1989	1990				
Cultivar	1-Cut Total	Cut 1 6/1	Cut 2 7/16	Cut 3 8/27	3-Cut Total	Relative Performance[a]
	tons DM / acre					%
Sure	1.28	1.33	2.45	1.20	4.98	112
Flint	1.30	1.20	2.30	1.30	4.80	108
Multi-plier	1.25	1.30	2.37	1.11	4.78	107
Arrow	1.21	1.27	2.32	1.18	4.77	107
Centurion	1.31	1.18	2.37	1.21	4.76	107
636	1.19	1.23	2.31	1.22	4.76	107
DK-125	1.42	1.26	2.32	1.17	4.75	106
88S[b]	1.19	1.20	2.32	1.18	4.70	105
SDHL1[b]	0.94	1.44	2.18	1.08	4.70	105
VS-775[b]	1.17	1.42	2.23	1.02	4.67	105
Majestic	1.20	1.35	2.23	1.04	4.62	103
526	1.06	1.25	2.35	0.99	4.60	103
DK-135	1.10	1.19	2.26	1.13	4.58	103
Action	1.19	1.24	2.31	1.01	4.56	102
VIP	0.90	1.12	2.28	1.16	4.56	102
Vernal	1.07	1.28	2.20	1.06	4.54	102
Aggressor	1.08	1.22	2.22	1.09	4.52	101
Dart	1.19	1.20	2.33	0.99	4.52	101
5262	1.08	1.27	2.23	1.00	4.50	101
VS-820[b]	1.22	1.32	2.21	0.96	4.49	101
Clipper	1.33	1.26	2.18	1.02	4.47	100
Victory	1.22	1.20	2.14	1.13	4.47	100
WL 225	1.20	1.21	2.15	1.07	4.43	99
630	1.06	1.12	2.23	1.05	4.41	99
Saranac AR	1.14	1.17	2.15	1.05	4.38	98
WL 317	1.19	1.21	2.24	0.92	4.37	98
Trident II	1.17	1.21	2.18	0.96	4.36	98
Royalty	1.18	1.20	2.11	0.99	4.29	96
Chief	1.00	1.16	2.05	1.08	4.29	96
Allegiance	0.88	1.15	2.18	0.94	4.27	96
Dawn	1.07	1.19	2.07	1.00	4.26	96
5472	1.12	1.19	2.07	0.98	4.24	95
Apollo Supreme	0.93	1.15	2.05	1.04	4.24	95
Cimarron VR	1.02	1.12	2.08	1.03	4.24	95
WL 320	1.03	1.09	2.19	0.95	4.23	95
Legend	1.10	1.13	2.13	0.97	4.23	95
SDHS6[b]	1.04	1.27	2.14	0.75	4.16	93
Ultra	1.07	1.07	2.10	0.94	4.11	92
H-174[b]	1.06	1.03	2.09	0.91	4.02	90
Sabre	1.13	1.08	2.00	0.87	3.95	89
Average	1.13	1.21	2.21	1.04	4.46	
Maturity[c]		3.5	5.4	6.0		
LSD(0.05)	NS[d]	0.17	NS	0.25	NS	

[a]% relative performance = ratio of cultivar 1990 total yield to 1990 total yield of all cultivars.

[b]Experimental line, not currently marketed.

[c]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[d]Cultivars not significantly different at the 0.05 level of probability.

Table 4. Forage yield of 34 alfalfa cultivars planted April 22, 1987, at the SDSU Research Station, Brookings, S.D.

Cultivar	1987 1-Cut Total	1988 2-Cut Total	1989 2-Cut Total	1990 Cut 1 6/5	1990 Cut 2 7/13	1990 Cut 3 8/29	1990 3-Cut Total	3 Year Avg.[a]	Relative Performance[b]
	tons DM / acre								-- % --
Saranac	1.39	2.05	2.02	1.38	1.84	0.80	4.02	2.70	111
636	1.30	2.15	2.07	1.35	1.70	0.65	3.70	2.64	109
Summit	1.43	2.02	2.05	1.16	1.89	0.76	3.80	2.62	108
Vernal	1.20	2.14	1.99	1.32	1.68	0.67	3.66	2.59	107
Webfoot	1.40	1.92	2.06	1.35	1.66	0.69	3.70	2.56	106
Endure	1.41	2.05	1.92	1.28	1.70	0.70	3.68	2.55	105
MTO S82[c]	1.50	1.99	1.96	1.35	1.68	0.62	3.65	2.53	105
526	1.19	1.72	2.13	1.31	1.72	0.71	3.74	2.53	105
Saranac AR	1.36	2.05	1.91	1.17	1.68	0.71	3.55	2.50	103
Ultra	1.58	2.03	1.76	1.20	1.69	0.74	3.63	2.47	102
Dart	1.43	2.04	1.64	1.21	1.75	0.76	3.71	2.46	102
Cimarron	1.33	2.00	1.93	1.15	1.61	0.69	3.45	2.46	102
Emerald	1.51	2.08	1.83	1.13	1.60	0.74	3.46	2.46	102
Blazer	1.48	1.80	1.97	1.26	1.69	0.64	3.59	2.45	101
120	1.38	1.88	1.81	1.27	1.68	0.72	3.66	2.45	101
Clipper	1.28	1.89	1.76	1.22	1.75	0.71	3.68	2.44	101
Target II	1.44	1.84	1.84	1.18	1.72	0.68	3.58	2.42	100
Big 10	1.32	1.93	1.74	1.19	1.70	0.69	3.57	2.41	100
Commandor	1.49	1.82	1.86	1.13	1.66	0.75	3.54	2.40	99
DS 701[c]	1.44	1.84	1.74	1.18	1.67	0.77	3.62	2.40	99
GH747	1.35	1.90	1.75	1.16	1.68	0.67	3.51	2.39	99
SX 217	1.36	1.92	1.81	1.06	1.62	0.69	3.37	2.37	98
Sure	1.45	1.90	1.75	1.06	1.65	0.73	3.44	2.36	98
Mohawk	1.50	1.91	1.77	1.17	1.56	0.65	3.37	2.35	97
SX 424	1.39	1.87	1.74	1.06	1.64	0.67	3.38	2.33	96
Apollo Supreme	1.39	1.87	1.65	1.23	1.60	0.63	3.45	2.33	96
DK-135	1.49	1.88	1.77	0.98	1.60	0.71	3.28	2.31	95
WL 225	1.42	1.76	1.79	1.17	1.56	0.63	3.36	2.31	95
Iroquois	1.31	1.65	1.81	1.22	1.61	0.62	3.44	2.30	95
Arrow	1.39	1.87	1.60	1.17	1.58	0.62	3.36	2.28	94
VIP	1.45	1.79	1.64	1.14	1.55	0.66	3.36	2.26	93
Fortress	1.37	1.80	1.58	1.03	1.63	0.68	3.34	2.24	93
532	1.27	1.58	1.62	1.17	1.69	0.63	3.48	2.23	92
MTO N82[c]	1.56	1.68	1.46	1.18	1.54	0.52	3.24	2.13	88
Average	1.40	1.90	1.81	1.19	1.66	0.68	3.54	2.42	
LSD(0.05)	NS[d]	NS	NS	0.16	NS	NS	NS	NS	

[a]Three-year average based on post-establishment year yields, 1988, 1989, and 1990.

[b]% relative performance = ratio of cultivar 3-yr average to 3-yr average of all cultivars.

[c]Experimental line, not currently marketed.

[d]Cultivars not significantly different at the 0.05 level of probability.

respectively. In contrast, the SDSU experimental lines MTO S82 and MTO N82 had the least amount of winter damage and produced the highest first-cut yields of 1.13 and 1.09 T/A, respectively.

The 1988 planting produced three harvests. Average total yields ranged from 2.48 to 4.33 T/A with some significant cultivar differences (Table 10).

The 1988 planting also suffered severe damage during the 1989-90 winter. The correlation coefficient between winter injury score and the fall dormancy rating (Appendix) of the cultivars was -0.72, slightly greater than that of the 1987 planting. The correlation coefficient between winter injury score and first-cut yields was 0.90, similar to that in the 1987 planting.

The experimental line MTO N82 had the least amount of winter damage and the highest first-cut yield of 1.22 T/A. This high first-cut yield gave MTO N82 the highest total seasonal yield among the 28 cultivars.

Two-year average yields ranged from 2.97 to 4.08 T/A, with some significant cultivar differences detected. Yields in 1990 were similar to those of 1989.

Data will be collected from this experiment for one more year; it will be interesting to see the yield performance of these cultivars one year after a severe winter. Some of the plots that suffered severe damage may be overtaken by weeds.

One cutting was obtained from the 1990 planting. Yields ranged from 1.42 to 1.67 T/A, with no significant differences among the cultivars (Table 11).

Table 5. Maturity[a] of 34 cultivars planted April 22, 1987, at the SDSU Research Station, Brookings, S.D.

	1987	1988		1989		1990		
	Cut-1	Cut-1	Cut-2	Cut-1	Cut-2	Cut-1	Cut-2	Cut-3
Cultivar	7/22	6/6	7/25	6/6	7/26	6/5	7/13	8/29
	index							
Apollo Supreme	3.7	3.4	4.1	2.5	4.4	3.1	4.9	3.5
Arrow	3.9	3.5	4.3	2.6	4.4	3.2	4.9	3.9
Big 10	3.6	3.9	5.0	2.9	4.6	3.6	5.0	3.7
Blazer	3.6	3.2	4.5	2.5	4.6	3.3	4.9	4.0
Cimarron	3.5	3.7	4.4	2.7	4.6	3.1	5.0	3.5
Clipper	3.2	3.7	4.4	2.7	4.5	3.4	5.2	3.9
Commandor	3.6	3.2	4.3	2.8	4.7	3.4	4.9	3.3
Dart	3.5	3.6	4.6	2.7	4.5	3.2	4.9	4.0
120	3.4	3.5	4.1	2.6	4.4	3.2	4.7	3.3
DK-135	3.6	3.5	4.6	2.6	4.7	3.4	4.8	3.5
DS 701[b]	3.3	3.7	4.1	2.8	4.5	3.4	4.9	3.8
Emerald	3.3	3.9	4.9	3.1	4.6	3.3	4.8	3.3
Endure	3.5	3.4	4.2	2.6	4.4	3.5	4.8	3.5
Fortress	3.7	3.5	4.6	2.8	4.6	3.3	4.9	3.8
636	3.6	3.6	4.8	3.2	4.4	3.4	5.1	3.9
GH747	3.5	3.7	4.5	2.8	4.7	3.3	4.9	3.7
Iroquois	3.5	3.6	4.5	2.9	4.7	3.6	5.0	3.5
Mohawk	3.4	3.7	4.8	2.9	4.5	3.3	4.9	3.1
MTO N82[b]	3.7	3.9	4.3	2.2	4.2	3.1	4.9	2.9
MTO S82[b]	3.5	4.0	4.4	2.7	4.4	3.4	4.8	4.1
Saranac	3.4	3.5	4.6	2.9	4.4	3.6	4.9	3.3
Saranac AR	3.6	3.7	4.8	3.0	4.7	3.3	5.0	3.8
Summit	3.6	3.5	4.7	3.2	4.5	3.6	5.0	3.9
Sure	3.8	3.5	4.5	2.8	4.7	3.4	4.8	3.9
SX 217	3.7	3.5	4.5	2.8	4.7	3.3	4.9	4.4
SX 424	3.5	3.4	5.1	2.5	4.5	3.3	5.0	3.8
Target II	3.7	3.5	4.8	2.7	4.5	3.6	5.0	4.0
Ultra	3.7	3.7	4.7	2.7	4.5	3.5	5.2	3.5
Vernal	3.4	3.7	4.5	2.8	4.6	3.3	4.8	3.6
VIP	3.3	3.8	4.4	2.4	4.7	3.3	4.9	3.6
Webfoot	3.3	3.7	4.4	2.7	4.4	3.2	4.9	3.5
WL 225	3.5	3.4	4.1	2.7	4.3	3.4	4.9	4.1
526	3.5	3.4	4.5	2.6	4.6	3.2	4.8	3.8
532	3.1	3.3	4.5	2.1	4.4	3.2	4.9	3.3
Average	3.5	3.6	4.5	2.7	4.5	3.3	4.9	3.7
LSD(0.05)	NS[c]	0.4	NS	NS	NS	0.3	NS	NS

[a]Kalu and Fick (1983) index, mean-stage-by-count.

[b]Experimental line, not currently marketed.

[c]Cultivars not significantly different at the 0.05 level of probability.

Table 6. Forage yield of 28 alfalfa cultivars planted April 20, 1988, at the SDSU Research Station, Brookings, S.D.

Cultivar	1988 1-Cut Total	1989 3-Cut Total	1990 Cut 1 6/5	1990 Cut 2 7/13	1990 Cut 3 8/29	1990 3-Cut Total	2 Year Avg.[a]	Relative Performance[b]
	tons DM / acre							-- % --
MTO N82[c]	0.75	3.56	1.45	1.87	1.03	4.35	3.96	109
526	0.76	3.58	1.31	1.81	1.08	4.19	3.89	107
Big 10	0.78	3.30	1.28	1.85	1.25	4.38	3.84	106
Vector	0.78	3.57	1.28	1.77	1.03	4.08	3.83	106
Vernal	0.78	3.28	1.32	1.88	1.15	4.36	3.82	105
5432	0.87	3.36	1.29	1.88	1.07	4.24	3.80	105
Magnum +	0.68	3.44	1.20	1.81	1.12	4.13	3.79	105
SX 217	0.78	3.36	1.15	1.86	1.18	4.19	3.77	104
Sure	0.72	3.27	1.08	1.96	1.19	4.22	3.75	104
Cimarron	0.87	3.32	1.20	1.73	1.26	4.18	3.75	104
120	0.72	3.27	1.22	1.87	1.11	4.20	3.74	103
AP 8620[c]	0.70	3.24	1.24	1.82	1.08	4.14	3.69	102
87M1[c]	0.85	3.10	1.30	1.88	1.05	4.23	3.66	101
87N3[c]	0.77	3.30	1.21	1.75	1.06	4.02	3.66	101
5262	0.57	3.19	1.14	1.89	1.06	4.08	3.64	100
Magnum III	0.72	3.07	1.24	1.74	1.14	4.12	3.60	99
Kingstar	0.76	3.12	1.23	1.78	1.04	4.06	3.59	99
Chief	0.79	3.08	1.18	1.72	1.19	4.09	3.59	99
Arrow	0.74	2.94	1.21	1.85	1.10	4.16	3.55	98
Allegiance	0.66	3.04	1.27	1.77	1.01	4.05	3.54	98
Dart	0.69	3.13	1.11	1.73	1.10	3.94	3.53	98
87N1[c]	0.77	3.06	1.16	1.73	1.09	3.98	3.52	97
DK-125	0.85	2.76	1.15	1.81	1.19	4.15	3.46	95
WL 225	0.66	2.68	1.17	1.78	1.21	4.16	3.42	95
AP 8631[c]	0.68	2.79	1.22	1.71	0.99	3.92	3.35	93
Premier	0.66	2.83	1.16	1.73	0.93	3.82	3.33	92
WL 320	0.71	2.72	1.02	1.64	0.99	3.65	3.18	88
SX 424	0.62	2.48	1.08	1.73	1.02	3.82	3.15	87
Average	0.74	3.14	1.21	1.80	1.10	4.10	3.62	
LSD(0.05)	NS[d]	NS	0.17	NS	0.16	NS	NS	

[a]Two-year average based on post-establishment year yields, 1989, and 1990.

[b]% relative performance = ratio of cultivar 2-yr average to 2-yr average of all cultivars.

[c]Experimental line, not currently marketed.

[d]Cultivars not significantly different at the 0.05 level of probability.

Central Research Station, Highmore

Average daily temperatures were near normal throughout the entire growing season (Fig 1). Precipitation was near normal, with the exception of August when rainfall was above normal.

Two harvests were obtained from the 1987 planting. Average total yields ranged from 1.39 to 1.65 T/A with no significant differences among the 24 cultivars (Table 12).

Second-cut yields were extremely low; the average yield was only 0.41 T/A. The 3-year average yields ranged from 1.19 to 1.69 T/A, with no significant cultivar differences detected.

The 1989 planting produced three harvests. Average total yields ranged from 2.50 to 4.06 T/A with some significant cultivar differences (Table 13). Significant cultivar differences were also found within the first and third cuttings.

Discussion

Average daily temperatures were near normal throughout the growing season at all locations (Fig 1). Each location received above-normal precipitation during some part of the growing season.

At Beresford and Brookings, most precipitation came during May and June, with below-normal precipitation during the rest of the growing season. At these two locations production will depend upon winter and spring precipitation. If adequate precipitation does not fall, alfalfa growth in the spring will be retarded, the first harvest may be delayed, and yields may be low.

Poor fall cutting management also threatens stand longevity. Producers should fall-cut after a hard frost when there is little chance for regrowth. Not harvesting in the fall will permit stubble to catch snow. Snow insulates the crown and provides moisture for plant growth the following spring.

Table 7. Maturity[a] of 28 cultivars planted April 20, 1988, at the SDSU Research Station, Brookings, S.D.

	1988	1989			1990		
Cultivar	Cut-1 7/12	Cut-1 6/6	Cut-2 7/16	Cut-3 8/23	Cut-1 6/5	Cut-2 7/13	Cut-3 8/29
	index						
Allegiance	4.1	3.6	4.9	4.0	3.4	5.2	5.1
AP 8620[b]	4.0	3.7	4.5	4.0	3.5	5.2	4.9
AP 8631[b]	4.4	3.5	4.7	4.0	3.2	5.7	5.0
Arrow	4.4	3.8	4.5	4.1	3.5	5.6	5.2
Big 10	4.3	3.8	4.7	4.0	3.3	5.2	4.9
Chief	3.9	3.5	4.9	4.0	3.2	5.2	5.1
Cimarron	4.1	4.0	4.8	4.0	3.3	5.2	5.1
Dart	4.2	3.3	4.7	4.0	3.3	5.2	5.3
120	4.0	3.5	4.8	4.1	3.0	5.3	5.0
DK-125	4.3	3.6	4.9	4.1	3.6	5.6	4.9
87M1[b]	4.2	3.5	4.7	4.1	3.2	5.3	4.9
87N1[b]	4.3	3.8	4.8	4.1	3.4	5.3	4.9
87N3[b]	4.3	3.7	4.7	4.1	3.2	5.4	4.9
Kingstar	4.2	3.6	4.7	4.0	3.4	4.9	4.8
Magnum +	3.9	3.9	4.7	4.0	3.1	4.9	4.9
Magnum III	4.4	3.5	4.8	4.0	3.1	5.0	4.9
MTO N82[b]	4.0	3.8	4.5	3.8	3.2	5.0	4.6
Premier	4.0	3.5	4.5	4.1	3.1	5.3	5.0
Sure	4.2	3.9	4.6	4.0	3.3	5.4	5.1
SX 217	4.1	3.4	4.7	4.0	3.1	5.3	5.0
SX 424	4.0	3.5	4.6	4.0	3.2	5.5	5.2
Vector	4.3	3.8	5.0	4.1	3.5	5.2	5.0
Vernal	4.0	3.5	4.6	4.0	3.2	5.1	4.9
WL 225	4.1	3.4	4.3	4.1	3.2	5.3	5.0
WL 320	4.1	3.4	4.6	4.1	3.0	5.1	5.1
5262	3.8	3.7	4.7	4.0	3.3	5.1	5.0
526	3.9	3.5	5.0	4.0	3.2	5.1	5.0
5432	4.1	3.6	5.0	4.1	3.3	5.2	5.0
Average	4.1	3.6	4.7	4.0	3.3	5.2	5.0
LSD(0.05)	0.3	0.4	0.4	NS[c]	NS	NS	NS

[a]Kalu and Fick (1983) index, mean-stage-by-count.

[b]Experimental line, not currently marketed.

[c]Cultivars not significantly different at the 0.05 level of probability.

Cultivar selection

When evaluating alfalfa cultivar test information, examine several plant characteristics before making your purchase.

Major characteristics include yield, fall dormancy, disease resistance, and cost per unit of pure live seed.

Yield:

Yield information in this circular represents seeding year or post-seeding year averages. Generally, yield data for several years are the most meaningful.

The data are also more reliable if you use figures from test locations where growing conditions most nearly resemble those on your farm.

To measure significant differences in yield between cultivars, we use a statistical measure known as the least significant difference (LSD). If the difference in yield between any two cultivars equals or exceeds the LSD value, the higher yielding cultivar is significantly higher in yield and should be favored. If the yield

Table 8. Forage yield of 32 alfalfa cultivars planted April 24, 1990, at the SDSU Research Station, Brookings, S.D.

Cultivar	1990 Cut 1 9/5	Maturity[a]
	- tons DM / acre -	-- % --
Centurion	1.39	4.1
G-2833	1.38	3.9
Crown II	1.37	3.7
G-2841	1.35	4.1
120	1.35	3.6
Vernal	1.33	3.4
Flint	1.32	3.7
MTO S82[b]	1.32	3.2
630	1.29	3.9
Multi-plier	1.29	3.7
VIP	1.27	3.8
SDHL1[b]	1.25	3.3
SDHS6[b]	1.25	3.2
H-154[b]	1.25	3.7
DK-122	1.25	3.7
Aggressor	1.24	3.8
WL 225	1.24	3.4
VS-888[b]	1.24	4.2
SX 217	1.23	3.8
MultiKing 1	1.23	4.0
5364	1.20	4.0
H-174[b]	1.20	3.9
8832N[b]	1.19	3.8
8941N[b]	1.19	4.0
Dawn	1.18	3.9
WL 317	1.17	3.7
5262	1.17	3.3
645	1.17	3.9
Allegiance	1.16	3.6
8837N[b]	1.15	3.9
MN GRN-14[b]	1.09	3.5
AFYF 88[b]	1.06	3.0
Average	1.24	3.7
LSD(0.05)	0.16	0.5

[a]Harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[b]Experimental line, not currently marketed.

difference is less than the LSD value, the two cultivars do not significantly differ and the cultivars are approximately equal in yielding ability. In some cases an LSD value is not presented and the designation NS (nonsignificant) indicates significant yield differences among the cultivars were not detected.

Fall dormancy:

Fall dormancy ratings (Appendix) range from values of 1 (early dormancy) to 9 (non-dormant). Fall dormancy is often thought to be related to the winterhardiness of an alfalfa cultivar. The severe winters of South Dakota require winterhardiness to be a major consideration in cultivar selection.

The relationship between fall dormancy ratings and winter injury was investigated at the Northeast Research Station where cultivars showed clear differences in winter injury followed the winter of 1989-90.

The visual rating scale for winter injury was compared with the fall dormancy ratings for the cultivars listed. Correlation coefficients between the winter injury score and the fall dormancy rating of the cultivars were -0.59 and -0.72 for the 1987 and 1988 plantings, respectively. If the fall dormancy ratings had matched the winter injury scores perfectly, the correlation coefficient would have been -1.0.

Correlation coefficients suggest that, although fall dormancy ratings may not estimate winter injury perfectly, they do a reasonable job. It is likely that correlations between winter injury and fall dormancy for periods following less severe winters would be much weaker.

Table 9. Forage yield and apparent winter injury of 31 alfalfa cultivars planted April 25, 1987, at the Northeastern Research Station, Watertown, S.D.

Cultivar	1987 1-Cut Total	1988 3-Cut Total	1989 3-Cut Total	1990 Cut 1 6/21	1990 Cut 2 7/27	1990 Cut 3 9/11	1990 3-Cut Total	3 Year Avg.[a]	Relative Performance[b]	Winter-kill[c]
	tons DM / acre								- % -	- score -
MTO S82[d]	1.91	4.15	3.50	1.13	1.49	1.36	3.99	3.88	112	8.5
120	2.00	4.34	3.58	0.80	1.33	1.38	3.51	3.81	110	5.8
526	1.66	4.10	3.45	0.92	1.41	1.45	3.78	3.78	109	6.8
Clipper	2.03	4.02	3.74	0.73	1.34	1.36	3.43	3.73	108	5.8
532	1.77	4.16	3.48	0.79	1.30	1.43	3.53	3.72	108	7.0
Arrow	1.65	3.87	3.77	0.71	1.32	1.35	3.38	3.67	106	3.6
Dart	1.93	4.28	3.54	0.64	1.23	1.33	3.19	3.67	106	4.9
WL 225	2.11	4.21	3.55	0.62	1.19	1.28	3.09	3.62	105	3.5
Cimarron	1.95	4.18	3.50	0.54	1.17	1.27	2.98	3.55	103	4.0
Big 10	1.74	3.92	3.40	0.74	1.23	1.32	3.29	3.54	102	3.9
Vernal	1.83	3.55	3.38	0.84	1.36	1.38	3.58	3.50	102	7.0
Dynasty	1.82	3.76	3.54	0.65	1.19	1.37	3.20	3.50	101	5.1
Iroquois	1.84	3.86	3.39	0.68	1.26	1.30	3.24	3.50	101	5.5
Apollo Supreme	1.81	3.66	3.39	0.78	1.32	1.34	3.44	3.50	101	5.9
Mohawk	1.68	3.94	3.38	0.70	1.18	1.26	3.13	3.48	101	5.3
Saranac	1.60	3.57	3.24	0.89	1.27	1.32	3.48	3.43	99	7.4
5432	1.72	3.73	3.37	0.71	1.18	1.29	3.18	3.43	99	4.3
Magnum III	1.86	3.92	3.30	0.57	1.13	1.29	2.99	3.40	99	3.6
Endure	1.81	3.83	3.20	0.68	1.21	1.23	3.11	3.38	98	4.4
SX 424	1.65	3.88	3.23	0.57	1.18	1.16	2.91	3.34	97	3.8
Blazer	1.82	3.86	3.09	0.64	1.21	1.18	3.03	3.33	96	4.1
MTO N82[d]	1.78	3.33	3.10	1.09	1.34	1.11	3.54	3.32	96	8.4
636	1.73	3.57	3.14	0.70	1.26	1.29	3.25	3.32	96	4.4
Commandor	1.80	3.56	3.21	0.59	1.27	1.30	3.16	3.31	96	5.4
SX 217	2.05	4.04	3.21	0.44	1.05	1.12	2.61	3.29	95	2.5
AF21	1.69	3.82	3.38	0.48	1.05	1.08	2.60	3.27	95	2.6
Fortress	1.87	4.31	3.17	0.34	0.97	0.99	2.30	3.26	95	1.3
Saranac AR	1.78	3.61	3.00	0.59	1.16	1.23	2.99	3.20	93	4.6
Cim 2000G[d]	1.79	3.78	3.07	0.47	1.05	1.15	2.68	3.17	92	2.9
DK-135	1.81	3.69	2.98	0.39	1.04	1.05	2.48	3.05	88	2.8
Eagle	1.72	3.78	2.91	0.33	0.95	0.90	2.17	2.95	86	1.6
Average	1.81	3.88	3.33	0.67	1.21	1.25	3.14	3.45		4.7
Maturity[e]				5.6	5.4	5.5				
LSD(0.05)	NS[f]	NS	0.46	0.12	0.15	0.14	0.34	0.35		1.4

[a]Three-year average based on post-establishment year yields, 1988, 1989, and 1990.

[b]% relative performance = ratio of cultivar 3-yr average to 3-yr average of all cultivars.

[c]Winter injury score, visual score conducted May 4, 1990. 1=plot completely dead, 10-solid and uniform stand.

[d]Experimental line, not currently marketed.

[e]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[f]Cultivars not significantly different at the 0.05 level of probability.

Table 10. Forage yield and winter injury scores of 28 alfalfa cultivars planted April 28, 1988, at the Northeastern Research Station, Watertown, S.D.

Cultivar	1988 1-Cut Total	1989 3-Cut Total	1990 Cut 1 6/21	1990 Cut 2 7/27	1990 Cut 3 9/11	1990 3-Cut Total	3 Year Avg.[a]	Relative Performance[b]	Winter-kill[c]
	tons DM / acre							-- % --	- score -
Big 10	0.76	4.45	0.68	1.59	1.44	3.71	4.08	118	3.4
MTO N82[d]	0.54	3.73	1.22	1.70	1.41	4.33	4.03	116	6.9
Vernal	0.77	4.00	0.80	1.60	1.47	3.87	3.93	113	5.9
5262	0.52	3.87	0.79	1.54	1.48	3.81	3.84	111	4.5
526	0.56	3.66	0.91	1.54	1.50	3.94	3.80	110	4.8
120	0.71	3.81	0.61	1.46	1.38	3.45	3.63	105	3.5
86639[d]	0.53	3.54	0.86	1.45	1.33	3.63	3.59	103	5.3
AP 8620[d]	0.67	3.86	0.61	1.42	1.25	3.29	3.57	103	2.9
Magnum +	0.52	3.92	0.49	1.42	1.30	3.21	3.57	103	2.0
DK-125	0.67	4.12	0.37	1.45	1.13	2.95	3.54	102	2.1
Magnum III	0.57	4.00	0.40	1.47	1.16	3.04	3.52	101	1.9
Arrow	0.57	3.94	0.47	1.45	1.16	3.09	3.51	101	2.4
5432	0.49	3.91	0.46	1.37	1.27	3.11	3.51	101	2.6
AP 8631[d]	0.55	3.84	0.52	1.40	1.22	3.13	3.48	100	3.1
Vector	0.62	4.06	0.30	1.39	1.13	2.83	3.44	99	1.3
87N1[d]	0.70	3.88	0.34	1.48	1.18	3.00	3.44	99	1.9
87N3[d]	0.57	3.86	0.45	1.38	1.15	2.98	3.42	99	3.9
Chief	0.58	4.15	0.27	1.38	0.99	2.64	3.40	98	1.3
SX 424	0.62	3.75	0.39	1.43	1.19	3.00	3.38	97	2.0
Dart	0.54	3.55	0.54	1.37	1.20	3.10	3.32	96	2.6
Sure	0.61	3.81	0.35	1.44	1.05	2.83	3.32	96	1.3
87M1[d]	0.67	3.60	0.47	1.34	1.21	3.01	3.31	95	2.6
Kingstar	0.58	3.53	0.47	1.38	0.95	2.81	3.17	91	2.4
Cimarron	0.67	3.56	0.30	1.32	1.09	2.71	3.14	90	1.8
WL 225	0.47	3.41	0.42	1.21	1.16	2.79	3.10	89	2.0
WL 320	0.53	3.62	0.20	1.39	0.96	2.55	3.09	89	1.6
SX 217	0.60	3.39	0.28	1.39	1.09	2.76	3.07	89	3.6
Premier	0.57	3.46	0.26	1.36	0.86	2.48	2.97	86	2.0
Average	0.60	3.80	0.51	1.43	1.20	3.15	3.47		2.9
Maturity[e]			5.2	5.7	5.4				
LSD(0.05)	NS[f]	NS	0.15	0.21	0.20	0.41	0.50		2.0

[a]Two-year average based on post-establishment year yields, 1989, and 1990.

[b]% relative performance = ratio of cultivar 2-yr average to 2-yr average of all cultivars.

[c]Visual winter injury score; 1=stand completely dead, 10=solid and uniform stand.

[d]Experimental line, not currently marketed.

[e]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[f]Cultivars not significantly different at the 0.05 level of probability.

Winter injury in alfalfa is a complex problem, and there are numerous factors that influence the extent of winter damage on a particular stand.

Nevertheless, at the present time, the fall dormancy rating scale is the best standardized method available to determine if a cultivar is likely to be susceptible to winter injury in South Dakota. We encourage the use of the fall dormancy ratings as a guide in cultivar selection.

Generally, cultivars with a fall dormancy rating of 1 or 2 are very winterhardy and may persist longer under South Dakota conditions; however, forage yield under optimum conditions may be lower for these cultivars than for less dormant types. Consequently, very winterhardy cultivars should be used if stand longevity is of primary concern.

Cultivars with a rating of 3 to 4 are winterhardy to moderately winterhardy; at least 3 to 4 years of excellent production can be expected. Cultivars with ratings of 7 to 9 are generally not winterhardy enough to survive several South Dakota winters. These cultivars may be used as annual forages.

Disease resistance:

Disease resistance ratings are important indicators of a cultivar's potential to perform in situations where specific diseases may be limiting to production. Major diseases that can affect alfalfa productivity in South Dakota include bacterial wilt, Phytophthora root rot, and Verticillium wilt. Check for resistance to these diseases when choosing a cultivar.

Bacterial wilt is generally not observed until after the second production year. Infection occurs in spring or early summer via cracks and wounds in the roots and crowns. Eventually, the water-conducting tissues of the roots become plugged, causing the top growth to wilt, especially during periods of moisture stress. Other symptoms are yellow leaves, stunted growth, and a yellow to brown discoloration of the root tissue beneath the outermost layer. Many cultivars are resistant to bacterial wilt, and the disease can be limited by their use.

Phytophthora root rot is a fungal disease which occurs in wet, poorly drained soils after excessive precipitation or irrigation. If stands appear thin, look for deteriorated root or crown tissue. Top growth symptoms generally include wilting, yellowing, and lack of vigorous growth. Early symptoms of this disease are sometimes involved in damping-off of alfalfa seedlings.

Verticillium wilt is a fungal disease which produces initial temporary wilting of upper leaves on warm days at pre-bud to floral stages of maturity. Affected leaves will generally turn yellow, then senesce and drop off. Eventually, the stems die. The woody cylinder of the tap root usually shows a yellow to brown discoloration. Verticillium wilt has not yet been documented in South Dakota; however, it has been observed in several surrounding states and its appearance in South Dakota is expected. Resistant cultivars are the most effective control.

Other diseases, such as anthracnose, leaf spots, Fusarium wilt, and other root and crown rots may be problems at a particular site. In these situations, consider using cultivars with resistance to the

Table 11. Forage yield of 36 alfalfa cultivars planted May 4, 1990, at the Northeastern Research Station, Watertown, S.D.

Cultivar	1990 Cut 1 7/27
	- tons DM / acre -
Multi-plier	1.67
VIP	1.66
VS-888[a]	1.66
645	1.65
MultiKing 1	1.64
SDHS6[a]	1.63
Flint	1.63
Crown II	1.63
G-2841	1.63
DK-122	1.59
AFYF 88[a]	1.59
Centurion	1.59
G-2833	1.59
5364	1.58
Baker	1.58
SX 217	1.58
8941N[a]	1.57
Dawn	1.56
H-154[a]	1.55
Perry	1.55
Vernal	1.54
120	1.54
8837N[a]	1.53
Wrangler	1.53
630	1.52
WL 225	1.52
SDHL1[a]	1.51
MTO S82[a]	1.50
5262	1.49
8832N[a]	1.49
H-174[a]	1.48
Allegiance	1.47
Aggressor	1.46
WL 317	1.45
MN GRN-14[a]	1.42
Saranac AR	1.42
Average	1.56
Maturity[b]	4.1
LSD(0.05)	NS[c]

[a]Experimental line, not currently marketed.

[b]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[c]Cultivars not significantly different at the 0.05 level of probability.

Table 12. Forage yield of 24 alfalfa cultivars planted April 27, 1987, at the Central Crops and Soils Research Station, Highmore, S.D.

Cultivar	1988 2-Cut Total	1989 1-Cut Total	1990 Cut 1 6/20	1990 Cut 2 9/6	1990 2-Cut Total	3 Year Avg.[a]	Relative Performance[b]
	tons DM / acre						%
636	2.08	1.39	1.14	0.46	1.60	1.69	115
Mohawk	2.23	1.29	1.05	0.42	1.47	1.66	113
Saranac	2.21	1.31	1.00	0.41	1.41	1.64	112
Saranac AR	2.18	1.27	1.04	0.38	1.43	1.63	111
Iroquois	1.94	1.33	1.09	0.50	1.59	1.62	110
Vernal	1.85	1.30	1.17	0.48	1.65	1.60	109
Big 10	1.87	1.23	1.10	0.49	1.60	1.57	106
120	1.89	1.18	1.13	0.39	1.52	1.53	104
Magnum III	1.79	1.18	1.08	0.51	1.59	1.52	103
526	1.74	1.22	1.16	0.43	1.58	1.51	103
Webfoot	1.81	1.25	1.03	0.41	1.44	1.50	102
MTO S82[c]	1.65	1.24	1.24	0.35	1.59	1.49	101
MTO N82[c]	1.70	1.18	1.29	0.28	1.58	1.49	101
Blazer	1.59	1.03	1.05	0.42	1.47	1.41	96
Cimarron	1.65	1.07	1.05	0.42	1.48	1.40	95
Emerald	1.61	1.16	1.00	0.39	1.39	1.39	94
DK-135	1.70	0.99	1.02	0.44	1.46	1.39	94
WL 225	1.50	1.12	1.14	0.37	1.50	1.37	93
Clipper	1.44	1.10	1.19	0.36	1.55	1.37	93
Eagle	1.56	1.08	1.03	0.37	1.40	1.35	92
SX 424	1.61	1.01	1.01	0.39	1.39	1.34	91
Dynasty	1.42	1.14	1.00	0.43	1.43	1.33	90
532	1.48	1.06	1.02	0.40	1.42	1.32	90
SX 217	1.24	0.92	1.02	0.39	1.41	1.19	81
Average	1.74	1.17	1.09	0.41	1.50	1.47	
Maturity			5.0	6.4			
LSD(0.05)	NS[e]	NS	0.14	NS	NS	NS	

[a]Three-year average based on post-establishment year yields, 1988, 1989, and 1990.

[b]% relative performance - ratio of cultivar 3-yr average to 3-yr average of all cultivars.

[c]Experimental line, not currently marketed.

[d]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[e]Cultivars not significantly different at the 0.05 level of probability.

particular disease, if possible. For many diseases, the only practical way to minimize economic loss is to use disease resistant cultivars. Reduced stress from use of multiple disease resistant cultivars can result in long-term increases in yield and quality.

Disease resistance ratings for the tested cultivars are given in the Appendix.

Conclusions

No single characteristic, such as yield, will make an alfalfa cultivar or small group of cultivars consistently superior to any others; several characteristics must be evaluated. Yield from 1- to-3-year-old stands serves as a good measure of economic production, but stand longevity and stress and disease tolerance are also important.

Yield response data collected over several years and locations may be useful indicators of stress tolerance, longevity, and economic production. Fall dormancy has a significant influence upon winterhardiness, stress tolerance, and yield potential and is related to stand longevity in stressful environments. Multiple disease resistance also benefits stand longevity and yield. The final characteristic to consider is seed cost per unit PLS.

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Table 13. Forage yield of 36 alfalfa cultivars planted May 11, 1989, at the Central Crops and Soils Research Station, Highmore, S.D.

	1990				
Cultivar	Cut 1 6/20	Cut 2 7/23	Cut 3 9/6	3-Cut Total	Relative Performance[a]
	tons DM / acre				%
Ultra	1.80	1.13	1.12	4.06	124
Chief	1.65	1.22	1.17	4.03	123
Flint	1.55	1.28	1.20	4.02	123
630	1.57	1.26	0.99	3.83	117
Victory	1.71	1.05	1.01	3.76	115
Sure	1.63	1.05	1.02	3.70	113
Action	1.52	1.18	0.92	3.62	110
Apollo Supreme	1.68	1.06	0.86	3.59	110
WL 225	1.61	1.00	0.92	3.53	108
VS-775[b]	1.61	0.98	0.90	3.49	106
Centurion	1.59	0.91	0.94	3.44	105
Legend	1.46	1.05	0.93	3.44	105
VS-820[b]	1.52	1.02	0.89	3.43	105
Sabre	1.56	0.99	0.86	3.40	104
WL 317	1.56	0.97	0.83	3.36	102
Dawn	1.64	0.90	0.81	3.35	102
VIP	1.83	0.86	0.64	3.33	102
5472	1.48	0.98	0.85	3.31	101
Royalty	1.60	0.94	0.75	3.29	100
Saranac AR	1.44	1.00	0.81	3.26	99
Multi-plier	1.57	0.92	0.72	3.21	98
Majestic	1.68	0.78	0.74	3.20	98
Aggressor	1.57	0.85	0.70	3.13	95
Clipper	1.41	0.84	0.87	3.12	95
H-174[b]	1.41	0.90	0.75	3.06	93
Trident II	1.34	0.78	0.80	2.92	89
526	1.59	0.74	0.58	2.92	89
636	1.53	0.72	0.66	2.91	89
Vernal	1.46	0.74	0.67	2.87	88
Arrow	1.31	0.83	0.74	2.87	87
SDHS6[b]	1.61	0.66	0.58	2.85	87
Dart	1.54	0.65	0.64	2.83	86
SDHL1[b]	1.52	0.56	0.71	2.80	85
5262	1.39	0.65	0.73	2.77	84
Cimarron VR	1.43	0.69	0.59	2.71	83
88S[b]	1.29	0.68	0.53	2.50	76
Average	1.55	0.91	0.82	3.28	
Maturity[c]	5.1	5.5	7.3		
LSD(0.05)	0.25	NS[d]	0.37	0.90	

[a]% relative performance = ratio of cultivar 1990 total yield to 1990 total yield of all cultivars.

[b]Experimental line, not currently marketed.

[c]Average harvest maturity. Value based on Kalu and Fick (1983) mean-stage-by-count index.

[d]Cultivars not significantly different at the 0.05 level of probability.

Appendix. Listing of alfalfa cultivars, developers, suppliers, and agronomic characteristics.[a]

Developer/ Supplier	Cultivar	FD[b]	Disease & Insect Resistance[c] BW	VW	FW	An	PRR	PA
AgriPro Biosciences	Aggressor	4	HR	R	HR	HR	HR	R
	Apollo Supreme	4	HR	R	HR	HR	R	R
	Arrow	3	HR	R	HR	MR	HR	R
AgriPro Seeds	Dart	3	HR	R	HR	R	HR	R
	Dawn	3	HR	R	HR	R	HR	--[d]
Allied Seed	Centurion	3	HR	R	R	R	R	R
	Majestic	3	R	HR	HR	HR	R	--
	Sabre	4	HR	HR	HR	HR	HR	--
Arrow Seed	Emerald	4	R	MR	R	MR	R	R
Asgrow Seed	AF 21	4	HR	R	R	HR	R	R
	Eagle	4	HR	MR	R	R	MR	R
Bio-Plant Research	Target II	4	HR	R	R	R	R	--
Cargill	Crown II	3	HR	R	HR	HR	HR	R
	Endure	3	R	R	R	MR	R	--
	Royalty	3	HR	R	HR	HR	HR	R
	Trident II	3	HR	R	HR	R	HR	R
Cenex/Land O'Lakes	Blazer	3	HR	LR	R	LR	MR	HR
	Legend	4	HR	R	HR	HR	R	R
	Sure	3	HR	R	HR	HR	R	HR
Dahlgren	Kingstar	3	R	R	HR	MR	R	MR
	Premier	4	R	R	HR	R	HR	HR
Dairyland Research Int'l.	Magnum III	4	R	MR	R	MR	R	--
	Dynasty	4	HR	R	R	MR	R	--
	Magnum +	4	R	LR	R	MR	R	--
Dekalb Plant Genetics	120	3	HR	--	R	LR	R	R
	DK 122	2	HR	R	--	HR	HR	--
	DK 125	3	HR	R	R	HR	R	R
	DK 135	4	R	MR	R	MR	MR	R
Funk Brand Seeds	G-2833	3	HR	R	HR	HR	HR	R
	G-2841	3	HR	R	R	R	R	R
Garst Seed	630	4	HR	MR	R	MR	R	--
	636	2	HR	R	R	MR	R	R
	645	3	HR	R	R	HR	HR	R
Golden Harvest	GH 747	4	HR	MR	R	HR	HR	HR
Great Lakes Hybrids	Big 10	3	HR	--	HR	R	R	R
	Webfoot	2	R	--	LR	LR	R	--
Great Plains Research	Cimarron	4	HR	LR	HR	R	MR	R
	Cimarron VR	4	HR	R	HR	HR	R	MR
Jacques Seed	Multi-plier	2	HR	R	HR	HR	HR	R
	Chief	4	HR	R	R	R	HR	R

Developer/ Supplier	Cultivar	FD[b]	Disease & Insect Resistance[c] BW	VW	FW	An	PRR	PA
J.C. Robinson Seed	GH 737	4	R	R	R	MR	HR	R
L. Peterson Ltd.	Vector	4	R	MR	HR	R	R	R
New York Agric. Exp. Stn.	Iroquois	2	R	--	--	--	--	--
	Mohawk	2	HR	--	MR	HR	--	--
	Saranac	4	R	--	--	--	--	--
	Saranac Ar	4	MR	--	R	HR	--	--
Northrup King	Commandor	4	R	MR	R	HR	R	--
	Fortress	4	R	R	R	R	HR	R
	MultiKing 1	4	HR	R	HR	R	R	--
	Summit	4	R	R	R	HR	R	R
Payco Seeds/ Interstate	Clipper	2	HR	R	HR	R	R	R
	WL 225	2	HR	R	HR	MR	HR	R
	WL 317	3	HR	R	HR	R	HR	HR
	WL 320	4	R	MR	HR	MR	R	MR
Pioneer Hi-Bred Int'l.	526	2	HR	--	MR	--	LR	R
	5262	2	HR	LR	MR	--	R	R
	532	3	HR	--	R	LR	LR	R
	5364	4	R	MR	R	MR	MR	HR
	5432	4	HR	R	HR	--	MR	R
	5472	4	HR	MR	HR	MR	MR	HR
Plant Genetics	Flint	4	R	LR	HR	HR	R	MR
Public Cultivars, South Dakota Crop Improvement Association	Baker	2	HR	--	R	LR	--	HR
	Perry	3	R	--	R	LR	MR	--
	Wrangler	2	R	LR	R	LR	HR	HR
Research Seeds	VIP	3	HR	R	R	R	R	HR
	Action	4	R	MR	R	HR	R	R
SeedTec	Ultra	3	HR	R	HR	HR	R	R
Sexauer	SX 217	4	R	--	HR	MR	MR	--
	SX 424	5	MR	--	R	R	R	--
United AgriSeeds	Allegiance	3	R	R	R	HR	R	R
	Salute	4	HR	MR	R	MR	R	--
Wisc. Agric. Exp. Stn./USDA	Vernal	2	R	--	MR	--	--	--

[a] Ratings obtained from: Pick and Choose Your Alfalfa Varieties. pp. 14-17. Hay and Forage Grower. Vol. 4 No. 8. Webb Div. Intertec Publishing Corp. St. Paul, MN.

[b] FD = Fall Dormancy Index, 1 = greatest fall dormancy; 9 = absence of fall dormancy.

[c] Refer to pest resistance rating below:

BW = Bacterial Wilt
VW = Verticillium wilt
FW = Fusarium wilt
An = Anthracnose
PRR = Phytophthora Root Rot
PA = Pea Aphid

Pest Resistance Rating	
% Resistance plants	Resistance class ,
0-5%	Susceptible (S)
6-14%	Low Resistance (RS)
15-30%	Moderate Resistance (MR)
31-50%	Resistance (R)
> 50%	High Resistance (HR)

[d] Blank spaces indicate cultivar is susceptible or has not been adequately tested.