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Sudangrass vs. Alfalfa-Grass for Dairy Pasture and Silage in Northeastern Ohio

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Sudangrass vs. Alfalfa-Grass for Dairy Pasture and Silage in Northeastern Ohio

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INTRODUCTION

The heavy, poorly drained soils of northeastern Ohio are not well adapted for alfalfa. These conditions result in the occasional loss or reduction of alfalfa stands because of winter-killing. This factor, together with the development of improved varieties of sudangrass and relatively cheap nitrogen, may make sudangrass a more desirable crop than formerly when it was considered largely as an emergency crop.

The seeding of oats is frequently delayed on these heavy, wet soils, resulting in low yields. If the meadow crop could be successfully established in corn planted in wide rows, going directly from corn to meadow crop in the rotation would produce more dairy feed than by including a year of oats.

The most commonly grown forage grass in northeastern Ohio has been timothy. A 5-year study at the Trumbull County Experiment Farm of the Ohio Agricultural Research and Development Center showed the relative value of timothy and smooth bromegrass for this area (1). The dairy herd at this farm produced equally well on alfalfa-timothy and alfalfa-smooth bromegrass utilized as hay and silage in the winter feed program and as pasture. The timothy-legume mixture slightly outyielded the brome-legume mixture in the first 2 years but the brome-legume mixture was higher yielding when left in meadows for 3 years or longer.

Studies were initiated in northeastern Ohio: (a) to determine if sudangrass should have a regular place in forage programs for dairy farms; (b) to compare the feeding value of sudangrass silage with alfalfa-grass silage for lactating dairy cows; and (c) to evaluate the experimental practice of establishing meadows in corn planted in wide rows.

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[2]The authors acknowledge the assistance of J. L. Haynes, former Professor of Agronomy; J. H. Vandersall, former Instructor in Dairy Science; and Robert Taylor and John Flickinger, former Managers of the Trumbull County Experiment Farm.

EXPERIMENTAL PROCEDURES

The study was conducted for 6 years, 1957-62, at the Trumbull County Experiment Farm near Cortland. The soils on the farm are largely of the Mahoning-Trumbull association. These are grayish-brown to gray, acid, poorly drained soils over clay sub-soils. The area is nearly level to undulating, generally poorly drained, and low in natural fertility and organic matter. Better drainage is needed, as well as liberal amounts of lime and fertilizer for good crop production. The soils on the farm had been periodically limed to keep the pH near 7.0. The soil fertility level had been improved to recommended levels by applications of fertilizer and manure during the recent cropping programs.

Two cropping systems were established for summer grazing and corn grain production: (1) sudangrass, corn (wide rows), meadow, meadow (S-C-M-M); and (2) corn (wide rows), meadow, meadow, meadow (C-M-M-M). Four fields of 4.6 acres each were assigned to each cropping system. Except for nitrogen, the same amounts and grades of fertilizer were applied to both rotations. All fields were limed to pH 7 whenever the pH dropped to 6.5. Manure, as available, was applied in equal quantities to the two cropping systems.

The commercial fertilizers used were as follows:

Sudangrass, corn, meadow, meadow rotation

sudangrass—40 lb. per acre of nitrogen plowed down
150 lb. per acre of 5-20-20 drilled with the sudangrass

corn—120 lb. per acre of nitrogen plowed down
150 lb. per acre of 5-20-20 drilled with the corn

meadow seeding in corn—150 lb. of 5-20-20 drilled

first-year meadow— 750 lb. per acre of 0-20-20 broadcast

Corn, meadow, meadow, meadow rotation

corn—40 lb. per acre of nitrogen plowed down
150 lb. per acre of 5-20-20 drilled with corn

meadow seeding in corn—150 lb. per acre of 5-20-20 drilled

first-year meadow—900 lb. per acre of 0-20-20 broadcast

The corn was planted in 70-inch rows with a four-row corn planter, using only two of the planting units. A four-row cultivator was used, adjusting it to accommodate two wide rows. Alfalfa and timothy were band seeded in the corn in early July when the corn was 12-14 inches tall. The disc openers of the drill which would have been over the corn rows were removed for planting the forages. Good stands of alfalfa were obtained by this procedure. However, it became necessary to drill

the timothy into the stand again the following spring because of the poor stands obtained from drilling in mid-summer.

Eight additional rotation fields on the farm, totaling 43.6 acres, were used to grow feed for the winter comparison period. Four fields were in the sudangrass, corn (wide rows), meadow, meadow rotation, and four in the corn (wide rows), meadow, meadow, meadow rotation. The field of sudangrass in the S-C-M-M rotation was put in one silo. The fields in meadow were seeded to alfalfa-timothy (2-year meadows) or alfalfa-bromegrass (3-year meadows) for filling the second silo and for hay. The corn was harvested for grain. The fertilizer practices were the same as for the cropping systems used for grazing.

The varieties used for all plantings were Piper sudangrass, common timothy, Lincoln smooth bromegrass, Ranger, later Vernal, alfalfa, and M-15, later M-53, early maturing corn hybrids. The area has the shortest growing season in the state, an average of 140 frost-free days.

The purebred Holstein-Friesian herd, with an average annual production of about 12,000 lb. of milk, was divided during each experimental period into two groups for the summer grazing and winter feeding experiments. From 12 to 14 animals were included in each group for each experimental period. The cows were weighed for 3 successive days at the beginning and close of the experimental periods or when added or removed from the experiments. Cows were added to each group in equal numbers as they freshened.

All cows were fed grain at the rate of 0.4 lb. per pound of milk above 20 lb., with a minimum grain level of 2 lb. per feed. Grain provided an average of 25% of the total digestible nutrient (TDN) requirements during the summer grazing period and about 35% during the winter feeding period. The grain mixture was 1,000 lb. corn and cob meal, 600 lb. ground oats, 200 lb. soybean oilmeal, and 18 lb. iodized salt. The mixture had a crude protein analysis of 14.4%. Other mineral supplement and salt were offered free choice. An analysis of the hay showed 12.6% crude protein. The silage protein analyses are given in Table 1.

During the summer grazing, one group was grazed on sudangrass and the other group on alfalfa-grass pasture to evaluate the two kinds of forage for summer milk production. When experimental pastures were not available, the herds were put on permanent pasture or hay meadow aftermath.

During the winter-feeding period, the cows in each treatment group were fed about 40 lb. of sudangrass or alfalfa-grass silage. Refusal was weighed and recorded. Both groups were fed alfalfa-grass hay from the

same mow. Amounts of hay fed to each cow were weighed and the refusal also weighed.

The TDN consumed per acre from pasture and from winter feeding were calculated, using 7.93 lb. TDN per 1000 lb. body weight for maintenance and .324 lb. TDN per pound of 4% fat-corrected milk (F.C.M.) (3); 3.53 and 2.73 lb. TDN for body weight gain and loss, respectively (2).

RESULTS

Animal Data

Summer feeding period. The animals grazing the alfalfa-grass averaged higher in production of 4% F.C.M. per day than those on sudangrass for the 5 years—37.8 lb. and 34.6 lb. for alfalfa-grass and sudangrass (Table 1A). This was 3.2 lb. more 4% F.C.M. per cow per day from alfalfa-grass than from sudangrass, although not statistically different ($P>.05$). Except for one year, 1962, the cows grazing alfalfa-grass produced more milk per day than those grazing sudangrass.

The grazing days per acre, pounds of 4% F.C.M. per acre, TDN per acre from pasture, and average body weight changes were also slightly higher on the average for the alfalfa-grass pasture than for the sudangrass pasture, but not statistically different ($P>.05$). There was some variation within years. Sudangrass occasionally was superior to alfalfa-grass in one or more of the comparisons, particularly in 1962 when sudangrass was higher in grazing days, average production per cow, and TDN from pasture. The alfalfa-grass group received 1 lb. more of grain per day on the average than the sudangrass group. The percent of TDN from pasture for the 5 years was almost identical, 75 and 76% for alfalfa-grass and sudangrass.

Winter feeding period. The average production of 4% F.C.M. per cow per day for the two silage treatments was almost identical for the 6 years, 40.1 and 39.9 lb. for alfalfa-grass and sudangrass silage groups, respectively (Table 1B). There was some variation within years between the two groups, particularly in 1960, 1961, and 1962.

The amount of silage fed per day was similar, averaging about 40 lb. per day. The percent TDN from silage in the ration was 37 and 33% on the average for the alfalfa-grass and sudangrass groups. Most of this difference occurred in 1959 and 1960, when the animals consumed about 10 lb. more TDN from alfalfa-grass than sudangrass silage. The amount of hay and grain consumed by the sudangrass groups averaged slightly higher than for the alfalfa-grass groups. The sudangrass silage, when properly made, was well accepted by the cows. It was usually much lower in protein than the alfalfa-grass silage.

Cropping Data

1957: The sudangrass was cut twice for silage and yielded 2.7 tons of dry matter per acre on September 1 at the early heading stage and a smaller harvest of 0.7 tons per acre on September 26. The two cuttings totaled 3.4 tons of dry matter per acre (8.7 tons of silage). The sudangrass was mowed and allowed to wilt before chopping. Sampled for moisture late in the fall, the sudangrass silage was 38.5% dry matter, compared with 22.0% for the alfalfa-grass silage. There was considerable spoilage from mold with the sudangrass, indicating that wetter material should have been used to give a tighter pack in the silo.

The alfalfa-grass harvested as silage and hay yielded about 27% more dry matter per acre than the sudangrass. Both the alfalfa-grass and sudangrass (where spoilage had not occurred) made acceptable silage. The sudangrass was much lower in protein than the alfalfa-grass silage—5.5 and 9.7% crude protein, respectively.

An excellent stand of alfalfa was established by drilling in the wide-row corn. A thin stand of timothy was obtained (4-5 plants per square foot) and it was necessary to replant the timothy the following spring.

Wide-row corn following 3 years of alfalfa-grass in the C-M-M-M rotation yielded 54 bushels per acre compared with 31 bushels per acre following sudangrass in the S-C-M-M rotation.

Similar TDN yield and grazing days per acre were obtained from grazing the sudangrass and the alfalfa-grass pastures (Table 1A).

1958: The sudangrass was cut once for silage, September 9-10, at the soft dough stage. It was direct-cut with a dry matter content of 23% and yielded 1.9 tons of dry matter per acre (8.0 tons of silage). A very acceptable silage was obtained from the sudangrass, with no loss from mold.

An analysis of the sudangrass and alfalfa-grass silages is shown in Table 2. The alfalfa-grass silage is much higher in crude protein and carotene than the sudangrass silage, 16.0% and 204.7μ per gram compared with 7.7% and 142.0μ per gram, respectively. The alfalfa-grass silage was relatively high in butyric acids (a result of the high moisture content), while the sudangrass silage was high in acetic and lactic acids. The alfalfa-grass silage contained approximately ten times the amount of fatty acids contained in the sudangrass silage.

The alfalfa-grass harvested for stored feed (hay and silage) yielded 26% more forage than the sudangrass utilized as stored feed (silage). Although an excellent stand of alfalfa was obtained by summer seeding in the wide-row corn, it winter-killed during the winter of 1958-59.

TABLE 1.—A Comparison of Alfalfa-grass and Sudangrass for Summer Grazing and as Silage for Winter Feeding, Trumbull County Experiment Farm, 1957-1962.

	A. SUMMER GRAZING PERIOD					
	1957		1958		1959	
	Alfalfa-grass	Sudan-grass	Alfalfa-grass	Sudan-grass	Alfalfa-grass	Sudan grass
Number of cows	12	13	14	13		
Av. body weight, lb.	1335	1392	1335	1356		
Grazing period	5/24-9/15	5/24-9/15	5/15-9/30	5/15-9/26	No comparison,	
Length of pasture season, days	114	114	138	134	seedings	
Grazing days per acre	47.0	55.2	92.3	62.3		
4% F.C.M. per cow per day, lb.	40.0	34.3	38.2	31.5	winter-	
4% F.C M. per acre, lb.	1882	1893	2227	1488	killed	
Grain per cow per day, lb.	9.0	8.0	9.5	8.7		
TDN per acre from pasture, lb.	898	953	1718	1079		
Percent TDN from pasture	74	74	77	73		
Av. body weight change, lb.	+34	+19	+ 8	+34		

TABLE 1. (Continued)—A Comparison of Alfalfa-grass and Sudangrass for Summer Grazing and as Silage for Winter Feeding, Trumbull County Experiment Farm, 1957-1962.

A. SUMMER GRAZING PERIOD

	1960		1961		1962		Average	
	Alfalfa-grass	Sudan-grass	Alfalfa-grass	Sudan-grass	Alfalfa-grass	Sudan-grass	Alfalfa-grass	Sudan-grass
Number of cows	14	14	13	14	13	13	13	13
Av. body weight, lb.	1349	1353	1229	1281	1244	1234	1298	1323
Grazing period	5/27-9/1	5/27-9/12	5/29-9/24	5/29-9/24	5/16-9/6	5/16-9/6	5/22-9/15	5/22-9/18
Length of pasture season, days	97	108	118	118	113	120	116	119
Grazing days per acre	45.9	56.8	76.3	70.7	74.4	81.2	67.1	65.2
4% F.C.M. per cow per day, lb.	33.2	32.4	47.7	40.4	30.1	34.4	37.8	34.6
4% F.C.M. per acre, lb.	960	1142	1762	1580	1664	1839	1568	1467
Grain per cow per day, lb.	4.0	4.0	5.6	4.7	9.0	10.9	8.1	7.1
TDN per acre from pasture, lb.	820	964	1331	1245	965	1292	1146	1107
Percent TDN from pasture	85	84	76	79	64	72	75	76
Av. body weight change, lb.	— 6	— 9	+28	+40	+55	+21	+24	+21

TABLE 1. (Continued)—A Comparison of Alfalfa-grass and Sudangrass for Summer Grazing and as Silage for Winter Feeding, Trumbull County Experiment Farm, 1957-1962.

	B. WINTER FEEDING PERIOD					
	1957		1958		1959	
	Alfalfa-grass Silage	Sudan-grass Silage	Alfalfa-grass Silage	Sudan-grass Silage	Alfalfa-grass Silage	Sudan-grass Silage
Number of cows	13	13	13	13	13	13
Av. body weight, lb.	1326	1368	1411	1388	1361	1370
Feeding period	10/14-1/12	10/14-1/12	10/14-1/31	10/14-1/31	11/11-3/16	11/11-3/16
Number of days	90	90	109	109	125	125
Total days in milk	1002	1076	1209	1072.5	1284	1473.5
4% F.C.M. per cow per day, lb.	42.6	40.9	36.6	35.2	41.3	38.3
Percent TDN from silage	38	38	39	40	44	33
Percent TDN from grain	27	30	29	30	28	24
Total TDN fed per cow per day, lb.	26.1	24.5	22.6	24.5	18.3	18.7
Av. body weight change, lb.	— 7	+17	+29	+33	+12	—51
Silage per cow per day, lb.	48.5	36.6	47.6	49.1	39.9	38.2
Hay per cow per day, lb.	22.3	20.4	19.4	19.8	17.8	25.1
Grain per cow per day, lb.	10.0	9.7	9.3	9.8	7.8	7.7
Percent protein, silage	9.7	5.5	16.0	7.7	16.0	6.8

TABLE 1. (Continued)—A Comparison of Alfalfa-grass and Sudangrass for Summer Grazing and as Silage for Winter Feeding, Trumbull County Experiment Farm, 1957-1962.

B. WINTER FEEDING PERIOD

	1960		1961		1962		Average	
	Alfalfa-grass Silage	Sudan-grass Silage	Alfalfa-grass Silage	Sudan-grass Silage	Alfalfa-grass Silage	Sudan-grass Silage	Alfalfa-grass Silage	Sudan-grass Silage
Number of cows	13	13	13	13	12	12	13	13
Av. body weight, lb.	1318	1393	1190	1240	1190	1183	1316	1324
Feeding period	10/31-3/8	10/31-3/8	11/27-3/14	11/27-3/14	12/1-2/14	12/1-2/14	11/5-1/14	11/5-1/14
Number of days	129	129	107	107	75	75	106	106
Total days in milk	1523	1271	1311	1195	913	836	1207	1154
4% F.C.M. per cow per day, lb.	37.0	31.5	36.2	40.0	36.9	43.3	40.1	39.9
Percent TDN from silage	39	28	30	29	33	37	37	33
Percent TDN from grain	28	27	30	34	35	36	30	30
Total TDN fed per cow per day, lb.	21.2	21.0	21.5	23.6	21.9	17.5	23.6	23.3
Av. body weight change, lb.	+64	+57	+85	+76	+ 3	—18	+31	+23
Silage per cow per day, lb.	38.0	31.1	39.5	36.3	37.9	39.1	41.8	38.2
Hay per cow per day, lb.	17.7	20.7	19.6	19.7	18.4	17.6	19.1	20.9
Grain per cow per day, lb.	7.9	7.5	8.8	11.0	9.1	11.9	8.9	9.4
Percent protein, silage			8.8	8.3	11.4	8.6	12.4	7.4

TABLE 2.—Chemical Analysis of Sudangrass and Alfalfa-grass Silage, 1958.

	Alfalfa-grass	Sudangrass
Dry matter, percent	18.0	22.6
Crude protein, percent (dry matter basis)	16.0	7.7
Carotene, μ/g (dry matter basis)	204.7	142.0
Relative proportions of fatty acids (molar %)		
acetic	39 3	19.2
propionic	7.6	0.8
butyric	53.1	0.0
lactic	0.0	80.0

Wide-row corn following alfalfa in the C-M-M-M rotation yielded 88 bushels per acre compared with 74 bushels following sudangrass in the S-C-M-M rotation.

About one-third more grazing days were obtained per acre from the alfalfa-grass pasture than from grazing the sudangrass. This difference is also shown in the larger amount of TDN obtained from the alfalfa-grass pastures than from the sudangrass (Table 1A).

1959: The sudangrass was direct-cut for the silo at the early heading stage. The first cutting yielded 2.3 tons of dry matter per acre (7.2 tons of silage) and the second cutting 0.6 tons of dry matter per acre (1.7 tons of silage), totaling 2.9 tons of dry matter per acre. A very acceptable silage resulted, with a crude protein content of 6.8%.

Because of the severe reduction of alfalfa stands from winter damage, no comparisons of stored forage yields were made. However, alfalfa-grass silage and hay were made from the thin stands remaining. The alfalfa-grass silage had 16.0% crude protein.

Vernal alfalfa with 1½ lb. of common timothy was summer seeded in the wide-row corn. Excellent stands of alfalfa were obtained. Additional timothy was drilled early in the following spring because of the poor stand of timothy obtained from summer seedings.

The yield of corn was 67 bushels per acre following the alfalfa in the C-M-M-M rotation and 58 bushels per acre following the sudangrass in the S-C-M-M rotation.

No grazing comparisons were made because of winter-killing of the alfalfa stands.

1960: The sudangrass was direct-cut for the silo on September 30 when the heads were in the hard dough stage. The yield was 3.5 tons of dry matter per acre (10.3 tons of silage). The material was 34.0% dry matter and considerable spoilage occurred, resulting in low

palatability. The reduced quality was reflected in the lower daily consumption of sudangrass silage (31.1 lb.) compared with the alfalfa-grass silage (38.0 lb.). With both groups of cows consuming about the same amount of hay and grain (Table 1B), the sudangrass silage group produced considerably less milk per day than the alfalfa-grass group, 31.5 and 37.0 lb. 4% F.C.M., respectively.

The alfalfa-grass fields yielded a first cutting of 2.4 tons of dry matter per acre as hay and silage. The aftermath was grazed so no direct total comparisons of forage yields of the two rotations were made for season total yields.

Good stands of alfalfa were established in the wide-row corn. The corn yield on both rotations was 67 bushels per acre.

More grazing days were obtained per acre from the sudangrass pasture than from the alfalfa-grass, 57 and 46 days, respectively.

1961: The sudangrass was direct-cut on August 21 at the early heading stage and yielded 3.1 tons of dry matter per acre (11.5 tons of silage at 26.9% dry matter). A good quality silage was obtained, as shown by the similar silage consumption and milk production between the two groups (Table 1B).

The alfalfa-grass harvested as silage and hay yielded about 23% more dry matter per acre than the sudangrass. Two first-year alfalfa-grass meadows averaged 2.4 tons of hay (85% dry matter) for the first cutting, indicating the good stands obtained from summer seeding in wide-row corn.

Alfalfa establishment was good in the wide-row corn. The corn yield following sudangrass in the S-C-M-M rotation was 50 bushels per acre, compared with 77 bushels per acre in the C-M-M-M rotation.

Slightly more grazing days per acre were obtained from the alfalfa-grass pasture than from the sudangrass, 76 and 71 days, respectively.

1962: Dry weather severely limited plant growth, as shown by the low crop yields. The sudangrass was direct-cut for the silo when the grain was in the milk stage. At 28.2% dry matter, the sudangrass yielded 1.7 tons of dry matter per acre (6.0 tons of silage). A good quality silage was obtained, with a crude protein analysis of 8.6% compared with 11.4% for the alfalfa-grass silage.

The first cutting of the alfalfa-grass was harvested as hay or silage, averaging 1.8 tons of hay and 5.0 tons of silage per acre. The regrowth was used as pasture.

The extremely dry weather resulted in low yields of corn, 38 bushels per acre following sudangrass and 25 bushels following alfalfa. In all previous years, corn following alfalfa outyielded corn following sudangrass. The dry weather undoubtedly caused the difference in 1962.

The spring-plowed alfalfa depleted the soil moisture, which was not replenished by the abnormally low spring and summer rainfall. The winter moisture was still largely available to the corn planted in the sudangrass sod.

Slightly more grazing days were obtained from the sudangrass pasture than from the alfalfa-grass, 81 and 74 days, respectively.

DISCUSSION

The amount of summer grazing from the two rotations was very similar, an average of 67.1 and 65.2 cow-days per acre for the alfalfa-grass and sudangrass pastures. The production of the alfalfa-grass group was slightly higher than the sudangrass group, averaging about 100 lb. more 4% F.C.M. per acre during the 5 years. The alfalfa-grass group also consumed 1 lb. more grain per cow per day than the sudangrass group. This group also utilized slightly more TDN per acre than the sudangrass group, 1,146 and 1,107 lb., respectively.

It appears that sudangrass is a satisfactory substitute for alfalfa-grass for summer grazing but offers no advantage. The costs involved for sudangrass would be slightly higher because of annual establishment cost and the added cost of nitrogen fertilizer.

More stored forage was harvested per acre from the alfalfa-grass than from the sudangrass, which was stored as silage only. An acceptable silage was obtained from sudangrass when it was direct-cut at early heading stage.

Wilting the sudangrass in the swath before ensiling or delaying harvest until the material was mature resulted in considerable loss from spoilage. The spoilage appeared to be the result of insufficient packing of the drier material.

The sudangrass silage was lower in crude protein than the alfalfa-grass silage, averaging 7.4 and 12.4% respectively. A ration including sudangrass would therefore require more protein concentrate to meet animal needs than one including alfalfa-grass silage.

The milk production and body weight changes were essentially the same for the two winter feeding groups. This indicates that sudangrass silage could be satisfactorily substituted for alfalfa-grass silage in a winter feeding program.

An excellent stand of alfalfa was obtained each year by band-seeding in the wide-row corn (70-inch) when the corn was 10-14 inches tall. Heaving was a problem during most winters and resulted in thin stands or stand losses of the alfalfa. Heaving and stand losses occurred regardless of whether spring or summer seedings were made.

Ignoring the 1962 yields when the severe drought sharply reduced the corn production, the corn following 3 years of alfalfa averaged 71 bushels per acre, compared with 56 bushels following sudangrass. These yield differences occurred despite the heavy application of nitrogen to the corn following sudangrass. The poor soil conditions following the sudangrass because of the heavy root system made it difficult to obtain a good stand of corn. It is believed that the somewhat poorer stand of corn obtained in sudangrass sod compared with alfalfa-grass sod caused the lower yield, rather than lack of sufficient nitrogen to decompose the sudangrass roots and stubble.

Sudangrass in the rotation showed no special merit. It should continue to be considered as an emergency crop for use whenever the alfalfa-grass stands are lost or badly reduced because of heaving or winter-killing.

SUMMARY

Studies were conducted with dairy cattle to compare sudangrass with alfalfa-grass for dairy pasture and silage.

The alfalfa-grass generally outyielded the sudangrass in dry matter production and was higher in quality for livestock feeding. Cattle grazing alfalfa-grass pastures averaged slightly higher in daily milk production than those grazing sudangrass. The sudangrass was shown to make an acceptable silage by direct-cut at the early-heading stage.

Similar milk production was obtained from the two groups fed hay, grain, and silage when the only difference between the rations was the inclusion of either alfalfa-grass silage or sudangrass silage. Good stands of alfalfa were obtained from band-seeding in wide-row corn (70-inch).

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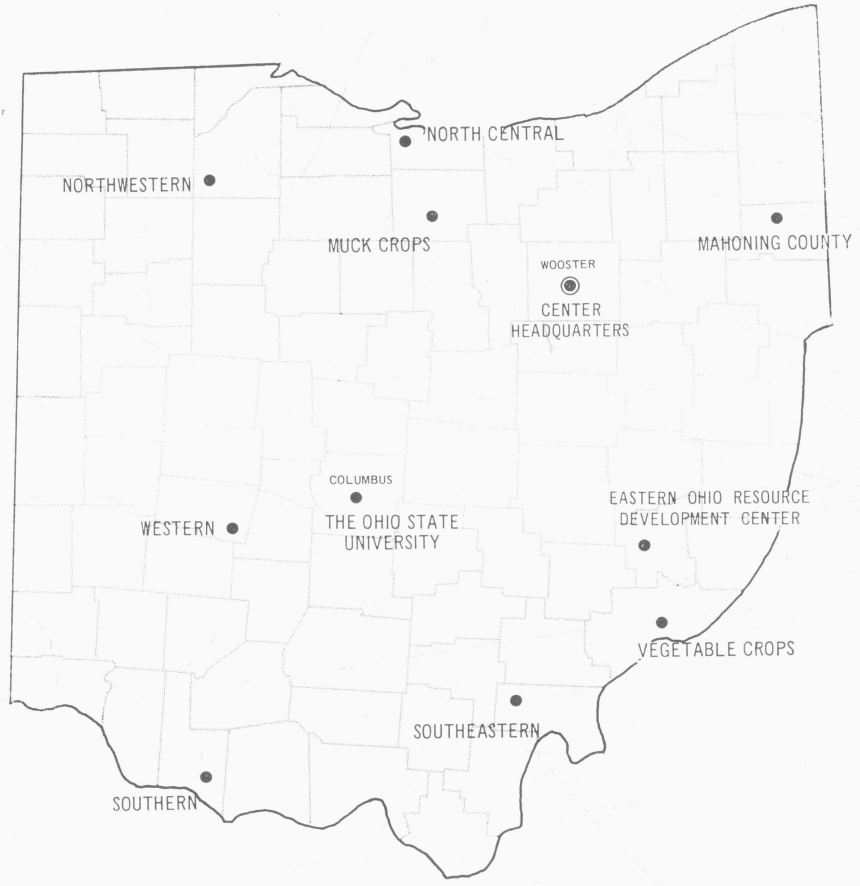
The State Is the Campus for Agricultural Research and Development



Ohio's major soil types and climatic conditions are represented at the Research Center's 11 locations. Thus, Center scientists can make field tests under conditions similar to those encountered by Ohio farmers.

Research is conducted by 14 departments on more than 6000 acres at Center headquarters in Wooster, nine branches, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 2017 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Mahoning County Experiment Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Marietta, Washington County: 20 acres

Western Branch, South Charleston, Clark County: 428 acres