1979 Research Results

Report of Progress 381
April 1980
Southeast Kansas Branch
Agricultural Experiment Station
Kansas State University, Manhattan
Floyd W. Smith, director

INTRODUCTION

Southeast Kansas Experiment Station is in its 30th year of operation. The emphasis has changed over this period to reflect changes in agricultural emphases of the area. The professional research staff consists of four scientists, each with a broad area of research responsibility. Together they emphasize improvement in crop production, forage production, beef cattle production and soil and water management.

The criterion for undertaking a research project is its expected contribution to improving agriculture in southeastern Kansas. Research at the Station contributes beyond the 15 counties of responsibility but the Branch Station scientists put priority on area needs.

The purpose of our research and this publication is to serve Southeast Kansas Agriculture. We hope these reports will interest and benefit our readers. We welcome suggestions to improve our efforts to improve Agriculture and, thus, improve life for all.

Information in this report is for farmers, producers, collagues, industry cooperators, and other interested persons. It is not a recommendation or endorsement, it only reports progress in research.

Publications and public meetings by the Kansas Agricultural Experiment Station are available and open to the public regardless of race, color, national origin, sex, or religion.

Contribution no. 80-271-S, Southeast Kansas Branch Experiment Station, Mound Valley, and Kansas Agricultural Experiment Station, Kansas State University, Manhattan.

CONTENTS

CROPS RESEARCH

Kenneth W. Kelley [1]

Small-grain-variety Performance Tests

The small-grain-variety test is to help southeastern Kansas growers select winter wheat, barley, and spring oat varieties best suited for the area.

Procedure: In 1979, 22 wheat varieties, six barley varieties, and eight spring oat varieties were compared.

Results: Wheat yields in 1979 were a record after unusually cool spring delayed heading and was followed by ideal cool weather and adequate rainfall during flowering and grain filling. Hart, a soft wheat, was the top yielder at 80 bushels per acre. The average for all varieties was 71 bushels per acre, with a range from 55 to 80. Complete wheat variety results are compiled in Kansas Agric. Experiment Station Report of Progress 370, available at county extension offices.

Barley varieties averaged 65 bushels per acre, with Paoli the high yielder at 82 bushels.

Spring oat varieties also set record yields, ranging from 131 to 152 bushels per acre. Barley and spring oat variety results appear in Tables 1 and 2.

Table 1. Winter barley variety comparisons, Parsons, 1979.

Variety	Yield, bu/a	Heading date, May	Height, in.	Lodging 1/ %	Winter survival, %
Kanby	51	14	35	35	88
Paoli	82	12	34	85	100
Nebar	56	14	38	36	96
Will	49	14	36	33	86
Post	76	16	34	30	88
Herb	75	14	38	91	100
LSD .05	18	--	--	29	10

1/ Varieties harvested past optimum harvest stage accounted for more severe lodging than normal.

1 Crops & Soils Agronomist, Southeast Kansas Branch Experiment Station, Mound Valley.

Table 2. Spring-oat-variety comparisons, Parsons, 1979.

Variety	Yield, bu/a	Test wt., lbs/bu	Heading date, May	Height, in.	Lodging %
Lang	146	34	21	34	5
Bates	147	33	23	36	8
Stout	146	35	23	34	5
Spear	133	34	24	38	5
Otee	141	34	23	36	5
Pettis	152	36	21	41	28
Trio	133	35	22	40	20
Cherokee	131	35	24	38	37
LSD .05	N.S.	1.2	--	2	4

Effect of Seeding Rate on Wheat Yields (Selected Varieties)

Wheat seeding rates in southeastern Kansas have gradually increased the past several years, as more semi-dwarf and soft wheat varieties are grown. But the effect of seeding rates on semi-dwarf and soft wheat varieties has not been evaluated in southeastern Kansas.

Procedure: Beginning in 1978 four varieties (Trison, Newton, Centurk, and Abe) were seeded at 60, 90, and 120 pounds per acre. In 1979 Hart, a more popular soft wheat variety, was substituted for Abe.

Results: Wheat yields were outstanding in 1979 with the semi-dwarf (Newton) and the soft variety (Hart) yielding 68 bushels per acre. The 90- and 120- pound seeding rates were significantly better than the 50-pound (1 bu.) rate. In 1978, when wheat was seeded in late November, the 120-pound rate was best for all varieties.

Table 3. Effect of seeding rate on wheat yields, Parsons, 1979.

Variety	Seeding rate, lbs/a	Yield, bu/a 1979	Yield, bu/a 1978	Test wt., lbs/bu
Newton	60	66.8	32.7	60
Newton	90	67.2	34.9	60
Newton	120	72.2	39.1	61
Centurk	60	64.8	28.3	59
Centurk	90	67.3	32.2	60
Centurk	120	65.4	34.2	60
Hart	60	64.7	- - -	59
Hart	90	69.1	- - -	59
Hart	120	70.5	- - -	59
Trison	60	57.7	21.3	62
Trison	90	58.9	24.1	62
Trison	120	59.4	24.2	62
LSD .05		4.7	- - -	1.4
Mean values:				
Newton		68.7	35.6	60
Centurk		65.8	31.6	60
Hart		68.1	- - -	59
Trison		58.7	23.2	62
LSD .05		2.7	- - -	1.8
60 lbs/a		63.5		60
90 lbs/a		65.6		60
120 lbs/a		66.9		61
LSD .05		2.4		N.S.

Effect of Fungicide Seed Treatments on Wheat Yields

Many farmers no longer treat seed wheat with a fungicide at planting time; however, where smutty wheat has been a problem, treating seed wheat with the proper fungicide is good management.

Procedure: Since 1976 wheat has been grown continuously on the same soil site to evaluate fungicide seed treatments applied as planter-box formulations. In 1979, Vitavax-25DB, Granox N-M and a control (no treatment) were compared.

Results: There was no yield advantage from fungicide seed treatments in 1979, although a year earlier fungicide treatments gave a slight yield benefit when wheat was planted in late November. Neither bunt nor loose smut has been a problem during the 4-year evaluation. Where either disease is present, fungicides generally increase yields.

Effect of Ice Cover on Soil Surface Where Nitrogen is Applied to Winter Wheat

It is recommended that nitrogen be applied to winter wheat in late winter when there is no frozen ice cover on the soil surface. But the amount of nitrogen loss under these conditions has not been fully determined.

Procedure: In 1979 nitrogen, as urea, was applied (1) in February when there was a 2 to 3-inch ice layer and (2) when the ice cover was melted.

Results: Yields were about 5 bushels per acre less when N was applied on the frozen ice cover than when applied after the ice cover had melted. However, nitrogen applied on the frozen ice increased yields 5 bu/acre over the control (no nitrogen).

Fall and Spring Nitrogen Applications Compared for Wheat

When winter precipitation is above normal, farmers in southeastern Kansas wonder if much nitrogen is lost after being applied to wheat in the fall. They also wonder if semi-dwarf wheat varieties tolerate higher N rates without lodging.

Procedure: In 1979 we compared fall and spring N applications at 30, 60, and 90 N pounds per acre on Trison, a standard height variety, and Newton, a semi-dwarf.

Results: Fall and spring N applications showed no significant differences in yield or grain protein. Lodging from high N rates was not a problem with either variety. Optimum yields were obtained with 60 pounds of N per acre, although grain protein increases paralled applied nitrogen increases.

There was no significant yield difference between Trison and Newton in 1979 (Table 4), nor was there any interaction between variety and N rate.

Table 4. Effects of nitrogen rates, application times, and varieties on winter wheat, Parsons, 1979.

N rate, lbs/a	Time applied	Variety	Yield, bu/a	Protein %
Nitrogen rate averages, all application times and varieties				
0			46.6	10.3
30			56.9	11.4
60			61.0	12.8
90			60.2	13.7
LSD .05			2.1	0.7
Time applied averages, all N rates and varieties				

(continued)

Table 4. Effects of nitrogen rates, application times, and varieties on winter wheat, Parsons, 1979. (continued)

N rate, lbs/a	Time applied	Variety	Yield, bu/a	Protein %
	Fall		59.2	12.5
	Spring		59.5	12.5
	LSD .05		N.S.	N.S.
Variety averages, all N rates and application times				
		Newton	60.2	12.4
		Trison	58.5	12.1
		LSD .05	N.S.	N.S.

Grain-sorghum-hybrid Performance Test

Farmers and seed companies want grain sorghum hybrids compared in performance tests where all entries are treated equally.

Procedure: In 1979, 67 hybrids entered by private seed companies were compared at the Parsons field in Labette county.

Results: Grain yields averaged 126 bushels per acre for all hybrids, with a range of 86 to 159 bushels per acre. Good growing conditons early in the season and adequate moisture during the critical grain-filling period led to high yields. Complete grain sorghum yield results are compiled in Agric. Expt. Station Report of Progress 375, available at county extension offices.

Grain Sorghum Hybrids and Planting Dates Compared

Grain sorghum hybrids with different plant maturities are planted from late April through early June in southeastern Kansas. Hybrid maturity and planting date are chosen to avoid flowering during the normal hot, dry period of late July and early August. More information is needed, however, to determine optimum planting dates with respect to hybrid maturities.

Procedure: Beginning in 1979 six grain sorghum hybrids - representing early (Pioneer 8790), medium (Acco 101GR, Acco 1089, and Pioneer 8585), and medium-late (Pioneer 8272 and Prairie Valley 708 GR) maturities, were planted on four dates (May 16 and 31, June 13, and July 3).

Results: In 1979 the highest yields came from the mid-June planting, regardless of hybrid maturity. The early July planting was too late for the medium and longer season hybrids, as they did not reach physiological maturity before the first killing frost.

Table 5. Early, medium, and full-season grain sorghum hybrids compared at indicated planting dates, Columbus, 1979.

Hybrid	Planting date	Yield, bu/a	Test wt., lbs/bu	Date of half bloom	Height, in.
Pioneer 8790	May 16	*90.2	59	7/18	41
(early)	May 31	*83.6	61	7/28	40
	June 13	109.7	59	8/7	40
	July 3	84.2	55	8/28	41
Acco GR1018	May 16	*107.5	60	7/21	42
(medium)	May 31	98.1	61	7/30	42
	June 13	113.7	60	8/9	43
	July 3	58.6	56	8/30	45
Acco GR1089	May 16	*109.3	60	7/21	43
(medium)	May 31	102.6	60	7/30	43
	June 13	112.7	58	8/9	44
	July 3	75.7	52	8/30	47
Pioneer 8585	May 16	*107.8	61	7/23	42
(medium)	May 31	102.3	62	8/1	42
	June 13	110.7	62	8/11	46
	July 3	68.7	55	9/1	47
Prairie Valley 708GR	May 16	*109.0	61	7/24	50
(medium-late)	May 31	112.7	62	8/1	46
	June 13	121.9	61	8/13	49
	July 3	76.2	55	9/3	49
Pioneer 8272	May 16	*118.2	61	7/26	45
(medium-late)	May 31	116.2	61	8/4	44
	June 13	119.6	58	8/15	46
	July 3	61.0	47	9/4	47

(continued)

Table 5. Early, medium, and full-season grain sorhgum hybrids compared at indicated planting dates, Columbus, 1979. (continued)

Mean values:

Hybrid	Yield, bu/a	Planting date	Yield, bu/a
Pioneer 8790	91.9	May 16	107.0
Acco GR1018	94.5	May 31	102.6
Acco GR1089	100.1	June 13	114.7
Pioneer 8585	97.4	July 3	70.7
Prairie Valley 708GR	105.0		
Pioneer 8272	103.4		

Yield LSD .05 Comparing planting dates within the same hybrid = 14.4.
Comparing hybrids within a planting date = 9.6.

Precipitation: (inches)

May 3,4 = 2.30; 10 = 1.25; 20 = 2.50
June: 6,7 = 1.50; 9 = 1.10; 10 = 0.80; 22,23 = 2.00; 27 = 1.12
July: 6 = 0.80; 8 = 0.40; 15,16 = 0.50; 30 = 1.80
Aug: 11 = 0.95; 15 = 0.30; 23 = 0.70; 27 = 2.75
Sept: None

Killing frost: Nov. 7, 1979

* Some bird damage early.

Fall and Spring Nitrogen Application Compared on Grain Sorghums

Nitrogen normally is applied to grain sorghum in the spring in southeastern Kansas. Depending on labor and weather, late fall might be advantageous some years, so research is needed to determine if fall applications result in significant N losses in clay-pan soils.

Procedure: For the past three years, fall and spring N applications on grain sorghum were compared at four rates (40,80, 120 and 160 pounds per acre). The N sources, urea and anhydrous ammonia, were also compared in this study.

Results: Small, but significant, yield benefits favor spring N applications. Yield differences between urea and anhydrous ammonia were not significant. Nitrogen rates exceeding 120 pounds per acre have not increased yields under dryland conditions. Lower N rates, 80 to 100 lbs/A, resulted in greater fertilizer efficiency (Table 6).

Table 6. Effects of nitrogen rates, nitrogen carriers and application times on grain sorghum yields, Parsons, 1979 and 1977-79 averages.

N rate, lbs/a	N carrier	When applied	Yield, bu/a 1979	1977-79
Nitrogen rate averages, all N carriers and application times				
0			60.1	52.8
40			75.0	65.8
80			100.4	76.8
120			107.3	83.0
160			105.6	81.9
LSD .05			3.5	7.0
N carrier averages, all N rates and application times				
	Ammonia		96.4	77.6
	Urea		97.7	76.1
	LSD .05		N.S.	N.S.
Application time averages, all N rates and N carriers				
		Fall	95.4	75.2
		Spring	98.9	78.6
	LSD .05		2.5	2.8

Grain Sorghum Herbicide Performance

Though more sensitive to herbicide injury than corn, grain sorghum is an important cash and feed crop in southeastern Kansas. The main concern with grain sorghum herbicides is to select a combination that control weeds without excessively injuring the crop.

Procedure: In 1979 we compared grain sorghum herbicides in conventional tillage and no-till systems.

Results: Where velvetleaf was a major problem, AAtrex and/or Bladex in several combinations with Bexton, and Ramrod/atrazine gave good control (Table 7). Incorporating Igran + AAtrex shallow reduced crop injury but also reduced velvetleaf control somewhat. AAtrex, applied after sorghum emerged, gave good control of small velvetleaf (less than 2 inches tall).

Modown, a newer broadleaf herbicide, gave fair control of velvetleaf.

Bicep at 2.7 lbs active ingredient per acre - incorporated lightly before planting or applied shortly after planting - did not control velvetleaf adequately. Even though the seed (Funk's 623GBR) had been treated with Concept, Bicep caused some early stunting injury and delayed maturity somewhat.

In the no-till study (Table 8), grain sorghum was planted no-till with a Buffalo slot-shoe planter into the previous years' grain sorghum residue that had been mowed. Most herbicides except Bicep, gave poor crabgrass control. Bicep controlled crabgrass longer than did tank mixtures containing Bexton or Igran.

Paraquat effectively controlled winter annual species and small annual weeds present in late April. All Paraquat treatments, along with some of the residual tank mixes, were applied in late April when weeds were less than 4 inches tall. The remaining residual herbicide treatments were applied after planting and before sorghum emerged, or 10 days after the initial Paraquat application.

Table 7. Grain-sorghum herbicides compared for control of velvetleaf, Columbus Field, 1979.

Treatment	lbs, a.i./a	When applied	Velvet-leaf control, %	Yield, bu/a	Seedling injury %
Control	- - -	- - -	0	35	0
Bexton 4L + AAtrex 4L	3.0 + 1.25	PRE 1/	98	104	0
Bexton 4L + Bladex 4L	3.0 + 1.25	PRE	85	105	0
Bexton 4L + Modown 4L	3.0 + 1.25	PRE	80	105	0
Bexton 4L + AAtrex 4L + Bladex 4L	3.0 + .75 + .75	PRE	98	106	0
Bexton 4L + SD 50093 4L	3.0 + 1.5	PRE	95	111	0
Igran 80W + AAtrex 4L	1.5 + .75	PPI 2/	85	91	10
Ramrod/atrazine 69W	4.0	PRE	98	115	0
Bicep 4.5L	2.7	PPI	50	90	15
Bicep 4.5L	2.7	PRE	60	96	10
AAtrex 4L	1.5	PRE	98	113	0
AAtrex 4L	1.5	POST 3/	98	110	0
LSD .05			--	7	--

1/ Applied after planting and before sorghum emerged.

2/ Incorporated shallow with a harrow before planting.

3/ Applied after sorghum emerged and when velvetleaf was less than 2 inches tall.

Soil type: Cherokee silt loam; 1.4% O.M.

Major weed competition was a heavy velvetleaf population.

Note: Used Funk's 623GBR that had been treated with Concept.
Bicep treatments caused some plant stunting, with somewhat later maturity.

Table 8. Grain sorghum herbicides compared under no-till conditions, Parsons Field, 1979.

Herbicide treatment	lbs, a.i./acre	Yield, bu/acre	Crabgrass control, % late May	Crabgrass control, % late Aug.	Seedling injury, %
Treated 10 days before planting					
Control	- - -	8	0	0	
Paraquat + AAtrex 4L	.5 + 1.6	41	50	25	5
Paraquat + AAtrex 4L + Igran 80W	.5 + .8 + 1.6	47	70	25	5
Paraquat + AAtrex 4L + Igran 80W + 2,4-D ester	.5 + .8 + 1.6 + .5	49	80	25	5
Paraquat + AAtrex 4L + Igran 80W + 2,4-D ester	.38 + 1.0 + 2.0 + .5	46	75	25	5
Paraquat + AAtrex + Bladex 4L + 2,4-D ester	.38 + .5 + 1.0 + .5	48	65	25	5
Paraquat + AAtrex 4L + Bladex 4L	.38 + .75 + .75	42	60	25	5
Paraquat + Bicep 4.5L	.5 + 3.2	75	95	90	10
Treated after planting and before sorghum emerged					
Paraquat 1/ + AAtrex 4L + Bexton 4L	.5 + 1.0 + 3.0	42	80	25	10
Paraquat 1/ + AAtrex 4L + Bladex 4L + Bexton 4L	.5 + .75 + .75 + 3.0	42	85	35	30
Paraquat 1/ + Modown 4F + Bexton 4L	.5 + 1.5 + 3.0	42	65	30	5
Paraquat 1/ + Bicep 4.5L	.5 + 2.7	69	95	80	10
LSD .05		9	--	--	--

1/ Paraquat was applied 10 days before planting. Residual herbicides were applied after planting and before sorghum emerged.

Soil type: Parsons silt loam; 1.4% O.M.

Note: Used Funk's 623GR that had been treated with Concept. Bicep treatments caused some sorghum plant stunting and delayed maturity somewhat.

Previous crop = grain sorghum.

Corn Herbicide Performance

Although corn acreage is limited in southeastern Kansas, it is an important cash and feed crop for many farmers. Keeping the crop clean of troublesome weeds is highly important in achieving optimum yields.

Procedure: In 1979 we evaluated several different herbicide combinations on three different soil sites harboring various weed species.

Results: Preplant incorporated herbicides (Eradicane and Sutan$^+$) in combination with AAtrex and/or Bladex effectively controlled crabgrass, giant foxtail, velvetleaf and smooth pigweed.

At another site AAtrex and/or Bladex in a tank-mix with an annual grass herbicide (Lasso, Dual, or Prowl) applied before corn emerged effectively controlled smooth pigweed and crabgrass. AAtrex controlled pigweed better than Bladex did, and Bicep controlled pigweed and crabgrass.

At one location where yellow nutsedge was a problem, Dual seemed to be more effective than Lasso.

None of the herbicides tested suppressed perennial problem weeds like climbing milkweed.

Soybean Variety Performance Test

Southeastern Kansas is the leading soybean producing area in the state, so extensive research is devoted to variety testing.

Procedure: In 1979, 42 soybean varieties, of private and university origin, were compared at the Columbus field in Cherokee county.

Results: Extremely dry weather during September and early October severely depressed soybean yields of later-maturing varieties. Varieties of Group III and early Group IV maturity yielded 30 to 35 bushels per acre, while later-maturing (Group IV and Group V) varieties yielded 20 to 30 bushels per acre. Complete soybean variety results are compiled in Agric. Expt. Station Report of Progress 376, available at county extension offices.

Soybean Varieties and Planting Dates Compared

The growing season in southeastern Kansas permits farmers to plant soybean varieties of various maturities over a wide range of dates. In general, full season varieties planted in June have yielded best, however, some of the newer varieties have not been evaluated over a wide range of planting dates.

Procedure: Since 1976 soybean varieties representing a wide maturity range have been planted from May through July. In 1976 varieties planted included Williams, Cutler 71, Crawford, Essex, and Forrest. In previous years, later maturing varieties (Tracy and Bragg) had been planted.

Results: Soybeans yields in 1979 were not normal for southeastern Kansas because September and early October were unusually dry. As a result, later-maturing varieties, caught in the pod-filling stage during the dry period, yielded below normal.

Four years of testing indicate that varieties of Essex maturity and earlier can be planted as late as July 10 in extreme southeastern Kansas, while Forrest normally should not be planted later than June 25. Varieties later in maturity than Forrest, like Tracy and Bragg, do not mature soon enough for southeastern Kansas.

Effects of Row Spacing on Soybean Yields with Full Season Varieties.

Narrower rows have been advocated as a way to boost soybean yields. How narrow rows affect longer season varieties grown in southeastern Kansas has not been studied.

Procedure: For the past three years, we planted Essex and Forrest at 7-, 14-, 21- and 30-inch row spacings, with seeding rates adjusted for the different row spacings, with the per-acre rate nearly the same regardless of row spacing.

Results: With full season Group V varieties, narrower rows have not increased soybean yields. In 1979, the 21-inch spacing gave a slight but not significant advantage. Full season varieties seem to react differently to narrow row spacings than the shorter season varieties do north of here where narrow rows have increased yields substantially.

Effects of Cropping Sequence on Soybean Yields

Soybeans are the number one cash crop in southeastern Kansas, and they are grown in several cropping sequences. More information is needed, however, to determine how different cropping rotations influence soybean yields, residual fertility, crop residues, and results from double cropping.

Procedure: We initiated four cropping rotations in 1979: (1) soybeans-wheat-doublecrop soybeans after wheat, (2) grain sorghum-soybeans-wheat, (3) grain sorghum-soybeans, (4) continuous soybeans fertilized every other year.

Results: The effects of the different cropping sequences on soybean yields will not be known for several more years. In 1979 wheat yielded 66 bushels per acre; grain sorghum, 107 bushels per acre; full season soybeans, 28 bushels per acre; and doublecrop soybeans after wheat, 12 bushels per acre.

Fluid Lime and Ag Limestone Compared

Interest in fluid lime developed several years ago when commercial, liquid-fertilizer vendors promoted applying a lime suspension with sprayer equipment.

Procedure: Since 1977, we have been comparing a liquid lime suspension with agricultural limestone on an acid soil producing soybeans. An initial rate of 5,000 pound effective calcium carbonate (ECC) per acre has been compared with annual ECC rates of 500 and 1,000 pounds per acre applied each spring before spring tillage.

Results: After three years, results indicate that liquid lime suspensions and agricultural limestone cause similar changes in pH. Low rates of lime (500-1000 pounds ECC per acre) require yearly applications to raise the soil pH to an optimum level.

Residual Effects of Phosphorus on Soybean Yields

Many soils in southeastern Kansas are low in available phosphorus. When phosphorus fertilizer is applied, part of it becomes unavailable over time and cannot be taken up by the plant-root system. How much phosphorus fixation results from residual P applications is not fully known for our clay-pan acid soils.

Procedure: Beginning in 1978, we initiated comparisons to see if heavy, first-year applications (200 pounds P_2O_5 per acre) would be as effective for soybeans as 100 pounds P_2O_5 per acre applied every other year, or as effective as annual applications of 50 pounds per acre. After 4 years, all plots will have received the same amount of P_2O_5. The two P sources used were diammonium orthophosphate (AOP, 18-46-0) and ammonium polyphosphate (APP, 15-62-0).

Results: Yields have increased 2 to 5 bushels per acre as a result of the applied phosphorus on a silt loam soil testing 10 pounds P/A. Two years after the 100- and 200- pound rates were applied, phosphorus responses are still good. Likewise, the annual 50 pounds P_2O_5 per acre increased yields significantly. Our recent results support earlier work that showed soybean yield responses from P fertilization are normally significant on soils testing less than 15 pounds of available P per acre.

Effects of Phosphorus and Potassium Fertilization on Soybean Yields

Soybeans have not responded consistently to fertilizer applications in southeastern Kansas. More research is needed to determine under what soil conditions a fertilizer response is likely.

Procedure: In 1979 three locations in Cherokee county were fertilized with various rates of phosphorus and potassium according to soil test. Fertilizer was broadcast and incorporated before planting.

Results: 1979 results confirm earlier work, which indicated that soybean response to phosphorus and potassium likely will be small where soil P tests in the 20's or more and soil K exceeds 100 pounds per acre. However, under some medium testing soil conditions a 3- to 5-bushel response from phosphate and potash has been observed, though not consistantly. Yield benefits from added fertilizer have been more positive where both phosphate and potassium were applied to low-testing soils.

Table 9. Soybean varieties and dates-of-planting compared, Parsons, 1979.

Variety	Planting date	Yield, bu/a	Matured	Height, in.	Seeds/ lb.	Seed quality 1/
Williams	May 30	29.0	Sept. 21	30	2892	1.0
	June 15	35.2	Sept. 24	30	2522	1.0
	June 25	27.1	Sept. 29	28	2594	1.0
	July 9	21.3	Oct. 4	22	3266	3.0
	July 20	18.1	Oct. 12	22	3175	3.0
Cutler 71	May 30	25.6	Sept. 22	34	2640	1.0
	June 15	32.1	Sept. 25	33	2565	1.0
	June 25	25.8	Sept. 30	30	2671	1.5
	July 9	21.8	Oct. 5	25	3674	3.5
	July 20	18.1	Oct. 13	23	3363	3.5
Crawford	May 30	27.3	Sept. 28	33	2609	1.0
	June 15	34.2	Sept. 30	33	2892	1.0
	June 25	26.9	Oct. 4	34	2752	2.0
	July 9	25.4	Oct. 9	28	3492	3.0
	July 20	16.9	Oct. 17	25	3721	3.5
Essex	May 30	30.2	Oct. 4	28	3363	1.5
	June 15	28.7	Oct. 6	28	3575	1.5
	June 25	29.7	Oct. 11	31	3880	1.5
	July 9	21.5	Oct. 22	25	4729	2.5
	July 20	15.0	Nov. 3	25	4779	2.5
Forrest	May 30	26.8	Oct. 6	39	3880	1.0
	June 15	28.1	Oct. 8	37	3847	2.0
	June 25	24.5	Oct. 15	36	4779	2.5
	July 9	16.1	Oct. 26	32	4989	3.0
	July 20	11.3	Nov. 12	28	4825	4.0

Mean values:	bu/a		bu/a
Williams	26.1	May 30	27.8
Cutler 71	24.7	June 15	31.7
Crawford	26.1	June 25	26.8
Essex	25.0	July 9	21.0
Forrest	21.4	July 20	15.9

1/ 1 = excellent, 5 = poor.

Killing frost date: Nov. 7, 1979.

Soybean Response to Fertilizer Applied Ahead of Wheat in a Double-cropping Rotation

Double-cropping wheat and soybeans is common in southeastern Kansas, but farmers seldom apply more phosphorus and potassium to the wheat when soybeans follow in a doublecropping rotation.

Procedure: In 1976 we established a study to determine how applying phosphorus and potassium to wheat would influence soybeans that follow the same year. We also included lime as a variable. The study was on a site that tested medium in soil phosphate and low in potassium; pH was 5.8.

Results: Wheat yields the past three years have increased substantially from the additional phosphorus, but lime and potassium have had little effect. Soybeans have benefited from the lime, but the residual phosphate and potassium from the preceding wheat crop have not increased soybean yields significantly. (Table 10)

Table 10. Soybean response to fertilizer applied to preceding wheat crop in a double-cropping rotation, Parsons, 1979.

Fertilizer, lbs/a 1/			1977-79 Wheat yield, bu/a		1977-79 Soybean yield, bu/a	
N	P_2O_5	K_2O	No lime	Lime	No lime	Lime
70	0	0	36.2	36.8	12.9	16.9
70	0	100	37.4	37.1	14.8	18.6
70	30	100	43.2	43.0	14.2	18.0
70	60	100	46.9	46.5	14.0	18.2
70	90	100	48.5	48.7	14.3	18.7
70	120	100	49.3	48.2	13.5	18.2
70	150	100	50.7	50.8	14.7	18.6
70	60	0	47.3	45.8	14.2	19.0
70	60	50	46.2	45.5	13.7	18.4
70	60	100	46.5	46.5	14.1	18.8
70	60	150	45.6	45.8	14.8	19.3
70	60	200	44.9	46.4	15.4	18.3
70	60	250	47.8	47.9	14.8	18.5
Mean values:			45.4	45.3	14.3	18.4
Fertilizer LSD .05			2.9	2.9	N.S.	N.S.

1/ Fertilizer applied to the wheat.

Initial Soil Test

pH=5.8

ECC=3,000 lbs/a

Avail. P=24 lbs/a

Exch. K=110 lbs/a

Soybean Herbicide Performance

Soybeans are the major cash crop for most southeastern Kansas farmers. Selecting the right herbicide combination is important to control troublesome weeds in soybean fields.

Procedure: In 1979 the main emphasis was evaluating soybean herbicides to control broadleaf weeds common in many southeastern Kansas fields. Herbicide studies were on sites heavily infested with velvetleaf, cocklebur, and annual morningglory.

Results: Sencor and/or Lexone at 0.25 a.i./acre effectively controlled velvetleaf, regardless of soil type. However, a near maximum labelled rate (0.38 to 0.50 a.i./acre) Sencor or Lexone was needed to control cocklebur in this silty clay loam soil, even then control was erratic. Velvetleaf and cocklebur control appeared to be improved when herbicides are applied after planting but before crop emergence rather than incorporated before planting.

Control of velvetleaf by Lorox on a medium textured soil required 0.75 lb a.i./acre. Higher rates severly damaged soybean germination, although 1.0 lb a.i./acre caused no injury on soils with more clay content. But cocklebur control was only fair even at the higher rates.

Goal, a newer broadleaf herbicide, controlled velvetleaf at 0.38 lb a.i./acre, but that rate severly reduced soybean germination on a medium textured soil. Likewise, Modown at 1.5 lbs a.i./acre reduced germination and gave poor velvetleaf control. Incorporating Modown before planting reduced damage, but the incorporation must be shallow for acceptable broadleaf control.

Basagran, applied after soybeans emerge gave excellent velvetleaf and cocklebur control. Morningglory control was fair. Blazer, another post-emergent, broadleaf herbicide, did not control velvetleaf so well as Basagran did, but it controlled cocklebur and morningglory as well as Basagran. Blazer appeared to cause slightly more leaf burning than Basagran, but plants recovered within 10 days.

In a no-till study where soybeans were planted into existing wheat stubble, pigweed was satisfactorily controlled by all herbicides tested. More research is needed, however, to evaluate herbicides and rates in no-till wheat stubble.

Table 11. Soybeans herbicides compared for control of velvetleaf, Columbus Field, 1979.

Treatment	lbs.a.i./acre	When applied	Velvet-leaf control,%	Yield, bu/acre	Crop injury,%
Control	- - -	- - -	0	17.7	0
Sencor 4F	.25	PRE 1/	98	26.6	0
Sencor 4F	.38	PPI 2/	95	23.2	20
Lexone 75 DF	.25 + .25	PPI + PRE	98	21.7	30
DPX-6573-50W	.75	PRE	98	25.6	5
DPX-6573-50W	1.12	PRE	98	17.3	60
Lorox 4L	.75	PRE	90	23.2	5
Lorox 4L	1.0	PRE	95	15.2	50
Modown 4F	1.5	PRE	10	11.9	80
Goal 2E	.38	PRE	90	15.4	80
Dyanap 3E	4.5	PRE	20	22.9	0
Vernam 7E + PPG 1032	2.5	PPI	20	22.0	0
Basagran 4E	1.0	POST 3/	95	27.0	5
Blazer 2L	.5	POST	55	23.5	10
LSD .05			--	3.4	--

1/ Applied after planting and before soybeans emerged.
2/ Incorporated before planting.
3/ Applied after soybeans emerged; velvetleaf was less than 2" tall.
Soil type: Cherokee silt loam; 1.2% O.M.

Table 12. Soybean herbicides compared, Cherokee co., 1979.

Treatment	lbs a.i./acre	When applied	Weed control, % Cocklebur	Velvetleaf	Morningglory
Control	- - -	- - -	0	0	0
Sencor 4F	.25	PRE1/	20	90	-
Sencor 4F	.38	PRE	70	95	-
DPX-6573 50W	.75	PRE	30	90	-
DPX-6573 50W	1.12	PRE	60	90	-
Lorox 4L	.75	PRE	25	75	-
Lorox 4L	1.0	PRE	60	80	-
Modown 4F	1.5	PRE	10	50	-
Blazer 2L	.5	POST2/	95	20	80
Basagran 4E	1.0	POST	95	85	80
Basagran 4E + Vistar 2S	.75 + .25	POST	95	85	85

Soil type: Cherokee silty clay loam; 2.2% O.M.

1/ Applied after planting and before soybeans emerged.

2/ Applied after soybeans emerged; cocklebur plants were less than 6" tall, velvetleaf plants were less than 2" tall, and morningglory had not started to vine.

Heavy weed pressure from cocklebur, velvetleaf, and annual morningglory.

Basagran and Blazer treatments resulted in temporary leaf burning, but plants recovered within 10 days.

There were no noticeable crop injury from the pre-emergent treatments.

Grain yields, not taken, were considered average.

LIVESTOCK INVESTIGATIONS, 1979

Richard J. Johnson and Lyle W. Lomas [1]

General Information

Experimental cattle were from the Station herd or purchased locally to provide as much uniformity of genetic and environmental background as possible. All were individually identified and provided preventive health measures as needed.

Feed was grown on the Station, purchased locally, or from Kansas State University Department of Grain Science feed plant. All pastures were fertilized according to soil test information.

To minimize differences due to fill, beginning and final weights of all cattle on test were taken after an overnight shrink.

Where statistical significance is indicated, the difference between treatments would occur by chance alone no more than 5 in 100 times.

Because results reported are based on one year's study, they must be regarded as tentative. Further study may strengthen or weaken the apparent conclusions of any one-year trial.

The use of any brand names is for better communication only and not to be taken as an endoresement.

1 Head and Animal Scientist, respectively, Southeast Kansas Branch Experiment Station, Mound Valley.

Gains of Yearling Steers on Brome Pasture with Energy Supplementation

Cool season grasses like fescue and smooth brome produce well during spring and again in fall, but not during the summer grazing period. So energy supplementation might economically maintain and improve summer gains of stocker cattle. This study compared supplementation at three levels with none and estimated possible returns from each level of supplementation.

Sixty yearling Hereford steers weighing approximately 525 pounds were innoculated for bovine viral diarrhea and blackleg and implanted with 36 mg Ralgro. Three days later they were allotted by weight to four groups of seven and four groups of eight each. On May 7 steers were placed one group to each of eight five-acre brome pastures. One group of seven head and one of eight were assigned to each of these treatments:

1. Control - pasture only
2. Pasture plus 2 pounds energy concentrate/head/day
3. Pasture plus 4 pounds energy concentrate/head/day
4. Pasture plus 6 pounds energy concentrate/head/day

Pastures declined to the point that hay was placed in each August 8 and replenished as needed until the end of the trial September 25. Results for the trial are shown in the following table:

Gains from grain supplement on pasture - 140 days

	Pounds grain/head/day			
	0	2	4	6
Initial weight (pounds)	533	528	526	527
Final weight	638	690	747	782
Total gain	105	162	221	255
Average daily gain	0.8	1.2	1.6	1.8
Increase over control	---	0.4	0.8	1.0
Feed/gain (pounds) 1/	---	5.0	5.0	6.0

1/ Based on gain increment due to supplement.

Assuming the cost of the grain at six cents per pound, daily cost was 12, 24, 36 cents for treatments two, three, and four. There was the additional cost of labor to feed the supplement daily. However, the 12, 24 and 36 cents added cost resulted in 0.4, 0.8 and 1.0 pounds gain.

The pastures where steers were supplemented maintained grass growth much better than those with no supplement.

In a similar study over a shorter period, 32 steers averaging about 500 lbs were allotted by weight to four groups and each group placed on a ten-acre brome pasture. Two groups received no additional feed and two an energy concentrate feed (primarily ground grain sorghum) at two pounds per head per day from April 23 to August 13. Steers receiving only pasture gained 1.2 pounds per head per day compared with 1.6 pounds by energy-supplemented steers. The 0.4 pounds difference resulting from the supplementation is the same as in the previous study. The additional labor of daily feeding must be considered.

Although costs and returns may vary considerable, it is apparent that energy supplementation will be profitable under a wide range of economic conditions.

Comparison of Fescue and Bermudagrass as Summer Graze for Cow-Calf Pairs

Fescue, a cool season grass that thrives in southeastern Kansas, is highly useful for spring and fall grazing. Hot summer months reduce the growth and quality of cool season grasses so cattle on them gain little or nothing. A warm season grass, like Bermudagrass should improve summer gains. This study compared summer grazing on fescue, a cool season grass, with grazing on Bermudagrass.

Thirty-two cow-calf pairs, after two months on a fescue pasture were divided into two groups with 16 placed on fescue pasture and 16 on Bermudagrass.

Average weights for the 56-day period were as follows:

	Fescue		Bermuda	
Pounds	Cows	Calves	Cows	Calves
Starting weight (June 14)	911	204	917	187
Ending weight (Aug. 9)	907	261	925	248
Gain or loss	-7	57	8	61

The small net advantage of 15 pounds for the Bermudagrass grazed cows and 4 pounds for their calves came on grass that had suffered considerable winter kill and was badly weed infested, while the fescue had been only sparsely grazed and was lush when the trail began.

Lasalocid Compared with Rumensin for Yearling Steers on Pasture

For many years various feed additives have been tested for ability to increase gains or improve efficiency of feed utilization by cattle. One of the most effective has been monensin (Rumensin), a product of Elanco. Lasalocid, a product of Hoffman-LaRoche, Inc., is another one currently under investigation. To compare the two, 48 yearling steers weighing approximately 500 pounds were allotted to six equal groups. Each group was placed on a 10-acre brome pasture and two groups were assigned to one of the three treatments from April 23 to August 13, 112 days:

1. Negative control - Pasture only
2. Control - Pasture plus 2 pounds per head per day of energy concentrate.
3. Lasalocid - Pasture plus 200 mg lasalocid in 2 pounds per head per day of energy concentrate.
4. Rumensin - Pasture plus 200 mg Rumensin in 2 pounds per head per day of energy concentrate.

The energy concentrate consisted of: grain sorghum, 83%; dehydrated alfalfa, 10%; molasses, 6%; salt, 1%.

Results of the trial are in the following table:

	Treatment			
	1	2	3	4
Number of steers	16	16	16	16
Initial weight (pounds)	513	508	511	512
Ending weight	647	685	713	722
Total gain	134	177	202	210
Average daily gain 1/	1.20	1.57	1.81	1.88

1/ Least significant difference, $P < .05 = 0.23$.

The additional 2 pounds of energy concentrate resulted in the greatest increment of gain, 0.37 pounds per day. Treatments 3 and 4 were significantly different ($P < .05$) from 2 which also differed from 1. Lasalocid appears to have potential for improving gains as a feed additive to steers on pasture. It, however, does not have approval for use in any cattle feeding regimen.

Comparison of Source of Nitrogen Fertilizer on Incidence of Grass Tetany

Grass tetany, an intermittent but often costly problem for southeastern Kansas livestock producers, most commonly occurs in cows with calves during a cool, wet spring with rapid, lush growth of grass. This study was an attempt to see if different sources of fertilizer nitrogen affected mineral levels in blood and plant tissue differently and if there was any relation to grass tetany.

Thirty-two cows and their spring calves were allotted four pairs each to eight five-acre fescue pastures April 12. February 26 four of the pastures had been fertilized with calcium nitrate and four with urea at 100 pounds of nitrogen per acre. All pastures received 30 pounds of P_2O_5 and K_2O. Blood samples were drawn from the cows before they went on grass and at weekly intervals through May 17. Samples of plant tissue also were taken at weekly intervals. None of the cows exhibited any sign of grass tetany during the trial period. Means of blood and plant tissue mineral levels from the two sources of fertilizer did not differ.

Workers in Holland have observed that a ratio of 2.2 of potassium to calcium plus magnesium (milliequivalents) in plant tissue indicate the probability of grass tetany. Our ratios were only 1.5 for the calcium nitrate fertilized plants and slightly higher at 1.6 for the urea fertilized plants.

FORAGE CROP RESEARCH

J. L. Moyer [1]

Interseeding and Fertilizing Lespedeza in Tall Fescue

Lespedeza, a warm-season annual legume, can be interseeded into tall fescue to effectively complement grass production. Managing the mixture for optimum production differs from managing a pure stand of tall fescue with regard to nitrogen fertilization. Two methods of lespedeza interseeding were tested, along with responses of fescue and lespedeza to spring and fall nitrogen applications, and to phosphate-potash fertilization. Interseeding methods tested were broadcast and 'zip'-seeding, with a control. On April 9, 1979, 'Summit' lespedeza seed was broadcast at 20 lb/A or drilled with a Midland 'Zip' seeder at 12 lb/A.

Plots receiving spring fertilizer were treated February 27, 1979. Fifty lb/A each of phosphate and potash were applied to half the plots. Nitrogen (N) treatments were control (0 N), 40 N in spring, 40 in fall, or 40 N spring + 40 N fall. All plots were cut May 15, and lespedeza-seeded plots were stand-rated and cut September 4. Fall N was applied September 7, and no further harvests were obtained in 1979 because of the dry fall.

First-cut yields contained only fescue because lespedeza seedlings were still small (Table 13). No yield differences were found between interseeding methods, nor between lespedeza-seeded and unseeded fescue. There was a small, nonsignificant (5% level) yield advantage by plots with 50 lb/A of phosphate and potash, and a highly significant (1% level) difference between plots that did and those that did not receive 40 lb/A of spring N.

Lespedeza stands were significantly reduced by spring N. Stands without spring N rated 1.4, while plots receiving 40 lb N/A in spring averaged a 3.2 rating, where 1 represents a perfect lespedeza stand. The two seeding methods produced similar stand ratings.

Second-cutting yields contained mostly lespedeza, so fescue-only plots were not cut. Hence, comparisons for second-cutting and total yields (cut 1 + cut 2) were only among interseeded plots. Broadcast-seeded plots yielded slightly but not significantly more than 'zip'-seeded plots. Adding phosphate and potash significantly increased second-cutting and total yields over control plots. Spring N decreased second-cut yields significantly compared with plots without spring N, but total yields did not differ with N treatment because differences in second-cut yields offset differences in first-cut yields.

1 Forage Agronomist, Southeast Kansas Branch Experiment Station, Mound Valley.

Table 13. Yields and stand ratings of lespedeza-interseeded fescue as affected by fertility treatments.

Treatment	Yield, T/A @12% moisture			Stand 1/ rating
	5-15	9-4	Total 2/	
Interseeding Treatment Means				
Fescue alone	0.54a 5/	--	--	--
Fescue + lespedeza (4-9)				
Broadcast seeded (20 lb/A)	0.59a	1.38a	1.97a	2.2a
Zip seeded (12 lb/A)	0.55a	1.26a	1.81a	2.1a
Nitrogen Treatment Means				
0 N spring 3/	0.32a	1.53b	1.85a	1.4a
40 N spring 4/ (2-27)	0.81b	1.11a	1.92a	3.2
Phosphate-Potash Treatment Means				
0 P_2O_3-0 K_2O	0.55a	1.09a	1.59b	2.3a
50 P_2O_5-50 K_2O (2-27)	0.59a	1.55b	2.14a	2.0a

1/ Rated 1-5, where 1 is a perfect stand and 5 is no lespedeza.

2/ Anticipated third cutting did not materialize. First cutting was practically all fescue, and second cutting was mostly lespedeza with some warm-season annual weeds.

3/ Includes 0 N and 40 N fall (9-7) treatments.

4/ Includes 40 N spring, and 40 N spring + 40 N fall treatments.

5/ Means of a column within a comparison, followed by the same letter did not differ at the 0.05 significance level, while means followed by different letters differed at the 0.01 level.

Effects of Burning and Low Fertilizer Rates on Native Grass in Southeastern Kansas

J. L. Moyer, John Meisenheimer, and Tom Glick

The effects of low fertilizer rates on yield, composition, and quality of native hay were measured with or without spring burning on land managed by the Kansas Fish and Game Commission. Treatments, begun in 1976, consisted of burned and unburned blocks containing eight fertility levels - a control and 30 lb N/A with 0, 10, or 30 lb/A of phosphate and/or potash applied annually.

Yields in 1979 averaged 2.48 tons/A at 12% moisture, ranging from 1.90 tons/A for the control to 3.03 tons/A for the 30-30-30 treatment. Phosphorus-treated plots yielded significantly more than plots receiving no phosphate, 2.81 and 2.15 tons/A, respectively. Burning had no significant effect on yields in 1979. Soil phosphorus (P) was higher in burned than unburned plots, and higher in plots that received 30 lb P_2O_5/A than in all other plots. Soil K in 1979 was higher in plots receiving 30 lb K_2O/A than in plots receiving no K. Neither soil pH nor soil organic matter content were affected by any treatments.

Crude protein content of forage averaged 5.8% in 1979. Fertilizer treatments interacted significantly with burning because burned plots varied less with fertilizers than unburned plots. The latter often seemed higher in crude protein than burned plots. Highest protein contents came when N and K were applied; lowest in the N-P treatments. Forage digestibility was improved by burning the three previous years, but analysis of 1979 forage is yet to be done.

Burning increased the proportion of warm-season perennial grass in the forage in 1979. Unburned plots averaged 65% warm-season grasses by weight, and burned plots 83%. Fertility had little effect on 1979 composition, since P did not reduce the warm-season grass percentage as it did in previous years.

Effect of Time and Method of N Application on Fescue Forage Yields

K. W. Kelley and J.L. Moyer

Tall fescue pastures often are fall-fertilized to improve fall and winter pasture. This study, started in August, 1977, was to determine if fall-applied nitrogen benefits spring fescue growth, particularly after a dry fall, and whether method or rate of application affects carryover.

Nitrogen (0, 50, 100 or 150 lb/A) was applied again to 'Fawn' tall fescue in August, 1978, or February, 1979. Solid urea was broadcast, or 28% N solution was applied as 'dribble' from field sprayer booms.

In 1977-78, a wetter-than-normal fall, no spring response to fall N application was found. However, only 7.83 inches of moisture (50% of normal) were received from July through October, 1978, and 15% of the average October amount, so fall forage yields (November 30) averaged only 0.52 ton/A (12% moisture), with no yield differences among treatments.

Spring, 1979 fescue responded to both August and February N applications (Table 14). The 50-lb N rate produced the same yield applied spring or fall, but the fall 100-lb rate produced less than 100-lb applied in the spring. The 150-lb fall N application produced the same as the 100-lb spring treatment.

Overall, we found no real yield difference between "dribble" application of 28% N solution and broadcast dry urea. Optimum rates were usually about 100 lb/A in spring and 50 lb/A in fall.

Table 14. Spring, 1979 [1/] fescue yields as affected by time and rate of nitrogen application.

N Rate (lb/A)	Time applied	Forage yield (tons/A @12% moisture)
0	- - -	0.58
50	August	0.96
100	"	1.17
150	"	1.50
50	February	0.94
100	"	1.48
150	"	1.64
LSD .05		0.22
	MEAN VALUES	
N Rate:		
50		0.95
100		1.32
150		1.57
LSD .05		0.15
Time Applied:		
August		1.21
February		1.35
LSD .05		0.12

1/ Spring forage harvested May 9, 1979.

Alfalfa Variety Trial

Twenty-four alfalfa varieties were seeded at 12 lb/A in spring, 1978, using 1.5 lb a.i./A of benefin (Balan) preemergence herbicide and 400 lb/A of 6-24-24 fertilizer preplant. Seven of the varieties originated at Federal and State experiment stations; the other 17 were from six seed companies. In 1979, 200 lb/A of 6-24-24 fertilizer were broadcast after the first cutting.

Total yields in 1979 averaged 4.76 tons/A (12% moisture). Yields of the varieties ranged from 4.48 to 5.10 tons/A for four cuttings, none significantly (5% level) different. Cutting dates were May 11, June 15, July 19, and August 21. Second-cutting yields differed significantly, and ranged from 1.02 tons/A or less for 'Cody', Pioneer 531, 'Kanza', and 'Olympic' to 1.30 tons/A for 'Pacer' and DeKalb 130.

Forage Sorghum Performance Test

J.L. Moyer and Ted L. Walter

Nineteen commercial entries and five checks (4 varieties and 1 station hybrid) were included in the 1979 silage-type sorghum test. Plots were planted at Mound Valley June 14 in 30-inch rows and thinned to six inches in the row (35,000 plants/A). Preplant atrazine, and 186 lb/A of urea and 250 lb/A of 6-24-24 fertilizer were used. Plots were sprayed with furadan June 19 and 29 to control chinch bugs.

Observations for bloom date, lodging, and height were recorded, and plots were harvested September 18. Complete results of the test are in 1979 Kansas Sorghum Performance Tests (Agric. Expt. Sta. Report of Progress 375). Silage yields (70% moisture) averaged 22.5 ton/A, excluding two checks, 'Atlas' and 'Early Sumac', which had poor stands. Silage yields ranged from 15 to 38 tons/A. Four hybrids yielded significantly more silage than the test average, and six others produced the equivalent of 60 bu/A or more of mature grain. Seven entries failed to produce mature grain. All entries bloomed 60 to 85 days after planting, but the test averaged only 29% dry matter, ranging from 24%-37%. Height to flag leaf ranged from 65 to 115 inches and lodging was from 0 to 56%.

SOIL AND WATER MANAGEMENT RESEARCH, 1979

Southeast Kansas Branch Experiment Station

R. E. Lamond [1]

Evaluations of Fertility-tillage Management Systems

Studies were initiated in 1979 in Labette and Cherokee counties to study various fertility-tillage management systems for grain sorghum and soybeans. Previous work had indicated that no-till systems performed poorly. Our 1979 results are shown in Table 15.

Tillage systems used included conventional, reduced, and no-till. Several fertility management variables were included.

Results of the 1979 studies show exceptional grain sorghum yields. Reduced tillage gave yields equal to conventional tillage under several fertility management regimes. No-till yields were good, except where UAN was the N source and yields were reduced. Apparently, UAN broadcast on no-till plots was lost to volatilization, as tissue N analysis indicated.

The Labette county site (soybeans), where yields were reduced by a late season dry spell, gave different results. Conventional tillage resulted in highest yields over all fertility management systems, followed by reduced tillage, and no-till gave significantly lower yields than conventional tillage.

These initial results indicate that soybeans are more affected by tillage than grain sorghum. The studies will be continued to further evaluate these fertility-tillage management systems.

Effects of N-P-K Rates and Application Methods on Soybean Yields

Studies were initiated at two locations in southeast Kansas to evaluate rates of N, P, and K applications as well as application methods on yields and tissue composition of soybeans. Soil tests showed both sites low in available phosphorus and potassium. Potassium tripolyphosphate (0-26-25) liquid fertilizer was used to facilitate knifing in of the P and K. The broadcast treatments were applied and incorporated with a springtooth. All fertilizer applications were preplant. Results are shown in Table 16.

Soybean yield response due to fertilizer treatments was not significant in 1979 at either location although adding P and K increased yields somewhat. In Neosho county, knifed applications gave higher yields than broadcast and significantly higher P and K concentrations in soybean plant tissues. Yields at both sites were reduced by a late-season dry period. These studies will be continued in 1980.

1 Soil & Water Management Specialist, Southeast Kansas Branch Experiment Station, Mound Valley.

Table 15. Evaluations of fertility-tillage management systems in Southeast Kansas

Tillage	N Carrier	N Method	P-K Carrier	P-K Method	Grain Sorghum - Cherokee Co. Grain yield bu/A	Grain Sorghum Tissue Analysis %N	%P	%K	Soybeans - Labette Co. Grain yield bu/A	Soybeans Tissue Analysis %N	%P	%K
Conventional 1/	---	---	---	---	98	2.24	.27	1.51	29.3	3.89	.36	1.68
Conventional	UAN	BC 3/	0-26-25 4/	BC	117	3.17	.34	1.45	31.4	4.59	.37	1.77
Conventional	UAN	KN	0-26-25	KN	126	3.17	.34	1.51	31.4	4.67	.38	1.79
Conventional	NH_3	KN	0-26-25	KN	123	3.01	.33	1.50	27.7	4.43	.37	1.81
Reduced 2/	UAN	BC	0-26-25	BC	125	3.00	.34	1.52	25.5	4.48	.35	1.75
Reduced	UAN	KN	0-26-25	KN	117	3.09	.33	1.53	28.1	4.59	.38	1.75
Reduced	NH_3	KN	0-26-25	KN	121	2.86	.32	1.53	28.3	4.40	.36	1.72
No-Till	UAN	BC	0-26-25	BC	96	2.75	.31	1.45	21.9	4.47	.35	1.67
No-Till	NH_4NO_3	BC	0-46-0, 0-0-60 5/	BC	120	3.27	.33	1.45	20.9	4.25	.35	1.70
		Treatment LSD (.05)			19	.17	.01	NS	4.7	NS	NS	NS

1/ Chisel, disk, disk, springtooth, spray, cultivate.

2/ 1 pass narrow shank chisel, cultivate.

3/ BC is broadcast on surface, KN is knifed in 6-8". N,P, and K were knifed simultaneously on KN treatments.

4/ Potassium tripolyphosphate liquid.

5/ Triple superphosphate, KCl.

N rate: 100 lbs/A for grain sorghum, 40 lbs/A for soybeans.
P_2O_5 and K_2O rate: 40 lbs/A for both crops.

Grain sorghum hybrid in Cherokee County was Pioneer 8272.
Soybean variety in Labette County was Essex.

Table 16. Effects of N, P, and K rates and application methods on soybean yields.

R.E. Lamond and K.W. Kelley

N Rate bu/A	P-K Rate lbs/A	N-P-K Method	Terry Weidert farm, Neosho, co. Yield bu/A	Tissue Analysis %N	%P	%K	Keith Kelley farm, Cherokee co. Yield bu/A	Tissue Analysis %N	%P	%K
0	0	---	22.4	4.54	.36	1.44	28.7	4.81	.32	1.66
0	30	BC 1/	25.8	4.56	.44	1.77	32.4	5.11	.37	1.77
0	30	KN	29.7	4.69	.45	1.68	28.3	4.84	.36	1.80
0	60	BC	25.7	4.68	.37	1.44	31.7	4.87	.33	1.69
0	60	KN	25.1	4.57	.45	2.01	32.4	5.01	.37	1.87
0	90	BC	27.1	4.34	.37	1.74	30.7	5.01	.38	1.62
0	90	KN	29.1	4.60	.46	2.05	30.0	4.93	.35	1.80
40	0	---	19.1	4.53	.39	1.66	30.4	4.86	.35	1.63
40	30	BC	25.4	4.79	.40	1.56	35.4	5.10	.38	1.71
40 2/	30	KN	29.7	4.65	.37	1.45	28.3	4.80	.34	1.71
40	60	BC	28.7	4.60	.38	1.57	29.7	4.99	.36	1.76
40	60	KN	29.7	4.49	.45	1.90	32.7	5.01	.37	1.74
40	90	BC	28.7	4.79	.44	1.78	33.7	5.01	.34	1.68
40	90	KN	27.4	4.65	.47	1.97	35.1	4.97	.38	1.86
Treatment LSD (.05)			7.9	NS	.08	.21	5.5	NS	.04	NS

Mean Values:		Neosho Yield bu/A	%N	%P	%K	Cherokee Yield bu/A	%N	%P	%K
N Rate (lbs/A)	0	27.1	4.57	.42	1.78	30.9	4.96	.36	1.76
	40	28.3	4.66	.42	1.70	32.5	4.98	.36	1.75
LSD (.05)		NS	NS	NS	.07	NS	NS	NS	NS
P-K Rate (lbs/A)	30	27.7	4.67	.42	1.62	31.1	4.96	.36	1.75
	60	27.3	4.58	.42	1.73	31.6	4.97	.36	1.77
	90	28.1	4.60	.43	1.88	32.4	4.97	.36	1.74
LSD (.05)		NS	NS	NS	.09	NS	NS	NS	NS
N-P-K Method	BC	26.9	4.62	.40	1.64	32.3	5.01	.36	1.71
	KN	28.5	4.61	.44	1.84	31.2	4.93	.36	1.80
LSD (.05)		NS	NS	.03	.07	NS	NS	NS	NS

1/ BC is broadcast, KN is knifed in 6-8".

2/ Where N, P, and K were knifed in, they were injected simultaneously. N as NH_3.

Initial Soil Test:	pH	Available P (lbs/A)	Exchangeable K (lbs/A)
Neosho Co.	6.1	16	120
Cherokee Co.	6.0	20	110

Effects of P-K Carriers, Rates, and Application Methods on Soybean Yields

Studies were initiated in 1979 at two southeastern Kansas locations to evaluate P-K rates, carriers, and application methods on soybean yields. Both sites were low to very low in available phosphorus and potassium according to soil tests. P-K carriers compared were dry (0-46-0, 0-0-60) and liquid (0-26-25). All dry solid fertilizer was broadcast and incorporated. Broadcast and knifed methods were used for the liquid fertilizer.

Soybean yield responses to P and K rates, carriers, and methods of application were nonsignificant. Results indicate yield benefits when P and K were applied and from knifed applications of P and K. Again, late season drought caused pod abortion and dampened effects of fertilizers. Similar studies will be continued in 1980.

Effects of N, P, and K Rates and Application Methods on Yields and Tissue Composition of Grain Sorghum

Studies were initiated at two locations in southeastern Kansas to evaluate rates of N, P, and K applications and application methods on yields and tissue composition of grain sorghum. N rates used were 0, 50, 100, and 150 pounds of N per acre. All N was applied as NH_3. P-K rates were 0 and 50 pounds of P_2O_5 and K_2O per acre, as potassium tripolyphosphate liquid (0-26-25). Applications were broadcast and knifed for the P and K; where P and K were knifed, they were applied simultaneously with the NH_3 6 to 8 inches deep. Both sites were low in both available phosphorus and potassium according to soil test. Results are shown in Table 17.

Labette county grain sorghum showed a significant yield response to N and a significant increase in tissue N concentrations with added N. There also was a response to P and K at the Parsons Field and knifed P and K gave the highest yield. P and K rate and method effects on tissue analysis were nonsignificant at Parsons.

Yields in Neosho county (Weidert farm) were exceptional. This location had been in fescue for several years and high organic matter probably resulted in no yield response to added N. Adding P and K increased yields, though nonsignificantly, and there was no significant difference in yields from broadcast versus knifed P and K. Similar studies will be continued in 1980.

Effects of Methods of Applying N and P and N-Form on Yield and Composition of Winter Wheat

In recent years, the technique of simultaneously injecting anhydrous ammonia with ammonium polyphosphate (10-34-0) 6 to 8 inches deep has proven to be a highly efficient way of fertilizing winter wheat. A study was conducted in Neosho county in 1979 to determine if the ionic form of fertilizer N, NH_4^+ or NO_3^-, in conjunction with methods of applying N-P affected use of P and winter wheat yields. N application rate totaled 75 pounds per acre and P was applied at 40 pounds of P_2O_5 per acre. N carriers used were urea-ammonium nitrate solution (UAN), anhydrous ammonia (NH_3) (predominantly NH_4^+-N) and sodium nitrate (NO_3-N). Results are shown in Table 18.

Table 17. Effects of N, P, and K Rates and Application Methods on Yields and Tissue Composition of Grain Sorghum

Lbs./A N	P_2O_5	K_2O	P-K Method	Parsons Field, Labette co. Yield bu/A	Tissue Analysis %N	%P	%K	Weidert farm, Neosho co. Yield bu/A
0	0	0	---	66	2.23	.27	1.52	107
0	50	50	BC	82	2.27	.29	1.54	113
0	50	50	KN	94	2.29	.29	1.58	114
50	0	0	---	92	2.42	.28	1.44	107
50	50	50	BC	96	2.62	.30	1.53	121
50	50	50	KN	105	2.60	.29	1.51	113
100	0	0	---	102	2.77	.30	1.40	123
100	50	50	BC	97	2.63	.30	1.54	125
100	50	50	KN	98	2.62	.29	1.57	118
150	0	0	---	94	2.93	.29	1.43	102
150	50	50	BC	99	2.88	.30	1.55	109
150	50	50	KN	101	2.79	.30	1.56	114
Treatment LSD (.05)				18	NS	NS	NS	NS
Mean Values:								
N Rate	0			80	2.27	.28	1.55	111
	50			98	2.54	.29	1.49	114
	100			99	2.67	.29	1.50	123
	150			98	2.87	.30	1.51	109
	LSD (.05)			10	.29	.01	NS	NS
Method	No PK			88	2.59	.29	1.45	110
	PK BC			94	2.60	.29	1.54	117
	PK KN			100	2.58	.29	1.56	115
	LSD (.05)			9	NS	NS	NS	NS

Initial Soil Test:	pH	Available P(lbs/A)	Exchange K (lbs/A)
Labette Co.	6.4	22	130
Neosho Co.	6.1	16	120

Leaf tissue concentrations of P were generally higher with treatments involving dual knife N-P applications. N tissue generally was highest in treatments receiving knifed N applications.

Grain yields at this location were depressed by hail damage estimated to cause a 40 percent loss. Dual knife N-P using NH_3 resulted in a significantly higher grain yield than any other treatment except the dual knife N-P with UAN. Dual knife N-P with sodium nitrate as the N source gave the lowest of the dual-knife yields.

The data from this study suggest maxium efficiency with the dual knife N-P technique is obtained with an ammonium (NH_4^+) form of nitrogen.

Table 18. Effects of Methods of Applying N and P and N-form on Winter Wheat, Terry Weidert farm, Neosho co.

Rate		Method		N	Grain			Tissue	
N	P	N	P	Source	Yield * (Bu/A)	%Protein	%P	%N	%P
0	0	--	--	---	8.7	12.0	.39	3.33	.25
0	40	--	Kn	---	11.9	11.3	.35	2.97	.27
0	40	--	Bc	---	8.6	11.5	.36	3.07	.26
75	0	Kn	--	$NaNO_3$	20.7	13.6	.35	3.93	.26
75	0	Bc	--	$NaNO_3$	15.4	11.9	.40	3.54	.23
75	0	Kn	--	UAN	22.7	13.1	.31	3.82	.21
75	0	Bc	--	UAN	12.6	12.9	.36	3.72	.25
75	0	Kn	--	NH_3	20.1	13.3	.35	4.05	.24
75	40	Kn	Kn	$NaNO_3$	26.1	13.3	.31	3.91	.26
75	40	Kn	Bc	$NaNO_3$	23.2	13.1	.35	3.99	.24
75	40	Bc	Kn	$NaNO_3$	24.3	12.0	.37	3.33	.23
75	40	Bc	Bc	$NaNO_3$	15.6	12.4	.42	3.77	.26
75	40	Kn	Kn	UAN	28.9	11.8	.35	3.81	.26
75	40	Kn	Bc	UAN	23.1	13.3	.38	3.94	.22
75	40	Bc	Kn	UAN	17.4	11.9	.37	3.47	.25
75	40	Bc	Bc	UAN	14.2	12.2	.39	3.43	.24
75	40	Kn	Kn	NH_3	32.9	12.8	.35	4.08	.27
75	40	Kn	Bc	NH_3	24.3	13.3	.36	4.27	.24
	LSD (.05)				6.2	1.2	NS	0.39	.03

* Hail reduced yields an estimated 40%.

Effects of Different Primary Tillage Operations and No-till on Yields of Soybeans and Grain Sorghum.

Because interest continues high throughout southeastern Kansas about different primary tillage operations and no-till, we are evaluating the different tillage operations and no-till at both the Parsons and Columbus fields, using grain sorghum at Parsons and soybeans at Columbus. After the primary tillage operations, which were done on April 16 at both sites, all tilled plots received identical seedbed preparation. Results are summarized in Table 19.

Yield data show that no-till performed poorly in 1979 for both crops. Yields were low despite excellent stands in the no-till plots, which corroborates earlier work with no-till at Parsons. The moldboard plow gave the highest yields at both locations but not significantly higher than other primary tillage operations for grain sorghum. This work will be continued in 1980 with a subsoiler included as a treatment.

Table 19. Effects of different primary tillage operations and no-till on yields of soybeans and grain sorghum, 1979.

Treatment	Grain sorghum Parsons field Yield, (Bu/A)	Soybeans Columbus field Yield, (Bu/A)
Plow	97	46
Chisel	89	42
Disk	81	39
Soil-Saver 1/	88	---
No-till	75	33
LSD .05	19.2	5

1/ Manufactured by Glencoe, combination heavy disk and chisel.

Effects of Irrigation and Irrigation Scheduling on Yields of Corn and Soybeans

Irrigation acreage continues to increase in southeast Kansas, exceeding 22,000 acres in 1978. Because irrigation practices in our area are unique, we initiated irrigation studies on corn and soybeans at the Columbus field. Our 1979 results are shown in Table 20.

Rainfall was excellent in May through August with average to above average amounts each month. Corn reached physiological maturity September 2. September and early October were very dry with no rain received in September, which was the critical stage for the Group V Essex beans.

Corn yields were exceptional, thanks to timely rainfall. Even with the timely rains, supplemental irrigation of 0.75 inch at tassel or blister significantly increased yields, but two irrigations were no better than one. One irrigation gave an extra 14 to 18 bushels of corn per acre. On December 1, 1979, corn prices existed that would mean an extra $30 to $40 per acre. Whether or not that would be profitable would depend on type of irrigation, system pumping costs, and other factors.

Even though the soybeans were irrigated during a time of stress, irrigation did little to increase yields. Two irrigations significantly increased yields but not enough to be economically feasible.

Irrigation studies will be expanded in 1980.

Table 20. Effects of irrigation and irrigation scheduling on yields of corn and soybeans.

Time of irrigation	Amount inches	Corn yield bu/A	Time of irrigation	Amount inches	Soybean yield, bu/A
None	---	131	None	---	34.4
Tassel	0.75	149	Bloom	0.66	35.9
Blister	0.75	145	Late fill	0.75	35.1
Tassel & Blister	0.75 + 0.75	151	Bloom + Late fill	0.66 + 0.75	37.8
LSD (.05)		7.6			2.5

Corn hybrid was Pioneer 3183

Soybean variety was Essex.

Effects of N, P, K Rates and Application Methods on Yield and Composition of Tall Fescue Forage

R. E. Lamond and J. L. Moyer

A study was initiated in Labette county in 1979 to evaluate the effects of nitrogen, phosphorus, and potassium; and application method on yield and composition of tall fescue. A soil test indicated low P and K (12 lbs/A available P and 85 lbs/A exchangeable K) and a pH of 6.8. Results of the study are shown in Table 21.

Nitrogen was applied at 50, 100, and 150 pounds per acre and phosphorus and potassium at 0 and 40 pounds per acre. All fertilizers were in liquid form, 28-0-0 (UAN) and 0-26-25 (potassium tripolyphosphate). Broadcast treatments were applied through flat spray nozzles. The dribble applications involved removing spray nozzles from the boom to apply the fertilizer in a band on the soil surface. Knifed treatments were applied through an injection tube behind a narrow shank 6 to 8 inches deep on 15-inch centers.

Yield data indicate a highly significant response to nitrogen and phosphorus-potassium. Adding 40 pounds of P and K increased forage yields nearly 850 pounds per acre.

Knifed applications gave highest yields - significantly higher than dribble applications and 300 pounds an acre more than broadcast applications.

N application rates significantly affected plant N content, which increased as N was increased. Adding 40 pounds of P and K significantly increased N, P, and K in the forage. The knifed application produced significantly higher forage N, P, and K than other methods.

Results of this study indicate that we need to add phosphorus and potassium on low testing soils to obtain maxium production of good quality forage. The 1979 results also indicate that knifed applications, to place fertilizer materials deeper in the root zone, were superior to surface applications. This work will be expanded in 1980.

Table 21. Effects of N, P, K rate and method of application on the yield and composition of tall fescue forage, Terry Weidert Farm, Labette county, 1979.

N/A	P_2O_5/A	K_2O/A	Method of application	Forage yields lbs/A @12.5%	N	P	K
- - - -	- - lbs-	- - - -			- - - -	-%-	- - - -
0	0	0	---	1517	2.21	.22	2.15
50	0	0	Broadcast 1/	1958	2.46	.22	1.93
100	0	0	"	2993	3.06	.21	1.66
150	0	0	"	2933	3.30	.21	1.88
50	40	40	"	3493	2.70	.27	1.81
100	40	40	"	3683	3.07	.26	2.16
150	40	40	"	4362	3.47	.27	1.94
50	0	0	Dribble 2/	2236	2.65	.22	1.82
100	0	0	"	2976	3.17	.21	1.89
150	0	0		2740	3.48	.20	1.69
50	40	40	"	2998	2.86	.27	2.14
100	40	40	"	3113	3.23	.25	1.71
150	40	40	"	3783	3.78	.28	2.46
50	0	0	Knifed 3/	2962	2.85	.21	2.06
100	0	0	"	3254	3.40	.21	1.99
150	0	0	"	3391	3.79	.23	1.73
50	40	40	"	2960	3.12	.28	2.20
100	40	40	"	3702	3.67	.31	2.20
150	40	40	"	4965	3.97	.29	2.40
100	0	40	"	4613	3.54	.21	2.51
Trt. LSD (.05)				942	.38	.04	.34
Mean Values:							
N-Rate	50			2768	2.77	.24	1.99
	100			3287	3.27	.24	1.93
	150			3695	3.63	.24	2.02
		LSD (.05)		363	.20	NS	.14
P-K-Rate	0			2827	3.13	.21	1.85
	40			3673	3.32	.27	2.11
		LSD (.05)		297	.12	.01	.12
Method:	Broadcast			3237	3.01	.24	1.90
	Dribble			2974	3.19	.24	1.95
	Knife			3539	3.47	.25	2.10
		LSD (.05)		363	.20	.01	.14

1/ Broadcast through flat spray nozzles.

2/ Nozzles removed.

3/ Knifed in on 18-inch centers, 6 to 8 inches deep.

Treatments applied March 12; harvest was May 9.

Effects of N, P, and Methods of Application on the Yield of Tall Fescue Forage

R. E. Lamond and J. L. Moyer

A study was continued in Allen county in 1979 to evaluate the effects of nitrogen, phosphorus, and the application method on the yield of tall fescue. This site, on the Stan Dreher farm, had been in fescue several years; soil tests indicated low (11 lb/A) P. Results of the 1979 study and three-year average yields are shown in Table 22.

Nitrogen was applied at 60, 120, and 180 pounds per acre, and phosphorus at 0 and 40 pounds P_2O_5 per acre. The fertilizers were broadcast or dribbled. Dribble applications were with spray nozzles removed so fertilizer material was banded on the soil surface.

Yield data indicate significant responses to nitrogen in 1979 and for three-year averages. Adding 40 pounds P_2O_5 per acre increased yields significantly in 1979 and produced an additional 400 pounds per acre on the three-year average yields. Dribble applications produced higher, though not significantly higher, yields than broadcast applications in 1979. Three-year average yields showed no difference between application methods.

This is the last year for this study at this location. The three years data tell us that when soil P is limiting, it may be necessary and profitable to include phosphorus as well as nitrogen in our forage fertilization programs.

Table 22. Effects of N-P rate and method of application on the yield of tall fescue. Stan Dreher Farm, Allen county, 1979.

N/A lbs.	P_2O_5/A lbs.	Application method	Forage yields, lbs/A, @ 12.5%	3 yr. avg yield, lbs/A, @12.5%
0	0	---	1426	2041
12	40	Broadcast	2209	2504
60	0	"	2332	2875
120	0	"	2329	3509
180	0	"	2729	4260
60	40	"	2358	3007
120	40	"	2424	3803
180	40	"	2748	4541
12	40	Dribble	2020	2261
60	0	"	2115	3093
120	0	"	2239	3138
180	0	"	2812	3736
60	40	"	2370	3379
120	40	"	3125	3965
180	40	"	3482	4498
Trt. LSD (.05)			627	
Mean Values:				
N Rate	60		2294	3088
	120		2529	3604
	180		2942	4259
		LSD (.05)	338	580
P_2O_5 Rate	0		2426	3435
	40		2751	3865
		LSD (.05)	276	402
Method:	Broadcast		2486	3665
	Dribble		2690	3635
		LSD (.05)	NS	NS

ACKNOWLEDGMENTS

Grain Crop Research

Amchem Products, Inc.
American Cyanamid Company
BASF Wyandotte Corporation
Chevron Chemical Company
CIBA-Geigy Corporation
DeKalb Ag Research, Inc.
Dow Chemical Company
E.I. duPont de Nemours & Company
Elanco Products Company
Hercules Incorporated
Midwest Minerals, Inc.
Mobay Chemical Corporation
Mobil Chemical Company
Monsanto Agricultural Products Company
Pioneer Seed Company
Rohm & Haas Company
Stauffer Chemical Company
Shell Chemical Company
Uniroyal Chemical Company

Cooperation of the following agricultural scientists is appreciated:

F. J. Crow, Extension Specialist, Plant Pathology, KSU, Manhattan.

E. G. Heyne, small grain research geneticist, Dept. of Agronomy, KSU, Manhattan.

D. Kissel, soil fertility research scientist, Dept. of Agronomy, KSU, Manhattan.

W. T. Schapaugh, research soybean geneticist, Dept. of Agronomy, KSU, Manhattan.

T. L. Walter, crops research scientist (crop performance testing). Dept. of Agronomy, KSU, Manhattan.

D. A. Whitney, research soil chemist, Dept. of Agronomy, KSU, Manhattan.

Kent Winter, research assistant, Dept. of Agronomy, KSU, Manhattan.

Livestock Research

The following individuals contributed to the livestock research effort at Southeast Kansas Branch Experiment Station:

E. E. Bartley, Dairy Cattle Research Nutritionist, Kansas Agricultural Experiment Station, KSU, Manhattan.

K. C. Behnke, Feed Technology Research Scientist, Kansas Agricultural Experiment Station, KSU, Manhattan.

Frank Brazle, Area Extension Livestock Specialist, Chanute.

Alberto Davidovich, D.V.M., Ph D., Animal Health Research, Hoffman-LaRoche, Inc., Nutley, NJ.

H. P. Grueter, D.V.M., Animal Science Field Representative, Elanco Products Co., Division of Eli Lilly & Co., Omaha, NE.

R. Miles McKee, Beef Cattle Research Scientist, Kansas Agricultural Experiment Station, KSU, Manhattan.

Robert M. Millaway, National Manager, Agronomy, Wilson and George Meyer & Co., San Francisco, CA.

R.R. Schalles, Meat Animal Research Scientist, Kansas Agricultural Experiment Station, KSU, Manhattan.

The following organizations have contributed to livestock research:

Cap-O-Ranch, Buffalo, KS.
Dept of Animal Sciences and Industry, KSU, Manhattan.
Eli Lilly & Co., Omaha, NE.
Hillcrest Farms, Havana, KS.
Hoffman-LaRoche Inc., Nutley, NJ.
Wilson and George Meyer & Co., San Francisco, CA.

Forage Crop Research

Acco Seed Co.
Asgro Seed Co.
Baugher Forage Equipment Co.
Chevron Chemical Co.
Cross Seed Co.
DeKalb Ag. Research, Inc.
Frontier Seeds, Ltd.
George Warner Seed Co.
Grower's Seed Association
J.C. Robinson Seed Co.
Johnson Seed Company
Perrier Implement Co.
Pioneer Seed
Prairie Valley, Inc.
Sharp Bros. Seed Co.
Taylor-Evans Seed Co.

Cooperation of these agricultural scientists and individuals is appreciated:

A.D. Dayton, consulting research statistician, Dept. of Statistics and Computer Science, KSU, Manhattan.

T. Glick, Wildlife Biologist, Kansas Fish and Game Commission, Chanute.

G. Huntington, Longton.

B. Jackson, Labette Co., Extension Agent, Altamont.

J. Meisenheimer, D.C., SCS-USDA, Altamont.

R. McNickle, Cherryvale.

D. Phillips, Dennis.

G.L. Posler, forage utilization agronomist, Dept. of Agronomy, KSU, Manhattan.

T.L. Walter, crops research scientist, Dept. of Agronomy, KSU, Manhattan.

T. Weidert, Parsons.

D.A. Whitney, research soil chemist, Dept. of Agronomy, KSU, Manhattan.

Soil & Water Management Research

National Fertilizer Solutions Association, Peoria, IL.
Twin States Engineering and Chemical Co., Des Moines, IA.
Farmland Industries, Kansas City, MO.
Terry Weidert, Labette Co.
Howard Markley, Labette Co.
Loren Rieck, Crawford Co.
Keith Kelley, Cherokee Co.
Stan Dreher, Allen Co.

Agricultural Experiment Station, Kansas State University, Manhattan 66506

Report of Progress 381 April 1980

Publications and public meetings by the Kansas Agricultural Experiment Station are available and open to the public regardless of race, color, national origin, sex, or religion. 4-80—2.6M