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1977 FIELD DAY REPORT

North Missouri Center Spickard

College of Agriculture
University of Missouri-Columbia
SR 208

UNIVERSITY OF MISSOURI-COLUMBIA

AGRICULTURAL EXPERIMENT STATION
NORTH MISSOURI CENTER

ROUTE ONE
SPICKARD, MISSOURI 64679

TELEPHONE
816-485-6576

Dear Visitor:

Welcome to the North Missouri Center.

Research here features beef crossbreeding; beef gains on grass; corn, grain sorghum, and soybean production, and a variety of other studies. This work is designed to help provide answers for agriculture right here in North Missouri.

You'll find reports on some of this research in this booklet. If you'd like to see or hear more, special tours can be arranged for you. We hope you will come back often.

Sincerely,

Larkin Langford

Larkin Langford
Superintendent

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The North Missouri Center is a 1600-acre unit located seven miles west of Spickard on State Highway C in Grundy County. It is operated by the College of Agriculture at the University of Missouri-Columbia.

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RESULTS OF THE MISSOURI CROSSBREEDING PROJECT WITH BEEF CATTLE

(September, 1977 - Phase 2)

M. Ellersieck, J. F. Lasley, L. H. Langford and L. Reber
Department of Animal Husbandry, University of Missouri-Columbia

The second phase of the Missouri crossbreeding project is designed to compare the performance of purebred and crossbred beef cows. Both groups will produce crossbred calves. The purebred cows are Angus, Charolais and Herefords. The crossbred cows represent all possible crosses among these three breeds. Three mating systems are being used. One is the two-breed cross where purebred cows of the three breeds are mated with bulls of another breed. A second is the two-breed backcross, or crisscross, where crossbred cows are mated with bulls of one of the breeds originally used to produce the crossbred cows. A third mating system is the three-breed cross where crossbred cows are mated with bulls of a third breed. The females for the second phase of the study were selected from the fourth, fifth and sixth calf crops of the first phase of the study where the performance of purebred and crossbred calves was compared. The cows are bred artificially to three bulls of each of the Angus, Charolais and Hereford breeds each year. Different bulls are used for breeding each year so that a wider sampling of bulls from each of the three breeds can be made during the course of the experiment.

The first calf crop on this second phase of the experiment was produced in 1971. Six calf crops have now been produced. This experiment will continue for several years in order to compare the lifetime production of purebred and crossbred cows. The results of the experiment to date are shown in Table 1. These figures represent only average figures and have not been adjusted for yearly differences or differences between ages of the cows.

The dystocia scores (calving difficulty) in this experiment range from 1 to 6 with 1 representing no difficulty and 6 resulting in the death of both the cow and calf.

Carcass grade scores were:

8 ---- good
9 ---- good plus
10 ---- choice minus
11 ---- choice
12 ---- choice plus
13 ---- prime minus
14 ---- prime

Marbling scores were:

3 ---- traces
4 ---- slight
5 ---- small
6 ---- modest
7 ---- moderate
8 ---- slightly abundant
9 ---- moderately abundant amount

RESULTS

The results comparing the three different mating systems are presented in Table 1.

These results show that there is very little difference among the three mating systems in the 205-day and 365-day weights of the calves and carcass quality and quantity. The most important difference between the three mating systems appears to be in the fertility of the cows and the livability of the calves. For some reason not readily apparent, the purebred cows producing a crossbred calf were equal to the 2-breed cross cows producing backcross calves in the pounds of calf weaned per cow exposed to the bull. However, crossbred cows bred to bulls of the third breed exceeded the purebred cows by 17.0% and crossbred cows producing backcross calves by 19.2% in the pounds of calf weaned per cow exposed to the bull. The backcross system of mating is improving in recent years as compared to the 2-breed cross.

A comparison of the two-breed cross with the three-breed cross is actually a comparison of the performance of purebred and crossbred cows since both produced crossbred calves. The advantage for the crossbred cows over the purebred cows is 17.0% in pounds of calf weaned per cow exposed to the bull. The advantage of the crossbred cow was about 13.0 pounds heavier calves at weaning and 11.3% more calves weaned per cow exposed than by purebred cows. The results have been consistent year after year.

* * * * * *

TABLE 1

RESULTS OF THE MISSOURI BEEF CATTLE CROSSBREEDING PROJECT
(Phase 2)

Trait	Breeding of calves		
	2-Breed cross	2-Breed backcross	3-Breed cross
Number of cows bred	195	240	167
Services per conc. of cows calving	1.44	1.43	1.39
Number of cows calved	170	210	159
Dystocia scores	1.49	1.49	1.19
Number of cows weaned a calf	159	189	155
% Calves weaned per cows exposed	81.5	78.8	92.8
% Calves weaned per calves born	93.5	90.0	97.5
Adjusted 205-day weight of calves	476	484	489
Pounds of calf weaned per cow exposed to bull	388	381	454
Number of calves	65	89	51
Adjusted 365-day weights	879	870	871
Carcass items:			
Fat thickness	.47	.45	.44
Carcass conformation	11.6	11.6	11.7
Marbling score	5.0	5.3	5.2
Carcass grade	9.7	10.0	10.0
Rib eye area	12.2	12.1	11.9

RUMENSIN* FOR STEERS ON PASTURE

Jerry Lipsey and Bud Reber
Department of Animal Husbandry

A project was started this spring which may be the trend of much of the research at this station in the future. Thirty-three black white-face calves were placed on a pasture trial. Half of the calves received one pound of corn per head per day mixed with 200 mg. of Rumensin. This feed additive is designed to alter rumen metabolism and change the action of rumen micro-organisms so cattle can use feed more efficiently.

The remaining half of the calves received one pound of corn per head per day without the Rumensin. The corn supplemented the fescue pasture.

Results were striking. The Rumensin calves had an average daily gain (ADG) of 1.71 pounds. Control calves gained only 1.32 pounds per day. This occurred through the dryest portion of the summer with pastures in a drought condition for the last two months of the test.

It should be noted that this is only one trial, and resulting differences in average daily gain may vary from other tests.

Treatment	Number	ADG for 112 days	Initial Weight	Final Weight
One lb. of corn with 200 mg. Rumensin/hd/day	32	1.71	382.1	573.4
One lb. of corn per hd/day	32	1.32	388.4	536.9

* A product of Eli Lilly, Elanco Division.

STORAGE AND PROCESSING SYSTEMS

Donald C. Rains
Area Agricultural Engineering Specialist

On farm grain storage and feed processing become more important as crop and livestock operations increase because of specialization and expansion. The need for better planning ahead cannot be over-emphasized. Thousand-dollar decisions made without good planning may mean thousand-dollar mistakes. Timeliness, capacities, quality control and marketing become more important as volumes of production increase.

On farm grain storage offers several advantages to the producer. In some cases less time is lost getting grain stored because of long lines at local elevators. In other cases, drying costs are reduced by using producer owned facilities. A producer has much more flexibility on where he can sell his grain if he has it stored on the farm.

The producer who plans to process and feed the grain to livestock has much better control on quality of feed fed to livestock. Time required to prepare feed for livestock can be reduced as well as the cost.

One of the best ways to organize a storage and processing system is to study flow patterns. In other words, follow the flow of grain from the field to consumption or market. This flow provides a logical basis for developing a system of handling the grain to meet the needs of the individual producer. The proper sizing of harvesting, transporting, handling, drying and storage equipment is critical in planning a good system so that bottle necks are eliminated.

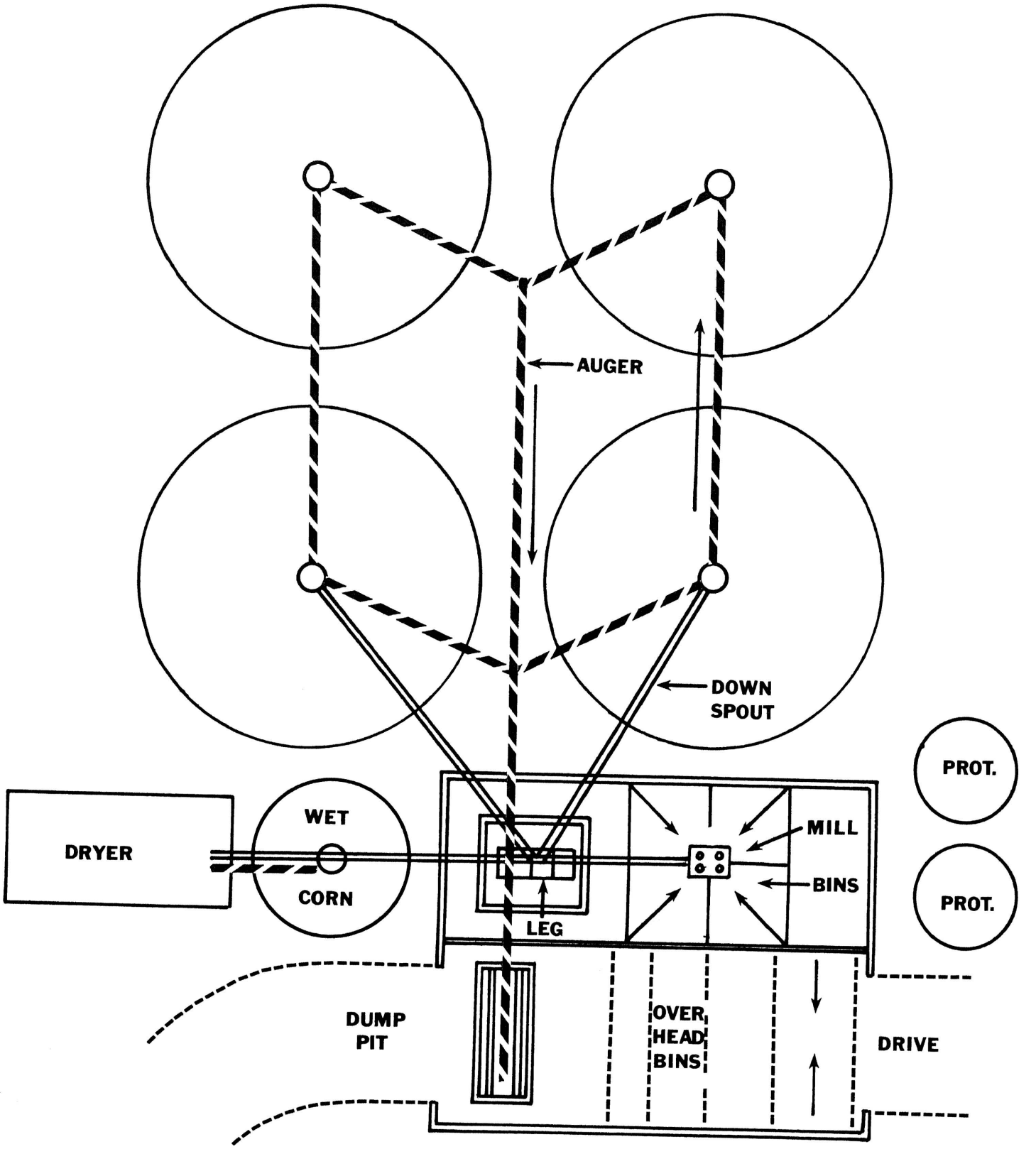
In past years portable equipment that could readily be moved to several locations was a real asset. Portability was and is sound with small volumes. As volumes increase a more labor efficient system should be considered. Central permanent facilities with a minimum knock-down and set-up time between operations should be considered.

Today's progressive farmer should be planning a system that will allow for increased capacities of storage and processing facilities. Tomorrow's volume may require a leg for handling an automatic grinder-mixer and a grain dryer.

Plan a system that will meet your present and foreseeable future needs, then double it. This may seem ridiculous, but, think back; what has happened to your operation in the last 10 years? By building part of a large size plan, you can later add the next bin, dryer, or different handling system. It is easier and less costly to reach the expanded plan this way, then to expand a facility to a size not considered in the original development.

Consider convenience and labor saving systems because some day you will be 10 years older, handling twice the volume and you may be 20 years more tired. What you may not think is worth considering today may be essential tomorrow.

AN EXAMPLE OF AN ON-FARM STORAGE AND FEED PROCESSING SYSTEM



FOLIAR FERTILIZATION OF SOYBEANS

Gary W. Colliver, Department of Agronomy, UMC and Louis Meinke, North Missouri Center.

Much publicity has been given to foliar fertilization of soybeans during the past 1 1/2 years. Dr. John Hanway at Iowa State University has reported very significant yield increases in soybeans through foliar applications of the nutrients NPKS during the pod-filling stages of development. Allied Chemical Corporation has also reported yield increases, although smaller, using a material and procedure somewhat different from that used by Hanway. In both cases, the treatments are intended to get extra nutrients into the developing seeds through foliar absorption, resulting in increased yields.

How does the process work? During pod-filling, photosynthates (sugars) produced in the leaves are translocated mainly to the developing seeds. This results in an "energy shortage" in the roots, causing them and the nodules to stop growing or die, so that nutrient uptake slows and stops. When this happens, nutrient needs of the developing seeds are met by translocation of nutrients to the seeds from leaves and stems. Nutrient loss from the leaves then results in a reduction in photosynthesis, and the leaves yellow and die because of the nutrient depletion.

Since plants can absorb nutrients through their leaves, foliar feeding during pod-filling may prevent this nutrient depletion. This could keep the leaves photosynthesizing longer, and help increase seed yields. However, since rather large quantities of nutrients are indicated as needed for this approach to succeed, the occurrence of "burning" of the leaves has heretofore largely precluded consistent success in foliar fertilization of this type. The process and resulting success reported by Dr. Hanway seem to be significant break-throughs in this area of research.

A foliar fertilization program of this type is intended as a supplement to a good soil fertilization program and in no way should be thought of as a replacement for soil fertilization. Also, the amounts of nutrients supplied are considerable, and this type of program should not be confused with other types of foliar programs available which use very low levels of nutrients. In addition this program differs from others commercially available in that it is a late-season application whereas others are often applied earlier in the growing season.

The "Hanway" method consists of 2 to 4 applications during pod-filling of a solution at the rate of 20 gallons per acre each time, containing about 20-25 lbs. N, 5-6 lbs. P_2O_5, 8-9 lbs. K_2O, and 1.5 lbs. sulfur. The base solution for making this mixture is an experimental material (an 0-26-25 potassium polyphosphate) made by the Tennessee Valley Authority (TVA). It is not available commercially and therefore must be considered still strictly in the research stage. The first application is made when beans begin to develop and can be felt when the pod is squeezed at one of the four uppermost nodes with a completely unrolled leaf. Then continue at 7-14 day intervals, ending when 50% of the leaves have turned yellow. This whole concept is considered to be in a research stage of development and should not be considered a proven practice ready for farmer adoption.

The method being developed by Allied Chemical involves the use of their Folian material. Folian has the analysis of 12% N, 6% P_2O_5, 6% K_2O, and 0.5% sulfur, and is applied at the rate of 10 gallons per acre, or about 100 lbs. Allied recommends only one application, to be made during early pod-development, which is earlier than in the "Hanway" method. Folian is commercially available in 1977, but the practice still should be considered as in developing stages, and not yet fully proven.

Both the "Hanway" method and Allied's Folian are being tested in research plots in five locations in Missouri in 1977. Only the "Hanway" method and some variations of it were tested in 1976. The 1976 results in Missouri did not show any yield increases using the "Hanway" method, in any of the five tests. Likewise, numerous researchers in surrounding states did not get yield increases, and in some cases got decreases. The year 1976, however, was dry in many areas, and the real potential of foliar fertilization perhaps could not be realized in this situation. A second factor also may have prevented yield increases, which was a "burning" of the foliage due to the fertilizer solution. Most researchers agree this problem has to be overcome before we can realistically evaluate foliar fertilization, and we have taken steps to prevent it in 1977.

The 1976 data from the North Missouri Center, Spickard, are presented in the following table.

Foliar Fertilization of Soybeans - 1976 - North Missouri Center
Spickard, Grundy County

Treatment Code[a]	Application Number	Application Timing	Yield, bu/a, 13% Variety Clark 63	Yield, bu/a, 13% Variety Williams
NPKS	3	pod-filling	30.6	28.9
NPKS+B	3	pod-filling	29.5	31.8
B	1	flowering	31.0	26.5
NPKS+F	3	pod-filling	29.9	30.2
10-10-10	3	pod-filling	32.3	31.0
NPKS-Conv.	3	pod-filling	29.8	30.2
Check	0	none	29.8	31.2
		L S D (.05)	N.S.	N.S.

Soil type: Grundy silt loam
Soil fertilization: 60 lb/A P_2O_5, 80 lb/A K_2O.
Planting date: May 24, 1976
Herbicides: 3/4 lb/A Sencor 50W + 2 qt/A Lasso 4EC
Weather conditions: Extremely dry

[a]N from dissolved granular urea; P from 0-26-25; K from 0-26-25 and K_2SO_4, which also supplied S. B is boron, from Solubor (20.5%B). F is Benlate 50W fungicide. The 10-10-10 was a clear liquid N-P_2O_5-K_2O product sold by Na Churs Plant Food Co., and was applied at 2 gal/A per application. All other treatments were applied in 20 gallons/A total solution. The NPKS-Conv. treatment was made using the base fertilizer material 10-34-0 instead of the TVA 0-26-25.

The treatments being evaluated at Spickard during 1977 are as follows.

Trt. No.	Treatment	Gallons/A	Applications Number	Applications Timing
1	"Hanway" NPKS	20	3-4	during pod-filling
2	"Hanway" NPKS+Boron	20	3-4	during pod-filling
3	Boron	10	1	at flowering
4	"Hanway" NPKS+Benlate	20	3-4	during pod-filling
5	Folian	10	1	at early pod
6	Untreated	—	—	—
7	"Hanway" NPKS	20	1	at early pod
8	Folian	10	3-4	during pod-filling

GRAIN SORGHUM PRODUCTION IN NORTH MISSOURI

R.D. Horrocks*, C.G. Morris*, and Louis Meinke**
*Department of Agronomy, University of Missouri-Columbia,
and ** Department of Agronomy, North Missouri Center

During the past two years drought has been prevelant in some areas of Missouri. This was especially so at the North Missouri Center in Grundy County (Table 1). With back-to-back dry years, grain sorghum has once again demonstrated why it has the reputation for being a drought tolerant crop.

Production of grain sorghum hybrids at the North Missouri Center in 1976 is shown in Table 2. Yields ranged from 2526 to 6206 lb/ac, depending on the hybrid. Due to the drought this production was considerably better than that of corn -- 1.4 times more grain was produced on the average. The difference in 1977 will be even more striking, since soil moisture was completely depleted by July 15 and the plants in the corn plots thus died, producing no grain at all. The rains that came the first two weeks in August revitalized the grain sorghum plants and production should be good. However harvesting will likely be complicated by immature heads from secondary tillers that developed after the rain fell.

This characteristic of grain sorghum, to withstand dry conditions, points to its utility. It should be used whenever the grower feels the risk of producing corn is too great because of drought. Some producers have almost entirely switched to grain sorghum, citing the following as reasons for the change: (1) drought tolerance, (2) no need for a corn head, (3) performance of hogs on grain sorghum is nearly the same as corn, and (4) yields average as good or better over a number of years.

Before a grower switches to grain sorghum he should be sure a market exists or that he can utilize the grain in his own feeding operation and he should recognize that drying facilities will be a must.

Those interested in grain sorghum production should obtain M.U. Guide 4347, "Grain Sorghum Production in Missouri", for tips on proper cultural practices and procedures.

Because of the wide production range of hybrids (Table 2), it is important that the grower carefully select the hybrid or hybrids to be grown. In order to provide growers with hybrid performance information the Department of Agronomy of the University of Missouri publishes an annual report on crop performance. This report includes the following crops: grain sorghum, corn, and soybeans. It is entitled Missouri Crop Performance and the 1977 edition will be available at County Extension Centers about December 1.

Table 1. Precipitation at the North Missouri Research Center (Grundy County) in 1976 and 1977.

Month	1976		1977	
	Amt. of Rain	Days With Rain	Amt. of Rain	Days With Rain
May	3.67	13	4.49	6
June	2.35	9	1.73	2
July	1.04	6	1.33	2
August	1.91	8	5.83*	5*
Total	8.97	36	--	--

* Total for August 1 to August 15.

Table 2. Performance of grain sorghum hybrids at the North Missouri Center near Spickard, Mo. (Grundy Co.). Planted May 25, 1976. Harvested October 28, 1976.

BRAND / HYBRID	ACRE YIELD (LB)	GRAIN MOIS-TURE (%)	LODGED PLANTS (%)	HEADS IN 20 FEET (#)	HEADS CMPT-NESS (1-5)	HEADS EXSER-TION (1-5)	OFF-TYPE HEADS (%)	TALL PLANTS (%)	PLANT HEIGHT (")	50% BLOOM DATE
DEKALB BR-54**	6206	17.5	0.0	81	4.3	4.3	0.0	0.0	42	8- 8
FUNK G-522+	5990	17.9	0.0	82	3.0	3.7	0.4	0.0	35	8-10
BROWNING 775W	5922	17.7	0.0	69	3.0	4.0	0.6	0.0	41	8- 5
RING A. BIRD GC 68**	5772	18.0	0.5	69	3.3	4.3	0.9	0.0	37	8- 5
TROJAN M-59	5734	17.7	0.0	86	3.0	4.0	0.0	0.0	41	8-10
TROJAN M-58	5676	18.1	0.0	64	4.0	3.7	1.8	0.0	36	8- 8
PIONEER 8311+	5666	16.7	0.0	72	3.0	3.7	0.0	0.0	37	8- 5
FUNK G-516BR**	5664	18.0	0.0	64	4.3	4.3	0.0	0.0	35	8-10
WARNER DBL.YELL. ST	5545	17.7	0.0	72	4.0	3.7	4.7	1.9	36	7-30
ACCO R1090	5541	18.2	0.0	68	4.3	4.3	0.7	0.0	37	8- 8
T-E BIRD-A-BOO II**	5509	17.7	0.0	74	4.7	4.7	0.0	0.0	39	8- 8
MCNAIR 695-D	5484	18.3	0.4	75	3.3	4.0	0.6	0.8	37	8- 8
MCNAIR 654+	5436	18.0	0.0	79	3.7	3.7	0.0	0.0	39	8- 8
DEKALB C-42Y++	5380	18.0	0.0	79	2.7	4.7	0.0	0.0	43	8- 5
WARNER W-744**	5339	18.0	0.0	71	4.7	5.0	0.0	0.0	37	8- 5
RING A. 811A	5330	18.3	0.0	68	3.0	3.7	0.0	0.0	38	8- 2
WARNER W-832	5294	18.0	0.0	72	3.0	3.7	0.0	0.0	37	8- 2
MCNAIR 650+	5252	18.4	0.0	68	3.0	3.3	0.0	0.0	32	8- 8
LONE ELM LM102	5216	17.7	0.0	77	2.7	4.3	0.0	0.0	43	8- 5
NK SAVANNA 3+	5198	18.0	0.0	66	3.7	5.0	0.0	0.0	36	7-27
ACCO R109-A+	5181	17.7	0.5	73	3.0	4.0	0.0	0.0	32	8- 5
RING A. 808	5142	18.5	0.0	58	3.0	3.7	0.0	0.0	35	8-16
WARNER W-866	5131	18.0	0.0	75	2.3	3.7	0.0	0.0	40	8- 2
COOP SG 40+	5099	18.7	0.0	46	3.0	3.7	1.5	0.0	36	8-16
PIONEER 8442+	5023	17.5	0.0	97	3.3	3.3	0.3	0.0	36	8- 5
FMC ADVANCE 78BR**	5016	17.9	0.0	79	3.7	4.0	0.0	0.0	36	8- 5
DEKALB E-59++	4974	17.8	0.0	72	2.3	3.3	0.5	0.0	35	8- 8
M-F-A GS11	4957	17.6	0.0	57	3.3	3.7	1.9	0.0	33	8- 5
COOP SG 36	4955	17.4	0.4	72	4.7	4.0	0.5	0.0	37	8- 5
T-E TOTAL-P	4898	17.8	0.0	71	2.7	4.3	0.5	0.0	37	8- 5
FMC ADVANCE 80	4816	17.8	0.0	58	3.0	3.7	0.5	0.0	34	8- 5
WARNER W-86ST	4789	17.2	0.0	84	4.0	4.3	0.0	0.4	34	7-27
PIONEER 8501	4784	17.5	0.0	59	2.7	4.3	0.5	0.0	39	8- 8
ACCO R1029-A	4781	17.8	0.0	61	3.7	4.7	0.0	0.0	37	8- 2
NK 222G+	4729	18.4	0.8	61	3.7	4.0	0.6	0.0	34	8-12
P-A-G 5512	4698	18.0	0.0	48	2.7	4.0	0.0	0.8	30	8-10
GREENBUSH GB-450	4691	17.7	0.0	78	3.0	4.0	0.0	0.0	33	8- 5
TROJAN M-55	4670	18.0	0.0	83	4.3	4.7	0.0	0.5	39	8- 2
FRONTIER 412-A	4660	18.1	0.0	51	3.3	4.7	0.0	0.0	37	8-12
TROJAN M-56GBR**	4651	17.5	0.0	78	2.3	4.0	0.0	0.0	36	8- 8
ASGROW DORADO+	4642	17.9	0.0	70	3.0	3.7	0.9	0.0	32	8- 5
PIONEER 8386	4636	17.6	0.0	72	3.3	4.0	1.6	0.0	34	8- 5
PIONEER 8877	4622	17.5	0.0	94	5.0	4.7	0.0	0.0	35	7-21
FRONTIER 412-R	4613	17.5	0.0	70	3.3	3.7	0.0	0.0	31	8- 5
M-F-A GS10+	4579	18.3	0.0	61	2.7	4.0	1.0	1.0	33	8-10
MCCURDY M16	4522	18.1	0.0	68	3.3	3.7	0.0	0.0	31	8- 8
NK 180	4501	18.5	0.4	65	3.0	5.0	0.7	0.0	38	7-29
FRONTIER 401-R	4498	17.3	0.0	87	3.0	4.3	1.1	0.0	37	7-27
DEKALB E-57+	4464	18.0	0.0	63	3.3	4.3	0.0	0.0	40	8- 2
TROJAN M-56	4463	18.0	0.0	60	3.3	3.7	0.0	0.0	34	8- 5
ACCO R1019	4448	18.7	0.0	70	3.7	4.0	0.5	0.4	34	7-27
FUNK G-622GBR	4444	18.2	0.0	65	2.7	4.0	0.0	0.0	34	8- 8
T-E Y-101-R	4411	17.5	0.0	79	3.3	4.3	1.0	0.0	33	7-29
P-A-G 5514	4400	17.7	0.0	77	2.7	3.7	0.0	0.4	33	8- 2
FRONTIER 4122	4378	18.0	0.0	57	2.3	3.3	0.0	0.0	39	8-16
FUNK G-520	4327	18.8	0.0	64	3.0	4.0	0.0	0.0	37	7-27
PIONEER 8626	4316	17.5	0.0	80	2.7	4.0	0.0	0.0	33	8- 2
FUNK G-722DR	4258	18.5	0.0	65	1.3	3.0	0.0	0.0	38	8-16
FUNK G-766W	4229	17.8	0.0	86	2.3	3.3	1.8	0.0	36	8- 8
FMC ADVANCE 81	4203	17.4	0.0	74	2.7	3.3	0.0	0.0	31	8- 2
T-E 88A	4165	17.9	0.0	80	2.7	4.7	0.0	0.9	36	8- 5
DEKALB BR-65**	4047	18.1	0.0	71	2.0	3.3	0.0	0.0	37	8-10
NK 278	3966	18.2	0.0	64	2.3	4.0	0.0	0.0	32	8-12
FUNK G-589	3893	17.7	0.0	50	2.0	3.3	3.5	0.0	37	8- 5
MCCURDY M89	3864	18.6	0.0	77	3.3	4.0	0.0	0.0	37	7-28
GREENBUSH GB-400	3843	20.6	0.0	80	2.7	4.7	0.0	0.0	38	7-19
ACCO BR-Y93**	3828	18.3	2.7	61	2.0	5.0	0.0	0.0	36	8- 8
NK 222A+	3799	18.0	0.0	64	3.3	3.3	0.5	0.0	33	8- 8
DEKALB F-67	3688	19.2	0.0	58	3.0	3.0	0.0	0.0	36	8-16
FUNK G-520GBR	3452	17.5	0.0	57	2.7	4.0	0.0	0.0	35	8- 8
MARTIN	2898	18.4	0.0	57	2.3	3.7	0.0	0.0	30	8-12
FUNK G-404	2526	17.0	0.0	51	4.0	3.7	0.0	0.0	24	8- 5
AVERAGE	4746	18.0	0.1	69	3.2	4.0	0.4	0.1	35	

LSD VALUE AT THE 5% LEVEL IS 1281. HYBRIDS DIFFERING BY MORE THAN THIS VALUE WILL DIFFER SIGNIFICANTLY 19 OF 20 TIMES GROWN.
LSD VALUE AT THE 20% LEVEL IS 820. HYBRIDS DIFFERING BY MORE THAN THIS VALUE WILL DIFFER SIGNIFICANTLY 16 OF 20 TIMES GROWN.
*DAYS AFTER PLANTING.
**BIRD-RESISTANT HYBRID.

ROW CROP HERBICIDE DEMONSTRATION

Gary D. Hoette
Area Agronomy Specialist

Many farmers like to compare herbicides before they buy. The small size demonstration plots are used so that a large number of herbicides can be compared side by side. The size reduces the chances of bias from changes in soil type or organic matter content from one plot to another. The small size also reduces the amount of material needed and problems involved with equipment during application.

Only herbicides recommended by the University of Missouri Agricultural Experiment Station were used. These are products that have been used in Missouri for several years and found to be dependable. The weed control in the plots is due entirely to the herbicide(s) used. The plots have not been cultivated.

The plots were put out by L. E. Anderson, State Extension Agronomist, and Louis Meinke, Agronomy Research Specialist. The plots are four rows wide and 82 feet in length. These plots cover 0.18 acres. The incorporated materials were applied before final tillage. All herbicides were applied with a two-row hand sprayer.

These plots will indicate how the herbicides perform under adverse weather conditions. The summer months have been extremely dry. This dry weather should be kept in mind while viewing the plots.

CORN DEMONSTRATION

Herbicides

1977

Plot No.	Herbicide	Rate/Acre
1	Check	
Pre 2	Lasso	2.5 lb.
3	Bladex + Atrazine	2.4 + 1.25
4	Prowl	2.0 lb.
5	Aatrex	2.5 lb.
6	Aatrex + Lasso	1.5 + 1.5 lb.
7	Bladex	3.0 lb.
8	Bladex + Lasso	2.0 + 1.5 lb.
9	Cultivate	
PPI 10	Sutan +	4.0 lb.
11	Aatrex + Sutan	1.25 + 3.0 lb.

The corn (Pioneer 3388) was planted April 27, 1977. Fertilize applied was 156# N + 72# P_2O_5 + 90# K_2O per acre.

SOYBEAN DEMONSTRATION

HERBICIDES

1977

Plot No. Herbicide

Plot No.	Herbicide	Rate/acre
PPI 1	Basalin	1.0 lb.
2	Tolban	1.0 lb.
3	Treflan	1.0 lb.
4	Treflan + Sencor	0.75 + 0.5 lb.
5	Vernam	3.0 lb.
PPI +		
Pre 6	Treflan + Sencor	1.0 + 0.5 lb.
Pre 7	Amiben	3.0 lb.
8	Lasso	2.5 lb.
9	Lasso + Lorox	1.5 + 1.0 lb.
10	Modown	2.5 lb.
11	Sencor	0.75 lb.
Post 12	Check	1.0 lb.
13	Dual **	2.5 lb.
14	Check	------
Pre 15	Prowl	1.0 lb.

The beans were planted and herbicide applied on May 16, 1977. The variety was Williams and the fertilizer used was O#N + 46# P_2O_5 per acre.

IRRIGATION IN NORTH MISSOURI

Phillip G. Stryker
State Extension Agronomy Specialist, Soil and Water Management

Irrigation is increasing in northern Missouri. Robert W. Schottman, State Extension Agricultural Engineer, reported that 41,800 acres were irrigated north of the Missouri River in 1976. Estimates by Area Extension Specialists suggest this figure could exceed 120,000 acres by 1981.

Getting into irrigation farming is a major step. Demands will be placed on cash flow and labor. Capital investments for different systems can exceed $200 to $400 per acre. Irrigation should be considered a long-range management tool.

Before switching to irrigation, a farmer should make certain that water is the limiting factor. Other crop management practices need to be corrected before irrigation is attempted.

1. A sound fertilization program is essential. Regular soil testing and maintenance of adequate levels of phosphate and potash are a key to top yields. Soil pHs should be maintained at or above 6.1 by frequent liming.

2. Plant populations should be adequate. Narrowing rows from 40" to 30" resulted in a 15% yield increase in corn. Populations should be increased 25 to 30% under irrigation to utilize available moisture.

3. Select varieties carefully. Seed costs per acre will be about the same, but the yield can vary considerably. Missouri Crop Performance Variety Trials have shown that the 25 most popular are not necessarily the top 25 yielders.

4. Effective pest management is essential for efficient crop production.

5. Timely planting and harvest can help to produce maximum yields. Missouri data suggest 1/3 to 2/3 bushel per acre per day reduction in yield for each day delay beyond ideal planting time.

Soil information can be very valuable in determining the feasibility of irrigation. Of particular importance is the infiltration rate, drainage, topography, and the available water storage capacity. The soils of north Missouri vary considerably. This variance can affect the equipment design, the quantity of water applied, and the frequency of application.

Crop water use and rainfall patterns affect the frequency of application also. The chart on the next page shows the estimated water use of four crops grown in the Trenton area. The rainfall data is a 42-year average from the Trenton Weather Station.

Estimated Crop Water Use in North Missouri by Months[1]

	Alfalfa	Corn	Soybeans	Grain Sorghum	42-Yr Average Rainfall[2]
April	1.40				3.30
May	4.19	2.06	.47	.26	4.19
June	6.19	4.97	2.84	2.94	5.46
July	7.16	7.27	5.87	6.58	3.82
Aug	6.06	5.72	5.23	6.70	3.88
Sept	3.78			3.61	4.22
Oct	1.00			1.32	2.81

[1] From 1974 Irrigation Handbook SCS (Blaney-Criddle method)

[2] From Monthly Precipitation in Missouri by Decker, 1963 Circular 650.

SMALL GRAINS RESEARCH

Louis Meinke, Dale Sechler, J. M. Poehlman and Paul Rowoth

Small grains research at the North Missouri Center involves wheat and spring oats primarily. Small grain was grown in variety evaluation trials, observation plots and in some double cropping experiments during the 1976-77 season.

Wheat breeding efforts are concentrated on developing high yielding varieties of soft red winter wheat which will tolerate the usual production hazards in the area. Short, stiff-strawed, fertilizer responsive varieties which are resistant to hessian fly and diseases such as Septoria, rust, mildew and smut are desired. New hard as well as soft wheat selections from surrounding states are evaluated, along with new selections from the Missouri breeding program, in the outstate variety trials. Forty varieties and strains (18 hard and 32 soft) were grown in replicated trials at Spickard in 1976-77. Performance data is shown in Table 1. Forty additional lines were grown in observation plots. Lodging was rather severe in the weaker strawed lines and Septoria was the most damaging disease.

Oat breeding efforts are concentrated on the development of high yielding, lodging, and disease resistant varieties. Forty selections, 13 of which are already in commercial production, were evaluated at Spickard in 1976-77. Performance data is shown in Table 2. Vegetative growth was excessive and lodging was rather severe but diseases were less prevalent than normal. BYDV, which is usually our most serious disease, was not present this year but is expected to recur and should be a prime consideration in the selection of a variety.

Varieties of wheat differ in maturity and therefore the date at which soybeans might be seeded in the stubble. Four varieties of wheat (varying in range of maturity) were seeded and each harvested at 3 moisture levels to determine the effect on wheat yield and quality. Soybeans were seeded in the stubble immediately after each harvest to evaluate the effect of time of planting on soybean performance. This is the second year for this experiment but several crops will be necessary to provide meaningful data.

Descriptions of small grain varieties adapted to Missouri are found in current UMC guides.

Table 1. Missouri Wheat Variety Tests, 1977 - Columbia, Spickard, Novelty, Lamar, Mt. Vernon, Portageville

Variety	Yield by Location						State Average (5 locations)										
	Col* bu/a	Spick bu/a	Novelty bu/a	Lamar bu/a	MtV. bu/a	Port. bu/a	Yield bu/a (5)	Test Wt. lb/bu (5)	Dt Hded (3)	Ht in. (5)	Lodg % (5)	Septoria leaf % (3)	Septoria head % (1)	Leaf rust % (2)	Mildew % (2)	Pearled off % (4)	Seed Size % on 6/64 (1)
Hard Wheat																	
Danne	72	64	50	44	58	44	51.9	60.1	4/28	38	49	37	2	37	54	27	81
Triumph 64	69	56	55	39	52	41	48.5	61.2	28	39	47	33	5	19	51	27	97
Parker	45	62	55	49	65	44	55.0	62.3	29	40	28	27	5	19	42	23	90
Parker 76	53	71	58	50	55	47	56.0	62.7	29	39	20	24	2	1	46	20	94
Centurk	53	43	52	47	63	47	50.3	60.4	31	40	42	41	2	7	37	22	67
Sage	59	57	47	39	60	48	50.0	61.0	5/ 5	42	31	29	2	1	27	23	84
Soft Wheat																	
Arthur	70	56	58	44	66	41	52.9	60.3	4/27	37	16	35	5	3	10	37	91
Arthur 71	56	45	54	45	66	37	49.2	60.4	30	37	22	36	5		10	39	96
Abe	70	56	62	49	67	48	56.3	59.6	28	36	27	40	5		10	42	97
Oasis	77	56	55	52	67	36	53.2	60.2	28	38	23	21	2		15	44	96
BEAU	75	56	41	47	64	39	49.3	60,8	29	36	12	34	2	4	15	36	97
Doublecrop	65	51	54	38	59	34	47.2	60.1	24	36	17	36	5	1	33	39	96
Stoddard	80	56	58	52	64	42	54.3	60.7	29	41	18	31	2		26	36	84
Hart	68	73	62	52	71	52	62.0	59.2	28	37	14	37	2	1	34	33	90
McNair 4823	55	57	50	45	59	48	51.7	60.0	5/3	35	9	35	20		40	31	61
McNair 1813	60	65	44	43	71	44	53.2	60.4	4/29	36	14	32	8	2	8	36	85
Coker 68-15	62	73	44	52	72	50	58.2	61.6	29	35	16	16	2		36	35	79
Ill 70-4126	22	74	58	53	74	51	61.9	58.8	5/3	35	15	33	20	5	2	45	81
W9148	71	60	59	52	79	56	61.1	59.6	4/21	36	25	25	5	11	45	30	66
W9202	47	57	52	41	67	46	52.8	56.1	29	35	8	24	40	2	44	40	74
W8656	69	67	52	56	76	53	60.7	59.5	23	36	10	42	5	1	50	36	91
W8993	59	75	53	54	70	52	60.8	60.4	23	35	13	24	5	3	42	34	89
W8998	77	76	65	56	70	52	63.6	59.9	22	33	6	24	5		23	37	96
W9307	60	62	49	48	72	48	55.7	57.2	23	32	9	28	15		30	32	55
W9385	55	70	53	36	74	47	55.9	57.1	21	31	13	25	15	1	38	32	35
W9360	75	64	55	56	65	56	59.1	58.2	23	38	40	30	2	1	49	33	79
W9411	64	65	51	38	73	52	55.6	56.1	23	34	13	29	15		42	34	63
W9314	46	52	49	44	63	45	50.6	56.8	22	32	9	42	20	1	33	38	83

*Yield at Columbia not included in state average. Due to poor stands only one rep. harvested
( ) Numbers in parenthesis refers to number of locations where observations were taken.
LSD 5% level (Yield)-Spickard 11.2 bu; Novelty 8.9bu; Lamar 7.9 bu; Mt.Vernon 9.3 bu; Portageville 9.0 bu/a.

Table 2. Spring Oat Variety Trials, 1977 - Columbia, Spickard, Novelty, Mt. Vernon

Variety	Yield by Location				State Average (4 locations)								
	Spickard bu/A	Novelty bu/A	Columbia bu/A	Mt. Vernon bu/A	Grain yield bu/A	Test wt. lb/bu	Seed size % on 6/64	Dt. Hded	Ht. in.	Lodg. %	Smut H/R	Halo blight %	Stem rust %
					(4)	(4)	(1)	(2)	(4)	(4)	(1)	(1)	(1)
Otee	87	93	99	81	90.0	38.2	10	5/20	40	30	12	5	0
Pettis	89	104	87	73	88.2	36.8	3	18	40	57	4	2	0
Nodaway 70	75	100	97	77	87.1	36.0	55	20	41	26	0	2	0
Lang	123	72	108	88	97.7	34.1	30	18	37	8	12	6	2
Bates	99	98	107	65	91.8	34.5	5	21	37	22	0	2	0
Trio	90	123	105	79	99.4	36.1	22	18	41	33	1	2	0
Chief	85	102	94	79	89.8	37.0	2	18	42	53	7	2	0
Spear	91	98	95	73	89.2	35.0	6	22	39	17	8	4	2
Noble	108	115	101	71	98.5	33.8	43	23	38	19	1	3	1
Stout	113	119	97	78	101.7	33.8	36	19	34	20	6	3	0
Iowa E77	86	99	92	79	89.1	35.6	25	18	40	21	25	4	1
Allen	100	95	96	66	88.8	35.3	11	19	37	15	42	3	3
Grundy	100	103	96	75	93.3	35.5	8	21	40	27	3	3	1

LSD (Yield) Spickard 16.5 bu/A; Columbia 15.4 bu/A; Novelty 14.3 bu/A; Mt. Vernon 9.3 bu/A.

( ) Numbers in parenthesis refers to no. of observations

Plots seeded at Spickard March 1; Columbia March 5; Novelty March 10; Mt. Vernon March 8, 1977.

Missouri Spring Oat Variety Trials, 4 yr. Average, 1974-77 (Columbia, Spickard, Mt. Vernon, Novelty)

Variety	Yield bu/A	Test wt. lb/bu	Seed Size % on 6/64	Dt. Hded	Ht. in.	Lodg. %	BYDV %	Crown Rust %	Smut H/R
Otee	73.1	35.2	20	5/29	39	20	9	36	8
Pettis	71.2	34.9	11	26	44	36	8	31	6
Nodaway 70	63.9	33.3	44	29	43	23	20	25	0
Trio	75.6	34.2	24	29	43	30	11	41	0
Noble	74.7	31.9	46	6/2	39	12	11	44	0
Stout	74.9	31.9	41	5/28	35	13	18	13	3
Bates	81.4	35.1	10	29	40	22	3	8	0
Grundy	60.1	32.7	22	6/1	40	33	31	34	2

One additional location was grown in 1977 but the average for each year was used in determining the 4 yr. average. BYDV or Crown Rust were not observed in 1977 so the figure shown is average for 3 previous years.

SOIL FERTILITY RESEARCH WITH FORAGE CROPS

Earl M. Kroth, Department of Agronomy, UMC
Louis Meinke, Agronomy Research Specialist, North Missouri Center

All fertility studies with forage crops at the North Missouri Center are related to "Feed the Plant" approach to forage production rather than the "fertilize the soil" procedure followed for rotated crops. One set of plots in the reed canarygrass fertility study was brought up to "soil test" with lime, superphosphate and potash and then topdressed by selected N, P, K topdressings for a comparison with topdressings without applying basic or corrective treatments before making the seedings. Dry weather during July and August limited forage yields in 1976.

A. Effect of Topdressing Fertilizers on Yields of Tall Fescue And Reed Canarygrass

Topdressed fertilizers in these studies consisted of 3 levels of N, 4 levels of P_2O_5 and 4 levels of K_2O in all combinations. (N = 0, 100, 200 split, P_2O_5 = 0, 30, 60, 320 (rock phosphate), K_2O = 0, 50, 100, 150). The combinations make a total of 48 different treatments.

Yields T/A 1976

Selected Treatments	Tall Fescue 2 cuts	Reed Canarygrass 2 cuts	Reed Canarygrass Basic Plus Topdress 2 cuts
0 + 0 + 0	0.1	0.1	---
100 + 0 + 0	0.6	1.9	---
200 + 0 + 0	0.9	1.7	2.4
0 + 30 + 0	0.3	0.1	---
100 + 30 + 0	1.9	1.5	---
200 + 30 + 0	2.3	2.7	2.5
0 + 30 + 100	0.2	0.1	---
100 + 30 + 100	2.0	1.6	---
200 + 30 + 100	2.8	3.1	2.9
0 + 30 + 150	0.3	0.2	---
100 + 30 + 150	2.2	2.3	---
200 + 30 + 150	2.9	3.1	3.5
0 + 60 + 150	0.3	0.1	---
100 + 60 + 150	2.5	1.8	---
200 + 60 + 150	3.4	3.3	3.4
200 + 320* + 100	2.2	3.0	---
200 + 320* + 150	3.0	3.1	---

*1,000 lbs rockphosphate topdressed on tall fescue March 1971 and on reed canarygrass March 1972.

Yields of both grasses were increased by using 200 lbs N in split applications (100 lbs March, 100 lbs after 1st cutting). In the case of tall fescue there was carry over effect from the 200 lbs N. No N carry over was noticed on the reed canarygrass this year. Reed canary tends to out-yield tall fescue and for this reason could probably make use of a higher N rate than fescue. Observations from this study and of grazing management problems suggest 80 lbs N in March and an additional 80 lbs in June could give optimum forage yields providing there were good summer rains.

Phosphorus topdressed at 30 lbs P_2O_5/A was adequate for both grasses. Rock phosphate supplied enough P for highest yields. In the case of K_2O, 100 lbs was adequate for the reed canarygrass but 150 lbs was indicated for the fescue. The reed canarygrass is growing on a soil containing larger amounts of exchangeable K than the soil where the fescue is planted. These soil differences will be evaluated by soil samples taken in the fall of 1977. All forage was removed in these studies. Under pasture conditions smaller amounts of P_2O_5 and K_2O would be indicated. These studies are being supported by Farmland Industries.

B. Establishing Red Clover in Stands of Pasture Grasses

In February 1976 certified Kenstar red clover was applied by a brillion seeder at 8 lbs/A on the zero N plots of the above two studies. Good stands of red clover were obtained on all plots. However, different rates of growth were observed depending on the amounts of P_2O_5 and K_2O that had been topdressed during the previous 5 years with fescue and 4 years on the reed canarygrass plots. The table below shows the concentrations of P_2O_5 and exchangeable K the seedling red clover plants found in the upper four inches of the differently treated plots.

	Tall Fescue				Reed Canarygrass			
	0+30+0		0+30+50		0+30+0		0+30+50	
Depth Inches	P_2O_5	E_xK	P_2O_5	E_xK	P_2O_5	E_xK	P_2O_5	E_xK
0-1	207	220	292	406	242	360	312	556
1-2	102	142	74	153	87	256	102	394
2-3	45	135	61	200	34	230	53	288
3-4	32	134	43	199	34	221	59	325

Nearly all of the red clover seedlings in the tall fescue died due to the dry summer and fall months. In contrast good stands of red clover resulted on all the reed canarygrass plots. This red clover-reed canarygrass mixture was harvested for hay May 10, 1977. The second growth of red clover was cut for seed July 27.

C. Renovation of Reed Canarygrass Sod with Legumes Topdressed with Phosphorus and Potassium

Reed canarygrass plots planted in April 1972 as part of a previous reed canarygrass establishment study were disked to reduce the stand by one-half in April 1974. Blocks of Victoria (creeping) alfalfa, Dawn birdsfoot trefoil, and common red clover (Kenstar varity not available) were band seeded with 80 lbs of superphosphate/Acre with a drill. The blocks of each legume were large enough to permit the following treatments with three replications:

Main Blocks - fertilizers topdressed annually in fall

1. 0 + 30 + 100
2. 0 + 30 + 200
3. 0 + 60 + 100
4. 0 + 60 + 200

Sub plots consist of nitrogen treatments topdressed on plots containing reed canarygrass-legume mixtures and on reed canarygrass alone - the legume having been removed by use of a herbicide. These subtreatments are as follows:

1. 0 N on grass-legume mixture.
2. 50 lbs N on grass-legume misture after first cutting.
3. 0 N on reed canarygrass alone.
4. 50 lbs N on reed canarygrass alone.

These treatments will permit the determination of effective N fixation by the three legumes; also the rates of P_2O_5 and K_2O and the soil test values necessary to produce optimum yields of the mixtures.

Three tons per acre of limestone were worked into the plowed surface when the reed canarygrass was planted on these plots in April 1972. A pilot study close by is being used as an indicator when to topdress additional limestone on these plots. Three tons per acre limestone were topdressed to all plots in March 1977.

The soil test values at the beginning of these reed canarygrass legume studies in April 1974 were as follows:

	P_2O_5 Lbs/A		OM	Ca	Mg	E_xK		N.A. me/	
Depth	P_1	P_2	%	Lbs/A	Lbs/A	Lbs/A	pHs	100 gms	CEC
0-3"	29	38	3.2	6570	930	239	6.1	3.3	24
4-6"	20	26	3.1	4470	910	177	4.9	7.8	23

The yields in 1976 in T/A produced by the various treatments are given below. The dry summer reduced the effectiveness of the N applied after the first cutting.

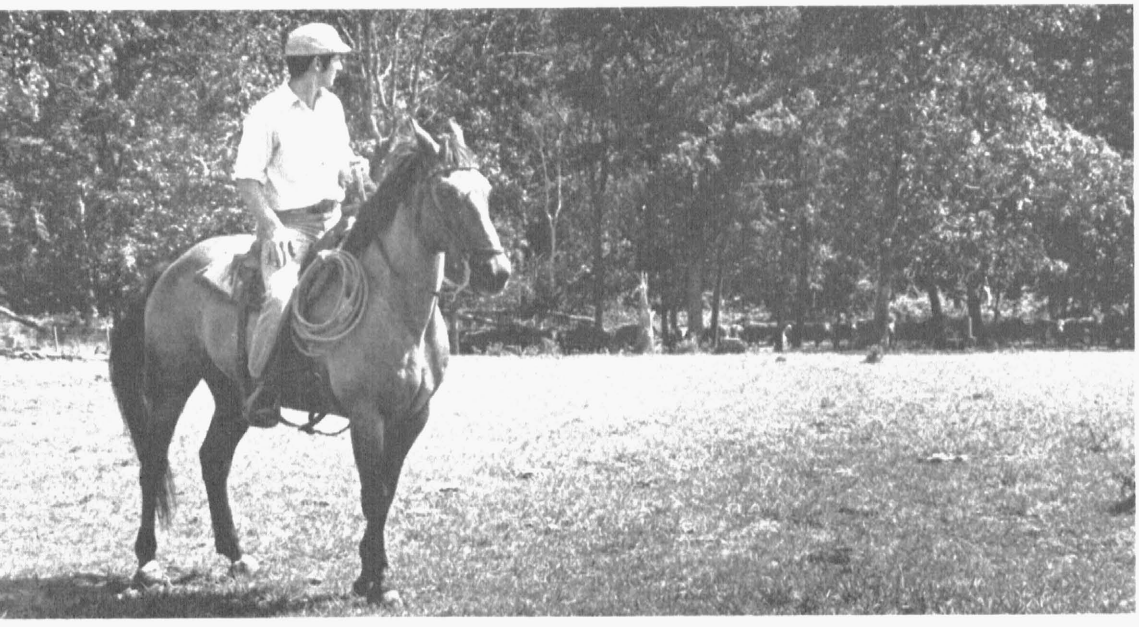
		Topdressings			
		0+30+100	0+30+200	0+60+100	0+60+200
(Reed Canary alone)	0N	0.3	0.3	0.3	0.4
	50N	0.9	1.0	1.0	1.2
(Reed Canary + alfalfa)	0N	4.0	3.7	4.5	4.8
	50N	5.0	4.0	4.8	4.9
(Reed Canary + red clover)	0N	2.0	2.0	2.0	2.1
	50N	2.5	2.1	2.4	2.4
(Reed Canary + trefoil)	0N	3.3	3.5	3.4	3.7
	50N	3.4	3.4	3.3	3.7

The data to date indicate that 50 lbs N/A on the grass-legume mixtures has not increased total yields. However, data by harvest dates may eventually indicate an advantage of applying some N after first cutting due to increased June and July growth of reed canarygrass. Rainfall distribution in June and July has not been favorable for early summer growth in 1975, 1976, and 1977. Conditions were more favorable in 1974.

The results of this study will also give us some data regarding the amount of limestone needed when interseeding legumes into stands of pasture grasses.

FORAGE INSECT CONTROL

James Huggans

Each year tests are conducted on the Center that evaluate experimental insecticides for the control of alfalfa weevil and other pests of alfalfa. Materials showing control qualities as good or better than insecticides currently labeled are usually a year or two from being on the market if they make it at all. For the past two seasons considerable interest has been generated in synthetic pyrethrins. Application rates down to 1/100 pound actual material per acre have given 95 to 98 per cent weevil control for 2-3 weeks.

Additional insecticide tests were conducted for control of spittlebugs in red clover and varigated cutworms in alfalfa. Neither labeled products nor experimental materials gave adequate control. The investigations will continue.