Colorado Agricultural and Mechanical College

OUTSTATE FERTILIZER TESTING PROGRAM

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COMMERCIAL FERTILIZER EXPERIMENTS
With
Non-Irrigated Corn and Sorghum in Eastern Colorado
in
1953

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OUTSTATE FERTILIZER TESTING PROGRAM

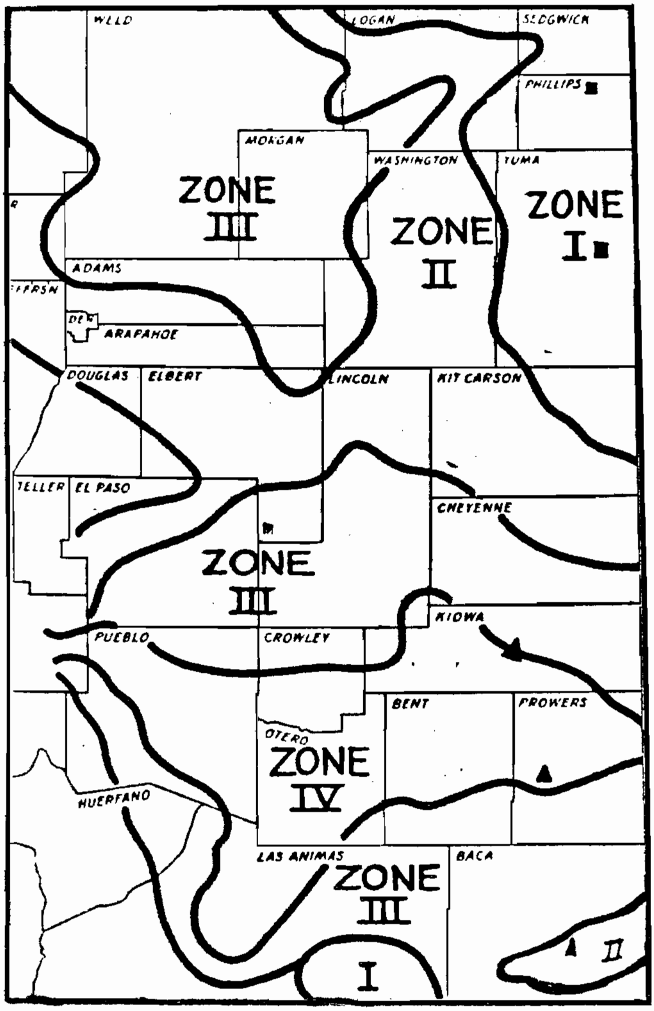
In the spring of 1952, a program was initiated for soil fertility research on non-irrigated crop-lands in Colorado. This program was made possible by a Grant-in-Aid from the Phillips Chemical Company which was supplemented by state and federal funds.

The long-range objective of the experimentation is to determine the effect of nitrogen fertilizers alone and in combination with phosphorus and potassium on the yield and quality of winter wheat, corn, and sorghum on non-irrigated land in relation to variations in soil and climate.

This circular is a progress report of commercial fertilizer experiments on corn and sorghum conducted by the Agronomy Section (Soils) of the Colorado Agricultural Experiment Station during the 1953 season.

Acknowledgement is made to the Colorado Extension Agents and Specialists, Experiment Station personnel, and farmer cooperators for their assistance in conducting these tests.

EASTERN COLORADO



Zone	Annual Effective Rainfall*	Crop
I	17-19 inches	■ Corn
II	15-17 "	▲ Sorghum
III	13-15 "	
IV	<13 "	

*Based on records of precipitation, temperature, evaporation, mature soil characteristics, altitude and crop yields.

Fig. 1. Climatic Zones and Location of 1953 Experiments

Map reproduced from "Land Types in Eastern Colorado" by L. A. Brown, D. S. Romine, R. T. Burdick, and A. Kezer. Colo. Agr. Exp. Sta. Bul. 486, June 1, 1944.

COMMERCIAL FERTILIZER EXPERIMENTS WITH NON-IRRIGATED CORN AND SORGHUM IN EASTERN COLORADO IN 1953

A total of six fertility experiments, three on corn and three on sorghums were conducted on non-irrigated croplands in eastern Colorado during 1953. The corn experiments were conducted on light textured soils of northeastern Colorado, and the sorghum experiments were located on soils of variable textures in southeastern Colorado. The location of these experiments is given in Figure 1 and Table 1.

The primary objectives of these tests are listed below:

1. To evaluate the effectiveness of different commercial carriers of nitrogen on corn and sorghum.
2. To determine the most effective rate of nitrogen to be used on non-irrigated corn and sorghum.
3. To determine the soil nutrient and soil moisture factors likely to result in yield increases when treated with nitrogen fertilizer under non-irrigated conditions in eastern Colorado.

Exploratory treatments of mixed fertilizers were used in some cases to determine if nutrient elements other than nitrogen could be used to an advantage.

Non-irrigated corn and sorghum are generally grown under continuous cultivation in eastern Colorado. The use of a row crop-fallow rotation is seldom practiced because of a wind erosion hazard. In some years when a large acreage of summer fallowed winter wheat fails to germinate in the fall, sorghums are planted the following spring on those idle acres. This practice is more common in southeastern than in northeastern Colorado.

Table 1. Fertilizer Test Locations, 1953

Field No.	Cooperator	Location	Management	County Agent	Land Fertilized	Land-Type	Variety
			CORN				
D-34-53	M. Collins	Eckley	Corn after Corn	W. Chandler	June 3	Sandy	Dekalb
D-35-53	J. Rhoades	Fairfield	Corn after Corn	T. Hadden	June 4	Sandy	Corn Husker
D-36-53	E. Orcutt	Simla	Corn after Corn	W. Mason	June 11	Moder-ately Sandy	Open Pollinated
			SORGHUM				
D-37-53	L. Blooding	Eads	Sorghum after Sorghum	B. Whitmore	June 22	Moder-ately Sandy	Martin
D-38-53	H. Ragsdale	Lamar	Sorghum after Sorghum	B. Young	June 24	Hard-land	Martin
D-39-53	B. Neill	Springfield	Sorghum after Sorghum	C. Fithian	June 23	Moder-ately Sandy	Ellis Sorgo

Climatic Conditions

Farm rain gages were placed at each experimental site and the precipitation recorded from mid-June until October 1. The rainfall data for the individual locations are given in Table 2.

Table 2. Precipitation Received on Corn and Sorghum Test Locations, 1953

CORN	Inches of Rainfall					
County & Town	Mid-June to July 1	July	August	Sept.	Total $3\frac{1}{2}$ months	Normal* Average Same Period
Yuma - Eckley	0.1	1.2	2.1	0.0	3.3	8.2
Phillips - Fairfield	2.2	4.4	1.8	0.0	8.4	8.8
Elbert - Simla	1.3	2.3	1.7	0.2	5.5	7.6
SORGHUM						
Kiowa - Eads	0.1	1.1	3.6	0.2	5.0	6.3
Prowers - Lamar	0.0	0.9	5.4	0.0	6.3	6.8
Baca - Springfield	0.3	2.3	2.4	0.0	5.0	6.7

* Colorado Agricultural Handbook, 1952.

The month of September was dry throughout eastern Colorado. The precipitation received in June was lower than normal in northeastern Colorado and almost no rainfall was received on the sorghum plots in southeastern Colorado. The rainfall received on the experimental plots in July and August ranged from 3.3 to 6.3 inches.

The yields were markedly affected by the lack of sufficient stored soil moisture at the Prowers and Baca County locations. No yield determination could be made on the Prowers County plots because of extreme moisture deficiency. Although 5.4 inches of rain was recorded for the month of August at this location, the precipitation came in two torrential storms which resulted in a high percentage of run-off.

At the other four locations, a combination of initial stored soil moisture at planting time and seasonal precipitation resulted in fair to good yields.

METHODS AND MATERIALS

The fertilizer elements used are expressed as follows: nitrogen (N), phosphorus (P_2O_5), and potassium (K_2O). The types of fertilizer materials used and analysis are listed below:

Ammonium nitrate	33.5% N
Ammonium sulfate	20.5% N
Urea	45 % N
Triple superphosphate	43 % P_2O_5
Potassium sulfate	50 % K_2O

The individual plots for both corn and sorghum were eighty feet long and four rows wide (40-inch rows). A total of eighty feet of crop row from the center two rows was selected for harvest on corn and 50 feet on sorghum.

The fertilizer treatments on all the corn and sorghum tests were identical with the exception of the mixed fertilizers used as exploratory treatments. The following treatments were used on all the experiments except two:

No.	Treatment Symbol	Treatment - Pounds per Acre
1.	Check	No fertilizer
2.	A. S. 25	Ammonium sulfate - 25 lbs. N
3.	A. S. 50	Ammonium sulfate - 50 lbs. N
4.	A. N. 25	Ammonium nitrate - 25 lbs. N
5.	A. N. 50	Ammonium nitrate - 50 lbs. N
6.	U 25	Urea - 25 lbs. N
7.	U 50	Urea - 50 lbs. N
8.	NP*	25 lbs. N, 50 lbs. P_2O_5
9.	NPK*	25 lbs. N, 50 lbs. P_2O_5, 50 lbs. K_2O

* Nitrogen from ammonium nitrate

The corn experiment at Yuma County did not include the NP and NPK treatments and the Phillips County test did not include the NP treatment.

From each plot of corn the ears were picked and weighed, and a moisture and protein sample was retained for analysis. The dry stalks (stover) were cut and weighed to obtain an estimate of the weight of crop residue which would be returned to the soil.

On the sorghum experiment in Kiowa County, the grain heads were cut, threshed, weighed, and a protein sample selected from each plot. The stover was cut and weighed.

The forage sorghum experiment in Baca County was harvested in the following manner: the stalks were cut from each plot, bundled, and weighed; then six stalks selected at random from each bundle were chopped into small pieces and retained in an air-tight container for subsequent moisture and protein analysis.

The experimental corn and sorghum results are given in Tables 3, 4, 5, 6, 7, and 8.

EXPERIMENTAL RESULTS - CORN

Collins Farm (D-34-53), Yuma County. Sandy Land, Continuous Corn.

This experiment was on continuously cropped light textured soil. The corn received less than half the normal precipitation during the mid-June to October growing period. The abundant supply of stored soil moisture at planting time undoubtedly contributed considerably to the yield of corn which was finally harvested. One replication was much lower in yield than the others because of moisture deficiency. The results shown in Table 3 include yields taken from all four replications.

Table 3. Collins Farm (D-34-53), Yuma County. Continuous Corn Grown on Loamy Sand.

Treatment	Yield of Corn Bushels/Acre	Air-Dry Stover lbs./Acre	Protein in Grain %
Check	15.6	580	6.6
A. Sulfate 25 lbs.N	26.5**	990**	8.3**
A. Sulfate 50 lbs.N	22.7	800*	8.6**
A. Nitrate 25 lbs.N	22.0	860*	8.6**
A. Nitrate 50 lbs.N	23.6*	920**	8.8**
Urea 25 lbs.N	23.3*	900**	8.4**
Urea 50 lbs.N	23.7*	1000**	8.5**
L. S. D., 5% pt.	7.3	216	0.7

Grain yield and protein analysis based on 15.5% moisture in grain
(* - Significant at 5% level)
(** - Significant at 1% level)

A significant increase in yield of corn, dry stover and protein in the grain was obtained by the use of nitrogen fertilizers at this location.

The different sources of nitrogen on the average were equally effective.

The 50 lbs. rate of nitrogen per acre produced no more corn, stover, or protein than 25 lbs. of nitrogen per acre. There was a slight increase in percent protein where 50 lbs. of nitrogen was used rather than the 25 lb. rate, but the increase was insignificant.

An average increase over the no treatment plots of 8.3 bushels grain, 340 lbs. dry stover, and 1.8% protein was obtained by the application of 25 lbs. of nitrogen per acre.

Rhoades Farm (D-35-53), Phillips County. Sandy Land, Continuous Corn.

An adequate supply of soil moisture was available for crop growth throughout the growing season at this location. The yield of corn was high, (see Table 4). There was no significant increase or decrease in yield of grain caused by any of the fertilizer treatments.

Table 4. Rhoades Farm (D-35-53), Phillips County. Continuous Corn Grown on Loamy Sand.

Treatment	Yield of Corn Bushels/Acre	Air-Dry Stover lbs./Acre	Protein in Grain %
Check	39.2	1330	7.8
A. Sulfate 25 lbs.N	43.4	1910**	8.4
A. Sulfate 50 lbs.N	40.3	1700*	8.8**
A. Nitrate 25 lbs.N	43.3	1760**	8.8**
A. Nitrate 50 lbs.N	40.0	1600	9.0**
Urea 25 lbs.N	40.1	1390	8.7**
Urea 50 lbs.N	40.9	1480	8.5*
NPK	37.6	2390**	8.5*
L. S. D., 5% pt.	N.S.	317	0.7

Grain yield and protein analysis based on 15.5% moisture in grain NPK = 25 lbs. N, 50 lbs. P_2O_5, 50 lbs. K_2O

(N.S. - Not significant)
(* - Significant at 5% level)
(** - Significant at 1% level)

The addition of commercial fertilizer produced a highly significant increase in yield of air-dry stover. A significantly greater quantity of stover was obtained by the use of mixed fertilizer (NPK) than by the use of nitrogen alone. Treatments with ammonium sulfate and ammonium nitrate produced significantly more stover than did urea. A field inspection (July 13) five weeks after fertilization showed the average height of corn as follows: 12" on the check plots, 24" on the nitrogen treatments, and 30" on the NPK plots. This early season response in corn growth due to fertilization was not reflected in an increase in grain.

A significant increase in the protein of the grain was obtained by the use of nitrogen fertilizers. The increase in protein amounted to about 1%.

Orcutt Farm (D-36-53), Elbert County. Moderately Sandy Land, Continuous Corn.

This experiment was conducted on moderately sandy soil where the initial soil moisture level was good at the time of fertilization. The rainfall received between planting and harvest was slightly below normal.

Table 5. Orcutt Farm (D-36-53) Elbert County. Corn Grown on Moderately Sandy Soil.

Treatment	Yield of Corn Bushels/Acre	Air-Dry Stover (- grain) lbs./Acre	Protein in Grain %
Check	19.4	660	8.6
A. Sulfate 25 lbs.N	20.0	780	9.8**
A. Sulfate 50 lbs.N	24.3*	980**	10.6**
A. Nitrate 25 lbs.N	23.2	840*	9.9**
A. Nitrate 50 lbs.N	23.7*	880*	10.0**
Urea 25 lbs.N	22.7	900**	9.8**
Urea 50 lbs.N	23.7*	780	10.2**
NP	25.4**	1000**	10.0**
NPK	25.4**	1020**	10.2**
L. S. D., 5% pt.	4.0	166	0.5

Grain yield and protein analysis based on 15.5% moisture in grain
NP = 25 lbs. N, 50 lbs. P_2O_5
NPK = 25 lbs. N, 50 lbs. P_2O_5, 50 lbs. K_2O

(* - Significant at 5% level)(** - Significant at 1% level)

A significant increase in the yield of corn, dry stover, and protein in the grain was obtained by the use of nitrogen fertilizers (see Table 5). There was no significant increase in yield of corn and stover from the use of 50 lbs. of nitrogen per acre when compared with the 25 lb. rate of application, but the higher rate did produce significantly more protein.

The mixed fertilizers (Np and NPK) containing 25 lbs. of nitrogen per acre produced significantly more grain and stover than did the average of all 25 lb. rates of nitrogen alone. The increased yield was due to the phosphorus added and not to the potassium. No significant difference in per cent protein was obtained for the same comparison.

There were no apparent differences in the ability of the three commercial carriers of nitrogen to increase the yield of grain, stover, and protein content of corn.

Discussion and Summary of Corn Experiments

Average crop performances on three trials conducted during the 1953 season revealed no apparent differences between the nitrogen supplied by the various commercial fertilizer carriers to produce more corn, stover, or protein.

Table 6. Comparative Effectiveness of Nitrogen Carriers and Rates of Nitrogen on Dryland Corn, 1953

Average of Three Experiments

Treatment		Ave. Bus. Per Acre	Ave. Dry Stover lbs./Acre	Ave. Protein in Grain %
Check		24.9	860	7.7
Amm. Sulfate	25	30.0	1230	8.6
Amm. Sulfate	50	29.8	1160	9.3
Amm. Nitrate	25	29.5	1150	9.1
Amm. Nitrate	50	29.1	1130	9.3
Urea	25	28.6	1060	9.0
Urea	50	29.4	1090	9.1

The use of 25 lbs. of nitrogen per acre on the average was equally effective as 50 lbs. of nitrogen in terms of yield and protein.

In all three trials, a significant increase in stover over the check plots was obtained by the use of nitrogen alone or the mixed fertilizers containing nitrogen with phosphorus, and potassium.

A significant increase in the protein content of the grain was obtained in all three experiments. This increase in protein ranged from 1% to 2%. A similar result was recorded in 1952.

Most of the non-irrigated corn in Colorado is grown on sandy soils without benefit of summer fallowing. Most of these soils contain a low level of organic matter. As available nitrogen is largely derived from organic materials, the probability of nitrogen deficiencies occurring in these soils is high. The degree of crop response to nitrogen fertilization will be governed to a large extent by the supply of available moisture throughout the growing season.

EXPERIMENTAL RESULTS - SORGHUM

Blooding Farm (D-37-53), Kiowa County, Moderately Sandy Land, Continuous Sorghum.

This experiment was conducted on a sand-covered loessial sub-soil which contained a moderate supply of moisture at the time of fertilization. Precipitation received from the date of fertilization until harvest was slightly below normal. A 3/4-inch rain in the latter part of July and 3.6 inches of moisture in August helped to produce a good yield of grain (see Table 7).

Table 7. Blooding Farm (D-37-53), Kiowa County. Grain Sorghum Grown on Moderately Sandy Soil.

Treatment	Yield Grain Bushels/Acre	Stover Tons/Acre	Protein in Grain %
Check	30.2	0.93	7.1
A. S. 25	44.5**	1.31**	9.1**
A. S. 50	47.8**	1.27**	10.2**
A. N. 25	40.2**	1.12*	8.4**
A. N. 50	46.9**	1.29**	10.0**
Urea 25	43.0**	1.21**	8.7**
Urea 50	41.9**	1.33**	9.5**
NP	40.7**	1.15*	8.4**
NPK	41.5**	1.23**	7.8
5% L. S. D.	4.5	0.18	0.8

Protein analysis based on 12% moisture in grain
NP = 25 lbs. N, 50 lbs. P_2O_5
NPK = 25 lbs. N, 50 lbs. P_2O_5, 50 lbs. K_2O
(* - Significant at 5% level)(** - Significant at 1% level)

A highly significant increase in yield of grain, stover, and protein was obtained by the use of nitrogen fertilization.

The three different sources of nitrogen increased the yield of sorghum grain, stover, and protein to about the same extent.

Fifty lbs. of nitrogen per acre in the form of ammonium sulfate and ammonium nitrate produced a significantly higher yield and percentage of protein in the grain than did the 25 lb. rate and the same treatment showed a trend toward higher yields. The higher rate of nitrogen from urea did not produce a higher yield of sorghum than did the 25 lb. rate but did increase the protein percentage.

No significant increase in the yield of grain and stover was obtained from the use of phosphorus and potassium along with 25 lbs. of nitrogen per acre when compared with 25 lbs. of nitrogen alone.

Ragsdale Farm (D-38-53), Prowers County. Hard Land, Continuous Sorghum.

A prolonged soil moisture deficiency at this location resulted in a yield failure. Several sorghum heads from each plot were selected for protein analysis. The grain heads were poorly formed and some of the kernels were small. The protein percentage of the grain was high; a 12% average was obtained for all plots. Abnormally high protein grain is frequently formed when plant maturity is delayed because of lack of moisture and abnormal growth.

Neill Farm (D-39-53), Baca County. Moderately Sandy Land, Continuous Sorghum.

The fertility experiment at this location was conducted on forage sorghum grown on a sand-covered loessial soil. Soil moisture at the time of fertilization was critically low. Precipitation received between planting and harvest was less than normal. Examination of the field at harvest time showed that the experimental area as a whole suffered from lack of moisture, particularly the east half of the plots. There was a marked difference in appearance of the sorghum in the west half of the experiment where moisture promoted better growth. On the west half, sorghum growing on the fertilized strips was shorter in height, greener in color, had stalks of greater diameter, and was less mature than sorghum growing on the check plots (no fertilizer). The only plants headed out were on the two no treatment plots on the west half of the experiment.

For the experiment as a whole, there was no significant increase in yield of green or dry stover caused by nitrogen fertilization (see Table 8).

Table 8. Neill Farm (D-39-53), Baca County. Sorghum Grown on Moderately Sandy Soil.

Treatment	Tons Green Forage Acre	Oven-Dry Forage Tons Acre	Protein in Dry Forage %	Protein Pounds Acre
Check	3.00	1.20	5.0	117
A. S. 25 N	3.45	1.37	6.8*	183*
A. S. 50 N	3.55	1.37	8.0**	213**
A. N. 25 N	3.03	1.18	6.9**	162
A. N. 50 N	3.63	1.39	8.1**	220**
Urea 25 N	3.23	1.23	6.4*	153
Urea 50 N	3.63	1.41	7.4**	210**
NP	3.70	1.51	6.1	174*
NPK	3.23	1.27	6.9**	174
5% L. S. D.	N.S.	N.S.	1.4	51

NP = 25 lbs. N, 50 lbs. P_2O_5 per acre
NPK = 25 lbs. N, 50 lbs. P_2O_5, 50 lbs. K_2O per acre
(* - Significant at 5% level)(** - Significant at 1% level)

The quality of forage was improved significantly by nitrogen applications. The average of the 50 lb. rates of nitrogen per acre gave significantly higher protein percentage in the forage than did the average of the 25 lb. rate of application. There was no significant difference in the protein content of forage when mixed fertilizers (NP and NPK containing 25 lbs. of nitrogen per acre) were used than when 25 lbs. of nitrogen was applied alone.

While no significant increase in tonnage was obtained by nitrogen, some indication of the value of fertilization can be observed by the amount of protein per acre produced. An average of 214 lbs., 168 lbs., and 117 lbs. of protein per acre were produced with 50 lbs. of nitrogen, 25 lbs. of nitrogen, and no fertilizer, respectively.

The moisture content of the green forage was consistently at 60% for all treatments even though some of the check plots appeared lighter in color and more mature.

Discussion and Summary of Sorghum Experiments

The 1953 results on sorghums showed that nitrogen derived from ammonium sulfate, ammonium nitrate, and urea were equally effective for increasing the yield and protein of forage and grain on the experiments tested.

Forage and grain higher in protein were obtained when 50 lbs. of nitrogen was used than when the 25 lb. rate was applied.

The use of mixed fertilizers (NP and NPK) containing nitrogen produced no greater yields of protein than did nitrogen alone.

The value of having a reasonable supply of stored soil moisture at planting time cannot be overemphasized. It has been observed on non-irrigated wheat, corn, and sorghum tests that normal or near normal precipitation between planting and harvesting will not consistently produce good yields unless reserve soil moisture is available. The question of whether or not to use nitrogen fertilizers on non-irrigated crops growing on nitrogen deficient soils depends mainly on sufficient moisture. If moisture becomes a greater limiting factor for plant growth than soil fertility, then any maximum benefits likely to be derived from fertilization are greatly reduced. In cases where sorghums and corn are grown continuously, the question of using nitrogen fertilizers may be largely determined by seasonal April, May, and early June precipitation. The more moisture stored during this period, the greater is the chance of obtaining an economic return from fertilization with nitrogen.

APPENDIX

SOIL PROPERTIES

A large portion of non-irrigated corn and sorghum in eastern Colorado is grown continuously on moderately sandy and sandy soils. Numerous soil analyses have shown that these soils are low in organic matter and total nitrogen. Nitrogen deficiency of these lighter textured soils frequently produces a yellowish-green color of the foliage. Continuous cropping with sorghums on heavier soils may show similar phenomena for two reasons. First, continuous cropping tends to deplete the amount of available nitrogen. Secondly, the return of large amounts of crop residues promotes temporary competition between the microbes decomposing plant residues and the growing plant. In any decay process, the nitrogen requirement for increased bacterial activity is high and a shortage of available nitrogen for plant use may occur.

Moderately sandy and sandy soils possess more rapid infiltration and percolation rates for moisture and have a lower moisture-holding capacity than the heavier textured soils. Some lighter soils in eastern Colorado show accumulations of clay below the plow depth which can act as a reservoir for holding larger quantities of water for plant use. These soils appear to make greater utilization of light rainfall than can soils with a heavier textured surface.

A summary of some of the properties of the soil involved in the corn and sorghum experiments is given in table 9.

Table 9. Soil Properties and Soil Moisture Levels

Field No.	Depth Inches	Soil Texture	pH	Lime %	Org. Matter %	Total Nitrogen %	Avail. P_2O_5* lbs. Acre	Moisture in Soil at Fertilization % H_2O	Moisture Equiv. % H_2O
	0-12	Loamy Sand	6.8	0.1	0.62	0.036	70	10.3	6.5
Collins	12-24	Sandy Loam	6.8	0.1	0.60			12.7	11.3
D-34-53	24-36	Sandy Loam	6.7	0.1	0.40			10.7	11.0
	36-48	Sandy Loam	6.8	0.3	0.40			14.3	14.6
	48-60	Sandy Loam	7.6	0.4	Trace			11.3	11.9
	0-12	Loamy Sand	6.7	0.1	0.91	0.042	35	9.8	6.0
Rhoades	12-24	Loamy Sand	6.8	0.1	0.53			10.7	6.5
D-35-53	24-36	Sandy Loam	6.5	0.1	0.43			15.4	15.5
	36-48	Sandy Loam	6.8	0.2	0.26			15.4	13.6
	48-60	Loamy Sand	7.1	0.2	Trace			7.8	6.5
	0-12	Sandy Loam	7.0	0.1	0.85	0.052	50	7.6	11.0
Orcutt	12-24	Loam	7.6	0.9	0.54			11.2	17.1
D-36-53	24-36	Sandy Clay Loam	8.4	3.1	0.40			10.3	16.3
	36-48	Loam	8.6	4.6	0.40			8.8	17.7
	48-60	Sandy Loam	8.6	6.1	Trace			9.8	15.5

* Determined by sodium bicarbonate extraction.

Table 9. (Continued) Soil Properties and Soil Moisture Levels

Field No.	Depth Inches	Soil Texture	pH	Lime %	Org. Matter %	Total Nitrogen %	Avail. P_2O_5* lbs. Acre	Moisture in Soil at Fertilization % H_2O	Moisture Equiv. % H_2O
	0-12	Loamy Sand	7.7	0.1	0.96	0.036	95	8.0	6.0
Blooding	12-24	Loam	7.6	1.1	0.92			16.1	20.1
D-37-53	24-36	Clay Loam	8.5	11.6	0.47			16.4	24.0
	36-48	Clay Loam	8.5	9.6	0.49			14.3	24.8
	48-60	Clay Loam	8.8	8.0	0.37			14.7	24.9
	0-12	Loam	8.3	6.1	1.09	0.064	105	14.8	19.3
Ragsdale	12-24	Silt Loam	9.0	9.7	0.37			9.9	22.0
D-38-53	24-36	Silt Loam	9.3	8.2	0.24			8.4	22.5
	36-48	Silt Loam	8.8	7.4	0.23			9.0	22.5
	48-60	Silt Loam	8.8	8.1	0.21			10.3	22.2
	0-12	Sandy Loam	7.4	6.5	0.91	0.043	100	11.6	6.0
Neill	12-24	Clay Loam	8.2	7.3	0.89			13.2	23.1
D-39-53	24-36	Clay Loam	8.6	9.4	0.64			12.2	28.0
	36-48	Clay Loam	8.7	6.9	0.48			12.3	28.0
	48-60	Clay Loam	8.6	4.8	0.41			12.8	28.0

* Determined by sodium bicarbonate extraction.