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FERTILIZATION OF NATIVE GRASS PASTURE  
on  
ERODED AND BRUSH LAND

at the

Red Plains Conservation Experiment Station  
Guthrie, Oklahoma

Progress Report, 1953

OKLAHOMA AGRICULTURAL EXPERIMENT STATION  
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in cooperation with

UNITED STATES DEPARTMENT OF AGRICULTURE  
Bureau of Plant Industry, Soils,  
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The plan of research on the Red Plains Station was reorganized in 1951 in order to devote almost the entire 350 acres to tests aimed at obtaining information on:

1. Methods of developing and managing pasture on (a) eroded land and (b) virgin land from which brush had been cleared; and
2. The effect of the various methods on soil and water losses and livestock gains.

One aspect of the current work involves the effect of commercial fertilizers on pastures. This publication reports results of some of the fertilizer trials for 1952 and 1953. In addition, it summarizes results from related work done previously. (Some phases of the comprehensive program started in 1951 had been studied since 1939.)

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\*Respectively, Soil Conservationist and Project Supervisor, with headquarters at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma.

WORK PRIOR TO 1951

Table I shows results of a two-year trial in which switch grass and weeping lovegrass on Class III land were fertilized with superphosphate and nitrogen. Hay yields of both grasses were greatly increased, and the seed yield of switch grass was increased about 2-1/2 times. The effect of fertilization on seed yield of the lovegrass was erratic in this particular test; however, at other locations in Oklahoma substantial increases have been obtained, as reported in Okla. Agri. Exp. Sta. Tech. Bul. T-48.

TABLE I. --Effect of Fertilizer\* on Seed and Hay Production of Grass\*\*

(Pounds per Acre)

	<u>Switch</u>		<u>Weeping Love</u>	
	<u>Fertilized</u>	<u>Unfertilized</u>	<u>Fertilized</u>	<u>Unfertilized</u>
	<u>Hay Yields</u>			
Broadcast	3201	1669	4433	3385
21-in. rows	2642	2092	4676	2392
42-in. rows	3780	1939	4012	3314
	<u>Seed Yields</u>			
Broadcast	131	46	27	30
21-in. rows	155	48	36	10
42-in. rows	159	55	52	65

\* Superphosphate 300 pounds per acre applied in 1947; nitrogen 33 pounds per acre applied spring of 1947 and 1948.

\*\* Average of two years results 1947-48. Row plantings were cultivated twice with sweeps during the growing season.

Table II shows animal gains by months, with and without fertilizer, on a native grass pasture on regrassed eroded land. Fertilization did not affect the daily gain of the cattle in May, while the grass was young and nutritious; but it increased the gains by a half pound or more per head daily in July and August, when the grass was approaching maturity. The average gain per acre for the season was more than doubled by the fertilizer treatment.

WORK NOW UNDER WAY

The work on pasture fertilization now under way is located on two different types of land: (1) Abandoned cultivated land which had been returned to grass after becoming badly eroded and gullied (Class VII land); and (2) virgin land from which brush (chiefly scrub oak) had been cleared and a good stand of native grass established.

Table III compares the animal gains from fertilized and unfertilized pastures on these two types of land during the first two years of the current tests. Animal gains are measured by grazing good yearling white face steers during the summer growing season. The steers averaged about 535 pounds when they went on the pastures, during these two seasons. The grazing season was 121 days in 1952 and 130 days in 1953.

The fertilized pastures received an application of 300 pounds of superphosphate (0-20-0) in 1952, using a distributor which splits the sod and places the fertilizer about 4 inches deep in furrows 30 inches apart. The plan is to repeat this application at three-year intervals, making an annual average of 100 pounds of superphosphate per acre. Nitrogen fertilizer is applied on the soil surface annually in the last week of May, at a rate equivalent to 33 pounds of actual nitrogen per acre.

TABLE II. --Beef Cattle Gains from Regrassed Native Grass Pastures on Eroded Land, Fertilized and Unfertilized; Three-year Average, 1947-1949.

(Pounds)

	Daily Gain Per Head				Per Acre Gain for Season
	May	June	July	August	
Fertilized*	3.0	2.7	1.9	1.4	87
Unfertilized	3.0	2.4	1.3	0.9	40
Difference	0.0	0.3	0.6	0.5	47

\* Superphosphate applied at the rate of 300 pounds per acre at three-year intervals. Nitrogen applied annually in early May at rate of 33 pounds of nitrogen per acre.

TABLE III. --Effect of Fertilization on Beef Production from (a) Regrassed Eroded Land and (b) Virgin Land After Removal of Brush; Progress Report, 1952 and 1953.

Pasture No.	Treatment	Grazing Season	Stocking Rate (Acres per animal)	Animal Gain (Pounds)		
				Per Steer		Per Acre for Season
				For Season*	Per day	
<u>Native Grass on Eroded Land</u>						
2	Fertilized**	1952	3.75	316	2.61	85
		1953	3.75	276	2.12	75
		Avg.	3.75	296	2.36	80
3	Unfertilized	1952	5.00	285	2.36	57
		1953	5.00	240	1.85	48
		Avg.	5.00	262	2.10	52
<u>Native Grass on Virgin Cleared Brush Land</u>						
8	Fertilized**	1952	2.50	334	2.76	134
		1953	2.30	304	2.34	132
		Avg.	2.40	319	2.55	133
7	Unfertilized	1952	3.33	321	2.65	96
		1953	3.33	242	1.86	73
		Avg.	3.33	281	2.25	84

\* Grazing period in 1952 was May 1 to August 29 (130 days). In 1953 it started April 24 and ended August 31 (121 days).

\*\* 300 pounds of superphosphate (0-20-0) was applied (1952) in furrows about four inches deep and 30 inches apart, using a distributor which split the sod. This treatment is to be repeated every third year, to provide an average of 100 pounds of 20% superphosphate annually. Nitrogen fertilizer providing 33 pounds of actual nitrogen is applied on the surface annually during the latter part of May.

### Native Grass on Eroded Land

During 1952 and 1953, animal grain per acre in the fertilized pasture on eroded class VII land was more than 1 1/2 times that in the unfertilized.

In a similar comparison made prior to 1952, the seven-year average animal gain on the fertilized pasture was exactly the same as the 1952-53 average in this test -- 80 pounds per acre. On the unfertilized pasture the seven-year average was 42 pounds per acre.

### Native Grass on Virgin Cleared Brush Land

On virgin soil from which brush had been removed, the per acre gain without fertilizer was greater than on the eroded soil where fertilizer was applied -- 84 pounds as compared to 80 pounds. When this virgin land was fertilized, the gains were increased by almost 60 percent -- from 84 to 133 pounds.

In 1953 good fall rains occurred; and, after the grazing season, the grass produced seed. An average of 78 pounds per acre of native grass seed was harvested from the fertilized pastures and only 42 pounds from the unfertilized. This is an increase of about 85 percent. Based on the price received for the cattle and the seed, the gross income in 1953 from the fertilized pasture was \$42.96 per acre, compared to \$23.34 from the unfertilized one.

In earlier work, eroded land was compared with land formerly in brush. Both carried stands of native grasses and neither was fertilized. The average seasonal gain per acre during a ten-year period was 40 pounds on the eroded land and 70 pounds on the virgin land.

### PERFORMANCE OF A KR BLUESTEM - LOVEGRASS MIXTURE WHEN FERTILIZED

The work with a mixture of KR bluestem (Andropogon ischaemum) and weeping lovegrass (Eragrostis curvula) reported in Table IV was started prior to the current series of trials, on 12 acres of formerly cultivated Class VII land which had become badly eroded and was then abandoned. About 1-1/3 acres of the area was badly gullied. In 1947, these gully banks were graded down, leveled, and treated with 200 pounds of superphosphate per acre. Then sweet clover was planted, and an excellent crop was produced in 1947 and 1948. In the spring of 1949, the entire 12 acres was plowed. Superphosphate (0-20-2) at 300 pounds per acre and nitrogen at 33 pounds of actual nitrogen per acre were applied, and the land seeded to KR bluestem. The seed proved to be contaminated with weeping lovegrass, however and as a result the final stand was about one-third lovegrass.

Beginning in 1950, this pasture was grazed annually during the growing season. It was fertilized with 33 pounds of nitrogen per acre in 1950, 200 pounds of 16-20-0 in 1951, 150 pounds in 1952, and 300 pounds in 1953. It has produced an average of 110 pounds of beef per acre during this four-year period. The highest production was 155 pounds per acre in 1952. Through this type of pasture improvement, together with proper management, much of the shallow, poor eroded, unused land can be converted into useful pasture and protected from erosion.

TABLE IV. --Beef Cattle Gains on Mixed KR Bluestem and Weeping Lovegrass\* Stand on Formerly Abandoned Eroded Land, When Fertilized.\*\*

(Pounds)

	Average Weight per Steer		Animal Gain		
	At start of season	At end of season	Per Head		Per Acre
			For Season†	Per day	
1950	634	846	212	2.60	88
1951	506	732	226	2.13	94
1952	226	866	310	2.56	155
1953	605	812	207	1.82	103
Average	575	814	239	2.28	110

\* About two-thirds KR Bluestem and one-third weeping lovegrass.

\*\* The rate per acre applied the last of May was 33 pounds of nitrogen in 1950, 200 pounds of 16-20-0 in 1951, 150 pounds in 1952, and 300 pounds in 1953.

+ Stocking rate, 2 acres per animal.