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RESTORATION OF SOIL PRODUCTIVITY WITH MANURE APPLICATIONS

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A study was initiated in October of 1990 at the Dickinson Research and Extension Center Ranch headquarters on a severely eroded Chama-Golva soil complex with the objectives of (1) evaluating the effectiveness of manure for restoring productivity in eroded soils; (2) evaluating manure quantities required; and (3) evaluating effects of manure on soil physical and chemical characteristics. This study was scheduled to be conducted for a period of 4 years with the option of reapplying the treatments for another 3 years at the end of the third year or to examine only residual effects during the fourth year.

The study consists of 3 treatments and 3 replications in a randomized block paired plot design. Ten T/A manure rates were applied as follows: (1) Treatment 1- manure applied in first year study, only; (2) Treatment 2 - manure applied in first and second years of study; (3) Treatment 3 - manure applied in first, second, and third years of study; and (4) Treatment 0 - untreated control. These treatments were applied for the first treatment cycle ending with the growing season in 1993.

In October 1993, a second treatment cycle was initiated with the same treatments but with the manure rate being increased to 20 T/A. manure applied through fall 1994 is reported in Table 1.

Table 1. Manure application rates 1990 - 1994.

	Year					
Treatment	1990	1991	1992	1993	1994	Total
	T/A					
0	0	0	0	0	0	0

1	10	0	0	20	0	30
2	10	10	0	20	20	60
3	10	10	10	20	20	70

Soil samples are being collected to a depth of 1.2 m where possible, for available water and NO_3-N content each spring and fall. Fertility is also being measured on the surface 15 cm each spring and fall. Bulk soil samples are being collected with a flat bottom shovel to a depth of 5 cm for water stable aggregate and rotary sieve analysis. Soil samples have been analyzed but the data has not been summarized yet.

The crops grown on this site include corn (1991), barley (1992), oat hay (1993) and corn (1994). Extremely dry weather did not allow for good crop growth at this site in 1991. Manure treatments increased Russian thistle growth and reduced the soil water available to the corn crop.

In 1992, barley was grown at this site. Barley yields are shown in Table 2. No significant difference were observed between manure treatments although Treatments 2 and 3 were numerically higher than the control (Treatment 0) and Treatment 1.

Table 2. Barley yields as affected by manure applications - 1992.

Treatment[1]	Yield[2] bu/A
0	28.0a
1	23.5a
2	30.5a
3	28.9a

[1] Treatments 2 and 3 are the same after 2 years of manure application
[2] Values followed by the same letter are not significantly different at P = .05.

Oat hay was grown in 1993 and harvested before yield data could be taken. Visual observations indicate that the

most recently manured plots (Treatments 2 and 3) showed the best growth based on plant color and appearance of foliage production.

The plots were cropped to silage corn in 1994. Yield data are reported in Table 3. Once again the manure treatments increased Russian thistle growth and reduced the soil water availability to the corn crop and this is reflected in the silage yields.

Table 3. Oven-dried corn silage yields as affected by manure applications - 1994

Treatment	Yield[1] T/A
0	0.80ab
1	1.15b
2	0.67ab
3	0.48a

[1]Values followed by the same letter are not significantly different at P = .05.

This study is projected to be continued in 1995 and 1996.

Back to 1994 Research Report Table of Contents
Back to Research Reports
Back to Dickinson Research Extension Center (http://www.ag.ndsu.nodak.edu/dickinso/)
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