and weed competition is always at a minimum. In his cropping program he then sows flax following the crop where the weed competition would be the least.

Early sowing in a firm seed bed is usually preferable for flax.

Rust resistant varieties like Dakota, B-5128 and Victory should have preference in areas where the rust hazard may be most serious. Sheyenne, early ripening, but highly rust resistant, appears suited best to the more southern section of the State. Koto and Royal yield well but are less resistant to rust, therefore, suited to a more limited area.

EFFECT OF ORGANIC AMENDMENTS ON CROP YIELDS AT MANDAN, NORTH DAKOTA

By

R. W. Carpenter[1]

Experiments were started at the Northern Great Plains Field Station in 1914 to determine the **effects of applying barnyard manure and plowing under green manure on crop production.** The area on which studies were established was broken from native sod in 1913.

Three-year triplicate rotations of corn, wheat, and oats and four-year rotations which included summer fallow were used. Manure was applied to a different crop in each replication of the three-year rotations and to the fallow in the four-year rotations. Wet rotted manure was applied at the rate of 20 tons per acre. Sweet clover was seeded with the crop following corn and turned under the second year at time of plowing for summer fallow. Winter rye was seeded in the stubble of the crop following corn and plowed at the same time as sweet clover.

Effect of Soil Treatments on Gain or Loss of Nitrogen and Organic Carbon

Analyses of the total nitrogen and organic carbon in the surface two feet of certain plots were made in 1944 to determine the cumulative effects

Table 1.—Effect of 30 years cropping on total nitrogen and organic carbon of selected rotations, Northern Great Plains Field Station, Mandan, N. Dak.

Crop Sequence and Treatment	Loss or gain as percentage of calculated original value					
	Total Nitrogen			Organic Carbon		
	0-6 inches	6-12 inches	12-24 inches	0-6 inches	6-12 inches	12-24 inches
Corn-Wheat-Oats						
Check	-34	-13	-8	-37	-14	- 9
Manure	0	+10	+6	- 7	+ 9	+6
Corn-Wheat-Fallow-Oats						
Check	-30	-12	-4	-34	-11	- 3
Manure	-7	+ 4	+6	-12	+ 5	+6
Sw. clover gr. manure	-29	- 9	-2	-33	-10	- 3
W. rye gr. manure	-32	-14	-8	-36	-14	-12

[1]Agronomist, Division of Soil Management and Irrigation, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Dept. of Agriculture; in cooperation with the North Dakota Agricultural Experiment Station.

of these treatments on soil fertility. Results were expressed as percentage gain or reduction in nitrogen and carbon. These findings were based on the assumption that the fertility of the plots when started in 1914 was the same as virgin sod today. Results are summarized in table 1.

Results of the analyses indicate that the application of barnyard manure has maintained the total nitrogen and organic carbon and that green manure crops have been of no benefit to the soil.

Effect of Green Manures on Crop Yields

Yield data of these rotations showing the effect of the different treatments on yield have been summarized by 8-year periods. The results are presented in table 2. Plowing under green manure crops has resulted in increased yields in some years, but on the average has not justified the

Table 2.—Comparison of average grain yields of crops grown in rotations with and without soil amendments for the 32 years 1915-47[1], Northern Great Plains Field Station, Mandan, N. Dak.

Crop Sequence and Treatment	Yield (bu. per acre) for years					
	1915-22	1923-30	1931-38	1939-45	1947	1915-47[1]
			Wheat			
Corn-Wheat-Oats						
Check	16.6	17.2	11.2	22.7	17.7	16.8
Manure	17.3	19.3	9.9	28.9	28.5	18.8
Corn-Wheat-Fallow-Oats						
Check	15.5	16.8	10.6	19.0	21.3	15.5
Manure	15.7	20.0	10.5	28.9	32.3	18.9
Sweet clover green manure	14.7	15.9	10.1	21.7	24.5	15.7
Corn-Oats-Fallow-Wheat						
Check	17.6	21.5	13.7	26.8	21.5	19.7
Manure	22.1	21.9	15.4	32.9	32.2	23.0
Sweet clover green manure	15.4	19.4	12.1	31.2	33.2	19.6
			Oats			
Corn-Wheat-Oats						
Check	29.4	29.1	16.9	43.1	43.4	29.6
Manure	31.5	33.2	18.0	52.0	74.1	34.4
Corn-Wheat-Fallow-Oats						
Check	48.1	49.5	26.8	62.6	53.8	46.5
Manure	48.6	53.4	28.7	68.5	90.9	50.5
Sweet clover green manure	32.9	40.5	24.4	58.3	70.6	39.4
Corn-Oats-Fallow-Wheat						
Check	31.9	35.5	20.7	44.5	38.1	33.0
Manure	31.4	37.7	21.3	58.4	68.1	37.5
Sweet clover green manure	32.6	31.5	17.4	47.4	50.9	32.3
			Corn			
Corn-Wheat-Oats						
Check	27.8	31.6	18.2	28.8	28.2	26.6
Manure	25.7	32.7	14.9	29.0	29.8	25.6
Corn-Wheat-Fallow-Oats						
Check	27.2	34.4	20.1	29.1	34.1	27.8
Manure	26.3	35.8	19.2	34.5	34.4	28.9
Sweet clover green manure	26.0	33.7	19.1	31.1	33.7	27.5
Corn-Oats-Fallow-Wheat						
Check	26.8	33.6	17.9	27.1	33.1	26.5
Manure	24.4	36.9	19.0	32.9	30.7	28.2
Sweet clover green manure	25.0	33.6	16.3	29.2	35.0	26.2

[1]1946 data not included as crop destroyed by hail.

extra expense. Winter rye data are not included in the table as results were similar to those obtained from sweet clover. Yields of oats immediately following the green manure crop have been less than the check in nearly all years. In most years, less moisture has been stored by green manure fallow than by ordinary fallow. The average annual amount of air dry material turned under has been 1,356 pounds sweet clover and 1,086 pounds winter rye. These amounts have been too small to result in much benefit to following crops. Possibly crops grown on the green manure rotations have had a higher nutritive value than crops grown in the check rotations, but no analyses have been made to verify this.

Effect of Manure on Crop Yields

Yield response to barnyard manure has been much greater than to green manure. Straw and stover yields in rotations receiving manure were significantly higher than the checks. Corn stover yields were greatest the years immediately following the application of manure. With the exception of corn ear yields the application of manure has resulted in substantial increases in yield the past few years of ample rainfall. Manure has reduced yields in some years of low rainfall resulting in lower average yields on manured plots. On the average, the return from manure has been worthwhile and by maintaining the fertility, gives promise of greater returns in the future over rotations receiving no amendment.

THE LAND MARKET IN NORTH DAKOTA APRIL TO SEPTEMBER, 1947 [1]

By
C. E. Stewart[2] and R. Engelking[3]

Summary

Sale prices of land from April to September 1947 were higher than those in any of the six years preceding 1947, though they were lower than in the first quarter of 1947. Volume of sales was down, equaling the low years since 1941. Relatively more of the sales were for cash than in 1946. Buyers equity in credit transactions remained about the same. Nonfarmer individuals were the chief sellers, and owner-operators bought more than two-thirds of the tracts. Resales comprised about the same proportion of all sales as in the first quarter of the year.

Sale Prices

Land sale prices continued high in the four sample counties during the summer and fall of 1947 (table 1), with an index of 208[4] for the second quarter and 219 for the third quarter. Although they were not quite so high as in the first quarter of the year, prices of land during 1947 have been greater than for any period in the preceding 6 years. In Morton and Stutsman Counties prices of land increased during the year, but the indexes in Traill and Ward Counties decreased with each succeeding quarter. The increases for Morton and Stutsman were for tracts with smaller proportions of cultivated land, whereas the cultivated tracts tended to decrease in price; in Ward County the opposite occurred. The uncultivated acreage was relatively large enough in these three counties to determine the price trend.

[1]Progress report in Purnell Project 108, North Dakota Agr. Expt. Sta. in cooperation with the Bureau of Agricultural Economics, USDA, based on voluntary transfers in Morton, Stutsman, Traill, and Ward Counties, including county and State Contracts for deed. Data were summarized on a quarterly basis and appear as such in the tables, but much of the narrative is written in terms of the semi-annual period, April to September, inclusive.

[2]Agricultural Economist—Bureau of Agricultural Economics, U. S. Department of Agriculture.

[3]Statistical Clerk, North Dakota Agricultural Experiment Station.

[4]Preliminary geometric mean in which each county has equal weight. Counties sales are excluded from price calculations.