

FERTILITY PROBLEMS AT A FOREST NURSERY

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This paper reports on the second part of experimental work on green manures and organic matter maintenance done by the British Columbia Forest Service near Cranbrook, B. C. The results of the first part of the experiment appeared in the February 1956 issue of *Tree Planters' Notes* (2), which also included a general description of the nursery.

During the 3-year period 1953-55, nineteen green manure experimental plots were initiated. Crops of barley, millet, and Sudan grass have been given duplicate trials in different years. Rye has been tried in each of the three years. Rape, crimson clover, oats, vetch and sweet clover have been tested once. Mixtures of sweet clover and millet and of Altaswede clover and rye have been tried once. Ammonium sulphate and ammonium phosphate were applied to barley and rye on one occasion.

Vegetation Analysis

In 1954, clover, millet, oats, rye, Sudan grass, and vetch were sown to six 0.23-acre plots. The crops were sown on May 31 and sampled while the plants were in flower.

In 1955, the following crops were sown to five 0.21-acre plots: rye, rye fertilized, barley, barley fertilized, sweet clover, and sweet clover plus millet. Each of the fertilized plots were divided into two halves and 800 pounds per acre of ammonium sulphate were applied to one-half, and 800 pounds per acre of ammonium phosphate applied to the other half. The crops were sown May 14 and sampled while in flower.

For the dry weight determinations, the entire plants were sampled. Two 2-x2-foot samples from each half of the fertilizer plots and four 2-x2-foot samples from the remainder were obtained. The samples were oven-dried for 48 hours at 75° C and the results appear in tables 1 and 2.

Of the annuals, millet produced the most dry weight of plant material, 2-year average of 3.64 tons per acre. Sudan grass and rye were the next highest producers, 2.76 and 2.71 tons per acre, respectively. Sweet clover was the only biennial tried, and it produced 4.57 tons per acre of dried plant material while growing for 2 years.

Soil Analysis

The soils were randomly sampled in May 1954 before the green manure crops were sown, and again in September 1955 after the crops had been ploughed in and left a year for decomposition.

TABLE 1.--Rate of seeding and dry matter produced for 1954

Crop	Rate of seeding per acre	Dry matter produced per acre
	<i>Pounds</i>	<i>Pounds</i>
Clover (crimson).....	15	4,025
Millet (Siberian).....	25	6,605
Oats (Victory).....	150	4,000
Rye (spring).....	100	5,530
Sudan grass.....	25	5,940
Vetch (spring).....	60	3,755

TABLE 2.--Rate of seeding, fertilizer applied, and dry matter produced for 1955

Crop and fertilizer	Rate sown per acre	Dry matter produced per acre
	<i>Pounds</i>	<i>Pounds</i>
Rye (spring).....	100	5,360
Rye + ammonium sulphate.....	100 + 800	4,610
Rye + ammonium phosphate.....	100 + 800	4,090
Barley (Vantage).....	100	5,465
Barley + ammonium phosphate.....	100 + 800	6,290
Sweet clover + millet (Siberian)	7.5 + 25	3,595
Sweet clover.....	15	¹ 9,135

¹ Biennial, therefore dry matter for two growing seasons.

Total nitrogen was analyzed according to the methods of the Association of Official Agricultural Chemists (1), while the organic matter determinations were a slight modification of Schollenberger's (5). Eight determinations of the percent of organic matter in the soil were taken and averaged (table 3). The total nitrogen figures (table 4) were based on an average of five determinations.

During the summer of 1955, one-half the experimental area that had grown rye, Sudan grass, and vetch was given an application of barnyard manure at a rate of 8 to 10 tons per acre.

The erratic results of the fertilizer trials, as shown in table 2, indicate further experimental work is required on the kind and amount of fertilizer to use and the time of its application.

The results of the soil analysis show that green manure crops alone cannot be expected to increase soil organic matter. Similar results have been reported (3, 4, 6). Therefore, green manure will have to be supplemented by other forms of organic matter in order to raise the organic matter content of the soil. The small increase in organic matter due to the application of barnyard manure shows that building up soil organic matter is a slow process.

The low total nitrogen in the soil indicates that additions of nitrogen are an immediate necessity. Generally there was little increase in soil nitrogen due to green manures or barnyard manure treatments. The clover plot showed a slight decrease, which is in keeping with the organic matter loss of this plot.

TABLE 3.--Organic matter in soils sampled in May 1954 before crops were sown, and in September 1955 after ploughing in and a year of decomposition

Crop	Organic matter in the soil		
	May 1954	September 1955	Change
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Oats (Victory).....	1.116	1.009	-0.107
Millet (Siberian).....	1.276	1.102	-0.174
Clover (crimson).....	1.021	.779	-0.242
Rye (spring).....	¹ 1.452	1.649	+0.197
Sudan grass.....	¹ 1.447	1.608	+0.161
Vetch (spring).....	¹ 1.464	1.498	+0.034

¹ Received application of barnyard manure.

TABLE 4.--Total nitrogen in soils sampled in May 1954 before crops were sown, and in September 1955 after ploughing in and a year of decomposition

Crop	Total Nitrogen in soil		
	May 1954	September 1955	Change
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Oats (Victory).....	0.044	0.049	+0.005
Millet (Siberian).....	.040	.041	+.001
Clover (erimson).....	.035	.034	-.001
Rye (spring).....	¹ .053	.056	+.003
Sudan grass.....	¹ .045	.058	+.013
Vetch (spring).....	¹ .048	.055	+.007

¹ Received application of barnyard manure.

References

- (1) Association Official Agricultural Chemists. 1950. Methods of analysis of the Association of Official Agricultural Chemists. Ed. 7. Washington 4, D. C.
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