GROWING GREEN MANURE CROPS AT A FOREST NURSERY

H. Knight

Research Division, British Columbia Forest Service
Victoria, British Columbia

In 1950 the British Columbia Forest Service established a nursery near Cranbrook, B . C . , in the southeastern part of the province (el. 3013). This region is semi-arid. The annual precipitation averages about 15 inches. The climatic data is shown in Table 1.

Table 1.*--44 year average monthly temperature and precipitation, and monthly extremes of temperature of 1953.

Months	J	F	M	A	M	J	J	A	S	O	N	D
	Temperature — degrees F.											
	16	21	32	43	51	58	63	62	52	42	29	20
	Extremes of Temperature for 1953 — degrees F.											
Max.	50	50	60	64	81	76	100	92	84	73	52	42
Min.	1	0	-5	15	25	34	35	39	25	21	13	5
TOTAL	Precipitation — inches											
14.57	1.48	1.14	.85	.68	1.24	1.92	1.09	1.02	1.11	1.03	1.34	1.67

*Climate of British Columbia, Report for 1953. British Columbia Department of Agriculture, Victoria, B.C.

The soil of the nursery area is alluvial in origin and is derived from limestones of the Rocky Mountains, and from acidic argillites and quartzite of the Selkirk Range. It is a typical, young alluvial soil that shows little or no profile development. The soil characteristics are determined primarily by the chemical composition, texture,. and climate, and to a lesser extent vegetation. The soil pH varies from 6.2 to 7.2 near the surface to over 9.0 in some sub-soil horizons. The organic matter content is low.

No information was available on suitable green manure crops for this region, and as organic matter maintenance is very important, trials were initiated in 1953 to determine a suitable crop.

EXPERIMENTAL

(a) Vegetation Analysis

On May 21, 1953, barley, millet, rape, rye, and Sudan grass were sown each to a 0. 34 acre plot. All crops except barley received 3.2 inches of water by means of a sprinkler system, barley re-

ceived only 2.4 inches as it was the first to be ploughed in. For the dry weight determination the entire plant was sampled from four, 2 feet by 2 feet areas of each plot, while the crop was still in flower. The samples were oven dried for 48 hours at 75° C to obtain the dry matter per acre and the dry weight top to root ratio. The results appear in Table 2.

(b) Soil Analysis

Table 2.--Rate of seeding, date of sampling and ploughing in of each crop, its dry weight per acre and top to root ratio.

Crop	Rate of seeding lbs/acre	Date of sampling and ploughing-in	Dry Wt. lbs/acre	Top-root ratio dry weight
Barley	100	July 14	4190	11.9
Millet	25	August 28	7950	9.2
Rape	24	" "	5990	3.5
Rye	100	" "	5310	4.3
Sudan Grass	25	" 10	5110	4.7

In order to obtain information about time in relation to decomposition of the green manure crops, each crop area was divided into two parts. Soil samples were taken from Part I or two-thirds of each plot in May, 1953 before the crops were sown and again in May 1954, 9-10 months after the crops were ploughed-in. Soil samples were taken from Part II or the remaining third of each plot in May 1953 and again in September 1954, 14-15 months after the crops were ploughed-in. The "before" and "after" in Table 3 refer to results of the analysis of soils sampled at these times. The "change" in each part gives the change in percent organic matter, and pH for the 9-10 month and 14-15 month periods. The soil analysis is based on an average of eleven composite samples for each crop area in Part I and 5 composite samples for each crop area in Part II.

Table 3.--Results of organic matter and pH determinations of soils from each crop area.

Crop	PART I					
	Percent Organic Matter			pH		
	Before	After	Change	Before	After	Change
			in 9-10 months			in 9-10 months
Barley	1.57	1.46	-0.11	7.1	7.5	+0.4
Millet	1.53	1.45	-0.08	7.3	7.7	+0.4
Rape	1.44	1.10	-0.34	7.0	7.0	0.0
Rye	1.38	1.28	-0.10	6.8	6.6	-0.2
Sudan Grass	1.12	1.07	-0.05	7.2	7.6	+0.4

Soil profile from nursery area showing little organic material or profile development. The surface 2 to 3 feet are very fine sandy loam underlain by coarse sand and gravel. These thicknesses and textures vary throughout the nursery. The shovel is four feet high.

Table 3.--(Cont.)

			PART II			
			in 14-15 months			in 14-15 months
Barley	2.25	1.70	-0.55	6.9	7.1	+0.2
Millet	2.46	2.32	-0.14	7.3	7.8	+0.5
Rape	1.42	1.88	+0.46	7.7	7.7	0.0
Rye	2.16	2.03	-0.13	7.2	7.3	+0.1
Sudan Grass	1.93	1.96	+0.03	7.0	7.0	0.0

DISCUSSION

The results show that millet was outstanding in adding dry matter to the soil, followed by rape, rye, Sudan grass, and barley. However, the barley was ploughed-in six weeks, and Sudan grass 18 days before the top three. These two crops had matured the earliest and had to be ploughed-in so that they would not create a weed problem the following year.

During the 9-10 month period a small reduction in organic matter is general. The 14-15 month period indicates some additions of organic matter. The large decrease in the barley plot might indicate that this crop was decomposing more rapidly than the rest, and had reached a more advanced stage of decomposition.

The top to root ratio indicated barley and millet consisted mostly of foliage, while rape, rye, and Sudan grass produced much more root growth.

It is doubtful if there is any practical change in pH that can be attributed to the green manure crops.

The reader is reminded that all analyses represents one season's results, and that the findings of other trials now in progress are necessary before reliable conclusions can be made.