

GREEN MANURE CROP CAUSES SEEDLING MORTALITY

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During the past three summers, green manure crops have been grown on most of the available area in the Mason State Tree Nursery located in Central Illinois. The green manure crop consisted of cowpeas or soybeans and sudan grass. This crop was plowed under before it matured seed. This practice was suggested by soils men as a step toward maintaining the soil in an intensively cropped nursery area. The soil is sandy, low in pH, nitrogen, and organic matter. In some cases, red and white pine were seeded following this cover crop. This was done with some misgivings due to published warnings that similar practices had sometimes resulted in seedling mortality. This information seemed to be a little too general and vague to apply to all situations, in view of the fact that the soil needed improvement, and the area was needed for seedling production.

The following table shows the history of 16 adjoining seedbeds over a 7-year period. All beds were in continuous northern conifer seedling production during the 7-year period, except beds nos. 5 through 12 which grew a green manure crop of cowpeas and sudan grass in 1949. The green manure crop was plowed under while green. In the spring of 1950, all 16 beds were prepared and seeded in the same manner on the same day with the same lot of seed. An 8-row seed

drill was used. The soil in beds nos. 5 and 12 was in better condition than the others, which were somewhat cloddy due to the lifting of 2-0 Jack pine that spring. The table shows the inventory of 2-0 red pine in these beds during the summer of 1951. It will be seen that the 8 beds which had been in continuous tree seedling production for at least 7 years produced 293, 000 seedlings, whereas the 8 beds which had a green manure crop in 1949 produced only 106, 000 seedlings.

It appears that the cowpea-sudan grass green manure crop resulted in a 64% reduction in the production of red pine seedlings through damping-off losses in 1950. It would require 2.76 times as much nursery area and cost to grow red pine seedlings under the latter conditions.

Bed No.	Inventory 1951	Total Green Manured Area	Total Continuous Seedling Area
1	33,840)		
2	35,820)	--	142,020
3	36,360)		
4	36,000)		
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5	23,040)		
6	10,800)		
7	3,240)		
8	15,840)	106,380	--
9	16,380)		
10	7,380)		
11	13,860)		
12	15,840)		
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13	32,760)		
14	37,620)	--	151,020
15	32,940)		
16	47,700)		
		<u>106,380</u>	<u>293,040</u>

The above is the best example, for which data are available, of a situation which has occurred in all cases where similar conditions existed during the last 2 years.

The nursery soil variation and production schedule make a cover crop, transplant, seedling rotation impossible. Some of the nursery area shows signs of fatigue from repeated cropping. Soil fumigation is a costly, but thus far a very effective, method of overcoming the effect of green manure on the subsequent seedling crop. Removal of the green manure crop from the seedbed area seems to be a fairly effective method of preventing seedling mortality. Present policy has been to shift from the use of green organic matter to brown organic matter, and to commercial fertilizers for nutrients on seedbed areas. Green manure crops will continue to be grown on transplant and hardwood areas in the nursery. Enlargement of the nursery may reduce the intensity of cropping and permit a longer rotation, and the growing of organic matter.

There are a number of questions which should be answered through research:

(1) What is the effect of various green manure crops on the production of various species of trees?

(2) What are the relationships between green manure crops, soil organisms, and tree seedlings ?

(3) By what means, if any, other than the use of green manure crops or large quantities of peat, can a nursery soil be maintained under intensive use?