

## FINAL REPORT FNE04-507

PROJECT TITLE: "USING RAMIAL WOOD CHIPS TO IMPROVE FERTILITY IN A FRUIT TREE NURSERY"

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PROJECT GOALS: To determine if soil fertility can be improved by applying ramial wood chips. Ramial wood chips are produced by chipping deciduous trees and the branches of deciduous trees that are less than 7 cm in diameter. Ramial wood chips will be referred to as RWC for the writing of this report.

FARM INFORMATION: The farm where the research is taking place is located in Northern Maine. With a mixed stand woodlot and 20 acres of cleared fields, the farm was out of production for 40 years. The farm, now, produces a diversity of greenhouse seedlings, perennial plants and ornamentals, vegetables and nursery trees (apple and pear trees, mostly). The nursery bed is in an area where the soil is sandy loam with low organic matter and low fertility. Soil improvement has been the greatest challenge for raising nursery stock. With the availability of wood chips on the farm, the use of RWC could be a very sustainable solution to soil fertility problems.

COOPERATORS: The research advisor, Renae Moran, has helped with the acquisition of scion wood from the University of Maine, experimental orchard. There have been telephone contacts and advice on how to gather data and report results. Bruce Hoskins, Assistant Scientist of Plant, Soil and Environmental Sciences at the University of Maine, offered information about the soil samples and the testing methods.

PROJECT ACTIVITIES: In the spring of 2004, soil samples were taken in the area being used for the research. Necessary amendments were added to meet the recommendations that were given by the University of Maine Soil Testing Lab. In the fall of 2004, Alder and Poplar saplings not exceeding 7 cm in diameter were harvested from an abandoned gravel pit on the farm. With a rented chipper, several cubic yards of wood chips were produced. The RWC were spread 2 inches thick in the experimental area, excluding the control area. With a PTO driven tiller behind a tractor, the RWC were incorporated into the soil 4-5 inches deep. Surplus RWC were piled for use in the spring.

In March of 2005, 250 dormant "Antanovka" apple rootstocks were delivered to the farm for grafting. Scion wood for Cortland (variety #1) and MacIntosh (variety #2) was obtained from the University of Maine Experimental Orchard in Monmouth, Maine. During March, the grafting of scion wood to rootstocks was completed and the resulting trees were held in cold storage until the time that conditions were suitable for outdoor planting.

During the last week in April 2005, dormant nursery trees were moved from the cold storage to the prepared area. Treatments were replicated for the two varieties as follows:

Variety #1

Treatment 1: 25 trees planted 1 foot apart with bloodmeal sidedressing.

Treatment 2: 25 trees planted 1 foot apart with bloodmeal sidedressing and 2 inches of RWC mulched around the base of each tree.

Treatment 3: 25 trees planted 1 foot apart with no bloodmeal and 2 inches of ramial wood chips around the base of each tree.

Treatment 4: 25 trees planted 1 foot apart as a control area. ( This area received no RWC in the fall or spring) . These trees were, however, sidedressed with bloodmeal. (the reason that bloodmeal is used is that the RWC may actually draw nitrogen from the soil as they begin to break down and there may be a drain on soil nitrogen and young trees can not tolerate such a loss.)

The treatments were repeated for variety #2.

JUNE-SEPTEMBER 2005: No additional amendments were added to the soil in the treatment area. Trees were monitored for good graft unions and insect problems that may affect the results. Some graft unions were not successful and, therefore the number of trees in any given treatment area is not always 25 as planned.

SEPTEMBER 2005: Soil samples were taken from each treatment for testing. These results are given in Table #2.

Shoot growth was measured for all the treatments. Average shoot growth for each treatment is given in Table #1.

SPRING 2006: For each variety, treatments were repeated as in the previous spring.

JUNE 2006: Weeds were removed by hand. Trees were monitored for insect problems and winter damage.

JULY 2006: Leaf tissue analysis was done on leaves from each treatment. The results are in Table #3.

SEPTEMBER 2006: Shoot measurements were completed. (table #1)

Stem circumference measurements were taken from a point 9 inches above the graft union ( see table #1)

Soil samples were taken and sent for analysis. (See table #2)

**TABLE 1**

Table 1. GROWTH OF TREES 2005-2006.

Treatment	McIntosh		Cortland	
	Tree height (in.)	Trunk circumference (in.)	Tree height (in.)	Trunk circumference (in.)
Control	21.3	1.6	23.3	1.6
Wood chips + blood meal	18.6	1.4	22.1	1.6
Wood chips + mulch	24.3	2.2	26.0	1.5
Wood chips + mulch + blood meal	27.3	1.6	28.8	1.9

As shown in treatments 2 and 3, shoot growth was greater in the mulched treatments. Within the mulched treatments, shoot growth was greater where bloodmeal was used as a sidedressing. Growth as measured in circumference does not reflect the same results.

The values recorded in Table #2 were calculated by taking the increase/decrease in soil components from 2005 to 2006 for each treatment and each variety. I averaged the treatment values for the two varieties.

Table 2. Change in soil characteristics and fertility from 2005-2006 with soil amendments.

Treatment	Δ lbs. per acre						
	P	K	Mg	Ca	CEC	Organic matter	pH
Control	128	68	21	772	0.75	0.0	0.05
Wood chips + blood meal	19	62	19	226	1.3	0.05	0.05
Wood chips + mulch	42	78	36	150	2.5	0.3	-.10
Wood chips + mulch + blood meal	61	77	52	45	1.2	0.2	-0.2

As shown in Table 2, the organic matter increased where RWC were used as a mulch. The Cation Exchange Capacity also increased. pH values went down where the RWC were used as a mulch.

TABLE # 3

RESULTS FROM LEAF TISSUE ANALYSIS

TREATMENT	N	Ca	K	MG	P	AL	B	CU	FE	MN	ZN
(Cortland)											
Control	2.5	1.0	1.2	.35	.24	59	18	7	65	50	16
RWC+bloodmeal	2.2	1.0	1.6	.26	.25	68	23	7	86	44	16
RWC+mulch	2.5	.85	1.9	.27	.30	80	20	8	80	44	16
RWC + bloodmeal+mulch	2.5	.93	1.9	.24	.31	64	25	8	76	47	16
(MacIntosh)											
Control	2.5	1.0	1.9	.25	.30	36	21	6	53	53	14
RWC + bloodmeal	2.6	1.0	1.7	.28	.26	40	20	8	81	37	14
RWC + mulch	2.5	1.0	1.7	.30	.23	48	18	6	64	56	13
RWC + mulch + bloodmeal	2.5	1.0	1.7	.30	.23	48	18	6	64	56	13

There was not enough variation in the leaf tissue analysis from different treatments to reflect the results of using RWC.

RESULTS: From the data collected, it is apparent that the RWC have a greater effect on the soil structure than the soil fertility over two years. It may be that two years is not enough time to see significant changes in the soil fertility. The control area where no ramial wood chips were applied showed an increase in nutrients that may have occurred because the amendments (manure, straw and compost) that I used to treat the plot in the spring of 2004 were breaking down and becoming available.

ASSESSMENT: Growth of trees was greatest in the treatments where RWC were used as a mulch. The fact that the treatments where RWC were mulched have increased in the percentage of organic matter is most encouraging. This sandy loam has been extremely low in organic matter and cover cropping, adding manure and compost have not changed the organic matter as much as two years of RWC applications have changed the percentage of organic matter. Lime will have to be applied where the RWC is used as a mulch, because the application tends to lower the pH of the soil. The most labor intensive part of this research was cutting and chipping the alders and poplar trees. This may not be practical on a large scale. Further research would involve looking at the application of RWC over a longer period of time. A combination of using RWC, cover crops and compost is a possibility.

OUTREACH: As of this date, I have not done the outreach on this project. I plan to submit an article to the Maine Organic Farmer News and I am going to open the farm to visitors on Open Farm Day, July 22<sup>nd</sup>, to discuss the project and the results.

SUMMARY: The purpose of this project was to determine if the use of RWC could make a difference in fertility and soil structure in a nursery bed. In the nursery bed, there were 4 treatments set up for two varieties of apple trees. In one treatment, no RWC was used (control) In the other 3 treatments, RWC were tilled into the soil, mulched over the roots of the trees and mulched with the addition of bloodmeal. The practice of spreading and mulching with RWC will definitely continue on the farm. The most encouraging gain to using RWC is the increase in organic matter. Soil testing will be done annually to check pH levels, soil fertility and percentage of organic matter in the areas where the RWC are used. Results from these tests, will further the knowledge of the effectiveness of using RWC to improve the sandy loam in the nursery area.

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