

An Assessment of Carbon Sequestration Benefits from Mikro-Tek's Mycorrhizal Inoculation Project

Prepared for

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Confidential

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Executive Summary

Since 1996, Mikro-Tek has undertaken field trials of different species of saplings inoculated with mycorrhiza. The collar diameter and height of the saplings and, in some cases, the dry mass were measured. These measurements show that mycorrhizal inoculation increases the conical volume and mass of saplings over control saplings. In this paper, we estimate the potential reductions in greenhouse gases that may result from Mikro-Tek's technology. This is achieved in a three step process. Firstly, we estimate the acceleration in growth that results from mycorrhizal inoculation. Then, we model the affects the acceleration has on stands. Finally, we extrapolate the affects from stands to forests.

To estimate the acceleration in growth, we convert the measured average conical volume to mass using relationships derived from the limited mass measurements. From these, we estimate the acceleration by comparing modelled growth curves using a young age approximation. Finally, we make a correction for the increased survival rate that inoculated saplings also show. At this time, all trials have been included. They are summarized in Table 1.

Table 1: Average Growth Acceleration and Survival Rates with Inoculation

Species	Growth Acceleration	Increased Survival	Combined Growth & Survival
Jack Pine	8.7%	2.0%	10.0%
Black Spruce	4.8%	2.6%	8.3%
White Spruce	8.6%	2.9%	15.8%

In the second step, we take the combined growth and survival acceleration and model the net sequestration and emissions from an inoculated stand as compared to a control stand. The estimates are made using a proprietary version of GORCAM, a published algorithm for modelling the flow of carbon and emissions from forestry projects. Table 2 summarizes the results from modelling. Inoculation would not change the rotation length on Jack Pine and Black Spruce sites. The changes in emissions that result from inoculation are simple to calculate. An inoculated White Spruce stand would have a different rotation period than a control stand. As a result, the net emissions varies with time.

Table 2: Modelled Net Emissions over a Rotation from Inoculated Stands

Species	Biomass (t CO ₂ e/ha)	Non-biomass (t CO ₂ e/ha)	Total (t CO ₂ e/ha)	Rotation (years)	Annual Average (t CO ₂ e/ha/yr)
Jack Pine	-20.0	0.7	-19.3	45	-0.44
Black Spruce	-21.8	0.6	-21.2	90	-0.24
White Spruce	-28.2	0.8	-27.4	95	-0.29

Finally, we model the affects that inoculation of saplings will have on a forest. In general, inoculation increases fibre production and could result in a decrease in harvesting away from the inoculated sites. Including these activities reduces net emissions further (Table 3).

Table 3: Modelled Net Emissions over a Rotation from Inoculated Forests

Species	Biomass (t CO ₂ e/ha)	Non-biomass (t CO ₂ e/ha)	Total (t CO ₂ e/ha)	Rotation (years)	Annual Average (t CO ₂ e/ha/yr)
Jack Pine	-23.5	0.0	-23.5	45	-0.52
Black Spruce	-24.7	0.0	-24.7	90	-0.27
White Spruce	-31.7	0.0	-31.8	85	-0.33