

ORGANIC LOW-TILL RESEARCH IN PRAIRIE CANADA

Interim Research Report W2008-47

INTRODUCTION

Soil conservation presents a unique challenge when farming organically. Even though only 6% of organically-managed land in Manitoba is summerfallowed, more tillage is used in organic compared with conventional crop production. Low-till weed control systems such as noble blades or rod weeders typically do not work as well in Manitoba compared with southern SK and AB where soil conditions tend to be dryer. Rolling and mowing are techniques that may have potential in Manitoba.

Most Manitoba organic farmers do not raise cattle and hence do not have perennial forages in their crop rotations. Instead, green manure crops are used to supply N to the soil and to facilitate weed control. Killing green manure crops with tillage causes the biologically-fixed N to be released and creates potential for N loss. Tillage also increases the risk of soil erosion.

Alternatives to disc and sweep tillage are required for organic farmers in Manitoba. Knowledge of rolling and mowing for vegetation control and residue management will benefit both conventional and organic farmers.

OBJECTIVES

- To evaluate rolling as an alternative to sweep or disc tillage for weed control in organic cropping systems.
- To evaluate rolling as a complementary tillage tool in organic cropping.
- To evaluate rolling, mowing and tillage (and combinations) on the N dynamics from various green manure crops.
- To compare rolling with disc and sweep tillage for termination of various green manure crops.
- To evaluate mowing as a complementary tool for termination of various green manure crops.



Crop roller: this research-scale blade roller was used to terminate an oat-pea green manure in 2006

WHAT WAS DONE

A rolling experiment was established at Carman, MB in 2006. An oat/pea green manure crop was planted in the spring of 2006, and crop termination treatments included:

- 1) rolling only (no-till organic)
- 2) discing only

In 2007, wheat was grown across all plots. Researchers measured green manure crop growth (year one) and wheat yield and N uptake into the wheat crop (year two). Another replication of this experiment was begun in 2007.

Additional experiments (established in 2007) will test different combinations of rolling and discing in an effort to ensure soil conservation while increasing N release from the green manure crop.

These trials will assess soil nitrate, soil and crop N dynamics in a subsequent wheat crop, and soil moisture levels in each of the different rolling/discing combinations.

PRELIMINARY RESULTS

The roller successfully terminated the oat-pea cover crop in 2006. Pea and oat stems were “crimped” by the blades approximately every 20 cm, and the crop showed signs of wilting within about 15 minutes of rolling. One week later, the rolled oat/pea crop was predominantly dead, although later in summer there was some pea regrowth. Total above-ground dry matter production for the oat/pea green manure crop in 2006 averaged 4348 kg ha⁻¹ and the N content was 2.21%.

The effect of rolling or tilling on N dynamics was assessed by measuring N uptake into the spring wheat crop grown the year after green manure termination. Results indicate that tillage produced the highest yield and highest N uptake. Rolling resulted in 20% less N uptake into the wheat crop. This observation suggests that rolling may slow the rate of N release from green manure to the following crop. However, the rolled plots had excellent soil cover during the winter and early spring period, and would be less susceptible to erosion. These plots will be monitored again in 2008, when an oat crop will be sown onto the area and N uptake will again be measured.

Table 1. 2007 Wheat yield, dry matter and grain N uptake between different termination treatments

	Wheat yield	Wheat dry matter	N uptake into wheat seed
	------(kg ha ⁻¹)-----		
Tilled	2625	6951	97
Rolled	2225	6467	80

THE BOTTOM LINE...

The crop roller is an effective way to terminate (kill) green manure crops. Rolling may slow the rate of nitrogen release from a green manure to the following crop, but the increased cover in winter would reduce the risk of erosion and help conserve soil on organic farms. The roller provided a practical alternative to non-selective herbicides, and offers an opportunity for organic farmers to reduce tillage intensity in their cropping systems.

ADDITIONAL RESOURCES

Video of the University of Manitoba’s crop roller in action:

<http://umanitoba.ca/outreach/naturalagriculture/video/roller.html>

Rodale Institute plans for building a crop roller

http://www.rodaleinstitute.org/notill_plans

CREDITS

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