



## PREVENTING NUTRIENT DEFICIENCIES ON PRAIRIE ORGANIC FARMS

Introductory Research Report W2008-49

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### BACKGROUND

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The interest and demand for organically-grown food and fiber products are increasing in Canada and internationally. In organic farming, inorganic fertilizers are not used to increase crop production; producers rely on cover cropping and allowable organic inputs to maintain soil fertility. Adequate amounts of nutrients are essential for sustainable crop production, and nutrient limitations may result in substantial yield reductions.

In the Prairie Provinces, most soils are deficient in available nitrogen (N) for optimum yield. There are many soils low in available phosphorus (P), and some soils contain insufficient amounts of sulfur (S) and potassium (K) for high crop yields. The N deficiency in soil on organic farms can be corrected by growing N-fixing legume crops in the rotations. However, if soils are deficient in available P, K or S, the only alternative is to use external sources to correct the deficiencies. Manure can provide these nutrients, but usually there is not enough manure to apply on all farm fields, particularly in remote areas because of the cost of transporting manure over long distances. On such soils, rock phosphate fertilizer, gypsum, elemental S fertilizer or wood ash as a source of P, S or K can be used to correct nutrient deficiencies. Wood ash, a waste product of industry, contains about 1% P<sub>2</sub>O<sub>5</sub>, 5% K<sub>2</sub>O, 1% S, and lots of Ca and Mg. Another option would be the use of mycorrhizal inoculants, which can make nutrients such as P more available from organic sources. More research is needed on the feasibility of these products in preventing nutrient deficiencies in organic farming under prairie soil-climatic conditions.

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### RESEARCH APPROACH

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Three different experiments have been proposed to test the use of different soil amendments to increase soil and crop nutrient levels. Experiment 1 will determine if the availability of P from rock phosphate can be increased with the use of *Penicillium bilaiae* (as Jumpstart™, a mycorrhizal inoculant that is applied to the seed). This four year trial (begun in 2006) will compare one-time additions of rock phosphate at different rates (50 – 200 kg P ha<sup>-1</sup>) with annual additions of rock P at lower rates (10 – 40 kg P ha<sup>-1</sup>). Each of these will be tested with untreated seed and with seed treated with *P. bilaiae* (Jumpstart™). These

will all be compared to conventional P fertilizer (TSP). Grain and straw yields will be recorded, and P levels will be measured in soil, grain and straw.

The second experiment will assess the capability of different amendments in preventing P deficiency in organic crops. On a site with low soil P (Naicam), comparisons will be made between wood ash, compost, alfalfa pellets, and granular and finely-ground rock phosphate. Amendments will be applied at several rates, based on the P need of the crop.

Experiment three will try to prevent S deficiency in crops with the use of different organic amendments. On a site that is deficient in S (Star City), comparisons will be made between compost, wood ash, gypsum, and alfalfa pellets. Amendments will be applied at several rates based on the S need of the crop. For both experiments 2 and 3, grain and straw yields will be recorded, and levels of N, P, K and S will be assessed in soil, grain and straw. These two trials will be started in the 2008 season. Greenhouse gas emissions will be measured through the second and third year of research, and soil properties will be tested at the end of the trial.

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