

# PHOSPHORUS REGULATION OF LEGUME BIOLOGICAL NITROGEN FIXATION ON ONTARIO ORGANIC DAIRY FARMS

*Introductory Research Report E2008-40*

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## BACKGROUND

Organic dairy farms in Canada have different nutrient balances than their conventional counterparts. For the most part, organic dairy farms have lower levels of nutrients imported onto the farm and lower soil nutrient levels. While this type of farming has environmental benefits, alternative methods of supplying nutrients must be found to maintain a high production standard on organic dairy farms.

Nitrogen can be supplied by planting legume crops, including clover, alfalfa and soybean. The legume crops form an association with rhizobia which are able to fix atmospheric nitrogen. The amount of nitrogen obtained through nitrogen fixation can be comparable to nitrogen from fertilizer. It appears the amount of nitrogen fixed is dependant upon phosphorus levels in the soil: the lower the level of phosphorus, the less nitrogen is fixed.

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## RESEARCH APPROACH

The first test will examine the effect of available soil phosphorus level on nitrogen fixation. Four different phosphorus concentrations will be tested on soybean and alfalfa in the greenhouse in a soil-less medium. The plant tissue will be tested to determine the amount of nitrogen fixed. The second test will be similar to the first; however, soil samples collected from organic dairy farms in Ontario will be used.

The third test will focus on five diverse soil amendments which will be tested to determine if they are suitable to increase soil available phosphorus. To test if these products will also increase nitrogen fixation, the products will be applied to soybean and alfalfa. After one growing season the soil will be tested for nitrogen content and the plants tested to determine the amount of nitrogen which was fixed by the legumes.



**A forage field at an Ontario organic dairy farm**

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## APPLICATION OF RESULTS

The results will supply researchers and producers with information to maintain a high production standard using legumes in place of synthetic fertilizers as a source of nitrogen. As well, this research will help identify soil amendments which are suitable to increase the level of soil phosphorus. This is especially important for organic dairy producers who rely on legume crops to supply nitrogen and to maintain productive forage (hay and pasture) stands of high quality feed.

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