

# REAP-Canada 1991 Research Projects

by Roger Samson On-Farm Research Coordinator

This is the 6th year REAP has operated an on-farm research program in Ontario and an update is due.

## **Operations**

The field office has been switched from the Tavistock area to Beachville to be centrally located for the farmer co-operators. A big thank you is owed to Kevin Rivers for hosting the REAP crew in the mobile office trailer, complete with solar shower (no beach could be found in Beachville).

Jeff Quinn has also joined REAP as the new research agronomist. Jeff is a former on-farm research cooperator and a 1983 crop science graduate from the University of Guelph. David Jones, a third year student in Resource Management at the University of Guelph, is the summer research assistant who is also helping with the magazine. The farmer co-operators for this year's program are Quentin, Keith and Craig Martin, from Winterbourne; Kevin Rivers, Beachville; Vernon Ruby, Shakespeare; Doug Smith, Thamesville; Harry Wilhelm, Tavistock; John and George Van Dorp, Woodstock. Half the co-operators are cash crop farmers and the other half livestock farmers (hog and/or dairy).

## **Last SWEEP for REAP**

It's the final year of the SWEEP (Soil and Water Environmental Enhancement Program) funded projects in Ontario, and as a result much of the program involves the planting of row crops on previously established plots. The main study focus is the effect of cover crops on nutrient cycling and how this interacts with other factors such as conservation tillage, manure management, weed development and the soil nitrogen test. Exploratory work has been undertaken again this year, which varies from trying new covercrops such as big flower vetch and white mustard, to foliar feeding soybeans with a 'witches brew' made from wiffledust to increase podset.

## **Manure Management In Conservation Farming for Pollution Control**

The objective of this project has been to find methods that would reduce the loss of nutrients from liquid and solid manure application. A series of experiments were established that evaluated manure application at various times in the growing season. In each case manure was applied either directly to an established crop or immediately prior

to seeding a rapidly growing cover crop. A no-till or conservation tillage system was used for the subsequent main crop. Systems tested included:

Early spring application of liquid manure or compost to winter wheat established under various conservation tillage systems following soybeans. Late spring application of low rates of solid manure and compost to established forage stands after first cut. Mid-summer application of liquid manure prior to seeding of oilseed radish as a fall catch crop and its' subsequent affect on corn grown under a number of tillage systems (aer-way, chisel plow, moldboard plow, and no-till). Late summer and early fall application of solid manure seeded prior to fall rye, with subsequent seeding of no-till planted soybeans.

Overall, the results to date in all experiments have been that manure has been compatible with good agronomic performance and can generally substitute for the use of commercial fertilizer. The oilseed radish appears to be a promising way to prevent nutrient leaching in the fall period from liquid manure applications as it takes up approximately 100 lbs per acre of N in its above ground biomass and reduces soil moisture through evapo-transpiration. This reduces leaching both by lowering the nitrate content of the soil in the fall and the volume of water moving into the ground water over the fall/ winter period.

### **Field Testing of Cover Crops**

In this set of experiments, side by side treatments with 6 replications are being evaluated to test the economics of using various cover crops including hairy vetch, red clover, oilseed radish and winter rye in corn or soybean production. Other measurements are also being made in addition to field operations and yields. For example, the oilseed radish catch crops appear to greatly reduce quack grass growth if the catch crop gets well established and has a high yield. Fertility studies were established in the field strips this spring and two additional projects are being tested.

### **Evaluation of the N soil test for predicting N supply by legume cover crops and brassica catch crops.**

Some concerns have been expressed in the past that the N soil test may not be appropriate for "biological N" systems. This project is evaluating 3 different sampling dates to determine the most suitable period for measuring the N soil test with cover crop N sources. The work is being done in conjunction with Dr. Gary Kachanoski at the University of Guelph. Preliminary results indicate that it takes approximately 3 weeks for the majority of the nitrogen to convert from the ammonia to nitrate form after the legumes are incorporated in the spring. Nitrogen from the winter killed oilseed radish appears to be readily detected by the N soil test in the spring with very little in the ammonia form. However, the solid manure and liquid manure applied to the oilseed radish plots appear to cause significant mineralization of soil N throughout the spring period which makes it difficult to interpret if additional fertilizer N is required.

### **Effect of Rye Cover Crops on Immobilization of Soil Nutrients and Weeds In No-till Soybean Production .**

The basic objective of this trial is to try and debunk the allelopathy theory that is connected with rye cover crops - that is rye exudes chemicals that inhibit the germination of weeds. The trial hypothesis is that the major reason for lack of weed growth under a rye mulch is that essentially no "plant food" is left for the weeds after the rye has sucked up most of the nitrates from the soil and that these nutrients are not readily returned to the soil when the rye mulch is killed. Rather than the rye immediately returning as nutrients to the soil, the speculation is that because of the high C:N ratio of the winter rye cover crop (approximately 35:1 ) the microbial biomass in the soil further ties up the nitrogen and phosphorus in the soil while breaking down the carbonaceous rye material over an extended period.

There are two sets of experiments associated with this trial; the first looks at the effects of various levels of nitrogen and phosphorus fertilizer on bare and rye mulch plots, and the second examines the effects of various mulches. The second experiment is particularly interesting in that it attempts to separate out the physical mulch effects, chemical effects of the mulches (ie. allelopathy), and soil nutrient effects of the rye mulch. The five treatments in this experiment are:

1. Rye grown in place
2. Rye grown in place with tops harvested
3. Rye tops added
4. Poplar excelsior added
5. Control

The poplar excelsior is used as a mulch which provides the physical effects of a surface mulch but has been identified by allelopathy researchers as not possessing allelopathic properties.

The main observation to date on these plots is that weed pressure is lowest where the rye is grown in place but weeds such as lambsquarters or pigweed increase if the rye is fertilized or if only rye tops or poplar mulch is present as a surface mulch. Soil nitrates and microbial N, P and C are being measured at this site at 4 week intervals. This work is being Reformed in conjunction with Dr. Craig Drury at the Agriculture Canada research station in Harrow.

### **Non-Field Research Projects**

While working in the field with the farmer co-operators is the most interesting part of the research work, REAP is also hitting the books. Chantal Foulds helped complete a report on waste management on farms for the Science Council of Canada's report on sustainable agriculture. The report focussed on waste reduction rather than waste treatment per se. For reducing dairy house wastes, the report emphasized the need to switch away from

phosphorus based dairy house cleaners and to reduce milk solids flushed through the line at the end of the milking to enable successful use of low cost treatment systems. For reducing livestock wastes the report emphasized de-intensifying livestock husbandry.

This summer, REAP is also currently completing a large literature search on big-energy. This includes the CO<sub>2</sub> and energy balance of ethanol derived from short rotation forestry crops, such as willows and poplars versus grain ethanol, as well as the potential of short rotation forest crops for electricity generation. This work is being conducted by summer student Gonzalo Milet. It is anticipated that a major project will be developed in this area, with field scale plantings being made in the spring of 1992.

The research tour and information meeting on August 23rd will provide an opportunity to discuss a research agenda for the future.

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