

# Construction and Use of Cover Crop Roller for Organic No-Till

## Farmer/Grower Grant Final Report

### FNE02-404

#### Goal of Project:

The primary goal of this project was to enable us to no-till plant corn in an organic system. The two main objectives were to; first design and fabricate a roller to mechanically kill cover crops of hairy vetch, and second to field test the roller to determine how it works in conjunction with the system.

#### Farm Update:

Since the time I first applied for this grant my farm operation has changed significantly. At the time of application my family and I ran a 300 head beef fattening operation. As mentioned in my application we were considering transitioning from beef to dairy. At this time we are now operating as a 65 cow, conventional, tie stall dairy with a pipeline milking system. We still farm approximately 250 acres of which 72 are owned and the rest rented. We still grow about 195 acres of organic grain and hay which are sold as cash crops or fed to our animals. I still operate a small farm shop but due to labor issues no longer grow produce and we closed down our roadside stand.

#### Cooperators and Roles:

John Brubaker/ Farmer – Roller design and fabricator, field test monitor

Jeff Moyer/ Farm Manager for The Rodale Institute – Field testing, roller design, outreach

Dave Wilson/ Researcher for The Rodale Institute – Field testing data collection

#### Project Methods and Outcomes:

As I said in my proposal: I know that the less tillage I perform on my farm the better it is for the environment, the soil biology, and the economics of the system. However as an organic farmer I see greater weed management problems as I reduce tillage without the ability or desire to use herbicides. What I proposed doing, and have done, was to work with a system of mechanically killed cover crops to plant corn as a no-till crop. I did this by first designing and fabricating a roller to mount on the front of a tractor to roll and crimp the cover crop while mounting a no-till corn planter behind the tractor to roll/crimp the cover and plant in a one pass operation.

I worked with Dave at The Rodale Institute in the fall of 2002 to establish a field of various cover crops in 20 foot wide strips. Two of these strips were set aside for moldboard plowing and for chisel plowing as a comparison for my no-till treatments. (See Attached Field Plan).

During the winter of 2002/2003 I worked with Jeff on the design of the front mounted roller. I wanted a front mounted design because I have seen that rear mounted equipment pulled in after planting balls up with residue. And if used before planting tends to leave un-killed strips of cover or makes the field difficult to plant into. My goal was to do everything in one pass to have the direction of the rolled cover line up perfectly with the planter and to have the roll/crimper be the first tool to touch the cover crop. I built the roller with recycled steel from a local salvage yard. The main body of the roller was built from a 10 foot 6 inch long piece of 16 inch pipe with a wall thickness of ½ inch. End cap were recessed in 3 inches from the end and welded in. This was done to allow room for the flange bearings and shields to prevent residue build up at the bearings.

Once the main tube was built, crimping tines were welded on in a chevron fashion. Each tine is 4 inches high and is attached by means of bolts to enable replacement should they become worn. The tines were attached at an 80 degree angle to prevent soil disturbance upon leaving contact with the ground. I wanted the soil to remain completely covered once planting is complete. The frame is made from 4"x4" square tubing with flanges and pins to form the 3 pt. hookup. The main roller tube was designed and built with a plug on one end to allow the tube to be filled with water to adjust the weight to match field conditions.

I'm a firm believer that a picture is worth 1000 words and photos are attached to this report.

A 3pt. hitch was ordered and mounted to the front of a JD 2950 tractor to carry the roller.

The spring of 2003 was very wet and very late. Since we had to wait till the vetch was in full bloom and the rye was fully headed to kill it, it was early June till we planted the no-till corn. The moldboard and chisel plowed plots were prepared in late May, and planted with NC+ Organic 48F37 corn. The no-till corn was the same variety planted on June 11th. The roller was mounted on the front of the tractor as planned and we used a 2 row modified Monosem vacuum planter to plant the corn. We wanted to try this planter with the modifications realizing if it worked as planned it would be converted to a 4 row unit over the following winter. It did work and the plan is to go ahead and build it into a 4 row unit.

The roller worked exactly as designed. In all but the heaviest biomass it had a good kill rate and directionally rolled the covers allowing the planter to move smoothly through the soil. (See Attached Photos)

Based on past experiments with soybeans we saw promising weed management effects with rolled grains. We used the same system for planting soybeans into rolled grass cover crops. Again the grains were planted in the fall of 2002 and the soybeans, NC+ HP204, were no-till planted on June 3rd. We used winter killed oats, wheat, rye, and barley. We also compared this to moldboard and chisel plowed treatments. (See Attached Photos)

### Research Findings:

I worked with The Rodale Institute to set up the field trial and to collect the data. The data is all attached in both table and text format.

In summary I would say the equipment and the system worked great and my plan for next year is to try the equipment again with no modifications. One problem we did experience was that since this corn was late planted and the only small corn in the area it attracted black birds by the hundreds, and they ate the entire field in 2 days when it was 2 inches tall. Therefore there will be no yield data. We were successful in killing the cover crop and establishing the crop, proof that the system works. In fact a large conventional grower stopped by to see why we were using herbicide and conventional no-till. When I explained what we were doing he was impressed that we could have this kind of success without chemicals.

The soybean planting also worked very well. The beans established well and grew throughout the season. In most cases there were fewer weeds in the no-tilled plots than in the plots where tillage took place and as many as 4 cultivation operations followed vs a one pass system.

### Outreach:

I depended on The Rodale Institute to get this information out to others who could use it. Three main outreach activities took place. I also have the roller stored at The Rodale Institute's research farm so many of their visitors are able to see it.

### Events:

1.) There was one twilight growers meeting sponsored by Berks County Extension and the local organic growers association held in July - farmers and interested citizens stopped by to see the plots.

2.) A Field Day at Elliot Acres Farm, Queen Anne's County, Maryland was held in April

The field day was organized as a part of the educational and training module of The Rodale Institute's "Regenerating Small Family Farms: Combining Research, Education, and Marketing" project sponsored by a USDA-CSREES-IFAFS grant. The activity was carried out in collaboration with CASA-Future Harvest. The broader goal of the program is to promote the adoption of regenerative agriculture techniques for increased efficiency, profitability, viability, and competitiveness of small and mid-sized family farms. During 2001 and 2002 more than 500 farmers and agriculture educators have taken advantage of Rodale Institute-sponsored training events under this program.

A total of 93 participants – 59 farmers and 34 educators and other agriculture professionals from MD, NJ, DE, Washington, DC, and VA attended the activity. According to estimates, the participating farmers represented over 12,000 acres of farmland.

3.) An extension training also took place in April: The workshop was organized as an educational event for The Rodale Institute program "Regenerating Small Family Farms: Combining Research, Education, and Marketing" sponsored by a USDA-CSREES-IFAFS grant. A total of 63 participants attended the workshop -- agriculture educators affiliated with Penn State University. All the participants are highly experienced -- representing a total of over 350 years of educational practice (median 8 yrs in current position). The majority of participants (73%) provide training in organic/sustainable methods to farmers reaching about 300 farmers on average. About 30% of them train other extension personnel. Participants report to receive an average of 20 requests for assistance in organic production from farmers annually.

Following this training the USDA Beltsville station has expressed interest in having a roller built for their use in on-going research at their location.

#### Conclusion:

For me this was a very successful project. I am pleased with the way the roll/crimper works and will continue to work with it and possibly modify it in the future. I like the idea of not needing to cultivate or plow. And while I did not collect soil loss data or economic information, I know that by not plowing or cultivating, and by having a one pass planting operation, I am saving both soil and money. I would like to thank the SARE funding committee for funding my project and supporting my work. I appreciate the cooperation of my partners and look forward to sharing information on the success of this system in the future.

Submitted By:

John Brubaker September 5, 2003