1997 SARE Farmer/Grower Grant – Final Report – April 1999

Project Title: Cover Crop Interseeding into Soybean at Time of Last Cultivation: Adapting Experimental Results into Practical, Farm-Scale Methods #FNE97-179

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1. Project Goals:

The project followed on the results of a 3-year experiment conducted on the Potenza farm, which evaluated 11 grass and legume species for their suitability for interseeding into soybeans. We are attempting to develop interseeding as a way of improving on the standard practice of seeding a rye cover crop following soybean harvest, which does not tend to provide significant winter groundcover. The most promising interseeded species were Dutch white clover, medium red clover, annual ryegrass, and creeping red fescue.

This SARE grower grant was used to evaluate these species on a field scale, for two years, as part of a working farm system. The project had two main goals: 1) To construct 6-row interseeding equipment by finding and mounting seed boxes on existing row-crop cultivators. To modify and adapt the interseeders until they work well. 2) To use the interseeders to evaluate the four cover crop species on two organic grain farms near Trumansburg, NY, and under different field conditions. These goals were successfully met over the course of the project.

2. Farm Update:

My farming practices have continued relatively unchanged since I received this grower grant in 1997. I continue to farm full time, managing approximately 650 acres of organic cash grains. I use a rotation which includes soybean, corn, wheat/clover, and alfalfa. Soybeans are the main income producer. I am continuing to develop methods for cover cropping, and thinking about how to apply reduced tillage to an organic system.

3. Cooperators:

Dean Hively, MS Student, Soil & Crop Sciences, Cornell University – Dean assisted in all aspects of this project, beginning with his MS experiment, conducted on my farm, which helped us to choose the cover crop species for evaluation. Dean has spent considerable time on my farm, and has been involved in the development and use of the interseeder, in seeding strip trials, in documenting activities and producing slide shows and summary material, and in keeping the project organized.

John Myers, OCIA certified organic grain farmer, Trumansburg, NY. John built the prototype 6-row interseeder, used it to seed cover crops on his farm from 1997 until the present time, constructed a SARE field day on his farm, and has been generally involved in the discussion of interseeding into soybeans.

4,5. Project Activities and Accomplishments:

The project was conducted much as planned. Two 6-row interseeders were constructed and used to seed 4 cover crop species into soybeans. Approximately 50 acres was seeded each year, on 2 farms, over the 1997-98 and 1998-99 growing seasons. Dutch white clover, medium red clover, and annual ryegrass all established successfully when interseeded into soybeans at the time of last cultivation.

Strip trials were planted on Potenza farm in the summer of 1996, using a 2-row interseeder from Cornell. Establishment was sparse due to drought conditions that summer, and perhaps due to the technology.

John Myers constructed a 6-row interseeder in the summer of 1997, mounting a Gandy seed box above a Danish shank row-crop cultivator. (See Figure 1) The machine uses a 6-volt electric motor to drive the seed box. Seeds drop through rubber hoses into the inter-rows, just behind the zone of cultivation. Approximately 95 acres were seeded on the Myers and Potenza farms [redacted] in mid-July 1997 using this interseeder. Strip trials were established on one field, although results were observed rather than scientifically sampled. John has continued to use the interseeder on his farm. He seems to prefer ryegrass (13lb/acre) for interseeding, because it establishes well, is relatively cheap, and provides biomass for spring grazing.

Tony Potenza constructed a second 6-row interseeder in the winter of 1997, mounting a similar Gandy seed box above a Danish shank row-crop cultivator. (Figure 2) Two improvements were made in this interseeder design. Use of a ground-driven wheel mechanism to power the seed box increased the precision of seed application rates. The drive wheel was mounted so as to ride in an inter-row in front of the cultivator, and to engage when the cultivator is lowered. We think a drive wheel could also be designed to run inside the hub of the rear tractor wheel. Deflector-shields were added to the end of the seed drop tubes, which allows more accurate placement of the seed in relation to the cultivator shanks, and which also spreads the seeds more evenly across the inter-row area. Tony prefers a mix of annual ryegrass (11lb/acre) and Dutch white clover (5lb/acre) because the species mix allows nitrogen fixation in dry areas, and grass establishment in wet-holes.

We had a strong outreach program, bringing discussion of soybean interseeding methods to several venues, as described below in #11.

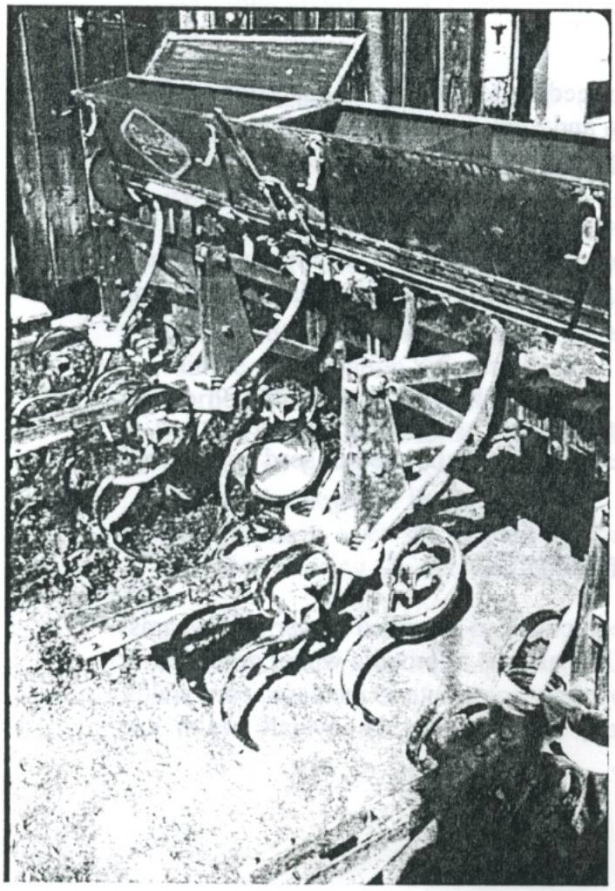
Findings: Dutch white clover, medium red clover, and annual ryegrass all established successfully when interseeded into soybeans at the time of last cultivation, using the 6-row interseeder equipment. A packer wheel behind the cultivator does not appear to be

necessary. Interseeded cover crops establish well in normal to wet years – in 1997 a drought for 3 weeks after seeding reduced establishment success. The cover crops provided a decent amount of groundcover the spring following seeding, and are a positive contribution to our farming methods.

Unexpected benefits: The strips of interseeded cover crop biomass provided forage for beef cattle on the Myers farm, which were grazed in the fields in early spring, before plowing. The strips of vegetation also made soybean harvest easier by providing a visual contrast which made it easier to see the soybean rows, and to adjust the height of the combine head. We also felt that the grass strips in the inter-row reduced compaction during harvest and plowing.

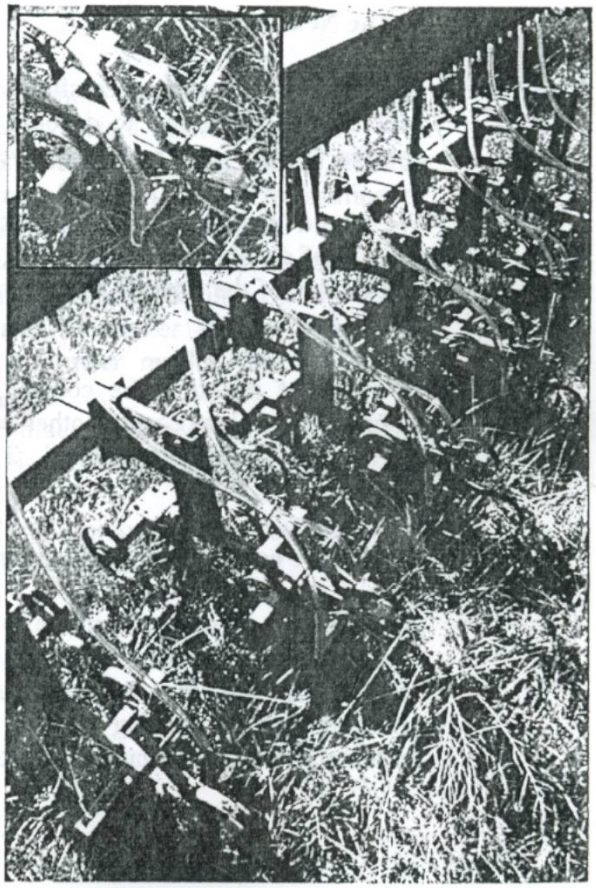
6. Specific Site Results (Interseeder design):

Figure 1



Myers Interseeder

Figure 2



Potenza Interseeder

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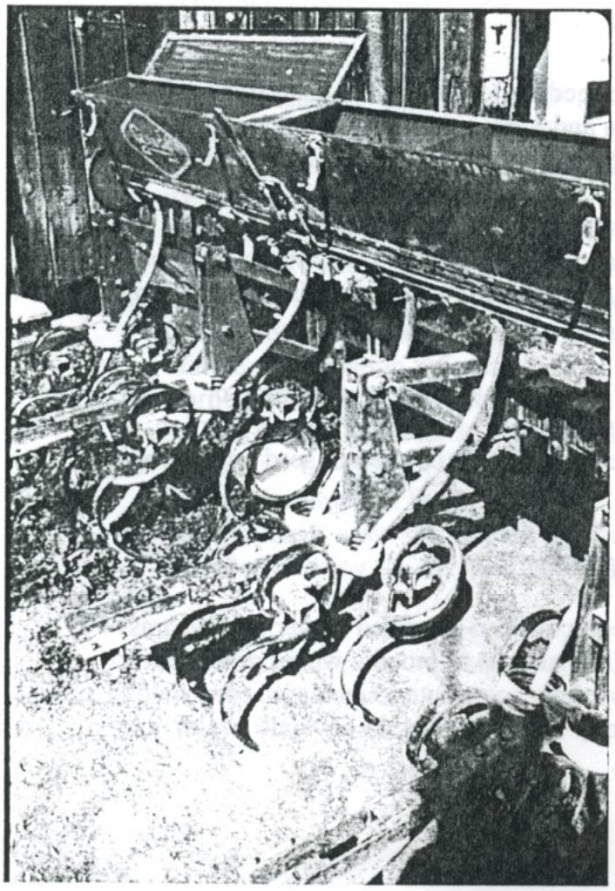

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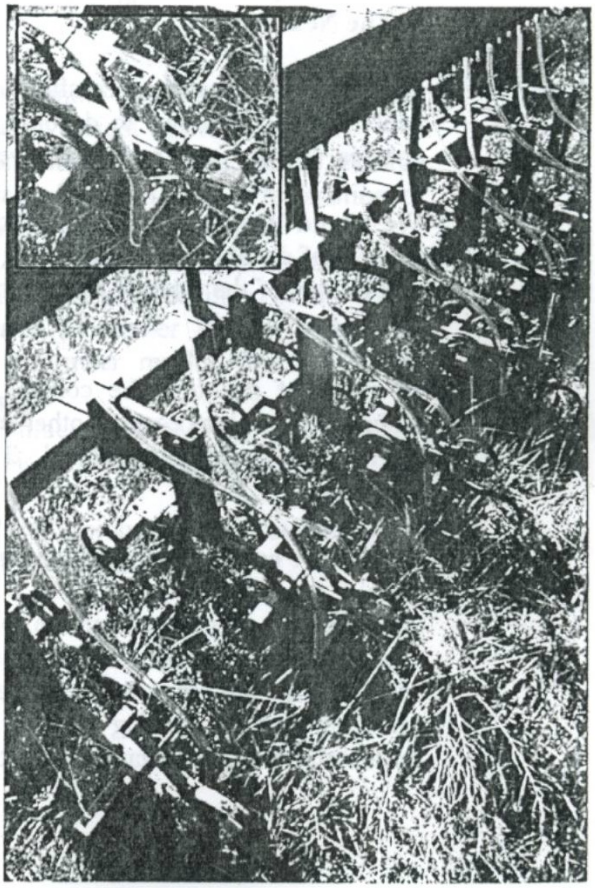

Potenza Interseeder

7. Economic Findings:

Initial research conducted on the Potenza farm showed an 8% increase in corn yield following interseeded legumes (clovers, alfalfa). Assuming an average yield of 86 Bu/Acre, an 8% yield increase would produce 7 additional bushels of corn per acre. At $ 4.50/Bushel for organic corn ($200/ton) this translates to an additional income of $31.50/acre on land planted to corn, following soybeans interseeded with legumes.

Cost of clover seed at 4-8 lb/acre, $1.80/lb for Red Clover, $2.70/lb for white clover, ranges from $6.40 to $21.60/acre. Assuming an average cost of $16/acre, interseeding of legumes will pay for seeds costs, and increase income by $15/acre. Ryegrass at $0.44/lb is much cheaper, but will not result in as large an increase in corn yield.

Because the cover crop is interseeding during a normal cultivation operation, labor and fuel costs for seeding are negligible. The cost of constructing an interseeder, which is assembled from readily available used equipment, is also low ($600-900 in parts).

Interseeding with this 6-row equipment appears to be cost effective. Interseeded cover crops can increase corn yields, provide forage for grazing cattle, and also provide indirect economic benefit by protecting the soil from erosion in the winter and spring.

8. The Next Step

The project was very successful, and the interseeding technology is ready for on-farm use. We will continue to develop our timing and application rates for the cover crop species, and may also make improvements in the seed box drive mechanism.

We would like to continue outreach regarding this practice. We are currently in the process of developing an extension packet of materials including a description, diagram, and photos of the interseeding equipment, as well as seeding rates and issues regarding timing and rotation.

In terms of adapting the concept, it might be possible to use minimum or no-till techniques to plant corn or other crops between the strips of cover crop vegetation, if competition could be controlled. The interseeders can also be used to seed cover crops into corn.

9. Will we continue to use the interseeding practice?:

Yes, we will definitely continue to use this equipment to interseed clover and ryegrass into soybeans and corn on our farms. This will enable us to provide winter groundcover on fields that are prone to erosion, and will hopefully contribute to increased corn yields, allow for spring grazing on the Myers farm, and improve the overall health and sustainability of our organic row-crop systems.

10. What do we tell other producers:

We are very positive about the interseeding methods when talking to other producers. The interseeder is easy to assemble, and cheap, as long as producers already use a cultivator for inter-row weed control in soybeans or corn. We highly recommend the interseeding methods, which can reduce erosion, increase fertility, and provide other benefits as already mentioned. There seem to be several grass and legume species that work well, although establishment is difficult if the weather is very dry following seeding. For better control of drive wheel placement you need to connect the drive wheel to a jack shaft and then to the seeder box, rather than connecting directly from the drive wheel to the seeder box. We're proud of the project, and we feel that it was a successful collaboration between our farms and Cornell, due to the involvement of Dean Hively.

11. Outreach:

Our outreach program was very strong. All three collaborators gave presentations or held farm demonstrations. We talked at local and regional farmer meetings, research meetings, and at Cornell. We have also benefitted from discussing the project with various farmers and researchers, as well as with folks at the Agriculver seed company. We are currently in the process of developing an extension packet of materials including a description, diagram, and photos of the interseeding equipment.

Presentations:

- PASA Meeting, February 1999 (Potenza). 90 minute session on retooling for sustainable food production in which the interseeding project was featured.
- OCIA Chapter Meetings: Fall 1997 - Slide presentation on the grant and the research we were going to conduct. (Hively and Potenza); Spring 1998 – Presentation of results and discussion of interseeding methods with organic grain farmers
- NOFA NY State Annual Conference, March 1998 (Potenza). Poster presentation and discussion with farmers on what we had learned from the interseeding project.
- Cornell Soil & Crop Science Annual Conference, December 1998 (Hively). 20 minute presentation of experimental and farmer/grower results, discussion with Cornell researchers and students.
- SARE Farm Tour Field Day, Myers Farm, Summer 1998 (Myers and Potenza). Hosted an on-farm SARE tour as a grant recipient, demonstrated equipment and interseeded soybean fields.
- Student farm visit by Cornell Agroecology class, October 1998. Potenza Farm. Included viewing of interseeding equipment and fields in farm tour.