The Natural Farmer

So What Kinds of Questions are Farmers Researching on Their Farms? - Summer 2002
Special Supplement on On-Farm Research

By Jack Kittredge

From my experience, farmers are a curious lot. They study the world around them with a questioning eye and are always trying to figure out how to do something better. This supplement honors organic farmers who have put in a little extra time and effort to formalize their curiosity into a research project. Many have been encouraged to do so by getting a small grant from a farming research support group, primarily SARE (The USDA's Sustainable Agriculture Research & Education program) or OFRF (the Organic Farming Research Foundation).

Leafing through farmers' recent reports on research they did in cooperation with these groups is very interesting. To get the full project report you may have to contact OFRF (11 are available online as .pdf files, but for the rest send a suggested $2 donation) or the appropriate regional SARE office (tax-payer supported and thus free). But anyone online can easily get summaries of these reports from OFRF (www.ofrf.org) or SARE (www.sare.org/projects/ – although the database is currently under construction and you may need to refer to www.sare.org/reporting/report_viewer.asp). I will try here to give you a bit of the flavor of many of them, which I perused for this issue.

Since 1990, OFRF has funded almost a million dollars to over 150 organic farming research projects. The foundation was set up by the California Certified Organic Farmers, the NOFA equivalent in California. Grants usually range between $5000 and $10,000, and run the range of issues plaguing organic farming systems. Although most of the money seems to go to academics or extension researchers in university settings, some farmers get direct grants. Some of the recent projects OFRF has supported in the northeast include:

- $9000 to Cornell University for nutrient budgeting in organic cropping
- $2000 to Maine Cooperative Extension for weed management in organic apple orchards
- $5000 to Cornell University for organic apple production
- $9000 to University of Massachusetts for caterpillar control in organic sweet corn
- $9000 to Cornell University for studying antibiotic susceptibility in organic and conventional dairy herds
- $3000 to Spring Meadow Farm in Massachusetts for cranberry fruitworm control
- $10,000 to Cornell University for organic apple production
- $8000 to Connecticut Cooperative Extension for biological control of the Mexican been beetle
- $6000 to Cornell University for natural controls of honey bee mites

- $10,000 to University of Massachusetts for non-chemical strategies for caterpillars in sweet corn

SARE, which succeeded to the older LISA (Low Input Sustainable Agriculture) program, has much deeper pockets. It essentially diverts a portion of USDA research moneys from chemical to non-chemical farming approaches. Although it still primarily funds the established Land Grant university and extension network, it does force them to seek out organic or near-organic solutions to farming problems. What follows is a recent selection from the small proportion of SARE farmer-research reports.

For simple honesty, it's hard to beat Jason Teets' summary of his work to control eastern red cedar and multi-flora roses by using intensive grazing [FNE99-279]: Fertility management and intensive grazing with goats were used in an attempt to control the invasion of Easter Red Cedar and Multi-flora Rose. Turkey litter and limestone were applied to 30 acres and goats were rotationally grazed using portable electric fence. The project was discontinued without conclusive results due to management problems such as cattle disrupting the fence and local dog predation. Goats were gone by June 2001 and fence was removed in August 2001.

I was somewhat surprised how many SARE grants went to projects involving synthetic chemical use. For instance 2 New Hampshire farms got a grant [FNE01-295] to test intercropping winter rye with corn silage. First they sprayed the corn with an herbicide, then spread winter rye mixed with a synthetic urea fertilizer. (The experiment was a failure as the winter rye did not germinate.)

In another example [FNE99-263], a Maryland grower transplanted watermelons into soil where a rye cover had been 1) plowed under followed by conventional tillage, or 2) killed with herbicides and not plowed up. In the no-till case, the mass of rye straw is hoped to prevent weed competition. In fact the no-till system worked, but the whole project required lots of synthetic fertilizers: 20-20-20 and 16-14-16, herbicides: 2 pints per acre of Roundup, 1.25 pints per acre of Gramoxone, 7 oz. per acre of Command, 2 oz. per acre of Sinbar, and fungicides: Ridomil Gold, Benlate, Poast, ManKocide, and Quadris. Was that a success?

Projects geared to better weed control were popular. In one 3-year project [FNE01-387], beds of broccoli, onions and beets were 1) planted and covered with wood chips, 2) covered with IRT plastic mulch early in the spring until planting time, then planted and covered with wood chips, and 3) planted without chips as a control. Preliminary first year data indicated the time spent weeding the control was 6 hours, the chipped bed 5 hours, and the first IRT then chipped bed 2.5 hours. But record-keeping was so spotty that the farmer felt the data was not really very useful. He hopes to do a better job the next two years.

In another mulching study, this time on asparagus [FNE01-382], 24 plots were divided among 6 treatments: a thick mulch of rye straw, a control with no cover and only occasional cultivation, and plantings of four different cover crops: buckwheat, dutch white clover, crimson clover and rape. The study concluded that cultivation is the best method to reduce weeds in asparagus, but is expensive. Next was the straw mulch, but it too was costly. Among the cover crops, buckwheat offered the best weed suppression and asparagus growth, followed by rape.

Another mulch and cover crop study [FNE01-388] focused on pumpkins. A field was disked twice,then plastic mulch was laid on 10 foot centers. In mid-May it was planted to pumpkins 18 to 24 inches on center. Between the plastic was planted buckwheat or red clover or white clover or nothing. Despite poor germination and cucumber beetle problems, the yield was good. It was best in the buckwheat,

which grew over three feet in height. Weed suppression was lower in the clover, where not much nitrogen seemed added to the crop, but better than the control where nothing was planted as a cover.

A different cover crop study [FNE01-392] looked at planting strawberries and blueberries into oats and white clover to reduce weed problems. In an honest (and somewhat humorous) listing of the events of that experiment, the farmer describes how the solution to one unexpected set-back usually leads to a new problem (something you, dear reader, are all too familiar with). In conclusion, however, he finds that the clover out-competed the strawberries, whereas the blueberries, which could grow over the clover, benefited from its mulching effect.

One farmer looked at various designs for rabbit cages [FNE01-354]. She hooped a 16' by 4' welded wire cattle panel, covered it with 1" by 2" welded wire and rubberized canvas to shed water, and affixed it to a 10' by 5' wooden foundation, using 2" by 4" wire as a floor. This provided room for 4 rabbit apartments and, mounted on wheels, enabled her to pasture the critters in a new spot every day. For individual housing, she found 1" by 2" welded wire for sides and 2" by 4" for bottom works well.

In an ill-fated New York study of cover crops [FNE00-322], the intent was to look at operations that rotate vegetables with wheat. During the early spring, clover was seeded in with the wheat, to serve as a cover crop once the wheat is harvested until the following spring. Of 9 plots, 4 were seeded to early clover. But then in late April herbicide was mistakenly applied to these plots (apparently early herbicide applications to wheat are common practice.) A fifth plot was left fallow and grew up to weeds. In the four remaining plots, clover was planted later and grew well the first summer. Drought in the following year, however, prevented regrowth and the hoped-for data on biomass yields from various cover crops based on variety and time of planting were inconclusive.

A Vermont effort to get rid of the need for tillage equipment [FNE01-368] put down 3' wide strips of black ground cloth on tilled and untilled beds (the latter in various just-mowed grasses) and planted each bed with tomatoes, peppers, eggplant and watermelon. Rather than tilling, every 7 to 10 days the farmer mowed between and around the perimeter of the beds. She found no significant difference in yield between the two beds. Calculating the labor of mowing compared to tillage, she believes they are roughly comparable.

One successful project [FNE99-242] looked at using a pryethrum/rotenone/soap spray mixture on a Finger Lakes vineyard. Nine sprays were applied between June 9 and August 27. Examination of leaves throughout the summer showed consistently higher dead leafhopper counts in the sprayed areas by large margins – always below 10% of dead nymphs in untreated areas, always above 50% in treated ones. Lacewing eggs were also released for parasitic biocontrol, but no lacewing nymphs were recovered. A local wasp, however, seemed to have parasitized a large number of lacewing eggs without ill effects from the sprayings.

In another pest control project [FNE00-294] fava beans and kale were grown in Connecticut to see if lady beetles could be collected in the spring from overwintering plants and the beetles transferred to the greenhouse for aphid control. It turned out that the beans and kale did not overwinter well there. But beetles collected in the fall could be kept over the winter and worked well for aphid control in the late winter and early spring. The beetles were collected by knocking them into jars dusted with flour (to prevent them climbing out again right away), then transferred to clean jars with paper towels to walk on and clean their feet, and banana slices for food and moisture. After a few days of feeding, they were stored in an old refrigerator (not a frost free one) at a steady 39½ F. and 50% humidity. Survival until placed in the greenhouse in February was excellent.

In an interesting proposal by a Philadelphia urban gardening project [FNE01-359], SARE supported the construction of raised beds designed to be used at former industrial sites where the growing areas must be separated from an impermeable and potentially contaminated substrate. Additionally, such sites are inherently temporary and the costs of construction must be low enough that they can be recouped immediately. This system used crushed rock for drainage and soil created from construction company donated clean fill, compost created by the City Park Commission, and horse manure provided by local stables. They ended up with well-drained, productive beds at a cost (materials and labor) of approximately $3800 for a 1500 square foot bed, or about $2.50 per square foot. This does not include the soil, but in their case the components were donated.

Another interesting proposal [FNE01-358] was to help a West Virginia grower create a network of herb growers with good markets. After growing organic vegetables for years and losing her fight against deer, she focused on growing lavender and lemon balm, took a course in France on distillation of essential oils, installed an essential oil distillery in her shop, and organized workshops on herb propagation and distillation. Despite the withdrawal from the project of the state Herb Association and several key collaborators, the farmer was hopeful: "…this project is going to take longer to put into place than first thought. Lavender takes 3 years to mature enough to make a good amount for distillation…not enough farmers are growing the herbs needed for even a small sized distillery such as mine." As a result instead of essential oils she is researching hydrosols, for which less product is necessary, although the formulation needs sanitary bottling and refrigeration to remain stable for a year.

One project aimed at developing a new agricultural product [FNE00-327] is growing a variety of black locust to replace pressure-treated posts. Shipmast black locust has black locust's renowned ability to resist rot but also has a straight grain. They have been collecting rootstock, propagating seedlings, and establishing forest plantings. The project has also involved a good deal of community education through workshops and youth planting and horse-logging sessions.

A simple West Virginia project [FNE99-246] explored improving fertility and water availability on dairy pasture in order to go to rotational grazing from confinement feeding. They opened up three springs and installed two cisterns to collect barn roof runoff, all of which was fed to troughs, as well as fencing 35 acres to make 6 paddocks, and stabilizing walkways with gravel to allow movement between barn and paddocks. The net result was an increase of over 5% in milk production, while maintaining consistent levels of fat and protein.

Another dairy project [FNE99-231] involved management of milkhouse waste water. Often this water, high in fat, clogs disposal systems using traditional leach fields. In this new system the water goes into a settling basin, then overflows into a bed of bark, and finally flows into a bed of cattails planted in sand. Material in the first two deposits can be occasionally removed and composted, and the cattail seedheads can be sold to the floral market. One concern was that the seasonal nature of the water flow (the whole herd is dry in the winter) might not suit the cattails, but their own seasonal fluctuation in need for water seems to be within the overall range of the milkhouse production system.

One dairy, concerned about a phosphorus build-up, decided to first process manure in a methane digester, then ship it to a facility where it could be molded into planting pots [FNE01-373]. Because of the high fiber content of manure, it forms relatively easily. The pots are being tested and work has begun to seek out markets and obtain patents.

A simple New York project involved comparison of quality and yield of 3 grass species (Timothy, Tall Fescue and Ryegrass) used for dry hay, cut twice a year. During the year in question (2000) Tall Fescue gave the best total digestible nutrients per acre, because of a high yield despite a somewhat lower feed value per ton. Timothy was in the middle of yield and quality, while Ryegrass gave the lowest feed value per acre because its lower yield per acre more than offset its higher quality.

A rather specialized grant [FNE01-356] was given to a New York grape grower to evaluate various pruning methods — full hand pruning, minimal hand pruning, tractor-mounted machine pruning with hand follow-up (the Betts system), and just machine pruning — on single-wire cordon trained vines. Although full hand pruning gives a higher quality grape (more sugars) than straight machine work or minimal pruning, the combination of machine work followed by hand pruning delivers the highest quality. And despite about 7% smaller yields per acre with the Betts system, savings are so significant (over 50% of pruning costs are saved) that the machine can be paid for in less than 2 years on 100 acres of Concord grapes.

In an interesting heirloom tomato study [FNE01-355] a number of varieties of black, pink, yellow, green, orange and striped tomatoes were grown at two different Massachusetts locations. Heirloom growers might want to look up the report to get fuller comments on the over 3 dozen varieties. But Green Pineapple, Cherokee Purple, Black Prince, Tasty Evergreen, Green Zebra, and Eva's Purple Ball were all well regarded.

One enterprising woodsman got a SARE grant [FNE01-375] to design a kiln to turn waste softwood into charcoal. Given that charcoal is about 80% lighter than wood, but retains 80-90% of it's fuel value, it is much easier to handle. It is also readily marketable to blacksmiths, barbecuers, and some who cook on wood stoves. This project converted a 500 gallon oil drum into a kiln holding about 1/3 of a cord of wood. The design had a couple of flaws, however, noted in the final report:

1. The lid of the kiln weighs about 150 pounds and has to be raised to head-height for every firing. Some people have done this with hoists. I welded handles on the lid but that did not make it any lighter. Solutions to this problem escape me.
2. The charge of wood carbonizes into charcoal in a hot, smoky, dark environment. I have not figured out a way to be able to observe the progress of the batch and so know when to regulate the drafts. As a result I rarely achieved the rate of charcoal production predicted. More often I completed the firing only to find a full barrel of blackened wood, or worse, a shovelful of gray ash.

In a fascinating report about oyster farming [FNE01-39] a Cape Cod company describes testing a new "Oyster Cylinder" for growing the mollusks from seed. Traditional operations use a mesh bag, but crowding in it often causes irregular growth. The cylinders are suspended from a floating pipe so that the tides roll and tumble the oysters inside the drum. Despite a higher initial cost, the faster growth and better shapes achieved with the cylinder make it a very attractive option.

A simple but encouraging project [FNE01-393] was an economic assessment of growing cherry tomatoes in high polytunnels (hoop houses) in Massachusetts. Sweet 100, Gold Nugget, and Sweet Olive varieties were tested, and produced 590 pints in a 588 sq. ft. polytunnel during a harvest extending from June 30 to October 4. These pints sold for $2.50 at the farmers market, grossing $1475. Production costs of $336 for seedlings, plastic, mulch, stakes, fertilizer, packaging, etc. plus labor costs of $756 for 94.5 hours at $8 an hour raising, harvesting and selling the tomatoes totaled $1092, leaving a profit of $383. Not bad!

Another simple project [FNE01-370] evaluated the usefulness of kaolin clay (Surround®) on apples. After a detailed orchard cleanup in the fall, a New Hampshire orchard conducted weekly sprayings at a rate of 50 pounds per 100 gallons, starting in early May. After a two week break, they concluded with two more sprayings at half rate in late July. Problems encountered were the need for heavy applications in the early spring because of wet conditions, difficulty in adequately covering trees over 10 feet tall without a handgun attachment, and the cost of the material and the applications. Even with these problems, however, the orchard plans to continue with the clay because they feel it was just as effective as previous treatments with Imidan (4 scarred apples in 100) and it also was effective against pear psylla. Despite being more costly than chemical treatments, the orchard feels the long term costs of chemicals is too great.

A very innovative project [FNE01-363] involved several Vermont farmstead cheesemakers in an effort to formalize a food safety/quality control program. Such a program could serve as a model throughout New England and generate data to form standards for raw milk cheesemakers to use in lieu of pasteurization. The research was able to collapse an elaborate 11-point control and testing protocol into 3 steps – assuring sanitary raw milk, assuring proper cheesemaking by monitoring ingredients plus fermentation and salt, and sampling one batch of aging cheese every two weeks until point of sale. The participating cheesemakers improved several-fold the results of their bacterial tests over a similar program last year, and are now well within the results of the current state regulatory expectations. They hope to make this a model for other farm scale cheese operations.

Louis Lego's apple study [FNE01-384] compared fruit produced by a baseline 1998 IPM program to that grown in a certified organic program in 2001 and also to the harvest in a 2001 program using the EPA's new "reduced risk" sprays. Lego's standards called for at least 70% fruit of a quality that the customer will self-select (very nearly perfect appearance), a guarantee of no pesticide residues, and orchards safe to work in and for water to runoff from. It is hard to summarize this excellent 17-page report which goes into detail about different controls for various pests and diseases, but his bottom line was that under 1998 IPM conditions using a fungicide (NOVA), Imidan, and dormant oil, he rejected 17% of apples for direct sales. In 2001, using the low risk program of dormant oil, a fungicide (Flint), kaolin clay (Surround), permethrin combined with a pheromone, dipel, a neem product and traps, he achieved a 26% rejection rate. With the 2001 certified organic program of dormant oil, sulfur, Surround, neem, dipel and traps, he achieved a 35% rate of rejection. Although the IPM rate was considerably better than the organic one (with the "reduced risk" IPM in between), I was very impressed that with wholly organic management a northeastern apple orchard can get a 65% rate of "firsts". This is good news for organic apples and Lego's detailed work is to be lauded.

A number of very interesting projects are underway right now. To mention just a few:

- Matthew Freund of Connecticut [FNE02-412] is looking into creating manure/fiber based materials which can replace polyethylene in such products as weed barrier mats and mulches.
- Ed Stockman of Massachusetts [FNE02-443] will explore cold-climate greeenhouse-based vermiculture to produce composts and compost teas.
- Jeff Cunningham of Vermont [FNE02-408] will breed honey bee queens for mite-resistance, hygenic behavior, high brood viability, good temperament, honey production and winter hardiness.
- Eric Wells, of Vermont's Ocean Arks International, will work to develop organic feed sources and production techniques for certified organic Tilapia fish production in recirculating aquaculture systems.

To end with a note of realism with which most of us are all too familiar, I cite the findings of a project [FNE01-364] to determine if pasture-quality Italian Ryegrass can be established without herbicides by no-tilling into existing sod. From April 30 through mid May, 2001, the rye was seeded onto six farms.

The report says:
Unfortunately, weather conditions couldn't have been much worse than what we had this spring and summer. After record snowfall that stayed on the ground until late April, we had a sudden warm spell with rapid snow melt followed by almost no rain for the month of May. Also the no-till seeder bought new this spring by one of the farms came with no coulters so much of the seed did not make good contact with the soil. These factors resulted in very poor germination of the seed. The few plants that did grow were eaten by an infestation of Armyworms that hit all six of the project farms in early July. To top it off, our area has had almost no rain since early July.

In the spirit that keeps northeastern farming alive, however, most of the participating farms are interested in trying it again next year!