RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

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INSIDE

Rye Cover Crop as Weed Control in Soybeans

Olga Wickerhauser, NJAES Sustainable Agriculture Coordinator

In recent field trials and farmer experience, annual rye (*Secale cereale*) has shown promise as an effective weed control in soybeans when the soybeans are planted directly into the rye cover.

Rye is commonly used as a winter cover crop in New Jersey by both conventional and organic growers. As a cover crop it has many benefits, including adding organic matter to the soil and controlling erosion, runoff and nutrient leaching.

Typically, growers till the rye into the soil before planting in the spring. However, there are indications that the rye cover can offer the additional benefit of weed suppression when left on the soil surface.

The September issue of the New Farm newsletter (available at www.newfarm.org) describes the experience of Robin Brekken, a Minnesota organic farmer who grows 3,000 acres of organic soybeans and uses rye as a weed control. Brekken has found that the rye boosts soybean yields, leaves his fields cleaner, and is a less expensive way to manage weeds than either cultivation or herbicides.

According to the article, the experience of Brekken and others has led Paul Porter, an agronomist at the University of Minnesota, to conduct field studies using rye in field crops. Porter is working with five farmers to evaluate the effectiveness of planting soybeans into fields that were sown with rye the previous fall.

A key to this management practice is to get a thick stand of rye cover crop established in the fall before the spring planting of soybeans. A thin stand leaves exposed soil that allows weeds to grow.

Brekken began experimenting with rye as part of his transition from conventional to organic production five years ago. The first year he tilled the rye when it was 8 to10 inches tall and drilled soybeans into the field. Very quickly the fields became weedy. The second year, he tilled most of his fields, but left a 40-foot wide strip of untilled rye. After the rye in that strip headed, he shredded it and then planted soybeans directly into it. Initially, the soybeans planted into the untilled, shredded rye were shorter and paler green than those planted into the tilled fields. In the end, however, those apparently stunted plants produced a higher yield.

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The soybeans in the untilled field produced two to three pods per plant, while the beans in the tilled area produced only one or two pods each. That translated into about 35/bu/acre for the untilled area, compared to 28.5/bu/acre for the tilled area.

Researches at The Rodale Institute in Kutztown, PA, have been experimenting with planting into untilled rye for several years. They have found that the most effective weed control is achieved when the soybeans are planted directly into a rye cover crop that has been flattened with a roller instead of mowed. Again, the key is to establish a strong stand of rye and to allow it to head before rolling it. Less mature rye may not be completely killed by rolling and may regrow. The rolled rye takes longer to break down than mowed or shredded rye, and so provides weed suppression for a longer period.

Rodale researchers have found that planting into a thick, rolled cover crop presents a challenge in itself. Generally, planters need to be modified for planting into thick residue. At Rodale, the researchers use a planter with a double disc opener.

The researchers also recommend planting the rye cover perpendicular to the direction of the soybean crop. This technique leaves fewer bare areas where weeds can grow.

In related research, scientists at Berea College in Kentucky have experimented with planting corn into a rolled rye cover crop. They compared the roll-down alone to roll-down plus one herbicide treatment at planting and to roll-down with one herbicide treatment at planting and another treatment one month later. They found that the roll-down alone performed as well as the single herbicide treatment and only slightly less well than the double herbicide treatment. Corn yields and net returns per acre were only slightly higher in the double herbicide treatment, and the roll-down alone proved more cost effective and produced higher yields than the single herbicide treatment. More information on the study is available at: www.ca.uky.edu/agc/pubs/pr/pr470/PR470C.HTM#vegetables. ❑

Improve Your Soil Though Leaf Mulching This Fall

Daniel Kluchinski, Chair, RCE Department of Agricultural and Resource Management Agents and Joseph Heckman, Ph.D., Specialist in Soil Fertility

Leaf mulching is the application and incorporation of collected municipal shade tree leaves on agricultural land. Research conducted by Rutgers University shows that leaf mulching can improve soil quality. In our study, leaves were applied to research plots each fall for three years. The applications rates were no leaves, 3 inch depth = 10 dry tons/acre or 6 inch depth = 20 dry tons/acre. Soil measurements were taken one year after the end of a three year period of annual leaf applications.

Leaves have relatively low concentrations of most plant nutrients (1% N, 0.1% P and 0.4% K) and an average carbon to nitrogen (C:N) ratio of 50 to 1. A valuable attribute of leaves is that they can be applied at high rates that rapidly build soil organic matter without causing a rapid release and buildup for available N and P. Soil organic matter levels increased from 2.4% in our unamended soil to 2.9% in plots that received 3 inches/year and to 3.1% where leaves were applied at 6 inches/year. Calculations indicate that about 17% of the organic carbon that was added to the soil remained in the soil one year after the end of the three-year period of annual applications. – a sign that organic matter levels were building.

The application of plant or animal residues with a C:N ratio of greater than 30:1 does not rapidly release mineral N in the soil. The addition of these high C:N ratio leaves did cause some initial 'tie-up' (immobilization) of N as they decomposed in the soil, reducing the amount of available N for the crop. However, in our study, crops grown (field corn, soybean) on soils amended with leaves the previous fall generally exhibited only mild to no symptoms of N deficiency. Plant tissue analysis performed on the corn and soybean during the reproductive growth stage revealed that applying N fertilizer to counteract the soil N immobilization was not necessary. One year after the end of the three-year period of annual applications, soil organic nitrogen levels rose from 0.10% in unamended soil to 0.14% for the 3 inches/year rate and to 0.20% for the 6 inches/year rate. The increased soil organic matter content provides slow release N for long term soil fertility.

An application of leaves at 6 inches would add an estimated 45 lbs. P/acre, 171 lbs. K/acre, 108 lbs. Mg/acre and 738 lbs Ca/acre. Annual applications of leaves over the three year study period did not significantly increase the soil test (Mehlich-3) levels of P or Mg. The K soil test level and especially the Ca level were significantly increased with applications of leaves. Base saturation percentages of soil cation exchange capacity (CEC) changed with the application of leaves; the Mg percentage decreased from 23% saturation on unamended soils to 20% on amended soil and the Ca percentage increased from 54% to 60% respectively. For micronutrients, applications of leaves did not change the soil test levels of copper (Cu), manganese (Mn), or zinc (Zn) but it increased boron (B) from 0.4 ppm on unamended soil to 0.6 ppm on amended soil.

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The application of leaves tended to cause a slight increase in soil pH. We observed a soil pH of 6.2 on unamended soil and a pH of 6.4 on amended soil (both leaf application rates). Although leaves do not appear to significantly influence the agricultural limestone requirement, the selection of the type of limestone for future maintenance of a balance between Ca and Mg in the soil may be a consideration for crops that are more susceptible to Mg deficiency.

Therefore leaves can provide a desirable source of organic material for soil improvement, add organic matter and some nutrients. However, careful planning and specific crop management must be followed. If you are interested in starting an on-farm leaf mulching operation, these ten steps should be followed to ensure success:

✔ **Get the facts:** Contact your county solid waste or recycling office to determine what permitting or approval process is required, as the process varies from county to county. In most cases approvals are simple, but it may also require some reporting and information sharing, so plan accordingly.

✔ **Follow the rules:** Leaf mulching is state regulated. Leaves can be accepted and spread on farm fields at a depth of 6 inches annually, cannot be stockpiled at the farm for more than seven days, and must be incorporated into the soil by spring.

✔ **Push the pencil:** Determine the fields to which leaves are to be applied and determine the total acreage. The six-inch application rate is equivalent to approximately 800 cubic yards of leaves per acre. Calculate the total amount of leaves you would need. Initially, consider accepting small quantities of leaves or operating on a limited acreage.

✔ **Plan, plan, and plan:** Have an all-weather road for truck traffic and a site for unloading. Remember that leaf deliveries will quickly "add up," especially if wet or freezing weather delays spreading.

✔ **Find a leaf source:** Ask county solid waste/recycling officials about municipalities who are looking for farmers to accept leaves, or contact potential leaf sources directly.

✔ **Form an agreement:** Ask any supplier if an agreement or contract stating the specific terms of the agreement can be made. Consider the following factors:

- length of agreement
- time period when leaves will be delivered
- amount of leaves to be delivered
- tipping fee (dollars per cubic yard or ton of leaves) to be received
- location(s) leaves are to be unloaded
- delivery schedule
- acceptable quality standards/conditions upon which loads can be rejected
- responsibility for removal of non-biodegradables and other trash
- responsibility for damage to fields from delivery trucks
- methods for dispute arbitration

✔ **Educate:** Make it clear to the leaf supplier why farm fields should not be driven on, or how bottles or trash can break equipment or injure animals. Explain that the leaves must be collected, handled and delivered properly to insure quality.

✔ **Experiment:** Test different spreading and incorporation equipment. Consider a manure spreader and chisel plow which have been shown to work well. Try different application rates. Research has determined that leaf mulching can increase soil moisture retention, increase surface residue, and may extend lower soil temperatures in early spring. This may affect planting or crop establishment. Leaf application may temporarily tie up soil nitrogen. Experiment with different crops, seeding rates, or combinations of nitrogen supplying materials such as manure. Consider legumes or low nitrogen use crops immediately after incorporating leaves, or transplants versus direct seeding.

✔ **Plan for problems:** Have written contingency plans should problems arise. For example, if odors become a problem with stockpiled leaves, will you apply limestone to neutralize odors? Move the material off site? Spread it immediately? What will happen if your spreading equipment breaks down and you cannot spread the material in a timely manner? Will you spread it by a different method? Be able to stop deliveries until the equipment is repaired? Plan ahead and have a response ready for any problems that may occur.

✔ **Keep good records:** Record leaf deliveries, application rates, spreading and incorporation methods, cropping practices, crop vigor and yields. These records will help you to determine the effects of the practice. In addition, they can be used to illustrate your successful use of the practice should problems arise, such as local opposition to or inspection of your operation.

These guidelines should help you prepare to start on-farm leaf mulching. Obviously, the success of such an operation depends on a good plan and proper execution, but the benefits to your soil can outweigh the investment in time spent planning. ❑

Crop Residue Management

Joe Ingerson-Mahar, Vegetable IPM Coordinator

Now that the growing season is coming to an end, it seems that it is too early to begin thinking about next year's crops and management. The reality, of course, is that it is not. How this cropping year wraps up could have a significant impact on next year's crops and pest levels.

A good example of this was the fall of 1999 after Hurricane Floyd broke the drought that year. It remained cool and wet with crops, especially field corn left in the field. We may have similar conditions this year as well. There has been ample rain and Hurricane Isabel has flattened some corn fields which may be difficult to harvest. Whether the ground dries enough to allow harvesting, remains to be seen. As in the spring of 2000, if we have a substantial number of fields remaining unharvested then we may see a surge in spring populations of **European corn borer**.

The same thing can happen with other insects and plant diseases. Undisturbed plant residues may contain disease pathogens that overwinter and reinfect susceptible crops in the spring of the following year. That is why our production recommendation books include residue management practices such as mowing and plowing, and in some cases, burning of the residue. In situations where the crop residue can't be turned under or burned, crop rotation in the following year becomes more of a factor. If the previous crop residue can't be broken down, then move susceptible crops to other locations on the farm.

For those of you who are planning to sell your produce as IPM produce, you will find in the IPM crop guidelines (available at the RCE website, under the vegetable pest management program) that residue management is one of the high priority items to be done by growers to manage disease pests.

Of course, for those with sloping ground, you must be aware of erosion problems that could be compounded by fall plowing. If erosion is a severe problem, then you may require the assistance of either your county agent or local Natural Resources and Conservation Service representative to help plan the best way to manage both crop residue and soil conditions. ❑

Precision Agriculture Tools for Diverse NJ Farms

Jack Rabin, Associate Director for Farm Services, NJAES

We are a few months into our NJ Department of Agriculture grant developing mobile GIS/GPS tools for seven pilot growers. Each grower has unique approaches to managing their operations, and each grower wants different information recorded.

In consultation with growers and their concerns, we have selected the Trimble Recon as the handheld device. It is like a typical handheld Personal Digital Assistant, only ruggedized. The Recon can fall from a pickup truck seat into a puddle, and not be affected.

At this time, what is possible? What things can we measure, map, and place in growers' hands? Though not all features are complete, and no grower needs nor wants too much information, below is a general list of the possibilities:

Fields Management (overhead view on screen)

- Base Map. Has exact field dimensions and area. This can save fertilizer and pesticide applications. Makes accurate automatic calculation of summary information easier.
- USDA map. This includes soil types, and may include elevation and slope maps for fruit production.
- Aerial image of farm and fields. May include land use/land cover or zoning of Twp. Map (if available).
- Soil sample test results. Fertility, pH, lime, soil electrical conductivity map, or even soil compaction maps can be produced if the information is collected. Manure management is currently being worked on.
- Irrigation system. Location of mains, risers, pumps can be mapped.
- Notes can be made by grower, and linked to fields.
- Weed and/or pest map.

Crops Management

- Current Crop. Track management of beds, groups of beds, and fields.
- Crop histories and yield histories.
- Pesticide records verified and printed on demand.
- Fertility applications recorded, totaled, and printed.
- Irrigation water management. We are still working on building a recording feature for this state regulation.
- Organic Transition Management. Provide NOP (National Organic Program) audit trail compliance. Accurately record and report rotations, buffers, and practices.
- Crop insurance. Accurately delineate size and scope of crops, fields, or parts of fields damaged by disasters like drought, excess precipitation, or hail etc.
- Greenhouse inventories of landscape perennials.

Integrating these production tools and information with farm management can be done, but it requires appropriate

See Precision Ag on page 5

Blueberry Fest a Success

Bill Sciarappa, Ph.D., Monmouth County Agricultural Agent

If you were one of the 100 plus participants of the Twilight Farm Tour for Organic Methods in Blueberry and Bramble production, you know what a wonderful experience this evening session was at Emery's Berry Patch in New Egypt, NJ. If you missed it, here's what happened. The program was sponsored by Rutgers Cooperative Extension and The Northeast Organic Farming Association of New Jersey and the Natural Resources Conservation Service. Our farm hosts John and Susan Marchese set up and organized a wonderful barbecue, with blueberry beverages and desserts under a large tent. NOFA director Karen Anderson expressed the essence of organic philosophy, with her emphasis on building long-term sustainable systems that provide high quality produce and conserve our environmental resources. Erich Bremer then explained the changes in the organic certification process under the new USDA rules and regulations. He also detailed some new OMRI approved organic pesticides available to commercial, organic and conventional growers.

The blueberry plant is an excellent organic crop candidate. It is one of the few native American fruits that has relatively good natural resistance to diseases and insects as well as an inherent vigor because it has been domesticated for less than 100 years. Perhaps 2/3's of what conventional growers do horticulturally is directly applicable to organic production. Some examples include selection for resistant varieties, pruning for canopy ventilation to reduce disease incidence, adding organic amendments in building soil such as peat and humus, mulching for weed control and water conservation, raised mounds, rogueing of infected plants and the use of natural plant protection products.

Dr. Gary Pavlis condensed his 30 years of blueberry crop production into a half hour talk on the importance of building quality soil and how pH affects the ability of the plant to extract these valuable nutrients from the soil. At pH 4.5, more ammonium ion is present which the blueberry roots can best utilize in obtaining a source of nitrogen. Organic based fertilizers include rock phosphate, greensand, bone meal, fish meal and composted manures that restore depleted soils.

Dean Polk, state coordinator of the Rutgers Fruit IPM Program, gave examples of the pest monitoring program with pheromone and attractant trapping systems. Dean also utilizes direct pest assessment for decision making which is mapped out in the field with GIS technology. By knowing what pests are out there and where they are, a grower can make better decisions as to any threat to their crop before problems are too large.

Dr. Sridhar Polavarapu spoke on the importance of pruning to reduce scale infestation and sanitation to reduce shelter for other insect pests. Sridhar reported success of a new pheromone mating disruption program for oriental beetle – the larvae feed on plant roots in the soil. By releasing small amounts of pheromone at the right time, the mate-searching behavior of the male beetle is disrupted. The females remain unmated and the next generation never develops into an economic threat. The Blueberry Research Working Group has also had excellent success in organically managing another key pest, the blueberry fruit fly. Various combinations of OMRI approved insecticides were commercially applied when attractant traps showed the development of a high population. The use of new formulations of pyrethrum, neem and spinosad are quite promising in this area.

Pathologist Peter Oudemans provided excellent information on the life cycle of key diseases in blueberry: botrytis, anthracnose, alternaria and mummyberry. Peter again stressed the importance of sanitation to minimize pathogen attack, the use of certified disease-free nursery stock and the rogueing of virally diseased plants. He is currently investigating any suppressive effects of organic fungicides like Bordeaux mixture, sulfur, hydrogen dioxide, compost teas and Serenade. This last material is a living fungus. This beneficial organism is applied to the plant where it parasitizes other fungi that attack plant leaves, flowers and fruit.

Dr. Nick Vorsa, director of the Phil Marucci Cranberry and Blueberry Research Center, spoke in the field on the importance of starting with key varieties that are relatively resistant to insect and disease attack among the dozens available. Nick also detailed the pollination process and the importance of bees, both domestic and wild, in enhancing berry size and crop load. With the cool and wet conditions of this spring, some hives pollinated much less and produced only one-half as much honey.

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software and grower time commitment. Information that can be determined includes:

- Tracking costs and returns by crop, field, variety, etc. (this has never been easy on diversified farms, even when growers have production budgets and know their yields)
- Equipment and labor time by field/crop
- Packed out yields and dollars by field/crop.

Growers will always think up their own ways to use these tools once the portability and technical difficulties are overcome. For example, though not part of our project, a landscape manager is interested in mapping all managed properties for size and features such as plants or areas requiring special management. ❑

Land Application of Non-Traditional Organic Wastes Publication

A new Rutgers Cooperative Extension bulletin (E281), "Guidelines for Land Application of Non-Traditional Organic Wastes (Food Processing By-Products and Municipal Yard Wastes) on Farmlands in New Jersey", is available on the RCE web site at: http://www.rce.rutgers.edu/pubs/pdfs/e281.pdf.

The 36 page document is authored by Uta Krogmann, Specialist in Solid Waste Management, Barbara F. Rogers, Program Associate, Solid Waste Management, William Bamka, Burlington County Agricultural Agent, Joseph R. Heckman, Extension Specialist in Soil Fertility, and Lisa Boyles. ❑

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Grower John Marchese gave an excellent overview of his farm's history and his future direction in organic agriculture. He demonstrated his trickle irrigation system that avoids leaf wetness and diseases found when overhead irrigation is used. He had his farm manager Wayne demonstrate mechanical weed control with a Weed Badger – a rotating and movable rotary cultivator that attaches on the PTO of the tractor and can weed between bushes. It was quite effective. John also explained his planting of fine fescue varieties in his walkways to provide suppressive cover and not compete with his crop for water and nutrients.

The event's organizer, Bill Sciarappa, explained his mulching experiment for suppressing weeds, building soil and conserving moisture. Bill compared local sources of mulch as composted municipal leaves, hardwood mulch, pine mulch, coffee grinds, cocoa grinds and high-grade compost in combination with landscape fabric. The long-term experiment is measuring changes in soil pH, soil microbiology, surface and root zone temperatures, plant growth and crop yield. Bill also explained the commercial use of a compost tea machine that uses specific compost sources for beneficial bacteria and fungi production in an aerobic environment.

Mark Citoli of The Berry Farm in Colts Neck provided the audience with a wealth of his information from 20 years experience in growing raspberries in Monmouth County. Mark's down-to-earth discussion of varietal differences, cultural techniques and farming approaches helped many newcomers avoid mistakes in their farm plans.

Returning as the sun set, to the beautiful storefront of Emery's, Susan Marchese had tasty blueberry pie waiting along with her sales display of numerous organic items. This was a perfect example of what our marketing consultant Maureen Scaramella, from the Food Innovation and Research Center, spoke on in adding value to your products and effectively reaching your clientele. ❑

Grower Input Requested

This year we are not conducting a formal reader survey, but since we'll be updating our promotional materials, we'd like to get quotes from readers on how the Plant & Pest Advisory is useful to your operation. Also, this is a good time to give us ideas on ways to improve the newsletter.

How is the Plant & Pest Advisory useful to you? _____

_____

_____

What are some ways to make the newsletter of more value to your business? _____

_____

_____

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Please send your responses either by e-mail to ppadvisory@aesop.rutgers.edu or fax to 732-932-9838 or by mail to Cindy Rovins, 18 College Farm Road, Cook College, New Brunswick, NJ 08901-8551. Thanks.

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