



The Crop Destined to Die

by Debra Levey Larson

SUMMER 2003

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Cover crops can help reduce soil erosion, control weeds and improve nutrients in the soil. Although some cover crops can have cash value, most are planted not to harvest, but to kill. Add to that the fact that cover crops can be difficult to manage and it's not surprising that most farmers are reluctant to try them. So, why do some farmers plant a crop that they plan to kill?

PROTECTING THE SOIL

Standing in a field of dry sunflowers, Allen Williams points to the cover crop of wheat that he planted in the same field about four weeks earlier. To the untrained eye, something looks wrong. The lovely sunflower crop has become overgrown with stubby clumps of green grass, but Williams is pleased with what he sees. "This is doing really well," he says. "After we harvest the sunflowers, the wheat will stay here over the winter to protect the ground from wind and rain erosion."

Williams farms about 1,600 acres in central Illinois. He owns 280 acres of farmland surrounding the 130-year-old farmhouse where he and his wife live and he rents another 1,300 acres across the road. He has been farming since 1972 and, yes, he plants cover crops, most of which he kills in the spring.

Williams is Chair of the Piatt County Soil and Water Conservation District so soil erosion is a hot topic for him. On his farm, he has designed sod-lined waterways to filter and direct the water, uses drainage tiles and a terrace system in addition to cover crops in order to combat the erosion problem in his fields. The land looks relatively flat but Williams says, "I've seen water coming off a no-till corn field that's almost muddy, it's so dark because it's loaded with silt and residue."

According to Williams, planting grasses as a cover crop, has a tremendous advantage over corn or soybean residue in preventing soil erosion because the grasses have a root system that's growing and strong— so they hold the soil in place much better than the dead, dry crop residue.

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The Crop Destined to Die, continued

On the Thompson farm near Ames, Iowa, Dick and Sharon Thompson have seen similar benefits from cover crops, saying that the plant protects the soil from the pummeling of direct rain in the spring while the root systems hold the soil in place. They have conducted research projects on their farm since 1967, experimenting with several combinations of cover crops. In earlier years they planted grain or cereal rye and a combination of oats with hairy vetch. About 10 years ago, they began using rye alone.

WHY RYE?

Rye isn't for everyone. But it has become a favorite cover crop for German Bollero, a crop science researcher at the University of Illinois. Bollero likes rye for the cooler, upper Midwest states, where much of his research is conducted. He has found that the use of rye prior to corn has not been successful because it can hinder corn growth, but it works well when planted before a soybean crop. "It doesn't hurt soybean yield and even helps to reduce weed pressure," says Bollero. But, he adds that more rye management research, especially in the area of residue decomposition, is needed in order to exploit the benefits of this cover crop without hurting the following corn crop.

But rye brings its own special challenges, and learning the strategies for managing it can be a somewhat daunting task for farmers. Bollero admits that incorporating cover crops into a rotation or using them during the winter can be very complicated. "There's a lot for farmers to learn and the planting and killing time can be critical," says Bollero.

Williams can identify with that. He says that one year he had a problem with rye. "We had a lot of rain and it grew too fast. We couldn't kill it in time. It headed out and we mowed it, but it added too much residue for the no-till corn. You just have to really watch it in the spring that it doesn't grow too tall, otherwise it can become a weed."

Much of Bollero's current research using rye as a cover crop is focusing on helping farmers to identify the perfect time to kill off the rye, while leaving the soil stable, and optimize the decomposition so that the nutrients are available for the cash crop that follows. Bollero has already learned that in Illinois, farmers need to abide by a fairly early kill date in order to maximize its effectiveness—17 to 27 days prior to planting.



A field of sunflowers with a cover crop of wheat on Allen William's farm in Cero Gordo.

Even though rye can be tricky, Bollero believes that it is worthwhile for another reason. The rye pulls up residual nitrogen from the soil, preventing it from leaching into the groundwater.

Excess nitrogen in the soil that eventually leaches into the groundwater has become a persistent problem for some communities in heavy agriculture areas. Joe Mitchell at the Illinois Department of Health says that in a recent year, out of 5,791 water samples tested on private wells, 567 were higher than 10 parts per million (ppm) and 149 of the samples were over 20 ppm, which is a dangerous level for humans, particularly babies. (Levels of nitrogen over 10 ppm can produce algal blooms and deplete oxygen, contributing to methemoglobinemia, or *blue baby syndrome*.)

“We also have records of 2,862 samples taken from schools and businesses around the state,” says Mitchell. “Of those, 88 were higher than 10 ppm and nine were higher than 20 ppm. Those systems over 20 ppm are restricted from providing water to users.”

In the Chesapeake Bay area, nutrient run-off has contributed to high levels of phosphorus, producing toxins and lesions in fish. As a result, nutrient management is mandatory as of January 2002 for farms on the East coast. Bollero believes that it is just a matter of time before nutrient management becomes mandatory in the Midwest as well.

PROACTIVE FARMING

The impending threat of nutrient management is something that Bollero believes presents Midwest farmers with a rare opportunity. He reasons that if nutrient management is indeed on the horizon, farmers might feel better about the changes they will need to make if the changes are their own idea—farmers can choose to be proactive rather than reactive in their farming practices. “If we anticipate mandatory nutrient management—changes that are coming—then it’s wise to encourage farmers to take the lead in these farm practices now rather than being forced to later,” says Bollero.

Williams has already begun making changes and seems to thrive on the challenges farming brings, along with its successes and disappointments. There is an obvious excitement in his face and voice as he tells of a new cover called chickling vetch that he is trying out on a small patch of land. “I read about it and got the seed from Canada. It’s supposed to set up to 200 pounds of nitrogen per acre, which is double the amount of hairy vetch. If it works, I’ll work it into our rotation.”



Allen Williams rotates white corn/ soybeans/double crop of wheat and sunflower, followed by a cover crop of wheat or rye on his non-organic acres.

Cover Crop Resources W on the Web

An online edition of the book, *Managing Cover Crops Profitably* explores how and why cover crops work and provides all the information needed to build them into any farming operation. This is the most comprehensive book ever published on the use of cover crops to sustain cropping systems and build soil.

<http://www.sare.org/handbook/mccp2/index.htm>

Reports from research on the Illinois Stewardship Farm which compared the economics of conventional, no-till, three-crop and organic cropping systems.

<http://todggg.tripod.com/Web-docs/Report-6-01.htm>

Practical Farmers of Iowa is a non-profit organization whose mission is to promote farming systems that are profitable, ecologically sound, and good for families and communities.

<http://www.pfi.iastate.edu/>

Appropriate Technology Transfer for Rural Areas (ATTRA)

<http://attra.ncat.org/attra-pub/covercrop.html>

University of Illinois Agroecology/Sustainable Agriculture Program

<http://www.aces.uiuc.edu/asap/covercrops/>

But Williams admits that his experiments and changes are also motivated by profit. He currently farms a small percentage of the acres he rents organically and is slowly transitioning more acreage. "The economics of farming today are driving me to going more organic," he says. "I can make more money, not a lot, but some more on organic crops."

On the organic acres, Williams uses a four-year rotation of corn/soybeans/wheat/mix of alfalfa, clover and grass. On the non-organic acres, he rotates white corn/soybeans/double crop of wheat and sunflower, followed by a cover crop of wheat or rye. On organic fields, he also uses clover every fifth year to rejuvenate the soil and adds chicken manure and compost.

Once he got the cover crops started, he has used his own seed from year to year so there isn't a new expense to purchase the seed. "And," he says, "there really isn't a lot of extra labor, just planting the cover crop. In the spring, you kill it and most farmers would use a burndown herbicide anyway so it's just a little more work in the fall."

Williams also likes the health benefits of a cover crop for the environment and for his family. He likes not having to use as many pesticides and says that the cover crops help a lot in reducing weeds. "The first year of corn rootworm infestation, we lost about 50 bushels per acre on the conventionally farmed field. On the organic field, we took a big hit because we couldn't use pesticides. But the return per acre was still higher on the organic crops."

From the researcher's perspective, Bollero is not suggesting that farmers make the switch to organic farming or other practices they perceive as radical. "We're not saying that farmers need to make major changes in their crop rotation or plant some unusual crop like eucalyptus or something," Bollero jokes. "If, for instance, there are 27 million acres of farmland in Illinois and even 10% of those acres adopted these different farming practices, it would make a tremendous beneficial impact on agriculture and the environment."

Williams realizes that farmers are reluctant to try new things. “Corn and beans grow well here, and there’s an infrastructure set up to handle the grain,” he says, “But especially if the farmer owns the land, they’d want to have a long-term commitment to prevent soil erosion, gain nitrogen, eventually increase yield, and improve the soil health.”

FOR THE SAKE OF THE SOIL

Soil health is hard to define and hard to measure. But Bollero compares the long-range plan to improve soil health to putting money into a long-term savings account. You won’t see dramatic benefits right away, but in time, you will. Like a savings account, soil health is a long-term pay-off. That’s the philosophy of many of those in favor of using cover crops. Bollero says that one of the ways cover crops improve soil is by keeping it in constant use. “The soil is working year round,” he says. Planting cover crops between cash crops keeps the soil working, adding nutrients for the future.

The Thompsons continue to use and experiment with cover crops regardless of changes in yield that they’ve experienced on their farm. Over the years, they have attributed both increases and decreases in yield to cover crops, realizing that many other variables also play a role. Still, they conclude that despite agronomic and economic setbacks, they will pursue various management techniques in order to “take advantage of long-term improvements in soil structure that cannot be given a price tag.” 🌱

Debra Levey Larson is a writer at the University of Illinois in the College of Agricultural, Consumer and Environmental Sciences.



Williams points to an emerging rye plant being utilized as a cover crop after harvesting a field of organic soybean.

Miscanthus: New Crop for U.S. Farmers?

by LeAnn Ormsby

Miscanthus, a tall perennial grass that grows 12 to 14 feet high, is being studied by C-FAR-funded researchers as a possible new crop for U.S. farmers. Miscanthus is already proven as a successful biomass crop in Europe, and an AgriFIRST 02 project in Piatt County, Illinois, has shown it is technically possible to grow miscanthus on a field scale. Miscanthus has the potential to increase the stability of farm incomes by providing farmers with another agricultural product while also reducing U.S. dependence on foreign oil.

"Recent events in the United States and abroad have highlighted the crucial need for energy sources that are not only clean and renewable but also domestically abundant," said

Emily Heaton, a University of Illinois graduate student in crop sciences. "One acre of miscanthus can provide the same energy as nine tons of coal."

In Europe, grassy biomass crops such as miscanthus are used for energy production by being burned with coal. Power stations fueled solely by plant biomass have been built and are operational in Britain and Denmark. Using computer models, researchers at the University of Illinois predict what miscanthus yields would be when grown on farms in the Midwest.

"Our model predicts that no matter where the crop is grown in Illinois, it will yield as well as or better than it does in Europe," said Stephen Long, University of Illinois plant biologist. "With C-FAR support, we are testing these predictions with trials of the crop across the state."

Long estimates Illinois farmers could harvest from 11 to 17 dry tons of miscanthus per acre per year. While miscanthus is also being studied for use in producing agricultural fiber products, its most important use in Illinois is likely to be in generating electricity. Dry miscanthus contains virtually no sulfur. Illinois coal is high in sulfur; mixing the two would result in lower emissions of sulfur per unit of electricity generated. This will benefit Illinois coal in allowing its combustion and Illinois agriculture in finding another profitable use of the land. Miscanthus is also suitable for marginal and slope land, which could extend the productive acres.




Emily Heaton, who is 5'4" tall, stands next to the miscanthus grass in order to demonstrate its remarkable size.

Because miscanthus is a sterile hybrid that does not produce seeds, planting is time consuming. Farmers must dig holes and plant sprigs, or pieces of the root called rhizomes, one at a time. The crop can be harvested in its second growing season, with yields quickly increasing through its third year. "You do need labor to put the crop into the

- As a sterile hybrid, it cannot spread or become a noxious weed.
- The crop can be planted alongside water supplies to reduce fertilizer runoff, and it provides cover for wildlife.

The use of miscanthus as a biofuel in Illinois is still in the research and development phase. Dynegy, the

the greenhouse effect and global change. The government is currently considering tax credits for electricity generated from renewable sources, which would further boost the value of miscanthus.

"The federal government has recognized the vital role agriculture can play in satisfying U.S. energy demand," said Heaton. "Biofuels, specifically energy crops, were included in the new 2002 farm bill, reflecting the increased importance of these crops in the U.S. energy and agricultural portfolio." 

"One acre of miscanthus can provide the same energy as nine tons of coal."

ground, but after that it involves considerably less labor than corn or soybeans, and current figures indicate it will be more profitable based on current energy prices," said Long. Long, who led production research in the European Union on this crop before moving to Illinois, said that miscanthus offers a variety of attractive characteristics for farmers:

- As a perennial, it is a low-input crop needing no annual tillage or planting.
- Rapid growth in the spring allows it to outgrow weeds.
- The plant has no known pests or diseases.
- Nutrients are recycled back into the soil as the plant dies back, so there is little fertilizer requirement.
- The crop can be harvested any time between November and February.
- Individual plants can last up to 30 years.
- The plant sequesters carbon in the soil at a rate of two tons per acre per year, giving it added value in the carbon credit market.

parent company of Illinois Power, is the only power company in Illinois that has currently offered to buy miscanthus and has indicated that it won't be ready to harvest biomass crops on a large scale for another five years. The energy company estimates that it could eventually pay \$40 to \$50 per ton for dried, harvested miscanthus. Dynegy is looking for farmers within a 50-mile radius of its power plant in Havana who are interested in growing the crop. While miscanthus doesn't burn as efficiently as coal, it produces far fewer pollutants. As energy companies are forced to meet stricter environmental requirements, the crop is becoming more appealing.

Burning miscanthus, unlike fossil fuels, does not add carbon to the atmosphere; the crop fixes the carbon from the atmosphere as it grows, and the carbon is returned when the miscanthus is burnt. There is thus no net effect on the atmosphere, and such renewable energy systems avoid

LeAnn Ormsby is communications director for the Illinois Council on Food and Agricultural Research (C-FAR).

Another Look at Miscanthus

by Debra Levey Larson

John Caveny, president of Environmentally Correct Concepts Inc. (ECCI), was first introduced to miscanthus by Emily Heaton and Steve Long, University of Illinois crop scientists. Caveny is interested in miscanthus for its potential as a bioenergy crop as well as its ability to sequester carbon.

“ECCI has U.S. patents and corresponding foreign patents relating to quantifying the amount of carbon dioxide that is removed from the air by deliberately managing plants to do that,” said Caveny. “Once amounts are quantified and verified, these amounts can be traded, banked, or sold.

These credits will be an additional source of income for farmers and ranchers around the world.”

Caveny believes that the production of grassy bioenergy crops presents a real opportunity for Illinois agriculture.

“Right now we are rather limited to switchgrass that yields 4 to 6 tons per acre per year of harvestable dry matter,” he said. “Miscanthus has the potential to produce in excess of 15 tons of harvestable dry matter per acre per year.” Ignoring establishment costs, the annual variable expenses, fertilizer and harvesting are about the same per acre. “If a higher-yielding crop is available like miscanthus, the economics and profit potential to the farmer look better,” said Caveny.

ECCI submitted a proposal to AgriFIRST 02 that was funded to investigate the agronomic and economic potential of miscanthus as a biomass crop for energy. The grant provided technical assistance to help establish the largest commercial planting of miscanthus for renewable energy in the U.S. The commercial test bed is in rural Piatt County, on Caveny’s farm. “The problems of establishment, best manage-

ment cultural practices and material handling haven’t been worked out yet,” said Caveny. “But we have demonstrated that it is technically possible to grow miscanthus in Illinois.”

Participants in one of last year’s field days visited Caveny’s farm and had the opportunity to ask questions about this new crop, and they had plenty:

“Where do I get plants?” Caveny said that although the plants are not available right now, he hopes to create a seed stock nursery and plant fields on a custom basis. “What would I do with it?” Caveny replied that it is an energy crop and not good for grazing. “Farmers also wanted to know if it would spread like kudzu,” said Caveny. “I explained that miscanthus is a sterile plant. It must be planted from pieces of the rhizomes like potatoes. It produces no underground runners. Each individual plant only expands to a diameter of about three feet and can be killed with glycosate.

“Energy from wind farms and solar collectors has potential, but Illinois’ trump card in the field of clean, renewable energy springs from the prairie,” said Caveny. “The soils and climate allow Illinois farmers to efficiently grow great quantities of biomass that can be converted into electric energy. Green energy from biomass crops, specifically *Miscanthus x giganteus*, provides an opportunity for the agricultural and energy industries to work together in finding profitable and sustainable new crops while simultaneously providing clean, renewable fuels and other ecosystem services.”

Caveny believes that miscanthus will become a new profitable and sustainable crop for Illinois farmers. “This new crop will be purchased by the electric utility industry,” said Caveny, “and all Illinois citizens will benefit from cleaner air and a secure, ample supply of safe domestic electric energy.” 🌱

Debra Levey Larson is a writer for the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois.

Attitudes Toward Clovers Surveyed

By Dean Oswald

At the April 2003 American Forage and Grassland Council annual meeting in Lafayette, Louisiana, a seminar was offered on clover establishment, benefits and utilization. Garry Lacefield, Kentucky Extension forage agronomist, and Don Ball, Auburn University Extension forage crop agronomist, presented papers on clover utilization. They listed six benefits to incorporating clovers into a grazing program:

- Improved forage quality
- Lower nitrogen fertilizer cost
- Better distribution of pasture growth
- Increased forage yield
- Crop rotation benefits
- Reduced animal toxicities

Recently the Oregon Clover Commission asked Lacefield and Ball to survey other Extension forage crop agronomists throughout the United States about using clovers in forage/livestock programs. Responses were received from 71 agronomists in 35 states. Participants were asked to rank a number of statements on a scale of 1 to 10 (1 = strongly disagree; 10 = strongly agree).

The five statements receiving the greatest agreement among agronomists were the following:

Clovers can significantly improve the forage quality of a pasture. The average score was 8.6. Responses were very positive and indicate a high awareness of the forage quality attributes of clovers and a major benefit that results from the use of clovers.

Better grazing management could greatly increase clover populations in many pastures in my state. The average score was 7.6. Agronomists seem to feel strongly that if producers knew more about grazing management, increased clover populations could result.

I believe the use of clovers in forage/livestock programs is becoming increasingly desirable and feasible. The average score was 7.5.

Better distribution of pasture growth is an important reason for using clovers. The average score was 7.0. Extension agronomists appear to view improved distribution of forage growth in pastures as a highly desirable trait, and clovers can accomplish this in some situations.

Producers in my state don't fully realize the benefits that clovers offer. The average score was 7.0. There is a significant need to provide producers with additional information regarding the benefits of clover. This survey revealed that Extension forage crop agronomists overall view clovers as being highly useful in forage/livestock programs. Potential problems or disadvantages were ranked as being of little concern.

Clovers are agronomically sound, environmentally friendly and economically advantageous. Producers should consider improved grazing management and the use of clovers in increasing forage quality and yield. Extension crop and animal systems educators can assist producers in selecting clover species and management systems that will enhance their forage/livestock system. 🌱

Dean Oswald is a University of Illinois Extension, animal systems educator.

6 **Benefits**
to incorporating
clover into grazing

- Improved forage quality
- Lower nitrogen fertilizer cost
- Better distribution of pasture growth
- Increased forage yield
- Crop rotation benefits
- Reduced animal toxicities

Illinois Pumpkin Proposal Funded

By Gerry Walter



University of Illinois crop scientist Mohammad Babadoost and Sayed Zahirul Islam, a postdoctoral research associate working with him, use a technique that exposes pumpkin seedlings to red light to induce disease resistance.

A University of Illinois crop scientist's trial of innovative methods for controlling plant diseases is among 18 proposals selected for FY 03-04 funding at the March meeting of the North Central Region Sustainable Agriculture Research and Education (NCR SARE) administrative council in Kansas City.

Mohammad Babadoost's project, "New Strategies for Management of Vegetable Diseases in Organic and Traditional Farms," will evaluate the effect exposure to red light has on development of *Phytophthora*-related diseases in pumpkin seedlings. Babadoost's was the only Illinois proposal funded.

The council's funding choices reflect both the diversity of Midwest agriculture and the breadth of SARE's mission. Slightly more than half the nearly \$2 million in funding went to 10 research projects, with the balance allocated to eight sustainable agriculture educational efforts. Projects focus on issues in crop and livestock production, rangeland management, food safety and local food security, and sustainable agricultural education opportunities for high school and college students.

Projects promising to explore new marketing opportunities or strengthen local food systems did not fare well in this year's funding process.

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*Fruit rot is one possible manifestation of *Phytophthora* infestation in processed pumpkin.*

CALENDAR

July 29 to 31

Upper Midwest Grazing Conference
(sponsored by 4-State Extension)
Lacrosse, Wisconsin

The conference features speakers from the Upper Midwest, with farm tours, a trade show, and networking opportunities. For more information, visit <http://www.wisc.edu/cias/uppermidwest/>.

July 29 to August 1

InfoAg 2003
Indianapolis, Indiana

The sixth Information Agriculture Conference will focus on site-specific crop and soil management, remote sensing, and computer applications in agriculture and will include hands-on workshops on data management, exhibits and demonstrations. For more information, visit <http://www.farmresearch.com/infoag/>.

September 16 & 17

64th Minnesota Animal Nutrition Conference
St. Paul, Minnesota

The Minnesota Nutrition Conference is an important forum for the nutrition industry. Local, national and international animal nutritionists gather to learn about the current innovative research being conducted at universities, in industry and at government centers. This year the conference focus is dairy, beef, swine and poultry nutrition.

For more information, visit <http://www.cce.umn.edu/ag/mn-nutrition.shtml>.


November 2 to 6

2003 ASA-CSSA-SSSA Annual Meetings
American Society of Agronomy (ASA)-Crop Science Society of America (CSSA)-Soil Science Society of America (SSSA)
Denver, Colorado

Over 2,800 symposia and paper/oral sessions will cover topics such as plant genomics, turfgrass science, soil mineralogy and integrated agricultural systems. The event also features exhibits, a career fair, guided tours, companion activities and childcare. For more information, visit <http://www.asa-cssa-sssa.org/anmeet/>.

Illinois remains historically under-represented in NCR SARE research and education grant funding.

The council also moved to enhance the proposal review process by moving up the research and education grant preproposal submission deadline. This will give the technical committee and outside reviewers more time to work with investigators to improve proposals prior to the final funding decision, but it will also significantly lengthen the interval between the first submission and release of funds. June 10 is the deadline for this year's process.

The council also increased by \$10,000 the total amount to be awarded in the graduate-student grant program. 

Gerry Walter is an adjunct assistant professor of agricultural communications in the Department of Human and Community Development at the University of Illinois. His academic training is in mass communication and rural sociology, and he has been a principal investigator or collaborator on a range of projects examining the ways to communicate information about sustainable agriculture.

TOURS

2003 SUSTAINABLE AGRICULTURE TOURS

Monday, July 14
Organic Farm Tour
The Land Connection, Woodford County

Tuesday, August 12
Community-Supported Agriculture
CSA Learning Center@Angelic Organics, Caledonia

Tuesday, August 19
Prawn Farming
Tanglefoot Farm, Simpson

Wednesday, September 10
Agritourism
Hardy's Reindeer Ranch, Rantoul

Wednesday, October 29
Waterfowl Fee Hunting
Pike's Hunting Club, Marion

Visit <http://www.aces.uiuc.edu/~asap/smallfarm/tourbrochure.pdf> for a printable brochure that includes more about the tours. For additional information, contact Deborah Cavanaugh-Grant at **(217) 968-5512** or cvnghgrn@uiuc.edu. A small fee will be charged for each tour.

Registration at least one week in advance is required. A registration form is available online at <https://webs.aces.uiuc.edu/asap/index.html> or by contacting Cavanaugh-Grant.

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News and Perspectives

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