



Partners

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Support Our Efforts

The Cost of Doing Business . . .



John Hassell, executive director of CTIC.

It seems like every time I am out visiting with other organizations, I hear the same message -- times are tough and money is not as available as it was several years ago to keep organizations in business. Many organizations that have relied on one or two sources for funding and now, as a result of dwindling resources, face difficult choices. Short of finding that one benefactor who will magically take care of the organization through annual donations or gifts, some organizations must cut staff and/or services. Unfortunately, there are thousands of organizations that scour the Internet looking for founda-

tions, benefactors or others that will provide salvation. There are volumes of books that provide names of foundations that grant money to organizations with the mission and work proposed meet the guidelines of the foundation. With the state of the economy and the uncertainty of the stock market and other investments, however even foundations are reducing the amount of funding that they are awarding to organizations. There's money out there, but it's limited.

The Conservation Technology Information Center (CTIC) is no different than any other organization. When money becomes tight, we look at staff and services to see where cuts can be made so that the organization keeps running. As you read this edition of *Partners* remember that it takes funding to support staff time, layout, printing and distribution of the magazine. We know from feedback that our readers value the information we provide. In order to keep *Partners* in production however, providing you with information that can be transferred to the ag producers, we need your support.

There are several ways to support CTIC. Individual memberships cost only \$25 per year and entitle you to 6 issues of *Partners*, member updates and the reward of being part of a national partnership working to provide economically viable and environmentally responsible decision making for agriculture.

This is accomplished by providing information to our readership that promotes conservation that is economically beneficial to our clientele. Think about this, for \$25 dollars a year, or 48 cents a week, you can provide support to a leading national organization working to sustain farming and conserve natural resources. And if you want to help more, you can make donations of \$50, \$100 or greater.

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There is a cost of doing business. If you are benefiting from the information you find in *Partners*, then take time to write a check and send it to CTIC to show your support for the work that we are doing.



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CTIC leads the development of public/private partnerships that promote the enhancement of soil, water and air quality and sound habitat management by equipping agriculture with realistic, affordable and integrated solutions.

STAFF

- John A. Hassell, Executive Director
- Cathy Myers, Know Your Watershed Coordinator
- Maliha Qasim, Administrative Intern
- Jill M. Reinhart, NRCS Water Quality Specialist
- Karen A. Scanlon, Communications Director
- Tammy Taylor, Office Manager
- Dan Towery, NRCS Natural Resources Specialist
- Jessica Woods, Accounting Specialist

TECHNICAL CONSULTANT

Dave Schertz

CONSULTANTS

- Angie Fletcher
- Mick Haberzette

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Conservation Technology Information Center (CTIC)
1220 Potter Drive, Suite 170
West Lafayette, Indiana 47906-1383
Tel: (765) 494-9555
Fax: (765) 494-5969
E-mail: ctic@ctic.purdue.edu
Web: www.ctic.purdue.edu

ON THE COVER

Public concern about the effects of air emissions from large animal feeding operations are prompting owners and operators to implement best management practices in their operations.

Photo Credit: USDA.





Animal Production and Air Quality

Answers to important air quality questions for animal producers

Animal producers across the country are facing public concerns and regulations dealing with the health effects and nuisance of emissions from their facilities.

Earl Dotson is chief executive officer and president of Environmental Management Solutions, LLC. (EMS, LLC.), a consulting firm and technical service provider that conducts environmental and animal welfare assessments and develops comprehensive nutrient management plans and certified conservation plans. Since being established by the National Pork Producers Council in 2000, EMS, LLC. has completed more than 4,000 assessments.

Before joining EMS, LLC., Dotson was vice president of Education, Environment and Production Research with the National Pork Producers Council (NPPC).

Partners spoke with Dotson, a long-time member of CTIC, about EMS, LLC. and the air quality issues surrounding animal feeding operations.

Environmental issues surrounding Concentrated Animal Feeding Operations (CAFOs) are big concerns for producers and the public today. Why are we seeing more emphasis on CAFOs?

Lack of agriculture knowledge, misperceptions by the public and a few bad actors are the primary reasons.

Many people don't understand agriculture and how it has grown in the last 20 years. Some people are against larger operations because they see a lot of manure that has to be contained. What they don't understand is how we have grown scientifically



to take care of these things.

Also, some people are losing the direct tie to agriculture. For example, dad grew up on a farm, but his children grow up in the city. They may go back to the farm, but their kids grow up in the city and pretty soon there is no farm to go back to. With this, you lose some perception of what really goes on in agriculture.

Finally, we have had some bad actors. A small percent of any industry that are not doing things correctly can cause the rest of the industry a lot of problems.

What air quality problems can be attributed to CAFOs and why should we be concerned?

The pollutants that cause the most concern are ammonia, hydrogen sulfide and methane, which exist in all operations, no matter what the size. The health and environmental effects of these emissions are cause for concern.

What do you see as the answer to the CAFO/air quality problem?

There is no one solution. Improved building management, lagoon covers, anaerobic digesters, improved ventilation systems and improved manure handling all can contribute to reducing pollutant emissions from animal operations. For example, instead of running manure through center pivots, more producers are injecting it into the ground. So the manure goes directly from a covered lagoon into the ground, and is never allowed to release

anything into the air.

Regulations aimed at abating air emissions from animal feeding operations should focus first on those emissions for which AFOs have significant environmental and possible health impacts. It is important that standardized sampling and analysis techniques be developed for measuring air concentrations, emission rates and fates for various important pollutants. To date, we have not devoted the resources necessary to estimate air emissions from AFOs and develop mitigation technologies, such as Best Management Practices (BMPs) known to minimize the amount of emissions, or their effects.

Best management practices are continuously being developed, some by large pork operations doing their own research. The results are innovative ideas, such as putting anaerobic digestion and liquid-solid separation together, developing a compost to be sold, or drying it further and selling it for organic fertilizer.

Why are regulations necessary to address environmental issues in CAFOs?

Many times, the emotional and political debate gets ahead of science with the mindset that a problem can be regulated. In today's society, regulations are necessary. The key is to develop sound science that will allow a producer to operate within the regulations established.

For more information about EMS, visit its web site at www.emsllc.org/default.asp



Air Quality Issues Facing Ag

Animal operations must address emission problems

By Angie Fletcher

For many years, agriculture was exempt from federal and state environmental laws that govern other businesses. Since the early 1990s, however, more regulations have been aimed at minimizing the environmental impacts of animal agriculture.

As public concern about the health effects of air emissions from animal feeding operations (AFOs) continue to escalate, government, academic and industry researchers are working with producers to determine the effects of odors from large animal feeding operations on the environment and human health.

Cause for Concern

Scientific studies are working to prove what neighbors to animal feeding operations already know — manure lagoons emit toxic airborne chemicals that can result in human health problems. According to *Controlling Odor and Gaseous Emission Problems from Industrial Swine Facilities: A Handbook for All*

Interested Parties, a Yale Center for Environmental Law and Policy student clinic publication, regardless if proof exists about the negative impacts of odors and gases from animal operations on public health and the environment, it is evident that workers and neighbors' quality of life is negatively affected. The report states, "People have been psychologically affected, property values have been depressed, local economies are suffering and community dynamics have been interrupted and altered, to say the very least." (Visit www.yale.edu/envirocenter/clinic/swine/swine.html for the entire document.)

Regulatory Approach

AFOs emitting large amounts of air pollution are subject to regulation under the Clean Air Act (CAA) as amended in 1990, which authorizes the National Ambient Air Quality Standards (NAAQS) to protect public health and welfare, and requires special measures of clean-up for regions that have not attained those standards (see sidebar for description of NAAQS).

Roel Vining, Natural Resources Conservation Service cooperating scientist and staff to the Agricultural Air Quality Task Force (AAQTF), says the areas of greatest concern to animal agriculture are particulate matter (PM10 and PM2.5), ozone, odor and greenhouse gases.

The CAA, enforced by the Environmental Protection

Agency, regulates pollution sources that present a serious threat to human health or environment. (See www.epa.gov/ttn/atw/orig189.html for a complete list of regulated sources.)

Earl Dotson, chief executive officer and president of Environmental Management Solutions, LLC. (EMS, LLC.), says, "The fear I have is that if we continually add regulation without common sense, it is possible to drive an industry out of this country."

In addition to federal regulations, Concentrated Animal Feeding Operations (CAFOs) are subject to state and county regulations, that, according to Dotson are excessive, "especially if those county ordinances became national ordinances."

"For instance, in Iowa, one county has an ordinance that you cannot build a livestock facility within two miles of a public building or school," says Dotson. "With our society today, unless you go out in the middle of the desert you cannot go two miles without running into some type of building."

Voluntary Approach

Many producer groups are developing voluntary, incentive-based programs to educate producers and assist them in making environmental management decisions that may help them to avoid air pollution regulation.

According to Dotson, producers are looking for scientific ways to better manage manure and odor. He says, "Most livestock producers are concerned about air and water quality and are doing things about it."

Covering lagoons, for example, reduces odor, particulate

Animal Feeding Operation (AFO)

According to the Environmental Protection Agency, an agriculture operation is considered an Animal Feeding Operation (AFO) if animals are kept and raised in confined situations for 45 days or more in any 12-month period, and crops, vegetation, forage growth or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

An AFO is considered a Concentrated Animal Feeding Operation (CAFO) when it confines more than 1,000 animal units (AUs) or confines between 301 to 1,000 AUs and discharge pollutants either into waters through a man-made ditch, flushing system or similar man-made device or direct into waters that originate outside of and pass over, across or through the facility or otherwise come into direct contact with the animals confined in the operation.



matter and methane emissions. And, injecting manure instead of spreading it across the land also decreases odor and pollutant emissions.

"Some parts of the 2002 CAFO rule – most of the required records, the nutrient management plans and conservation plans – are really good," says Dotson. "Operations that incorporate these practices are going to be better because they manage manure and wastewater to meet the needs of the crops they are growing," he says. "If not, they make arrangements to move those nutrients to someone who can use them."

Dotson recommends producers be allowed to participate in voluntary/regulatory programs. "With some of the programs that already exist and new programs being developed, including assessments, nutrient management plans and record keeping, and as producers talk more about environmental management systems, a voluntary regulatory approach will work," says Dotson. "We are getting closer all the time."

Animal operations grew faster than the technology for the industry, Dotson says, and for many years there was a lag in research about environmental management. "With all the studies going on now, however, the gap is narrowing," he says.

"We are seeing a lot of changes that couldn't happen before because we didn't have the technologies," says Dotson.

Producer's Perspective

Several larger pork operations are conducting their own research and developing innovative alternatives to managing manure. Creative ideas put to use include putting anaerobic digestion and liquid/solid separation together, developing a compost that can be sold, or drying it and selling it as organic fertilizer.

For Premium Standards Farms, one of the largest pork

producers in the U.S. with approximately 200,000 sows in Missouri, North Carolina and Texas, conservation efforts are voluntary as well as driven by regulation.

Dave Townsend, director of environmental compliance programs and technology implementation

programs for Premium Standard Farms, says, "Our conservation efforts are not entirely voluntary." He cites two settlement agreements: 1999 consent decree with Missouri and 2000 consent decree with EPA. Both are results of legal action taken against Premium Standard Farms.

"In Missouri, pursuant to the decrees, we have agreed to convert our largest farms to new emission reduction technology," says Townsend. Research is currently underway to identify that technology.

Pursuant to the 2000 decree, Premium Standard Farms signed an agreement with the North Carolina attorney general's office to provide North Carolina State University \$2.5 million to identify new emission reduction technology, and the company has agreed to implement that technology on all of its farms in North Carolina.

In Missouri, as a voluntary action, an Advanced Nitrification Denitrification (AND) system has been constructed to reduce air pollutant emissions. According to Townsend, all liquid from six existing anaerobic lagoons is treated like a city-style waste treatment plant to remove the nitrogen and reduce the phosphorus. "Odorous gas, ammonia, is stripped away, releasing only harmless nitrogen into the air. The first full-scale AND system has been operating at Whitetail Farm, Mo., for approximately one

National Ambient Air Quality Standards

The Environmental Protection Agency Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. They are: sulfur dioxide, nitrogen dioxide, particulate matter, carbon monoxide, ozone and lead. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m³) and micrograms per cubic meter of air (µg/m³).

The national standards are implemented by state implementation plans (SIPs.)

year," says Townsend.

Also voluntarily, as part of an expansion in Texas, Premium Standard Farms built new anaerobic digesters, where all of the waste from two facilities is digested and used to produce methane gas. The methane is used for energy production, which is primarily used to heat the digester. Townsend says, "No electrical power is needed. No lagoons are present."

These conservation practices do not come without costs. According to Premium Standard Farm's Environmental Work Plan, the proposed budget for 2003 is nearly \$1.6 million, with previous funds spent totalling more than \$6.6 million.

Improving for the Future

"What people have to remember is that it took a long time to get to where we are today, and we must continue to improve to get to where we want to be in the future," says Dotson.

For more information about the CAFO ruling, visit <http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm>.

For more information about the Clean Air Act, visit www.epa.gov/oar/caa/contents.html.



No-till Blossoms in Argentina

Soybean powerhouse spawns no-till revolution

By Steve Werblow

International Conservation Series:

Conservation Here and Abroad



Argentina burst onto the world's radar screen in the 1980s as an agricultural powerhouse. In spite of periodic economic upheavals and the need to build agricultural infrastructure from square one – or perhaps because of those challenges – Argentina has also emerged as a no-till leader over the past two decades.

With about half of the nation's cropland in no-till, most of it continuously no-tilled, Argentine farmers are enthusiastic about the money-saving and soil-saving benefits of conservation technology. Their enthusiasm is matched by that of the nation's researchers, consultants and innovative growers, who continually seek new ways to make no-till work – to the benefit of growers in both the northern and southern hemispheres.

It's no surprise that Argentina has emerged as a force to be reckoned with in soybeans and other grains and oilseeds. Farming rich soils like those in the U.S. Corn Belt, farmers in humid Pampas of Argentina enjoy a frost-free growing season that can last nine months, dashed moderately with 3 to 5 inches of monthly rainfall and mild weather that coddles crops.

A closer look reveals why Argentina has also emerged as a leader in no-till adoption. Alarmed by soil erosion and degradation when long-time pastures were converted to soybean fields, many growers

sought more sustainable approaches to row crop farming. With high labor and transportation costs, high export taxes, shaky currency and a lack of government subsidies, Argentine farmers need to be extremely efficient on the production end. Largely unfettered by generations of a plowing tradition, growers saw no-till as an excellent efficiency tool.

Adding to the lure of no-till, the Argentine government reintroduced a 20-percent export tax to boost its floundering economy. Efficiency is more important than ever.

Graceful Curve

With all the motivation to minimize costs and optimize sustainability, Argentine farmers have taken to no-till with enthusiasm. Nearly 38 million acres – about half of Argentina's cropland – is in no-till today, following a graceful adoption curve sweeping skyward since no-till was introduced there in the late 1980s. And this isn't just no-till when it's convenient – no-till is continuously practiced on 90 percent of the nation's no-till acreage. That's no ripping, no periodic disking and no rotational tillage. Just direct seeding year after year, giving Mother Nature a chance to maintain friable soil structure and build organic matter to sustain the row crop boom.

No-till fits Argentina's farming culture comfortably. Rather than a patchwork of family farms

steeped in tradition, 60 to 70 percent of the Argentine grain industry is managed largely by professional farm managers who hire out farming operations, according to Roberto Peiretti, an Argentine farm manager who serves as president of CAAPAS, the American Confederation of Farmers' Organizations Working for Sustainable Agriculture. No-till pencils out strikingly well to a numbers-oriented farm manager seeking savings on time, labor, fuel and inputs.

Consolidation in the nation's farming industry could help push no-till among time-crunched managers. According to a paper by Walter Pengue of the University of Buenos Aires, the number of producers in Argentina's prime soybean-growing area dropped 32 percent between 1992 and 1997, from 170,000 growers to 116,000. Meanwhile, average farm size increased from 600 acres to 881 acres. With more ground to cover and continuing economic pressure, expect even more no-till in the future.

Technology Bonanza

Tools to aid in no-till are eagerly accepted in Argentina. Roundup Ready soybeans have stormed the countryside, mush-



Dense mats of residue illustrate the tremendous productivity of Argentina's prime Pampas farmland – and the tremendous soil-building potential of no-till there.



rooming from 1.9 million acres at their introduction in 1996 to about 90 percent of the nation's soybean acres today. According to renowned no-till consultant Rolf Derpsch of Paraguay, Argentina is home to about 30 equipment companies that make no-till machinery.

Farmers' interest in no-till technology has driven a concerted no-till research effort in Argentina, led largely by the nation's no-till association, AAPRESID. In-house AAPRESID researchers team up with farmers to conduct field-scale trials across the nation. "They're light years ahead of any organization I'm aware of," says John Hassell, CTIC's executive director. "They have great research capabilities and wonderful technology transfer."

AAPRESID hosts a pair of national field days that draw as many as 1,200 growers each. The association's annual congress generates similar attendance, and conference proceedings, papers, technical magazines and an AAPRESID magazine highlighting success stories and new products keep the information flowing.

Claudio Dunan, an Argentina-born Colorado State University weed scientist with long ties to AAPRESID, notes that AAPRESID's research results are highly valued by growers. "A lot of the research is done on farms of leading farmers or people already involved in no-till," he says. "People believe it or trust it more if you see it on a farm rather than in a test plot." The research gains credibility because it's grower-funded. Although corporate sponsors play a vital role in the organization's finances, AAPRESID is supported largely by growers' annual dues: the market value of 1.4 tons of soybeans per member.

Perhaps just as important, adds Dunan, is the researchers' unflinching focus on making no-till work. "Let's say there was a technical problem, like slugs or

soil insects," he says. "[AAPRESID's researchers] didn't determine that the solution was to avoid no-till. They built the technical solution within no-till. People really see this as their system, and they don't want to go back to something different."

Steve Werblow is a free-lance writer based in Ashland, Ore.



Heavy stubble and vast agricultural potential make no-till a powerful – and widely accepted – tool on Argentina's Pampas.

Trans-America No-Till

Argentina's no-till success casts a long shadow. At the first Inter-American No-Till Congress, organized by AAPRESID in 1992, a group of sustainable farming advocates from both North and South America decided to launch a regional effort to promote no-till farming, and CAAPAS, the American Confederation of Farmers' Organizations Working for Sustainable Agriculture, was born.

CAAPAS links farmers, researchers, policymakers, governments and non-governmental organizations in dialogues about sustainable agriculture. It has cultivated ties with the United Nations' Food and Agriculture Organization, the American Society of Agronomy, USDA, CYMMIT (the International Center for the Improvement of Wheat and Corn, based in Mexico) and European groups. CTIC is a long-time member – in fact, the organization has helped develop a new web site for CAAPAS at www.caapas.org, which outlines the all-Americas group's goals and vision.

At the heart of that vision is the importance of sustainability. "From the beginning of our institutional life, any farming system based on 'mining,' or taking from the agro-ecosystem more than was returned to it, was discarded as a valid option," says Peiretti, CAAPAS president. "At the bottom line, and to be able to achieve sustainability, we understood that we should at least achieve a neutral future impact of our present actions. We could even consider that our present actions are being positioned beyond sustainability, or into an improvement stage."

To further the adoption of no-till across North America – from the Canadian Prairie to the windswept tip of Tierra del Fuego – CAAPAS is developing a strategic plan. The strategic process, led by Colorado State University weed scientist Claudio Dunan, is based on the organizational models made famous by management guru Peter Drucker and others.

The organization is also exploring stands on key challenges and opportunities that can dramatically affect the adoption of no-till:

- Biotechnology
- "Green Certificates," eco-labels that could help growers differentiate sustainably produced agricultural products from more conventional yields
- Free trade.

"We can have realistic hopes that in the future we will be able to 'scale up' the adoption process and reach a much larger number of hectares across the entire world with positive impacts," says Peiretti.



Clean Waterway Recipe: BMPs

West Virginia producers improve farms and watershed *By Jill M. Reinhart*

In the scenic headwaters of the Potomac River, West Virginia farmers have taken action to manage water quality and flooding issues. Largely thanks to their conservation efforts, the West Virginia Department of Environmental Protection (DEP) removed the North Fork of the South Branch of the Potomac River from its list of impaired waterbodies.

Most of the land in the North Fork Potomac watershed is federally owned forests. The second most prevalent land use, agriculture, is located on the foot slopes of rugged terrain adjacent to the river. Being located next to the river, the primarily beef and poultry operations have always faced the challenges and consequences of flooding. "Everything is right on the floodway, and as a result, pollutant delivery is immediate," said Tom Iivari with Environmental Protection Agency Region 3. This flooding exacerbates nutrient run off, leading to water quality problems, because the amount of manure generated far exceeds the land available to spread it on in the watershed.

The North Fork of the South Branch of the Potomac was

placed on West Virginia's impaired list of waters for fecal coliform in 1996 based on a U.S. Geological Survey study in 1994-1995, which showed elevated levels twice those allowed by state standards. Being placed on the list put the watershed in need of a Total Maximum Daily Load (TMDL).

While the DEP began working on a TMDL for the area, a local group of citizens formed the North Fork Watershed Association in response to a series of devastating floods in 1996. The association approached the Potomac Valley Conservation District for assistance. In turn, the association hired a consultant to complete a watershed study focusing on the ways to alleviate flooding. The study recommended relocations, land swaps with the Forest Service and expensive dams. The idea of moving landowners, "went over like a lead balloon," says Natural Resources Conservation Service (NRCS) District Conservationist Doris Brackenrich.

Finding Funding

The district began pursuing funding to deal with the

association's concerns. An unfunded NRCS Environmental Quality Incentive Program proposal caught the attention of the state's Section 319 nonpoint source grant program. After being rewritten to focus on water quality issues, the group's proposal received funding.

"The local watershed association was trying to

get flood protection, but, due to the soils and a lot of federal property, it was not feasible to do dams. They looked at water quality as well and did get funding," says Mike Mullenex, a former NRCS soil conservationist in the watershed.

The shift in focus from flooding to water quality also enabled the district to acquire additional funding, including a NRCS Land Treatment Watershed cost-share program and the first nonpoint source State Revolving Fund (SRF) project, which provided low interest loans for best management practices. The loan program was a cooperative effort between DEP, West Virginia Soil Conservation Agency, NRCS, local conservation districts and local banks.

An additional Section 319 grant was awarded in 2000, allowing the association to hire a project coordinator to focus on outreach and education efforts. This 319 project addressed bacteria and sediment associated with agriculture, past timber operations, stream bank erosion and road maintenance. In addition to the original partners, the Extension Service, Division of Forestry, Division of Highways, and Trout Unlimited came on board for this phase.

Increasing Participation

Early attempts at involving the broader agricultural community in the association's work were disappointing. Only one local landowner attended the first public meeting. "This is a group that is historically not really comfortable working with the government," explains Brackenrich. The watershed association was able to buffer communication between the ag



Funds from a Section 319 nonpoint source grant were used to install best management practices to an animal feeding area to control runoff containing bacteria.



community and the government agencies. "The association became a contact between the agencies and the landowners," explains J.D. Wilkins, co-chairman of the association. By working through the association's advisory board, the district was able to reach the landowners. "Because we had that advisory board, they were more trusting," says Brackenrich.

The 2000 Section 319 project was able to focus on landowner needs, which also led to greater participation. The combination of district coordination, agency funding and NRCS technical support also helped involve more landowners, says Patrick Bowen, NRCS assistant state conservationist for West Virginia. Participation increased from one landowner at the initial meeting to one-fifth of the landowners in the watershed participating in the 319 project.

According to Mullenex, dry conditions in the watershed also helped to bring in farmers who were looking for alternative watering sources, typically wells. In addition, with the North Fork on the state's list of impaired waters, "folks knew what was coming down the pike," explains Mullenex, "They knew they would be forced at some point to do these practices with or without cost share."

Facing a TMDL

What was coming down the pike was a TMDL for fecal coliform bacteria, established by EPA Region 3 in 1998. Forest, agriculture and urban areas were addressed in the TMDL, and agriculture was determined to be the major source of fecal coliform. In fact, the TMDL stated that agriculture in the North Fork watershed would need to reduce fecal coliform in runoff by more than 36 percent to meet water quality standards. The recommended mechanism for improvement was best management practices to control or eliminate runoff containing the bacteria.

Through the combination of the Section 319 grants, the SRF loan program and the land treatment watershed project, more than 85 percent of farmers in the watershed have participated in applying best management practices. For the local farmers, "the focus wasn't about the TMDL as much as it was (improving) individual farms," explains Wilkins.

Practices have included relocating feedlots, installing fences, creating alternative watering facilities, putting roofs over confined feeding areas, paving concentrated feeding areas, improving animal waste storage, installing filter strips and riparian buffers, building composting facilities, controlling roof runoff and stabilizing eroding areas. Nutrient management plans and manure record keeping have been implemented on 2,531 acres of land receiving manure. It is estimated that, as of 2001, 4,100 tons of poultry litter and 1,600 tons of beef manure have been removed as a threat to streams.

Water Quality Improved: River De-listed

DNA testing in the river to identify sources of bacteria has shown little trace of poultry wastes, and DEP water quality monitoring has shown significant declines in fecal coliform levels at the previously monitored USGS sites. The DEP has taken the North Fork River off the list of impaired waters, and moved it to a list titled, "TMDL developed and below listing criteria."

The project also became part of a larger restoration effort when



Individual farms were improved by installing best management practices: installation of waste storage facility, roof runoff control system, stream fencing, clean water diversion, paved feeding area, livestock watering facility, stabilized access road and critical area planting.

West Virginia signed a Memorandum of Understanding in 2000 to work toward the goals of the Chesapeake Bay Agreement, joining Virginia, Pennsylvania, Maryland and the District of Columbia in striving to meet the water quality goals of the agreement.

Although West Virginia didn't join the agreement until 2000, all improvements in water quality in that state since 1985 will count toward the overall goals for the Bay. West Virginia recognizes that their efforts help to improve the Chesapeake Bay watershed.

For more information about TMDLs, visit www.epa.gov/owow/tmdl/intro.html.

Jill Reinhart is CTIC/NRCS water quality specialist.

EPA's TMDL Definition

A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.



World's Oldest Cotton Experiment

Researchers study modern best management practices

By Angie Fletcher

Research at the world's oldest continuous cotton experiment in Auburn, Ala., is proving that conservation agriculture, including conservation tillage, is not only possible, but profitable and sustainable as well.

"The beauty of this test is that it has been ongoing for more than 100 years," says Wayne Reeves, lead agronomist, U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS).

In 1896, J.F. Duggar began the "Old Rotation" experiment to research sustainable ways to produce cotton. "At that time, they used green manure cover crops as nitrogen fertilizer along with several different rotations, which included cow peas and velvet beans, as well as others," says Reeves. After World War II, the rotations shifted to include soybeans, corn and wheat (or other small grains).

Expanding the Research

Following the centennial celebration in 1996, Dr. Charles Mitchell, who is an extension agronomist, soil scientist and current curator of the experiment, agreed to update the project to include modern best management practices (BMPs), including conservation tillage.

"We want to merge new and old technologies," says Reeves. In 1996, they began using herbicide-resistance seed, rolling the cover crops, as farmers do in Brazil, and employing non-inversion deep tillage to break up the compaction layer that had been neglected for 100 years.

According to Reeves, some of the plots with continuous cotton are in bad shape. "The organic matter is very low," he says, "so we want to maintain as much residue as possible."

In 1997, all plots were switched to a form of conserva-

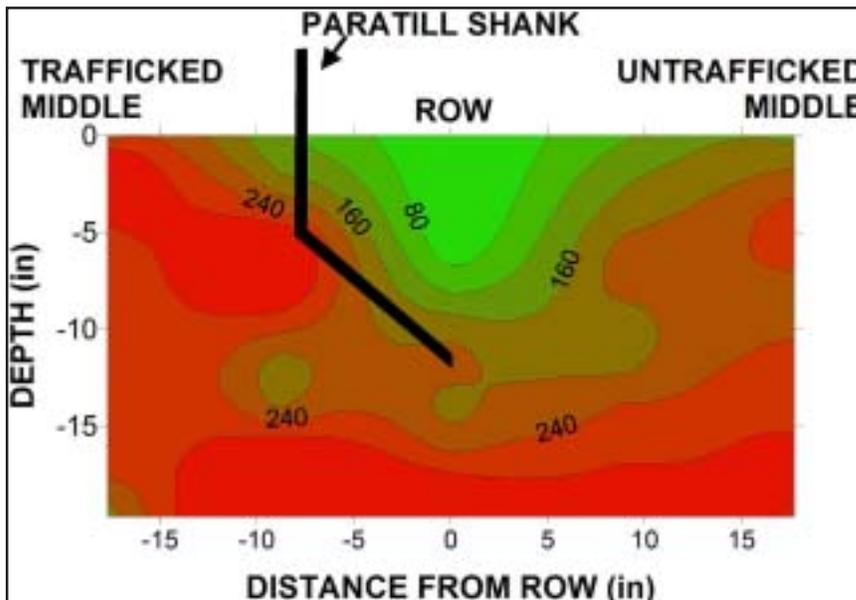
tion tillage, with specialized deep tillage, sometimes referred to as non-inversion deep tillage, vertical tillage or ripping.

"The non-inversion tillage breaks up the compaction and leaves the residue on the soil surface," explains Reeves.

"The key to conservation-till is a lot of cover," says Reeves. He suggests having corn or a good cover crop in the rotation. "The mulch preserves the soil," he says, "preventing crusting. So when we do get a lot of rainfall, the water goes into the soil, instead of running off," says Reeves. "And, once the moisture gets into the soil, the mulch keeps it from evaporating," he adds.

If enough residue is left, the residue fits into a weed control program, as well, "helping to suppress weeds, thus using fewer inputs than a conventional tillage system," adds Reeves.

Randy Raper, agricultural engineer and lead scientist at the USDA-ARS National Soil Dynamics Laboratory in Auburn, Ala., says when the subsoil in the southeast is overlooked, it can impede production. "If the subsoil is extremely dense, roots may not penetrate, causing decreased rooting volume, nutrient uptake reduction and plants more susceptible to drought," explains Raper. In addition, water may not be allowed to infiltrate into the subsoil, limiting available water for plant growth and increasing surface runoff and potential soil erosion. "Disrupting the subsoil to allow proper water infiltration and root growth may be necessary for optimum plant response in these soils," says Raper.



Soil strength isolines indicating the soil loosening provided by a Paratill operating at a 12 inch depth. The isolines indicate the pressures (psi) recorded by a soil strength measurement device as it is inserted into the soil.

First Step: Diagnosis

Before performing non-inversion deep tillage, Raper



suggests having a qualified professional test the soil. "The first step is diagnosis," says Raper. "How bad is the problem? How big of an area is compacted? How deep is the zone?"

"If a producer tills too shallow, he is not taking care of the problem. If he tills too deep, he's wasting a lot of energy for nothing," says Raper.

Once producers switch to a conservation tillage system, Raper says, they may need to occasionally break up the compacted subsoil. "But they don't want to go back to conventional tillage and destroy all the organic matter they have accumulated," says Raper. Non-inversion deep tillage is not like moldboard plowing – it just disrupts the compacted zone and leaves the soil surface where it is with minimal disruption.

Non-Inversion Tillage Equipment

Non-inversion type tillage implements are available from several different manufacturers. These implements consist of several shanks which are pulled through the soil. According to Raper, one of the most popular type of shank in the southeast is a bentleg shank, often called the Paratill. "This shank is tilted forward at a 25 degree angle for 10 to 12 inches and then breaks off at a 45 degree angle to the side, disrupting a total width of soil of more than eight inches when subsoiling at a 15 to 16 inch depth," says Raper. Non-inversion subsoilers are available from several different manufacturers but they all attempt to disrupt compacted soil profiles while maintaining crop residue on the soil surface.

Horsepower requirements for non-version tillage vary between 25 -35 hp per shank depending upon soil type, soil compaction and tillage depth. Raper suggests checking with conservation districts for availability of this type of equipment.

Impressive Early Results

"We noticed dramatic results almost immediately," says Reeves. "Soil carbon and associated soil quality and productivity have increased more rapidly than we thought possible," he explains. "After just 42 months, the organic carbon in the plow layer (approximately 8 inches) has increased by 35 percent," says Reeves.

"The first year, we set a record for wheat production. The second year we broke that record and then broke that record in the third year," says Reeves. Last year's wheat harvest didn't break any records. "But it was still a very respectable year, with approximately 75 bushels per acre," Reeves explains.

Cotton and corn production have also set records. In 2001, one cotton plot measured more than 1,600 pounds of cotton lint per acre, more than 3.3 bales, and averaged a per acre increase of 35 percent. Corn yields have increased an average of 35 percent since conservation tillage was added, with a record harvest of 236 bushels per acre from one plot in 1999.

Raper emphasizes that conservation tillage is not the only step toward preserving the land. "The best way to approach agricultural conservation is as a system," he says. Combining conservation tillage, cover crops and an intensive crop rotation, such as corn, wheat, soybeans and cotton,



Shanks, such as the one pictured above, are used to perform non-inversion tillage. The shank dives straight into the soil and then breaks off at a 45 degree angle. This type of equipment is available through different manufactures in different parts of the country.

brings greater economic and environmental benefits.

Because the soil is not touched from the time of harvest to the next growing season, more residue remains on the fields and less erosion occurs. This residue traps moisture and nutrients in the soil and suppresses weeds.

Conservation tillage requires less machinery, less labor and fewer inputs than conventional tillage. Reeves says, "A farmer may have to modify or purchase some new equipment with conservation tillage, but that will pay off with increased yields and less money spent on herbicides, fuel and labor."

For more information

For information about the Old Rotation, visit www.ag.auburn.edu/dept/ay/cotton.htm. For more information on the research, contact Wayne Reeves, Tel: (706) 769-5631 ext. 203; E-mail: dwreeves@arches.uga.edu or Randy Raper, Tel: (334) 844-4654; E-mail: rlraper@ars.usda.gov.



Oh, Say, Can You See - the Secchi Disk?

By Cathy Meyers

July has been declared Lakes Awareness Month. Americans love to spend weekends and holidays, especially July 4th, at beaches and on the lake. Boating, fishing and swimming are favorite recreational uses. But are you aware that lakes and reservoirs are used for much more than just recreation? Lakes also provide drinking water and irrigation water for agricultural fields and are a source of electricity and power generation. Lakes also serve the important function of absorbing rainfall and runoff from land, helping to prevent floods. In addition, lakes provide food, home and water for many kinds of wildlife.

The North American Lake Management Society (NALMS) in cooperation with Environmental Protection Agency chose July to be Lakes Awareness Month so that it would coincide with The Great American Secchi Dip-In. In this nationwide lake-monitoring event, volunteers measure the clarity of lake waters by using a simple device called the Secchi (rhymes with Becky) disk—a flat disk with alternating black and white quadrants. The Secchi disk is

lowered into the water, and the depth at which it is

Transparency can serve as an early warning that activities on the land are having an effect on a lake. If transparency is measured throughout the various seasons and from year to year, trends in transparency may be observed.



In theory, the Secchi disk works as a contrast instrument. It disappears when the human eye can no longer see it, meaning that there no longer remains any contrast between the disk and its background.

no longer visible to the naked eye is designated as the measure of the transparency of the lake water.

Transparency is affected by the color of the water, algae and suspended sediments. Soil and sediment can transport other pollutants such as nitrogen and phosphorus. Suspended particles, whether they are sediment or algae, can smother beneficial bottom dwelling insects such as dragonfly larvae and fish eggs. The worst problem caused by suspended particles is the reduction of light that penetrates the lake, which in turn reduces photosynthesis and oxygen production by water plants. Without adequate oxygen, the lake's fish will die.

It is important that we keep our lakes clean and clear. To check the transparency of your favorite lake or reservoir, follow the simple directions given at www.ctic.purdue.edu, or contact Cathy Myers at Tel: 765-494-1827

or E-mail: myers@ctic.purdue.edu.

CTIC Board Meeting



The 2003 summer Board of Directors meeting will be held Oct. 29-30, at the Washington Court Hotel, in Washington, D.C. The Business Alliance Meeting and CTIC Members Meeting is scheduled for Oct. 29, with the Board Meeting Oct. 30.

Following the board meeting will be an opportunity to discuss agricultural conservation in the Ukraine with representatives from that country's agricultural community.

For more information, contact CTIC, Tel: (765) 494-9555.



Working Together for Cleaner Air

A cooperative agreement between EPA and CTIC has been finalized and work has begun on CTIC's air quality initiative, *Promoting Agricultural Improvements for Air Quality in the San Joaquin Valley*. CTIC will work with partners to identify and promote success stories that illustrate the advances agricultural industries are making in reducing particulate matter (PM) levels in California's San Joaquin Valley. While working with the Valley's agricultural community, CTIC will work to build an alliance of partners that will support, promote and provide assistance for conservation that enhances air quality in the region.

CTIC invites our members with experience or interest in California agriculture or air quality issues to contribute to this important project. Please contact CTIC at 765-494-9555.

Environmental Quality and Agriculture Conference

Coexisting in the 21st Century

Balancing Nutrients and Enhancing the Environment

Nov. 10-12

Des Moines Marriott in downtown Des Moines, Iowa

Crop and animal producers, technical service providers, certified crop consultants, ag industry professional, educators, researchers, regulators and anyone interested in balancing nutrients and enhancing the environment should attend this meeting. The program includes workshops, presentations, national speakers and facilitated work groups discussions on: developing nutrient management plans, funding opportunities for watershed assessment, nutrient management that balances production and conservation, the importance of Total Maximum Daily Loads, combining agronomy and best management practices, and alternative land uses management.

For more information and to register online, go to www.ctic.purdue.edu/eqa

Feature Member

The North American Equipment Dealers Association (NAEDA) was founded Sept. 21, 1900. Today, NAEDA is affiliated with 18 state, regional and provincial associations. Of the 18 affiliates, three are in



Canada. Together, NAEDA and its affiliates provide a variety of educational, financial and legislative services to equipment dealers in the United States and Canada.

Partners spoke with Paul Kidinger, chief executive officer of NAEDA and long-time member of CTIC.

How long have you been a member?

North American Equipment Dealers Association has been actively involved with CTIC for over 14 years.

What benefits have you received by being a member?

The greatest benefits of being a member have been the broad network of contacts for NAEDA and our involvement in helping solve environmental issues and providing benefits to soil, air and water quality.

What has your membership provided CTIC?

Input in the creation of the Core 4 Conservation concept and promotion of it to various dealers and customers.

In what ways could CTIC provide greater benefits to your organization?

CTIC can help directly demonstrate how NAEDA can improve equipment sales and the relationships between dealers and their customers.

ADVERTISE IN PARTNERS MAGAZINE

Send your message to more than 40,000 *Partners* readers!

For price information and to place your ad, call Karen Scanlon, communications director, at (765) 494-2238 or send an E-mail to scanlon@ctic.purdue.edu.



Blackland Conservation Technology Alliance (BCTA)

Approximately 400 people attended the Blackland Conservation Technology Alliance field day June 17 at the Stiles Farm Foundation at Thrall, Texas. Charles Stickler, a Texas Cooperative Extension Service agronomist told the crowd that farmers using "no-till" methods on their farms may run into trouble after a few years of the practice. He said studies done at the Luling Foundation near San Antonio and at the Stiles Farm found root systems growing in a tomahawk-shape in fields that have not been tilled for several years. He said the condition indicates compacted soil that is making it hard for the roots to grow straight down. Roots growing sideways in compacted soil indicates roots hitting something hard and altering the growth path sideways before growing straight down. (See Research and Technology article on pages 10-11.)

Strip-till has not shown the same problems of compacted soil. Conservation tillage offers a way to reduce cost but some tillage, especially in cotton, is necessary. Instead of plowing the stubble under, strip-till leaves plant residues on the field after harvest and the new crop is planted directly into the residue or into small strips of tilled soil.

White grubs and Mexican corn worms were the subject of another demonstration. Studies testing certain pesticides along with new transgenic crops designed to resist corn worm infestations were discussed. While transgenic crops hold more promise than most conventional treatments, the new technology is not a cure-all. The producer must look at the insects they control. This does not mean do away with pesticides, as it may control one worm and not the other.

Other sessions included information on weed control and weed resistance management and the impact of crop rotation and tillage systems. The afternoon

sessions included a demonstration of tillage equipment, forages for summer stocker cattle, summer stocker programs and maintaining pastures for upland game birds.

For more information, contact Charles Wade, Tel: (254) 697-3692; E-mail: Charles.wade@tx.usda.gov.

Conservation Agriculture (CA)

Two on-farm demonstrations will be established on CA farms this summer.

Clark Lemley, a Pillsbury, N.D. farmer, is establishing a legume cover crop evaluation on his no-till wheat field. The cover crop should take up excess moisture, important for an area in a 10-year wet cycle, and contribute to the nitrogen budget the following year. Cover crops reportedly contribute 25 pounds or more nitrogen to the succeeding year's crop.

The demonstration consists of planting three cover crops and a control in four 10-acre blocks. Hairy vetch will be broadcast-seeded by air after the wheat field has been sprayed. Lentils and field peas will be drilled in immediately after harvest.

Clark will make observations on growth progress, weed competition and flowering date. Before frost, biomass samples will be taken from each cover crop type to determine dry matter and yield. Soil will be sampled in June 2004 to determine the nitrogen credits attributed to each cover crop type.

The second demonstration involves Tom Langemo, Fingal, N.D. farmer, who is concerned about the encroachment of the soybean aphid in his county, although none of his fields have yet been infected. He raised this concern with his resource team, resulting in a bio-control demonstration using forage crops, which harbor beneficial insects. The forage is harvested just at the time when insect pests may begin posing a problem, and it is anticipated that the beneficial

insects will migrate to the adjacent soybean crop. This demonstration will monitor the insects using sticky cards placed along three transects extending into both the forage crop adjacent to the soybean field. Just before harvest, both crops will be swept for insects, and one week later the soybean crop will be swept for insects to determine the movement of the beneficial insects and determine their potential interaction with soybean insect pests.

Neighboring farmers will be informed of these field demonstrations, invited to follow the progress and be made aware of the results.

For more information, contact Sharon Clancy, Tel: (701) 662-4088, E-mail: sharon.clancy@nd.usda.gov.

Muskegon River Watershed Assembly (MRWA)

The MRWA, in west-central Lower Michigan, recently was awarded a \$3,000 grant from the Great Lakes Energy People Fund to reprint a special edition newsletter to inform the public about current research and other activities in the Muskegon River Watershed. To assist the MRWA in its educational efforts, the Wege Foundation has also agreed to match this award dollar for dollar.

The MRWA is now online at www.mrwa.org, and it has recently added a data repository about watersheds, particularly the Muskegon River Watershed.

For more information, contact Terry Stilson, executive assistant, at (231) 591-2324 or e-mail at mrwa@ferris.edu.

Ohio Agricultural Environmental Assurance Alliance

The Ohio Agricultural Environmental Assurance Alliance Steering Committee met July 23, to review and provide comments on draft environmental self-assessment materials. During the development of the materials, every effort was made



to coordinate the environmental self-assessment program and the Farm Bill Conservation Security Program. The goal is to pilot the environmental self-assessment program in late 2003.

In addition, a letter of understanding, to formalize membership in the alliance, has been circulated to members of the steering committee. To date, over 80 percent of the steering committee members have committed to become formal members of the Ohio Agricultural Environmental Assurance Alliance.

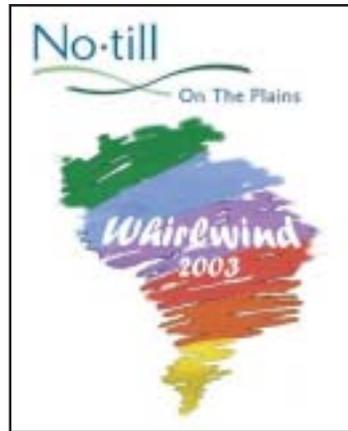
For information about the Ohio Agricultural Environmental Assurance Alliance, contact Larry Antosch, Tel: (614) 677-8773 or E-mail: lantosch@ofbf.org.

No-Till on the Plains (NTOP)

No-Till on the Plains, Inc., will host two summer sessions, providing ways to increase profitability, gain better agronomic understanding of soils and their reactions to fertility, and increase efficiency with new rotations and sequencing of crops. The Whirlwind No-Till Expo, a three-day hands-on learning experience with the pros of no-till across Kansas and Oklahoma, was July 28-30. Day-long events are planned at Glen Elder and Hutchinson, Kans. and Blackwell and Red Rock, Okla.

Experts Ray Ward, Paul Jasa and Bob Wolf shared vital information, as well as in-the-field demonstrations.

The 8th Annual South Dakota No-Till Tour will take place Aug. 4-6. This will be a chance to candidly discuss production practices and management challenges with people committed to long-term success with no-till (and achieving it), and to meet fellow Kansans, Oklahomans, and Nebraskans in various stages of no-till adoption. This intense three-day tour departs from Salina and features the Dakota Lakes Research Farm with Dwayne Beck and three no-till farming operations. Enrollment is limited to the first 40



participants, and the fee of \$200 covers transportation and lodging.

Many regional and local Alliance meetings and Field Days are also taking place in Kansas throughout the month of August. Interested individuals may check the No-Till on the Plains web site for locations and times of these meetings.

Looking ahead, the No-Till on the Plains Winter Conference will be held Jan. 26-27, 2004, in the Bicentennial Center, Salina, Kans. Designed "by farmers...for farmers," expects more than 1,400 attendees at this yearly premiere no-till conference of North America. Speakers from several states and countries will enlighten and motivate producers about the benefits of utilizing no-till. In addition, over 60 exhibitors participate in the very popular tradeshow portion of the two-day event.

For more information, contact No-Till on the Plains, Inc., at Tel: (888) 330-5142 or visit the web site at www.notill.org.

Tri-State Strip-Till Alliance

The Irrigation Research Foundation (IRF) is promoting the August 20-21 Farm Show where regional growers, consultants and other interested participants visit the plots and attend field talks about the limited irrigation studies and strip-till comparison plots. There will be three

field presentations over the two-day show by Natural Resource Conservation Service, Monsanto and Potash-Phosphate Institute scientists discussing the world of High Plains irrigated crops.

For more information, contact the Tri-State Strip-till Alliance, Chris Glaze, Tel: (970) 848-3043; E-mail: irf@plains.net. or Mike Petersen, Tel: (970) 330-0380; E-mail: michael.petersen@co.usda.gov.

Delta Conservation Demonstration Center

Sam Newsom, chairman of the Board of Directors, gave a summary report of the Core 4 Conservation activities at the National Association of Conservation District meeting in Point Clear, Ala.

The business plan will be titled Delta Conservation Demonstration Center – Core 4 Conservation Alliance.

Contacts are being made with other potential alliance members.

The local John Deere representative has agreed to serve as an alliance member. They plan to use the DCDC for Deere Day and demonstrate new equipment.

The local Case IH representative has agreed to serve as an alliance member. They plan to use the DCDC to demonstrate new equipment and assist with field days.

The DCDC hosted the Mississippi Chapter of the Soil & Water Conservation Society and Mississippi Chapter of Agronomy meeting. Core 4 Conservation was a key component of the presentation and tour.

For more information, contact Hiram Boone, Tel: (662) 332-0400 or E-mail: hiram-boone@ms.nacdnet.org.

Send Alliance updates to Karen Scanlon, communications director, E-mail: scanlon@ctic.purdue.edu

