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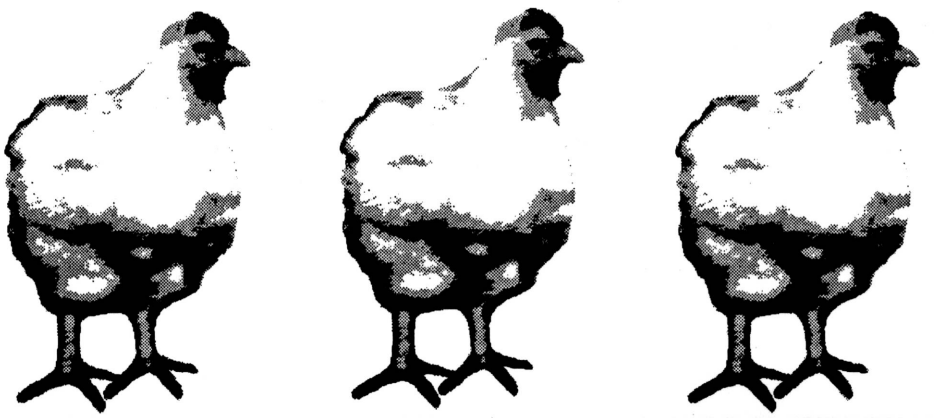


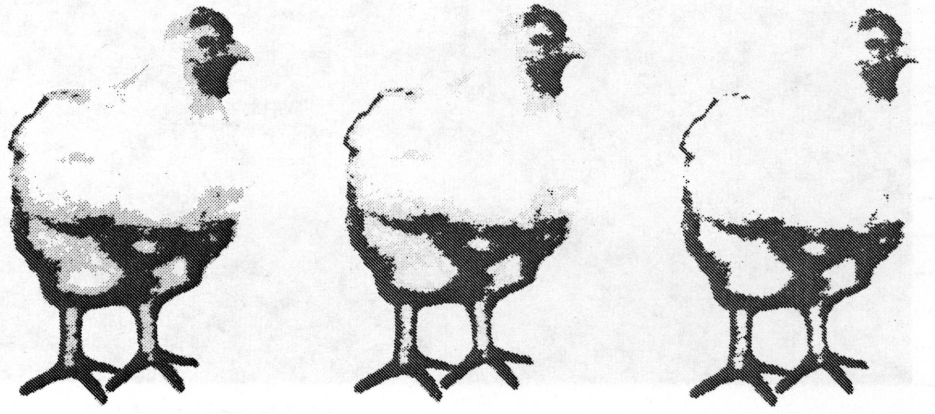
Poultry Litter Marketing & Utilization Project

A Case Study 1992-1995

Creating Market Demand to Link and Resolve Two Environmental Problems

Winrock International

May 1995



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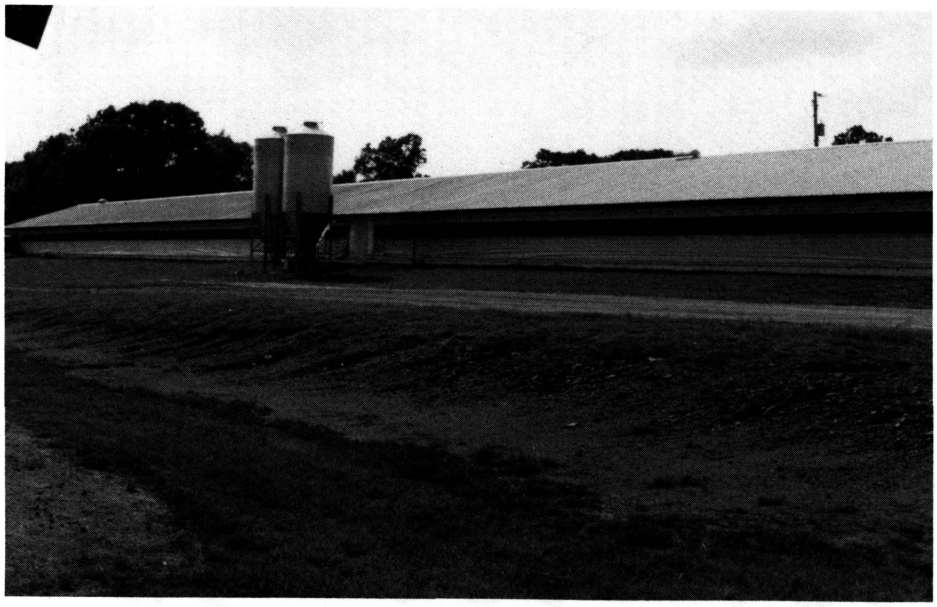
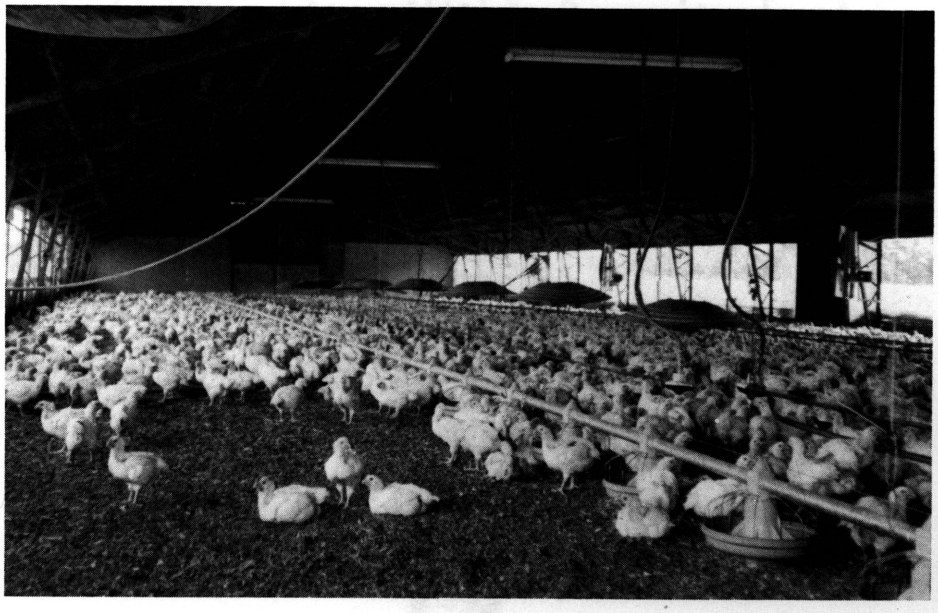
By

Jonathan Harsch

Winrock International

May 1995





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I. Executive Summary — Creating a Market

"In the United States, economic development and environmental protection often are treated as separate and conflicting objectives. . ."

Winrock Poultry Litter Project Report, 1994

"There is absolutely no dichotomy at all between economic growth, job creation and environmental protection. You do not have to choose environmental protection versus economic growth; they go hand in hand."

Robert Watson, Associate Director for Environment, White House Office of Science & Technology Policy

Spreading Manure. . . & Information

After three years of working with a network of organizations cooperating in the Winrock Institute's poultry litter project, western Arkansas farmer Jerry Sherrill laughs about some of the things he didn't know before — and that now seem obvious.

Previously, Sherrill recalls with a broad grin, when he had a load of manure to spread on his fields, it never occurred to him to shut off his spreader when crossing a stream or going along the creek banks.

Now it's a very different story. First, Sherrill knows the commercial value of the poultry litter that his farm generates and so doesn't want to waste any. Second, he now understands the environmental consequences of either over applying litter on pastures or letting any of it reach a pond or stream.

Overturning Conventional Wisdom

Sherrill isn't the only one thinking differently today compared to just a few years ago. Guided by the Winrock Institute's iconoclastic approach to rural development, the managers for Winrock's 1992-1995 poultry litter project successfully overturned key tenets of conventional wisdom and demonstrated better ways of doing business. Disseminating university research findings through an outreach program that included hands-on farmer field days along with mass-media publicity and a toll-free information line, the project delivered several important lessons to the general public, to farmers and to the array of local, state and federal agencies dealing with both agricultural and environmental issues.

Poultry Litter: chicken or turkey manure mixed with spilled feed and poultry house bedding which may include wood shavings, sawdust, rice hulls, peanut hulls, etc. Both nutrient content and moisture level are highly variable in poultry litter. Composted or pelletized litter may be more uniform in nutrient content and moisture level and is certainly easier to handle. Litter is used both as a soil amendment to raise crop yields on poor soils and as a cattle feed supplement.

The Poultry Industry: poultry is the #1 farm commodity in Arkansas, valued at over $2 billion and creating 1 out of every 12 jobs in the state. Raising over 1 million birds every year, Arkansas is the largest broiler-producing state in the nation and ranks third in national turkey production and sixth in egg production.

In this particular project, the targeted accepted beliefs were that:

1. pursuing environmental objectives necessarily requires government regulation, creates conflicts and imposes costs;
2. on-farm problems require on-farm solutions;
3. poultry litter's value is limited to its nutrient (NPK) value;
4. poultry litter is too low-value to move beyond a 30-mile radius;
5. disease concerns rule out the use of the same trucks for delivering clean bedding and back-hauling poultry litter;
6. you can't arbitrarily create a new market — and certainly can't create one quickly.

As brought out consistently by the 52 farmers, litter brokers, poultry industry officials, researchers, government agency staff and volunteers, and Winrock personnel interviewed for this report, these beliefs were individually identified, challenged and vanquished in the step-by-step progress of the poultry litter project.

The first-level result was that Winrock *did* create a multi-state market for poultry litter. Today, just three years after the project was launched, row-crop farmers in the Delta region of eastern Arkansas regularly buy poultry litter by the 24-ton truckload

both directly from western Arkansas poultry farmers and from the private brokerage firms that Winrock helped establish.

The second-level result carries the project far beyond Arkansas — and far beyond poultry litter. Livestock farmers and government agencies in Virginia, Maryland, Michigan and other states have followed Winrock project activities closely. At the U.S. EPA's regional office in Dallas, for instance, Brad Lamb reports that he has drawn heavily on Winrock's "knowledge in dealing with animal waste" in implementing a new EPA program to cope with a Texas-scale flood of dairy manure.

The potentially most significant result is that the Winrock project proves that "Jobs and Clean Water" can mix. Conventional wisdom insists that society and individual polluters must pay high prices for cleaning up environmental problems — problems such as water quality degradation linked to concentrated livestock operations. Winrock set out to prove that creative thinking could solve environmental problems with market-driven systems which provide both environmental and economic benefits. By creating a self-sustaining private-sector market in poultry litter, Winrock demonstrated that it was possible to address environmental problems in ways that, instead of imposing costs, create new jobs and new income.

Replicable Market-Driven Solution

Creative people may design new markets that provide no-cost, private-sector solutions for problems such as cleaning up the nation's hazardous waste dumps, disposing of spent nuclear fuel or saving the world's rain forests. If so, these innovators will be able to use the Winrock poultry litter project as a working model which demonstrates how to create such a market. Sandra Miller, the Winrock staffer who drafted the original proposal to create a poultry litter market, puts it this way:

> "We set out to demonstrate that you could address environmental problems with economic market solutions that made everyone better off, or at least no worse off. I think we have done that."

The importance of the project for Arkansas is that a new market is in place that helps Delta crop farmers improve poor soils, helps poultry farmers dispose of any excess poultry litter and generates additional income for both groups of farmers while at the same time reducing a potential threat to water quality in poultry production areas.

For Sandra Miller, the project's importance reaches far beyond Arkansas:

> "The basic question is 'How do you create supply and demand simultaneously? In a situation of no supply and no demand, how do you create a market?' We showed that it can be done through trial and error that eventually arrives at the right points for strategic intervention, in ways that don't require government regulations.
> "What is important, what is replicable in all this is the thought processes. The questions you ask."

Starting with a series of questionnaires mailed out to farmers and poultry house clean-out contractors throughout the state, follow-up interviews and detailed analysis of the survey results, Miller recalls that:

> "We set out to find the critical constraints, the market barriers and then worked with the clean-out contractors, the people in the middle, to develop demand through getting information out and getting the price down. . What we didn't do was scold farmers for not responding to the opportunities we saw. . . We were always looking for the underlying causal relationships and critical barriers, for the intervention points that would allow us to make incremental advances. . . To make it all work, we knew that access to good market information was vital for all participants in the market, the buyers and the sellers."

As a result of asking the right questions — and refusing to be discouraged by the dead-ends along the way (such as the one-ton bags of litter that refused to unload) — Winrock's USDA/SARE-supported project demonstrated in very practical ways that:

1. achieving environmental benefits actually can create jobs and new sources of long-term income;
2. on-farm problems may require state-wide, regional, national or international solutions;
3. poultry litter's value is far greater than its nutrient (NPK) value;
4. poultry litter can be moved hundreds of miles economically once its full value is recognized;
5. standard truck cleaning makes it possible to back-haul poultry litter, reducing costs for both delivering bedding and back-hauling litter;
6. it is possible to create a self-sustaining private-sector market that generates a mutually

supportive combination of economic and environmental benefits.

The Winrock Impact

Networking

What Winrock has done in working with farmers like Jerry Sherrill is provide them with information tailored to their specific needs along with access to a full spectrum of outside resources.

In the poultry litter project, as in its other rural development activities, the key to Winrock's successful intervention has been its wealth of contacts — its ability, for instance, to connect participating farmers with other farmers; with the right sources for federal, state and local assistance; and with researchers able to provide very specific, replicated answers to very specific questions.

Winrock's Fee Busby, manager for the poultry litter project, explains that the networking established both through personal contacts and via the project's toll-free 800 line serves more than just poultry farmers interested in marketing their poultry litter. Winrock's poultry litter network includes researchers throughout the country, government agencies dealing with both agricultural and environmental issues and businesses that offer litter clean-out, hauling and spreading services. Most importantly, says Busby, the network includes the end users in the new market:

> "Crop farmers who have seen the productivity of their land reduced because of precision leveling or because of other soil problems now have an opportunity to purchase poultry litter at a fair price and restore productivity."

Poultry Litter Hotline: launched by Winrock in 1993, the hotline provides a "dating service" to link prospective buyers and sellers. Callers are questioned about how much litter they want to either sell or buy, the time when it will be available or needed, and hauling and spreading details. This constantly updated information is available to hotline callers directly or at local County Extension and Farm Bureau offices. Proving that the hotline serves market needs, Farm Bureau has funded and operated the hotline since July 1994. To check out the hotline for yourself, call 1-800-467-3898 during normal business hours.

Managing

Intervening to help identify and solve rural problems requires not only a broad range of practical agricultural, business, social and political skills. It also requires something that Winrock has developed over many years — credibility as a neutral source of expertise, a flexible source unhampered by hidden agendas or institutional self-interest.

One point voiced repeatedly in interviews with farmers, truckers, poultry industry officials, government administrators, university researchers and others involved in the poultry litter project was that Winrock's clear objective throughout the project has been to enable project participants to solve problems for themselves in ways that would bring lasting economic and environmental benefits for everyone.

Winrock President Robert L. Thompson insists that the proof of success for a Winrock project comes only when Winrock withdraws and the new venture continues under its own steam. "I don't think Winrock ought to stay involved in any project," Dr. Thompson says. "Our objective always is to put ourselves out of a job."

In the poultry litter project, Winrock has done just that. The farmers, clean-out contractors, truckers and researchers all urge Winrock to stay involved to the extent that Winrock staff remain available for advice and to lend the "credibility" of the name when needed. Otherwise, poultry litter is on its own now, with an independent farm organization, Arkansas Farm Bureau, now operating the hotline information service and the market itself driven by market forces.

Winrock did create two subsidy programs that will continue without Winrock involvement. Winrock helped secure five litter spreader wagons that are parked at five Arkansas Conservation District offices in row-crop counties for use by local farmers. Winrock also provided money that Arkansas Resource Conservation and Development offices will use to subsidize the shipment of litter from poultry production areas with the greatest potential for litter causing water quality problems.

What Next?

Winrock's Poultry Litter Marketing and Utilization project ended June 30, 1995. In the final weeks before stepping back to let the new system operate without their intervention, Winrock staff were confident that the newly operating state-wide poultry litter market that already involves a substantial number of people and interests would continue to

expand and improve. Staff members explained that the project will only be counted as a success if this market provides so many benefits that it grows without outside support.

Continuing Winrock Role

Yet even as Winrock switches its attention and resources to other rural development programs in the U.S. and overseas, what Winrock set in motion will continue to receive at least indirect Winrock support in the form of:

- Winrock credibility: the state-wide knowledge that Winrock launched the new poultry litter market will continue to reassure potential participants that this market is legitimate.
- Contacts: project participants will continue to be able to consult with Winrock staff members.
- Subsidies: as its final contribution, the project transferred remaining funds to the Resource Conservation and Development Council to create a pilot program to lower the cost of poultry litter shipped from critical watersheds for use on eastern Arkansas cropland.
- Research: due to the creation of the new poultry litter market, university researchers will continue further research in areas such as poultry litter storage, using litter as a cattle feed, and best management practices for applying litter for pasture, row crops and higher-value uses such as golf courses and land reclamation.

With or without Winrock, development of the poultry litter market seems certain to continue. Proof of what the Winrock program has accomplished and a strong indication that the new market is accepted and established is in a May 1995 publication from the University of Arkansas Cooperative Extension Service. This informative brochure makes points that only seem obvious and non-controversial today because of the work that Winrock orchestrated:

- "Poultry litter is a valuable, natural soil amendment that adds nutrients and organic matter to increase soil fertility."
- "Litter is a natural soil amendment that may enhance crop production more than a mineral fertilizer, especially where topsoil has been cut during land leveling operations."
- "Arkansas rice farmers and other row crop producers are a rapidly developing market for poultry litter."

As further proof of the poultry litter project's impact, the new Extension flyer draws on project research jointly funded by Extension and Winrock to point out that:

- poultry litter is "a potential pollutant of surface and groundwater if mishandled;"
- nitrogen content of litter typically increases with the number of flocks raised on the litter until leveling off at four to five flock litter;
- proper storage requires stacking no more than six feet deep (to prevent overheating) and protecting stacks from rainfall and surface runoff (to prevent nutrient loss from leaching and consequent water pollution problems);
- a nutrient management plan is recommended, though not required, for each field where litter will be applied.

A copy of the Extension flyer is appended to this report.

Project Partners

Another reason to expect the new poultry litter market to flourish without Winrock's direct involvement is that right from the start, Winrock identified potential stakeholders in the new market and actively sought their participation. The list of project partners includes not only the project's main source of funding, the U.S. Department of Agriculture's Sustainable Agriculture Research and Education (SARE) Program, but four other funding organizations: the Environmental Protection Agency's Agriculture in Concert with the Environment Program, the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service), the Pew Charitable Trusts, and the Inglewood Foundation.

To supplement the grant funds, time and expertise were contributed to the project by many farmers and entrepreneurs and by U.S. EPA, the Arkansas Contract Poultry Growers Association, USDA's Soil Conservation Service/Natural Resources Conservation Service, USDA's Agricultural Stabilization and Conservation Service/Farm Service Agency, the University of Arkansas' Agronomy Department and Department of Animal and Poultry Science, the University of Arkansas Agricultural Experiment Stations, the Rice Research and Extension Center in Stuttgart, the Southwest Research and Extension Center in Hope, the University of Arkansas Cooperative Extension Service, the Oklahoma Cooperative Extension Service, the Arkansas Soil and Water Conservation

Commission, the Arkansas Conservation Districts, the Arkansas Delta Council, the Arkansas Development and Finance Authority, the Arkansas Development Commission's Energy Office, the Southeastern Region Biomass Energy Program, the Resources Conservation and Development Councils, Tyson Foods, Hudson Farms, ConAgra, Simmons Poultry, Wayne Poultry, O.K. Feeds, OrganiGro, Inc., Rye Farm Management Services, and Natural Gro, Inc.

Lessons Learned

The genesis of the poultry litter project lay in Winrock's "Jobs and Clean Water" program. What evolved was progressive understanding among project staff that the focus of the program needed to change in two important ways to have the maximum possible impact on rural development in Arkansas — and the greatest potential for replicability.

First, the Winrock team recognized that the presenting problem — potential water quality problems in northwest Arkansas related to increasing poultry production — could not be solved within single watersheds or even within northwest Arkansas. Solutions would require a state-wide approach to create:

- demand for poultry litter among row-crop farmers in eastern Arkansas, and,
- an integrated market system including information and transportation to link western supply with eastern demand.

The team also recognized, as Winrock Senior Vice President Earl Kellogg explains, that:

> "Rather than trying to do it all, sanitation, schools, etc., we say that the broad approach is proven not to work very well. Instead, let's find a particular industry that employs a lot of people in rural areas and work closely with that industry."

Working closely with poultry litter generators as well as with potential brokers and end users for this litter has included far more than is now part of the new industry. Winrock's work included some wrong turns, such as one-ton bags, and some avenues that have led nowhere so far, such as shipping by rail or barge, forming a clean-out contractors association to provide certification and training, and establishing uniform standards for poultry litter.

Yet project participants agree that if there hadn't been some failures, they weren't trying hard enough — and that those parts of the project that have failed or haven't worked out so far can be as valuable as the project's successes.

Overall, the lessons learned include these:

- Environmental problems demand economically viable, sustainable answers — answers that may need to be regional, state-wide or national in scope.
- Shape the solution to fit the problem, not to fit existing boundaries, turf or preconceptions.
- "Jobs And Clean Water" are compatible if there is proper information and management.
- Market forces can be used to create systems that provide both environmental and economic benefits.
- Critical barriers must be identified and removed one by one.
- Expect and build on "incremental advances" rather than wait for dramatic breakthroughs.
- Public/private partnerships are essential.
- Information is key: held by a few, it gives unfair advantage; freely available, markets can work equitably and effectively.
- People living on the margin are risk averse but the right intervention strategies directed at their needs can change their behavior and enlist their participation.
- Become familiar with, catalogue and build on rural America's wealth of existing resources which can be leveraged through networking and coordination.
- Never underestimate the veto power of established interests opposed to changes such as the formation of a new trade association.
- Project failures can be as valuable as the successes, helping future projects avoid the dead ends.

Recommendations

Three years of hard work by a diverse network of people has produced not only a working poultry litter market in Arkansas but a replicable model for rural development. As Russ Perkinson, Nutrient Management Program Manager for the Virginia Division of Soil and Water, explains, there needs to be a pooling of information — sharing the failures along with the successes — to help transform animal waste management problems faced in every state into economic opportunities. Perkinson notes that just as is true for Arkansas, Virginia has been working hard to develop nutrient management plans for individual poultry farms and to create markets for poultry litter.

There have been disappointments. A large volume of poultry litter is moving from poultry houses to

rice and other cropland in the Delta. This movement has turned a potential environmental problem into additional income for both poultry producers and row-crop farmers. The project's greatest disappointment is that this litter movement has been almost entirely from poultry farms relatively close to the Delta region, not from the more remote western Arkansas counties where the potential water quality threat is greatest. The reason for this pattern of movement is that trucking costs are significant when handling high-bulk, low-value poultry litter. Crop farmers naturally buy from the closest source to keep their costs down. To deal with this disappointment, the Winrock project's remaining SARE funds have been earmarked for cost-share payments that the Resource Conservation and Development Council will use to lower the cost of litter shipped from the most critical watersheds.

To deal with other areas where the poultry litter project's accomplishments could be enhanced over the coming years, this report recommends that despite the formal termination of the project, Winrock International:

- Continue to monitor the growth of the poultry litter market.
- Seek ways to provide for more uniformity of litter products.
- Help entrepreneurs prepare applications for AARC and other federal and state grants and loans to expand their new businesses.
- Secure funds to support a continuing role for Paul Brown in advising program participants, speaking at farmer field days in Arkansas and making presentations on project findings to interested groups in other states.
- Monitor the pilot cost-share project now being used to move litter from critical watersheds and publicize its results as an example of how USDA and EPA water quality funding might be used more effectively.
- Continue to encourage clean-out contractors to form an association to be responsible for registration, certification and on-going training.
- Continue to educate row-crop farmers on litter so they are able to buy the most suitable product for their needs at a fair price.
- Act as a clearing house to provide farmers and researchers with access to ongoing poultry litter research and to potential funding sources.
- Maintain contact with researchers and government agencies in other states to coordinate findings and assess differing approaches to the universal problems associated with waste handling.

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II. Turning Two Environmental Problems into a Market Opportunity

> "Winrock, an independent, nonprofit organization, works to better the lives of people in rural areas by improving agriculture. That work is made possible through the generous support of development agencies, foundations, corporations, and individuals. . . The Institute achieves its goals by helping to create and improve the institutions responsible for long-term change."
>
> from *Seeds*, the Winrock newsletter

Winrock's poultry litter project benefited from a fortunate combination of circumstances. In fairly rapid succession,

- University of Arkansas soil scientist Dr. Richard Norman recalled the barnyard manure his father used to turn their back yard into a lush lawn long before any of the neighbors' yards in the new development turned green — and so started experimenting with poultry litter on "cut" or leveled rice fields;
- Arkansas farmers started widespread precision grading of their rice fields to reduce irrigation costs and improve management, sometimes cutting away up to six feet of soil and scraping down to unproductive red clay;
- the national media zoomed in on water quality problems in Arkansas as part of its coverage of Arkansas Governor Bill Clinton's presidential campaign;
- the Winrock Institute refocused its "Jobs and Clean Water" program to show that both eastern Arkansas croplands and western Arkansas water quality might benefit from a "market-oriented" solution — trucking poultry litter to where it was needed to boost crop yields.

Poultry litter got another helping hand in the form of a sharp rise in commercial fertilizer prices, with plant closings pushing nitrogen from $180 up to $280 a ton in Arkansas early this year. Row-crop farmers in Arkansas' flat Delta region started paying more attention to the research results and publicity about how poultry litter — now seeming more competitive with commercial fertilizer — could boost yields dramatically on poor or cut soils. Until this year, poultry litter at $40 to $60 per ton penciled out only for rice farmers with deeply cut fields. Now, it seemed to make sense even for soybeans, cotton and wheat.

Making the Connection

Winrock's response, back in 1991, was to reason that there must be some way to connect eastern crop farmers suffering from low yields on cut soils with western poultry farmers coming under fire from environmental groups for threatening water quality.

Characteristically thinking in terms of how each project can be useful to other areas facing their own environmental and economic problems, poultry litter project manager Fee Busby says that the key lesson of the project is that "You can't always solve your problem in your own back yard. You've got to look outside of the box." In the case of poultry litter, he concludes:

> "We wouldn't be moving a pound of poultry litter from the west if there weren't problems with rice and cut soils in the Delta. Something like this only works when there is a real economic benefit at both ends."

Dr. Busby points out that with today's increasing concentration of livestock operations, whether with beef or dairy cattle, hogs or poultry, "There's no way you can use all the manure in the local area." Where there is a threat to water quality, he says, whether in Arkansas, Michigan, Maryland or California, "if you want to maintain production of the livestock industry, it may be worth it to subsidize the transportation of the manure." He sees Arkansas as fortunate since poultry litter's ability to boost rice yields and therefore farmers' income dramatically provides an economic benefit. This benefit can cover the relatively high handling and transportation costs to get poultry litter moved to where it is needed. In other cases, Busby and other Winrock staff explain, it may be necessary to subsidize the movement of poultry litter or other materials

"Through Sandra Miller's vision," Busby says, "we were able to identify the connection between the problem in the Delta and the problem in the west — two problems that were each other's solution. The problem in the Delta came first and provided a market opportunity." At that point, Winrock's

creative approach to problem solving "helped people identify connections that they might not otherwise have been able to see."

Once the connection was made, Busby says, Winrock stepped in to fund research studies, publicize the results and set up its toll-free Poultry Hotline to provide the information and the buyer/seller contacts needed to launch the poultry litter market. Busby says he was convinced that once crop farmers were using litter and "happy with the results," they would spread the word. Just as first envisaged in Winrock strategy meetings, the market has developed to the point where the innovators have gotten good results, their more cautious neighbors are now trying out litter for themselves and there is enough interest and volume so that farmers now are "willing to pay a bit more for the litter."

One Little Unreplicated Test Plot

Dr. Richard Norman is pleased with how far the use of litter has progressed from his first experiment in 1988 when "We put out one little unreplicated test plot and three weeks after we seeded, we had a bare field except for one little square of rice."

After that first dramatic result, Norman teamed up with University of Arkansas colleague David Miller and, with support and funding from the Arkansas Delta Council, they jointly carried out research projects that documented poultry litter's beneficial effects.

Building on Rick Norman's research results, Winrock's Sandra Miller reached three conclusions:

- "to make poultry litter a more valuable resource, you have to move it off the farm;"
- "if we could get poultry litter cheap enough, demand would exceed supply;"
- and market demand for litter could provide a no-cost market answer to western Arkansas' water quality concerns.

Based on those conclusions, the Winrock team set out to create a low-cost transportation system. Working closely with private entrepreneurs such as Truman Atkinson, Jack Sisemore and Tom Newberry, a system has been at least partially created. The great regret at Winrock is that, as Sandra Miller explains, "Most of the poultry litter moving is not coming out of the most threatened watersheds which are in the more remote and mountainous parts of the state. It's coming from areas along the Interstate." That's why, as its final act, the Winrock project earmarked the remaining project funds to subsidize the transportation of litter out of the most critical watersheds.

Miller recalls that one early Winrock conclusion was that their market-creation strategy depended on creating sufficient volume. Today, the market isn't perfect. Volume, already at an estimated 150,000 tons per year, is large and steadily rising. Problems remain, such as the cases of Delta farmers negotiating "deals" on poor quality litter that no one else would buy. More needs to be done to educate buyers about what's worth paying top dollar for — litter that had four or five flocks raised on it without the nutrient-rich "cakes" being removed between flocks. In the meanwhile, says Winrock Vice President Kellogg, "It is a very unregulated market with people getting ripped off, which is exactly what you would expect of a new, emerging market."

Winrock staff would like to see such problems handled by the market itself, through steps such as the creation of an independent clean-out contractors' association that would provide training and certification for the people hauling and spreading the largest volumes of litter. In the meanwhile, says Sandra Miller, not only is the market operating and litter moving, but "One important measure of success is that there is not as wide a range in prices as when we started."

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III. Winrock's Market-Oriented Win/Win Philosophy

> "The poultry project is a good example of how to use government funds to kick-start an activity or new enterprise that can be technically and economically feasible and environmentally sound and can ultimately be embraced by the private sector."
>
> Jim Wimberly, Director, Biomass Utilization Program, Winrock

Winrock's poultry litter project has attracted its share of criticism — almost all of which is in the form of regrets expressed by Winrock administrators who now acknowledge they should have done more sooner both to recognize the importance of the project's accomplishments — and to publicize these accomplishments far more widely.

Winrock President Robert L. Thompson has no doubt that "The biggest environmental problems in American agriculture today are associated with animals — with concentrated cattle, dairy, hog and poultry operations. He is convinced that "If you can create a market for dealing with animal wastes, it beats the heavy hand of federal regulation. And creating new income opportunities off the farm makes it a win/win situation." Accordingly, he is pleased with the poultry litter project's success as proven by the fact that "the private sector is making good use of the things we started with the poultry litter project."

Winrock Senior Vice President Kellogg recalls that the poultry litter project and its precursor "Jobs and Clean Water— We Need Both!" program were launched on the basis of fundamental Winrock convictions:

> "We often see environmental concerns and economic goals as competing activities. They don't have to be. We need a strong economy but we have to have an economy that will allow us to deal with environmental challenges effectively. We believe that there are ways to enhance the environment while pursuing economic goals."

Dr. Kellogg explains that Winrock's role is to be "the broker or facilitator. Winrock is not going to do basic research and usually will not operate a for-profit business. Instead, we can visualize, conceptualize and work with both university researchers and private entrepreneurs to get the job done."

Kellogg says Winrock's philosophical approach to rural development, as in the case of the poultry litter project, is founded on "the notion that the private sector is an extraordinarily important part of rural development." Based on this approach, he says, "We look for ways to enhance the productivity of private sector activities. If they make money, that sustains the activities."

Whether the project involves Arkansas, California, Egypt or Bangladesh, Kellogg believes that sound development must be based on three factors:

1. "increasing productivity and incomes;"
2. "sustainability, which means finding ways to keep the momentum going by setting up institutions or mechanisms to continue the development process after we move on to other areas;"
3. "equity, which is often forgotten and which means that we can't have sound development without paying attention to the people or institutions on the margin, that are being neglected in our economic system."

Kellogg attributes the poultry litter project's success to the fact that Winrock staff share this market-oriented approach to rural development. He says the project worked so well because Winrock made the right connections — launching a state-wide poultry litter market to address water quality concerns and creating a complex network of farmers, truckers, researchers and government agencies to make use of this new market.

Winrock's U.S. projects such as with poultry litter or pellet stoves in Arkansas and with small wood and metal manufacturing companies in Kentucky offer important models for other U.S. and overseas projects, Kellogg says. In each case, he explains, the Winrock aim is to "make that industry more efficient, improve their profits and help them cope with government regulation — make them healthy industries that can employ more people at higher wages."

Winrock Vice President Hugh Murphy adds that Winrock picked wood wastes and poultry litter to work with in Arkansas because:

> "We saw a state that is immensely biomass-rich and saw that this wealth of biomass was not being used effectively. . .We knew the Delta had problems where the topsoil had been scraped

> off and then we saw a real problem with the concentration of poultry litter in the western parts of the state. . . We said, let's see if we can't marry these two problems and we tried. Our first idea didn't work, using one-ton bags. But when we combined the two problems, we found we could create an economic opportunity."

"The researchers still aren't sure why," Dr. Kellogg continues, "but the research shows that poultry litter does something to the yield response curve. It increases that more than the equivalent level of nitrogen would, probably due to the organic materials or microorganisms that subsoils need... I was amazed when I saw the experimental results."

Murphy says "We have shown that what you can do with poultry litter as a soil amendment can apply to cattle and hog manure as well, whether in Minnesota, Iowa, California or Nebraska."

"We have shown there can be better ways to deal with non-point pollution than simply writing new laws and regulations," Kellogg points out, noting that Winrock's past work in this area led the U.S. EPA to seek Winrock's help in designing a program to deal with dairy wastes in Texas.

These signs of success, however, haven't stopped these Winrock administrators from criticizing their own performance. "We should have viewed the poultry litter project as more of an innovative approach rather than as a project limited to dealing with just the poultry litter problem," Kellogg comments. "We may not have recognized the creatively of this enough early on and we've ended up concluding that maybe we didn't make enough investment in expanding the private market as early as we could have... We could have spent more money on publicizing the benefits of poultry litter and pushed more on opening up additional markets."

Murphy is convinced that if the benefits of poultry litter are publicized and understood, "there are immense opportunities." He says that if properly managed, poultry can provide win/win alternatives to such "environmentally insensitive" practices as building more land fills or "exporting our environmental problems to Mexico." He sees many uses for poultry litter and other "waste" materials in bringing overworked farmland back to full productivity and restoring land damaged by flooding or mining operations.

Dr. Rick Norman shares Winrock's enthusiastic view of litter's future and welcomes Winrock's role in making his research findings widely available. Yet he is convinced that change comes slowly within the farming community and that therefore the new litter market will require continuing support since "We won't be able to put a value on the organic benefits of litter for another four or five years."

Murphy notes that the poultry litter project successfully "brought the environmentalists and chicken farmers together, when if they'd gone on doing what they had been doing, both would have been spending their money to hire lawyers."

Kellogg says that one of Winrock's major strengths is that "We have built an organization with credibility with both sides; we can talk to both agricultural and environmental groups."

Best of all, says Murphy in summing up the litter project's accomplishments, is that the small entrepreneurs now trucking large volumes of litter "consider it their own idea."

Winrock Strengths

Developing ideas and then successfully creating a widespread sense of ownership of these ideas — this is the strength of the Winrock system according to Jim Wimberly, director of Winrock's Biomass Utilization Program that intersects at many points with the poultry litter project.

Wimberly explains that while projects such as poultry litter, pelletizing waste sawdust to create an efficient heating fuel, making Kentucky sawmills more efficient and creating markets for hog and dairy manure all are separate, the close working relationships among the Winrock staff managing these projects adds synergistic value to each of the projects. Due to this synergy, it's not surprising that studies prepared for one of the projects often provide valuable resources for other Winrock projects.

Wimberly explains that

> "One of the best outcomes of the litter project has been the quantification of the economic impacts of using litter on cut rice soils. Most research that has evaluated the impacts of manures or organic materials such as compost has focused on the agronomic impacts, with particular attention to crop yields. However, the most important criteria for evaluating a system should be its economic impacts for the end user, in this case the farmer. Support for the farmer today needs to focus on profits, not yield maximization."

New Focus For Research

"It takes an organization like Winrock to bring together the range of disciplines, agronomic and economic, required to fully analyze the impacts of utilization of manure or organic materials such as poultry litter," Wimberly adds, "because to do this requires an understanding of the ultimate needs and an ability to coordinate with the range of specialists involved and to pull together and disseminate the resulting information effectively."

Wimberly notes that with both poultry litter and his own work on compost, "We are facing the same dilemma — historically farmers base their perceived value of such organic materials primarily on the NPK [nutrient] content. However, we have many research projects that have shown from an agronomic perspective there are benefits that can not be explained."

Wimberly calls for additional poultry litter research to "quantify the inexplicable factors" that somehow, as Dr. Norman's research has shown, boost rice yields dramatically on poor soils.

For Wimberly, the key to solidifying the newly formed poultry litter market is to demonstrate clearly to farmers the full value of litter — value that significantly exceeds the relatively small amounts of NPK (nitrogen, phosphorus and potassium) provided by the litter. Once this full accounting of value is made, Wimberly explains, then the market will operate more efficiently and equitably — making it more able to achieve Winrock's remaining objective of drawing litter out of the more remote watersheds that have been bypassed due to higher trucking costs. Wimberly sums up the sequence this way:

> "Agriculturists must be encouraged to incorporate economic analysis of any such future treatments and the ultimate need is to transfer that information back to the farmer. To the extent that the economic value of the material can clearly be shown to be more than just the NPK, then the willingness of the farmer to pay for the added value will drive the engine, drive all the economics of the entire system from the supply through transportation and land application."

Add Enough Value — and the Market Will Take Over

Typical of the Winrock attitude of putting the farmer and his profitability first, Wimberly adds that fully substantiated research findings are essential since "We have to be able to convince the farmers and we don't want to push them in a certain direction unless we are completely confident that we are pushing them in the right direction."

Wimberly is convinced that once the economics are right — once farmers are willing to pay higher prices for litter based on an understanding of its full value compared with commercial fertilizers — then the market itself will be able to correct remaining problems such as:

- "ensuring that litter is moving out of the critical watersheds,"
- "having the industry itself, not government regulators, establish quality standards for poultry litter,"
- "making litter spreaders more widely available in the row-crop areas,"
- improving brokerage and storage systems "to optimize the timing of litter application which should not be based on when the chicken houses are cleaned out, but on when particular farmers need to apply the litter on their land."

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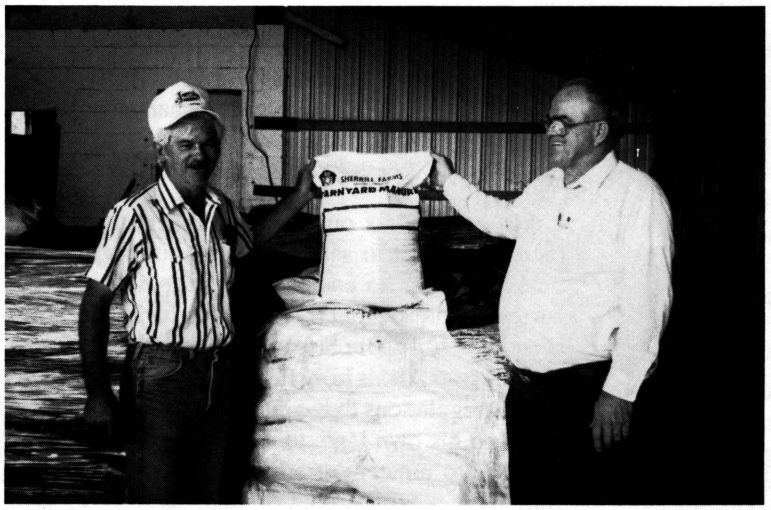
IV. Poultry Growers of Western Arkansas

"The people in farming are not good marketers, not good at getting full value for their products. That's where Winrock's help is really valuable for me."

Jerry Sherrill,
Arkansas Poultry Farmer

Raising 600,000 broilers every year with only 45 acres of his own to spread the litter on, Jerry Sherrill knew he needed other uses for his litter. Working largely on his own back in the mid '80s, "reading everything I could get from the universities and trying it all," Sherrill quickly learned that "You can burn a building down with composting and I have done that." In the process of his experimenting, he also built up a loyal market for his first products — 40-pound bags of Barnyard Manure, Potting Soil and Top Soil sold through hardware and lawn and garden stores in a 100-mile radius from his busy farmstead. Before long, he was also giving composting talks to garden clubs around the state.



The next phase in the expansion of Sherrill Farms Inc. came when the whole family pitched in to invent, design, manufacture and deliver small user-friendly, odor-free plant food figurines for fertilizing house and yard plants. This latest and highest-value Sherrill product turns half a ton of composted litter — which would fetch roughly $50 when sold in his 40-pound bags — into 2,000 neatly packaged, animal-shaped "Organic Plant Food Figurines" worth about $7,000 at retail.

Developing his businesses hasn't been easy, Sherrill says, so he has welcomed Winrock's help via its poultry litter project because "When you run up against a stump and they throw some ideas at you, some of them work." In return, Winrock staff are enthusiastic about entrepreneurs like Sherrill because they provide practical examples of how potential problems like poultry litter can be turned into very high-value end products through identifying and satisfying consumer needs.

The Sherrill Farms example is also touted because its products do more than just deal with poultry litter. As a key ingredient in his proprietary method for making odor-free composted litter, Sherrill mixes in a furniture factory's mill dust that previously was land filled.

Sherrill's current goal is to "go national" with his plant-food Teddy bear and pony figurines. That's called for continuing help from Winrock and the university experts Winrock linked him up to because "It's tough breaking into a new market." Even in his own area, Sherrill finds it tough because selling bags of compost has become a "very competitive business," now that discounted "lower-value" products are being sold by everyone from feedlots and horse tracks to municipal dumps.

Sherrill uses the Winrock poultry litter hotline, now operated by Farm Bureau, to sell bulk litter at those times when he "loses a pile" that retains raw litter's strong smell. Thanks to the hotline and the Winrock project's overall effort to develop a litter market, he predicts:

"I don't think we'll have any problems in the future with surpluses of poultry litter now that the market

is putting a value to it. As demand increases, the value increases and that makes it even scarcer. Right now, I have people calling me all the time wanting raw litter for their land or for backgrounding steers."

Plenty of Litter Customers . . .

Ramona Fate who began hand-feeding chickens more than 30 years ago agrees that poultry litter demand is likely to increase steadily, providing much needed extra income for poultry farmers. She points out that as well as being the ideal fertilizer for pasture land, litter is "great cattle feed — at our place, the cows would come right into the chicken house after the litter, just like they were grazing grass."

Darrell Shelton, who has just expanded his operations by building four new 500x40-foot poultry houses that will turn out 600,000 broilers per year, expects poultry litter to provide a steady income stream. "I've had people right and left wanting to buy poultry litter; they want everything they can get their hands on." His wife Julie adds that even with a strong local market for litter, she welcomes the development of a state-wide market for "times when it's too wet to spread on the fields around here."

Poultry farmer Alan Thomas is in the same comfortable situation, reporting that "I have people waiting in line to get my litter."

. . . But More Needed Soon

Bob Lakey, State President of the Contract Poultry Growers Association says that he has always "disposed of all of my litter locally" although one load ended up on rice fields in the Delta when he "traded it for 'dozer work." Yet speaking for the low-margin growers that raise chickens under contract for large "integrators" such as Tyson Foods Inc., Lakey says that "Any amount that Winrock can move is very helpful to the growers. Anything that will help the poultry growers get an extra buck is very much needed at a time when we are struggling."

Lakey explains that thanks to higher commercial fertilizer prices "making our litter worth more, I really think that before long we growers will make as much off selling the litter as selling the chickens." Lakey especially welcomes Winrock's role in sponsoring and publicizing research on feeding litter to cattle. "If you process and convert litter into cattle feed, converting it to a high-dollar product," Lakey says, "I don't think there is any other feed source that can compete." Impressed by cattle-feeding prospects, he recalls, "I looked into building a processing plant until I saw that would mean an investment of at least $1 million and I backed off." Given the high entry cost, he says he hopes that Winrock will sponsor "research on building a feed mill to add value to our litter."

Estimating that the average poultry farmer spends $80,000 to build and equip a new poultry house which will net about $4,000 a year "not allowing for your labor or the investments you constantly have to make in new equipment," Lakey says that "Anything done to move more litter into value-added products is really important to growers."

Lakey welcomes the new litter market, noting that "It's only two or three years ago that I was giving my poultry litter away just for the cost of clean-out. This year, I sold quite a lot for $45 a [4 1/2 ton] load, delivered." He attributes this change to the fact that "Winrock has made row-crop farmers aware of the value of litter."

Lakey also points out that he expects to have an increasing need to sell the litter from his 800,000 birds per year to eastern row-crop farmers. He currently spreads much of his litter on his own 125 acres of pasture. But he says that with three streams running through his hilly fields, he expects there will be new regulations that will limit the amount his can apply on his own land. "I'm not arguing with this, we have to protect the environment," he explains, "but in the not distant future, I probably won't have over one-third of my land that I can put litter on, so I will need a market to sell into."

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V. Row-Crop Farmers of Eastern Arkansas

"The farming community has changed. The day of a guy not being attuned to new information is gone. Today we know we've got to be doing a more efficient job as farmers or we know we will not be here. The people who are left are attuned to making progress. If there's research somewhere out there that is applicable to Delta soils, I'm going to find out about it, find out if this is something that's worthwhile for me."

L. D. Brantley,
Arkansas Crop Farmer

Faced with rice yields that haven't gone up during a decade of falling prices and rising production costs, George Dunklin says that he had no choice in managing his farm's 2,400 acres of continuous rice: he had to reduce risk in every possible way in order to achieve his goal of consistently being "the lowest-cost rice producer."

Pointing out that "We really don't have much control over price and we can't control the labor unions at John Deere or the cost of urea [nitrogen fertilizer]," Dunklin says he's done everything possible to control other variables—including the weather.

"We can control how many times the tractor goes over the field, how much labor we use, and how much water we apply," this determinedly innovative farmer explains. In his constant striving for even more control, Dunklin has found that poultry litter provides an extremely important new tool in his operations. He says that the litter has made it economic to zero-grade his fields without sacrificing yields. Once leveled, the easily irrigated and drained fields "significantly reduce our weather risk so that we can get into the field when we want to get in, not when the weather would allow us to get in."

When Dunklin began leveling fields in 1987 to improve management and profits, one time- and money-consuming part of the work was piling the thin layer of topsoil and then re-spreading it over the cut red clay. Then he heard about university research results with using poultry litter on cut soils and got excited. He recalls that his more efficient operations today date back to when:

"We gave the university 15 acres, divided into six different fields, with cuts in every field from 6 inches up to 3 feet. We set the university up for three years of studies in those fields. But after I saw the results that first year, with yields on the cut land that were zero where we didn't apply the poultry litter and 90 percent of normal where the poultry litter was applied, I didn't have to wait for the three-year study to be

Rice on precision leveled field without litter.

Rice (same area) with one ton per acre of litter.

> convinced. I saw where that first summer, after two months, on the untreated land the rice died while it was beautifully lush and up to your waist where the poultry litter went on. I started that fall, the fall of 1991. That was the year we made our first dramatic cuts down to the red clay, our first year of zero grading."

Dunklin contracted with a local man to "buy all the litter he could find for me" and at the same time "we went into intensive leveling." Thanks to the remarkable restorative action of the poultry litter, he says, he was able to zero-grade virtually all of his rice fields. After applying two tons of litter per acre on the cut soils the first year, he has continued to apply half a ton per acre per year for maintenance.

Dunklin is so convinced of the value of adding poultry litter every year to build up the soil that he has considered adding poultry houses as part of his 15,000-acre farm's mix that now includes cotton, corn, milo and wheat along with rice. All he's waiting for, he says, is to find a poultry integrator willing to sign a five-year contract.

After working closely with Winrock and University of Arkansas researchers and the Arkansas Delta Council, Dunklin insists that "We need to continue the research." Convinced that "transportation is the killer," he says that "Winrock either needs to find some way to change the basic litter to get it into a more economically transportable form or get the poultry houses here near our fields to cut out the transportation costs."

Farmer Field Days

George Dunklin convinced himself of the value of litter. To help convince other farmers, the Winrock poultry litter project sponsored a series of field days to share research findings, introduce crop farmers to poultry growers and brokers with litter to sell, and to provide a hands-on demonstration of the custom poultry litter spreader wagons farmers now can borrow to spread litter on their fields.

At the Winrock field day held in Conway, Arkansas, J. C. Rodman went away with a litter broker's phone number, a breakdown of litter prices that he'll compare to his commercial fertilizer costs and a notion that he may try out litter on some of his 250 acres of hay ground this year. "You've got to be cost conscious," Rodman explained, " so I need to figure how long this litter will benefit my hay ground."

Farmer Mark Wilcox, owner of the land used for the field day, said that once he finishes spreading the litter provided for the demonstration he plans to buy more. Travis Birchfield said he's also ready to try litter out, starting with a 30-acre rice field where leveling has cut away the topsoil. Another of the 40 farmers at the field day, Charles Gates, said he'd put in an order for litter to treat 140 acres of pasture if the local USDA office approves his making the switch from commercial fertilizer.

Worth the Extra Trouble . . .

With his 2,400 acres of cotton, rice and soybeans, L. D. Brantley doesn't have time to spare during spring planting for anything that doesn't offer "good economic justification." But with that much land, he knows how much even a small boost in production efficiency can improve his bottom line — which is just what he's found that poultry litter is doing for his farm.

Intrigued by university research results, Brantley started using raw litter for his precision-leveled land four years ago and says simply that "We got a response." At the same time he found that as he leveled more fields to cut irrigation costs and improve drainage, "clearly we were having some problems in areas where we had the heavy cuts." He points out that "It takes real commitment to use the raw litter" because its bulk and lack of uniformity make it far more difficult and time-consuming to spread than granular commercial fertilizer. That's why he experimented with composted litter at from $115 to $300 a ton until he found the raw litter at $30 a ton "works equally well." Litter works so well in raising yields on his cut fields that he's committed to spreading half a ton per acre whenever possible. But he ran into weather and availability problems which forced him to plant his rice without litter this year.

Brantley has found that "The benefits of managing the water better are well worth the costs of leveling the land" particularly now that poultry litter allows him to avoid yield losses on his cut fields. He explains that he's using litter as a soil amendment, to build up his soil, not as a fertilizer. "I think the poultry litter gives me something I can't buy in the manufactured fertilizer," he says. "Since we have such low organic matter in our soils, the litter helps with water retention and even helps with herbicides since crops are more sensitive to herbicide injury in low organic soils."

Brantley welcomes Winrock's help in creating a poultry litter market and says it's been particularly helpful to have a spreader available locally for borrowing. To help even more, he would like to have

Winrock arrange to stockpile litter in the row-crop areas to have it available during the sometimes narrow windows between spring rains.

. . . and the Smell

Aside from being awkward to spread compared to commercial fertilizer, Brantley says the only disadvantage he sees in litter lies "in being a good neighbor." He tells the story of a neighboring farmer who is a friendly rival. The day Brantley spread some typically pungent litter on a field just downwind from the neighbor's house, Brantley recalls with a grin, "He put up the white flag." As for Brantley himself, he comments that his litter "starts smelling a lot like money."

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VI. Creating a Research Paper Trail

"Soils have been cut in Arkansas since the 1960s for land leveling to improve irrigation for soybeans as well as rice, often right down to unproductive subsoil. In some cases, you take the soil tests and it all looks fine, yet not even a weed will grow where you've cut."

Dr. Richard J. Norman,
University of Arkansas

Winrock's poultry litter project has generated an impressive and continuing paper trail, both in research directly funded by the project and also in research triggered by the higher profile that Winrock created for litter. Both areas of research certainly have benefited from a larger and more interested audience that now stretches well beyond just the farming and rural development communities and far beyond Arkansas.

It all started seven years ago with Rick Norman's research plots at the Rice Research and Extension Center and his hunch that poultry litter might benefit precision-leveled cropland stripped of topsoil.

Looking back, Dr. Norman recalls that "I knew Arkansas had a lot of poultry litter, so I decided to look into using it." In his first look, "We put out one little unreplicated test plot and three weeks after we seeded, we had a bare field except for one little square of rice."

The dramatic contrast showing up in that first test plot led to Norman running a series of research studies in collaboration with his University of Arkansas colleague David Miller and the Arkansas Delta Council.

Norman and Miller remain uncertain about exactly why litter can help produce a near-normal crop on subsoils where otherwise "not even a weed will grow."

Norman lists several possible answers:

- "you are adding a suite of nutrients when you add poultry litter,"
- "poultry litter provides microorganisms,"
- "litter adds a very active carbon fraction that microorganisms in the soil can consume readily,"
- "litter's effects in the root zone seem to help plants intercept nutrients better."

Adding to the remaining mystery and to reasons to consider litter a "soil amendment" rather than a substitute for fertilizer, Norman notes that litter doesn't increase yields on productive soils although over four or five years, litter will make the soil more workable and reduce Arkansas farmers' serious crusting problems which can leave the soil impenetrable to seedlings.

More Litter for Deeper Cuts

Norman's years of research have convinced him that "farmers with graded soils can't afford not to use poultry litter." With today's litter prices, he says, it makes economic sense to use one ton of litter per acre on graded soils and that "the deeper the cut, the more you will need and the longer you will need the poultry litter."

He says the current research challenge is to determine where else poultry litter can fit in. He expects the answer to be provided by fortifying litter with nitrogen to raise its nutrient value. Once such an "organically enhanced fertilizer" product is available — a product that he says the University of Arkansas hopes to patent — the result should be a product that is good for all farmers, on all soils. He predicts that the increased volume this will bring for poultry litter should make it possible to shift transportation from trucks to lower-cost rail and barge shipment. He also predicts that initially the new product will be available for higher markup uses such as on golf courses and yards.

As he works toward this new goal of a universally useful poultry litter product, Norman praises the work done by the Winrock project. He's a fan of the poultry litter hotline in particular, explaining that before its launch "I was getting all the poultry litter calls." He also appreciates the fact that the program has made litter spreaders available for loan to row-crop farmers who want to try litter for themselves. As a researcher committed to never publishing a research paper that doesn't share the credit among several researchers, he says that "I was glad to have Winrock on board because they're so good at organizing meetings, getting people together and involving more researchers."

Nutrient Recycling Then & Now

Soil scientist David Miller also welcomed having Winrock step in to publicize the findings from his joint research with Rick Norman. "Winrock didn't

get involved in the agronomics," Dr. Miller explains. "Instead, Winrock focused on developing a market for litter in eastern Arkansas, which was something that I felt needed to be done but not something I was able to undertake as a soil scientist."

Miller is convinced that fully developing the new market still calls for outside support due to "the economic forces working against us." He explains that with changing livestock production practices, there's an increasing need for this state-wide market:

> "We have major nutrient problems due to modern integrated agriculture which results in heavy concentrations of livestock production in certain areas that are far from the grain production areas. The 'nutrient cycling' that once took place on the individual farm now may require nutrient cycling on a regional basis, involving transporting materials hundreds of miles."

Miller says that initially, given the relative costs of fertilizer and litter, "Rice was probably the only crop people could grow and afford to use poultry litter. With rice, there was a dramatic response over what they could get with inorganic fertilizers." He says that with poultry litter presenting farmers with handling problems and high transportation costs, it only paid to use it in the Delta "with soils that have basically been drastically and artificially disturbed." He says that particularly when the margins in farming are so tight, "the farmer is not going to pay more simply because it's better for the soil."

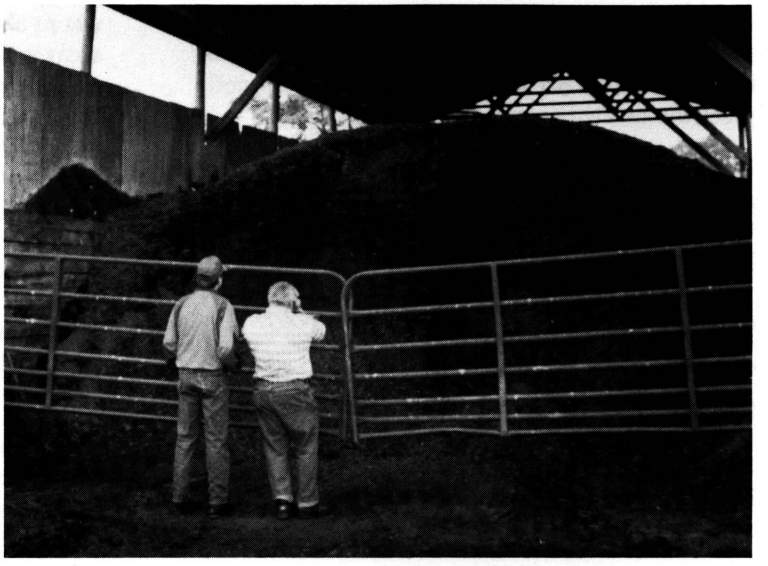
Miller notes that even heavily cut soils will recover naturally but "the poultry litter greatly accelerates the process," thus justifying the farmer's extra trouble and expense. He says he is hopeful that, with further support, the new litter market "will work on a regional scale, because nutrient recycling is extremely important."

Cattle Feed

Two other University of Arkansas researchers, forage agronomist Mike Phillips and animal scientist Bobby Simpson, both at the Southwest Research and Extension Center, have conducted extensive research on supplementing cattle feed with poultry litter as part of the Winrock litter project.

Simpson explains that the research shows that feeding broiler litter to younger cattle has no harmful effects on the animals' subsequent weight gain in a feedlot or on the quality of the meat.

Phillips points out that in studying the use of litter as a high-protein feed ingredient for cattle, "We're preparing for the day when poultry litter will be regulated." Currently, he says, there's a natural fit in western Arkansas where an abundant supply of litter over the years has turned scrub land into lush beef-producing pastures. But Phillips predicts that eventually regulations will limit the amount of litter that can be spread per acre in western Arkansas where the hilly, creek-laced topography makes water pollution a constant concern. Such regulations, he says, will force a number of western counties to export their litter. When that day comes, the researchers hope to be ready with new markets for litter and procedures for separating poultry litter into one portion rich with spilled chicken feed for use as cattle feed, another portion suitable for potting soil and a portion ready to be reused as bedding.



Litter deep stacked for cattle feed.

To make that transition take place as smoothly as possible, Phillips says, he hopes Winrock will continue its "outstanding role in bringing people and agencies together" to solve problems before they become crises.

Extension—Trying to Do More with Less

In a University of Arkansas Cooperative Extension Service discussion of the litter project, Gary Huitink echoes Phillips, recalling that Winrock not only created a network of agricultural interests but enlarged the network in important ways by bringing

in "people who haven't been our clientele" such as the clean-out contractors that Winrock's initial surveys identified as key to launching a litter market. Huitink adds that as a result of Winrock's initiative, Extension "will be pushing more aggressively, more involved" in developing the new litter market.

Huitink sees a need for enlarging and continuing Extension's involvement, explaining that "we're talking about much more than just connecting buyers and sellers — the litter business requires knowing how to put litter on the right land, at the right time, at the right rate." Extension Economist Wayne Miller, the author of a series of studies carried out as part of the Winrock litter project, points out that "the key is getting people aware of the true value of litter, and that's got to begin with letting all the county [Extension] agents know this new litter market is a priority." Huitink agrees, explaining that at a time when Extension personnel are constantly being expected to do more despite shrinking resources, "I've never had enough time or money to do this program justice, to provide the educational program that's needed."

Huitink says that ideally he would convene "a session where this information is shared with the county agents as a group." He also would like the money and the manpower "to assist new clients, such as truckers" and to provide "all the soil and litter testing that needs to be done."

Wayne Miller says one urgent reason for more active Extension involvement is that "some farmers have been burned on poultry litter on composition and rates," paying too much for poor quality litter or not getting the promised results simply because they hadn't been given enough information "to make more rational decisions." Extension Environmental Policy Specialist Tommy Riley says Extension has an obligation to "provide the consumer the opportunity to ask the right kind of questions, such as how many flocks have been on the litter."

Riley warns that Extension will face more demands on its resources once buyers are taught to ask the right questions: "The farmers in eastern Arkansas are used to pulling soil samples, so they are going to demand litter analysis." Huitink replies that one answer would be to "develop a portable testing kit, for when the truck shows up in the field." He adds that Extension should also work with the truckers who haul litter so that "they will know the answers" to buyers' questions about litter and how to spread it.

Wayne Miller says Winrock and the University of Arkansas Cooperative Extension Service need to work together to help establish standards for the new litter industry. He adds that uniform standards are an essential part of establishing a continuing business in which buyers have the knowledge to both buy a good product and "get the most out of it." Extension Soils Specialist Stanley Chapman points out that establishing realistic standards will depend on further research on handling, stacking, storage and mixing to produce uniform products which maintain nutrient levels within a certain range.

Riley notes that since timeliness of litter application will be as important as product uniformity, there may be a need to build stacking sheds in eastern row-crop areas. Given the need for "massive stockpiles" of perhaps 2,000 tons each, the University of Arkansas Cooperative Extension Service specialists agreed this is an area that calls for research to determine if such a approach is feasible. They agreed that composting offers the best avenue toward creating more uniformity and easing handling problems, but warned that composting probably won't make economic sense "until the buyers learn the true value of the litter" and are willing to pay more for litter.

Riley suggested that one option to investigate is combining litter with municipal leaf and yard wastes so that litter composting costs could be offset by the tipping fees paid by the cities. The Extension officials added that Winrock could be very helpful in working out such arrangements since "Winrock can get dollars we couldn't touch" and since "if anyone can bring some of the key players, such as the poultry industry, together, it is Winrock."

Huitink said that the key point is that all parties involved or potentially involved in litter, from poultry growers and row crop farmers to environmentalists who worry about smell and air quality, must "learn about the full value of litter." Once they do, he predicted, "this knowledge is what is going to motivate people to spread it properly."

Project coordinator Paul Brown, a USDA Soil Conservation Service official who was loaned to the project by SCS, adds that disseminating such knowledge also will eliminate some of the initial problems such as when unscrupulous companies and salesmen misrepresented research findings in marketing litter.

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VII. Tapping Existing Rural Development Resources

> "Winrock filled a void that we, as a government agency, could not fill. I think there is a continuing need for some kind of coordinating effort to keep the momentum going. This project should continue to the point where every farmer, even in the more remote areas, can get a competitive bid on any chicken litter he wants to sell."
>
> Jerry Mitchell,
> USDA, NRCS

Winrock staff stress that a primary reason for the success of the poultry litter project was that they were able to pick Paul Brown as the person loaned to the project by USDA's then Soil Conservation Service (SCS, now the Natural Resources Conservation Service, NRCS). Not only had Winrock's Fee Busby, Sandra Miller and Jim Wimberly worked closely with Brown in the past, getting to know him as an expert and practical "problem solver," but they knew he possessed precisely what the project most needed — excellent contacts and credibility among the row crop farmers of the Arkansas Delta region, the area where excess litter from western Arkansas could be put to productive use.

Five years ago, as Winrock's "Jobs and Clean Water" program evolved in the hands of Miller and other Winrock staff, its focus shifted dramatically. At first, Winrock looked at a very full range of farming issues including hog, cattle and dairy manure and dead animal disposal along with poultry litter. The program, as originally designed, sought solutions based on changing farming practices within individual watersheds where there was a potential problem with more manure being generated than was needed for fertilizing the available farmland.

Focusing on Litter

Very soon, Miller recalls, the Winrock team realized that creating a new system that would be both environmentally sound and economically sustainable required working on a far larger scale—state-wide—while focusing Winrock efforts very specifically on poultry litter. Bringing to the problem what Miller calls "a very different perspective," Winrock saw the need to identify and link a diverse group of potential "stakeholders" who could benefit from a long-term system to transform poultry litter from a troublesome disposal concern into a value-added resource.

Drawing on their collective familiarity with agricultural and rural development programs and research, the Winrock team made the vital connections that others had noted but not been able to pursue:

- western Arkansas' abundant supply of poultry litter posed a potential environmental problem;
- Arkansas' Delta region in the eastern part of the state had increasing problems with unproductive soils, particularly with more rice farmers precision leveling their fields to cut costs for both irrigation and harvesting;
- research showed that spring application of one to two tons of raw poultry litter per acre could produce dramatic yield increases on "cut" rice land;
- moving poultry litter from the state's western poultry-producing areas to the flat Delta cropland of the eastern part of the state might benefit the two areas both environmentally and economically.

Paul Brown, who as an SCS Conservationist had administrative responsibility for all SCS work in the Delta region, explains in retrospect that the project "could have been more successful if we could have figured out more ways to lower transportation costs." The flip side to Brown's disappointment was voiced by Sandra Miller. She notes that by the time the original "Jobs and Clean Water" proposal evolved into the poultry litter program, "We had figured out that bringing buyers and sellers together and reducing cost of moving litter were the two key constraints." She says "The defining moment was when the conventional wisdom on back hauls [that poultry litter couldn't be back hauled in the same trucks used to deliver rice hulls and other clean bedding materials] was overturned by Paul Brown's one phone call to Dr. Ellis Brunton at Tyson Foods." That one call led to Brunton assuring Brown two weeks later that there would be no problem with such back hauls as long as the trucks were washed out and disinfected with a 50 percent bleach solution after each load of litter.

One phone call challenging an assumption dramatically lowered transportation costs, put a private-sector market solution within reach and became an example for this and future projects,

highlighting the importance of identifying, questioning and removing "critical constraints."

The Winrock project included a number of attempts to reduce transportation costs such as loading litter into giant sacks to use flatbed trucks, compressing litter by using cotton module builders to ease handling by reducing bulk, or using lower-cost rail or barge. All of these approaches would have lowered transportation costs — but, as yet, none have turned out to be practical. What did work was taking advantage of back-hauling to keep costs down — and persisting in the face of apparent road blocks.

Transportation costs is a key factor in litter marketing.

Looking back on progress so far and outlining ways to build on what has been accomplished, Paul Brown insists that one essential element of rural development programs is recognizing the need to address a number of sometimes very different audiences. The poultry litter project, he says, could not have succeeded without consulting and working closely with groups which included:

- the environmental community ranging from government agencies such as EPA to the non-profits such as the Sierra Club, in order to "reach the people who feel there is a problem with animal waste and demonstrate to them there are practical ways to turn potential pollution problems into valuable resources;"
- the university community, to make full use of its tremendous research capabilities that too often remain underutilized due to a shortage of the time and money required to disseminate research findings;
- farmers, including both the poultry growers whose birds generate the litter and the row-crop farmers with land which can benefit from litter spreading;
- the poultry industry including the handful of major "integrators" such as Tyson Foods and ConAgra that set standards for growing poultry efficiently;
- the transportation industry whose trucks and negotiating skills are needed to move litter in the quickest and most cost-effective ways.

Brown acknowledges that more advance consultation might have avoided his major disappointment. Probably due to simple misunderstanding — and lack of time as the clock ran down on the three-year project — Winrock never achieved its goal of helping the state's clean-out contractors form an independent association that would take responsibility for registering, training and certifying its members. Brown says that one early surprise was learning how vital these generally unnoticed people are. He points out that these contractors handle the great bulk of the litter that is moved off poultry farmers' own property and most often are responsible for spreading litter. Until this group somehow is systematically trained in the best practices for handling and spreading litter, he explains, litter will not be uniform, end users will not always get the results they expect and litter's potential benefits will not be maximized.

Brown warns that some problems will continue "until we have proper management of animal waste which depends on having trained applicators who understand the nutrient cycle." Brown welcomes the fact that the Arkansas Soil and Water Conservation Commission secured nutrient management planning funding from U.S. EPA. The money has been used to hire technicians who are working with poultry farmers in most Arkansas counties to develop nutrient management plans. Yet one of these technicians, Jody Rodgers, is the first to point out that more money and manpower should be focused on getting the job done. In particular, Brown insists, a clean-out contractors' association would complement Jody Rodgers' work with poultry

farmers by ensuring that litter is spread according to best management practices on the fields of row-crop farmers far from where the litter is generated and monitored.

University Link

While Paul Brown hoped to provide row crop farmers even more help via a clean-out contractors' association, the efforts to educate and make Delta farmers aware of the value of poultry litter in their soil fertility management, have been very successful. Brown says that as a direct result of these efforts combining the work of a score of government and private organizations under Winrock's direction, "The demand for poultry litter is there if it can be delivered a low enough price." He notes in particular that along with Dr. David Miller's research on using poultry litter on rice, Dr. Rich Norman of the Rice Research and Extension Center "has been the shining light in promoting the use of poultry litter, especially in low production areas"

Brown and others add that having commercial fertilizer prices jump from $180 to $280 per ton provided timely and welcome help by raising the value of poultry litter proportionately. Thanks to everything that was happening, including the Norman/Miller research and rising fertilizer prices, Brown says, transportation expert Truman Atkinson "decided there was a potential, opened up a brokerage business and has been able to significantly reduce transportation costs because he knows the trucking business and so he has been able to arrange back hauls which have been a very important part of selling litter in the Delta."

More good news for the emerging litter market came just as Winrock was about to close down the poultry litter hotline which had been created to link western sellers with eastern buyers. Because a number of Farm Bureau members were using the hotline service to either buy or sell litter or simply get answers to questions about litter, Arkansas Farm Bureau's Ed Cross asked if the independent farm organization could take over running the service — which Farm Bureau now does.

As the poultry litter project continued, momentum built. Cooperating groups provided the additional resources needed to "raise awareness among the poultry growers in Western Arkansas of the potential pollution threat and that they did have a resource that could be marketed." At the same time, working with USDA and state agencies in reaching out to the Delta's row-crop farmers, Winrock staff became aware of another "critical constraint" — that the Delta farmers were ready to buy a lot more litter now that its benefits were documented and spreading practices were being publicized "but they didn't have any spreading equipment" in an area where animals and manure were exceptions rather than part of normal farming practices. The Winrock team responded with a decision to make "loaner" spreaders available, just as earlier programs made now popular no-till planters and laser leveling equipment available on loan through U.S. Department of Agriculture county offices.

Using the Winrock philosophy of expecting and solving a series of problems one at a time, litter project staff weren't discouraged by the fact that their USDA/SARE funding could not be used to pay for litter spreaders. Instead, they discovered that state oil overcharge money could be used for equipment — and obtained a grant. The next hurdle was learning that this overcharge money could not be used for the overheads which are included in any Winrock project. Their solution was to route the $62,500 for five spreaders via the Resource Conservation and Development Councils which do not take out anything for overhead.

Winrock's typically flexible, ad hoc approach to problem solving first successfully worked out a way to buy the custom-made litter spreaders — and then provided additional funding to pay for a series of field days that showcased the spreaders at work spreading litter on the fields of five host farmers. At these hands-on field days, along with having the host farmer hook up the loaner spreader to his own tractor, state and federal agency staff were on hand to answer farmers' questions about litter, Farm Bureau was there to explain the hotline, and private litter brokers eagerly took orders to deliver litter.

Brown reports that as a result of such outreach efforts, "Lots of litter is moving, but not necessarily from where the critical areas are in terms of potential water quality problems. Most of the litter is coming from areas with good access to Interstate 40." To deal with this next problem, Winrock has provided funds for the Resource Conservation and Development Councils to use to subsidize litter purchased from targeted watersheds.

Brown said a similar cost-share program was used by USDA in the past to accelerate the acceptance of no-till planting. With the new cost-share for litter purchases, Brown says, "We hope to demonstrate to NRCS, EPA and the Arkansas Soil and Water Conservation Commission that if you have a watershed problem, it works to offer incentive

payments rather than build structures; it's a better way to spend the money."

Major Water Quality Study

University of Arkansas Cooperative Extension Service Alternative Agriculture Specialist Billy Moore recalls what the USDA Moore's Creek Hydrologic Unit Area Project taught him and the state about poultry litter — and about Winrock's key role in dealing with litter and similar concerns. He says there really are two problems related to litter and water quality — one perceived and one real. "The real problems we can take care of with the knowledge that we have," he says. "The perceived problems are harder to work with" — such as the perception that animal manure was everywhere in northwest Arkansas which was, as one environmentalist group claimed, "swimming in a sea of animal manure." Moore points out that the high-priority Moore's Creek Project involved USDA and EPA at the federal level, the major state agricultural and environmental agencies, the local Conservation District, university researchers, private industry, farm organizations, "and, most important of all, the farmers."

The study involved calculating the total amount of animal manure generated, comparing this with the number of acres available for spreading manure within the watershed, running soil tests on over 20,000 acres in 1,120 fields on 205 farms, and analyzing 262 water samples from wells, springs, ponds, creeks and rivers. Moore says the study concluded that with an educational program to ensure that farmers follow recommended "best management practices" (BMPs), "We could manage any of the litter produced in that watershed without exporting it."

Despite that conclusion, Moore explains, Winrock's intervention with its poultry litter project served extremely useful purposes both short-term and long-term. He says to deal with the immediate problem of public perception of a major environmental problem, "Winrock decided that something had to be done in a hurry and they had a very positive approach by demonstrating through their actions that positive and immediate actions were under way to deal with the problem. They got across the idea that if there was a litter problem, it could be handled by moving the litter to another area where it was needed."

"After we got all our marbles counted," Moore says, "it turned out there wasn't the problem people thought there was, probably because nobody had given enough credit to industry and farmers in managing litter over the years and since chicken houses don't smell too good, they are easy targets."

Longer term, Moore adds philosophically:

> "I think this project served a very useful purpose because it convinced people outside agriculture that we were willing to address whatever problems we had, whether real or perceived... Sometimes we have to do something at the moment when we don't have the luxury of waiting. And there is no doubt that the movement of poultry litter to eastern Arkansas has benefited farmers there, particularly farmers with cut ground or on land with high salt. And for western Arkansas, litter has become a value-added product once it leaves the farmer's chicken house."

Moore adds that transforming litter into a value-added product gives the poultry grower new options. If he finds his soil doesn't need a complete fertilizer, he now can benefit from selling his litter and buying commercial fertilizer to supply only the particular nutrients he needs, whether N, P or K.

In addition to benefits specifically related to litter, Moore points out that "I think there is a definite need for this kind of a program, whether it's run by Farm Bureau, the University of Arkansas Cooperative Extension Service, Winrock or whatever, because what we need much more of is the networking among people and organizations that was part of the litter project... One of the real plusses is the networking among agencies and people that was part of the litter project."

Spreading the Word with Extension

Agricultural Engineer Gary Huitink of the University of Arkansas Cooperative Extension Service remains a key part of the network formed by the litter project. Surrounded by 40 interested yet still skeptical farmers at a litter-spreader field day in Conway, Arkansas, Huitink was one of a team of experts gathered to answer questions in very practical ways. He tells the farmers that Extension's recommendation that farmers use of poultry litter is based on Extension's commitment "to provide those things that are based on research and that have been shown to be sustainable in terms of overall benefits, because we feel if a practice doesn't make economic sense for the farmers, then it is not sustainable."

Huitink then runs through the numbers to show that even if some of litter's nitrogen is not available in the first year and some is lost, "It pays to spread litter when you're getting $15 a ton value from the

litter nitrogen alone, not counting the fact that organic materials may enhance water-holding capacity and build the soil and may make the P and K in your soil more available to the crop."

Huitink then details some of the variables, such as a difference in nutrient value "depending on the time in the house and the bird density on the litter" and moisture content. "Don't stack over five foot deep or there's enough heat to burn out the nitrogen," he cautions. And soil test regularly to ensure that you're always adding what the soil needs — never paying for an excess.

As Huitink and other experts begin convincing farmers that litter is certainly worth a try, Gary Smart of C & S Poultry Fertilizer circulates, explaining that he's not surprised that farmers have found it difficult to purchase litter and have it spread during the spring when it's most needed. Availability problems, he says, were what prompted him to go into the spreading business — a business that has kept him and his partner busy seven days a week this past spring. Ed Cross of the Farm Bureau is another speaker at the field day, telling farmers how to make use of the poultry hotline to link up with litter sellers.

After two hours of listening to the speakers and watching the new litter spreader in action, local farmers including field day host Mark Wilcox, Travis Birchfield, Charles Gates and Bill and Tim Tyler all agree to try out litter on some of their land.

Later, in a discussion on the litter project's accomplishments and remaining challenges, Bruce Leggitt, Coordinator for the eight-county Central Arkansas Resource Conservation and Development (RC&D) Council, says that with the need to spread litter just before planting, "there's a very narrow window, so there's a need to set up distribution centers where litter is stockpiled, with a spreader available."

Debbie Moreland, an RC&D Council member whose husband farms 1,800 acres, says the key to increasing litter's acceptance is to provide more field days:

> "Farmers have to be on site where they can see how something works, with the researchers on hand to answer their questions quickly and concisely, because their time is very important to the farmers. So do what Winrock has done — bring all the resources to them at one site."

Leggitt agrees on the need for more field days to "create a market so farmers will buy spreaders and use litter." He and the other state and local officials also agree on the need to find more cost-share funding to bring litter out of critical watersheds and to continue research on poultry litter. Fred Morgan of the Arkansas Soil and Water Conservation Commission says that the only way to get the cost-share money and to continue research is to go to EPA and "ask for money early and repeatedly."

Moreland says the secret to progress so far has been that "Winrock provided the expertise and the credibility as people who have nothing to gain, who are unbiased." Leggitt agrees, saying there's a continuing need for Winrock involvement at the very least in testifying on proposed legislation because "the legislators know that Winrock has researched the issues."

As the brainstorming session warms up, Leggitt points out that to take advantage of the benefits offered by litter "We need to go after the Forest Service with their thousands of acres of pasture land out there where they are putting on commercial fertilizer. Why wouldn't they want to use litter and the same goes for all the other federal lands."

Gene Holloway, the NRCS Coordinator working with the RC&D Councils, adds that even more needs to be done with the trucking industry because "every trucker is looking for a back-haul after taking rice or vegetables to northern Arkansas or Missouri."

Leggitt, Moreland and others agree: the most essential factor in dealing with poultry litter in particular and rural development as a whole is bringing the full range of agencies and organizations together into a coordinated network — something that Deborah Carmen of AmeriCorps and the Central Arkansas RC&D says "Winrock does so well because of its credibility."

Best of the New & the Old

Joe Moore, District Conservationist for row-crop Prairie County, bears witness to some of the dramatic effects of Winrock credibility. With local farmers still busy planting, he reports that the litter spreader available from his office has been in constant use and that "One farmer is even going to use some for his fish ponds and he's using litter on all of his precision-leveled ground after the results he's seen over the past couple of years."

Moore says he's not surprised at the heavy use in his area because "We've got some of the best farmland in Arkansas and a lot of the best farmers who are well read and keep up on the research." In talking with local farmers about their experiences with litter, he says the only complaints have been about

receiving "some litter that is really trashy, with rocks and metal in the loads." But he says there's increasing demand — and an understanding of the need to work with reputable suppliers — because farmers here have learned that "anywhere your yields are fairly low, if you can spend $35 an acre and get a yield increase, that's worth it."

Moore figures that Prairie County alone has some 80,000 acres of cropland that can benefit from litter to build the soil and boost yields for rice, soybeans and wheat. He says that thanks to research on litter, "Now we're getting the best of the new combined with the best of the old — animal manure." He predicts a continuing rapid increase in demand for litter "unless these guys up in the hills try to jack the prices up too much."

Act Now — Not Later

Dr. Ken Steel at the Arkansas Water Resource Center predicts that rather than jack up prices, poultry growers will see an increasing need to export their litter. He agrees with Billy Moore that the extensive water quality studies done recently show that there is no immediate water quality crisis even in the hilly areas with the highest concentration of poultry houses. However, he continues:

> "Interpretations differ, the data still is incomplete. . . We do have studies indicating that the amount of acreage available for spreading litter is close to the maximum using BMPs and, with rapid growth, we are losing some of that land for spreading. . . Personally I favor the perception of crisis. I'd rather control the problem by acting now rather than have to take remedial action later. Without the perception of crisis, there would never have been as much done."

Along with so many others dealing with litter and water quality, Steel concludes that coordinating policies and people may be the greatest need, in order to make best use of already existing resources. He recalls, for instance, the case of one small lake that was getting EPA funding for dealing with non-point-source pollution — while a different government agency had drawn up plans for fertilizing the lake to feed the fish.

Marshall Rye of Rye Farm Management agrees on the need for coordination and education. He notes that his own company's studies indicate "there are only a very few areas where the heavy concentration of litter is going to be a problem." He says research is needed to pinpoint these potential trouble spots and then outreach programs are needed to "educate farmers about using litter, about its benefits as a soil builder."

Filling a Void

NRCS Area Conservationist Jerry Mitchell, working in northwest Arkansas where poultry is the main industry, praises the Winrock litter project for "creating awareness" and providing "the coordination, locating watersheds and identifying farms, then locating the areas that could use poultry litter."

Mitchell is convinced that "Winrock filled a void that we, as a government agency, could not fill." He concludes that "there is a continuing need for some kind of coordinating effort to keep the momentum going. This project should continue to the point where every farmer, even in the more remote areas, can get a competitive bid on any chicken litter he wants to sell."

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VIII. Creating an Independent Poultry Litter Market

"Winrock's involvement has awakened people to how valuable litter is — and that's what has helped small businesses like mine move a lot of litter from here over to the Delta farmers in the eastern part of the state."

Jack Sisemore,
Poultry Litter Broker

Dr. Ellis Brunton, Vice President of Research and Quality Assurance for Tyson Foods, Inc., has no doubt that what Winrock started has turned into a viable market that benefits the independent poultry growers that raise poultry for his company — and benefits Arkansas crop farmers. The Winrock concept of creating a litter market "made a lot of sense and needed to be explored," says Brunton in explaining why Tyson Foods supported the project. "We knew there were needs on either side of the state and that it had to be an economically favorable situation on both ends of the process."

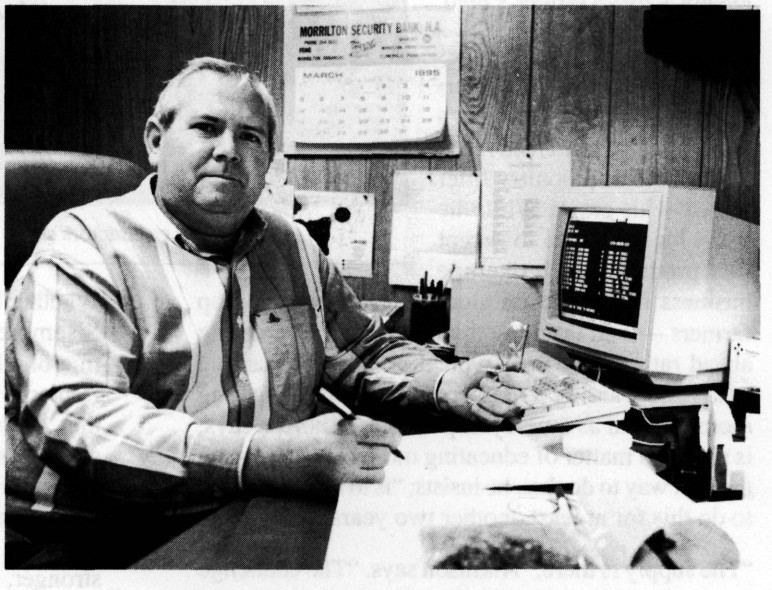
Today's litter market has been successfully established at least in part thanks to Tyson Foods approving the use of the same trucks for delivering clean bedding and back-hauling litter. For this new market to survive, Brunton says, "The economics are going to drive this market, and if it is economical, if the value-added concept works with this organic fertilizer and if the transportation can be economically justified, then the poultry growers will definitely go forward with using this market."

Poultry Litter Hotline

Ed Cross, Poultry Division Director for Arkansas Farm Bureau, says he has been pleased with the active use of the poultry litter hotline since Farm Bureau took over the service from Winrock. With an average of 30 litter buyers and sellers listed on the hotline throughout the year "and double that number in December and January," Cross expects usage to increase now that Farm Bureau is starting to "push this program more aggressively." He says Farm Bureau plans to improve the service by providing additional information, such as how many flocks have been raised on litter offered for sale.

Cross says that based on extensive water quality studies at Moore's Creek (v. page 23 above), there seems to be no immediate need to move litter to protect water quality even in areas of highly concentrated livestock production. Yet he says that the poultry growers he works with are "very sensitive about the environmental situation" and have cooperated fully in various water quality studies such as the Moore's Creek project. He says the growers "understand there is a potential for water quality problems and they want to be careful about what they do." But as long as there is no present environmental reason to sell their litter rather than use it to build up their own pasture land, Cross says, "litter prices are going to have to go higher to move as much litter as some people would like. . . to entice growers to sell it, the price is going to have to increase."

Cross also believes that prices will increase as "more farmers on the eastern side find out that litter is a great soil amendment which can be a very valuable part of their soil management." He says a smoothly operating litter market is key to finding a fair balance between "what the growers and the transporters get and what the row-crop farmers are willing to pay." Cross adds, however, that achieving this balance probably will require continuing guidance from Winrock or some other outside organization to iron out continuing problems such as providing more uniformity in litter, with "some standards so that farmers will know what they are buying."



Truman Atkinson: A pioneer in poultry litter brokerage.

The Brokerage Business

Drawing on his past experience with transportation and livestock feed, Truman Atkinson set up his own Central Arkansas Poultry Waste brokerage business with advice from Winrock. Today, Winrock staff look on the private brokerage services provided by Atkinson and a handful of other brokers that are able to truck litter several hundred miles profitably as both essential to the success of the litter market and private-sector proof that the market is working.

At Winrock's Conway field day, Truman Atkinson not only shakes hands with all 40 farmers who thought litter might be important enough to miss a morning's field work. With each handshake, he also delivers his personal guarantee that he has enough good litter stockpiled to deliver all these farmers might need, when they need it, at just $28.50 per ton. Currently, Aktinson's firm guarantee has resulted in his shipping four 24-ton trucks of litter per day to row-crop areas, six days a week.

Answering farmers' non-stop questions at the field day, Atkinson explains that what he prefers to deliver, because it works best for his customers, is turkey litter that has been deep stacked for four weeks to "kill that bit of extra [weed] seed" and that is just the right consistency for spreading — not either sloppy or toothpaste-like, yet not so dry that "it will crumble and fall off" rather than spread evenly across a farmer's field.

Longer term, Atkinson sees cattle feed as the highest-value market for litter. He's already registered a feed made from processed poultry litter mixed with grain. While he waits for cattlemen to accept this product, his brokerage business is focused on signing up more row-crop farmers — and teaching them the value of ordering ahead rather than their typical practice of "calling today and wanting it delivered yesterday." Creating more demand as quickly as possible, Atkinson says, is simply a matter of educating more farmers — and the best way to do that, he insists, "is to have Winrock to do this for at least another two years."

"The supply is there," Atkinson says. "The challenge is educating the end users little by little on what to buy, how to apply, what equipment to use, how to store to have it available when they need it. We are trying to educate the end users to purchase this litter ahead of time and store it for later use." Once farmers know litter's true value as a soil builder and yield booster, Atkinson says, they become steady customers — which explains why today he's trucking litter from his area in central Arkansas not only to the Arkansas Delta but to crop farmers in Mississippi and Missouri as well.

Litter's Bright Prospects

Benefiting from Winrock's advice just as Atkinson did, Jack Sisemore grew his local clean-out contracting business into his long-haul Blossom Gro brokerage service that serves Missouri along with Arkansas. Again like Atkinson, Sisemore views building up crop farmers' fields as the immediate market but cattle feed as a far higher-value market longer term. Sisemore is also investing in developing odor-free, higher-value litter products for use on golf courses and other specialty markets.

Clean-out contractors serve a key role in litter management.

Whether for crops, putting greens or African violets, Sisemore believes, litter's value lies in its rich microbial activity. In delivering litter to Delta crop farmers over the past two years, Sisemore has learned that "their ground is so poor that what they call their good ground is less than one half percent organic matter." He's seen the results of putting litter on that land: "One farmer's milling yield increased over 10 percent. Another swears that the litter grew a stronger, healthier, more disease-resistant rice. . . Another cut 197 bushel rice at $2.62 per bushel, when

the best he'd ever done before was 125 bushels." Results like that, he says, quickly spread from neighbor to neighbor and build business for brokers like himself.

To make litter demand grow even faster, Sisemore recommends strongly that "Winrock should continue to support the rice production meetings that are held in every county every fall, where you may have 100 or more farmers and you can talk to them all at once." Sisemore insists that Winrock and others should continue with research projects to further document the benefits of litter.

Based on his own surveys of poultry farmers in western Arkansas, Sisemore sees no problems with availability. He points out that litter will be available for sale wherever there are potential water quality problems because "These farmers are as concerned as anyone about the EPA regulations they are afraid will come down on them. These growers have invested from $750,000 to over $1 million in their poultry operations, so they are going to do whatever it takes to stay in business and protect their investment."

Ready to Expand

Tom Newberry, who raises turkeys along with running his own Newberry Trucking business, is equally optimistic. Rather than expecting environmental problems to close down or even limit poultry operations in western Arkansas, he expects that the increasingly recognized value of litter as a soil builder will:

- provide a continuing additional income stream for poultry growers;
- give poultry growers additional incentives to manage their litter properly, thus avoiding the need for regulation or limits on production;
- create steadily growing demand for western Arkansas litter in row-crop areas in Arkansas and neighboring states;
- guarantee that Newberry's litter trucking business continues its course of rapid growth.

Newberry says the remaining problem he sees is that "for rural development, we need an influx of venture capital." Newberry welcomes all that Winrock has done in "putting people in touch with each other to help move litter from counties with too much litter to other counties where the land needs litter." He singles out Winrock's support for research and its poultry litter hotline as having been extremely helpful. One result of such activities, he says, has been that "there's more of a demand for litter than I can meet with my present equipment. To meet the demand, he's looking for $100,00 to add two new walking-floor trailers. He's convinced that he will need to keep right on expanding his fleet of trucks to meet the demand that he expects to continue growing rapidly — even if cattlemen don't overcome their squeamishness about feeding poultry litter any time soon.

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IX. Lessons Learned: Jobs, Clean Water & Markets Mix

> "Our work was based on a simple formula: there's no demand for litter at $300 a ton, some at $60, for cut rice land, and at $40 a ton we can expect to add a lot more uses."
>
> Sandra Miller,
> Winrock International

In retrospect, Sandra Miller says that one of the most important lessons hammered home by the poultry litter project is the critical importance of understanding the people whose behavior each project is designed to influence. In this case, she explains:

> "Whether it was the farmers, the truckers or other small entrepreneurs, in this project we were working with people who naturally are risk averse. They do not respond to opportunities, they respond to minimizing risk, to security of income. To create a market in which these folks would participate, we found out that we needed to focus on minimizing risk. We had to reduce costs, stabilize prices and make the returns high enough to attract participants."

In a situation where poultry growers and row crop farmers were already operating on the margin and in no position to take on further risk, Miller concludes, "it was up to Winrock to take risks." Those risks involved experimenting with a variety of possible ways to launch a market, some of which flopped. The end result of Winrock's persistent effort was the creation of a private-sector litter market that now seems likely to grow and prosper without significant outside support. Undoubtedly, the market will fare better if Winrock and/or other organizations provide limited support in the form of research and consultation. Yet the size of the businesses that brokers like Truman Atkinson, Jack Sisemore and Tom Newberry have built, the fact that Farm Bureau has taken over the litter hotline and Bob Lakey's prediction that regulations will be imposed on poultry growers are strong indications that the new litter market will continue to grow.

The new market will pass its next test successfully when there is replication — when other groups in other areas draw on the Winrock model in creating markets that might handle animal manure or, just as easily, might trade in hazardous wastes, forestry residues, etc. Miller's advice to anyone studying the Winrock project is to focus on the thought processes which in the case of poultry litter, she says, meant first asking the right questions, then working with the clean-out contractors in the middle to get the price down and working with the crop farmers to develop demand — rather than "scold farmers for not responding to the opportunities we saw."

Overall, based on interviews with 52 people who had a wide variety of both paid and voluntary involvement with Winrock's litter project, the most replicable lessons learned include these:

- Environmental problems demand economically viable, sustainable answers — answers that may need to be regional, statewide or national in scope.
- Shape the solution to fit the problem, not to fit existing boundaries, turf or preconceptions.
- "Jobs And Clean Water" are compatible if there is proper information and management.
- Market forces can be used to create systems that provide both environmental and economic benefits.
- Critical barriers must be identified and removed one by one.
- Expect and build on "incremental advances" rather than wait for dramatic breakthroughs.
- Public/private partnerships are essential.
- Information is key: held by a few, it gives unfair advantage; freely available, markets can work equitably and effectively.
- People living on the margin are risk averse but the right intervention strategies directed at their needs can change their behavior and enlist their participation.
- Become familiar with, catalogue and build on rural America's wealth of existing resources which can be leveraged through networking and coordination.
- Never underestimate the veto power of established interests opposed to changes such as the formation of a new trade association.
- Project failures can be as valuable as the successes, helping future projects avoid the dead ends.

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X. Recommendations: Continuing Role Needed

> "In the United States, economic development and environmental protection often are treated as separate and conflicting objectives. . .
> "The trade-offs we perceive are, in part, an artifact of the way we have separated responsibility for economic development and environmental protection in our institutions. This separation has caused people at all levels to believe and act as though an inevitable trade-off exists between environmental protection and jobs. . .
> "Our choice is not economic development *or* environmental protection. Rather, we must choose between clinging desperately to our present ways, courting environmental and ultimately economic disaster, or finding new approaches and new technologies that provide for both jobs and the environment."
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> Winrock Poultry Litter Project Report, 1994

One key finding of the initial round of Winrock poultry litter surveys was that little-noticed "clean-out contractors" handle the bulk of the both litter applied to poultry farmers' own fields and litter trucked to other locations. This unexpected piece of knowledge led to Winrock's so far unsuccessful effort to help these contractors form an independent association. The Winrock objective is to have this association take responsibility for registration, training and certification of the clean-out contractors who turn out to be vital to the development of a smoothly running litter market. Winrock sees a self-regulating contractors' association as the ideal alternative to what otherwise might be imposed on the emerging litter industry — costly and clumsy government regulation.

One key accomplishment of the Soil and Water Division of Virginia's Department of Natural Resources came when the major poultry industry companies in Virginia voluntarily agreed to require each new poultry operation in the state to obtain a state Nutrient Management Plan before beginning production. That plan must include details on proper application of litter and must show that the farmer has adequate arrangements for spreading and/or feeding litter.

Given the budget and time constraints limiting both Winrock Poultry Litter Project Coordinator Paul Brown and Virginia's Nutrient Management Program Manager Russ Perkinson, the two have not been able to fully share insights provided by their two waste management programs.

In an era of federal, state and local budget cuts affecting both government agencies and the non-profits that often depend on funding by these agencies, sharing information to reduce duplication and speed delivery of information is more important than ever. Yet, in a Catch-22 situation, the money to support such sharing is shrinking.

Such challenges add to the urgency of building on the accomplishments of Winrock's poultry litter project. Accordingly, this report offers the following recommendations drawn from the comments of the 52 individuals interviewed:

- Continue to monitor the growth of the poultry litter market.
- Seek ways to provide for more uniformity of litter products.
- Help both private entrepreneurs and researchers apply for AARC and other federal and state grants and loans.
- Secure funds to support a continuing role for Paul Brown in advising program participants, speaking at farmer field days in Arkansas and making presentations on project findings to interested groups in other states.
- Monitor the pilot cost-share project now being used to move litter from critical watersheds and publicize its results as an example of how USDA and EPA water quality funding might be used more effectively.
- Continue to encourage clean-out contractors to form an association to be responsible for registration, certification and on-going training.
- Continue to educate row-crop farmers on litter so they are able to buy the most suitable product for their needs at a fair price.
- Act as a clearing house to provide farmers and researchers with access to ongoing poultry litter research and to potential funding sources.
- Maintain contact with researchers and government agencies in other states to coordinate findings and assess differing approaches to the universal problems associated with waste handling.

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Winrock International is a private, nonprofit organization
dedicated to working with people to build a better world —
increasing agricultural productivity and rural employment while protecting the environment.

Projects focus on agricultural productivity, renewable energy, rural employment,
forestry/natural resource management, and women's leadership development in
Africa, Asia, Latin America and the Caribbean, Eastern Europe, the United States,
and the New Independent States of the former Soviet Union.

Winrock's headquarters are located on Petit Jean Mountain near Morrilton Arkansas,
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