Watershed Protection through Manure Marketing (Pilot Program)

Final Report

CWA Section 319(h) FY 1997

Nonpoint Source Pollution Program Task 800

Oklahoma Conservation Commission Task #93

OSU Project Account AC-5-95570

Timothy L. Propst

Biosystems & Agricultural Engineering, OSU

OCES Extension Engineer/Environmental Scientist

Project Director

Dr. Michael D. Smolen

Professor, Biosystems & Agricultural Engineering, OSU

OCES Water Quality Program Coordinator

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Correspondence: **OCES Water Quality Programs**
218 Agriculture Hall
Oklahoma State University
Stillwater, OK 74078
Tel: 405/744-5653, FAX: 405/744-6059
Email: smolen@okstate.edu
Web: http://biosystems.okstate.edu/waterquality

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- Jim Britton
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- Bill Burton
- Mitch Fram
- Marty Green
- Jason Hollenback
- Bret Sholar
- Roger Williams
- Bob Woods

List of Commonly Used Abbreviations

BAE – Biosystems and Agricultural Engineering Department
BMP – Best Management Practice
CorpComm – Oklahoma Corporation Commission
DEQ – Department of Environmental Quality
EPP – Entomology and Plant Pathology Department
EQIP – Environmental Quality Incentives Program
FSA – Farm Service Agency
IRB – Institutional Review Board
NPS – Non-Point Source
NRCS – Natural Resource Conservation Service
OCC – Oklahoma Conservation Commission
OCES – Oklahoma Cooperative Extension Service
ODAFF – Oklahoma Department of Agriculture Food and Forestry
ODA-FD – Oklahoma Department of Agriculture-Forestry Division
ODWC – Oklahoma Department of Wildlife Conservation
ONLA – Oklahoma Nursery and Landscape Association
OSE – Office of the Secretary of the Environment
OSNA – Oklahoma State Nursery Association (now known as ONLA)
OSU – Oklahoma State University
OWRB – Oklahoma Water Resources Board
PPP – Pollution Prevention Plan
TMDL – Total Maximum Daily Load
USFS – United States Forestry Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
WHIP – Wildlife Habitat Improvement Program

Table of Contents

List of Tables

List of Figures

Conclusions

The emergence of the Internet and online commerce greatly enhances the vision of establishing a market to move litter from areas of surplus phosphorus to areas of deficit phosphorus. Through the online litter market, a grain farmer in north-central Oklahoma can learn who has litter to offer, how much, what quality, etc. Likewise, a seller can find out who wishes to buy litter, how much, when it is needed, and other information essential to establishing a trade.

The "Service Providers" category on the market website addresses a severe bottleneck in the poultry litter market. The cost of transportation limits litter movement out of sensitive water-sheds. Many service providers have a difficult time keeping business stable because of the seasonal basis of litter production and fertilizer use. The website facilitates the coordination of these calendars.

Having all transaction information present on one website facilitates the operation of fertilizer brokers. An entrepreneur could find the names and locations of sellers, buyers, haulers, spreaders, loaders, and any other services needed to complete a transaction. Assuming poultry litter sells for $6-8 per ton and hauling costs of $0.35 per ton-mile in a semi, the sale of a single house (about 100 tons), at a distance of 50 miles might generate in excess of $2,000. The commission on such as sale might be sufficient to attract such a businessperson.

The Ok-littermarket.org website offers the additional opportunity to educate both buyers and sellers on all the facets of litter use and handling. The website includes direct links to calculators to estimate the value of litter and fact sheets to help determine if litter is the right fertilizer or soil amendment to use in a given location. The fact sheets tell the user how to sample litter, how to sample soils, and how to determine appropriate application rates.

The project, ODAFF, and OCC sponsored litter demonstrations outside the main poultry producing counties. This increased the audience for poultry litter use in a way that written materials or testimonials could not do.

Additional demonstration sites located inside the producer counties showed how soils already rich in soil test-P could produce forage without further use of litter. Most interesting to local producers was a demonstration of overseeding pastures with alfalfa. Alfalfa uses large amounts of phosphorus and potassium, even when nitrogen is in short supply. Thus, a high-quality forage is produced in these soils without further addition of poultry litter or fertilizer.

The project, in combination with the Poultry Producer Education Program mandated by State law, presented information about marketing litter and how to get on the website to more than 1100 producers.

At the conclusion of the funded period of this project, the website was just getting into full operation. As implemented, it can operate with very little supervision or maintenance. Users can log in to post their own information, or they can browse without any cost to see what has already been listed. The OSU Cooperative Extension Service is committed to keeping the website operational for another year to test the concept. In that time, we will continue to advertise the website and marketing program through educational publications. There will be assistance to producers through the county offices and limited assistance through the market coordinator (the cost of phone calls and personal follow up is too high to promise very much attention from the market coordinator.)

Although the market did not move large amounts of litter before the end of the project period, the structure is in place to promote litter movement as soon as regulations dictate that manure must move out of the sensitive watersheds or the price of hauling comes down.

Measures of Success

1. Establishment of a publicly reported market for litter where none previously existed.

At the start of the project, only two efforts to develop a Litter Market in eastern Oklahoma and western Arkansas existed. Both were based on toll-free hotlines. The first, developed by Winrock International for Arkansas, was passed to Arkansas Farm Bureau. The second was set up and operated by ODAFF. Both hotlines were initially well received, but slowed dramatically after the first year. The electronic Litter Market developed in this project is a direct descendent of the ODAFF Hotline, as any information received by ODAFF is quickly transferred to the website.

A website has very clear advantages over a hotline. First it is not just a list, but a communication system, offering direct control by the user, the buyer or seller. Second it can be viewed repeatedly in different formats. The user can sort it to identify those listing in a certain geographic area or those offering product or needs at a certain time. It offers flexibility in terms of sharing comments such as negotiating points, and it offers the opportunity to specify quality of the product offered or of the material desired.

Perhaps the biggest advantage of the website over a hotline is the possibility of providing education along with timely market information. In this case the market information is linked with supporting educational information such as fact sheets and calculators to help the user determine the suitability and value of the product.

The Oklahoma Litter Market website currently includes all those who have called the ODAFF Hotline with information to post, plus those who have come upon it directly from the web, through the State Poultry Producer Education Program, or been referred to Extension from other sources. At this time, the number of sellers is expanding rapidly; the number of buyers is expanding slowly and the number of service providers has remained constant.

Approximately 22 of the 52 sellers currently listed have updated their information recently. Although verified during 2002, it cannot be assumed the remainder are still actively selling litter or willing to sell on the market. Seven of the 37 buyers currently listed updated their information since September 2002, when they were transferred from the previous version of the hotline/market list. All were verified during 2002.

Hauler information has been updated largely since October 2002, but there has been little change since.

2. Number of users and quantity of litter marketed, measured by volume and recorded on the website.

As of February 15, 2003, there were 52 sellers, 37 buyers, and 17 haulers represented on the website. Sellers have listed approximately 14,625 tons, and buyers have requested 11,375 tons. Sellers represent 100-120 houses.

3. Tons of manure moved from sensitive watersheds: Spavinaw Creek, Illinois River, and Little River, to other areas.

The website cannot track sales directly. Even if asked for the information, there is no incentive for the seller or buyer to report their sales. When the market coordinator was active, it was possible to contact individuals to verify sales and get details. At this time, however, there is no money to pay the market coordinator for such effort. Furthermore, it would be wasteful to conduct such calls because the level of utilization is low. After use of the website expands, a survey of users could estimate the quantity of sales and other more specific information.

Both ODAFF and OCC receive information from poultry producers and litter applicators concerning movement of poultry litter across county lines. A summary of this information is contained in Tables 4a and 5a. Table 4a, derived primarily from applicator reports to ODAFF, shows the number of growers, birds, and houses by county in all the eastern Oklahoma counties for 2000, 2001, and 2002. This listing is not broken down by watershed. Assuming about 100 to 125 tons of litter per house, the total production in Oklahoma can be estimated to be between 300,000 and 367,000 tons per year in 2002. This is about twice the amount reported by applicators in Table 5a.

Table 5a shows estimated litter production and actual litter application, as reported by applicators. Presumably, the difference represents litter not handled by commercial applicators. Excess litter is estimated in this table as the difference between litter applied and litter produced (based entirely on applicator estimates). The percent excess applied is an indicator of how much was transported into or out of the county. The larger numbers indicate counties that import most, or all, of their litter. These include: Craig, Lincoln, Kingfisher, McIntosh, Nowata, Okfuskee, Okmulgee, and Rogers counties. Many of the producing counties are much lower or even negative, such as Cherokee, Delaware, Haskell, LeFlore, Mayes, and McCurtain.

In general, Table 4a and Table 5a show that poultry production and litter application is basically in balance within counties. Of the major producing counties, it appears that LeFlore and Mayes counties are shipping the most litter to other areas.

Table 4a. Poultry production in Oklahoma, as reported by applicators to ODAFF.

County	2000			2001			2002		
	Total Growers	Total Birds	Total Houses	Total Growers	Total Birds	Total Houses	Total Growers	Total Birds	Total Houses
Adair*	76	6,034,800	355	71	5,983,200	348	67	6,043,500	344
Blaine							1	5,000	3
Cherokee	24	912,500	73	24	1,051,100	75	21	911,100	68
Choctaw	4	193,000	10	5	198,000	10	5	198,000	10
Craig	8	757,000	36	9	989,000	44	9	987,000	44
Creek				1	30,000	2	1	30,000	2
Delaware	171	9,323,270	562	175	9,736,010	578	170	9,190,110	554
Haskell	59	3,587,698	162	61	4,182,398	189	63	4,212,898	196
Latimer	5	202,000	13	5	202,000	13	4	222,000	13
Le Flore	244	14,931,494	686	247	17,717,444	782	238	18,013,544	780
Mayes	17	1,060,500	59	19	1,344,000	69	21	1,755,000	83
McCurtain	239	11,379,055	609	240	11,279,700	602	238	11,538,492	607
McIntosh	2	46,400	5	2	45,800	5	2	45,800	5
Muskogee	7	256,200	13	6	220,400	13	7	281,400	17
Okfuskee				1	4,400	1	1	4,400	1
Ottawa	27	2,432,100	132	30	2,783,650	145	29	2,858,300	145
Pittsburg	1	70,000	3	1	70,000	3	1	70,000	3
Pushmataha	3	41,200	4	2	30,000	3	2	30,000	3
Rogers				1	24,000	8	2	420,000	14
Sequoyah	16	432,343	28	16	532,743	34	19	598,343	41
Totals	**903**	**51,659,560**	**2,750**	**916**	**56,423,845**	**2,924**	**901**	**57,414,887**	**2,933**

**Shaded counties are centers of poultry production, containing more than 100 houses.*

Table 5a. Poultry litter in Conservation Districts, as reported February 28, 2002 to OCC by litter applicators.

Conservation District	Poultry Houses (from ODAFF)	Litter Production* (tons)	Litter Application (tons)	Excess Litter Applied (tons)	Excess Applied (% of Produced)
Adair County	348	13,834.0	15,733.0	1,899.0	12.07%
Checotah (McIntosh County)		348.0	348.0	0.0	0.00%
Cherokee County	75	3,587.0	3,750.0	163.0	4.35%
Craig County	44	2,871.0	11,589.0	8,718.0	75.23%
Delaware County	578	23,895.0	29,304.0	5,409.0	18.46%
Haskell County	189	18,662.0	20,830.0	2,168.0	10.41%
Latimer County	13	204.0	204.0	0.0	0.00%
LeFlore County	782	58,469.0	57,278.0	-1,191.0	-2.08%
Lincoln County		0.0	193.0	193.0	100.00%
Kingfisher County		0.0	161.0	161.0	100.00%
Mayes County	69	1,798.5	1,428.5	-370.0	-25.90%
McCurtain County	602	15,963.0	17,064.0	1,101.0	6.45%
McIntosh County	5	0.0	373.0	373.0	100.00%
Murray County		1,888.0	1,888.0	0.0	0.00%
Muskogee County	13	1,988.0	2,372.0	384.0	16.19%
Nowata County		0.0	1,046.0	1,046.0	100.00%
Okfuskee County	1	0.0	320.0	320.0	100.00%
Okmulgee County		0.0	248.0	248.0	100.00%
Ottawa County	145	8,630.0	8,198.0	-432.0	-5.27%
Pittsburg County	3	450.0	0.0	-450.0	--
Pushmataha	3	355.0	355.0	0.0	0.00%
Rogers County	8	0.0	761.0	761.0	100.00%
Sequoyah County	34	1,794.0	1,794.0	0.0	0.00%
Total		**154,736.5**	**175,237.5**	**20,501.0**	**11.70%**

**Litter production as reported by applicators does not include data on litter produced, but not land applied in the State of Oklahoma, nor does it include data from incomplete, incorrect, or unreadable applicator reports.*

4. Increased awareness of the value and potential uses of litter as shown by 10% increase in soil testing, 100% increase in manure testing, 50% increase in demand for Poultry Facts and Farm Records books in project counties.

Because of the impact of the Poultry Producer Education Program, mandated by State law, the frequency of soil testing and manure testing has far exceeded these goals. Poultry producers in nutrient sensitive watersheds are currently required to soil test every year. All other producers are required to soil test every three years. All producers are required to test their litter annually. All producers must attend the education program, and so they have record books and fact sheets. Furthermore, ODAFF poultry inspectors check the use of record books annually.

5. Increase in movement of litter as shown by 10 to 20% of litter produced in sensitive watersheds transported to less sensitive watersheds measured by comparing buyer and seller locations.

This information is not currently available. After the litter market has been operating for a year or two, it will be possible to survey buyers and sellers to evaluate success in moving litter from sensitive to less sensitive watersheds. Analysis of litter applicator reports shown under measure (3) above suggests that we have not come close to achieving this goal at this time.

6. Increased general interest in managing wastes as measured by number of hits to website.

The website is very popular. Since it went online there have been more than 6200 hits, originating from a wide number of sources. A recent review (February 2003) of output from site monitoring software indicated that, on average, there were about seven hits per day, with an average visit length of about eight minutes. Most interesting is the observation that viewers stay about seven minutes per page. This measure is likely to increase dramatically as the new advertising push gains momentum.

7. Successful determination of barriers to expanding litter market and recommendations to overcome barriers.

Project personnel successfully determined barriers to market expansion, as well as information needs to increase the market. Their recommendations resulted in the workplan revision of 2000 that included a major re-focusing of project goals and efforts. The biggest barrier identified to success of a litter market is the restricted flow of information between producers and buyers. This project has already had some effect in this area. As the site allows producers to show price and litter value (in terms of manure test results), a great deal more information is available now than there ever was previously. The market analysis also identified barriers to the transportation of litter. There seem to be fewer service providers hauling litter at the end of the project than there were at the start. Ostensibly this is because of increased reporting and education requirements that have come to into play through the Poultry Producer Act (SB 1075).

8. Participation of poultry industry in supporting and promoting electronic market.

Poultry industry representatives played a significant role in the technical advisory committees that directed the initial project efforts. They have also helped distribute literature to producers encouraging them to subscribe. A larger role for poultry producer organizations is anticipated in the future, perhaps even as a sponsor for the website.

Executive Summary

This report details OCES activities from 1997 – 2002 in support of the FY 1997 CWA 319(h) Nonpoint Source Pollution Program grant, "Task 800: Watershed Protection Through Manure Marketing (Pilot Program)," (OCC Task #93, OSU Account No. 3-5-95570). The grant was administered by OCC (Kendra Eddlemon and Jim Leach). Project Director was Michael D. Smolen (OCES Water Quality Programs Coordinator).

INTRODUCTION

Regional concentrations of the livestock industry result in excess nutrient loading to land and water resources when wastes are applied as fertilizer in a limited geographic area. The high density of production in source areas and the high cost of transportation hinder the market for these wastes. High transaction costs, such as fees charged by government agencies and costs required to exchange information, also limit the market. This pilot program was designed to expand the boundaries of litter markets by reducing these barriers, resulting in physical removal of animal waste from critical watersheds, improved waste nutrient utilization, and a more even distribution of nutrients within a watershed.

PROJECT AREA AND PROJECT GOALS

This project was formulated as an initiative to stimulate a market for broiler litter in eastern Oklahoma, where poultry production has been expanding rapidly. Recreational water resources, thin and rocky soils, and high rainfall make the area particularly vulnerable to excess nutrients. The project's ultimate purpose was to create a self-sustaining market. Goals were set in four main areas: (1) creation of a litter quality certification procedure, (2) development of marketing infrastructure, (3) improved information exchange, and (4) an educational program to ensure proper litter use. The first two goals were refocused, as explained below.

PROJECT TASKS

The project was divided into ten separate tasks. A full description of each task is included in the project workplan (see Appendix 2). Task accomplishments are summarized below.

TASK I: ESTABLISH PROJECT ADVISORY COMMITTEE AND PROJECT ADMINISTRATIVE STRUCTURE

Output 801.1: Ten semi-annual progress reports - ***previously submitted, not included***
Output 801.2: Minutes from ten meetings of advisory committee – ***previously submitted, included as Appendix 3***

Smolen and the OCES Water Quality Office ensured project outputs were completed and facilitated the writing of semi-annual and other progress reports.

Prior to the project, the poultry industry and use of poultry litter had become highly controversial in the project area. In fact, a Litter Marketing Workgroup had been formed that included many OSU personnel. To avoid duplication of effort, this body served as the Advisory Committee throughout the first two years of the project. They helped with market analysis and in planning the operation and promotion of the project.

In 2001, after many of the main elements of a successful market had been identified, the Project Action Workgroup was assembled. This group was responsible for implementing project tasks such as advertising free litter tests in the project area, running newspaper ads, sponsoring market workshops for poultry producers, and otherwise promoting the litter market.

TASK II: CREATE EDUCATIONAL PROGRAM

Output 802.1: Two fact sheets covering litter marketing, and sampling, to augment Poultry Facts and Farm Record Books – ***previously submitted, included as Appendices 9 and 10***
Output 802.2: Newsletter to deliver market information, important announcements, and educational items - ***previously submitted, included as Appendix 8***
Output 802.3: Case studies for two farms located outside of Small Farms and Lake Wister project areas demonstrating environmentally and economically sustaining use of poultry litter - ***previously submitted, included as Appendices 6 and 7***

The project developed, adapted, or accumulated educational materials to address proper use of litter through soil testing, litter testing, applying litter at rates to meet crop needs, calibration of litter application equipment, and recordkeeping. The materials were distributed through normal Extension channels as well as through the Oklahoma Litter Market website.

The Oklahoma Licensed Poultry Operators Act of 1998 (SB 1075) designated OCES as the body responsible for developing the curriculum and instituting the Poultry Producer Education Program. This project provided educational content to that Program. The project also sponsored continuing education workshops for the Program that focused on litter marketing and promoted face-to-face contact between potential buyers and sellers (see Appendix 4).

"Litter-as-fertilizer" demonstration plots were sponsored by the project, OCC, and ODAFF (Appendix 5). Pollution prevention techniques were demonstrated on two area farms (Appendices 6 and 7). A market newsletter was distributed to Poultry Producer Education Program attendees (Appendix 8). Finally, litter use fact sheets were published (Appendices 9-12).

TASK III: ESTABLISH QUALITY CRITERIA AND CERTIFICATION PROCEDURES FOR LITTER

Output 803.1: Standard operating procedures to measure volume of litter in poultry house and obtain representative sample for litter quality - ***previously submitted, included as Appendices 11 and 12***

Preliminary market analysis (see Task IV below) indicated that much of this Task would not be worthwhile. Specifically, the market grader-training program was dropped (see workplan revisions, Appendix 1). However, some aspects were retained. Two fact sheets describing how to obtain a representative litter sample and how to measure the volume of litter in a poultry house were published (see Appendices 11 and 12 under Task II above).

TASK IV: IDENTIFY CRITICAL BARRIERS AND INFORMATION NEEDS

Output 804.1: Report on state of litter marketing in Eastern Oklahoma and recommendations for market structure to facilitate movement of litter across watershed boundaries - ***previously submitted, included as Appendix 13***

Derrell Peel (OSU Ag Econ) directed the market analysis efforts. His graduate student, Tina Eaton, surveyed and described the pre-project informal litter market of eastern Oklahoma. Peel summarized her conclusions in 2000 (Appendix 13). Three main litter market barriers were identified; 1) a lack of demand, 2) a lack of market infrastructure, and 3) supply limitations. In order to combat these issues, the researchers suggested:

- Improve information exchange and facilitate the development of a formal litter market through the website,
- Develop two or more publications on strategic use of litter for alternative land use and cropping patterns.
- Conduct a statewide survey of agricultural producers to determine current attitudes about litter use, perceptions about litter value and price, and educational needs.

- Use survey information to design more appropriate litter information and education programs.
- Provide information and in-service for extension educators and others, targeting areas outside traditional poultry production areas.
- Enhance the litter website to increase information about litter use, value and management, with special emphasis on reaching new potential users.
- Continue supporting litter demonstrations as part of Extension Education program.

These recommendations resulted in revisions to the project workplan (Appendix 1) and helped direct activities for the final two years of the project period.

TASK V: ESTABLISH INTERNET WEBSITE AND COORDINATE WITH THE OKLAHOMA DEPARTMENT OF AGRICULTURE'S POULTRY LITTER HOTLINE

Output 805.1: Report on effectiveness of Website for tracking market information, including: buyer location, seller location, volume of litter transferred, quality of litter sold, available and delivered date – ***Discussion of this task in the body of this report is the initial submittal of this output.***

The initial website provided a bulletin board on which to post information from the ODAFF Poultry Litter Hotline, as well as links to other informational sites. To be listed on the website, sellers, buyers, and haulers had to call ODAFF through their 1-800 number or call an Extension office. OSU established an agreement with ODAFF to facilitate this information transfer. Later, a web designer developed a fully interactive, dynamic website. The new website, OK-Littermarket.org, serves as an electronic educational media center and as a forum for litter information exchange between potential buyers and sellers.

The new website had more than 6000 hits from October 2002 to February 2003. As of February 14, 2003, there were 51 sellers, 37 buyers, and 17 haulers listed, with 11,395 tons requested and 14,625 tons offered. Although these numbers are lower than anticipated, the extra work and attention to detail that has gone into reviewing the data provides a high level of confidence that these are indeed market participants. To date, it has not been possible to trace transactions without individual contacts, but this would be feasible with some funding.

TASK VI: UPGRADE PARTICIPATING COUNTY OFFICE COMPUTERS

Output 806.1: Description of computer network located at county extension offices serving as backbone for the market information system - ***previously submitted, included as Appendix 14***

The OCES computer network evolved significantly in the time between drafting the project workplan and the awarding of the grant (Appendix 14), resulting in minimal expenses for this task. Project funds were used to purchase a computer to support the initial project website and to pay for Internet access for two counties. Excess funds for this task were transferred to other areas (see workplan revisions, Appendix 1).

TASK VII: TRAIN MARKET GRADERS

After the findings of the market analysis (Task IV) re-focused the goals of the project, the market grader certification program was determined to be unnecessary. Task VII was reprogrammed and resources re-allocated to more worthwhile endeavors (see workplan revisions, Appendix 1).

TASK VIII: PROMOTE MARKET

Output 808.1 - Report on effectiveness of market promotion campaign - ***initial submittal, included as Appendix 16***

Personal contacts and newspaper advertising were planned to increase market membership. A part-time Market Coordinator was hired to oversee market promotion, contact members, verify

data, and otherwise help facilitate the market. The Market Coordinator was particularly effective because he also worked as an ODAFF contract inspector, with frequent contact with producers.

Ads in project area newspapers offered free litter testing. Only about 30 tests have been performed to date. When the first Market Coordinator resigned, a replacement was hired. She contacted all members listed on the website, updated information and promoted the market. Appendices 15 and 16 contain market promotion reports from 2002 and 2003, respectively.

TASK IX: FINAL REPORT

Output 809.1 – Final report.

This document, including appendices, is the final report.

TASK X: SURVEY POTENTIAL LITTER USERS (NEW TASK)

Output 810.1 - Report on survey of producers. ***initial submittal, included as Appendix 17***

Two surveys were added to the workplan in 2000 (Appendix 2). To determine litter demand statewide, a mail-out survey was to be conducted with the ODAFF Statistical Service. A second, more focused, telephone survey was to be conducted in one or two counties within 50 miles of poultry production. The latter was not done, but a statewide survey was completed. Unable to coordinate with the ODAFF group, an alternate survey was administered at the Oklahoma Cattleman's Association annual meeting in July 2002. Respondents were registered in a drawing for a digital camera. Of the 300 surveys distributed, 39 were returned. Of these, 35 indicated they were cattle ranchers. Using OCES district lines, there were 12 from NE Oklahoma, 11 from NW, 4 from SE, and 8 from SW (Appendix 17).

MEASURES OF SUCCESS

1. Establishment of a publicly reported market for litter where none previously existed.

The electronic Litter Market developed in this project is a direct descendent of the ODAFF Hotline. It currently includes all those who have called the ODAFF Hotline with information to post, plus those who have come upon it directly from the web, through the State Poultry Producer Education Program, or been referred to Extension from other sources. At this time, the number of sellers is expanding rapidly; the number of buyers is expanding slowly and the number of service providers has remained constant.

A website has very clear advantages over a hotline. First, it is not just a list, but also a communication system, offering direct control by the user, the buyer or seller. Second, it can be viewed repeatedly in different formats. Perhaps the biggest advantage is the possibility of providing education along with timely market information. .

2. Number of users and quantity of litter marketed, measured by volume and recorded on the website.

As of February 15, 2003, there were 52 sellers, 37 buyers, and 17 haulers represented on the website. Sellers have listed approximately 14,625 tons, and buyers have requested 11,375 tons. Sellers represent 100-120 houses.

3. Tons of manure moved from sensitive watersheds: Spavinaw Creek, Illinois River, and Little River, to other areas.

The website cannot track sales directly. Individual phone calls could obtain this information, but there is no money to pay for such an effort and the current low utilization level does not warrant it. After website use expands, user surveys could estimate these parameters.

A rough estimate of litter movement can be obtained utilizing county poultry production information reported to ODAFF and OCC.

4. Increased awareness of the value and potential uses of litter as shown by 10% increase in soil testing, 100% increase in manure testing, 50% increase in demand for Poultry Facts and Farm Records books in project counties.

These goals have been far exceeded, due to the State-mandated Poultry Producer Education Program. Poultry producers in nutrient sensitive watersheds must soil test annually. All other producers must soil test every three years. All producers are required to test their litter annually. All producers must attend the education program, and so they have record books and fact sheets. Furthermore, ODAFF poultry inspectors check the use of record books annually.

5. Increase in movement of litter as shown by 10 to 20% of litter produced in sensitive watersheds transported to less sensitive watersheds measured by comparing buyer and seller locations.

This information is not currently available. After a year or two, it will be possible to evaluate market success at this level. Analysis of litter applicator reports shown under measure (3) above suggests that this goal has not been achieved at this time.

6. Increased general interest in managing wastes as measured by number of hits to website.

The website is very popular, with more than 6200 hits since October 2002. A February 2003 review indicated that, on average, there were about seven hits per day, with an average visit length of about eight minutes. Viewers stay about seven minutes per page. This measure is likely to increase dramatically as the new advertising push gains momentum.

7. Successful determination of barriers to expanding litter market and recommendations to overcome barriers.

Barriers to market expansion were identified, resulting in the workplan revision of 2000. Development of the website as a direct response to the biggest barrier identified, restricted information flow. Analysis also identified litter transportation as barrier. Fewer haulers in the market are ostensibly due to increased reporting and education required under the Poultry Producer Act (SB 1075).

8. Participation of poultry industry in supporting and promoting electronic market.

Poultry industry representatives played a significant role in the technical advisory committees that directed initial project efforts. They have also helped distribute literature to producers encouraging them to subscribe. A larger role for poultry producer organizations is anticipated in the future, perhaps even as a sponsor for the website.

CONCLUSIONS

This project, combined with the Poultry Producer Education Program, provided information about marketing litter and the market website to more than 1100 producers. Project fact sheets explain how to sample litter and soils, and how to determine appropriate application rates. Demonstration in producer counties showed how high soil test-P soils could produce forage without further litter use, most notably by overseeding pastures with alfalfa. Demonstrations outside producer counties increased the litter user audience. Finally, the Ok-littermarket.org website offers an educational opportunity on all facets of litter use and marketing.

Online commerce greatly enhances the vision of establishing a litter market. At the end of the project, the website was just getting into full operation. As implemented, it can operate with very

little supervision or maintenance. Users can post their own information or browse to see what has already been listed, at no charge. The website facilitates coordination between service providers that desire steady business and the seasonal basis of litter production and fertilizer use, addressing a severe bottleneck in the litter market. It also opens the door for fertilizer brokers. An entrepreneur could find the names and locations of sellers, buyers, haulers, spreaders, loaders, and any other services needed to complete a transaction. The sale of a single house of litter, about 100 tons, might generate $2,000 or more.

The OSU Cooperative Extension Service is committed to keeping the website operational for another year to test the concept. In that time, the website and marketing program will continue to be advertised through educational publications. There will be assistance to producers through the county offices and limited assistance through the market coordinator. Although the market did not move large amounts of litter before the end of the project, the structure is in place to promote litter movement as soon as regulations dictate that manure must move out of nutrient-sensitive watersheds or the price of hauling comes down.

Final Project Report

This report details OCES activities from 1997–2002 in support of the FY 1997 CWA 319(h) Nonpoint Source Pollution Program grant, "Task 800: Watershed Protection Through Manure Marketing (Pilot Program)," (OCC Task #93, OSU Account No. 3-5-95570). The grant was administered by OCC (Kendra Eddlemon and Jim Leach). Project Director was Michael D. Smolen (OCES Water Quality Programs Coordinator).

INTRODUCTION

Regional concentrations of the livestock industry result in excess nutrient loading to land and water resources when wastes are applied as fertilizer in a limited geographic area. Although the economic value of these wastes is widely recognized, the market for them operates relatively inefficiently due to certain well-known barriers such as the high density of production in source areas and the relatively high cost of transportation to market destinations.

Perhaps just as great a barrier to marketing, although not as widely recognized as the transportation cost, are the relatively high transaction costs associated with animal waste commerce. These costs come from two primary sources: 1) fees charged by government agencies to regulate the sale of feeds, fertilizers, and soil amendments and 2) costs required to exchange information about sources, quality, variability and handling of wastes among potential buyers and sellers.

This pilot program was designed to expand the litter market by removing, or at least reducing, these barriers and also by increasing the dissemination of market information. Success in these two areas would expand the geographical boundaries of litter markets, resulting in physical removal of pollutant sources from critical watershed areas, improved waste nutrient utilization, and a more even distribution of nutrients within a watershed.

PROJECT AREA

The project focused on the easternmost counties in Oklahoma, where poultry production has been expanding rapidly for the past ten years (see Figure 1). Suitable areas for disposal or utilization of broiler litter in this region are limited. A combination of valuable recreational water resources, thin, rocky soils, and high rainfall makes the area particularly vulnerable to excess nutrients. The area contains the following water bodies that require protection from excessive animal waste nutrients:

- Illinois River (OK121700010010 -- OK121700030350; priority: medium-high)
- Little River (OK410200010010 -- OK410200080010; priority low to high)
- Grand Lake of the Cherokees-Neosho River (OK121600010040-OK121600030380)
- Poteau River (OK220100010010; priority high)

PROJECT GOALS

This project was formulated as an initiative to stimulate a market for agricultural wastes, with an initial focus on broiler litter. Litter is generally perceived as a marketable product, as evidenced by the buying and selling of broiler litter that took place, albeit inefficiently, in the project area prior to the start of the program. The ultimate goal of the project was to generate enough momentum during the project period to create a self-sustaining market. Toward that end, the project initially set goals in four main areas: (1) creation of a litter quality certification procedure, (2) development of infrastructure for marketing, (3) improved information exchange, and (4) an educational program to ensure proper use of litter.

Figure 1. Map of initial Oklahoma Litter Market project area.

Following is a brief description of project goals under each of these four areas. Goals number 1 and 2 were refocused after about one year of operation as explained below.

LITTER QUALITY CERTIFICATION & DEVELOPMENT OF MARKET INFRASTRUCTURE (REFOCUSED)

This task was removed from the workplan and project resources redirected to more beneficial activities. Preliminary market analysis indicated that litter quality was not a limiting factor to success of the litter market. The project team determined that allocation of project resources to development of a litter quality certification procedure and infrastructure to support the certification would not help improve market efficiency. These revisions were submitted to EPA in October 2000 and approved (see Appendix 1).

Appendix 1. 2000 Project Workplan Revisions

IMPROVED INFORMATION EXCHANGE

It was observed that market prices for litter were often significantly lower than the apparent value of litter. For example, litter might sell for $5-7 per ton while the apparent value of the litter for fertilizer or animal feed use, based on nutrient content, was 2 to 4 times greater. Such occurrences indicated that significant market inefficiencies existed in the form of poor information exchange and large transaction costs.

Unlike previous attempts to accelerate marketing of litter, this project addressed all phases of the market: time, place and form. Previous efforts focused on either informal private exchanges or inefficient 'hot lines' -- toll free numbers through which buyers can identify sellers and vice versa. The problem with such systems is that most of the information is not visible to market participants. The Oklahoma Litter Market in this project was modeled after the successful OCES Haymarket program. The basic premise was to create an online bulletin board with quality, quantity, and other litter information. Potential buyers and sellers would be able to access complete information directly via a home Internet connection or indirectly by calling or visiting their County Extension office.

Initially, the Extension Area Agricultural Economics Specialist, Bill Burton, set up and maintained a bulletin board website. Burton received information directly from Freda Odell, who managed the ODAFF Litter Hotline (1-800 number). To establish the market network

website, a computer was purchased for Burton at the OCES Claremore location and ISP service was provided to the County Extension Offices in Adair and Haskell counties. Other essential computer hardware, originally in the project budget, was not purchased by the project because it was provided by OSU Extension. As the project progressed, OSU provided the entire network, including web server and county office PCs. The complete network included all poultry producing counties (McCurtain, LeFlore, Sequoyah, Adair, Cherokee, Delaware and Ottawa) as well as counties on the "fringe" of the poultry producing area that are close enough to receive litter with reasonable travel costs. These fringe counties include: Choctaw, Haskell, Muskogee, Wagoner, Mayes, Rogers, and Craig. By the end of the project period, a dynamic web site was set up on the ODAFF web server to replace the bulletin board website on Burton's computer. The website is still coordinated with the ODAFF Poultry Litter Hotline.

EDUCATIONAL PROGRAM

The educational objectives of the marketing project were accomplished through the newsletter, the website, presentations at various public meetings, and the Poultry Producer Education Program. The Poultry Producer Education Program, mandated by Oklahoma SB 1075, provided an effective means of reaching all poultry producers in the state beginning in 1999. It is mandated to focus on the environmental aspects of poultry production and requires each producer to receive 9 hrs of education the first year and 3 hrs each subsequent year to maintain his or her license. This assures a ready audience for educational programs on marketing litter, proper use of litter, soil testing, litter testing, and determining value of litter. The program emphasized soil testing, litter testing, applying nutrients to meet crop needs, calibrating application equipment, and recordkeeping. Record books and fact sheets developed in the Small Farms Livestock Pollution Prevention Project (CWA 319(h) Grant: FY 1995 TASK #500, OCC TASK #69), along with materials produced in this project, were used extensively in the educational program.

This project was further reinforced by demonstrations of litter use outside the nutrient sensitive watersheds and demonstrations of alternatives to litter use on high-phosphorus soils inside the nutrient sensitive watersheds. Fact sheets, newspaper articles, and newsletter articles were published to transfer market information to litter users and the general public. Public advertisements in newsletters and newspapers were used to bring in new members for the Litter Market. An incentive of a free litter test was offered to those who joined the Litter Market and provided information for the website. The Market Coordinator, hired by the project, provided personal follow-up with all those who listed themselves with the market as sellers, buyers, or haulers.

PROJECT MANAGEMENT

Oklahoma Conservation Commission gave oversight to the project through a cooperative agreement with Oklahoma Cooperative Extension Service.

The project was initially planned and led by Dr. Darrell Peel (OSU Agricultural Economics), Dr. Douglas Hamilton (OSU Agricultural Engineering), and Dr. Hailin Zhang (OSU Plant and Soil Sciences). After the first two years, Dr. Peel completed the market analysis and reduced his participation in the project. Dr. Smolen took over day-to-day administration of the project with help from Mitch Fram, NE Area Water Quality Specialist, and a team of county Extension Educators and area specialists including Joe Bullard (LeFlore County), Marty Green (Adair County), Jason Hollenback (Delaware County), Roger Williams (Cherokee County), Jim Britton (State Poultry Specialist), and Bob Woods (NE Area Agronomy Specialist). Woods planned the manure demonstrations and Jim Britton assisted in project planning and industry communications. A market representative/market

coordinator was hired midway through the project to follow-up on all contacts and eliminate those that were outdated. A programmer was hired to design the website.

PROJECT TASKS

The project was divided into ten separate tasks. A full description of each task is included in the project work plan (see Appendix 2). Accomplishments by task are presented below.

Appendix 2. Project Workplan

TASK I: ESTABLISH PROJECT ADVISORY COMMITTEE AND PROJECT ADMINISTRATIVE STRUCTURE

Output 801.1: Ten semi-annual progress reports - ***previously submitted***
Output 801.2: Minutes from ten meetings of advisory committee – ***previously submitted, included as Appendix 3***

Smolen, OCES Water Quality Coordinator, provided oversight and coordination of the project and provided a link between OCES and other agencies and groups. Smolen and the OCES Water Quality Office ensured project outputs were completed and facilitated the writing of semi-annual and other progress reports.

At the outset of this project, the poultry industry and use of poultry litter had become highly controversial issues in the project area. The City of Tulsa had already contracted with Jim Wimberly of Winrock International to investigate alternate uses of litter and other potential solutions. The Oklahoma Department of Agriculture and Conservation Commission had both expressed interest in promoting entrepreneurial ventures to move litter out of nutrient sensitive watersheds. OSU project personnel, including Smolen, Peel, Zhang, Fram, Britton, and Don Stotts (OSU Agricultural Communications), joined with Gary Bledsoe of ODAFF, Eldon Merklin of OCC, Claude Rutherford of Simmons Poultry, and Wimberly to form a Litter Marketing Workgroup. This work group acted as the project Advisory Committee throughout the first two years of the project.

The diverse constituency of this group helped to facilitate information exchange among state agencies, poultry producers, and industry (Table 1). This body met with County Extension Educators, Conservation District personnel, representatives of poultry house cleanout companies, trucking companies, pelleting companies, and inventors with interest in the litter market. Information gained in these meetings helped in market analysis and in planning the operation and promotion of the project.

Table 1. Advisory Committee

Name	Organization
Gary Bledsoe	ODAFF
Jim Britton	OCES Area Poultry Specialist
Bill Burton	OCES Area Ag Economist
Mitch Fram	OCES Area Water Quality Specialist
Doug Hamilton	OCES Animal Waste Specialist
Eldon Merklin	OCC
Derrell Peel	OSU Ag Econ
Claude Rutherford	Simmons Foods, Inc.
Mike Smolen	OCES Water Quality
Don Stotts	OCES Ag Communications
Jim Wimberly	Winrock and City of Tulsa
Hailin Zhang	OCES Soil, Water, & Forage Lab

In 2001, after many of the main elements of a successful market had been identified, a second committee, loosely termed the Project Action Workgroup, was assembled to implement the project (Table 2) and promote the Litter Market. This group consisted of OCES personnel and a Market Coordinator, hired by the project. It carried the responsibility of implementing project tasks, such as advertising free litter tests in the project area, running newspaper ads, sponsoring market workshops for poultry producers, and otherwise promoting the litter market.

Table 2. Action Work Group

Name	Organization
Jim Britton	OCES Area Poultry Specialist
Joe Bullard	LeFlore County Extension Educator, Ag/4-H Youth Dev.
Christy Bryan	Market Coordinator (2002-present)
Mitch Fram	OCES Area Water Quality Specialist
Marty Green	Adair County Extension Educator, Ag/4-H Youth Dev.
Jason Hollenback	Delaware County Extension Educator, Ag/4-H Youth Dev.
Bret Sholar	Market Coordinator (2000-2002)
Mike Smolen	OCES Water Quality
Roger Williams	Cherokee County Extension Educator, Ag/4-H Youth Dev.
Bob Woods	OCES Area Agronomist

Copies of the minutes from ten meetings from these two advisory groups are included with this report as Appendix 3.

Appendix 3. Advisory Committee Minutes

TASK II: CREATE EDUCATIONAL PROGRAM

Output 802.1: Two fact sheets covering litter marketing, and sampling, to augment Poultry Facts and Farm Record Books – ***previously submitted, included as Appendices 9 and 10***
Output 802.2: Newsletter to deliver market information, important announcements, and educational items - ***previously submitted, included as Appendix 8***
Output 802.3: Case studies for two farms located outside of Small Farms and Lake Wister project areas demonstrating environmentally and economically sustaining use of poultry litter - ***previously submitted, included as Appendices 6 and 7***

The original intent of the educational program was to develop educational materials aimed at poultry producers and potential users of litter. The materials would be distributed through normal Extension channels as well as through the Oklahoma Litter Market website.

Educational materials developed, adapted, or accumulated for this program addressed proper use of litter through soil testing, litter testing, applying litter at rates to meet crop needs, calibration of litter application equipment, and recordkeeping. Some of the materials used in this program were developed earlier in the Small Farms Livestock Pollution Prevention project (CWA 319(h) Grant: FY 1995 Task #500, OCC TASK #69).

The Small Farms project had developed recordkeeping procedures and educational materials that were pilot tested in a few farms in Delaware and Adair Counties. In the current project, use of these materials was expanded to the entire 14 county project area.

The educational component of the project benefited from the simultaneous implementation of the Oklahoma Licensed Poultry Operators Act by the State legislature in 1998 (SB 1075). The Legislature designated the Oklahoma Cooperative Extension Service as the body responsible for developing the curriculum and instituting the Poultry Producer Education Program. To become licensed, the Act mandates nine-hours of first-year training for all

poultry farm operators in the state. To maintain certification, operators are required to obtain 3 hours of continuing education credit annually.

The current project worked hand-in-hand with the Poultry Producer Education Program, providing educational content addressing marketing, litter quality, litter sampling, and other information useful to developing an active market for poultry litter. Project fact sheets and brochures were distributed to poultry producers attending the training. Applicator training needs were also addressed through discussion with the Program. Furthermore, under the Program, the project sponsored continuing education workshops that focused on litter marketing and promoted face-to-face contact between potential buyers and sellers. A list of these meetings is provided in Appendix 4.

Appendix 4. Litter Market Continuing Education Meetings

Litter application demonstrations were also used to reinforce the educational effort. In 1999, the project provided support of litter demonstration plots through OCC and ODAFF to facilitate the litter market, including the purchase of 15 signs for use at various litter demonstrations. A copy of these signs, as well as additional information regarding the demonstrations, is contained in Appendix 5.

Appendix 5. Litter Application Demonstrations

Demonstration farms were also utilized to exhibit pollution prevention techniques for broiler producers. Soil testing, yield goals, litter testing, equipment calibration, and recordkeeping were used to establish a nutrient balance across each farm. These sites show farmers how they can use this knowledge to determine proper application rates, maintain water quality, and establish the amount of litter they can market off-farm. Case studies for two demonstration farms are included in Appendices 6 and 7.

Appendix 6. Poultry Litter Use on the JB Ranch

Appendix 7. Poultry Litter Use on the J&J Cattle Co.

An informational market newsletter and an Extension fact sheet series on poultry waste management were produced under this task. The newsletter used the distribution list from the Poultry Producer Education program. Copies of the newsletter are provided in Appendix 8. For continuation of Litter Market information, a column will be established in the Education Program newsletter.

Appendix 8. Poultry Litter Market Update Newsletter

Fact sheets completed as part of the project included: PT2002-24, *Poultry Litter Quality Criteria;* PT99-15, *How to Obtain a Good Poultry Litter Sample;* PT99-15, *How to Obtain a Good Poultry Litter Sample,* and a series of three brochures, one each focused on litter buyers, sellers, or haulers. Copies of the factsheets are contained in Appendices 9-12.

Appendix 9. PT2002-24: Poultry Litter Quality Criteria

Appendix 10. Litter Market Brochures

Appendix 11. PT99-15: How to Obtain a Good Poultry Litter Sample

Appendix 12. PT2002-28: Estimating Volume and Bulk Density of Poultry Litter in the House

TASK III: ESTABLISH QUALITY CRITERIA AND CERTIFICATION PROCEDURES FOR LITTER

Outputs 803.1: Standard operating procedures to measure volume of litter in poultry house and obtain representative sample for litter quality - ***previously submitted, included as Appendices 11 and 12***

As a result of the findings from the preliminary market analysis performed as part of Task IV (see below), it was determined that much of the original Task III would not be worthwhile. Specifically, the market grader-training program was dropped. The market analysis determined that the quality of litter was not a limiting factor in the success of the market. Consequently, the task was reprogrammed and resources redirected to other areas.

However, some aspects of Task III were retained as part of Task II because they overlapped with the needs of the education program. Alternative litter sampling methods were compared to obtain data on the sensitivity between various techniques for testing quality and nutrient content. These efforts led to the publication of fact sheets describing how to obtain a representative litter sample and how to measure the volume of litter in a poultry house (see Appendices 11 and 12 under Task II above). These fact sheets were utilized in the education program and published on the website.

TASK IV: IDENTIFY CRITICAL BARRIERS AND INFORMATION NEEDS

Output 804.1: Report on state of litter marketing in Eastern Oklahoma and recommendations for market structure to facilitate movement of litter across watershed boundaries - ***previously submitted, included as Appendix 13***

Efforts to identify critical barriers and information needs to expand litter markets were directed by Derrell Peel. Although no formal market existed in eastern Oklahoma prior to the start of the project, litter was bought, sold, bartered, and transported throughout the region. Tina Eaton, a graduate assistant in the OSU Department of Agricultural Economics, surveyed and described this informal litter market in her 1999 Master's thesis, "*Factors affecting the development of the broiler litter market in eastern Oklahoma*." A copy of this document is included with the digital copy of this report.

Dr. Peel summarized Eaton's conclusions in his 2000 project report, "*The State of the Oklahoma Litter Market*," included as Appendix 13.

Appendix 13. The State of the Oklahoma Litter Market, 2000 Project Report

The findings of this research resulted in a major shift in the project focus. The three main barriers to the litter market were identified as 1) a lack of demand, 2) a lack of market infrastructure, and 3) supply limitations. Several subfactors were grouped into these broad categories. In order to combat these issues, the researchers suggested focusing project efforts on "enhancing bulk land application of litter with particular emphasis on expanding the demand base in terms of geography and volume of litter." Specifically,

- Improve information exchange and facilitate the development of a formal litter market through the website,
- Develop two or more publications on strategic use of litter for alternative land use and cropping patterns.
- Conduct a statewide survey of agricultural producers to determine current attitudes about litter use, perceptions about litter value and price, and educational needs.
- Use survey information to design more appropriate litter information and education programs.

- Provide information and in-service for extension educators and others, targeting areas outside traditional poultry production areas.
- Enhance the litter website to increase information about litter use, value and management, with special emphasis on reaching new potential users.
- Continue supporting litter demonstrations as part of Extension Education program.

These recommendations resulted in revisions to the project workplan and helped direct activities for the final two years of the project period.

Additional studies investigating the effects of incentives were discussed, particularly as pertaining to the Wister Lake program, but not attempted.

TASK V: ESTABLISH INTERNET WEBSITE AND COORDINATE WITH THE OKLAHOMA DEPARTMENT OF AGRICULTURE'S POULTRY LITTER HOTLINE.

Output 805.1: Report on effectiveness of Website for tracking market information, including: buyer location, seller location, volume of litter transferred, quality of litter sold, available and delivered date – ***The following discussion comprises the initial submittal of this output.***

OSU established an agreement with ODAFF to facilitate information transfer from their Poultry Litter Hotline to the website. Through this agreement ODAFF received calls from their 1-800 hotline and faxed potential buyer and seller data to OSU on a daily basis. Also through the agreement, OSU incorporated Hotline data into the project website, developed a database for use by OSU and ODAFF, advertised the Poultry Litter Hotline through all Extension channels, developed procedures to check authenticity of callers to the Hotline, provided quarterly data reports to ODAFF, and provided ODAFF with $3,315 to help offset the expense of the increased number of calls during two cleanout seasons, January through June of 2001 and 2002.

Early in the project, a website was designed and maintained by Bill Burton, OCES Area Agricultural Economist. The website can be accessed directly via a home Internet connection or indirectly by calling or visiting a county Extension office. Initial efforts focused on providing a bulletin board on which to post information received through the ODAFF Poultry Litter Hotline and links to existing informational sites. In the initial version, sellers, buyers, and haulers had to call ODAFF through the 1-800 number or call an Extension office to be listed on the website. Later, a web designer was employed to change this static website to a fully interactive, dynamic website where sellers, buyers, and/or haulers could browse or join the litter market and list their own information.

The site provides links to a number of useful features such as a nutrient value calculator on the OSU Soil, Water, & Forage Analytical Laboratory web site. This program (or Decisison Support System) allows producers to obtain fertilizer recommendations from a soil test, calculate the amount of litter needed to meet nutrients required, estimate the value of litter based on its nutrient composition, and/or estimate litter application rates to provide N or P.

After extensive testing, the Oklahoma Litter Market website was registered as

OK-Littermarket.org

The commercial site that supports the registered name transfers directly to the OSU Division of Agriculture and Natural Resources webserver, where the software and database reside.

The website serves as an electronic educational media center and a collection site for user survey information, providing a forum for exchange of information between potential buyers and sellers of litter, allowing them to post quality and quantity, time of availability of litter,

and bidding and asking prices. The market newsletter was also made available on the website in electronic form.

The newly designed website has generated a great deal of interest among those who use the web. From October 2002 to February 15, 2003, there have been more than 6000 hits on the home page for the litter market. There have been more than 6267 on Sellers, 6040 on buyers, and 5922 have hit on the haulers and service provider page. A search on MSN (just typing littermarket in the browser) or Google.com gets it as the only hit. Searching for "litter" on google.com gets the litter market on page 4. Searching for "selling poultry litter" gets it on the second page.

In January 1999, Bret Sholar, the Market Coordinator reported 142 sellers, and 165 buyers listed on the ODA Poultry Litter Hotline. On December 31, 2001, after checking all those listed, 25 buyers, 34 sellers and 20 haulers were verified. By February 14, 2003, these numbers advanced to: 51 sellers, 37 buyers, and 17 haulers, mostly added in 2003. In 1999 there were about 73,000 tons of litter requested and only 57,000 tons offered for sale. The 2003 stats are 11,395 tons requested and 14,625 tons offered. To date it has not been possible to trace transactions across the website without calling individual buyers and sellers and asking them to share their experience. Such phone calls would be feasible with some funding.

Although these numbers are lower than anticipated at the outset of the project, the extra work and attention to detail that has gone into reviewing the data provides a high level of confidence that individuals are indeed market participants. The foundation that has been laid provides a solid basis on which to continue to build the manure market in eastern Oklahoma. And, indeed, this is a continuing effort. The project personnel that have provided much of the driving force behind the efforts so far continue to dedicate their time and energy to the success of this endeavor.

TASK VI: UPGRADE PARTICIPATING COUNTY OFFICE COMPUTERS.

Output 806.1: Description of computer network located at county extension offices serving as backbone for the market information system - ***previously submitted, included as Appendix 14***

To ensure public access through the county Extension offices, a survey was conducted in 1998 to assess what additional resources, if any, were needed to bring them to the level of microprocessor speed and memory needed to handle the web-based market information system. Survey results indicated that most Extension offices were already online and either already in possession of the necessary equipment or in the process of obtaining the needed technology through other avenues. Commercial Internet access was provided for two counties through the early stage of the projects. All counties were supported locally or by OSU by 2003. Overall, minimal funds were expended for this task. Description of the computer network is attached as Appendix 14.

Appendix 14. OCES Computer Network Description

TASK VII: TRAIN MARKET GRADERS.

After the findings of the market analysis (Task IV) re-focused the goals of the project, the market grader certification program was determined to be unnecessary. Task VII was reprogrammed and resources re-allocated to more worthwhile endeavors.

TASK VIII: PROMOTE MARKET.

Output 808.1 - Report on effectiveness of market promotion campaign ***initial submittal, included as Appendix 16***

Once the market proceeded beyond a rudimentary bulletin board stage, the Project Action Workgroup (see Table 2) began actively working on market promotion. A plan was put into place to obtain greater participation in the market through personal contacts and newspaper advertising. To aid in this process, a part-time Market Coordinator was hired on federal funds to oversee promotion of the market, and to work closely with industry groups and the public to support the market. The project contracted with Bret Sholar to contact buyers and sellers, verify data, and otherwise help facilitate the litter market. Sholar was particularly effective because he also worked with the Department of Ag as a contract inspector. This other activity gave him frequent contact with poultry producers.

The project offered a "Free Litter Test" through the county Extension offices in the project area. County Extension agricultural educators ran ads in local newspapers offering free litter testing to help them recruit buyers and sellers. When Brett Sholar resigned to take a position with the Bureau of Mines in Oklahoma City, Christy Bryan was hired to replace Sholar. As one of her first duties, she contacted all producers listed on the Litter Market website to update information and to promote the market. An interim report on the market promotion effort was submitted in January 2002 and is included as Appendix 15. A summary of the market promotion effort, required as Project Output 808.1, is provided as Appendix 16.

Appendix 15. 2002 Project Report, Report on Oklahoma Litter Market

Appendix 16. Report on Market Promotion Campaign

TASK IX: FINAL REPORT.

Output 809.1 – Final report.

This document, including appendices, is the final report.

TASK X: SURVEY POTENTIAL LITTER USERS (NEW TASK)

Output 810.1 - Report on survey of producers. ***initial submittal, included as Appendix 17***

This task was added to the project effort in the 2000 workplan revision. To determine the demand for litter, a statewide survey concerning use of poultry litter and other animal manures was to be conducted in coordination with the Oklahoma Department of Agriculture Statistical Service. This was to be an inexpensive mail-out survey to document Oklahoma producers' attitudes toward the litter market and to record the range of values they attribute to the various components of such a market. A second, more focused, telephone survey was to be conducted in one or two counties within 50 miles of poultry production, to provide a more detailed picture of the mechanisms of an operating market, including records of costs and benefits, both actual and perceived. This second survey was not done.

Due to an inability to coordinate with the ODAFF Statistical Service, the mail-out survey plan was replaced with a survey administered as part of the Oklahoma Cattleman's Association annual meeting in July 2002. A survey instrument was developed and approved by the OSU Institutional Review Board. Surveys were included in registration packets for the Oklahoma Cattlemen's Association Meeting in Oklahoma City on July 25-27, 2002.

As an inducement to complete the survey, respondents were registered in a drawing for a digital camera. Of the 300 surveys distributed, 39 were returned to the registration desk. Of

these, 35 indicated they were cattle ranchers. Using the OCES district lines as boundaries, there were 12 ranchers from NE Oklahoma, 11 from NW, 4 from SE, and 8 from SW.

A copy of the survey instrument and a report discussing the findings of the survey (Output 810.1) are submitted as Appendix 17.

Appendix 17. Oklahoma Cattleman's Ass'n Litter Market Survey

A summary of these findings is listed below:

Table 3. Results of Oklahoma Cattleman's Ass'n survey.

General Information					Fertilizer Information						"Would-pay Price"			
Region	Ranchers	Acres (avg)	Acres (range)	Acres (median)	Fertilize Pasture (n)	Commercial fertilizer (n)	Beef manure (n)	Hog manure (n)	Poultry litter (n)	Other (n)	Would pay for Poultry Litter (n)	Poultry Litter ($/ton)	Would pay for Beef Manure (n)	Beef Manure ($/ton)
NE	12	4100	60-15,000	1350	12	11	1	1	4	1	11	$9.55	11	$7.73
NW	11	8000	160-65,000	1420	9	9	3	0	0	1	9	$13.89	9	$13.89
SE	4	1260	80-3,000	700	4	4	1	0	1	1	3	$15.00	2	$10.00
SW	8	1212	120-2,800	640	8	8	0	0	0	0	4	$12.50	3	$25.00

MEASURES OF SUCCESS

1. Establishment of a publicly reported market for litter where none previously existed.

At the start of the project, only two efforts to develop a Litter Market in eastern Oklahoma and western Arkansas existed. Both were based on toll-free hotlines. The first, developed by Winrock International for Arkansas, was passed to Arkansas Farm Bureau. The second was set up and operated by ODAFF. Both hotlines were initially well received, but slowed dramatically after the first year. The electronic Litter Market developed in this project is a direct descendent of the ODAFF Hotline, as any information received by ODAFF is quickly transferred to the website.

A website has very clear advantages over a hotline. First it is not just a list, but a communication system, offering direct control by the user, the buyer or seller. Second it can be viewed repeatedly in different formats. The user can sort it to identify those listing in a certain geographic area or those offering product or needs at a certain time. It offers flexibility in terms of sharing comments such as negotiating points, and it offers the opportunity to specify quality of the product offered or of the material desired.

Perhaps the biggest advantage of the website over a hotline is the possibility of providing education along with timely market information. In this case the market information is linked with supporting educational information such as fact sheets and calculators to help the user determine the suitability and value of the product.

The Oklahoma Litter Market website currently includes all those who have called the ODAFF Hotline with information to post, plus those who have come upon it directly from

the web, through the State Poultry Producer Education Program, or been referred to Extension from other sources. At this time, the number of sellers is expanding rapidly; the number of buyers is expanding slowly and the number of service providers has remained constant.

Approximately 22 of the 52 sellers currently listed have updated their information recently. Although verified during 2002, it cannot be assumed the remainder are still actively selling litter or willing to sell on the market. Seven of the 37 buyers currently listed updated their information since September 2002, when they were transferred from the previous version of the hotline/market list. All were verified during 2002.

Hauler information has been updated largely since October 2002, but there has been little change since.

2. Number of users and quantity of litter marketed, measured by volume and recorded on the website.

As of February 15, 2003, there were 52 sellers, 37 buyers, and 17 haulers represented on the website. Sellers have listed approximately 14,625 tons, and buyers have requested 11,375 tons. Sellers represent 100-120 houses.

3. Tons of manure moved from sensitive watersheds: Spavinaw Creek, Illinois River, and Little River, to other areas.

The website cannot track sales directly. Even if asked for the information, there is no incentive for the seller or buyer to report their sales. When the market coordinator was active, it was possible to contact individuals to verify sales and get details. At this time, however, there is no money to pay the market coordinator for such effort. Furthermore, it would be wasteful to conduct such calls because the level of utilization is low. After use of the website expands, a survey of users could estimate the quantity of sales and other more specific information.

Both ODAFF and OCC receive information from poultry producers and litter applicators concerning movement of poultry litter across county lines. A summary of this information is contained in Tables 4 and 5. Table 4, derived primarily from applicator reports to ODAFF, shows the number of growers, birds, and houses by county in all the eastern Oklahoma counties for 2000, 2001, and 2002. This listing is not broken down by watershed. Assuming about 100 to 125 tons of litter per house, the total production in Oklahoma can be estimated to be between 300,000 and 367,000 tons per year in 2002. This is about twice the amount reported by applicators in Table 5.

Table 5 shows estimated litter production and actual litter application, as reported by applicators. Presumably, the difference represents litter not handled by commercial applicators. Excess litter is estimated in this table as the difference between litter applied and litter produced (based entirely on applicator estimates). The percent excess applied is an indicator of how much was transported into or out of the county. The larger numbers indicate counties that import most, or all, of their litter. These include: Craig, Lincoln, Kingfisher, McIntosh, Nowata, Okfuskee, Okmulgee, and Rogers counties. Many of the producing counties are much lower or even negative, such as Cherokee, Delaware, Haskell, LeFlore, Mayes, and McCurtain.

In general, Table 4 and Table 5 show that poultry production and litter application is basically in balance within counties. Of the major producing counties, it appears that LeFlore and Mayes counties are shipping the most litter to other areas.

Table 4. Poultry production in Oklahoma, as reported by applicators to ODAFF.

County	2000 Total Growers	2000 Total Birds	2000 Total Houses	2001 Total Growers	2001 Total Birds	2001 Total Houses	2002 Total Growers	2002 Total Birds	2002 Total Houses
Adair*	76	6,034,800	355	71	5,983,200	348	67	6,043,500	344
Blaine							1	5,000	3
Cherokee	24	912,500	73	24	1,051,100	75	21	911,100	68
Choctaw	4	193,000	10	5	198,000	10	5	198,000	10
Craig	8	757,000	36	9	989,000	44	9	987,000	44
Creek				1	30,000	2	1	30,000	2
Delaware	171	9,323,270	562	175	9,736,010	578	170	9,190,110	554
Haskell	59	3,587,698	162	61	4,182,398	189	63	4,212,898	196
Latimer	5	202,000	13	5	202,000	13	4	222,000	13
Le Flore	244	14,931,494	686	247	17,717,444	782	238	18,013,544	780
Mayes	17	1,060,500	59	19	1,344,000	69	21	1,755,000	83
McCurtain	239	11,379,055	609	240	11,279,700	602	238	11,538,492	607
McIntosh	2	46,400	5	2	45,800	5	2	45,800	5
Muskogee	7	256,200	13	6	220,400	13	7	281,400	17
Okfuskee				1	4,400	1	1	4,400	1
Ottawa	27	2,432,100	132	30	2,783,650	145	29	2,858,300	145
Pittsburg	1	70,000	3	1	70,000	3	1	70,000	3
Pushmataha	3	41,200	4	2	30,000	3	2	30,000	3
Rogers				1	24,000	8	2	420,000	14
Sequoyah	16	432,343	28	16	532,743	34	19	598,343	41
Totals	**903**	**51,659,560**	**2,750**	**916**	**56,423,845**	**2,924**	**901**	**57,414,887**	**2,933**

**Shaded counties are centers of poultry production, containing more than 100 houses.*

4. Increased awareness of the value and potential uses of litter as shown by 10% increase in soil testing, 100% increase in manure testing, 50% increase in demand for Poultry Facts and Farm Records books in project counties.

Because of the impact of the Poultry Producer Education Program, mandated by State law, the frequency of soil testing and manure testing has far exceeded these goals. Poultry producers in nutrient sensitive watersheds are currently required to soil test every year. All other producers are required to soil test every three years. All producers are required to test their litter annually. All producers must attend the education program, and so they have record books and fact sheets. Furthermore, ODAFF poultry inspectors check the use of record books annually.

5. Increase in movement of litter as shown by 10 to 20% of litter produced in sensitive watersheds transported to less sensitive watersheds measured by comparing buyer and seller locations.

This information is not currently available. After the litter market has been operating for a year or two, it will be possible to survey buyers and sellers to evaluate success in moving litter from sensitive to less sensitive watersheds. Analysis of litter applicator reports shown under measure (3) above suggests that we have not come close to achieving this goal at this time.

Table 5. Poultry litter in Conservation Districts, as reported February 28, 2002 to OCC by litter applicators.

Conservation District	Poultry Houses (from ODAFF)	Litter Production* (tons)	Litter Application (tons)	Excess Litter Applied (tons)	Excess Applied (% of Produced)
Adair County	348	13,834.0	15,733.0	1,899.0	12.07%
Checotah (McIntosh County)		348.0	348.0	0.0	0.00%
Cherokee County	75	3,587.0	3,750.0	163.0	4.35%
Craig County	44	2,871.0	11,589.0	8,718.0	75.23%
Delaware County	578	23,895.0	29,304.0	5,409.0	18.46%
Haskell County	189	18,662.0	20,830.0	2,168.0	10.41%
Latimer County	13	204.0	204.0	0.0	0.00%
LeFlore County	782	58,469.0	57,278.0	-1,191.0	-2.08%
Lincoln County		0.0	193.0	193.0	100.00%
Kingfisher County		0.0	161.0	161.0	100.00%
Mayes County	69	1,798.5	1,428.5	-370.0	-25.90%
McCurtain County	602	15,963.0	17,064.0	1,101.0	6.45%
McIntosh County	5	0.0	373.0	373.0	100.00%
Murray County		1,888.0	1,888.0	0.0	0.00%
Muskogee County	13	1,988.0	2,372.0	384.0	16.19%
Nowata County		0.0	1,046.0	1,046.0	100.00%
Okfuskee County	1	0.0	320.0	320.0	100.00%
Okmulgee County		0.0	248.0	248.0	100.00%
Ottawa County	145	8,630.0	8,198.0	-432.0	-5.27%
Pittsburg County	3	450.0	0.0	-450.0	--
Pushmataha	3	355.0	355.0	0.0	0.00%
Rogers County	8	0.0	761.0	761.0	100.00%
Sequoyah County	34	1,794.0	1,794.0	0.0	0.00%
Total		**154,736.5**	**175,237.5**	**20,501.0**	**11.70%**

**Litter production as reported by applicators does not include data on litter produced, but not land applied in the State of Oklahoma, nor does it include data from incomplete, incorrect, or unreadable applicator reports.*

6. Increased general interest in managing wastes as measured by number of hits to website.

The website is very popular. Since it went online there have been more than 6200 hits, originating from a wide number of sources. A recent review (February 2003) of output from site monitoring software indicated that, on average, there were about seven hits per day, with an average visit length of about eight minutes. Most interesting is the observation that viewers stay about seven minutes per page. This measure is likely to increase dramatically as the new advertising push gains momentum.

7. Successful determination of barriers to expanding litter market and recommendations to overcome barriers.

Project personnel successfully determined barriers to market expansion, as well as information needs to increase the market. Their recommendations resulted in the

workplan revision of 2000 that included a major re-focusing of project goals and efforts. The biggest barrier identified to success of a litter market is the restricted flow of information between producers and buyers. This project has already had some effect in this area. As the site allows producers to show price and litter value (in terms of manure test results), a great deal more information is available now than there ever was previously. The market analysis also identified barriers to the transportation of litter. There seem to be fewer service providers hauling litter at the end of the project than there were at the start. Ostensibly this is because of increased reporting and education requirements that have come to into play through the Poultry Producer Act (SB 1075).

8. Participation of poultry industry in supporting and promoting electronic market.

Poultry industry representatives played a significant role in the technical advisory committees that directed the initial project efforts. They have also helped distribute literature to producers encouraging them to subscribe. A larger role for poultry producer organizations is anticipated in the future, perhaps even as a sponsor for the website.

CONCLUSIONS

The emergence of the Internet and online commerce greatly enhances the vision of establishing a market to move litter from areas of surplus phosphorus to areas of deficit phosphorus. Through the online litter market, a grain farmer in north-central Oklahoma can learn who has litter to offer, how much, what quality, etc. Likewise, a seller can find out who wishes to buy litter, how much, when it is needed, and other information essential to establishing a trade.

The addition of a "Service Providers" category to the online market website addresses a severe bottleneck in the market for poultry litter. The limiting cost of moving poultry litter outside the sensitive watersheds is the cost of transportation. Many service providers have a difficult time keeping a stable business going because of the seasonal basis of litter production and fertilizer use. The online website facilitates the coordination of these calendars. A user of the website can identify all the elements of a successful trade: a seller, a buyer, and a hauler.

The idea of having all transaction information present on one website facilitates the operation of fertilizer brokers. An entrepreneur could find the names and locations of sellers, buyers, haulers, spreaders, loaders, and any other services needed to complete a transaction. Assuming poultry litter sells for $6-8 per ton and hauling costs of $0.35 per ton-mile in a semi, the sale of a single house (about 100 tons), at a distance of 50 miles might generate in excess of $2,000. The commission on such as sale might be sufficient to attract such a businessperson.

The Ok-littermarket.org website offers the additional opportunity to educate both buyers and sellers on all the facets of litter use and handling. The website includes direct links to calculators to estimate the value of litter and fact sheets to help determine if litter is the right fertilizer or soil amendment to use in a given location. The fact sheets tell the user how to sample litter, how to sample soils, and how to determine appropriate application rates.

The project developed litter demonstrations outside the counties with large numbers of producers. These helped increase the user experience with poultry litter in a way that written materials or testimonials could not do. The ODAFF and Conservation Commission provided support to purchase litter for application at demonstration sites.

Additional demonstration sites located inside the producer counties showed how soils already rich in soil test-P could produce forage without further use of litter. Most interesting

to local producers was a demonstration of overseeding pastures with alfalfa. Alfalfa uses large amounts of phosphorus and potassium, even when nitrogen is in short supply. Thus, a high quality forage is produced in these P-rich soils without further addition of poultry litter or fertilizer.

The combination of the litter market project with the Poultry Producer Education Program, mandated by State law, was extremely successful in meeting the goals of this project. More than 1100 producers were reached with relevant information including information about marketing litter and how to get on the website.

At the conclusion of the funded period of this project, the website was just getting into full operation. As implemented, it can operate with very little supervision or maintenance. Users can log in to post their own information, or they can browse without any cost to see what has already been listed. The OSU Cooperative Extension Service is committed to keeping the website operational for another year to test the concept. In that time, we will continue to advertise the website and marketing program through educational publications. There will be assistance to producers through the county offices and limited assistance through the market coordinator (the cost of phone calls and personal follow up is too high to promise very much attention from the market coordinator.)

Although the market did not move large amounts of litter before the end of the project period, this project has put the structure in place to promote litter movement as soon as regulations dictate that manure must move out of the sensitive watersheds or the price of hauling comes down.

Watershed Protection Through Manure Marketing (Pilot Program)

Revised Work Plan

Justification 10/3/00

The request to revise the Manure Marketing work plan is based predominantly on the document, *The State of the Oklahoma Litter Market.* (Output 804.1)

Request 1: Extend Project from three years to five years.

Justification: Findings from the first phase of the project indicate that a better course of action would be more effective. Extending the project two more years will be sufficient time to reach project objectives through the means outlined in the revised work plan.

Request 2: Reprogram the project away from certifying the quality through a program of trained graders, to more active market development and improved information exchange.

Justification: The market analysis conducted by Darrell Peel and his student, Tina Eaton, (Output 804.1 and it's addendum 804.1a) indicates that quality of litter is not a major element in the efficiency of the litter market. The report identifies many other elements that are far more significant, such as the efficiency of information exchange, the cost of transportation, the timeliness of supply, and the need for storage.

The basic change of emphasis is detailed at the bottom of page 1 and top of page 2.

Requests by Task:

Task 1. No change in cost. The advisory board will be reconstituted to include potential groups who might take over the website and market information component after the project ends.

NEW TASK, designated Task 10 is proposed. This task will seek to gain marketing information through two surveys. One, through the Ag Statistics Service at the Oklahoma Department of Agriculture, will be a mail-back survey to address the attitudes of farmers around the state to evaluate interest in poultry litter. The second will be a telephone survey to focus on a county near poultry production to get more precise information about potential markets and factors that can improve or impede it. We propose to rebudget $7,000 from other tasks into this.

Task 2. This task is the existing education program concerning potential uses of litter. This task will promote some demonstrations of litter use. It will be compared to use of commercial fertilizer in areas where there is a potential of market development. Experience from a state-run demonstration program (funded by ODA and OCC) were less than satisfactory because site selection was not optimal for educational purposes. OCES will play a larger role in the selection of sites for demonstration, so they can be included in county education programs. We propose reprogramming to add $6,000 to this task.

Task 3. We propose eliminating this task because we view litter certification programs, with the grader education and other elements to be an inefficient approach to market

development. We propose reducing the budget from $23,500 to $3,000, leaving only enough in this category to cover that already spent.

Task 4. This element is complete at this time. Derrell Peel and his graduate student have conducted the market analysis on which this revision is based. $5,000 is retained in the budget to revisit the market performance at the end of the project.

Task 5. We propose reducing this budget from $29,500 to $17,000. At the same time we propose to focus this element to get the exact website and data base we seek. Less money will be spent on hardware, as a web server at OSU will carry the website. The website developed by Bill Burton will be redesigned by a student employee and maintained by Burton. This task as rebudgeted includes coordination with ODA to obtain data on a daily basis from their Poultry Litter Hotline. Dan Parrish, Water Quality Division Director, has committed their help in this effort.

Task 6. Network upgrade for County Extension Educators will be reprogrammed to other tasks. Most counties were able to upgrade their computer facilities through other means. A total of $3,000 is left in this task to cover that already spent and some existing commitments.

Task 7. Training of Market graders will be completely reprogrammed saving $12,000. The justification is based on the analysis of Peel and Eaton discussed above.

Task 8. Promotion of the Market. We propose to increase this budget to allow us to hire a coordinator to facilitate the information transfer from producers to potential buyers. This person is essential to achieving the project objectives.

Task 9. No provision was previously made for writing the final report. Money ($3,000) has been reprogrammed from other tasks.

We are requesting no additional funds.

Agency: Oklahoma Cooperative Extension Service

Title: Watershed Protection Through Manure Marketing (Pilot Program)

Project Number: 800

Project Duration: Five years

Project Location:
The manure market will focus on the counties of eastern Oklahoma and western Arkansas. This area contains the following water bodies that require protection from excessive animal waste nutrients:

- Illinois River [OK121700010010 - OK121700030350; priority: medium-high, p. 15]
- Little River [OK410200010010 - OK410200080010; priority: low to high, pp. 18-19]
- Grand Lake of the Cherokees-Neosho River [OK121600010040 - OK121600030380, pp. 17-20]
- Poteau River [OK2201 0001 001 0; priority: high, p. 23]

Problem Statement:
Regional concentrations of the livestock industry result in excess nutrient loading to land and water resources when wastes are applied in a limited geographic area. The problem is particularly acute in Eastern Oklahoma, where poultry production has been expanding rapidly for the past ten years and suitable areas for disposal or utilization of broiler litter are limited. High value recreational water resources, thin and rocky soils, and high rainfall make this area particularly vulnerable to excess nutrients. To prevent water quality degradation, animal wastes need to be distributed over a broad geographic region to avoid nutrient imbalances in critical watersheds. It is widely recognized that animal wastes have economic value but markets for animal wastes operate relatively inefficiently due to certain well known barriers such as the high density of production in source areas and the relatively high cost of transportation to market destinations. Although not as widely recognized, the relatively high transaction costs associated with marketing may present just as great a barrier. Transaction costs come from two primary sources1) fees charged by government agencies to regulate the sale of feeds, fertilizers, and soil amendments, and 2) costs required to exchange information about sources, quality, variability and handling of wastes among potential buyers and sellers.

Removing market barriers and increasing market information will expand the geographic boundaries of litter markets. This would result in physical removal of pollutant sources from the critical watershed areas, improved waste nutrient utilization, and even distribution of nutrients within a watershed.

Description:
This project is a pilot program to implement an electronic market for agricultural wastes. Initially the market will focus on broiler litter, since litter is generally perceived as a marketable product. Much buying and selling of litter currently takes place, albeit inefficiently, in Eastern Oklahoma and western Arkansas. At the conclusion of the pilot program, the manure market will be transferred to a private entity such as a poultry producer organization.

This project differs from previous attempts to market litter in that it addresses all phases of the market: time, place and form. Most existing markets are either informal private

exchanges or inefficient 'hot lines' - toll free numbers through which buyers can identify sellers and vice versa. The Oklahoma Litter Market will be modeled after the successful OCES Haymarket program. Litter quality and quantity and other information will be posted on an electronic bulletin board. Potential buyers and sellers will be able to access the information directly through the Internet or indirectly by calling or visiting their County Extension office where frequent updates will be posted based on the up-to-date information from the web site. County Extension Agents, producer organizations, poultry integrators and other cooperators will work actively to promote the market to all poultry producers and potential litter buyers in their counties. An education program based on litter use demonstrations will also be set up in potential user areas to further promote the market

Funding for this project will establish a marketing network, of agents with access to the Internet. Essential computer hardware will be provided for the few county Extension offices in Eastern Oklahoma that are not already online. The complete network will include poultry producing counties (McCurtain, LeFlore, Sequoyah, Adair, Cherokee, Delaware and Ottawa) and counties on the "fringe" of the poultry producing area that have the potential to accept litter (Choctaw, Haskell, Muskogee, Wagoner, Mayes, Rogers, and Craig). The Extension Area Agricultural Economics Specialist located in Claremore will serve as Market Coordinator. The project will purchase a file server for the Claremore location, needed to establish the market network.

It has been observed that current market prices for litter are often significantly lower than the apparent value of litter. For example, litter may sell for $5-7 per ton when the apparent value of the nutrients in litter for fertilizer or animal feed use is 2 to 4 times greater. This indicates that significant market inefficiencies exist in the form of poor information exchange and large transaction costs. Determination of such barriers will be a primary component of an on-going market analysis conducted by a graduate assistant. This analysis will show the effectiveness of the market and provide information to manage project activities. Market analysis will be used to refine the website and continuously improve the market.

We will reduce information barriers to marketing by promoting the exchange of litter quality, volume, and availability information from sellers to potential buyers. As information accumulates, we will establish a set of quality standards to help buyers and sellers determine the value of their litter.

The market will accomplish little for the environment if litter is transported out of one watershed only to be improperly applied in another watershed. An educational program will be established to ensure proper use of litter. The program will emphasize soil-testing, litter testing, applying nutrients to meet crop needs, calibrating application equipment, and recordkeeping. Record books and fact sheets developed in the Small Farms Livestock Pollution Prevention Project (CWA 319 Grant: FY 1995 TASK #500, OCC TASK #69) will be used as a starting point for the educational program. The educational program will be reinforced through two demonstration farms. These demonstrations will be located in areas not currently covered under the Small Farms Project. Market information will be transferred to market users and the general public through fact sheets, publications, articles, and a quarterly newsletter. This newsletter will be available in print and on the website in electronic form.

The market concept is transferable to other geographic areas and commodities. Given the global nature of the Internet, a grain farmer in north central Oklahoma can contract to buy litter for use as fertilizer or feed from Eastern Oklahoma, Missouri, or Arkansas. Other organic materials, such as composted horse manure and Class-A biosolids, can be marketed once an electronic network is established. The information exchange and experience of this project should facilitate similar programs in these areas.

Project Tasks:

Task 1: Establish Project Advisory Committee and Project Administrative Structure.
Smolen, OCES Water Quality Coordinator, will provide administration and coordination of the project within OCES. He will chart progress, assure timely project outputs, and facilitate the writing of semi-annual reports. A new project advisory committee will be established to facilitate information exchange among poultry producers, state agencies, and other elements of the private sector. The board will include representatives of the Oklahoma Conservation Commission, NRCS, Oklahoma Department of Agriculture, County Extension Agents, Conservation Districts, poultry producer organizations, integrators, and litter haulers. The advisory committee will provide advice, feedback, and assistance in actual marketing of litter. Committee activities will occur throughout the duration of the project, with formal advisory committee meetings every 6 months.

Cost: $4000

Basis for cost: is 4 days each OCES Water Quality Coordinator (Smolen), Waste Management Specialist (Hamilton), and Livestock Marketing Specialist, (Peel), 2 weeks Project Manager.

Task 10: Survey potential litter users (NEW TASK).
A statewide survey concerning use of poultry litter and other animal manures will be conducted in coordination with the Oklahoma Deparment of Agriculture Statistical Service. This will be an inexpensive mail-out survey to document Oklahoma producers' attitudes toward the litter market and to record the range of values they attribute to the various components of such a market. A second, more focused, telephone survey will be conducted in one or two counties within 50 miles of poultry production. The second survey will provide a more detailed picture of the mechanisms of an operating market, including records of costs and benefits, both actual and perceived.

Cost: $7000

Basis for cost: Bureau for Social Research contract ($4,200) and faculty time for interpretation ($2,800).

Task 2: Conduct educational program.
The educational program will be aimed at both poultry producers and potential users of litter. This program will promote proper use of litter through soil testing, litter testing, applying litter to meet crop needs, calibration of application equipment, and record keeping. Much of the material used in the program has been developed through the Small Farms Livestock Pollution Prevention 319 Project (CWA 319 Grant: FY 1995 TASK #500, OCC TASK #69). The area covered by this educational program will include all 14 counties of the Project area, whereas the Small Farms project only targets poultry producers in Adair, Cherokee, and Delaware counties. Curricula created by the educational program will include an informational market newsletter and a continuation of the Extension fact sheet series on

poultry waste management. During the Small Farms project period, the majority of the educational effort will take place in Delaware and Adair counties. OCES will also coordinate with a larger effort to educate producers in the Lake Eucha watershed in Delaware County. Once the Small Farms project is complete, the scope of the educational effort will be increased to the entire 14 county Project area.

Demonstration farms, including those initiated by the Small Farms and Lake Wister projects as well as two new farms outside of those projects' boundaries, will be used to reinforce the educational effort. . The demonstration farms exhibit (and will continue to exhibit) pollution prevention techniques for broiler producers. Pollution prevention is, in essence, using soil testing, yield goals, litter testing, equipment calibration, and recordkeeping to establish a nutrient balance across the farm. Farmers can use this knowledge to determine proper application rates to maintain water quality and to establish the amount of litter they can market off-farm.

This task will extend the management and recordkeeping emphasis of the curricula from the Small Farms and Lake Wister projects by including litter market value considerations. These efforts occur largely after the ending date of the Small Farms and Lake Wister projects.

Cost: $18,000

Basis for cost is 20 days Waste Management Specialist (Hamilton), 15 days Livestock Marketing Specialist, (Peel), 150 hours Student Worker. $1000 will go towards cost share for demonstration farms. Additional costs include printing and travel. Additional funds are added for litter demonstrations in areas outside the production counties.

Task 3: Reprogram this task.

Cost: $3,000

Basis for cost Budget reflects work that has already been done toward this topic. Additional work will be reprogrammed because the task will not improve the market.

Task 4: Identify critical barriers and information needs.

Identification of critical barriers and information needs to expand litter markets will be directed by Derrell Peel and will represent the majority of the effort by a graduate assistant. The graduate student will survey and describe the current informal litter market in Eastern Oklahoma. Although no formal market exists there, litter is bought, sold, bartered, and transported throughout the region. OCES will issue a report by the end of the second year reviewing the state of the current market with recommendations to make the market more efficient. Additional studies will look at the effect of incentives, using the example of Wister Lake program.

Cost: $39,000

Basis for cost is Graduate Assistant Salary, 40 days Livestock Marketing Specialist (Peel), and travel.

Task 5: Establish Internet website and coordinate with the Oklahoma Department of Agriculture's Poultry Litter Hotline.

The website will provide a forum for exchange of information between potential buyers and sellers of litter, allowing them to post quality and quantity, time of availability of litter, and bidding and asking prices. The website will also serve as an electronic educational media center and a collection site for user survey information. A web designer will be employed to

develop the website for interactive purposes, and information will be maintained by Bill Burton. Initial efforts will focus on providing educational information and links to other sites. The market newsletter will be available on the website in electronic form. The assumed methods of access are direct connection via home Internet access or indirect by calling or visiting the county Extension or Conservation District offices. OSU will establish an agreement with ODA to facilitate information transfer from the Poultry Litter Hotline to the website. Through this agreement ODA will receive calls from their 1-800 hotline and provide potential buyer and seller data to OSU through fax on a daily basis. Also through the agreement, OSU will incorporate Hotline data into the project website, develop a database for use by OSU and ODA, advertise the Poultry Litter Hotline through all Extension channels, develop procedures to check authenticity of callers to the Hotline, provide quarterly data reports to ODA, and provide ODA with $3,315 to help offset the expense of the increased number of calls during two cleanout seasons, January through June 2001 and January through June 2002.

Cost: $17,000

Basis for Cost This has been reduced in cost. Through contractual agreement, we will hire a web designer ($9,000). Bill Burton will maintain the website and update the database after it is designed. (OSU match $9600) Through a subcontractual arrangement, ODA will provide data from the Poultry Litter Hotline ($3,315). Computer for web maintenance ($1,975).

Task 6: Upgrade participating county office computers.

Because of the need to have public access through the Extension offices, a survey will be conducted within the first month of the project to assess what additional resources will be needed to bring county Extension offices to a level of microprocessor speed and memory needed to handle the system. Most counties already are set up to participate. Most Extension offices are already on the Web. Minimal funds will be expended for this task.

Cost: $3000

Basis for Cost is five days Area Agricultural Economics Specialist (Burton), computer upgrades for 14 county offices, and three years internet access for 14 county offices.

Task 7: Reprogram this task.

This task has been zeroed out because analysis of market indicates it would not be the most effective course to follow. Funds have been reprogrammed into market promotion.

Task 8: Promote market.

Once the market proceeds beyond a rudimentary bulletin board stage , a part-time promoter-project manager will be hired on federal funds to oversee promotion of the market. The part-time promoter-project manager , will work closely with industry groups and the public to support the market. It will be at the discretion of the market promoter to use additional media to promote.

Cost: $59,500

Basis for Cost is 21 months Market Promoter-Project Manger($26,000),, travel ($5,000), and advertising ($500), County Extension Educators, Extension Specialists, and Project Director ($23,800).

Task 9. Final report

Cost: $3,000

Basis for Cost is Project manager ($1,800) and Project Director ($1,200) time.

Project Outputs:

801.1 Ten semi-annual progress reports

801.2 Minutes from ten meetings of advisory committee.

802.1 Two fact sheets covering litter marketing, and sampling, to augment Poultry Facts and Farm Record Books. Due: December 31, 2000.

802.2 Newsletter to deliver market information, important announcements, and educational items. Due: Quarterly (newsletter more frequently as market develops) January 2001.

802.3 Two farms located outside of Small Farms and Lake Wister project areas demonstrating environmentally and economically sustaining use of poultry litter. Case study report due September 30, 2001.

803.1 Standard operating procedures to measure volume of litter in poultry house and obtain representative sample for litter quality. Due December 31, 2000.

804.1 Report on state of litter marketing in Eastern Oklahoma and recommendations for market structure to facilitate movement of litter across watershed boundaries. Due: June 30, 1999.

805.1 Report on effectiveness of Website for tracking market information, including: buyer location, seller location, volume of litter transferred, quality of litter sold, and available and delivered date. Due date: September 30, 2001.

806.1 Description of computer network located at county extension offices serving as backbone for the market information system. Due date: June 30, 2001.

808.1 Report on effectiveness of market promotion campaign. Due date: September 30, 2002.

809.1 Final Report. Due date September 30, 2002

810.1 Report on Survey of Producers. Due January 31, 2001.

Project Management:

Oklahoma Conservation Commission will give oversight to the project through a cooperative agreement with Oklahoma Cooperative Extension Service.

An advisory committee will be established early in the project consisting of government agencies, poultry industry representatives, and litter cleaner- haulers.

Michael Smolen will be the contact person with OCES. Derrell Peel, OCES Livestock Marketing Specialist, will serve as project coordinator and will oversee the identification of market barriers. Bill Burton, OCES Area Agricultural Economics Specialist, will administer and coordinate the pilot electronic market. Doug Hamilton, OCES Waste Management Specialist, in cooperation with Hailin Zhang, OCES Soil, Water, & Forage Analysis Lab Coordinator will take leadership in developing litter

quality criteria and in-service training for litter graders. Doug Hamilton will coordinate the educational tasks, and distribute record keeping systems developed in the Small Farms Livestock Pollution Prevention 319 Project.

The Oklahoma Department of Agriculture, Plant Industry Division will provide assistance in developing quality criteria for litter and certification procedures for litter graders. Individual County Extension Offices and Conservation Districts will provide educational assistance and will be called upon to provide potential litter graders.

Measures of Success:

1. Establishment of a publicly reported market for litter where none previously existed.
2. Number of users and quantity of litter marketed, measured by volume and recorded on the website.
3. Tons of manure moved from sensitive watersheds: Spavinaw Creek, Illinois River, and Little River, to other areas.
4. Increased awareness of the value and potential uses of litter as shown by 10% increase in soil testing, 100% increase in manure testing, 50% increase in demand for Poultry Facts and Farm Records books in project counties.
5. Increase in movement of litter as shown by 10 to 20% of litter produced in sensitive watersheds transported to less sensitive watersheds measured by comparing buyer and seller locations.
6. Increased general interest in managing wastes as measured by number of hits to website.
7. Successful determination of barriers to expanding litter market and recommendations to overcome barriers.
8. Participation of poultry industry in supporting and promoting electronic market.

Itemized Budget: September 1, 1997 through September 30,2002

Budget Category		Federal Cost	**OSU Cost**
Salaries:			
Faculty - Smolen	2% FTE	0.00	3,000.00
Faculty - Peel	15% FTE	0.00	9,000.00
Faculty - Hamilton	5% FTE	0.00	7,500.00
Faculty - Zhang	7% FTE	0.00	7,500.00
Area Specialist - Burton	15% FTE	0.00	,600.00
Area Specialist - Britton	7% FTE		7,600.00
Market Promoter	50% FTE	35,000.00	0.00
Graduate Assistant	50% FTE	22,000.00	0.00
Web designer (temp)		9,000.00	
Sub-Total		**66,000**	**49,200**
Benefits		**13,100.00**	**13,000**
Travel			
			0.00
District Staff and Promoter		4,000.00	0.00
			0.00
Sub-Total		**4,00.00**	**0.00**
Contractual Services			
			0.00
			0.00
Litter Hauling for Training		1,500.00	0.00
Advertising		500.00	0.00
Oklahoma Dept of Ag		3300	**0.00**
Internet providers		200	
Sub-Total		**5,500.00**	
Equipment			
Website Computer		2000.00	0.00
			0.00
Sub-Total		**2,00.00**	**0.00**
Printing			
Fact sheets		1,750.00	0.00
Newsletter		700.00	0.00
			0.00
Sub-Total		**2,450.00**	**0.00**
		250.00	**0.00**
Postage			
Totals		**93,300.00**	**62,200.00**
Grand Total			**$155,500.00**

Minutes

Litter Promotion Subcommittee

January 29, 1997

Tulsa, OK

Meeting started at 9:30 am.

Attendance:

Mike Smolen (OSU), Don Stotts (OSU), Hailin Zhang (OSU), Ray Elliott (ODA), Claud Rutherford (Simmons), Mitch Fram (OSU), Jack Carson (ODA)

Claud reported on progress in his survey of poultry producers to determine how much litter will be available for sale and when it will be available. Preliminary results show that many of the houses on the list at this time are breeders, and many already have long-standing arrangements with cleanout companies, so their litter will not be available directly. Breeder litter is not as desirable as broiler litter because of high moisture. In summation, Claud indicated that his survey shows there will be more litter for sale this year than in previous years.

Claud also reported on other efforts of the industry to expand education of producers and cleanout personnel. An educational meeting will be held in Neosho, MO by MO-DNR and NRCS to give cleanout personnel 6 hrs of training. Simmons is requiring all its growers to have a soil test for any litter sold for application inside Spavinaw watershed.

He also announced there are educational meetings planned for Oklahoma growers Feb 17 at Jay, 19 at Stilwell, 24 at Poteau, and 26 at Broken Bow. Each meeting will be conducted twice for 3 hours of education to be conducted by OCES. Meetings are planned for Decatur, AR on Feb 11 and 18, even though Arkansas does not require education. Claud believes the educational meetings will reach 95% of all growers.

Jack Carson indicated he would prepare news releases on the ODA incentive for selling litter outside the sensitive watersheds. He also suggested writing about the activities of the industry in dealing with the training issue and in encouraging their growers to sell litter rather than use it themselves. He indicated he would write articles that show the public that the Poultry Industry is trying to be a “good neighbor,” highlighting that they go beyond the requirements of the state regulations.

Ray Elliott suggested that wherever possible the literature we write should highlight more than the nutrient values. The suggestion arose that Organic Gardening literature could be used.

Hailin pointed out there are misconceptions that could be highlighted. Specifically some believe that litter will lower pH. He has firm evidence that this is not the case. In fact it tends to raise the pH, particularly on low pH wheatland. It can also be used effectively to remediate salt damaged land.

Other misconceptions on heavy metals and antiobiotics were discussed. There is evidence that heavy metals are low in poultry litter. Claud indicated that copper additives are limited by law, and arsenic acid is no longer used in the diet (currently use 3 nitro arsenyllic acid).

OSU has a fact sheet showing heavy metal content of litter is very low by all environmental standards.

Hailin reported on results to date from the free soil testing in Delaware county. He has found that 25% of fields have soil P index less than 65, 40% less than 120, and 75% less than 400. This shows that only about 25% of Oklahoma farms will be restricted from applying litter this year, and about 40% are below the OSU recommended upper limit of 120.

It was suggested that one of the writers contact OCC for details on their Clearview reclamation project to highlight the "environmental" use of litter.

Mitch indicated that he has sent a list of litter haulers to the Extension agents in the Northeastern District. He intends to keep the list up to date and encourage the agents to publicize it.

Don Stottes indicated he would begin a series of items for agent packets. These would provide 3-4 paragraph items for use in the newspapers. They would highlight things like:

- Litter availability
- Litter and pH
- What is organic matter and why is it important? Using examples from Organic literature.
- Recycling animal manures back to the soil.
- Case studies on use of litter for erosion control

Smolen agreed to work with Don on these items.

Claud indicated the industry was ready and willing to highlight their efforts. Smolen suggested they consider displaying their effort at the AWRA Water Quality and Animal Waste Conference in OKC March 2-4, 1998. Claud took a flier to consider this.

Smolen also suggested that it might be possible to get demonstrations of the effectiveness of poultry litter in new agricultural applications if the industry could provide a few truckloads to County Agents in Central and Western Oklahoma. Claud indicated he would look into this possibility. If support can be found for trucking the litter, Smolen will announce to agents that a 20-ton truckload of litter can be provided to agents who indicate they can line up some demonstrations. Cost of trucking is estimated as about $800 for 20 tons.

Meeting adjourned at noon.

Marketing Work Group Meeting

Minutes

January 7, 1998

Attendance: M. Smolen, Joe Flushi, Keith Morgan, Bev Sanders, Claude Rutherford, James Peak, John Yinshing, John Evans, Joe Patterson, Bill Bailey, Pete Wilson, Gene Veith, Robert Willy, Gary Bledsoe, Derrell Peel, J. Wimberly, Patsy Bragg, Jason Hollenback

Gary Bledsoe talked about the proposed state incentive program for trucking manure out of Eucha, Wister, and Illinois River basins. He thought it would start February 1998. It is only available for Oklahoma producers. In addition there would be a $5 tax credit for processing litter if moved out of the watersheds.

Claude Rutherford: He is still trying to compile a list of sellers. The poultry companies are having meetings on a 12 pt commitment for pollution control. A key point for producers will be to soil test before applying litter.

Claude noted that rental equipment is needed for loading trucks.

Pete Walters (trucker) is contacting growers to schedule cleanouts. He gets too many all at once. He expects 120 tons house and can load 25 tons on a big trailer truck with a dump end.

Gary: Johnson's Grain was interested in back hauling grain

Patterson can exceed 100,000 lbs in a walking floor truck (more stable than an end dump).

Bill Bailery, of Craig County Conservation District, says he has more than 68,000 acres needing litter in Craig County.

There was talk about independent cleanout companies and company farms. The independents may be at a disadvantage. Some growers in the Fayetteville area give litter away. Keith Morgan gets about $6/ton. He pays $30-35 for spreading 5-6 tons. He cleans his own house. It costs $6/ton to re-bed with rice hulls. Shavings are more expensive.

Derrell Peel talked about the problems of a market and announced the formation of our marketing project. The concerns are location, variation, quality, and price.

There was discussion of pelleting plants. Gary saw one that pelleted newspaper during down time. Can be used for bedding. Another possibility is peanut hulls from Anadarko

Claude wants training for producers on how to store litter outside.

Wimberly: variability of materials calls for processing.

Jason Hollenback: There is a market in Muskogee for litter at $20/ton. Same to Rogers County. He is looking into storage facilities.

Walters: There is a market in West Texas and North Kansas at $40/ton, but he needs a back haul to make that work. Back haul of gypsum won't work because the N from litter is bad for concrete.

Claude: Simmons cleans out houses every 3 months. This keeps supply regular and eliminates bottlenecks in transportation.

Joe Patterson: need more education on value of litter (he finds $30/ton compared to fertilizer). He and others think we need more education showing value of litter.

Existing chicken houses don't make good storage, but they could be retrofitted.

Question: Should there be requirement for animal waste management plan at the receiving end? There is pressure for this, but it would severely inhibit the litter market.

Simmons company farms in Eucha watershed produce about 6,000 t/yr. This is being handled. Claude says the 1100 producers in Oklahoma produce about 330,000 to 400,000 tons per year.

OSU has produced educational packets about litter use (Hailin Zhang). ODA will run the 800 hotline number. Extension will discuss benefits of litter in production meetings.

Recommended that Tulsa Utility Board buy advertising for litter sales.

Date: 20000120

Meeting of: Manure Marketing group

In attendance: Smolen, Peel, Hamilton, Zhang, and Propst

Minutes:

Zhang opened with a description of the online NPK-figuring program developed by Mitch Fram and Bob Woods. Producers can input their numbers and calculate the most cost effective application rate for them. The program is also available 3.5" diskette.

A discussion of demonstrations to date determined that they have not been well controlled. It was decided that there is a need to have Woods involved, but he probably will not be. Peel noted that all the demonstrations have shown is that only considering N is bad. Although this is a goal of the project, he stressed that other options must also be demonstrated that are successful alternatives.

Hamilton updated everyone on the progress of the poultry producer training. New amendments have resulted in the inclusion of spreader certifications. He stressed the need to tie in with agents and get them involved, particularly in sensitive watersheds.

Hamilton also mentioned the possibility of applying litter to reclamation sites. Smolen suggested that specific demonstrations be written into the workplan.

When Smolen asked if anyone had any ideas, Zhang suggested purchasing a moisture meter and software. He said he would be willing to provide an outline of a demonstration on the uses of the instrument to Haskell.

The final topic of discussion was the case study report. An outline for the report is needed, as is a subject who has exported litter. Joe Bullard and Jackie Smith were suggested.

Meeting was adjourned.

Date: 2000719

Meeting of: Manure Marketing group

In attendance: Smolen, Yoder, Zhang, Hamilton, Peel, Propst

Minutes:

Smolen opened the meeting with a discussion of the possibility of meshing our Manure Marketing project and OCC's Lake Wister project. This would likely involve developing incentives for litter removal. He then asked who would be available to attend a management meeting in OKC with OCC regarding this possibility. Peel said he could probably make it.

Peel then introduced Jon Yoder, a colleague from the Ag Econ department. He had been discussing the project with him. Jon expressed interest, especially in the subsidy issue. A discussion of this aspect, particularly its role in helping to track the movement of litter, followed.

A general discussion regarding project tasks resulted in the following suggestions/assignments:

- Utilize the web site as a 'classified ads' section
- Revise workplan
- Fact sheets need to be completed
    - Zhang – sampling litter quality
    - Peel – litter market
- Case Studies need to be completed
    - Hamilton will contact Jack Smith
    - Propst will contact Joe Bullard
- The SOP for littler sampling and volume needs to be completed
    - Hamilton

Finally, the survey of producers litter awareness was discussed. Smolen suggested developing a survey instrument and using the Bureau of Social Research at OSU. Peel said he would check out the possibility of cooperating with a State Statistician from ODA.

Meeting was adjourned.

Date: 2000822

Meeting of: Manure Marketing group

In attendance: Smolen, Peel, Propst

Minutes:

Smolen opened the meeting with a discussion of project budget changes. Propst was asked to get copy of Tina Eaton's thesis to Justin to convert to PDF.

Several ideas for project activities were discussed, including:

- Hire a buyers' side promoter
    - PR person
    - Ag. Education, Ag Comm. degree
    - Along the lines of the "Cowboy Journal"
- Develop a module for other Extension meetings
- Provide booth at local meetings like county Cattleman's Association
- Develop pasture management calendar that includes litter application
- Develop materials that are more eye-catching

Smolen mentioned a September 5 meeting at 10:00 am in OKC with ODA re: litter hotline.

Meeting was adjourned.

Manure Marketing Meeting

OSU and Oklahoma Department of Ag

September 5, 2000

Minutes

Present: Mike Smolen, Derrell Peel, Gary Bledsoe, Dan Parrish, Jim Britton

The purpose of the meeting was to discuss potential coordination of the ODA Litter Hotline and the OSU Manure Marketing Project.

The Manure Marketing project is an EPA-sponsored 319 project that is currently being revised. Smolen explained that by building in some close involvement of the marketing project with the Litter Hotline, it may be possible to facilitate the flow of market information more effectively than either could alone.

Parrish indicated that ODA hotline has been very effective in moving litter the past few years, but it is very difficult to document the actual amount. ODA is interested in improving the hotline, and our involvement would be appreciated. Dan and Gary mentioned specific problems: (1) there is always uncertainty about how current the posted buyers and sellers are; (2) there are problems of frequently updating the information; and (3) there is some uncertainty that the people listed as buyers are really serious about purchasing litter.

Currently updates to the hotline list are less frequent than desired because of the manpower required. There currently procedure is that the hotline is answered from a special phone line in Tulsa. The person who answers the phone fills out a detailed form. Currently Brett Sholar (their livestock market person) updates the computer file monthly. The updates are more frequent during cleanout season.

Smolen indicated that the OSU project would like to assist in the hotline project to expedite the posting process and have rapid access to the data for use on the litter web page. He offered two suggestions: (1) ODA could share data daily with the OSU, or (2) OSU could take over answering the telephone and logging the data. The second alternative was not seen as the very desirable because OSU might not be able to continue answering the phone after their project is complete.

All agreed that the best alternative might be for ODA (Freda) to continue answering the telephone and taking data on designated forms, then on a daily basis (when there have been calls), Freda would fax the forms to Bill Burton. Bill Burton would update the web page approximately as information comes in and provide summaries to ODA weekly or bi-weekly as requested.

OSU would consider the additional workload for ODA when developing workplan and budget. Some funding would be provided to assist ODA with the additional workload from a more active hotline and website.

Smolen - Notes from Litter Marketing meeting March 7, 2001

Attendance: Smolen, Burton, Britton, Fram, Green, Sholar, Bullard

Decisions:

- Brent will follow up on sellers database, get complete information and ask if grower/seller wants to become a member. Members will receive a market newsletter this spring and next Feb (maybe next fall, too).
- Marty, Jason, and Joe will find out who is cleaning out and who is hauling. Get details on how far they will haul and can they load a semi.
- Marty, Jason, and Joe will advertise in local paper for membership in litter market. First ad will seek haulers and cleanouts. Project will pay for ad. Call Smolen with price.
- Brent will redesign the membership form to get all the details we need.
- Mitch will take lead on market newsletter to agents.
- Smolen will hire a web designer and work with Burton to design the web site.

General comments:

- Jason says the biggest constraint on litter sales now is haulers. He can't even get litter because there is no one to haul it! There are no semi's available.
- Joe says OK Farms won't start any new contracts even if they have the houses. They have been canceling letters of intent.

Discussion of Project:

- Brent Sholar will be working on contract for the project as our market representative. Brent will manage a database of buyers and sellers.
- Discussion of funding for advertising.
- Make signs for county offices to indicate who has litter and who is available to do hauling.
- Information can be updated and emailed to county agents, so they are current.
- Someone has to contact existing cleanout companies and haulers to get first hand information about who is in the business.
- Summary of buyers and sellers needs to be easy to read.
- Licenses were required January 1, 2001 for all applicators. Check with ODA to see who they have listed. (haulers don't need license)
- Can't haul litter in a hopper tailer.
- There are typically 6 times as many buyers listed as sellers.
- Need market update for county newsletters.

- Send letters to growers asking if they want to be a member of the Litter Market. Members will get a newsletter in April 01 and February 02 (maybe one in the fall 01, too)
- Hire a website designer and Register the website. Follow the design of the soil testing site.
- Provide some kind of bonus to those who set up litter sales.
- Sort the database by county and make it simple for people to find what they want.
- Bill Burton needs the same software as the web developer so he can manage the site.
- Idea for student project: Design a system for loading semis from a bobcat. May involve a ramp, a conveyor, etc. consider providing rentable conveyors in the District.
- Ask Haulers/Cleanouts – how far will you haul? Do you have trailers? Can you load a semi? Will you spread at a remote site?
- Advertise for cleanouts and haulers.
- Have a regular Litter Market meeting the third week of January.
- Keep track of who gets the list.
- Meet next month to discuss the web design.

Manure Marketing Project Meeting

Kansas, Oklahoma

June 7, 2001

MINUTES

Summary:

Next meeting: 9:30 am July 23, in Little Kansas

Decision: renew Brett's contact at same level through the year.

Decision: Add cakeout dates to list of information, not just cleanout dates.

Decision: Offer free litter tests for membership and advertising in litter market.

Decision: Next issue of Litter Market Update will be before end of the month.

Decision: The project will advertise in classified ads in Jay, Stillwell, and Poteau. Jason, Marty, and Joe will determine cost for continuing border ad.

Decision: Project will provide $750 per county for demonstration of sowing alfalfa into Bermudagrass where soil test P and K are high. Bob Woods will design the demos.

Decision: Agents and Brett will make calls to identify more haulers.

See complete report below:

Attendance: Mitch Fram, Jason Hollenback, Marty Green, Bob Woods, Roger Williams, Bret Sholar, Mike Smolen, Sriram Kikani

Smolen introduced Sriram Kikani, graduate student assistant, who will be working on website design.

1. There was general agreement to **renew Bret's contract** for the coming year, July 1, 2001 through June 30, 2002. Bret will continue to work with the project at approximately the same level of effort as in the first three months.

2. **Response to date.** Most producers are using our list as a last minute place to check. They call in panic, when they have to cleanout and haven't made arrangements.

Freda, at ODA in Tulsa, has been emailing new calls to Bret. Few have been received. We picked up a few with the newsletter, but less than expected. Jason has told some producers about it, but no one has done any advertising.

Discussion. There is still concern for finding haulers, particularly those between the range of a spreader truck (10-15 miles) and the range of a semi (>50 miles). It is difficult for many buyers to find litter. Bradley is providing litter to Craig Co. at $17/ton dumped and spread, much of it coming from Arkansas. Arkansas litter may have been treated with alum. Simmons is now paying for alum treatment.

Concern was identified about the value of alum treated litter. Does it have the same value as fertilizer? Is the phosphorus reported, truly available for crops? Bob Woods will speak with

Hailin Zhang about developing a report on this issue. This could be an article for the Market Update. Does Alum use affect soil test results?

Question: should we be including cakeout in the Litter Market? If market members would report availability of cakeout, we could help move it to suitable areas rather than disposal areas. Those with storage, could particularly benefit from the market.

Tyson requires cakeout for each new flock. Cakeout quality is similar to litter, but wetter (around 25% moisture). Other problem litters are breeder and pullet litter. Breeder litter is high moisture, and pullet litter, requiring cleanout every 20 weeks, is low nutrient.

Smolen noted that the proposed CAFO rules could make marketing cakeout, etc. very desirable. The proposed rules contain a loophole that producers could take advantage of; if they do not use any litter on their property, they will not be a CAFO. Otherwise, most poultry producers are likely to become CAFOs.

Decision. Encourage producers to list dates and amounts of cakeout.

Decision. Offer free litter test to those who sign up for the Litter Market. We have limited budget for this, but we could offer this to the first 100 who sign up. First offer will be from July 1 through September 30. See if Jim Britton can find support to continue this offer. A special fund could be established. Details on procedure for this offer will be attached to final draft of these minutes..

3. **Survey of Ag Producers.** Bob Woods reported that he has been part of a survey of forage producers that mentioned poultry litter. Two surveys were completed, a detailed one in the NE District and a general one through Ag Stat service that went statewide. He has the results from NE District.

4. **Next issue of the Update.** Last issue went to all producers. It may not have gone to legislators. Smolen will ask Ross Love to transmit it to them. **Decision:** The next issue will come out by July 1, to include announcement of the free litter test.

Content might include an article on alum-treated litter, cakeout marketing, and sampling method for breeder litter (Jason will develop this.). Also needed is a simple procedure for sampling broiler litter (coffee can method, no digging necessary). Check with Hamilton, Britton, and Zhang.

We will make sure that the following are on the list for Update: all legislators from poultry counties, Farm Bureau, City of Tulsa, ODA, the Poultry Growers Association. This next issue will again be sent to all producers.

5. **Website Design.** Sriram reported he is working on website design to allow database entry through the web and display of information in useful screens. The user will not have to scroll down or to the side to see information. He will use drop down menus and links to present extra information. Basic information screen will contain the names, location, types of litter, and date available. Other information will be obtained by clicking on an entry.

The web will contain databases for buyers, sellers, and haulers, so agents or users can put these together as needed.

6. **Advertising.** We will get costs for a classified, border ad in local newspapers in Stillwell, Jay, Tahlequah, and Poteau. The ad will say something like the following:

.

OSU Pilot Poultry Litter Market Project

Wanted sellers, buyers, haulers. Call county OSU Cooperative Extension _____

Ask about the free litter test for project members

Jason, Joe, Marty, and Roger will get the price for a continuing ad. Smolen will check cost of Rural Electric Coop classified ads. Bob advised caution about advertising OSU sponsorship in a way that might appear unfair to fertilizer industry.

6. **Demonstrations.** Bob Woods suggested setting up demonstrations on use of legumes (alfalfa, clovers) no-tilled into high phosphorus soils. Would require good sized pastures, 10-15 acres. Need about $10/A for herbicide, $50/A for seed. Mike : project has ~$5000 available for demos.

Decision: Budget will be set up to support one demonstration per county: Delaware, Adair, Cherokee, (possibly LeFlore). Amount: $750 per county for seed and herbicide. See Bob Woods for design of demonstrations. Purpose will be to develop a site for the pasture tour, showing "how to profit from selling your litter."

Other items.

a. A forum for discussion of issues among producers, haulers, and farmers. Consider the need to promote communication and its effect on the market. Items include (1) findings of this project with respect to constraints on the litter market (2) cost of litter and experience, (3) analysis of potential distance for hauling (spread sheet analysis of cost and distance hauled), effect of storage and effect of incentives. Could be eligible for poultry ed credit. Invite legislators, City of Tulsa, etc. Possibility of doing this at the Tulsa Farm Show in December. Mitch will contact Bruce Peverly about this.

b. Special 3 hours for applicators. Desirable to teach 3 hours tailored to applicators this fall.

c. Attract more haulers. Jason will call to see if he can update the haulers list.

d. Next meeting will be July 23; 9:30 am in little Kansas.

Manure Marketing Meeting Minutes
December 14, 2001
Muskogee

The following items were covered in today's Litter Market Committee meeting. Please look this over, and let me know what I've left out.

1. Mike handed out results of poultry producer survey from the October BMP meeting in Poteau (compared to a similar survey done at a Briggs Ranch tour 2 years ago). Results were definitive that producers are learning something as a result of the education effort. There were about 45 respondants.
2. We discussed evaluation efforts for the Market. Bret has been following up with sellers, calling them after the "sell date" on the list. I hope Bret can give us a brief summary on this before he leaves. Bret will be going to a new job with the Bureau of Mines in OKC. We wish him the best of luck, and we'll miss him on our project, where he did a great job.
3. Free litter test: poor results so far; only 4-5 free tests have been done. Consensus: offer the free test once more this winter and spring, and try to get the word out in a more targeted way. Mitch will develop a flyer to be passed out by integrator field service people. We'll also do another mailing of the UPDATE.
4. We discussed ads targeted at buyers, and agreed focus needs to be on getting people to sell. Most buyers that have been signing up want relatively small quantities - a pickup load to a few spreader loads. (Mitch still thinks maybe we should pay for an ad in local or statewide cattlemen's newsletters - your response?) Joe and Roger pointed that we need some buyers to really succeed at getting large purchases done.
5. Discussion of current events in the poultry/water quality controversy: Consensus that now would be good time to visit all the integrators, let them know what we're trying to do, and seek their support. Jim and Mitch will schedule these visits for after the 1st of the year
6. Discussion on education about the laws and rules, i.e., soil sampling requirements, "cheating", etc. Whose responsibility? Warning: This will come up on the 16th.
7. Jason's Litter Market Meeting, Jan 31, 3 hr. credit: He needs a spokesperson from ODA on regulations for haulers/applicators. Mitch will work on short presentation about the Market and website, then have people fill in the appropriate sheets at the meeting. (Then, he is needed to pour the punch.) Free litter test coupons will be handed out. Jason will contact us with his agenda. Joe also requested a short PP program about the market and website. Will the new website (below) be ready by Jan. 31?
8. Mike showed us a copy of the revamped Litter Market Website. Membership Forms will be set up to fill out on the web. Please, everyone, take a look at them on handouts or site below, and make recommendations. http://biosystems.okstate.edu/waterquality/www Buyers', Sellers, Haulers lists will be set up with just a few important columns - name, county, type of litter, date? Then you click on the name to get more details for that entry. When the new website is ready, we will need to get around to to train county staff how to make entries.
9. Demo. plots: Mostly in Delaware Co.; one alfalfa plot on high P ground got sprayed, but not seeded. Seeding to be done this spring. There are also plots with bermuda and fescue on high P soil; some will be interseeded w/ clover, others not. Plots on low P ground include comparing commercial fert. vs PL; alum-treated vs PLT-treated vs untreated litter. Bob could not attend today but he reported that 3 other planned alfalfa plots in other counties failed to materialize. We should try again this coming season. NOTE: project ends next September; we need to spend the money this season or not at all.
10. Funds are available for summer interns or other help. Jason has someone in mind who could help him with plotwork. Someone could be set up to make follow-up calls to Market members (buyers and sellers), since we really need the evaluation,
11. Next U*P*D*A*T*E will contain a list of education programs. We'll push the free litter test again. We still need another article(s). Suggestions?
12. Mitch typed up a cost/benefit analysis that Bob first did last season using a Lincoln county example. It showed that litter could (theoretically) be shipped up to 150 miles in semiloads

($2 per loaded mile) and still break even with commercial fertilizer, on low fertility pasture. Jason and others questioned this, saying that unless a big fleet of trucks was operating, house cleanout would be too slow to make this practical, at least without storage. In other words, the real cost of handling and hauling was probably underestimated. Also, spreading is a problem, with only about 2 acres per spreader load. These are all impediments to the market. We will ask Hailin to help us develop a market calculator to do this analysis for a range of variables.

Comments on these notes are invited. Thanks for coming, everyone.

****

Mitch Fram
Area Water Quality Specialist
Oklahoma Cooperative Extension Service
230-B West Okmulgee
Muskogee, OK 74401

Phone: 918-687-2466
FAX: 918-687-2484
mitch@okstate.edu

Litter Marketing Project

January 17, 2002

Minutes

Attendance: Mike Smolen, Mitch Fram, Jim Britton, Hailin Zhang

1. Jim Britton & Mitch Fram reported on their meetings with the poultry companies. They explained the litter market to them and discussed how the companies could assist us with our project.
2. Jim and Mitch also called commercial applicators. They found that some were listed incorrectly.
3. We have hired a replacement for Bret Sholar. She is Christie Bryan, from Tahlequah, and she used to work for the Tulsa Co. Conservation District.
4. Suggested that one of Christy's first duties be to check all applicators and verify all sellers.
3. Discussed new website, membership forms, coordination with ODA, and changes we may need to make in how the free litter test promotion will be handled. Website can be found at: http://biosystems.okstate.edu/waterquality/www/htmlpages/
5. Discussed procedure for signing people up on the website. Free litter tests as an incentive were also brought up. Zhang had 3 invoices for litter tests of new members.
6. Some of us will be meeting with Dan Parrish's group soon. We will request continued cooperation with the litter hotline. Freda O'Dell (ODA) should send new listings to Christy, who will follow up and get complete information.

Date	Title	Description	County	Location	Attendance
8/12/99	Fall Fertilization	Emphasize how litter can be used to increase fall forage production	Mayes	Tom Giles Farm	3
1/20/00	Litter Marketing	Promote economics of moving litter out of critical watersheds	Delaware	Jay Community Center, Jay OK	130
2/24/00	Litter Marketing	Producers will develop litter-marketing plan & learn good advertising techniques	LeFlore	Choctaw Family Investment Center, Poteau, OK	136
5/25/00	Litter Storage Needs	To help producers estimate storage needs for litter.	Haskell	Haskell County Fairgrounds	22
8/15/00	Fall Fertilization	To promote nutrient management for timely forage production.	Delaware	Delaware County Fairgrounds, Jay, OK	90
9/14/00	Poultry Waste Use	Late season forage fertility, fall clean out of poultry waste, value of poultry litter	Ottawa	NEO Campus	10
10/26/00	Wildlife/Forage Budgeting Meeting	It will help producers manage litter to increase pasture management	Delaware	Bull Hollow, Kenwood, OK	2
1/18/01	Poultry Litter Marketing Meeting	It will help producers sell litter rather than spread it	Delaware	Jay Community Center, Jay, OK	120
6/18/02	Litter Value & Soil Fertility	Learn how to access value of litter and phosphorus. Also proper pasture fertility and management	Haskell	Kiamichi Technology Center	12
5/28/02	Using Poultry Litter as Fertilizer	OCES is looking at ways to assist poultry producers and other ag producers in the use of poultry litter. Discuss economics of litter, how to take soil samples and correct application of litter.	Ottawa	NE Vo Tech Center, Afton	8
3/21/02	Litter Marketing	Explains OSU Poultry Litter Marketing Program. Will provide basis for evaluation of litter and provide research on a local level as to litter benefits. The program will offer an opportunity for poultry litter producers and buyers to interest concerning sales	LeFlore	Choctaw Family Investment Center, Poteau, OK	37
1/31/02	Litter Marketing		Delaware	Jay Community Center, Jay, OK	121
1/30/03	Litter Marketing		Delaware	Jay Community Center, Jay, OK	152

Memo

To: Cooperative Extension Educators
Conservation District Managers

From: M. D. Smolen Eldon Merklin,

Date: April 9, 1998

Re: Litter Demonstration Opportunity

Attached is a request for proposals to facilitate demonstration of poultry litter in cropping systems where litter is not normally used. The object is to give farmers a first-hand experience to evaluate for it themselves. We feel the experience could increase demand and facilitate development of market.

If you can identify a team including Extension, the Conservation District, and one or more farmers, you may be eligible to receive a truckload of poultry litter (20 to 25 tons).

The Commission will fund as many good demonstrations as funds allow.

If you have questions, please call me (405-744-8414), Eldon Merklin (405-979-2215), or Hailin Zhang (405-744-9655). Any of us will be pleased to help you develop a fundable proposal.

Request for Proposals
Demonstrate Use of Poultry Litter in Nontraditional Areas
April 15, 1998 through September 30, 1998

Background

The OSU Cooperative Extension Service and the Oklahoma Conservation Commission are offering an opportunity to demonstrate the use of poultry litter in cropping systems outside the poultry producing areas of the state. The objective is to stimulate the market for poultry litter by helping crop producers in Central and Western Oklahoma evaluate its use in their crop production systems.

The N-P-K value of poultry litter and its value to crop and pasture production are well documented. However, there are values beyond those of N-P-K, which have not been quantified. Many of these values depend on special needs of a crop or the crop-soil system in which it will be used. For example, it may be well suited to production of wheat, peanuts, milo, soybeans, and other row crops because it releases nitrogen slowly, adds organic matter, helps raise or maintain pH, and supplies micro-nutrients. In addition some report antibiotic and anti-nematode activity that may benefit certain crops.

Proposals

The Conservation Commission will receive proposals to cover the cost of purchase and transportation for up to one semi-trailer load of poultry litter (20 to 25 tons) for cooperative demonstration projects. **To qualify, proposals must be submitted by teams that include the OSU Cooperative Extension Agent, the District Conservationist, and one or more farmers**. Each area designated for litter application must have a current soil test that shows a need for poultry litter nutrients and an animal waste management plan designating rates and timing of litter application. **Contact Eldon Merklin (405-979-2215) or Hailin Zhang (405-979-9566) for information on demonstration plots.**

A Memorandum of Understanding (MOU) will be required as part of the proposal indicating the role of each agency and private party. Demonstration sites should be accessible to the public and located on a hard surface road. Sites should be available for data collection for at least three years from the beginning of the demonstration. An annual report from a designated member of the project team will be required, indicating results of the poultry litter demonstrations.

Poultry Litter

If approved by the Conservation Commission and OSU Cooperative Extension, the Commission will purchase and arrange transportation for litter to one or more designated demonstration sites. The county team will be responsible for obtaining appropriate spreader equipment, calibration of spreader, and incorporation of litter. The Conservation Commission may assist with obtaining a spreader.

OSU Cooperative Extension will provide signs to identify the demonstration sites, help publicize the demonstration program and share results of the demonstration projects.

Submission of Proposals

Proposals may be submitted at any time. Two demonstration periods are anticipated, April – May for summer row crops, and mid-summer for wheat. The program will seek to fund ten (10) or more demonstrations at an average cost of $400.

Send proposals to:

Poultry Litter Demonstrations
Oklahoma Conservation Commission
2800 N. Lincoln Blvd.
Oklahoma City, OK 73105

Figure 5-1. Summary of poultry litter application demonstration information.

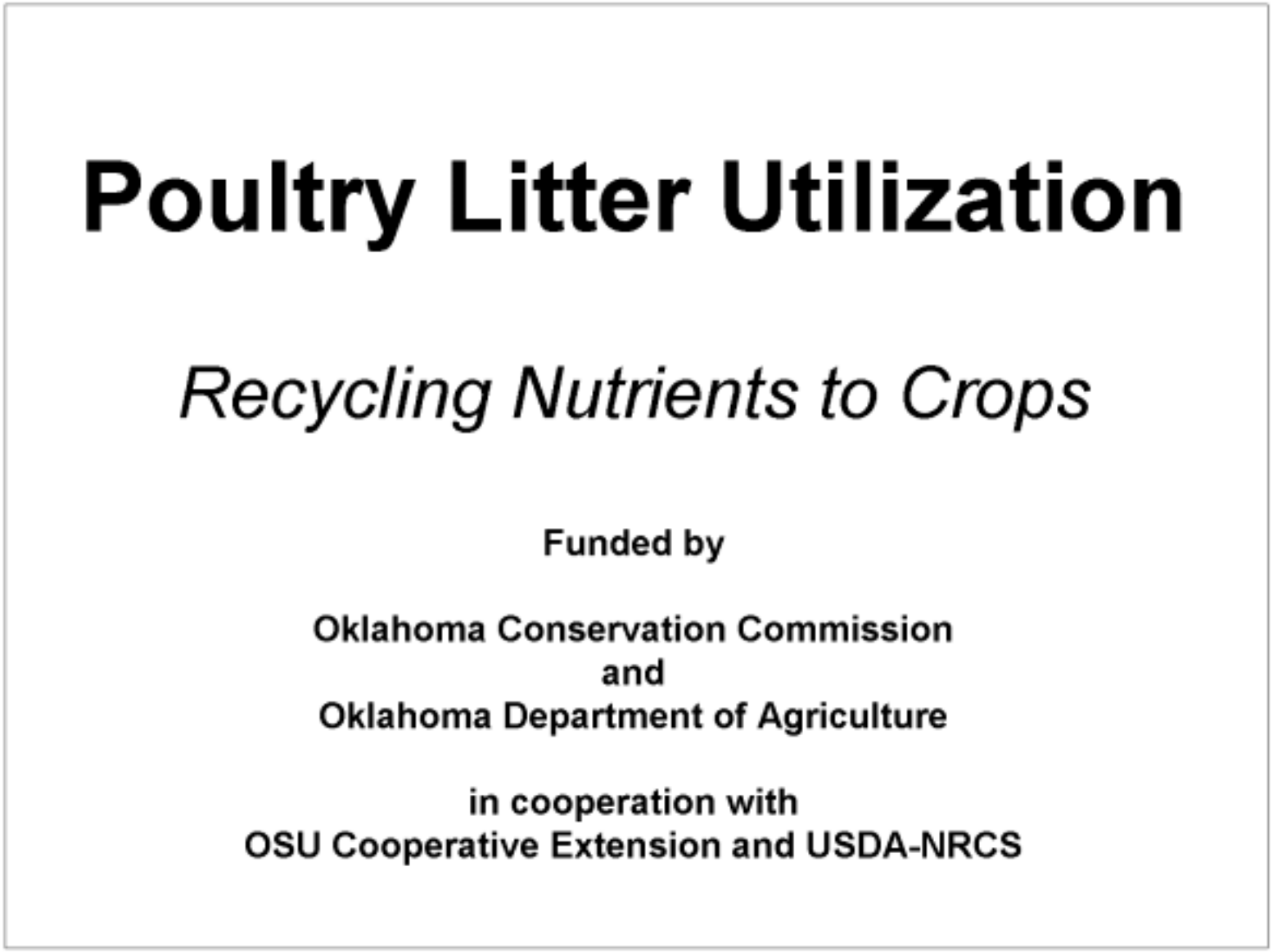
Year	Season	County	Owner	CD/NRCS	Agent	Proposal	Crop	App data	Pre-app soil test	Post-app Soil test	Comments
1998	Spring	Garfield	Brad Loesch		Ron Robinson		wheat				
1998	Fall	Harper	Sterling Profit		Beck		wheat				
1998	Fall	Kay	Rick Jeans								Kerr Center project
1998	Spring	Marshall	Ronnie Muncrief	RD Hartman(?), Chris Goedecke	Walter Bruce Bigger	x	peanuts	x	x		Litter applied. Crop failure due to drought.
1998	Fall	McIntosh	Ed Kolotker(?)		Randell Burris		cool season grasses				
1998	Fall	Okfuskee	Tom Hodges	Mark Maples	Ron Vick	x	clover (3 types)	x	x	x	3 plots with diff rates. Field day. Improved legume production? Two producers purchased litter. Pictures.
1998		Okfuskee	Ronnie Banks	Mark Maples	Ron Vick	x	Bermuda/clover				No litter supplied.
1998		Okfuskee	John Taylor	Mark Maples	Ron Vick	x	wheat/soybeans				unknown
1998	Spring	Okmulgee	Robert Greenlee	Pat Bogart	Doug Maxey	x	soybeans				
1998	Spring	Okmulgee	Lee Bob Martin	Pat Bogart	Doug Maxey	x	Bermuda				
1998	Fall	Okmulgee	Elijah Nash	Pat Bogart	Doug Maxey		peach orchard				USDA project
1998		Pittsburg	Leslie Smith	Jerry Mathiews	Ted Evicks	x	organic Fruit				didn't grow
1998	Spring	Sequoyah	Cosner Farms	Andy Inman	Tony Yates	x	soybeans/corn/wheat/milo				
1998	Spring	Wagoner	George Stunkard		Alan Parnell		soybeans				
1998	Spring	Wagoner	Joe Hopping		Alan Parnell		grass pasture				
1999	Spring	Lincoln	John Ball		Mick Jones				x	x	
1999	Spring	Lincoln	Ken Seitz		Mick Jones						
1999	Spring	Okfuskee	L.T. Wheaton	Mark Maples	Ron Vick	x	clovers/bermuda	x	x	x	bermuda est. w/o more fertilizer. P & K increased from previous year, requiring less. Tour planned. 2 producers bought litter for fesce/Bermuda & legume pasture.
1999	Spring	Okmulgee	Jack Sharp	Pat Bogart	Doug Maxey		fescue/bermuda	x	x	x	improved yields. Held tour. Other producers have bought litter
1999	Spring	Pottawatomie	Bob Sanders		Don Britton*				x		
1999	Spring	Seminole	Jim Watts		Joe Benton*				x		
1999	Fall	Grant	Richard Metcalf		Scott Price						
1999	Fall	Garfield	Loesch		Ron Robinson						

*split one load

Use of poultry litter seemed to increase legume growth in one pasture. In another demo, actual yields were greater than those expected based on actual nutrients applied. Some demos were
utilized for educational meetings, field tours, etc. Two OCES Educators reported that a few producers in their counties did purchase and apply poultry litter, presumably, at least partially, due
to viewing its benefits in the demos.

Figure 5-2. Signs displayed at project poultry litter application demonstration sites.

18" x 24" Orange sign, letters Black/White



6" x 14" sign will hang below with name of cooperator.

Valuing Poultry Litter Fertilizer:
A Cost Analysis of the Lincoln County Poultry Litter Application Demonstration

by Bob Woods, OCES Area Agronomist

One approach to determining the fertilizer value of poultry litter has been simply to choose an average nutrient analysis, and calculate the maximum value based on current prices for commercial nutrients, after adjusting for lower availability of litter nutrients. By this reckoning, a ton of poultry litter that analyses 60-60-50 (lbs. per ton of N,P, and K, respectively) would be valued at $22.83 for its available major nutrients, based on current commercial fertilizer costs (as of 12/10/01). Estimated lime value would add another $2.00 per ton for a total of $24.83.

That approach yields a maximum potential value, but doesn't tell the whole story. Valuing a manure fertilizer must take into account the buyer's need for and use of the product, and the benefits obtained. Obviously, this will vary from case to case, depending on existing soil fertility, potential crop yield, crop value, and cost to deliver and apply litter. The example below illustrates an approach to valuing litter for an operator with a specific set of conditions. Here, value is not determined in dollars per ton of litter, but in terms of the cost of producing a crop. It assumes an over-application of P and K for the first season's crop, which would be utilized in subsequent years. It also takes into account the critical factor of distance and cost of hauling litter.

Assumptions:

- Ranch in Lincoln Co. 150 miles from litter source in Eucha Watershed.
- Crop and yield goal: Bermudagrass, 3 tons/acre.
- Fertilizer requirement based on Soil Test Report (annual, per acre):
  - Year 1: 121 lb N -- 33 lb P -- 20 lb K
  - Year 2: 150 lb N -- 33lb P -- 20 lb K
  - Year 3: 150 lb N -- 33 lb P -- 20 lb K
- Poultry litter analysis (per ton as applied): 60 lb N; 60 lb P_2O_5; 50 lb K_2O.
- Availability of litter N:
  - 1^{st} year – 50%
  - 2^{nd} year – 15%
  - 3^{rd} year – 6%
- Availability of P and K: 90%.
- Cost of litter loaded onto semi at poultry house: $10/ton.
- Transport: $12 / ton (25 ton load, 150 miles, $2 / loaded mile. Requires high sides or walking floor trailer).
- Application cost: $2 / ton.
- Total cost, litter + transport + application: $24 / ton.
- Commercial fertilizer cost (Webbers Falls, 12/10/01):
  - 18-46-0: $210/T P = .15/lb
  - 0–0–60: $185/T K = .15/lb
  - 46-0-0: $175/T N = .19/lb

COMPARISON:

Litter – 2 T application		**vs.**	**Commercial Fertilizer**	
Application	*Cost*		*Application*	*Cost*
YEAR 1: 2 T litter: **Litter nutrients provided:** ▪ N = 60 lb ▪ P = 108 lb ▪ K = 90 lb **Additional commercial needed** ▪ N = 60 lb@ .19 Year 1 subtotal	$48.00 11.40 59.40		**YEAR 1:** ▪ N: 121 lb @ .19 ▪ P: 33 lb @ .15 ▪ K: 20 lb @ .15 Year 1 subtotal	22.99 4.95 3.00 30.94
YEAR 2: ▪ 18 lb N credit from litter ▪ N = 132 lb @.19 Year 2 subtotal	 25.08 25.08		**YEAR 2:** ▪ N: 150 lb @ .19 ▪ P: 33 lb @ .15 ▪ K: 20 lb @ .15 Year 2 subtotal	28.50 4.95 3.00 36.45
YEAR 3: ▪ 7 lb N credit from litter ▪ N = 143 lb @ .19 Year 3 subtotal	 27.17 27.17		**YEAR 3:** ▪ N: 150 lb @ .19 ▪ P: 33 lb @ .15 ▪ K: 20 lb @ .15 Year 3 subtotal	28.50 4.95 3.00 36.45
Total nutrient cost Credit for lime value ($2/ton) **Total fertilizer cost**	109.65 (4.00) $105.65		----------→ ----------→	103.84 $103.84
Nutrient cost per ton of hay produced (9 tons over 3 years)	$12.18		----------→	$11.54
Fertilizer cost per ton, including lime value	$11.74		----------→	$11.54

We can see that, at least under this set of conditions, transport of litter of about 150 miles is a breakeven proposition. Transport to closer sites would provide economic benefits over commercial fertilizer.

CASE STUDY I

Poultry Litter use on the - JB Ranch

Gerald Bullard

September 2002

The JB Ranch is located in western Haskell County, Ok. The ranch consists of some 500 acres, with a mixture of improved pastures of Bermudagrass and fescue, and about 90 acres in native hay meadow (Bluestems, Indiangrass, Switchgrass and native forbs). The ranch lies in an area of fairly new poultry production, so poultry houses are not as numerous as in longer established poultry areas, and much of the poultry litter available is utilized on the poultry growers' farms or ranches. This results in higher prices for litter in this area, and limited availability.

As the owner of the JB Ranch was familiar with poultry litter use for fertilization, he tried to find poultry litter to fertilizes in 1999. The nearest poultry farm that was interested in selling poultry litter was some three miles away, with no other poultry farm in close proximity willing to sell litter. Due to the demand for litter, the poultry farm price was $12 per ton at the house, a higher price than in the more concentrated poultry producing area about 50 miles away. In addition to the litter cost, there was a charge of $25 dollar per six-ton load for hauling and spreading.

JB Ranch purchased approximately 108 tons to spread on 40 acres at a rate of slightly less than 3 tons per acre based on a soil test of 6-29-108 (N-P-K). The JB long-range plan was, to use poultry litter until soil phosphorus and potassium levels reached sufficiency, then use only commercial nitrogen fertilizer for forage production.

To reduce cost in 2000, JB purchased litter from the more concentrated poultry producing area 50 miles away. In this case litter cost $6 per ton loaded at the house. The owner provided hauling to JB Ranch with existing equipment (grain truck), dumping it on the site. The litter was then loaded and spread at an additional cost of $25 per 6 ton spreader load.

JB purchased some 80 tons to spread on the same 40 acres that had received litter in 1999, this time at the rate of two tons per acre. Although other land was available for litter application the 40 acres were utilized as this was some of the better land on the ranch. The owner felt this would allow more definitive experimenting with litter without excessive costs.

In soil tests in 2001, the nutrient level on this 40-acre tract increased to 12-59-168. While not reaching sufficiency some progress had been made in raising phosphorus and potassium levels. Sufficiency would have probably been reached on phosphorus with one more application, with sufficient potassium levels expected after about two more application at the 2-3 ton per acre rate.

The JB Ranch owner cited the following as advantages to using poultry (broiler) litter..

(1) Forage production seemed to be as good or slightly better compared to commercial fertilizer.

(2) The goals of increasing phosphorus and potassium levels were obtained.

(3) Increased forage production was observed for a longer period of time than he expected with commercial fertilizer.

In addition, as both of these years were considered drought years in this area, the littered pastures seemed to withstand drought pressure somewhat better than adjoining fields that received only commercial fertilizer.

The disadvantage of using poultry litter was its inconvenience, primarily due to two factors: (1) the need to move large volumes of litter to achieve the same nutrient levels, and (2) the difficulty coordinating the availability of a spreader and the poultry grower's time of clean out with. Commercial fertilizer can be available at virtually any time, avoiding problems with the weather (muddy impassable fields), whereas litter is only available at clean-out time, which may not coordinate with weather conditions.

Odor was only a minor consideration, as the area where the litter was spread is not heavily populated. Pollution potential was low because the land utilized for poultry litter is very flat, and there are no nearby phosphorus-sensitive water bodies. The manager chose to avoid using litter on the area directly above his pond to avoid local pollution problems.

Litter has not been utilized on JB Ranch since the spring of 1999 and 2000. The owner would consider using it again if more sources of litter could be found in the immediate area. He feels this would extend the period over which litter is available and reduce the cost. The owner recommends increasing the number of storage sheds on poultry growers' farms as a way to ease these problems.

CASE STUDY II

Poultry Litter use on the J&J Cattle Co.

Gerald Bullard

September 2002

The J& J Cattle Company is a registered beef seedstock operation in Haskell County, Oklahoma. This is an intensively managed registered cattle operation utilizing both artificial insemination and embryo transplanting. The operation markets numerous registered bulls and heifers during the year, and sells a substantial number of registered animals to youth and adults for show purposes. Cattle are marketed throughout Oklahoma and other states as far as Georgia.

The operation consists of approximately 1200 acres, some 800 acres of which is in improved Bermudagrass pasture and cleared of timber. The remaining 400 acres is in a combination of pine tree plantation and upland native timber, with the upland timber area used primarily for recreational deer and turkey hunting. Management is practiced on the pine tree plantation, with some management of the hunting areas.

Soil type varies across the 1200 acres, but most of the pastureland is a very sandy loam. A recently purchased 160 acres of pastureland, not contiguous to the original acreage, is a clay loam soil. The pastureland, for the most part is moderately level to very level.

The operator has used broiler and breeder house litter on about 320 acres of pasture over the past 4 years. Pricing of the litter on a per ton basis has varied, due to different arrangements with poultry growers. For the most part, broiler litter is purchased *at the house* and spread by a commercial spreader operation. The breeder house litter is *given* to J&J for the cost of cleanout of re-bedding the house. Careful records are maintained, and on the basis of these records, the managing partner of J&J estimates the cost is very close between the two types of litter. The rate of litter per acre has been consistently held at the 3 ton per acre rate.

The initial goals of J&J in using litter were to improve quantity and quality of forage. The operation continues to grow in cattle numbers, and more forage is needed each year. Soils in this area are typically phosphorus deficient and moderately acid, with soil test phosphorus as low as 12 on unfertilized pastures (65 being sufficient for Bermudagrass)and pH typically 5.0 – 5.2with some areas very acidic (4.3-4.7). J&J intended to raise soil phosphorus level and raise pH by using poultry litter in place of commercial fertilizer.

After the 4 years of poultry litter use, the managing partner of J&J believes there has been an improvement in forage quality, although this has not been documented through forage (hay) testing. In previous years the operation has purchased most of their hay, so there was no strong base to compare.

The manager perceived that the littered pastures have become more drought tolerant than non-littered pastures. As three (3) of the past four (4) years have had moderate to severe drought conditions, he believes using poultry litter helped them avoid drought-related

severe shortages of forages. He also feels his soils are in better condition due to increased organic matter.

On a more scientific basis, soil tests this year indicate that all but one pasture (littered only one year) have reached a sufficiency level in phosphorus (65 or higher). The pH has also come up some in all but one pasture (all except the first-year pasture) reaching the 5.7-5.8 pH goal.

Two major disadvantages were cited in utilizing poultry litter. (1) Because they apply litter in the spring when field conditions are often wet to very wet, spreader trucks have become stuck in the fields, slowing operations and damaging fields. (2) Litter is often not available at the most optimum time for spreading. Conditions can change on a day to day basis in the spring. For example when conditions are ideal for spreading there may be no litter available. When litter is available the fields may be soggy. Often litter must be spread anyway even though conditions are not optimal. Odor was cited as a very minor problem, which is related to moisture conditions. They note that one major rain will usually decrease odor intensity significantly.

In the future, the managing partner indicated he would continue to use poultry litter (up to 300 additional tons, if readily available). He indicated he would be willing to pay up to $15 per ton spread for litter and still consider the practice economic. The manager is aware of water quality concerns, indicating that when fields start to show excessive phosphorus levels he will discontinue litter use. With additional land purchased and limited litter available, he does not feel this will happen very soon.

OKLAHOMA POULTRY LITTER MARKET

U*P*D*A*T*E

A Cooperative Project of:
Oklahoma Cooperative Extension Service
Oklahoma Department of Agriculture

"Recycling for environment and profit"

ISSUE NUMBER 1 ` MAY 2001

WELCOME TO THE OKLAHOMA POULTRY LITTER MARKET!

This project wants to overcome some of the problems farmers and ranchers run into when they try to buy, sell or set up deliveries of poultry litter. By now, most everyone knows why there is a *public* interest in moving litter; there is a surplus of litter in some areas of the state where poultry is produced, and continued use of litter on pastures in those areas can lead to a buildup of fertilizer nutrients. Runoff from these areas presents a risk to lakes and streams because run-off can carry excess nutrients that increase algae growth. But, there is also an *agriculture business interest* in moving litter, because litter is a great fertilizer! It contains an abundance of plant-available nitrogen, phosphorus and potassium, and unlike commercial fertilizers, it comes with organic matter and calcium that improve soil structure and help to stabilize soil pH. It's a valuable commodity that should profit both buyers and sellers.

However, getting folks to realize the benefits of poultry litter fertilizer is not the big problem. Lots of people want to buy it, and quite a few poultry producers want to sell it. Over the past two years, the OK Dept. of Agriculture's Litter Hotline has received numerous calls with offers to buy or sell litter. These have been posted on OSU Extension's Litter Line website. The real problem has been getting likely buyers and sellers together, and finding haulers and applicators who can provide services in a timely manner. The Poultry Litter Market is an attempt to solve this communication problem. This UPDATE is part of the effort.

HOW DOES THE POULTRY LITTER MARKET WORK?

1. HOTLINE: The Oklahoma Department of Agriculture Litter Hotline is still working. If you want to buy or sell, simply call **1-800-583-7131.** Be prepared to provide details on what you want to buy or sell: quantities, dates, and any transport arrangements you can handle.

2. FOLLOW-UP: We have obtained the services of a market coordinator, to follow up on offers to buy or sell litter. He will make sure the information we have is correct. When possible, he will put likely prospects in contact with one another. He will also be calling litter haulers and dealers to maintain an updated list of who is in business, what services they can provide, and in which areas of the state. So, if you call the Hotline, expect a call back from the market coordinator.

Contact Us !
Call your County OSU Extension Office,
Or: OK Dept. of Ag. Litter Hotline,
800-583-7131
Or, on the web at:
http://dasnr.okstate.edu/poultry/ index.html

Mitch Sam

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

3. MEMBERSHIP: Anyone who is interested in buying or selling litter or providing related services should become a member of the Oklahoma Poultry Litter Market. There is no charge for membership. To join, you will be asked for information on your location, and how to contact you. You will also be asked if and when you expect to sell or buy litter, and any brokering, hauling or application services you can provide. With your permission, this information will be put up on our Internet site (below). If you prefer not to be listed on the website, just tell us. We will still refer prospects to you when appropriate.

4. OKLAHOMA LITTER LINE: Our web site is your best access to all the information in the Litter Market. You do not have to be a Member to get it. Just click on http://dasnr.okstate.edu/poultry/index.html.

   Here's what you will find on the Litter Line:

   - ➔ Lists of interested buyers and sellers of poultry litter
   - ➔ Lists of haulers, applicators, brokers and other service providers
   - ➔ How much sellers are charging for litter
   - ➔ How much haulers are charging
   - ➔ How to calculate the value of litter in your operation
   - ➔ State regulations concerning poultry litter
   - ➔ A bulletin board and a mailbox to get in touch with us
   - ➔ AND THERE IS MORE TO COME!

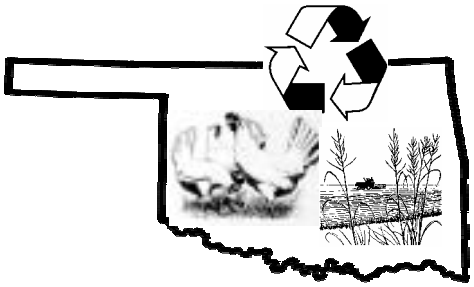
5. WHAT IF I CAN'T GET THE INTERNET? Simply call or drop by any County OSU Extension Office, where the staff will help you obtain the lists and other information from the Litter Line. Most public libraries also have Internet access available.

6. NEWS: Future issues of the UPDATE will be mailed out and posted on the Internet on an occasional basis. Look to us to keep you "up to date" on changes regarding the Litter Market, regulations, and services available. Eventually, we would like to include information on average prices and amounts of litter being sold. This kind of data is vital to any real commodity market. You may be asked to voluntarily help us obtain this information. If so, the data you provide will be held strictly confidential, unless you wish to have it posted. Survey information will be used only to calculate price ranges and averages.

7. COVERAGE: Every Oklahoma poultry producer, Agriculture Extension Agent, and poultry company field service rep. will receive a copy of this first UPDATE. Litter haulers, dealers and applicators, and anyone who has called the Hotline this year will also receive a copy. After this first issue, only members of the Oklahoma Litter Market or subscribers to the Update will automatically receive future issues in the mail. **Anyone else who wishes to be a member or subscriber to the Update should call 1-800-513-7131**. There is no charge for The Oklahoma Poultry Litter Market UPDATE.

8. YOUR SUGGESTIONS are important. Please let us know your thoughts about improving the Poultry Litter Market. You can contact us through the Department of Agriculture HOTLINE, from the Litter Line website, or by directly contacting the UPDATE editor, below.

Mitch Fram, Editor:
Area Extension Water Quality Specialist
N.E. Area Office, OSU Cooperative Extension Service
230-B West Okmulgee
Muskogee, OK 74401
Email: mitch@okstate.edu
Phone: 918-687-2466



OKLAHOMA POULTRY LITTER MARKET

U*P*D*A*T*E

A Cooperative Project of:
Oklahoma Cooperative Extension Service
Oklahoma Department of Agriculture

"Recycling for environment and profit"

ISSUE NUMBER 2 JULY 2001

OUR MARKET IS BUILDING

Our market coordinator, Bret Sholar, is continuing to get calls from sellers. 18 were listed on the OSU Poultry Litter Market Website as of May 30. We have continued to update the lists of haulers and dealers. Only a small number of buyers are listed. This does not mean a lack of interest. Some buyers prefer to just check out the seller listings on the website, or contact their county OSU Agriculture Educator. In any case, Ag Educators and others insist that locating buyers is not the problem…. We need more producers willing to sell! Please join the OK Poultry Litter Market and list your litter to sell with us. Call the Hotline below. To sweeten the pot, we're making an offer: Join the OK Litter Market now and **get a free litter test!** See details below. And, be sure to check out our website at: http://dasnr.okstate.edu/poultry/index.html.

WHAT ABOUT POULTRY LITTER THAT'S BEEN TREATED WITH ALUM?

Some people have asked if it's OK to fertilize with broiler litter that has been treated with alum. So we posed this question to Dr. Hailin Zhang, OSU Department of Plant and Soil Sciences and Director of the Soil, Water and Forage Analytical Laboratory:

How does alum treatment affect phosphorus availability to plants?

Alum is the common name of aluminum sulfate. Adding alum to poultry litter has been shown to improve poultry performance and reduce ventilation cost by reducing ammonia levels in broiler houses. Alum also reduces phosphorus pollution from field-applied poultry litter because it binds with the phosphorus to form an insoluble compound. Dr. Philip Moore, a Soil Scientist with USDA-ARS in Arkansas, has also shown that using alum-treated poultry litter on pastureland does not result in plants taking up extra aluminum, or extra aluminum being carried into rivers and lakes by rainfall. But, does alum treatment affect the amount of phosphorus (P) available to plants?

First, we can consider the effect of diluting the litter. To effectively reduce ammonia in the house, addition of as much as 2 tons of alum per batch is recommended. This could amount to up to 10 tons per year. Alum does not contain any phosphorus, so addition of this much alum could dilute P in litter by almost 10%. Actually, many broiler growers who use alum are only adding about ½ ton or less per batch, or about 2½ % per year. Therefore, you would get just slightly less total P shown on a **litter test** if you buy alum-treated litter, compared to the same amount of untreated litter. Otherwise, the **litter test P** should not be affected much. On the other hand, the total nitrogen (N) content should be slightly higher due to less ammonia loss from the litter.

Contact Us !
Call your County OSU Extension Office,
Or: OK Dept. of Ag. Litter Hotline,
800-583-7131
Or, on the web at:
http://dasnr.okstate.edu/poultry/ index.html

Mitch Sam

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

The amount of P shown in a **litter** test does not tell the whole story. Two **soil** tests are widely used to measure the availability of P for absorption by plant roots. They are: water-soluble P, and Mehlich 3 extractable P. A 3-year study conducted by Dr. Moore's group showed that plots fertilized with alum-amended poultry litter had lower Mehlich 3 and water soluble P values than those of the untreated litter plots. This finding suggests that alum treatment does reduce litter P availability to plants. However, the exact amount of P availability reduction on different soils remains unknown. No research has been done to evaluate how alum treatment affects P availability in soils that should respond to P fertilization (soil test P index less than 65 in Oklahoma).

So, although the reduction in total litter P will be very small, but we still don't know what the effect is on plant-available P. Bottom line: For the present, **we recommend using only untreated litter on fields that are deficient in soil test P.** Alum-treated litter would be a better choice if soil test P is high (>65), since it contains more N and reduces P loss to runoff. --Dr. Hailin Zhang

POULTRY PRODUCERS

LIST YOUR LITTER FOR SALE WITH THE OKLAHOMA LITTER MARKET
AND GET A **FREE LITTER TEST** (VALUE, $20)!!

CALL YOUR COUNTY OSU EXTENSION CENTER FOR DETAILS.
THE OKLAHOMA LITTER MARKET PROJECT WILL PROVIDE A FREE LITTER TEST FOR NEW AND EXISTING MEMBERS

NOTE: OFFER LIMITED TO ONE FREE TEST PER MEMBER, AND ENDS ON OCTOBER 1, 2001, OR AFTER 100 FREE LITTER TESTS HAVE BEEN SUBMITTED

REMEMBER, your suggestions and ideas are important to us. Please let us know your thoughts about improving the Poultry Litter Market. Contact us through the Department of Agriculture HOTLINE, or from the Litter Line website, or directly contacting the UPDATE Editor, below.

Mitch Fram, Editor:
Area Extension Water Quality Specialist
N.E. Area Office, OSU Cooperative Extension Service
230-B West Okmulgee
Muskogee, OK 74401
Email: mitch@okstate.edu
Phone: 918-687-2466

OKLAHOMA POULTRY LITTER MARKET

*U*P*D*A*T*E*

A Cooperative Project of:
Oklahoma Cooperative Extension Service
Oklahoma Department of Agriculture

"Recycling for environment and profit"

ISSUE NUMBER 3 March 2002

OUR PROGRESS TO DATE:

Check out the Oklahoma Litter Line Market Website, http://dasnr.okstate.edu/poultry. We currently have 37 sellers advertizing over 14,000 tons. and 26 buyers, including 12 needing more than 100 tons each. Twenty service providers are listed, including folks who haul and spread poultry litter.

We've contacted all 58 people listed by the state as Commercial Applicators, but only 20 wished to appear on the website. Lack of haulers and spreaders, particularly those who can load semis, is a definite roadblock to an efficient litter market. Let us know if we have missed any service providers.

If you have litter to sell, call the Oklahoma Department of Agriculture's Litter Line (1-800-583-7131). YOU CAN STILL GET A FREE LITTER TEST JUST FOR LISTING! This also applies to anyone currently on the seller list who has not yet obtained a free litter test.

WHY SELL YOUR LITTER?

Markets can improve and become efficient only when people actually trade in them. Even if you have privately arranged in the past for the sale or transfer of your litter, consider listing with the Litter Market Project. You have nothing to lose, and there may be a better deal out there. There may be someone who NEEDS litter to correct phosphorus deficiencies, add organic matter, or correct an acid soil problem. As you visit with your friends and neighbors in the poultry business, mention our litter market project - it can help everyone in the area. Some points to consider:

- ✓ Our industry is coming under increased pressure on the waste management issue.
- ✓ Moving litter out of sensitive watersheds would demonstrate positive voluntary action.
- ✓ Even though your pastures and hayfields may be "legal to spread" (i.e. below the soil test P limit), its Phosphate and Potash value may be wasted.
- ✓ New nationwide rules on animal feeding operations are in the works. Developing a workable litter market now could put you ahead of the curve and make it easier to move your litter in the future.

JOIN THE MARKET!

LIST YOUR LITTER FOR SALE WITH THE OKLAHOMA LITTER MARKET AND GET A **FREE LITTER TEST** (VALUE, $20)!! AVAILABLE FOR CURRENT AND NEW MEMBERS. CALL YOUR COUNTY OSU EXTENSION CENTER FOR DETAILS.

Contact Us !
Call your County OSU Extension Office,
Or: OK Dept. of Ag. Litter Hotline,
800-583-7131
Or, on the web at:
http://dasnr.okstate.edu/poultry/ index.html

Mitch Sam

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NEW MARKET COORDINATOR

Christy Bryan will be replacing Bret Sholar, as litter market coordinator. We wish him well in his new job at the Department of Mines in OKC. Christy worked with the Tulsa County Conservation District before moving to Tahlequah. She will soon be calling sellers, buyers and service providers to update our website lists. If you call the Litter Market Hotline, 800-583-7131, your call will be referred to her and she will call you back.

WHAT IS YOUR POULTRY LITTER WORTH?

The answer is vital to maximizing profit from your major by-product (not waste!). Litter is mostly used as a fertilizer, and as such, its value is determined by (1) its nutrient contents; (2) the fertility of the soil it will be applied to; and (3) the nutrient needs of the expected crop. OSU has developed a program to put all these factors together and compare it to fertilizer.

The program is called the **Soil Test Interpretation and Fertilizer Decision Support System**. It operates like a calculator on your computer screen. You enter the results from your soil test report, your litter test results, and your cropping plans. The program compares litter with fertilizer alternatives. The program will tell you what your litter is really worth on ***your*** soil, for ***your*** crop or ***your*** pasture. You can also use it to help a prospective buyer.

This program is available to you in three ways:

1. access and use it directly on the Web at http://clay.agr.okstate.edu/extensio/swfal/nutrientdecision/index.html.
2. download it free, then to use on your computer at http://clay.agr.okstate.edu/extensio/swfal/nutrientdecision/soiltest.html.
3. Simply take your soil test and litter test information to your County Extension Ag Educator, and he will help you work through it. What a deal!

WE WOULD LIKE TO HEAR FROM YOU.

LET US KNOW your ideas and suggestions about the Litter Market Project. Contact us through the ODA HOTLINE, 800-583-7151, or call or email the editor, Mitch Fram, at 918-687-2466, email: mitch@okstate.edu.

OKLAHOMA COOPERATIVE EXTENSION SERVICE

PRODUCTION TECHNOLOGY

PT 2002-24 September 2002

Poultry Litter Quality Criteria

Hailin Zhang, Mike Smolen, and Doug Hamilton

Poultry litter can be an excellent, low cost fertilizer, soil amendment, or feed supplement, but unlike commercial fertilizer there is no state Department of Agriculture label to assure its quality. The type of poultry, type of bedding used, moisture content, and nutrient content are important factors to consider.

The value of litter is normally determined by comparison to commercial fertilizer, considering "N-P-K," the nitrogen (N), phosphorus (P), and potassium (K) values. But poultry manure also contains calcium (Ca), magnesium (Mg), sulfur, micronutrients, and organic matter that add value if they are needed. The Ca and Mg have a small liming effect that can increase its value, especially on acid soils. Sulfur, micronutrients, and organic matter, too, may increase its value where there are soil deficiencies or a need to improve soil texture.

Litter from different types of poultry operations differ in handling characteristics, consistency, and nutrient content depending on the production system and animal feed. Litter from Chicken Breeder and Egg Layer operations typically have high moisture, often appearing as a slurry that may require special handling equipment. Litter from a Pullet operation, on the other hand, may be relatively dry, but has relatively low nutrient content. The most highly valued litter is generally that from Broiler production because it typically has both low moisture and high nutrient content.

Within a type of poultry litter, quality is largely a function of moisture and nutrient content. As shown in Figure 1, nutrient content declines as moisture increases. High moisture is also undesirable because it makes litter difficult to handle and increases odor.

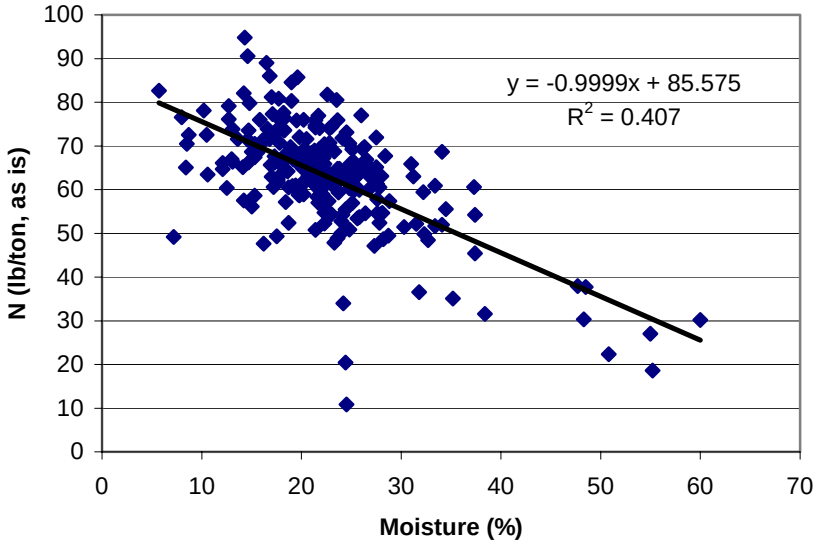

Figure 1 Nitrogen content declines as moisture increases in poultry litter. Results from 240 broiler litter samples in Delaware County, Oklahoma.

The actual nutrient value of poultry litter differs considerably from farm to farm depending on the type of birds, number of batches of birds between cleanout periods, and storage conditions. Further, removal of the manure crust, or "cake", between cleanout periods will also affect the quality of litter. Average fertilizer nutrient content and other properties for three types of chicken litter are shown in Table 1 on an "as-is" basis. Nutrient content, moisture, and pH vary considerably both within and between types of manure. Therefore, a litter analysis from a reputable laboratory is strongly recommended rather than relying on average values when poultry litter is bought or sold.

Table 1. Averages and Ranges of Analyses (as is)* for Major Types of Poultry Manure in Oklahoma.

Type of Chicken	Broiler	Hen	Pullet
No. of Samples	240	80	24
pH	7.1 (6.4-8.5)	7.5 (6.5-8.8)	7.4 (6.7-8.0)
Total N (lb/ton)	63 (22-95)	44 (13-86)	40 (20-95)
P_2O_5 (lb/ton)	61 (11-76)	62 (40-118)	47 (24-108)
K_2O (lb/ton)	50 (14-67)	44 (27-69)	36 (23-61)
Ca (lb/ton)	51 (12-164)	129 (31-272)	37 (26-79)
Moisture %	23 (9-51)	33 (10-61)	23 (11-46)
Average Nutrient Value ($/ton)**	$29.86	$25.32	$20.92

*P_2O_5 and K_2O are commonly used for fertilizer ingredients instead of P and K. Some laboratories may still report elemental P and K content. Use the following equations to convert these values: $K_2O = K \times 1.2$ or $P_2O_5 = P \times 2.29$

**Nutrient values are calculated based on 20¢/lb N, 16¢/lb P_2O_5, and 15¢/lb K_2O. Ca could be worth 2¢/lb if lime is needed, but it was not included in this calculation.

When evaluating the nutrient content, consider both the "as-is" value and the moisture content. "As-is" means the nutrient content of the material in the house or on the truck. It is generally the number to consider unless further drying can occur before the litter is used. Dry weight can be converted to "as-is" by adjusting for moisture content.

Moisture content is important in three respects; (1) it affects the cost of hauling, as it adds weight to the load, (2) moisture content above about 25% may be biologically unstable, and (3) moisture above about 35% is quite wet and may require special equipment. Unstable manure can heat up or produce flammable gases. On the other hand, too little moisture can also be a problem. Litter much dryer than 20% moisture may be dusty and abrasive to equipment.

In summary, in addition to nutrient content, these other quality criteria should also be considered:

1. Moisture content of the manure affects the distance it can be shipped.
2. Consistency of the manure affects the type of equipment needed to handle, process, or apply it to the land. Solids can be spread with a manure spreader or a lime spreader, but a slurry or liquid requires specialized pumps and nozzles. [Note a fertilizer spreader generally does not work for litter, because it tends to clog.]
3. Bedding type: rice hulls are preferred to either wheat straw or wood shavings.
4. Treatments such as alum may lower the phosphorus availability to plants, reducing its value. Therefore, it may not be suitable for P deficient fields.
5. Other foreign objects can damage equipment.

A litter test can be obtained by taking a sample to your county OSU Cooperative Extension Office.

For more information use of poultry litter please refer to the follow extension publications:

- F-2207 - How to Get a Good Soil Sample
- F-2228 - Fertilizer Nutrients in Animal Manure
- F-2246 - Using Poultry Litter as Fertilizer
- F-2248 - Sampling Animal Manure
- F-2249 - Managing Phosphorus From Animal Manure

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OKLAHOMA POULTRY LITTER MARKET

DO YOU HAVE LITTER TO SELL?

PLAN AHEAD:

CALL THE OSU – ODAFF*
LITTER MARKET HOTLINE

1-800-583-7131

Sign up to list your litter for sale, and

GET A FREE LITTER TEST!

Remember, a litter test is required in Oklahoma every year. To get your litter test ***free***, call the HOTLINE 1-800-583-7131 or list your litter on the OSU Litter Market website at:

OK-Littermarket.org

Then, take your litter sample **and this notice** to your County OSU Extension Office, and ask for a free litter test. This offer is good for one free test only if you agree to have your litter listed for sale on the ODA Hotline and OSU website.

[Offer good through June 30, 2003]

*Oklahoma Department of Agriculture, Food, and Forestry

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SEVEN GREAT REASONS WHY YOU SHOULD SELL YOUR LITTER…

7. Phosphorus builds up in the soil with repeated litter use on pasture and hay land.
6. If your soil test P is above 120, you don't need any more, and you're wasting money.
5. Litter is great for cropland and pastures that are low in fertility – ***let's send it where it's really needed!***
4. Water quality problems in some streams and lakes are related to repeated, widespread use of litter in their watersheds.
3. Selling your litter helps improve the public image of our industry. ***It's seen as voluntary action.***
2. There is an Oklahoma Litter Market – with more buyers than sellers!

AND

1. ***You'll get a Free Litter Test just for joining and listing your litter for sale.***

✓ Call the ODAFF Litter Market HOTLINE at 1-800-583-7131.

✓ Check out the OSU Litter Line website – OK-Littermarket.org

✓ Visit your OSU County Extension Agriculture Educator for advice on pricing, and for information about the free litter test.

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OKLAHOMA POULTRY LITTER MARKET

POULTRY SERVICE PROVIDERS: WE CAN HELP YOU!

HAULERS, BROKERS,
CLEAN-OUT CONTRACTORS,
COMMERCIAL APPLICATORS

LOG ON TO OUR WEBSITE,

OK-Littermarket.org

OR,

CALL THE OSU – ODAFF*
LITTER MARKET HOTLINE

1-800-583-7131

FOR FREE ADVERTISING

Sign up to advertise your business on the Oklahoma Litter Market Website. There is no charge and no obligation. You decide the information you wish to list. The website is accessed regularly by poultry farmers, potential buyers of poultry litter, and other service providers.

See reasons why on the other side!

*Oklahoma Dept. of Agriculture, Food, and Forestry.

OKLAHOMA COOPERATIVE EXTENSION SERVICE

WHY ADVERTISE ON THE LITTER MARKET WEBSITE…

Soil phosphorus buildup, water quality, and regulations are an increasing concern in poultry growing areas. Poultry producers are facing increasing pressure to sell their litter to long-distance buyers.

- But litter can improve the low-fertility cropland and pastures outside the nutrient sensitive watersheds – ***you can help producers send it where it's really needed!***
- Moving litter away from problem watersheds improves the public image of our industry. ***It is seen as voluntary action.***
- The Oklahoma Litter Market is a public database of buyers, sellers, and service providers, visible on the World Wide Web.
- ***For a limited time, sellers can get free litter tests and buyers can get free soil tests as an incentive to sign up. Service providers get free advertising.***

Check out the OSU Litter Market website online at:

OK-Littermarket.org

or:

- ✓ Call the ODAFF Litter Market HOTLINE at 1-800-583-7131, if you prefer not to use the Internet.
- ✓ Visit your OSU County Extension Agriculture Educator for advice on pricing, and other information about the Oklahoma Litter Market.

OKLAHOMA COOPERATIVE EXTENSION SERVICE

OKLAHOMA POULTRY LITTER MARKET

DO YOU WANT TO BUY POULTRY LITTER?

CALL THE OSU – ODAFF* LITTER MARKET HOTLINE
1-800-583-7131

Sign up to list your needs, and

GET ONE FREE SOIL TEST!

Remember, a soil test is required in Oklahoma before litter is spread. To get your free soil test, just call the ODAFF HOTLINE, **1-800-583-7131** or list your litter needs on the OSU Litter Market website at:

OK-Littermarket.org

Then, take your soil sample **and this notice** to your County OSU Extension Office, and ask for a free soil test. This offer is good for one free test for the first 50 who agree to list their information on the OSU website.

Visit your OSU County Extension Agriculture Educator for advice on litter value, and the free soil test.

[Offer ends June 30, 2003]

*Oklahoma Dept. of Agriculture, Food and Forestry

OKLAHOMA COOPERATIVE EXTENSION SERVICE

IS LITTER THE RIGHT SOIL AMENDMENT FOR YOU?…

1. Is your soil low in Phosphorus and Potassium?
2. Is your soil low in organic matter?
3. Do you have a current soil test?
4. Do you have access to litter spreading equipment, or is there a commercial applicator in your area?

If the answer to these questions is YES, poultry litter may be right for you.

Information on the OK-Littermarket.org website can help you determine the fertilizer value of poultry litter and help you identify sellers, haulers, and applicators.

Information about Litter:

- *On average, nutrient content is similar to a 3-3-2.5 fertilizer, N, P_2O_5, and K_2O respectively. (about 60, 60, and 50 lb per ton).* ***Always ask for a litter analysis because this varies from farm to farm.***
- *The bulk of litter consists of wood shavings, rice hulls, straw, feathers, and other inert organic matter.*
- *Poultry litter raises soil pH, reducing aluminum toxicity in acid soils.*

Call the ODAFF Litter Market Hotline at **1-800-583-7131.**

Or logon and see who is selling litter on:

OK-Littermarket.org

OKLAHOMA COOPERATIVE EXTENSION SERVICE

OKLAHOMA COOPERATIVE EXTENSION SERVICE

PRODUCTION TECHNOLOGY

PT 99-15 May 1999

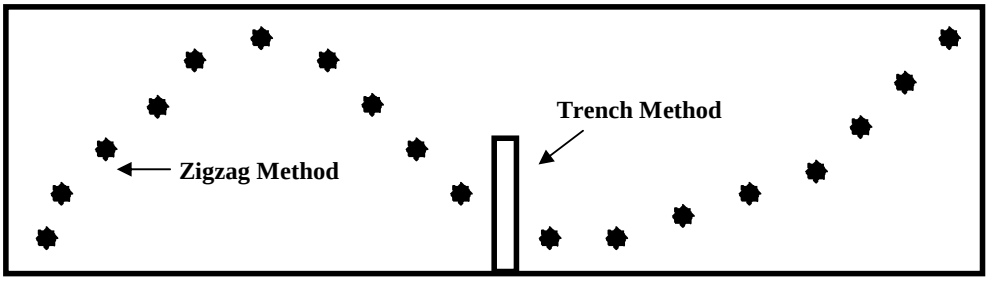
How to Collect a Good Poultry Litter Sample

Hailin Zhang, Doug Hamilton and Jim Britton

Taking Litter Sample Inside a Broiler or Pullet House: Dry litter varies across the width of the house: material near the curtains is different from that under feeders and waterers. There are also differences between brood and growout areas and even the north and south sides of a house. These differences must be considered to get a representative sample. The following techniques allow samples to be taken with birds in the house.

Trench Method: Using a shovel (a narrow spade works well) dig a trench as wide as the shovel across half of the house. Start at the centerline of the house and dig a trench in the litter to the sidewall. If there is cake on top, cut the caked litter to the width of the shovel and collect it too. Place the entire contents of the trench on a tarp or drop cloth. Thoroughly mix the litter using a hoe. Place a portion of this well-mixed litter into a zipper-closing plastic bag. Place it in a second bag. Use the litter remaining on the tarp to backfill the trench.

Zigzag Method: Walk the entire house in a zipzag pattern and grab 15 to 20 sub-samples with a shovel or coffee can. Collect the entire depth of the litter, but be careful not to remove soil beneath the litter. Place sub-samples in a plastic bucket, and mix thoroughly. Take a small sample from the bucket and place in a zipper-closing plastic bag. Place it in a second plastic bag.



Taking Litter Sample inside a Breeder House (partially slatted): A composite sample from a partially slatted breeder house can be sampled by collecting sub-samples from both slatted and litter area. In all collect at least 20 sub-samples to get a representative sample of the building. Since 2/3 of the house is under slats, and 1/3 is litter area, collect 14 cores from under the slats and 7 samples from the litter area. Sample through the slats using a soil probe or section of pipe. Collect litter samples similar to the zigzag method above. Place slat and litter samples in a plastic bucket and mix thoroughly. Take a small sample from the bucket and place in a zipper-closing plastic bag. Place it in a second plastic bag.

Ship litter samples through your local county extension office.

OKLAHOMA COOPERATIVE EXTENSION SERVICE

PRODUCTION TECHNOLOGY

PT 2002-28 December 2002

Standard Operating Procedures
Estimating Volume and Bulk Density of Poultry Litter in the House

Mike Smolen, Hailin Zhang and Doug Hamilton

OBJECTIVES

To estimate the volume of poultry litter in a poultry house. This measurement is useful to determine the amount of litter available for marketing or land application. Volume can be used directly to estimate truck capacity needed. With bulk density estimate, the volume can be converted to tons.

PROCEDURES FOR ESTIMATING VOLUME

1. Measure the length and width of the house, or obtain dimensions from a floor plan.
2. Measure depth of litter in at least 20 random locations, sampling all areas of the house (see Figure 1).
3. Calculate Average Depth in inches.
4. The volume of the litter is:

$$V\ (ft^3) = \text{Width (ft)} \times \text{Length (ft)} \times \text{Average Depth (inches)}/12$$

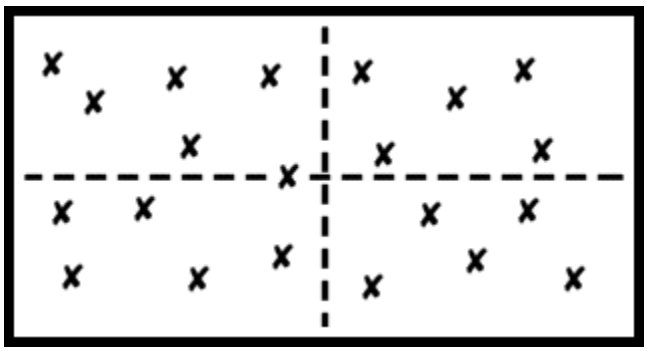


Figure 1. Measure litter depth at 20 random locations inside the house.

PROCEDURES TO ESTIMATE BULK DENSITY AND TOTAL WEIGHT

Obtain bulk density of the litter in the house (lbs/ft^3) by sampling 1 ft square at four locations. Samples should represent the average depth of the house.

1. Divide house into quadrants.
2. In each quadrant, toss 1 ft square frame.
3. Measure litter depth in center of square frame, where it lies. If more than *150*% or less than *50*% of Average Depth (from step 3 above), do not sample, but toss the frame again.

4. Scoop up and weigh all litter from area bounded by the 1 ft square foot frame.
5. The bulk density is:

$$\text{Bulk Density (lbs/ft}^3\text{)} = \frac{\text{Litter weight (lbs) X depth of litter (inches)}}{12}$$

6. The total weight is:

$$\text{Total Weight (tons)} = \frac{\text{Density (lbs/ft}^3\text{) X V (ft.}^3\text{)}}{2000}$$

ERRORS ASSOCIATED WITH THIS METHOD

Thickness of the litter and bulk density vary a lot inside a poultry house. The accuracy of the total volume and weight depends largely on how well the thickness and bulk density are measured.

For more information on use of poultry litter please refer to the follow extension publications:

- F-2207 - How to Get a Good Soil Sample
- F-2228 - Fertilizer Nutrients in Animal Manure
- F-2246 - Using Poultry Litter as Fertilizer
- F-2248 - Sampling Animal Manure
- F-2249 - Managing Phosphorus From Animal Manure
- PT2002-24 Poultry Litter Quality Criteria

October 3, 2000

The State of the Oklahoma Litter Market

Derrell S. Peel[1]

Background

Proper management of poultry litter has received increased public and regulatory attention recently. Market activities are hypothesized to have potential to provide a partial solution and/or lower the social cost of improving litter management. The basis for this hypothesis is two-fold:

1) The policy approach for litter management has been to identify and regulate misuse of the litter rather than significantly reduce litter production. This is in contrast to a pure negative externality (pollution) context, where the policy approach may be to endogenize costs to the industry and thus reduce the overall pollution load (optimally, to balance pollution against the value of products that result in pollution). However, ruling out certain uses and practices with respect to litter does not remove the reality of needing to understand proper uses and management practices. The policy cost will be lower if litter can be targeted to best uses.
2) The regulatory approach in 1) is based on the recognition that litter is bad (environmentally) only in excess concentrations and when misused (excessive application). Beyond that litter is a fundamentally benign product with potential value in a variety of uses. Misuse occurs and movement is limited when litter is misvalued in current uses relative to potential uses. The primary problem of excess concentrations logically suggests a generalized solution of increased geographical dispersion. Increased dispersion can potentially result from market activities, regulatory restrictions, or a combination of both.

Although the concept of a potential market for litter is logically obvious, the reality that a market has so far failed to develop is equally obvious[2]. This lack of market development suggests one of two possibilities. The first is that the relative value of litter is not sufficient to economically support an expanded litter market. In that case, the only recourse will be policy prescriptions aimed at managing litter production and use to (hopefully) socially optimal levels. In this instance, the level and severity of policy intervention will be greater and will result in greater impacts on poultry producers and consumers.

The second possibility is that the litter market is constrained by any of a number of barriers that result in increased costs and thus restrict the size (in volume and geographically) of the litter market. Identifying and understanding those barriers has the potential to suggest publicly supported activities, either temporary and/or permanent, which will enhance the litter market and result in a lower cost solution to

[1] Derrell S. Peel, Department of Agricultural Economics, Oklahoma State University

[2] Clearly a limited, localized market does exist for litter. The failure of this market to further develop and increase litter dispersion is the issue at hand.

improved litter management. The barriers which contribute to market failure may take many forms including lack of information on the part of sellers and/or potential buyers, buyer or seller uncertainty (risk), product complexity, improper timing, institutional/infrastructure limitations and management requirements.

Original Project Focus

This project was originally conceived as a broad based survey of market barriers. The plan of work focused much attention on product complexity and quality, litter sampling, litter testing and the possibility of a pilot market based on reducing product quality uncertainty and reducing the cost of improved information on litter composition. As summarized below, the original focus of the plan of work appears inappropriate at this time. In short, quality variation and uncertainty do not appear to be the primary limitation to an expanded litter market in Oklahoma. The following sections summarize findings so far and resulting recommendations for changes in the focus of the project.

Litter Demand and Uses

One objective of the project was to evaluate potential demand for litter in various applications and to survey technologies that may affect litter use. A large and diverse number of uses have been suggested for poultry litter. This diversity of uses stem primarily from the complex set of components found in litter. Various uses typically depend on a subset of the total set of attributes of litter. The list of potential uses includes bulk land application, animal feed, composting, fuel source and a variety of valued-added processing uses.

Bulk Land Application**.** Bulk land application of raw litter is likely the simplest and least cost use of litter. Litter provides macronutrients, micronutrients, and soil amendments when applied to cropland or pastureland. Bulk land application has been the predominant use of litter in Oklahoma and is likely to remain so. The problem has been that litter application has been confined to extremely small areas near sources of production. The area where poultry production occurs is predominantly pastureland. The value of litter applied to these areas is smaller because relatively small amounts of nutrients (especially phosphorous) are transported from the soil with livestock grazing. The apparent value of litter today appears to be too small to justify increased hauling of litter.

Although data on use and value of litter are limited, Eaton[3] used an indirect method to demonstrate that current litter value and use are almost exclusively for the nitrogen component. Thus litter applications for land uses which would value other nutrient components and other litter attributes would support expanded geographical distribution of litter. Depending on specific circumstances, the potential value of litter for land application appears to be two to four times the current value.

Oklahoma has an advantage, compared to other poultry production areas, in being located on the western fringe of poultry production. This means that there exists a huge potential land base for litter application exists beginning directly adjacent to litter

[3] Eaton, Tina. 1999. Factors Affecting the Development of the Broiler Litter Market in Eastern Oklahoma. M.S. Thesis. Agricultural Engineering Department. Oklahoma State University.

production sources. Moreover, westward movement of litter quickly begins to encompass areas of increased crop production, where the potential value of litter is higher.

Animal Feed**.** There is a large body of literature on the use of litter for animal feed, mostly from research conducted in the southeastern part of the U.S. The predominantly organic composition of litter, combined with limited amounts of inorganic nitrogen, lends itself well to feed use for ruminant animals. However, animal industry experience and comfort with the use of litter for feed is limited in Oklahoma. Although a small amount of litter is used for animal feed in Oklahoma, there is considerable reluctance of animal scientists to support and promote litter use for animal feed. Moreover, amid increasing public concern over animal production practices such as use of residues, the cattle industry, fearing adverse public reaction, is unwilling to support increased litter use for feed. The potential for litter use for animal feed appears extremely limited barring a significant change in public and industry attitudes.

Compost. There is a limited national market for compost materials that sell as relatively high valued products in garden and home centers and through nurseries and landscape companies. Litter is but one of many organic products that can be used as the raw material for compost. The majority of compost firms are likely to be located in more concentrated areas of poultry production and also closer to population centers. Year around availability of litter is critical for compost and other processed products. Oklahoma may have limited potential for a regional compost market but compost seems unlikely to be a major use of Oklahoma poultry litter.

Processed Products**.** Like compost, there is a small number of relatively high-value processed products made from poultry litter. The majority of these are fertilizer products for indoor and outdoor household use. Even more so than for compost, the market seems to be small and firms are likely to locate near larger and more dependable litter supplies.

Fuel Source**.** Litter is often cited as a potential biofuel source but thus far has seen little actual use as such in the U.S. Litter is used as a primary fuel source in a large-scale generation facility in Britain but the economics of the energy market in the U.S today are not conducive to such an application in this country. There is growing policy interest in biofuels in the U.S. and it is feasible that use of litter as a fuel source could become more feasible in the future. The chance of a large-scale biofuel or cogeneration facility being located in Oklahoma is remote. Systems of farm-level use of litter for fuel to heat poultry houses have also been suggested but so far have not proven feasible for widespread application.

Processing

Numerous litter processing technologies have been touted but relatively few have been shown feasible. There are three that do warrant some discussion. The first is composting or aerobic digestion. Properly conducted, litter composting leads to a specific end product, compost, discussed above.

The second method, ensiling or anaerobic fermentation, is probably the most common. This occurs, either inadvertently or deliberately, anytime litter is piled or

"deep stacked" and left for a period of time. Fermentation occurs because raw litter is unstable. The deep stacking process allows for a natural heating and fermentation process that stabilizes the litter. The end result is a product that is slightly drier, slightly denser and slightly lower in quality (primarily from a loss in volatile nitrogen).

The third and most common purely mechanical processing technology is that of pelleting. The advantages of pelleting are a stable product that is lower in moisture and easier to haul, store and handle. The disadvantages are cost and some loss of quality (mostly nitrogen). Pelleting litter without a well-defined market justification in terms of storage, hauling or handling is not feasible.

Storage

Storage issues play a significant role in litter marketing. Historically most litter production has occurred in relatively brief periods at certain times of the year, as dictated by optimal poultry house management. In general, the value of litter will depend, not only on the specific use, but also on having litter available when and where it is needed. Increasing the value of litter to support expanding litter markets is likely to depend, in part, on increased flexibility in timing litter applications.

Conceptually, storage can be thought of as having two alternatives; on-farm storage and centralized storage. Centralized storage may occur near the source or near hauling destinations. Each of these alternatives offers advantages and disadvantages. More work is needed to sort out the best combination of storage activities.

On-farm storage offers the greatest flexibility for the producer and is the simplest system because it does not require centralized control and management. On-farm storage may reduce overall litter handling. Collectively, the investment in and maintenance of on-farm storage is probably more expensive than for centralized storage. Moreover, on-farm storage likely requires a greater quantity and more specialized handling equipment. On-farm storage is less conducive to efficient longer hauling using semi-trucks.

Conversely, centralized litter storage provides for efficient investments in facilities and equipment and is most conducive to efficient handling. Centralized storage increases the opportunity for long distance hauling (especially backhauls) using commercial trucking by allowing for fast and timely loading. Centralized storage near destinations provides for greater flexibility and timeliness for users and may provide for reduced peak-load problems for short-haul and speading equipment. Centralized storage requires more management but may improve litter handling and storage (processing).

Reasons for Litter Market Failure

The failure of a more efficient litter market to arise spontaneously is the result of a complex set of causes. No simple, single cause can be identified for obvious policy prescription. Broadly categorized, there are three causes for a poorly performing litter market.

First, and probably most important, is a lack of demand. The causes of poor demand are many. Many potential users of litter are simply unaware of the potential value (and in some case of the availability) of litter. The complex composition of litter increases the difficulty of understanding its value for various uses. This is further exacerbated by the fact that litter varies considerably from sample to sample and thus the user is often uncertain about exact composition. Much of the variation appears to be highly correlated to variability in moisture content. Extensive and costly quality testing is probably not justified but some ability to distinguish quality will be needed to improve market valuation of litter.

Litter value is increased when litter is viewed and managed as part of a comprehensive, strategic soil management plan. Litter may well be best used strategically in different ways for different cropping patterns where timing, frequency and rate of application depend upon specific circumstances. Such use implies the simultaneous need for variable, strategic fertilizer management. Clearly the management requirement are higher. Historically, relatively little attention has been given to management of soil for such nonnutrient characteristics as increased organic matter, increased tilth and water holding capability, and increased microbial activity. Little research has been published to help producers evaluate and value these attributes.

In some cases the information needs are more basic. Potential litter users simply do not know how to locate sources of litter or how to arrange for transportation and spreading. This lack of information about litter quality, value and logistics, coupled with the infrastructure bottlenecks (discussed below), represent significant costs to users in addition to the actual dollar cost of litter.

The second factor limiting the litter market is the lack of market infrastructure. This includes lack of storage facilities and handling equipment which limit timely application of litter and inability to utilize commercial hauling (especially backhauls) due to lack of facilities and equipment for fast and timely loading. In some cases, poor quality of rural roads and bridges limits access for large trucks. Current practices of bunching cleanouts in a short time period in the spring create severe peak-load problems for equipment use. Increased distances of litter hauling create additional demand for spreading equipment and the need for increased coordination to ensure efficient use of equipment. Additional work is needed to evaluate the potential for use of non specialized equipment for hauling, handling and spreading.

The third factor limiting the litter market relates to supply limitations. The supply problem is not the amount of litter production per se, which clearly is sufficient to support a sizable market but rather producer's willingness to sell litter. An economic definition of supply is the willingness and ability to supply a given quantity at a given price. There are numerous instances where potential users with a willingness to buy litter (at some price) have reported difficulty in finding anyone willing to sell litter to them.

The problem likely has economic, financial and social roots. The problem could be economic in that the current price may simply not be high enough to lure litter away from its present use. There is, however, evidence that litter is not currently valued

anywhere near its potential value. It appears that litter is often held off the market for financial rather than economic reasons. In some cases, litter producers may use litter for fertilizer rather than sell it and buy a more appropriate (and perhaps economical) mixture of commercial fertilizer simply to avoid increased cash flow and perhaps to reduce credit needs. In other instances, litter producers may use litter as a barter item with neighbors to acquire needed services or products, again avoiding increased cash flow and credit needs. These arrangements are often longstanding and are slow and difficult to change. Finally, social attitudes towards dealing with third parties may limit marketing opportunities. Producers are often suspicious about marketing agents (middlemen) and fear "being taken advantage of" when selling litter. Producers have been reluctant to commit to supply contracts with potential users, especially processors, who then are forced to look elsewhere for adequate and stable litter supplies.

Plans for Further Efforts

The preceding discussion leads to a conclusion that litter marketing efforts in Oklahoma should be focused on enhancing bulk land application of litter with particular emphasis on expanding the demand base in terms of geography and volume of litter. The following actions are planned:

- Improve information exchange and facilitate the development of a formal litter market through the website,
- Develop two or more publications on strategic use of litter for alternative land use and cropping patterns.
- Conduct a statewide survey of agricultural producers to determine current attitudes about litter use, perceptions about litter value and price, and educational needs.
- Use survey information to design more appropriate litter information and education programs.
- Provide information and in-service for extension educators and others, targeting areas outside traditional poultry production areas.
- Enhance the litter website to increase information about litter use, value and management, with special emphasis on reaching new potential users.
- Continue supporting litter demonstrations as part of Extension Education program.

Biosystems & Agricultural Engineering • 218 Agriculture Hall • Oklahoma State University
Stillwater, Oklahoma • 74078-6021 • Telephone: 405/744-5653 • FAX: 405/744-6059 • Email: smolen@.okstate.edu

MEMORANDUM

DATE: April 3, 2002

TO: Oklahoma Conservation Commission

FROM: Mike Smolen, Extension Water Quality Programs, Coordinator

RE: FY1997 319(h) Task#800, OCC Task#93, AC-5-95570
"Watershed Protection through Manure Marketing (Demonstration Project)"

The attached output is submitted in fulfillment of the indicated tasks required by the approved workplan of the above-named project.

Task/Output Number	Title/Description
806.1	Description of computer network at county extension offices serving as backbone for the market information system.

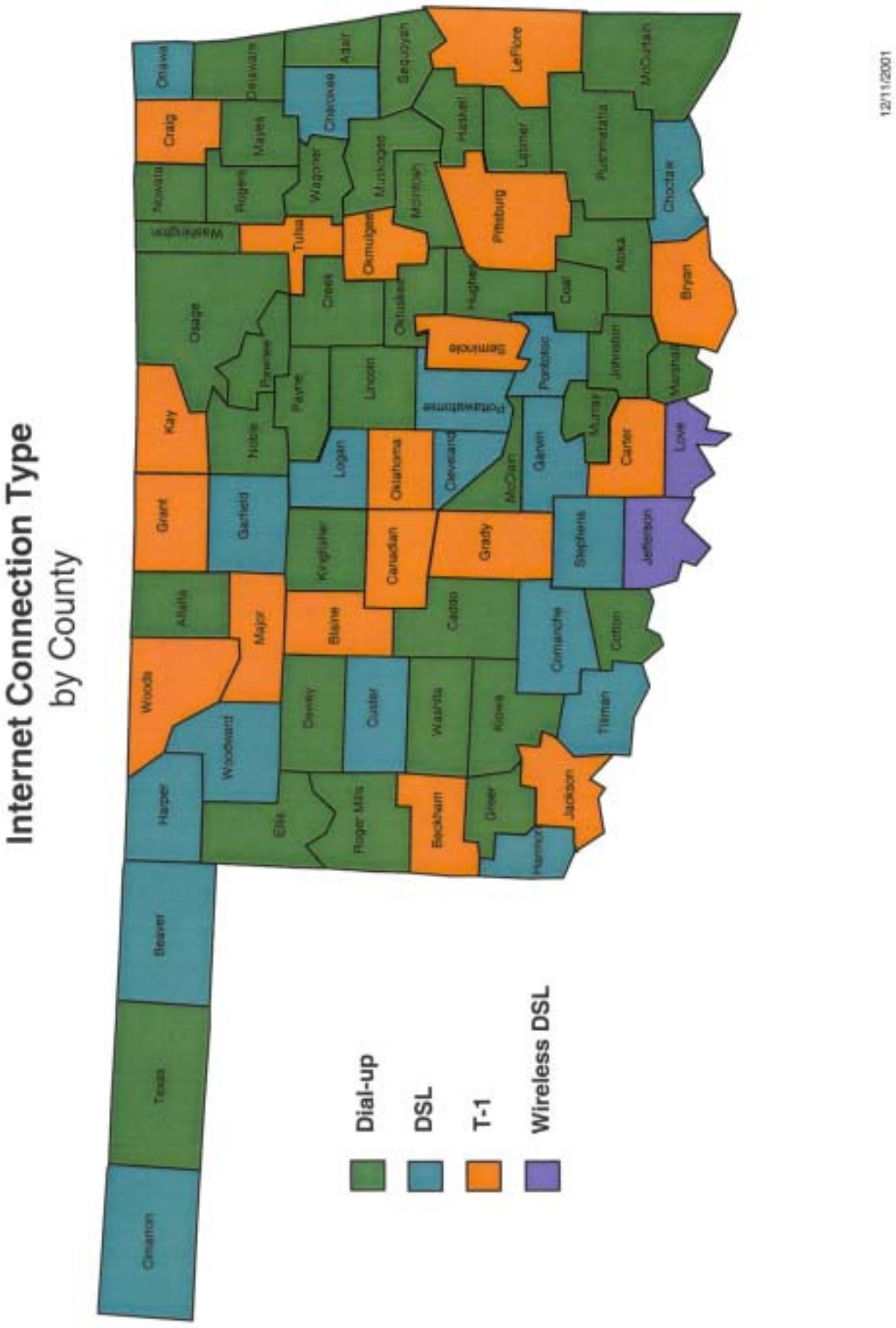
The information below completes this task. Please notify me as soon as possible if this does not agree with your records.

Report:

During the period that elapsed between drafting this project workplan and the awarding of the grant, the OSU Cooperative Extension computer network evolved significantly. This made it unnecessary to use project money for this purpose. Consequently the workplan was modified at the first opportunity to transfer funds from task 806 to other areas (see currently approved workplan).

Project funds were used to purchase a computer for Bill Burton, Area Economics Specialist, to support the posting of information on the project website. Project funds have also been used to pay some of the internet provider costs for dial-up access from Adair and Haskell counties, two of the most active counties in this project.

A complete description of the Extension computer network is provided in the attached diagram.


Internet Connection Type
by County
Dial-up
DSL
T-1
Wireless DSL
Cimarron
Texas
Beaver
Harper
Woods
Alfalfa
Grant
Kay
Osage
Ottawa
Craig
Nowata
Washington
Delaware
Mayes
Rogers
Tulsa
Creek
Pawnee
Noble
Payne
Lincoln
Logan
Garfield
Major
Woodward
Ellis
Roger Mills
Beckham
Custer
Dewey
Blaine
Kingfisher
Canadian
Oklahoma
Pottawatomie
Cleveland
McClain
Caddo
Grady
Garvin
Murray
Carter
Love
Jefferson
Stephens
Comanche
Cotton
Tillman
Jackson
Greer
Kiowa
Washita
Hemphill
Cherokee
Adair
Sequoyah
Muskogee
Okmulgee
McIntosh
Okfuskee
Seminole
Hughes
Pittsburg
LeFlore
Haskell
Latimer
Pushmataha
McCurtain
Choctaw
Coal
Atoka
Bryan
Pontotoc
Johnston
Marshall
12/11/2001

Report on Oklahoma Litter Market, January 2002

M. D. Smolen

The project obtained the services of Bret Sholar as Market Representative. Bret was asked to validate all individuals on the Buyer and Seller Lists obtained from the Oklahoma Department of Agriculture Poultry Litter Hotline. At the same time we initiated a process of updating forms and developing a website. As the lists were validated, they were shared with County Extension Offices and posted to the Web Site.

Monthly meetings were held in either Muskogee or Kansas, OK. At these meetings concern was raised that the number of bona fide haulers poultry litter haulers has declined severely, and it would be difficult for a person trying to buy litter to arrange for shipment. To address this, the agents, and Bret sought out the names of haulers and asked them to be listed on the litter market. We added a new form to sign up haulers and capture relevant information.

A newsletter was developed, the "Oklahoma Poultry Market Update," edited by Mitch Fram. The Update was distributed to every registered poultry operator as well as other interested parties. The update included information useful to poultry producers intended to help them choose to market their litter rather than use it themselves.

Because the number of sellers remained low, we advertised in the Market Update and in several newspapers in Adair County for sellers. The ads offered a free litter test to the first 100 people to sign up. Very few people have taken advantage of the free litter tests, and formal advertising has been discontinued to save money. Advertising continues through free publications.

Bret contacted all individuals on ODA's original Buyer and Seller Lists. He explained the changes and asked if they would be interested in remaining on the list. Many said no. The majority of these were sellers that were added to the database after a January 2000 Litter Marketing Meeting in Delaware County. They just signed up to get Poultry Education Credit and did not really want to sell their litter.

Bret contacted each seller after his/her "available" date had passed and asked if the Litter Membership was helpful in selling the litter and, if so, how much did they get for it and would they be willing to remain on the list. He sent the list of buyers, sellers and haulers/dealers to those interested in participating.

Every Commercial Applicator registered with ODA was contacted and invited to participate in the program. Out of the 58 contacted, only 20 were interested in participating and are currently on the Haulers/Dealers List. A decision has been made to list only the names of those who chose not to participate. Those who are members will include more more information to help them get business.

As of December 31, 2001, there are 25 buyers, 34 sellers and 20 haulers listed.

The original ODA database was maintained on Microsoft Access. For the convenience of those handling the data, it was transferred as Microsoft Excel files. Freda O'Dell at the ODA office in Tulsa has the new forms on her computer. While Bret was working, she would obtain information from calls on the Litter Hotline. She would then fill out what information she could and send by e-mail to Bret. Bret would then contact the individual, get additional information and forward the new list to Bill Burton to be update on the web page. We hope to establish a similar pattern when a replacement for Bret is hired.

Poultry Litter Market Promotion Report
2003
M. D. Smolen

The January 2002 Oklahoma Litter Market Report, (Appendix 15) described the work done by the Market Coordinator to that date in verifying member contact information and the improvements made to the website. As of December 31, 2001, there were 25 buyers, 34 sellers and 20 haulers listed. As of February 14, 2003, there were 51 sellers, 37 buyers, and 17 haulers listed on the market website.

Initial publicity for the litter market was confined to ODAFF's advertisements for the litter hotline and word of mouth from County Extension Educators and the OSU Market Coordinator. Although the website was up and running, providing 24hr/7 day a week access to market information, the process by which this information was updated was still very much a manual task. Any new or revised listing for the litter market bulletin board had to be typed in by OCES personnel. In addition, the Market Coordinator usually contacted any new members to confirm their listing. Despite the low number of members in the market, all members were personally verified by the market coordinator. This required a considerable effort.

During 2002 advertisements were run in local newspapers in Adair County and LeFlore County. The ads offered free litter tests through the OSU Soil, Water, and Forage Analytical Laboratory for anyone joining the market. Only about 30 producers took advantage of this offer. The paid advertisements have been discontinued, but free litter tests are still being promoted in free publications and at meetings of the Poultry Producer Education Program. The free litter test offer has been extended until June 30, 2003. An offer of free soil test was added for the first 50 to register as litter buyers.

As of February 14, 2003, there were 51 sellers, 37 buyers, and 17 haulers listed on the market website. Although these numbers are lower than anticipated at the outset of the project, the extra work and attention to detail that has gone into reviewing the data provides a high level of confidence that individuals are indeed market participants. The foundation that has been laid provides a solid basis on which to continue to build the manure market in eastern Oklahoma. And, indeed, this is a continuing effort. The project personnel that have provided much of the driving force behind the efforts so far continue to dedicate their time and energy to the success of this endeavor.

The use of the website is expected to expand rapidly during spring 2003. A series of publications is planned, including newspaper columns, trade journals, and word of mouth through poultry company inspectors, poultry producer education meetings, and county extension agent programs. There is increasing pressure on producers to sell their litter to avoid building up soil P and be considered responsible for water quality degradation in Spavinaw/Eucha waters, the Illinois River, and Wister Lake.

Results from Oklahoma Cattlemen's Association Annual Meeting Survey
July 25-27, 2002

A survey instrument was developed and approved by the OSU Institutional Review Board. Surveys were included in registration packets for the Oklahoma Cattlemen's Association Meeting in Oklahoma City on July 25-27, 2002. As an inducement to complete the survey, respondents were registered in a drawing for a digital camera. Of the 300 surveys distributed, 39 were returned to the registration desk. Of these, 35 indicated they were cattle ranchers. Using the OCES district lines as boundaries, there were 12 ranchers from NE Oklahoma, 11 from NW, 4 from SE, and 8 from SW.

Reported holdings ranged from 60ac to 65,000ac. Average ranch size was calculated for each region, but the wide range among this small sample size made these values misleading. Therefore, median ranch size for each region was identified. These results showed a dichotomy between the northern and southern parts of the state. Median ranch size in the NW and NE neared 1500ac, while in the SE and SW, this value was approximately half that, approximately 700ac.

Only two of the 35 rancher respondents said they do not fertilize their pastureland. Both of these individuals were from NW. Of those that fertilized, all but two (both from NE) use commercial fertilizer to some degree. Usage of animal waste products as fertilizer was mentioned much less frequently. Three ranchers in the NW, and one each in the NE and SE fertilize with beef manure. One NE rancher uses hog manure. Poultry litter is used by 4 NE ranchers and 1 SE rancher. One NE and one SE rancher use horse manure, while one NW rancher uses another unspecified fertilizer. Interestingly, no SW ranchers indicated use of any animal waste products as fertilizer.

When asked the most they would pay for a load of poultry litter delivered to their gate, respondents were given six choices; (1) less than $10, (2) $11-20, (3) $21-30, (4) $31-40, (5) $41-50, and (6) more than $50. All prices were on a per ton basis. As a point of reference, the same question was asked regarding a load of beef manure fertilizer. For comparison purposes, an average for each region and each waste product was calculated using the $5 amount below the highest value listed in that choice. In other words, if a rancher selected "less than $10" this was recorded as $5/ton. The "$11-20" choice was interpreted as $15; "$21-30" as $25, and so on.

Using these methods, NE ranchers were willing to pay the least amount for either fertilizer type; $9.55/ton for poultry litter and $7.73/ton for beef manure. In the NW, ranchers indicated they would pay an equal amount for either fertilizer, $13.89/ton. Results from the SE show an average price for poultry litter of $15/ton and $10/ton for beef manure. The SW was the only region in which poultry litter was less desirable than beef manure. Ranchers there indicated they would pay $12.50/ton for poultry litter, while willing to pay twice that for beef manure ($25/ton). (These numbers are based upon a small sample size, especially in the two southern districts, so care should be taken in interpretation of these results.)

Region	Ranchers	Acres (avg)	Acres (range)	Acres (median)	Fertilize Pasture (n)	Commercial fertilizer (n)	Beef manure (n)	Hog manure (n)	Poultry litter (n)	Other (n)	Would pay for Poultry Litter (n)	Poultry Litter ($/ton)	Would pay for Beef Manure (n)	Beef Manure ($/ton)
General Information					**Fertilizer Information**						**"Would-pay Price"**			
NE	12	4100	60-15,000	1350	12	11	1	1	4	1	11	$9.55	11	$7.73
NW	11	8000	160-65,000	1420	9	9	3	0	0	1	9	$13.89	9	$13.89
SE	4	1260	80-3,000	700	4	4	1	0	1	1	3	$15.00	2	$10.00
SW	8	1212	120-2,800	640	8	8	0	0	0	0	4	$12.50	3	$25.00