

Odor and Nutrient Management

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Shelterbelts and “Clean Air Pork”

by John Tyndall, Department of Natural Resource Ecology and Management, Iowa State University

Introduction

For some time now it has been suggested by Iowa State University (ISU) economists that the sustainability of industries within agriculture will be shaped by its collective ability to improve environmental impact technologies—this is particularly true in the case for swine odor mitigation technologies.

To that end, joint research from the ISU departments of Natural Resource Ecology and Management (NREM) and Agricultural and Biosystems Engineering suggests that when used appropriately, shelterbelts—linear arrangements of living tree barriers, can be cost-effective, biologically active buffers that can incrementally reduce odor and complement other odor control strategies used by producers.

It is, however, recognized that odor problems and odor mitigation is not just a simple physical issue; rather odor mitigation is a function of complex physical and social system interaction. At the very least it is a socio-technological issue which recognizes the importance of public input in the recommendation, use and acceptance of agricultural technologies. This view also recognizes that responsibility for odor mitigation need not rest solely on the shoulders of swine producers – there are other key players in the chain of pork production, not least of who are the consumers of pork products. Previous research at ISU has suggested that some pork consumers accept partial responsibility in environmental issues and exhibit an interest in purchasing labeled pork that came from farms that did “extra” management to protect air quality.

NREM researchers have surveyed pork consumers and producers in three different states - Iowa, North Carolina and Washington– to examine attitudes regarding market-based incentives for odor control and producer/consumer values regarding odor management in general, odor management specifically involving the use of shelterbelts, and the production and marketing of “Clean Air Pork” (CAP).

The “Clean Air Pork” System

The various surveys were instrumental in identifying the key elements in a “Clean Air Pork” system. Figure 1 helps visualize what this system “looks” like and how the various elements interact—only factors that have a statistical significance are shown.

For pork producers, across all three states, the mean willingness to pay (WTP) for planting and maintaining shelterbelts (for incremental hog odor mitigation) is \$0.14/hog produced. However there are details that help explain how producers differ in their WTP. As Figure 1 shows, smaller producers are more likely to pay for shelterbelts and pay more for them. Not surprisingly, producers who have more concerns about the management and efficacy of shelterbelts are less likely to pay for them. Additionally, producers who have facilities close to neighbors (1 mile or less) are more likely to pay for shelterbelts and pay more for them, perhaps suggesting a desire to be a “good neighbor”.

Overall, across all three states 51 percent of the producers (37 percent in Iowa) are interested to very interested in producing “Clean Air Pork” as long as the prices received covered additional odor management costs. Looking closely at what kind of producers might be willing to participate in growing and marketing “Clean Air Pork” again the size of the farm matters with smaller producers (marketing less than 5000 head/ year) more likely to be interested. Interestingly, mixed farms—producing both crops



J. Love, NREM, ISU 2004

Vegetative environmental buffer located in SW Iowa.



(Shelterbelts and “Clean Air Pork” continued)

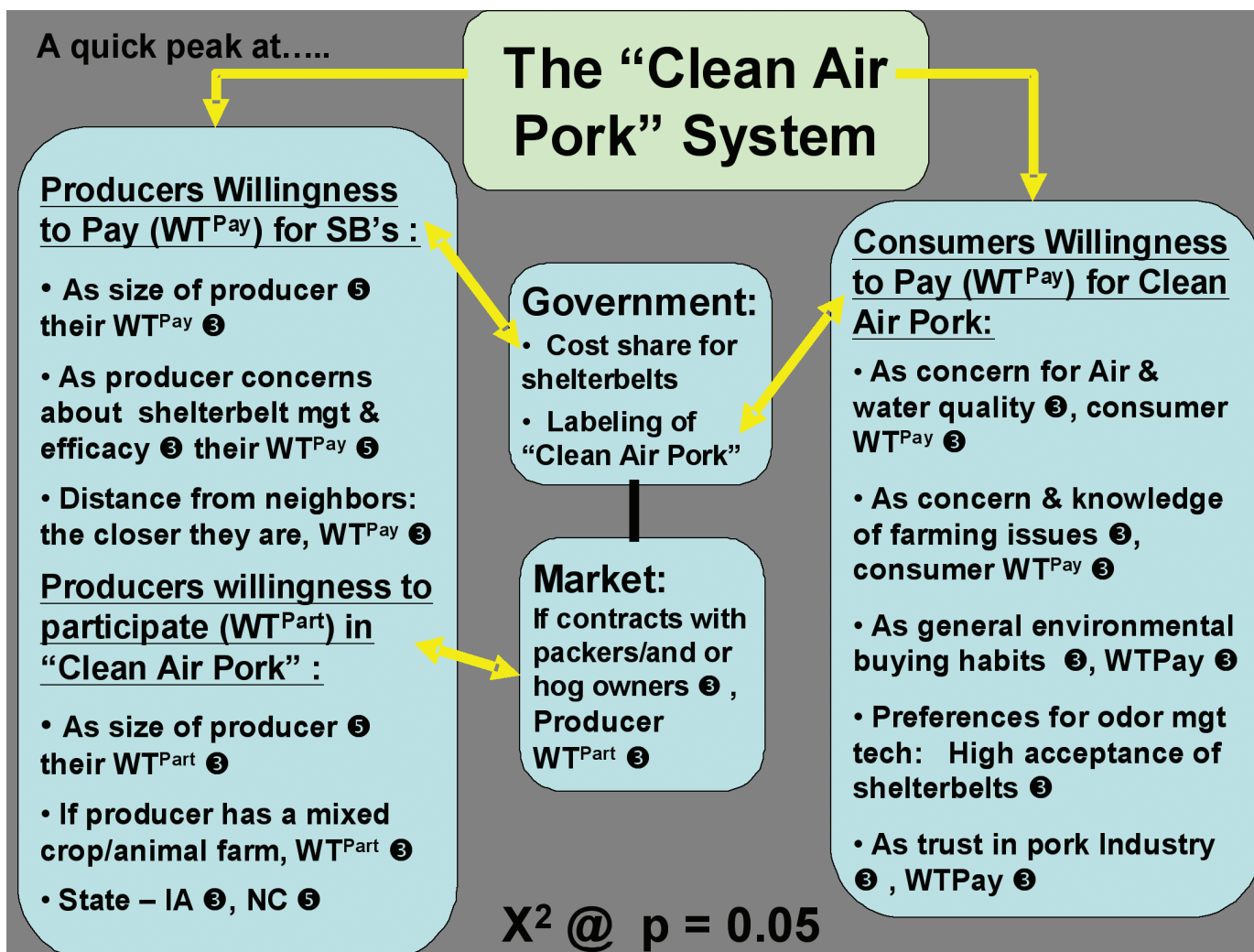


Figure 1. A quick look at the “Clean Air Pork” System. All items listed are statistically significant factors ($p < 0.05$).

and livestock—are more likely to participate in such a market. And between the two largest hog producing states, Iowa producers are far more interested in this type of market than North Carolina producers. A key component of this system is also that producers who are interested in producing such a differentiated pork product believe that contract arrangement with either packers or, if the producer is a contract feed operation, the owner of the hogs.

Note:

Consumer Surveys (total completed interviews 349: Iowa = 145; North Carolina = 77; Washington = 127) The overall response rate was 31.5 percent, with 48.2 percent in Iowa

Producer Surveys (total completed interviews 587: Iowa = 410; North Carolina = 141; Washington = 36) The overall response rate was 64 percent, with 68 percent in Iowa.

Examining pork consumers, the surveys revealed that the maximum mean willingness to pay was \$0.14/pound of pork meat purchased. When looking at pork consumers across all three states who are willing to pay for labeled “Clean Air Pork”, a number of interesting factors were discovered. Overall, consumers who have strong concerns for rural air and water quality are more likely to buy CAP and are more likely to pay more on a per pound of pork meat basis. Consumers who are more aware of farming issues in general are highly interested in such a pork product. Those



consumers who have in the past made purchases (of any kind, not necessarily food) based partly on environmental reasons are more likely to buy and pay more for CAP. However, those who buy organic or natural pork showed no more interest than those who don't. Consumers across all three states had clear preferences for odor mitigation technology that was considered more "natural" (examples include the filtration of odors through organic based bio-filters and the use of shelterbelts) as opposed to methods that were considered more mechanical or chemical (e.g. chemical scrubbers on vent outlets). And those consumers who had the highest appreciation of shelterbelts for odor mitigation also expressed higher WTP for "Clean Air Pork". Other important factors are whether or not consumers have strong trust in pork industry associations

Government involvement is implicitly suggested through producer approval of cost share programs for the planting of shelterbelts and through consumer general trust in the USDA in regulating possible labeling of a "Clean Air Pork" product.

General Conclusion

Results indicate that there are pork consumers who are likely to pay more for meat originating from farms with higher air quality management. Moreover, consumers indicate a preference for the "natural look and feel" of shelterbelts (trees) relative to other bio-chemical-mechanical odor control technologies. It seems that pork producers and consumers agree that shelterbelts can and should play a role in mitigating swine odor. Some pork producers are willing to explore new ways to capture the extra money that consumers are seemingly willing to spend for "clean air pork" through innovative marketing strategies while others simply value the addition of shelterbelts to farms. Shelterbelts should provide a suite of benefits for the pork industry, producer, consumer, and communities. Ultimately, the results of this research will support cooperative approaches to solving odor problems that include natural odor control strategies, and help to sustain two vitally important parts of agriculture—pork production and rural communities.

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Is There Too Much P in Distillers Grains with Solubles? A Systems Approach to Answering the Question.

by Wendy Powers, Animal Science, Iowa State University

Ethanol production in Iowa and the U.S. continues to increase. During the ethanol production process, energy is removed from the grain. Therefore the co-product that is produced, in addition to the ethanol, contains nutrients that are more concentrated than in the feedstock grain. The concentrated nutrients include phosphorus (P) and nitrogen (N). Whereas corn contains approximately 10 percent crude protein and 0.30 percent P on a dry matter basis, dried distillers grains with solubles (DDGs) contains approximately 26 percent crude protein and 0.84 percent P. As a result, concerns regarding the concentrated P have been raised as to whether or not feeding DDGs will create more P in manure than can be managed following land application.

To address this concern, one has to think about the farm as a system with boundaries that often extend beyond the property line. A recent publication from the Iowa Beef Center approaches this issue by considering the dietary P content when DDGs is varied in the diet from 0 to 40 percent of the diet dry matter. Please see Use of Distillers Grains in Feedlot Diets: Impact on Phosphorus Excretion (IBC 29) at <http://www.extension.iastate.edu/Publications/IBC29.pdf>.

In addition to estimating the amount of P that is excreted when steers are fed the different diets, mass of P excreted was estimated as was the acreage requirements for P removal in corn. While the number of acres

increased as amount of P in the diet increased, it is important also to consider the number of acres needed to grow the corn that was fed to the steers as either corn or DDGs. When that aspect of the farm system is taken into consider-



(continued on page 4)



(Is There Too Much P in Distillers Grains with Solubles? continued)

ation, using DDGs does not appear to present a P problem. In fact when 40 percent DDGs is fed to the example steer, more P is needed to grow the corn for both corn grain and DDGs than is actually provided in manure. Getting the manure P to the corn fields is the real issue; nutrient distribution rather than nutrient abundance. No question, producers will be reluctant to haul manure as far as may be needed but it is imperative that the real issues be unveiled so that solutions can be developed.



Most of the attention has focused on P content of DDGs with little attention on N content. However, as particulate matter and ammonia emissions become a greater challenge for all livestock producers to contend with, it is important to consider dietary N and manure N, particularly the fraction of manure N that can not be

captured and is volatilized to the atmosphere. Using the same diets as our example, the Iowa Beef Center publication demonstrates that when only 50 percent of the N is captured from a feedlot, increasing the DDGs content of the diet from 15 to 40 percent, N lost to the atmosphere increases by 50 percent. However, in the event that all of the excreted N can be trapped, the producer feeding 40 percent DDGs needs much less commercial N on the corn grown to supply the grain and the DDGs when manure is applied based on P removal application rates.

The bottom line is that we need to consider all aspects of the system when determining the environmental impact for what appears obvious may in fact have plausible solutions and less obvious issues may pose greater challenges. For more information on the examples developed to make this point, logon to the Iowa Beef Center website at: <http://www.iowabeefcenter.org/>

New Fact Sheet Series Regarding Manure Management is Available

by Angela Rieck-Hinz, Department of Agronomy, ISU;
Alison Smith, Iowa Pork Producer's Association

A new series of fact sheets for Iowa crop and livestock producers titled the "Iowa Manure Manager Series" is currently being developed, with the first fact sheet available in early July. This series of fact sheets is being developed by the members of the Iowa Manure Management Action Group (IMMAG) in response to the continued need to provide information on regulations, best management practices, neighbor relations and sources of additional information for people producing or applying manure as crop nutrients.

Topics for each of the 11 facts sheets were identified by the members of IMMAG and are listed below. The fact sheets will be available through the IMMAG Web page and will be distributed by the members of IMMAG through their respective newsletters, magazines, producer mailings and the popular press. Anyone wanting hard copies of the fact sheets will be able to print the material from the Web.

Month	Fact Sheet Title/Topic
July	Introduction to the Iowa Manure Manager Series
August	Land Application
September	Neighbor Relations
October	Agronomics of Manure vs. Commercial Fertilizer
November	Winter Application of Manure
December	Manure Stockpiling
January	Financial and Technical Assistance for Producers
February	Regulations/Compliance
March	Small Animal Feeding Operations
April	Manure and Organic Agricultural Production
May	What Crop Producers Need to Know About Using Manure

Members of IMMAG and additional contributors include: Natural Resources Conservation Service, Iowa Department of Natural Resources, Iowa Pork Producer's Association, Iowa Cattlemen's Association, Iowa Turkey Federation, Iowa Poultry Association, Iowa State Dairy



Association, Iowa Corn Grower's Association, Iowa Soybean Association, Agribusiness Association of Iowa, Iowa Commercial Nutrient Applicators Association, Iowa Farm Bureau Federation, Coalition to Support Iowa's Farmers, Iowa Department of Agriculture and Land Stewardship-Division of Soil Conservation, Conservation Districts of Iowa, Iowa Environmental Council, Iowa Pork Industry Center, Iowa Beef Center, Iowa State University Extension and the Iowa State University College of Agriculture.

BMPs for Manure Management

by Angela Rieck-Hinz, Department of Agronomy, Iowa State University

Best management practices, or BMPs can mean a myriad of different things to different people. Traditionally, in agriculture, a best management practice has been a series of practices, standards or implementation of physical structures based on the best possible science to address environmental, production and economic issues all at the same time. By definition BMPs can and should change over time. Unfortunately, perhaps, we have become so obsessed on what the regulations require that we forget there are BMPs, tools or resources that can help us make sound management decisions without the need to require that these practices be mandated by state or federal law. Some of these practices require an investment of time, resources and money, but overall, these investments may be quite small compared to the cost of regulatory compliance.

Manure Sampling

Taking a manure sample and having it analyzed for nutrient content is the single best practice to help you fully know and use your manure as a fertilizer source for crop production. While book values for manure nutrient analysis can provide a reasonable starting place for new facilities that do not have access to existing manure analyses, actual nutrient concentrations can vary significantly from book values. Manure nutrient content is affected by many things, age of animal, feed sources, management, manure storage type, length manure is stored, land application methods, weather conditions and so forth. Also because of the time involved in collecting a database of manure samples, book values are often dated and do not reflect current feeding or management strategies.

For example, with the increased use of distiller's grain in animal diets in Iowa, there are no book values for manure from animals being fed these diets. Manure sampling for nutrient analysis is not without its challenges, so be prepared to collect samples over several years to see if they change yearly, why they change yearly and how to manage and use your nutrient analysis. For a list of laboratories that offer manure analysis please see: <http://extension.agron.iastate.edu/immag/splabssma.html>. Remember, if you choose to use a manure analysis in your state-required manure management plan for the Iowa Department of Natural Resources, you must use actual documented manure production volumes from your farm.

Equipment Calibration

Now that we know what is in the manure by taking manure samples, we need to know how much we are land-applying for crop production. Unless you own a liquid manure tank wagon with a flow-meter, most producers still calculate application rates in terms of loads of manure applied per acre, and then back-calculate to determine actual tons or gallons per acres and subsequent nutrient rates. Flow meters are very expensive so they are primarily used in the commercial manure application business. Generally speaking, if you are land applying liquid manure, you should calibrate your tank wagon once per year. After several seasons with the same equipment, you should have a general idea of tractor speeds and application rates. Solid manure calibration can be a little more difficult depending on if bedding is used and how this affects how the manure is stacked in the spreader and how the manure is distributed from the back of the spreader.

Specific details on how to collect manure samples or to calibrate equipment can be found in fact sheets developed by Iowa State University Extension. Please see the article titled "Using Your Resources" for additional information on how to obtain copies of these publications.



Weighing manure tank wagon for calibration

Photo by Joel DeJong



Using Your Resources

by Rachel Klein, Iowa State University

Finding publications about manure management can be just a click away. At the Iowa Manure Management Action Group (IMMAG) web site, there is a vast collection of publications about manure management. The URL for IMMAG is: <http://extension.agron.iastate.edu/immag/>. To get to the manure management publication section on IMMAG, click on the publications button, <http://extension.agron.iastate.edu/immag/pubs.html>. Publications are categorized by topics such as nutrient management, handling, hauling, feed management, and air quality to name a few. Examples of the publications include the following:

• Nutrient management

- PM 1811 *Managing Manure Nutrients for Crop Production*
- PM 1558 *How to Sample Manure for Nutrient Analysis*

• Calibration

- PM 1941 *Calibrating and Uniformity of Solid Manure Spreaders*
- PM 1948 *Calibrating Liquid Tank Manure Applicators*



• Handling

- PM 1859 *Emergency Action Plans*

• Hauling

- AE 3301 *New Weight Restrictions for Manure Hauling Equipment*

• Odors

- PM 1936 *Air Quality Resources for Iowa Animal Agriculture*
- PM 1971A *Practices to Reduce Ammonia Emission from Livestock Operations*
- PM 1972A *Practices to Reduce Hydrogen Sulfide from Livestock Operations*
- PM 1970A *Practices to Reduce Odor from Livestock Operation*
- PM 1973A *Practices to Reduce Dust and Particles*

• Regulations

- PM 1778 *Commercial Manure Applicator Study Guide*
- PM 1779 *Confinement Site Manure Applicator Study Guide*

All of the above mentioned publications can be purchased through the Iowa State University Extension Online Store. When ordering, please include the publication title and ID number in your message. A downloadable order form can be printed and is available at <https://www.extension.iastate.edu/store/OrderingInformation.aspx>. It is in PDF format. After printing it, you can fill it out and fax it to (515) 294-2945. To visit the online store, go to: <https://www.extension.iastate.edu/store/> or call (515) 294-5247 for more information about the publications. Orders can be also made at any county extension office. Some publications are also available to be downloaded in a PDF.





Upcoming Events

RUSLE2 and Iowa P Index Workshop

Dec. 6, 2006; 9 a.m. to 4 p.m.

Montgomery Hall, Johnson County Fairgrounds,
4265 Oak Crest Hill Rd. SE; Iowa City, Iowa

This workshop will teach the basics of how to operate the RUSLE2 and the Iowa P Index software for both DNR and NRCS requirements for manure and nutrient management planning requirements in Iowa. You must bring a laptop computer to attend this workshop. The software will be provided. Registration information and computer requirements will be available on the IMMAG web events page in late October at: <http://extension.agron.iastate.edu/immag/events.html>.

The Liners and Covers for Agricultural and Industrial Waste Storage Course

Dec. 4-6, 2006

Radisson Hotel City Centre, Indianapolis, Indiana

The course is offered by Iowa State University in cooperation with the Natural Resources Conversation Service. The first day of the course will cover compacted clay liners, the second day will cover geosynthetic liners and the third day will cover geosynthetic and natural covers. The design, installation and testing methods covered in the course are appropriate for manures, agricultural wastes, industrial wastes and municipal wastes. This three-day short course is designed for engineers, consultants, regulators, educators and others who are involved in the selection, specification, design, installation or testing of liner and cover systems for manure or waste storage systems. If you have questions contact Lara Moody (lmoody@iastate.edu). Additional course information and registration are available at the address below:

<http://www.ucs.iastate.edu/mnet/linersandcovers/home.html>

Feed Management for CNMP Development

Dec. 13, 2006; 8 a.m. - 4 p.m.

Iowa State University, Ames, Iowa

This one day training is for consultants providing nutrient management assistance to animal feeding operations. It will provide information about how feed

management can be used to assist in nutrient management planning and what steps can be taken to acquire assistance in the development of a feed management plan. The training would accomplish three objectives, 1) provide information about feed management as it relates to CNMPs and assists plan preparers in that area, 2) give individuals who are already certified in the area of "Feed Management for CNMP Development" the opportunity to obtain some update hours (6 will be available), and 3) give individuals the opportunity to certify in Feed Management for CNMP Development. For more information visit the ISU Animal Waste Management homepage or contact Lara Moody (lmoody@iastate.edu) <http://www.abe.iastate.edu/wastemgmt>.

Commercial Manure Applicator Satellite Uplink

Jan. 5, 2007; 9 a.m to noon.

This workshop will provide the annual 3 hours of training needed for commercial manure applicators to initiate or renew their manure applicator license. The program will be broadcast from 9 a.m. to noon. Commercial applicators will receive a registration brochure in early December that will identify the locations offering this workshop. Plan now to attend this workshop.

Comprehensive Nutrient Management Plan Development Course

Feb. 26-28, 2007

Texas (location being determined)

The CNMP Development Course provides the educational component of the ISU Technical Service Provider certification program. This three-day short course is designed to train individuals in the development of CNMPs. If you have questions or would like to be added to the mailing list to receive information about this training, contact Lara Moody (lmoody@iastate.edu). When available, additional course information and registration information will be posted at the following: <http://www.abe.iastate.edu/wastemgmt>.

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Iowa Manure Matters: Odor and Nutrient Management



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... and justice for all

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