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## Agricultural Environmental Programming in Pennsylvania: Increasing Visibility and Relevancy of Extension

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## Agricultural Environmental Programming in Pennsylvania: Increasing Visibility and Relevancy of Extension

### Abstract

Penn State Cooperative Extension Dairy and Livestock Nutrient and Environmental Education Days (NEEDs) is a multi-disciplinary collaborative educational program for government conservation professionals working with producers. The objective of this program is to provide participants with an understanding of the links among community concerns, agricultural air and water quality impacts, changing policy, and farm-level environmental management tools. This article describes the development of the NEEDs program, evaluation results, and future program plans. As Extension's role evolves to address the educational needs of conservation professionals, evaluation results indicate the use of a multi-disciplinary approach can serve as an effective educational method.

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## Introduction

Agricultural production and its impact on the environment are critical, complex, and rapidly changing issues. Education is needed to address different environmental media and define connections among changing policies, farm-level requirements, and environmental impacts. The audience is diverse, providing an opportunity to develop a multi-disciplinary program to make these connections. In response to this need, a team of Extension educators with backgrounds in natural resource policy, dairy and animal science, and crop and soil science designed the Penn State Cooperative Extension Dairy and Livestock Nutrient and Environmental Education Days (NEEDs). The program was held in seven locations across the state in 2003 and 2004.

The program is significant for several reasons. First, it provides timely information and makes linkages among phosphorus (P) and water quality impairment, air quality, changing federal and state policy, and farm-level management tools used to reduce environmental risk. Second, the program was developed and implemented in cooperation with the Pennsylvania Dairy Alliance, the Pennsylvania Environmental Agricultural Conservation Certification of Excellence, the USDA, and the departments of Dairy and Animal Science, and Agricultural Economics and Rural Sociology at Penn State University.

The audience is primarily USDA Natural Resource Conservation Service (NRCS) professionals. As the country's largest conservation agency, NRCS encourages voluntary efforts to protect soil, water, air, and wildlife on private lands and provides leadership in a partnership effort "to help people conserve, improve, and sustain our natural resources" (NRCS, 2004, Agency Capability Statement, paragraph 2, <http://www.nrcs.usda.gov/programs/international/capability.html>). In Pennsylvania alone, over 200 NRCS employees contribute to this mission (USDA, 2004). Finally, the program is significant because it was designed to be delivered over multiple years in order to build the knowledge, skills, and abilities of conservation professionals.

The role of Extension in providing agricultural environmental programming for NRCS personnel is likely to increase. In Pennsylvania, NRCS professionals are challenged with the need to remain current with programs, operations, management, and technical tools, along with increasing work loads (T. Matticks, personal communication, August 12, 2005). Nationally, the NRCS published a strategy for meeting the environmental stewardship challenges facing animal agriculture over the next 15 years (USDA, 2003). The framework calls upon Extension educators to provide accurate and timely information and educational materials regarding the relationships between animal agriculture and natural resources, regulatory requirements, conservation opportunities, and the benefits and challenges of animal agriculture.

As Extension evolves to address the changing educational needs of NRCS and other conservation professionals, the use of a multi-disciplinary collaborative approach has the potential to serve as an effective educational method. This article describes the development of the NEEDs program, program evaluation measures, and results. Finally, keys to increasing the relevance of Extension's work are identified and future plans for the NEEDs program are summarized.

## Making Connections: The NEEDs Program

In 2002/2003, a multi-disciplinary team of Extension educators, along with a USDA colleague, delivered five educational workshops entitled Dairy Phosphorus and Regulations for dairy producers and agricultural industry professionals. The workshops addressed P, proposed changes to nutrient management regulations, and air quality. Participants responded positively to both the content and format of the program. However, several participants suggested that producer attendance was low due to negative misconceptions regarding agriculture and environmental issues.

In spring 2003, a multi-disciplinary team met to develop follow-up educational programs. An opportunity was identified to expand Extension's reach by shifting audience focus from producers and agricultural industry professionals to conservation professionals who work with producers. The NRCS expressed the need for an educational program that addressed high-priority technical material and emerging issues (T. Matticks, personal communication, August 12, 2005). The decision was made that the program content would address the specific needs of government conservation professionals, while remaining appropriate for producers and agricultural industry personnel. As a result, the NEEDs program was developed.

The main objective of the program was to provide participants with an understanding of the links among community concerns, environmental impacts, changing federal and state policy, and farm-level environmental risk management tools. The comprehensive program focused on four topical training areas: odor management, P management, environmental stewardship, and changing regulations to protect water resources. These topics are described in more detail below.

### Odor Management

Community odor conflict has increased in some parts of Pennsylvania as a result of new and

expanding livestock facilities. Participants were introduced to common odor sources, the principles of odor dispersion, management technologies, and on-farm strategies to reduce the potential for odor conflict. Additionally, participants were introduced to Penn State's On-Farm Assessment and Environmental Review Program, a free site evaluation service to assess odor-related impacts of new and expanding livestock facilities (Meinen, n.d.).

## Phosphorus Management

Phosphorus and its impact on water resources are of increasing importance in Pennsylvania and throughout the country. Recently, the NRCS revised their internal Practice 590 Nutrient Management Standard to include a P management component. In Pennsylvania, the standard requires producers who are voluntarily accepting NRCS funding or nutrient management related technical assistance to develop a nutrient management plan using the P Index. The index is a field-level tool that identifies critical areas most vulnerable to P loss and where management changes are needed to protect water resources (Weld, Beegle, Gburek, Kleinman, & Sharpley, 2003). The NEEDs program included an interactive case study that combined the influence of animal nutrition, manure nutrient content, and soil conservation management strategies on a P Index evaluation.

## Environmental Stewardship

The NEEDs program introduced participants to the Pennsylvania Environmental Agricultural Conservation Certification of Excellence program. Both Penn State Cooperative Extension and NRCS are sponsors, along with several government agencies and agricultural interest groups. The program promotes environmentally safe agricultural practices among producers to minimize environmental risks and personal liability and recognizes producers who meet standards established by the program (Meinen, n.d.). The certification program has four components: an environmental awareness course, an on-farm assessment and environmental review, verification that requirements are met, and certification maintenance. Participation in the NEEDs program fulfilled the environmental awareness course requirement.

## Changing Regulations to Protect Water Quality

In December 2002, the U.S. Environmental Protection Agency changed federal Clean Water Act regulations to reduce the environmental risk of concentrated animal feeding operations (Dodd, Abdalla, Lanyon, & Graves, 2003). The Pennsylvania Department of Environmental Protection is responsible for implementing the regulatory program and must change current state regulations to meet new federal rules. In addition, Pennsylvania is in the process of revising state nutrient management regulations. Participants of the NEEDs program were presented the latest information on the new federal rules, the state-level regulatory revision processes taking place, and opportunities for public comment.

## Documenting Knowledge Change

Seven NEEDs programs held throughout 2003 and 2004 reached 138 participants. NRCS professionals were the primary audience, making up 64% of the participants. Other participants included conservation district professionals (14%), agricultural private sector professionals (12%), and Extension educators and Pennsylvania Department of Environmental Protection personnel (10%).

To document knowledge change, participants answered a 14-question pre- and post-test. The correct answers were sent to each participant via e-mail a few days after the program was completed. Results of pre- and post-test results varied across the four NEEDs topical training areas (Table 1). Results indicate the multi-disciplinary and comprehensive content provided new knowledge to a majority of participants. The greatest knowledge was gained in the area of odor management (35%), followed by P management (28%), and environmental stewardship (25%). Knowledge gained regarding changing regulations was relatively small (9%). A paired t-test showed statistically significant knowledge increases ( $p=.01$  level) from before to after the program for all four topical training areas.

**Table 1.**

Summary of Knowledge Change Based on Pre and Post-test Results from the Dairy and Livestock Nutrient and Environmental Education Days (NEEDs) Program

Topical Training Area	Question Content	Pre-Test: Participants Answering Correctly Before (%)	Post-Test: Participants Answering Correctly After (%)	Knowledge Change (%)	Knowledge Change per Topical Training Area (%)
<b>Odor Management</b>					

	1	Odor Dispersion	35%	95%	60%	35%*
	2	Thermal Inversion	24%	79%	55%	
	3	Odor Perception	91%	97%	6%	
<b>Phosphorus Management</b>						
	4	P-Index Rating	42%	84%	42%	28%*
	5	Feeding Strategies	10%	51%	41%	
	6	P-Index	52%	80%	28%	
	7	Feed P Levels	71%	72%	1%	
<b>Environmental Stewardship</b>						
	8	PEACCE Acronym	55%	96%	41%	25%*
	9	Steps in PEACCE	60%	92%	32%	
	10	Manure Spill	55%	86%	30%	
	11	Manure Handling	94%	87%	-6%	
<b>Changing Regulations</b>						
	12	CAFO Changes	37%	56%	19%	9%*
	13	Regulating Agency	56%	71%	15%	
	14	Policy Links	75%	66%	-8%	
*P<.01, two-tailed test						

## Odor Management

Participants were asked three questions to measure knowledge changes related to odor dispersion, thermal inversion, and strategies for improving odor perception. After participating, 60% increased

their odor dispersion knowledge and 55% increased their thermal inversion knowledge. Before the program, over 90% of participants were aware of strategies to improve odor perception. Therefore, a small percentage of participants (6%) gained knowledge in this area. Overall, compared to other question categories, the largest number of participants gained new knowledge related to odor management.

### Phosphorus Management

Four questions were asked to measure knowledge of the P-Index and its rating system, strategies for controlling P feed intake, and P feeding levels. After participating, approximately 40% gained knowledge regarding the P-index rating system and strategies for controlling P feed intake. Almost 30% gained general knowledge about the P-index. Before the program, approximately 70% of participants were aware of P feeding levels, but few (1%) gained knowledge in this area.

### Environmental Stewardship

To measure program participant knowledge gains in the area of environmental stewardship, two questions were asked about the PEACCE program and two questions regarding manure spill and storage management. A little over half of program participants were familiar with the PEACCE before the program. After, over 30% gained knowledge about PEACCE and the four key steps in the certification process. Additionally, 30% of participants gained knowledge regarding the best procedure to follow if a manure spill occurs.

Results show a decrease in knowledge regarding negligent manure storage. Several participants changed their correct answer, "allowing manure to exceed freeboard" to an answer reflecting a higher standard of environmental stewardship "allowing manure to approach freeboard." The decrease in correct response rate may be the result of the wording of the question.

### Changing Regulations

Participants were asked three questions to measure knowledge of key changes to federal concentrated animal feeding operation (CAFO) regulations, the government agency responsible for implementation, and the linkages between federal and state regulatory programs to protect water quality from agricultural impacts. Approximately 20% of participants gained knowledge in the area of key federal changes, and 15% gained knowledge about the government agency responsible for implementing Pennsylvania CAFO regulations.

The third question aimed to measure knowledge changes regarding links between programs and policies. Results show more participants answering the question incorrectly after the program. While the cause is uncertain, one potential contributing factor is poorly developed answer categories for each of these questions. Overall, compared to other question categories, only a small number of participants gained new knowledge related to regulatory changes and programs.

## Documenting Increasing Skills and Abilities

A follow-up postcard, sent 3 months after the program, was used to document increasing skills and abilities as a result of the program. Thirty-five of the 138 participants returned the postcard, representing a 25% response rate. Of those responding (N=35), approximately 70% believed the NEEDs program prepared them to tackle nutritional P management options and the P Index (Table 2). Additionally, 60% have taken actions to stay abreast of policy developments, approximately 45% have taken actions related to odor and air quality, and 25% have changed manure storage recommendations as a result of the NEEDs program.

**Table 2.**  
Summary of Follow-Up Evaluations from the Dairy and Livestock Nutrient and Environmental Education Days (NEEDs) Program

Question	Response Frequency (N=35)		
	Yes	No	Not Applicable
Did the NEEDs program prepare you to deal with phosphorus nutrition and the Phosphorus Index?	25	5	5
Have you taken any actions to stay current on policy developments or participate in the policy process?	21	10	4

Have you taken any action to assist producers in managing odor and air quality?	16	13	6
In regards to manure storage structures, have your recommendations to producers changes as a result of the NEEDs program?	9	16	10

The follow-up postcard provided a "not applicable" response category, but did not ask respondents to clarify why the question or action was unrelated to their work responsibilities. The summary suggests the more specific the action, for example, recommendations regarding manure storage structures, the more respondents selected "not applicable." While the cause is uncertain, one potential contributing factor could be the structure of NRCS conservation positions, which are technical in nature and differentiate between nutrient management technicians, conservation technicians, and agricultural engineers.

## **Lessons Learned**

### **A Catalyst Is Key**

The catalyst for the NEEDs program was a college administrator with a strong NRCS working relationship and a comprehensive understanding of Extension expertise. During a conversation with an NRCS administrator, he described how Extension could support continuous learning of NRCS professionals, and the NEEDs collaboration was born.

### **A Program Coordinator Is Essential**

Collaborations require additional time and effort devoted to planning, preparation, and communication among program partners. A dedicated and organized Extension associate took on this role. Responsibilities were extensive and included organizing meetings, securing program locations, marketing, registration, collecting and summarizing evaluation data, and communicating with partners, presenters, and participants.

### **Extension Associate Positions Facilitated Responsiveness**

The multi-disciplinary team of educators was comprised primarily of Extension associates. These educators work statewide, devoting 100% of their time to Extension efforts. As resources decline within Extension, county educators with ongoing programs and Extension faculty with research, publication, and/or resident teaching responsibilities may find it difficult to commit to several 1-day workshops around the state. Given the organizational structure of Penn State Cooperative Extension, Extension associates had the flexibility to address the educational need.

### **Interdisciplinary Programs Showcase the Breadth of Extension**

Fundamentally, the NEEDs program is based on the simple "big picture" concept. This approach allows Extension to demonstrate our ability to deliver timely and significant educational programs on a breadth of topics and connect participants with Extension educators who have expertise in an area that may not be available at the local level.

## **Increasing Extension's Visibility and Relevance to Audiences**

Through its collaborative and multidisciplinary approach, the NEEDs program has increased the visibility of Extension. Although it is based on a partnership with NRCS, the program's identity lies with Extension. This is a result of statewide marketing, the use of Extension educators to deliver the majority of the program content, and Extension coordination of participant registration. Feedback from NRCS administrators and state agricultural and environmental officials suggests that the visibility of the NEEDs program and awareness of Extension's capabilities in agricultural environmental education is growing.

The collaborative NEEDs program also increased NRCS and other audiences' awareness of Extension resources. In addition, through its multidisciplinary approach, the program coordinated educational materials previously presented separately, thereby increasing the value of the information to participants. An indicator of the value and relevance of the NEEDs program is that the NRCS has asked for the program to continue in the future.

Discussion among the NEEDs program planners has led to identification of new issues. Thus far the program planners have managed to update and revise the program and supporting materials to meet new educational needs. The collaborative planning process appears to be serving as an effective mechanism for matching program content with educational needs.

## Conclusion and Future Programming

We believe the success of the NEEDs program resulted from our multi-disciplinary team and collaborative approach. Partnerships among academic departments and between Extension and USDA led to a diverse and relevant program that gained NRCS support. The program included timely and comprehensive educational resources relevant to poultry, swine, and dairy, and incorporated flexibility to address local interests. Additionally, educators continuously worked to improve the program over time based on evaluation data and personal feedback.

The pre- and post-tests were valuable tools for gauging the effectiveness of the program and allowed the participating educators to clarify presentations in future sessions. However, as demonstrated in two questions, the wording of the evaluation questions and answer categories should be carefully considered. Ambiguous wording can lead to more than one correct answer. Follow-up questionnaires provided longer-term impact and helped to assess how useful the information provided was in guiding the participant's recommendations and decisions.

After the 2003/2004 NEEDs program ended, we met with NRCS to develop a new program for 2004/2005. The program will continue to focus on timely, comprehensive content. We will provide the latest information on changing water quality regulations, introduce the Clean Air Act and agricultural emissions, discuss alternative uses of manure, and address nutrient and nutrition issues associated with grazing systems.

The NEEDs program has strengthened Extension's relationship with the NRCS and local conservation professionals. Money was provided upfront by the agency for 80 NRCS professionals (\$25 per person) to attend the 2004/2005 NEEDs program. The program was offered in the same geographic locations in an effort to continue to build local knowledge, skills, and abilities. Extension is working to strengthen relationships with the Pennsylvania Association of Conservation Districts (PACD) in order to increase conservation district participation.

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