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# Knowledge and dissemination of sustainable agriculture practices by county extension agents in Ohio, Pennsylvania, and West Virginia

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Knowledge and Dissemination of Sustainable Agriculture Practices by County Extension Agents  
in Ohio, Pennsylvania, and West Virginia

Erin M. Hersman

Thesis submitted to the  
Davis College of Agriculture, Forestry, and Consumer Sciences  
at West Virginia University  
in partial fulfillment of the requirements  
for the degree of

Master of Science  
in  
Agricultural Education

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Morgantown, West Virginia  
2004

Keywords: Extension Educators, Information Sessions, Sustainable Agriculture

## ABSTRACT

### Knowledge and Dissemination of Sustainable Agriculture Practices by County Extension Agents in Ohio, Pennsylvania, and West Virginia

Erin M. Hersman

The purpose of this study was to determine the level of knowledge and preparation that Extension educators possess concerning the numerous dimensions of sustainable agriculture. From this information, a relationship between the amount of education that Extension educators receive about sustainable agriculture and the amount of information that Extension educators offer to their clientele about this topic was determined. Part-time agriculturalists were perceived to attend workshops/meetings based on sustainable agriculture practices, use more fact sheets or publications on the concepts of sustainable agriculture, and, in turn, apply more concepts of sustainable agriculture. Full-time agriculturalists were attending the workshops and/or meetings and were receiving the fact sheets based on the concepts of sustainable agriculture, but were not perceived by Extension agents in their county to be participating in sustainable practices. Extension agents also need to “follow-up” on sustainable agriculture workshop participants to ensure that their audience understands the concepts of sustainable agriculture and are putting these concepts to practice.

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## CHAPTER I

### Introduction

Agriculture continues to experience a crisis that includes, in addition to rapid financial and structural changes, an awareness of farming's enormous influence on ecosystem health (National Research Council, 1989). When determining the level of environmental stewardship necessary to maintain an ecologically sound farmland system, sustainable agriculture comes into play. The National Research Council (1993) argues that sustainability is necessary to "keep the productive capacity of natural resources in step with population growth and economic demands while protecting and, where necessary, restoring environmental quality" (p. 66). Sustainable agriculture refers to an agricultural production and distribution system that:

- Achieves the integration of natural biological cycle and controls;
- Protects and renews soil fertility and the natural resource base;
- Optimizes the management and use of on-farm resources;
- Reduces the use of nonrenewable resources and purchased production inputs;
- Provides adequate and dependable farm income;
- Promotes opportunity in family farming and farm communities;
- Minimizes adverse impacts on health, safety, wildlife, water quality, and the environment (Sustainable Agriculture Network, 2002, p.1).

Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs (Feenstra, 1997). In other words, sustainable agriculture challenges educators and farmers to think about the long-term implications of practices and the broad interactions and dynamics of agricultural systems. This is to be accomplished while balancing profitability, stewardship of natural resources, and

the health of the rural community. Sustainable agriculture practices will eventually lead to the successful management and improvement of ecologically sound farmlands.

There are many ways to improve the sustainability of a given farming system and these vary from region to region. However, there are some common sets of practices among farmers trying to take a more sustainable approach, in part through greater use of on-farm and local resources (Sustainable Agricultural Network, 2002). For example, in order for farmers that practice sustainable agriculture to be successful in managing their farmlands, there must be a continuous network of information, new technologies, and innovations that are available to them. Educators must remain current on the latest agricultural research and technology, enabling them to understand the needs and problems that their clientele are facing.

The Extension Service can play a crucial role in providing this network of information on sustainable agriculture education. Extension not only has a long history of service to farmers but Extension agents have also gained their respect and trust (Warner & Christenson, 1984; McDowell, 1992). The role that Extension should occupy in promoting sustainable agriculture is spelled out in the 1990 Farm Bill. The Farm Bill states that Extension agents must be trained in sustainable agriculture in order to “develop their understanding, competence, and ability to teach and communicate the concepts” to farmers and others (Agunga, 1995, p. 172).

The Extension Service, due to its large network of personnel, is in position to formulate a cohesive structure for promoting sustainable agriculture education, however, if extension agents are not convinced of the value of sustainability, how can they expect to educate farmers on the concepts (Agunga, 1995). Because the Extension Service must play a critical role in the involvement of sustainable agriculture education, it is vital to understand the preparation levels that Extension educators have regarding the relatively new concepts involved with sustainable

agriculture. Extension educators' knowledge about the concept of sustainability is necessary in order to move the program forward (Minarovic & Mueller, 2000). A necessity in the progression of sustainability programming is that Extension educators present and disseminate sustainable agriculture knowledge information that they acquire.

#### *Purpose of the Study*

The purpose of this study was to determine the level of knowledge and preparation that Extension educators possess related to the numerous dimensions of sustainable agriculture. A relationship between the amount of education that Extension educators receive about sustainable agriculture and the amount of information that Extension educators offer to their clientele about this topic could be determined.

#### *Objectives of the Study*

The objective of this study was to determine the level of knowledge and preparation that Extension educators possess related to sustainable agriculture, the amount of information they offer their clientele concerning this topic, and if a relationship existed between the two variables. This information will be useful in estimating the percentage of farmers that put sustainable agriculture applications to practice.

#### *Research Questions*

The following research questions were used to guide the study:

1. Do Extension educators have a clear understanding of sustainable agriculture?
2. What is the number of sustainable agriculture workshops or other information sessions that Extension educators attended?
3. How many sustainable agriculture workshops or other information sessions have Extension educators offered?

4. What are Extension educators' perceptions of the percentage of farmers that are practicing sustainable agriculture applications?

#### *Definition of Terms*

*Extension Educators:* Agriculture Extension Agents.

*Information Sessions:* Any type of meeting, program, or seminar that deals with sustainable agriculture.

*Sustainable Agriculture:* A system of farming which over time encompasses and provides balance to the goal of economic stability, environmental soundness, and social impacts (Iowa State University Extension Service, 2001).

#### *Limitations of the Study*

The study was limited to Extension educators employed Spring 2004 in Ohio, Pennsylvania, and West Virginia.

## CHAPTER II

### Review of Literature

Today's agricultural research and Extension must consider environmental implications, social issues, and overall economic growth within the agriculture sector. The objective of the proposed study was to determine the level of knowledge and preparation that Extension educators possess about sustainable agriculture, the amount of information they offer their clientele concerning this topic, and if a relationship existed between the two components. Determining the impact that sustainable agriculture has on today's society and being able to assist small scale farmers will allow for continued competition in marketing of agricultural commodities. In turn, Extension programs and other educational initiatives can be developed to aid in keeping today's families on the farm.

#### *Extension and Sustainable Agriculture Practices*

The utilization of educational materials available will affect the potential outcome of sustainable agriculture as a farming practice (Timmer, Rafferty, & Berquist, 2002). Extension educators must utilize educational materials derived from the latest research, and, in turn, present this information to their clientele. When researchers, Extension educators, and farmers work as peers, the traditional, "top-down" approach to research and education becomes a horizontal structure (Watkins, 1990). Forming linkages with farmers exercises shared responsibilities in research and Extension, giving programs creditability in the eyes of the farmer (Minarovic & Mueller, 2000). King and Frances (1994) discussed four target groups for education in sustainable agriculture. They included: farmers and ranchers, families, rural youth, and general public. According to King and Frances (1994), the farmers and ranchers tend to have concerns about being more productive at a lower price. Families are looking for more practical and

efficient food, clothing, and home management. The rural youth (involved in 4-H and FFA) have the resources to implement and research methods of sustainable agriculture and in turn educate others. The general public is concerned with food, fuel, health, and quality of life.

In a 1995 study Agunga concluded that Extension workers in Ohio who responded to the survey lacked a firm understanding of sustainable agriculture. Extension agents in this sector have expressed a need for training in sustainable agriculture. It was recommended that The Ohio State University Extension Service organize regular inservice training programs to prepare these agents adequately so that they, in turn, could educate their farmers (Agunga, 1995). In the long run, the study urged agricultural education departments in land-grant universities to include sustainable agricultural education as part of the curriculum for Extension graduates (Agunga, 1995). Finally, the researcher found a communication gap existed between members of the sustainable agriculture movement and Extension agents. This gap must be narrowed through open discussions and increased flow of information in both directions (Agunga, 1995).

There were many implications about educators understanding of sustainable agriculture in a 2000 study in which Minarovic and Mueller revealed the need for a stronger, unified, vision for sustainable agriculture. There was a need to clarify concepts under the sustainable agriculture umbrella so it is understood how environmental, economic, and social concepts are interrelated and grasp a vision for sustainable agriculture (Minarovic & Mueller, 2000). Educators must remain current on agricultural information and technologies and provide support for sustainable agriculture concepts. As an educational organization, Extension must understand the needs and problems of its clientele so that it can select the appropriate information to help farmers understand their short and long-term goals and provide them with the tools for problem solving (Doll & Francis, 1992).

### *Identifying Farmer Needs*

In a 1995 study Hanson, Kauffman, and Schauer identified principles and approaches consistent with an effective, Extension program to specifically meet the needs of sustainable farmers. Given the unevenness of current Extension efforts in sustainable agriculture and the imminence of mandated training for agents, considerable effort still needs to be directed to determine how best the Cooperative Extension Service (CES) can support educational programs in sustainable agriculture (Hanson et al., 1995). It was the authors' contention that at least part of the answer can be obtained by studying the Extension needs of those farmers who describe themselves as sustainable (Hanson et al., 1995). If it is understood how these people farm, what kind of information they need, and how best Extension agents can work with them; then educational principles can be identified that could guide the development of an extension program that facilitates the growth of sustainable agriculture.

From Hanson's study, three educational approaches were identified. They included: (1) recognizing that significantly reducing chemical use is important, (2) systems education through multidisciplinary sustainable agriculture teams is most effective, and (3) proper outreach for sustainable agricultural programs is critical (Hanson, et al. 1995). It was suggested that these approaches to working with sustainable farmers also have applicability to other efforts such as the mandated training for agents.

In a 1998 article author and education coordinator, Rich Pirog, expressed his concerns about establishing more cooperative learning environments between farmers, educators, and researchers. Pirog suggests that Iowa farmers are finding more direct links with consumers and businesses, and are forming cooperatives to do their own marketing. "Interest among farmers in programs about value-added and organic agriculture as well as local food systems is at an all-

time high” (Pirog, 1998, p.1). Educators and researchers need to partner with innovative farmers to determine the varying potential of these alternatives.

In a 1998 study it was determined that sustainable farming systems must be adapted to the conditions of each site in order to be successful (Lockeretz & Anderson, 1993). The objectives of their study was to determine future educational needs by determining the differences between onion and sweet corn growers’ use of sustainable farming practices. There were many conclusions that were drawn from this study. When evaluating the onion growers, it was evident that farmers who earn a greater portion of their income from farming also used consultant and Extension advice more often than those who earn less income on the farm (Drost, Long, & Hales, 1997). Because educated farmers tend to work off-farm, they may lack access to the information available from consultants and Extension and have less farm experience, putting them at a disadvantage (Drost et al., 1997). The data from this study suggested that research and Extension efforts might not meet the needs of different farmer groups. The challenge is to increase the involvement of less-experienced, part-time farmers in the research and Extension effort.

In 2001, Iowa State University Extension Service issued a plan of work dealing with sustainable agriculture. This plan of work stressed the concern Iowans had about profitability, the environment, and the quality of life associated with agriculture. Sixty percent of the farmers polled in 1994 believed there was too much reliance on agricultural chemicals in farming and only 20% felt that their quality of life had improved during the last five years. Sixty-two percent felt that increased use of sustainable farming practices would help maintain the natural resource base (Iowa State University Extension, 2001). From this plan of work, it was evident that a need exists to provide sustainable agriculture education and training in Iowa. Extension clientele are



aiding in the development of educational resources that they plan to utilize in the future. Over the next five years, Iowa State University Extension Service will attempt to reduce this need for sustainable agriculture education and training by implementing several output indicators. The output indicators, or the information that is easily assessable, for this plan of work include: educational meetings, field days, workshops, publications, mass media dissemination, one-on-one contacts, phone contacts, research and demonstration grants, and direct teaching events.

In 1996, Drost, Long, Wilson, Miller and Campbell assessed farming practices and barriers to adoption of more sustainable practices by farmers in Utah. This study stemmed from the idea that transition problems often limit the adoption of sustainable farming practices, regardless of the perceived benefits (Auburn, 1994; Taylor & Dobbs, 1990). There were also limitations due to individual farm production practices, environmental constraints, and perception problems. According to Roling (1998), improved knowledge of the present farming system will allow researchers, Extension educators, and farmers to develop research agendas and adopt practices that meet present and future farming needs. The study implied the usefulness of information is positively related to developing working relationships with the information provider. It also concluded that Extension must explain the benefits of sustainable practices and tailor studies toward the interest of the farmers. Without grower participation in the design and implementation process, growers will be reluctant to adopt sustainable practices (Drost et al., 1996).

### *Educational Initiatives*

Sustainable agriculture education in California is taking a different approach. Since 1995, an increasing number of California farmers and livestock producers are reducing their reliance on agricultural chemicals while maintaining yields and quality through the Sustainable

Agriculture Research and Education Program's (SAREP) innovative grant program, Biologically Integrated Farming Systems (BIFS). The goal of BIFS is to expand the use of biologically integrated farming systems by establishing on-farm demonstrations in which growers reduce negative environmental impacts from pollutants such as agricultural chemicals, animal waste, and soil erosion (SAREP, 2002). BIFS projects assist farmers in maintaining their economic viability while developing alternative farming practices. Farmers participating in BIFS projects:

- Integrate biological and cultural control of pests into their production systems;
- Use pest monitoring and economic thresholds for decisions about whether and when to apply chemicals;
- Emphasize soil building practices such as use of cover crops to provide nitrogen, increase water infiltration, and decrease erosion and flooding;
- Create on-farm habitat and restore riparian areas to encourage beneficial insect populations and improve habitat for fish, migrant birds, and game species; and
- Improve livestock management while protecting natural resources (SAREP, 2002, p.1).

In 1986, The Farming Alternatives Program, a national model Extension program that promotes sustainable agriculture, was established. This program is housed in the Department of Rural Sociology in the College of Agriculture and Life Sciences at Cornell University in New York. The mission of the Farming Alternatives Program is to promote a sustainable food and agriculture system that supports farm families and their communities (Green, 1999). This program has developed more than 30 widely used publications that cover many facets of sustainable agriculture as well as sustainable farming practices. More than 85 educational programs have helped farmers, agricultural educators, and many others to address critical issues

facing agriculture (Green, 1999). Alternatives Program staff is in demand locally and nationally for presentations, consultations, and field visits. Staff responds to thousands of information requests each year from established and beginning farmers, agricultural educators, community agriculture development leaders, and many others. This program indicates the intense demand and utilization for educational programming in sustainable agriculture.

### *Summary*

Today's agriculture is complex and agricultural research and Extension must consider environmental implications, social issues, and overall profitability. Teams of interdisciplinary experts can address complex problems and provide comprehensive information on agriculture (Minarovic & Mueller, 2000). Creating a truly sustainable farming system is an extremely difficult task. Individually, farmers must choose for themselves what methods are best for their own situation. Farmers must be concerned about maintaining soil fertility, stopping soil erosion, avoiding soil compaction, protecting their own crops from pests, using adequate amounts of water, working within political systems, making a livable wage, and creating a product that is safe to eat (Sustainable Agriculture Educational Project, 2002).

## CHAPTER III

### Methodology

#### *Purpose of the Study*

The purpose of this study was to determine the level of knowledge and preparation that Extension educators possess related to the numerous dimensions of sustainable agriculture. A relationship between the amount of education that Extension educators receive about sustainable agriculture and the amount of information that Extension educators offer to their clientele about this topic could be determined.

#### *Objectives of the Study*

The objective of this study was to determine the level of knowledge and preparation that Extension educators possess related to sustainable agriculture, the amount of information they offer their clientele concerning this topic, and if a relationship existed between the two variables. This information will be useful in estimating the percentage of farmers that put sustainable agriculture applications to practice.

#### *Research Questions*

The following research questions were used to guide the study:

1. Do Extension educators have a clear understanding of sustainable agriculture?
2. What is the number of sustainable agriculture workshops or other information sessions that Extension educators attended?
3. How many sustainable agriculture workshops or other information sessions have Extension educators offered?
4. What are Extension educators' perceptions of the percentage of farmers that are practicing sustainable agriculture applications?

### *Research Design and Population*

A descriptive survey research method was used to collect data from the target population. “Descriptive surveys focus on determining the status of a defined population with respect to certain variables. They basically inquire into the status quo; they attempt to measure what exists without questioning why it exists” (Ary, Jacobs, & Razavieh, 1990, p. 407).

The target population for this study was 179 Agriculture and Natural Resource Extension Agents employed in Ohio, Pennsylvania, and West Virginia. Out of the total 179 questionnaires administered, 126 were returned. Of those returned, 121 (67.5%) were usable.

### *Instrumentation*

A questionnaire was mailed to the 179 Agriculture and Natural Resource Extension Agents in Ohio, Pennsylvania, and West Virginia. The survey instrument was developed by the researcher based on the review of literature (see Appendix A). Faculty members in Agricultural and Environmental Education and the West Virginia University Extension Service examined the survey to establish content and face validity. Instrument reliability was determined from an analysis of the data from the sample population using Cronbach’s alpha. A reliability coefficient of  $\alpha = .84$  was calculated.

The questionnaire contained statements designed to meet the described research objectives. The agents presented their level of agreement on 17 statements in the first three sections of the questionnaire. This was followed by requesting agents to determine their use of information and skills that they have gained through their professional development experiences. Another set of items asked agents to indicate the sustainable agriculture topics in which they would like to receive training. A six-point Likert-scale was used in evaluating the responses of

the initial 17 questions as well as the final training questions: 1 = Very Strongly Disagree, 2 = Strongly Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree and 6 = Very Strongly Agree.

#### *Data Collection Procedures*

The questionnaire was accompanied by a hand-signed cover letter (see Appendix B) which explained the purpose of the study and gave directions for completing and returning the survey. Color-coded questionnaires that specified each of the three states were mailed to the selected subjects along with a self addressed stamped envelope to encourage response. The questionnaires were numbered in order to facilitate follow up letters to the non-respondents. Follow up letters (see Appendix C) with a questionnaire were sent three weeks after the initial mailing.

#### *Analysis of Data*

The objective of the proposed study was to determine the level of knowledge and preparation that Extension educators possess about sustainable agriculture, the amount of information they offer their clientele concerning this topic, and if a relationship existed between the two components. Data were analyzed using the Statistical Package for Social Sciences (SPSS-PC) at the West Virginia University. Descriptive statistics were used to analyze data collected from questionnaires in the form of frequencies, percentages, and means. Data were recorded and presented in narrative as well as tabular form.

#### *Use of Findings*

Findings from this study may be used by Extension supervisors and personnel as well as other sustainable agriculture agencies to understand and meet the educational needs of agricultural Extension agents. This study will provide information that might lead to the most

efficient decisions on providing sustainable agriculture educational services and trainings to Agricultural Extension agents in Ohio, Pennsylvania, and West Virginia.

## CHAPTER IV

### Findings

#### *Purpose of the Study*

The purpose of this study was to determine the level of knowledge and preparation that Extension educators possess related to the numerous dimensions of sustainable agriculture. A relationship between the amount of education that Extension educators receive about sustainable agriculture and the amount of information that Extension educators offer to their clientele about this topic could be determined.

#### *Objectives of the Study*

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3. How many sustainable agriculture workshops or other information sessions have Extension educators offered?
4. What are Extension educators' perceptions of the percentage of farmers that are practicing sustainable agriculture applications?



## *Findings*

### *Sustainable Agriculture: Understanding and Research Availability*

Extension agents were asked a series of questions to determine their understanding of sustainable agriculture and their perception of the availability of research findings on the topic. The individual items were rated on the following scale: 1 = Very Strongly Disagree, 2 = Strongly Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree and 6 = Very Strongly Agree. The findings were summarized in Table 1. The means were calculated by state as well as overall means (see Table 2).

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, profitability readily comes to mind. Ninety-six respondents (79.3%) expressed some level of agreement and 25 respondents (20.7%) demonstrated some level of disagreement with the statement. In terms of agreement with the profitability statement, Ohio respondents had a mean of 4.16, Pennsylvania respondents had a mean of 4.29, and West Virginia respondents had a mean of 4.33. The overall mean for this question was 4.23.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, productivity readily comes to mind. Ninety-one respondents (75.2%) expressed some level of agreement and 30 respondents (24.9%) demonstrated some level of disagreement with the statement. In terms of productivity, Ohio respondents had a mean of 3.95, Pennsylvania respondents had a mean of 4.10, and West Virginia respondents had a mean of 4.22. The overall mean for this question was 4.05.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, small-scale agriculture readily comes to mind. One hundred respondents (82.7%) expressed some level of agreement and 21 respondents (17.4%) demonstrated some

level of disagreement with the statement. In terms of small-scale agriculture, Ohio respondents had a mean of 4.38, Pennsylvania respondents had a mean of 4.13, and West Virginia respondents had a mean of 4.56. The overall mean for this question was 4.36.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, environmental protection readily comes to mind. One hundred and seven respondents (89.2%) expressed some level of agreement and 13 respondents (10.8%) demonstrated some level of disagreement with the statement. In terms of environmental protection, Ohio respondents had a mean of 4.60, Pennsylvania respondents had a mean of 4.45, and West Virginia respondents had a mean of 4.59. The overall mean for this question was 4.56.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, organic farming readily comes to mind. Seventy respondents (58.3%) expressed some level of agreement and 50 respondents (41.7%) demonstrated some level of disagreement with the statement. In terms of organic farming, Ohio respondents had a mean of 4.06, Pennsylvania respondents had a mean of 3.90, and West Virginia respondents had a mean of 3.78. The overall mean for this question was 3.96.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, low chemical input readily comes to mind. Ninety-six respondents (80.0%) expressed some level of agreement and 24 respondents (20.0%) demonstrated some level of disagreement with the statement. In terms of low chemical input, Ohio respondents had a mean of 4.21, Pennsylvania respondents had a mean of 4.45, and West Virginia respondents had a mean of 3.96. The overall mean for this question was 4.22.

Respondents were asked to react to the following statement: When I hear the term sustainable agriculture, non-animal agriculture readily comes to mind. Fifteen respondents

(12.5%) expressed some level of agreement and 105 respondents (87.5%) demonstrated some level of disagreement with the statement. In terms of non-animal agriculture, Ohio respondents had a mean of 2.74, Pennsylvania respondents had a mean of 2.61, and West Virginia respondents had a mean of 3.19. The overall mean for this question was 2.81.

Respondents were asked to react to the following statement: I do not consider it a priority for present clientele interactions. Fifteen respondents (12.4%) expressed some level of agreement and 106 respondents (87.7%) demonstrated some level of disagreement with the statement. In terms of present clientele interactions, Ohio respondents had a mean of 2.63, Pennsylvania respondents had a mean of 2.77, and West Virginia respondents had a mean of 2.63. The overall mean for this question was 2.67.

Respondents were asked to react to the following statement: I do not consider it a priority for future clientele interactions. Eleven respondents (9.2%) expressed some level of agreement and 109 respondents (90.9%) demonstrated some level of disagreement with the statement. In terms of future clientele interactions, Ohio respondents had a mean of 2.35, Pennsylvania respondents had a mean of 2.55, and West Virginia respondents had a mean of 2.59. The overall mean for this question was 2.46.

Respondents were asked to react to the following statement: If farmers were provided information on sustainable agriculture, it would increase the likelihood that they would adopt the concepts. Ninety-nine respondents (83.9%) expressed some level of agreement and 19 respondents (16.1%) demonstrated some level of disagreement with the statement. In terms of farmers adopting sustainable agriculture concepts, Ohio respondents had a mean of 4.02, Pennsylvania respondents had a mean of 4.00, and West Virginia respondents had a mean of 4.30. The overall mean for this question was 4.08.

Respondents were asked to react to the following statement: There is scientific proof that sustainable agriculture is environmentally sound. Ninety-two respondents (77.3%) expressed some level of agreement and 27 respondents (22.6%) demonstrated some level of disagreement with the statement. In terms of sustainable agriculture being environmentally sound, Ohio respondents had a mean of 3.98, Pennsylvania respondents had a mean of 3.97, and West Virginia respondents had a mean of 3.93. The overall mean for this question was 3.97.

Respondents were asked to react to the following statement: There is scientific proof that sustainable agriculture is economically feasible. Eighty-one respondents (68.1%) expressed some level of agreement and 38 respondents (31.9%) demonstrated some level of disagreement with the statement. In terms of sustainable agriculture being economically feasible, Ohio respondents had a mean of 3.89, Pennsylvania respondents had a mean of 3.90, and West Virginia respondents had a mean of 3.73. The overall mean for this question was 3.86.

Respondents were asked to react to the following statement: There is scientific proof that sustainable agriculture is socially acceptable. Ninety-five respondents (80.5%) expressed some level of agreement and 23 respondents (19.4%) demonstrated some level of disagreement with the statement. In terms of sustainable agriculture being socially acceptable, Ohio respondents had a mean of 4.24, Pennsylvania respondents had a mean of 4.13, and West Virginia respondents had a mean of 4.19. The overall mean for this question was 4.20.

Respondents were asked to react to the following statement: Research on sustainable agriculture is still in its infancy. Eighty-nine respondents (73.6%) expressed some level of agreement and 32 respondents (26.5%) demonstrated some level of disagreement with the statement. In terms of sustainable agriculture research still being in its infancy, Ohio

respondents had a mean of 3.83, Pennsylvania respondents had a mean of 3.77, and West Virginia respondents had a mean of 4.22. The overall mean for this question was 3.90.

Respondents were asked to react to the following statement: If researchers make innovations available on sustainable agriculture, I will communicate the information to farmers. One hundred and seventeen respondents (98.3%) expressed some level of agreement and 2 respondents (1.7%) demonstrated some level of disagreement with the statement. In terms of communicating innovations to farmers, Ohio respondents had a mean of 4.71, Pennsylvania respondents had a mean of 4.43, and West Virginia respondents had a mean of 4.74. The overall mean for this question was 4.65.

Respondents were asked to react to the following statement: I do not know where to get information on sustainable agriculture. Seventeen respondents (14.3%) expressed some level of agreement and 102 respondents (85.7%) demonstrated some level of disagreement with the statement. In terms of not knowing where to get information on sustainable agriculture, Ohio respondents had a mean of 2.72, Pennsylvania respondents had a mean of 2.84, and West Virginia respondents had a mean of 2.93. The overall mean for this question was 2.80.

Respondents were asked to react to the following statement: I do not know enough about sustainable agriculture to inform others. Thirty respondents (25.3%) expressed some level of agreement and 89 respondents (74.4%) demonstrated some level of disagreement with the statement. In terms of not knowing enough about sustainable agriculture to inform others, Ohio respondents had a mean of 2.84, Pennsylvania respondents had a mean of 3.10, and West Virginia respondents had a mean of 3.22. The overall mean for this question was 2.99.

Table 1

*Extension Educators Understanding and Perception of Research Findings on Sustainable Agriculture*

	Very Strongly Disagree		Strongly Disagree		Disagree		Agree		Strongly Agree		Very Strongly Agree	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Profitability	1	.8	3	2.5	21	17.4	55	45.5	24	19.8	17	14.0
Productivity	2	1.7	3	2.5	25	20.7	58	47.9	23	19.0	10	8.3
Small-scale Agriculture	0	0.0	2	1.7	19	15.7	48	39.7	38	31.4	14	11.6
Environmental Protection	0	0.0	1	.8	12	10.0	43	35.8	47	39.2	17	14.2
Organic Farming	0	0.0	8	6.7	42	35.0	30	25.0	27	22.5	13	10.8
Low Chemical Input	0	0.0	8	6.7	16	13.3	50	41.7	34	28.3	12	10.0
Non-Animal Agriculture	9	7.5	28	23.3	68	56.7	9	7.5	4	3.3	2	1.7
Present Clientele	14	11.6	29	24.0	63	52.1	13	10.7	2	1.7	0	0.0
Future Clientele	20	16.7	38	31.7	51	42.5	9	7.5	2	1.7	0	0.0
Provide Information	0	0.0	0	0.0	19	16.1	78	66.1	14	11.9	7	5.9
Environmentally Sound	1	.8	0	0.0	26	21.8	72	60.5	15	12.6	5	4.2
Economic	1	.8	1	.8	36	30.3	62	52.1	14	11.8	5	4.2
Socially	0	0.0	1	.8	22	18.6	58	49.2	26	22.0	11	9.3
Infancy Research	3	2.5	8	6.6	21	17.4	63	52.1	18	14.9	8	6.6
Innovations Reported	0	0.0	0	0.0	2	1.7	56	47.1	43	36.1	18	15.1
Don't Know	13	10.9	19	16.0	70	58.8	14	11.8	2	1.7	1	.8
Don't Know Enough	13	10.9	13	10.9	63	52.9	24	20.2	4	3.4	2	1.7

Table 2

*Descriptive Data of Extension Educators Understanding and Perception of Research Findings on Sustainable Agriculture*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Profitability	4.16	1.07	4.29	.94	4.33	1.07	4.23	1.03
Productivity	3.95	1.14	4.10	.87	4.22	.70	4.05	.99
Small-scale Agriculture	4.38	.96	4.13	.85	4.56	.97	4.36	.94
Environmental Protection	4.60	.82	4.45	.85	4.59	1.08	4.56	.89
Organic Farming	4.06	1.20	3.90	.98	3.78	1.15	3.96	1.13
Low Chemical Input	4.21	1.07	4.45	.77	3.96	1.13	4.22	1.02
Non-Animal Agriculture	2.74	.83	2.61	.76	3.19	1.21	2.81	.93
Present Clientele	2.63	.96	2.77	.72	2.63	.88	2.67	.88
Future Clientele	2.35	.89	2.55	.93	2.59	.97	2.46	.92
Provide Information	4.02	.75	4.00	.58	4.30	.78	4.08	.72
Environmentally Sound	3.98	.79	3.97	.71	3.93	.83	3.97	.77
Economic	3.89	.93	3.90	.75	3.73	.67	3.86	.83
Socially	4.24	.80	4.13	.86	4.19	1.10	4.20	.88
Infancy Research	3.83	1.06	3.77	.99	4.22	1.01	3.90	1.04
Innovations Reported	4.71	.76	4.43	.63	4.74	.86	4.65	.75
Don't Know	2.72	1.03	2.84	.58	2.93	.92	2.80	.91
Don't Know Enough	2.84	1.10	3.10	.84	3.22	.97	2.99	1.02

*Extension Educators' Participation in Sustainable Agriculture Professional Development*

Respondents were asked to identify the number of professional development opportunities in which they have participated on the central concepts of sustainable agriculture.

In Ohio, 49 respondents (77.8%) participated in conferences, 52 respondents (82.5%)

participated in workshops, 12 respondents (19.0%) participated in dinner meetings, and 18 respondents (28.6%) participated in professional development activities other than those listed.

In Pennsylvania, 23 respondents (74.2%) participated in conferences, 27 respondents (87.1%) participated in workshops, three respondents (9.7%) participated in dinner meetings, and seven respondents (23.3%) participated in professional development activities other than those listed.

In West Virginia, 18 respondents (66.7%) participated in conferences, 20 respondents (74.1%) participated in workshops, 13 respondents (48.1%) participated in dinner meetings, and 6 respondents (22.2%) participated in professional development activities other than those listed.

Table 3

*Professional Development on Central Concepts of Sustainable Agriculture*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Conferences	49	77.8	23	74.2	18	66.7	90	74.4
Workshops	52	82.5	27	87.1	20	74.1	99	81.8
Dinner Meetings	12	19.0	3	9.7	13	48.1	28	23.1
Other	18	28.6	7	23.3	6	22.2	31	25.8

Participants were asked to identify the specific concepts of sustainable agriculture that were addressed in the professional development opportunities. In Ohio, 48 respondents (77.4%) participated in professional development activities that specifically dealt with environmental soundness, 51 respondents (82.3%) participated in professional development activities that specifically dealt with economic viability, and 31 respondents (50.0%) participated in professional development activities that specifically dealt with social acceptability. In Pennsylvania, 23 respondents (76.7%) participated in professional development activities that



specifically dealt with environmental soundness, 23 respondents (74.2%) participated in professional development activities that specifically dealt with economic viability, and nine respondents (29.0%) participated in professional development activities that specifically dealt with social acceptability. In West Virginia, 21 respondents (77.8%) participated in professional development activities that specifically dealt with environmental soundness, 22 respondents (81.5%) participated in professional development activities that specifically dealt with economic viability, and seven respondents (25.9%) participated in professional development activities that specifically dealt with social acceptability.

Table 4

*Professional Development Events Dealing Specifically with Environmental Soundness, Economic Viability, Social Acceptability*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Environmental Soundness	48	77.4	23	76.7	21	77.8	92	77.3
Economic Viability	51	82.3	23	74.2	22	81.5	96	80.0
Social Acceptability	31	50.0	9	29.0	7	25.9	47	39.2

*Extension Educators' use of Information and Skills gained from Professional Development*

Respondents were asked to identify their perceptions of the relationship between their education and sustainable agriculture practices. In Ohio, six respondents (9.5%) perceived most of their education on agricultural practices to be in direct conflict with their perception of sustainable agriculture, 46 respondents (73.0%) perceived most of their education on agricultural practices to have sustainable implications, and nine respondents (14.3%) perceived that most of their education on agricultural practices used sustainable examples. In Pennsylvania, one

respondent (3.2%) perceived most of their education on agricultural practices to be in direct conflict with their perception of sustainable agriculture, 25 respondents (80.6%) perceived most of their education on agricultural practices to have sustainable implications, and 2 respondents (6.5%) perceived that most of their education on agricultural practices used sustainable examples. In West Virginia, two respondents (7.4%) perceived most of their education on agricultural practices to be in direct conflict with their perception of sustainable agriculture, 21 respondents (77.8%) perceived most of their education on agricultural practices to have sustainable implications, and four respondents (14.8%) perceived that most of their education on agricultural practices used sustainable examples.

Table 5

*Personal Perception of Education on Agricultural Practices*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Conflict with my Perceptions	6	9.5	1	3.2	2	7.4	9	7.4
Sustainable Implications	46	73.0	25	80.6	21	77.8	92	76.0
Sustainable Examples	9	14.3	2	6.5	4	14.8	15	12.4

Extension educators' were asked the number of workshops and/or meetings they had presented on the concepts of sustainable agriculture. The information was further broken down into audience distribution of participation in workshops and/or meetings on sustainable agriculture. In Ohio, 48 respondents presented workshops and/or meetings based on what they have learned about the concepts of sustainable agriculture. Forty-four respondents (91.7%) indicated that their audience consisted of farmers, 28 respondents (58.3%) indicated that their

audience consisted of part-time agriculturalists, and 22 respondents (45.8%) indicated that their audience consisted of both rural agriculturalists and other agents.

In Pennsylvania, 19 respondents presented workshops and/or meetings based on what they have learned about the concepts of sustainable agriculture. Seventeen respondents (89.5%) indicated that their audience consisted of farmers, 12 respondents (63.2%) indicated that their audience consisted of part-time agriculturalists, and 10 respondents (52.6%) indicated that their audience consisted of the public.

In West Virginia, 17 respondents presented workshops and/or meetings based on what they have learned about the concepts of sustainable agriculture. Thirteen respondents (76.5%) indicated that their audience consisted of both farmers and part-time agriculturalists and nine respondents (52.9%) indicated that their audience consisted of high school students. With the three state combined, there was a total of 84 respondents. Seventy-four respondents (88.1%) indicated that their audience consisted of farmers, 53 respondents (63.1%) indicated that their audience consisted of part-time agriculturalists, and 37 respondents indicated that their audience consisted of both the public and other Extension agents.

Extension educators' were asked about their perception of the concept of sustainable agriculture in relation to workshops and meetings. In Ohio, 29 respondents (46.6%) indicated that the concepts of sustainable agriculture were the subject of at least one workshop and/or meeting that they have conducted, 29 respondents (46.8%) indicated that the concepts of sustainable agriculture were addressed in workshops and/or meetings that they have conducted, and four respondents (6.5%) indicated that the concepts of sustainable agriculture were never addressed in workshops and/or meetings that they have conducted.

Table 6

*Audience Distribution of Participation in Workshops and/ or Meetings on Sustainable Agriculture*

	Ohio (N=48)		Pennsylvania (N=19)		West Virginia (N=17)		Total (N=84)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Farmers	44	91.7	17	89.5	13	76.5	74	88.1
Rural	22	45.8	6	31.6	8	47.1	36	42.9
Part-Time	28	58.3	12	63.2	13	76.5	53	63.1
Urban	12	25.0	5	26.3	5	29.4	22	26.2
College	9	18.8	4	21.1	6	35.3	19	22.6
High School	5	10.4	6	31.6	9	52.9	20	23.8
Public	20	41.7	10	52.6	7	41.2	37	44.0
Other Agents	22	45.8	9	47.4	6	35.3	37	44.0

In Pennsylvania, seven respondents (22.6%) indicated that the concepts of sustainable agriculture were the subject of at least one workshop and/or meeting that they have conducted, 20 respondents (64.5%) indicated that the concepts of sustainable agriculture were addressed in workshops and/or meetings that they have conducted, and four respondents (12.9%) indicated that the concepts of sustainable agriculture were never addressed in workshops and/or meetings that they have conducted. In West Virginia, six respondents (22.2%) indicated that the concepts of sustainable agriculture were the subject of at least one workshop and/or meeting that they have conducted, 15 respondents (55.6%) indicated that the concepts of sustainable agriculture were addressed in workshops and/or meetings that they have conducted, and six respondents (22.2%) indicated that the concepts of sustainable agriculture were never addressed in workshops and/or meetings that they have conducted. In totaling the three states, 64 of the respondents

(53.3%) indicated that the concepts of sustainable agriculture were addressed, although not the major topic, in workshops and/or meetings that they had presented.

Table 7

*Concept of Sustainable Agriculture in Relation to Workshops and Meetings*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
One Workshop	29	46.6	7	22.6	6	22.2	42	35.0
Not Major Topic	29	46.8	20	64.5	15	55.6	64	53.3
Never Addressed	4	6.5	4	12.9	6	22.2	14	11.7

Extension educators were asked about the development and use of fact sheets or publications based on the concepts of sustainable agriculture. In Ohio, 15 respondents (23.8%) developed fact sheets or publications based on the concepts of sustainable agriculture, and 27 respondents (56.3%) used these fact sheets or publications in their educational activities. In Pennsylvania, six respondents (19.4%) developed fact sheets or publications based on the concepts of sustainable agriculture, and 12 respondents (52.2%) used these fact sheets or publications in their educational activities. In West Virginia, seven respondents (25.9%) developed fact sheets or publications based on the concepts of sustainable agriculture, and 10 respondents (40.0%) used these fact sheets or publications in their educational activities.

Table 8

*Development and Use of Fact Sheets*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Develop Fact Sheet	15	23.8	6	19.4	7	25.9	28	23.1
Used Fact Sheet	27	56.3	12	52.2	10	40.0	49	51.0

The respondents who used fact sheets were asked to identify the audience(s) to whom the sustainable agriculture fact sheets were distributed. Of the 27 respondents from Ohio, 44.4% indicated that their audience consisted of farmers, 17 respondents (27.0%) indicated that their audience consisted of part-time agriculturalists, and 14 respondents indicated that their audience consisted of rural agriculturalists. Of the 12 respondents from Pennsylvania, nine respondents (29.0%) indicated that their audience consisted of farmers, seven respondents (22.6%) indicated that their audience consisted of part-time agriculturalists, and five respondents (16.1%) indicated that their audience consisted of both rural agriculturalists and other agents. Of the 10 respondents from West Virginia, 10 respondents (37.0%) indicated that their audience consisted of farmers, six respondents (22.2%) indicated that their audience consisted of part-time agriculturalists, and five respondents (18.5%) indicated that their audience consisted of urban residents, high school students, and the public.

Table 9

*Audience Distribution of Sustainable Agriculture Fact Sheets*

	Ohio (N=27)		Pennsylvania (N=12)		West Virginia (N=10)		Total (N=49)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Farmers	28	44.4	9	29.0	10	37.0	47	38.8
Rural	14	22.2	5	16.1	4	14.8	23	19.0
Part-Time	17	27.0	7	22.6	6	22.2	30	24.8
Urban	8	12.7	3	9.7	5	18.5	16	13.2
College	4	6.3	1	3.2	3	11.1	8	6.6
High School	2	3.2	2	6.5	5	18.5	9	7.4
Public	12	19.0	4	12.9	5	18.5	21	17.4
Other Agents	11	17.5	5	16.1	1	3.7	17	14.0

Extension educators were asked about how their work was proportioned using the major concepts of sustainable agriculture. In Ohio, 30 respondents (48.4%) spend more time and focus addressing economic aspects, 13 respondents (21.0%) spend an equal amount of time and focus addressing environmental and economic aspects, and eight respondents spend more time and focus addressing environmental aspects. In Pennsylvania, 13 respondents (44.8%) spend more time and focus addressing economic aspects, and six respondents (20.7%) spend more time and focus addressing environmental aspects as well as an equal amount of time and focus addressing environmental and economic aspects. In West Virginia, 10 respondents (40.0%) spend an equal amount of time and focus addressing environmental and economic aspects, and eight respondents (32.0%) spend more time and focus addressing economic aspects.

Table 10

*Breakdown of Sustainable Agriculture Work Areas*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Environ Aspects	8	12.9	6	20.7	3	12.0	17	14.7
Social Aspects	2	3.2	1	3.4	0	0.0	3	2.6
Economic Aspects	30	48.4	13	44.8	8	32.0	51	44.0
Equal Social	1	1.6	0	0.0	1	4.0	2	1.7
Equal Environ	13	21.0	6	20.7	10	40.0	29	25.0
Equal Economic	1	1.6	0	0.0	0	0.0	1	0.9
Same All Three	3	4.8	0	0.0	1	4.0	4	3.4
Very Little Time	4	6.5	3	10.3	2	8.0	9	7.8

Respondents were asked to react to the following statement: what percentage of full-time agriculturalists in your county/community applies the concepts of sustainable agriculture? In Ohio, 17 respondents (30.4%) indicated that less than 5% of farmers apply concepts of

sustainable agriculture, and 12 respondents (21.4%) indicated that 31-45% of farmers apply the concepts of sustainable agriculture. In Pennsylvania, eight respondents (28.6%) indicated that 16-30% of farmers apply the concepts of sustainable agriculture, and seven respondents (25.0%) indicated that only 6-15% of farmers apply the concepts of sustainable agriculture. In West Virginia, eight respondents (30.8%) indicated that less than 5% of farmers apply the concepts of sustainable agriculture, and six respondents (23.1%) indicated that either 6-15% or 16-30% of farmers apply the concepts of sustainable agriculture. All three state totaled indicated that 72 respondents (65.5%) specified that 30% or less of farmers apply the concepts of sustainable agriculture. This information is summarized in Table 11.

Table 11

*Full-Time Agriculturalists Applying Concepts of Sustainable Agriculture*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Less Than 5%	17	30.4	5	17.9	8	30.8	30	27.3
6-15%	8	14.3	7	25.0	6	23.1	21	19.1
16-30%	7	12.5	8	28.6	6	23.1	21	19.1
31-45%	12	21.4	3	10.7	0	0.0	15	13.6
46-60%	5	8.9	2	7.1	2	7.7	9	8.2
Over 60%	7	12.5	3	10.7	4	15.4	14	12.7

Respondents were asked to react to the following statement: what percentage of part-time agriculturalists in your county/community applies the concepts of sustainable agriculture? In Ohio, 14 respondents (25.0%) indicated that 16-30% of farmers apply sustainable agriculture concepts, and 13 respondents (23.2%) indicated that 31-45% of farmers apply sustainable agriculture concepts. In Pennsylvania, eight respondents (28.6%) indicated that either 16-30% or



31-45% of farmers apply the concepts of sustainable agriculture. In West Virginia, nine respondents (34.6%) indicated that 6-15% of farmers apply the concepts of sustainable agriculture, and six respondents (23.1%) indicated that 46-60% of farmers apply the concepts of sustainable agriculture. All three states totaled indicated that 54 respondents (49%) specified that 6-30% of part-time agriculturalists apply concepts of sustainable agriculture (see Table 12).

Table 12

*Part-Time Agriculturalists Applying Concepts of Sustainable Agriculture*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Less Than 5%	7	12.5	2	7.1	3	11.5	12	10.9
6-15%	11	19.6	7	25.0	9	34.6	27	24.5
16-30%	14	25.0	8	28.6	5	19.2	27	24.5
31-45%	13	23.2	8	28.6	3	11.5	24	21.8
46-60%	6	10.7	2	7.1	6	23.1	14	12.7
Over 60%	5	8.9	1	3.6	0	0.0	6	5.5

*Areas of Sustainable Agriculture that Extension Agents Desire Training*

Extension educators were asked to identify the areas they desire sustainable agriculture training. The responses were broken down by state as well as the overall means. The individual items were rated on the following scale: 1 = Very Strongly Disagree, 2 = Strongly Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree and 6 = Very Strongly Agree.

Respondents were asked to react to the following statement: I am interested in training on integrated insect pest management. Ninety-seven respondents (85.0%) expressed some level of agreement with the statement. In terms of integrated insect pest management, Ohio respondents had a mean of 4.40, Pennsylvania respondents had a mean of 4.22 and West Virginia respondents had a mean of 4.11. The overall mean for this question was 4.29.

Respondents were asked to react to the following statement: I am interested in training on sustainable agriculture farm management practices. One hundred and one respondents (89.4%) expressed some level of agreement with the statement. In terms of sustainable agriculture farm management practices, Ohio respondents had a mean of 4.50, Pennsylvania respondents had a mean of 4.07 and West Virginia respondents had a mean of 4.38. The overall mean for this question was 4.37.

Respondents were asked to react to the following statement: I am interested in training on natural resource conservation. Eighty-nine respondents (78.7%) expressed some level of agreement with the statement. In terms of natural resource conservation, Ohio respondents had a mean of 4.15, Pennsylvania respondents had a mean of 3.89 and West Virginia respondents had a mean of 3.85. The overall mean for this question was 4.02.

Respondents were asked to react to the following statement: I am interested in training on organic matter management. Ninety-four respondents (83.1%) expressed some level of agreement with the statement. In terms of organic matter management, Ohio respondents had a mean of 4.33, Pennsylvania respondents had a mean of 4.18 and West Virginia respondents had a mean of 3.92. The overall mean for this question was 4.20.

Respondents were asked to react to the following statement: I am interested in training on water quality with respect to agrichemicals. Ninety respondents (79.0%) expressed some level of agreement with the statement. In terms of water quality with respect to agrichemicals, Ohio respondents had a mean of 4.20, Pennsylvania respondents had a mean of 4.15, and West Virginia respondents had a mean of 3.85. The overall mean for this question was 4.11.

Respondents were asked to react to the following statement: I am interested in training on innovative farming systems. One hundred and eight respondents (94.7%) expressed some level

of agreement with the statement. In terms of innovative farming systems, Ohio respondents had a mean of 4.65, Pennsylvania respondents had a mean of 4.71, and West Virginia respondents had a mean of 4.54. The overall mean for this question was 4.64.

Respondents were asked to react to the following statement: I am interested in training on crop rotations. Eighty-eight respondents (77.9%) expressed some level of agreement with the statement. In terms of crop rotations, Ohio respondents had a mean of 4.58, Pennsylvania respondents had a mean of 3.93, and West Virginia respondents had a mean of 3.96. The overall mean for this question was 4.28.

Respondents were asked to react to the following statement: I am interested in training on food safety and pesticide residues. Eighty-four respondents (75.0%) expressed some level of agreement with the statement. In terms of food safety and pesticide residues, Ohio respondents had a mean of 4.32, Pennsylvania respondents had a mean of 3.81, and West Virginia respondents had a mean of 3.72. The overall mean for this question was 4.06.

Respondents were asked to react to the following statement: I am interested in training on recycling farm wastes. Ninety-five respondents (84.0%) expressed some level of agreement with the statement. In terms of recycling farm wastes, Ohio respondents had a mean of 4.25, Pennsylvania respondents had a mean of 4.22, and West Virginia respondents had a mean of 4.04. The overall mean for this question was 4.19.

Respondents were asked to react to the following statement: I am interested in training on economics of sustainable agriculture. One hundred and four respondents (91.2%) expressed some level of agreement with the statement. In terms of economics of sustainable agriculture, Ohio respondents had a mean of 4.98, Pennsylvania respondents had a mean of 4.57, and West Virginia respondents had a mean of 4.42. The overall mean for this question was 4.75.

Respondents were asked to react to the following statement: I am interested in training on educational, communication/Extension in sustainable agriculture. Eighty-nine respondents (81.0%) expressed some level of agreement with the statement. In terms of educational, communication/Extension in sustainable agriculture, Ohio respondents had a mean of 4.31, Pennsylvania respondents had a mean of 3.96, and West Virginia respondents had a mean of 3.96. The overall mean for this question was 4.15.

Respondents were asked to react to the following statement: I am interested in training on restoration of the family farm. Seventy-six respondents (68.4%) expressed some level of agreement with the statement. In terms of restoration of the family farm, Ohio respondents had a mean of 3.93, Pennsylvania respondents had a mean of 4.08, and West Virginia respondents had a mean of 4.41. The overall mean for this question was 4.08.

Respondents were asked to react to the following statement: I am interested in training on system theory including biological systems. Sixty-two respondents (59.6%) expressed some level of agreement with the statement. In terms of system theory including biological systems, Ohio respondents had a mean of 3.85, Pennsylvania respondents had a mean of 3.72, and West Virginia respondents had a mean of 3.21. The overall mean for this question was 3.67.

Respondents were asked to react to the following statement: I am interested in training on marketing of sustainable agricultural products. Ninety-eight respondents (86.1%) expressed some level of agreement with the statement. In terms of marketing sustainable agricultural products, Ohio respondents had a mean of 4.55, Pennsylvania respondents had a mean of 4.57, and West Virginia respondents had a mean of 4.54. The overall mean for this question was 4.55.

Respondents were asked to react to the following statement: I am interested in training on composting. Eighty-four respondents (73.1%) expressed some level of agreement with the

statement. In terms of composting, Ohio respondents had a mean of 4.15, Pennsylvania respondents had a mean of 3.93, and West Virginia respondents had a mean of 3.70. The overall mean for this question was 3.99.

Respondents were asked to react to the following statement: I am interested in training on grazing/forage management. Ninety respondents (79.7%) expressed some level of agreement with the statement. In terms of grazing/forage management, Ohio respondents had a mean of 4.53, Pennsylvania respondents had a mean of 3.93, and West Virginia respondents had a mean of 4.68. The overall mean for this question was 4.42.

Respondents were asked to react to the following statement: I am interested in training on grass fed livestock. Seventy-nine respondents (71.1%) expressed some level of agreement with the statement. In terms of grass fed livestock, Ohio respondents had a mean of 4.09, Pennsylvania respondents had a mean of 3.93, and West Virginia respondents had a mean of 4.32. The overall mean for this question was 4.10.

Table 13

*Areas that Extension Educators Desire Sustainable Agriculture Training*

	Very Strongly Disagree		Strongly Disagree		Disagree		Agree		Strongly Agree		Very Strongly Agree	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Pest	1	.9	1	.9	15	13.2	56	49.1	29	25.4	12	10.5
Farm Mgmt	1	.9	1	.9	10	8.8	55	48.7	35	31.0	11	9.7
Nat. Resources	1	.9	3	2.7	20	17.7	64	56.6	19	16.8	6	5.3
Organic	1	.9	2	1.8	16	14.2	59	52.2	24	21.2	11	9.7
Water Quality	1	.9	3	2.6	20	17.5	58	50.9	23	20.2	9	7.9
Systems	0	0.0	2	1.8	4	3.5	47	41.2	41	36.0	20	17.5
Rotations	0	0.0	2	1.8	23	20.4	43	38.1	31	27.4	14	12.4
Safety	1	.9	6	5.4	21	18.8	52	46.4	21	18.8	11	9.8
Recycling	1	.9	2	1.8	15	13.3	58	51.3	30	26.5	7	6.2
Economics	0	0.0	2	1.8	8	7.0	34	29.8	42	36.8	28	24.6
Educational	4	3.6	3	2.7	14	12.7	51	46.4	28	25.5	10	9.1
Restoration	2	1.8	3	2.7	30	27.0	40	36.0	21	18.9	15	13.5
Bio Systems	2	1.9	9	8.7	31	29.8	44	42.3	15	14.4	3	2.9
Marketing	1	.9	4	3.5	11	9.6	37	32.5	37	32.5	24	21.1
Composting	2	1.7	6	5.2	23	20.0	54	47.0	20	17.4	10	8.7
Grazing	1	.9	5	4.4	17	15.0	34	30.1	35	31.0	21	18.6
Livestock	2	1.8	7	6.3	23	20.7	38	34.2	28	25.2	13	11.7

Table 14

*Descriptive Data of Areas that Extension Educators Desire Sustainable Agriculture Training*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Pest	4.40	.85	4.22	.97	4.11	1.01	4.29	.92
Farm Mgmt	4.50	.79	4.07	.87	4.38	1.02	4.37	.88
Natural Resources	4.15	.82	3.89	.89	3.85	.92	4.02	.87
Organic	4.33	.84	4.18	.82	3.92	1.19	4.20	.93
Water Quality	4.20	.90	4.15	.77	3.85	1.13	4.11	.93
Systems	4.65	.86	4.71	.98	4.54	.81	4.64	.87
Rotations	4.58	.89	3.93	.83	3.96	1.15	4.28	.99
Safety	4.32	1.00	3.81	.96	3.72	1.06	4.06	1.03
Recycling	4.25	.79	4.22	.85	4.04	1.08	4.19	.87
Economics	4.98	.91	4.57	1.03	4.42	.90	4.75	.96
Educational	4.31	1.05	3.96	.96	3.96	1.24	4.15	1.08
Restoration	3.93	1.06	4.08	1.20	4.41	1.19	4.08	1.13
Bio Systems	3.85	.95	3.72	1.02	3.21	.93	3.67	.99
Marketing	4.55	1.11	4.57	1.07	4.54	1.10	4.55	1.09
Composting	4.15	.99	3.93	.98	3.70	1.20	3.99	1.05
Grazing	4.53	1.07	3.93	1.05	4.68	1.28	4.42	1.14
Livestock	4.09	1.10	3.93	1.27	4.32	1.18	4.10	1.16

*Demographic Information*

Using ten-year incremental categories, the respondents were asked to provide their age. The majority of the respondents were between the ages of 40-59. There were 30 respondents (37.0%) that were between the ages of 40-49, and 27 respondents (33.3%) that were between the ages of 50-59.

Table 15

*Age Categories of Respondents*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Age 20-29	3	6.4	1	5.9	1	5.9	5	6.2
30-39	6	12.8	2	11.8	3	17.6	11	13.6
40-49	18	38.3	6	35.3	6	35.3	30	37.0
50-59	15	31.9	7	41.2	5	29.4	27	33.3
60 and over	5	10.6	1	5.9	2	11.8	8	9.9

Respondents were asked to provide information on their Cooperative Extension work experience. In Ohio, there were 16 respondents (25.8%) that had worked for Extension for 6-10 years and 10 respondents (16.1%) in each category that had worked for Extension for both 11-15 years and 16-20 years. In Pennsylvania, there were eight respondents (27.6%) that had worked for Extension for 6-10 years, and six respondents (20.7%) in each category that had worked for Extension for both the 16-20 years and the 21-25 years. In West Virginia, nine respondents (33.3%) worked for Extension for 11-15 years. The total of all three states indicated that the majority of the survey respondents had worked for Extension for 6-15 years (see Table 17). After totaling all three states, it was determined that the majority of the respondents (87.2%) had a Master’s degree or a Master’s degree plus additional credits.

Respondents were asked to identify the professional relationships they possess with sustainable agriculture organizations. After totaling the three states it was determined that 92 respondents (76.0%) had a professional relationship with university Extension specialists working in the area of sustainable agriculture, 59 respondents (48.8%) had a professional relationship with other university faculty working in sustainable agriculture, 43 respondents (35.5%) had a professional relationship with Sustainable Agriculture Research and Education



(SARE) regional representatives, and 13 respondents (10.7%) had a professional relationship with Appropriate Technology Transfer for Rural Areas (ATTRA) (see Table 18).

Table 16

*Cooperative Extension Work Experience in Years*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
< 1 year	0	0.0	0	0.0	1	3.7	1	0.8
1 to 5 years	9	14.5	2	6.9	3	11.1	14	11.9
6-10 years	16	25.8	8	27.6	4	14.8	28	23.7
11-15 years	10	16.1	2	6.9	9	33.3	21	17.8
16-20 years	10	16.1	6	20.7	2	7.4	18	15.3
21-25 years	3	4.8	6	20.7	2	7.4	11	9.3
26-30 years	5	8.1	3	10.3	4	14.8	12	10.2
31-35 years	8	12.9	1	3.4	1	3.7	10	8.5
36-40 years	1	1.6	1	3.4	1	3.7	3	2.5

Table 17

*Highest Level of Education of Respondents*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
4 year college	1	1.6	6	21.4	0	0.0	7	6.0
Master's Degree	30	48.4	15	53.6	17	63.0	62	53.0
Master's Plus	25	40.3	7	25.0	8	29.6	40	34.2
Doctorate Degree	6	9.7	0	0.0	2	7.4	8	6.8

Table 18

*Professional Relationships with Sustainable Agriculture Organizations*

	Ohio		Pennsylvania		West Virginia		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
SARE	24	38.1	10	32.3	9	33.3	43	35.5
ATTRA	8	12.7	2	6.5	3	11.1	13	10.7
Ext. Specialist	45	71.4	22	71.0	25	92.6	92	76.0
Other Faculty	34	54.0	12	38.7	13	48.1	59	48.8

## CHAPTER V

### Summary, Conclusions, and Recommendations

#### *Purpose of the Study*

The purpose of this study was to determine the level of knowledge and preparation that Extension educators possess related to the numerous dimensions of sustainable agriculture. A relationship between the amount of education that Extension educators receive about sustainable agriculture and the amount of information that Extension educators offer to their clientele about this topic could be determined.

#### *Objectives of the Study*

The objective of this study was to determine the level of knowledge and preparation that Extension educators possess related sustainable agriculture, the amount of information they offer their clientele concerning this topic, and if a relationship existed between the two variables. This information will be useful in estimating the percentage of farmers that put sustainable agriculture applications to practice.

#### *Research Questions*

The following research questions were used to guide the study:

1. Do Extension educators have a clear understanding of sustainable agriculture?
2. What is the number of sustainable agriculture workshops or other information sessions that Extension educators attended?
3. How many sustainable agriculture workshops or other information sessions have Extension educators offered?
4. What are Extension educators' perceptions of the percentage of farmers that are practicing sustainable agriculture applications?

## *Summary*

*Sustainable Agriculture: Understanding and Research Availability.* In general, the Extension agents that were surveyed believed that sustainable agriculture was profitable (79.3%), productive (75.2%), small-scale (82.7%), environmentally sound (89.2%), and with low chemical input (80.0%). In terms of organic farming, there was a more even distribution between respondents that agreed (58.3%) that organic farming constituted sustainability and respondents that disagreed (41.7%) that organic farming constituted sustainability ( $M = 3.96$ ,  $SD = 1.13$ ). The Extension agents that were surveyed did not believe that sustainable agriculture was non-animal related (87.5%); they believed it was a priority for present clientele interactions (87.7%), and they considered it a priority for future clientele interactions (90.9%).

In terms of perception of availability of research findings, Extension agents that were surveyed agreed that if farmers were provided information on sustainable agriculture, it would increase the likelihood they would adopt the concepts (83.9%); there was scientific proof that sustainable agriculture was environmentally sound (77.3%); there was scientific proof that sustainable agriculture was economically feasible (68.1%); there was scientific proof that sustainable agriculture was socially acceptable (80.5%); research on sustainable agriculture was still in its infancy (73.6%); and if researchers made innovations available on sustainable agriculture, they would communicate the information to farmers (98.3%). Extension agents that were surveyed disagreed that they did not know where to get information on sustainable agriculture (85.7%) and disagreed that they did not know enough about sustainable agriculture to inform others (74.7%).

*Extension Educators' Participation in Sustainable Agriculture Professional*

*Development.* The majority of the respondents attended workshops (81.8%) and conferences (74.4%) on the central concepts of sustainable agriculture. There were fewer respondents (23.1%) that attended dinner meetings or other (25.8%) professional development events dealing with the central concepts of sustainable agriculture. The majority of the respondents that attended professional development events perceived them as dealing more with the economic viability (80.0%) and environmental soundness (77.3%) aspects of sustainable agriculture as opposed to the social acceptability aspect (39.2%).

*Extension Educators' Use of Information and Skills Gained from Professional*

*Development.* The majority of the respondents' education on sustainable agriculture has sustainable implications (76.0%). Some respondents indicated that their education on sustainable used sustainable examples (12.4%), and 7.4% of the respondents indicated that their education on agricultural practices was in direct conflict with their perception of sustainable agriculture. The audience that participated in workshops and/or meetings on sustainable agriculture were mostly farmers (88.1%), part-time agriculturalists (63.1%), the public (44.0%), and other agents (44.0%).

The majority of the respondents (53.3%) indicated that the concepts of sustainable agriculture were addressed, although not the major topic, in workshops and/or meetings that they had conducted. Thirty-five percent of the respondents indicated that the concepts of sustainable agriculture were the subject of at least one workshop and/or meetings that they have conducted and 11.7% of the respondents indicated that the concepts of sustainable agriculture were never addressed in workshops or meeting that they had conducted.

For the Extension agents that responded to the survey, 23.1% developed fact sheets or publications based on the concepts of sustainable agriculture, and 51.0% of the respondents used fact sheets or publications on the concepts of sustainable agriculture in their educational activities. The audiences that most benefited from sustainable agriculture fact sheets and publications were farmers (38.8%) and part-time agriculturalists (24.8%).

Extension educators summarized how their work was proportioned according to the major concepts of sustainable agriculture. It was evident that respondents spent more time and focus addressing economic aspects (44.0%), or they spent an equal amount of time and focus addressing environmental and economic aspects (25.0%). The majority of the respondents (27.3%) perceived less than 5% of full-time agriculturalists apply sustainable agriculture concepts, and 19.1% of respondents for each of the categories 6-15% and 16-30% perceived full-time agriculturalists apply sustainable agriculture concepts.

Respondents were asked their perception of the number of part-time agriculturalists in their county/community that apply the concepts of sustainable agriculture. It was concluded that a majority of the respondents perceived less than 30% of the part-time agriculturalists apply sustainable agriculture concepts and 21.8% of respondents perceived 31-45% of part-time agriculturalists apply the concepts of sustainable agriculture.

*Areas of Sustainable Agriculture that Extension Agents Desire Training.* Extension agents that responded to the survey were interested in training on the following topics: integrated insect pest management (85.0%), sustainable agriculture farm management practices (89.4%), natural resource conservation (78.7%), organic matter management (83.1%), water quality with respect to agrichemicals (79.0%), innovative farming systems (94.7%), crop rotations (77.9%), food safety and pesticide residues (75.0%), recycling farm waste (84.0%),

economics of sustainable agriculture (91.2%), educational communication/Extension in sustainable agriculture (81.0%), restoration of the family farm (68.4%), system theory including biological systems (59.6%), marketing of sustainable agricultural products (86.1%), composting (73.1%), grazing/forage management (79.7%), and grass fed livestock (71.1%).

### *Conclusions*

Based upon the findings of the study, the following conclusions were reached:

- Part-time agriculturalists were perceived to attend workshops/meetings based on sustainable agriculture practices, use fact sheets or publications on the concepts of sustainable agriculture, and, in turn, apply concepts of sustainable agriculture.
- Full-time agriculturalists attended the workshops and/or meetings and received the fact sheets and/or publications based on the concepts of sustainable agriculture, but were not perceived by Extension agents in their county to be participating in as many sustainable practices as part-time agriculturalists.
- Extension agents need to continue to present workshops/meetings that focus on direct sustainable agriculture concepts and incorporate more sustainable agriculture examples.
- Extension agents also need to “follow-up” on sustainable agriculture workshop participants to ensure that their audience understands the concepts of sustainable agriculture and are putting these concepts to practice.
- Social acceptability and the link between community and agriculture needs to be more heavily incorporated into sustainable agriculture concepts and practices.
- Extension agents need to distinguish between the terms “organic” and “sustainable” and realize that they do not share the same definition.

- Extension agents have expressed a need for training in sustainable agriculture in areas such as innovative farming systems, economics of sustainable agriculture, and sustainable agriculture farm management practices. Inservice training seminars could be created to address these issues. Sustainable agriculture curriculum could also be incorporated into the technical agriculture curriculum at The Ohio State University, The Pennsylvania State University, and West Virginia University.
- Whether accepting or not accepting of the term “sustainable agriculture” Extension agents need to become knowledgeable on the concepts and practices of sustainable agriculture in order to assist their farmers in utilizing the most up to date research in this area.

#### *Recommendations for Extension Professionals*

The following recommendations are made to Agriculture and Natural Resource Extension Agents employed in Ohio, Pennsylvania, and West Virginia based on the review of literature, the researcher’s experience, and the results of this study:

- Extension agents need to attend professional development events that focus on direct sustainable agriculture concepts and incorporate more sustainable agriculture examples.
- Extension agents need to present workshops/meetings that focus on direct sustainable agriculture concepts and incorporate more sustainable agriculture examples.
- Extension agents need to “follow-up” on sustainable agriculture workshop participants to ensure that their audience understands the concepts of sustainable agriculture and are putting these concepts to practice.
- Social acceptability needs to be incorporated into both professional development events that Extension agents attend and workshops/meetings that Extension agents present.



- Currently, an “us verses them” situation exists between the sustainable agriculture movement on the one hand, and some Extension agents and commercial farmers on the other. Extension administrators must find a way to deal with this controversy (Agunga, 1995).

*Additional Research.*

- Determine the institutional barriers to adopting sustainable agriculture practices.
- Determine the profitability of existing sustainable agriculture enterprises and compare to the profitability of “non-sustainable” enterprises.
- Determine specific sustainable practices that are currently in use to allow better and more specific training of both agents and farmers.

## REFERENCES

- Agunga, R. (1995). What ohio extension say about sustainable agriculture. *Journal of Sustainable Agriculture*, 5(3), 169-187.
- Ary, D., Jacobs, L. C., & Razavieh, A. (1990). *Introduction to Research in Education*. Orlando, FL: Harcourt Brace.
- Auburn, J. S. (1994). Society pressures farmers to adopt more sustainable systems. *California Agriculture*, 48(5), 7-10.
- Doll, J. D. & Francis, C. A. (1992). Participatory research and extension strategies for sustainable agricultural systems. *Weed Technology*, 6, 473-482.
- Drost, D., Long, G., Wilson, D., Miller, B., & Campbell, W. (1996). Barriers to adopting sustainable agricultural practices. *Journal of Extension*, 34 (6).
- Drost, D., Long, G. & Hales, K. (1997). Utah's vegetable growers: assessing sustainable agriculture. *HortTech*, 7(4),445-450.
- Drost, D., Long, G. & Kales, K. (1998). Targeting extension efforts for the adoption of sustainable farming practices. *Journal of Extension*, 36 (9).
- Hanson, Kauffman, & Schauer. (1995). Attitudes and practices of sustainable farmers, with applications to designing a sustainable agriculture extension program. *Journal of Sustainable Agriculture*, 6(2/3), 135-156.
- Feenstra, G. (1997). *What is sustainable agriculture?* UC Sustainable Agriculture Research and Education Program. University of California, Davis, CA.
- Green, J. (1999). *The farming alternatives program*. Retrieved October 28, 2002, from <http://www.osp.cornell.edu/VPR/Outreach/programs/farm.html>
- Iowa State University Extension Service. (2001). *Plan of work: 147 sustainable agriculture*. Retrieved October 28, 2002, from <http://www.extension.iastate.edu/Pages/planofwork/plan147.html>
- King, J. W. & Francis, C. A. (1994). *Extension and education materials for sustainable agriculture*. (Vol. 2): Center for Sustainable Agriculture Systems.
- Lockeretz, W. & Anderson, M. D. (1993). *Agricultural research alternatives*. Lincoln: University of Nebraska Press.

- Minarovic, R. & Mueller, J. P. (2000). North Carolina Cooperative Extension Service professionals' attitudes toward sustainable agriculture. *Journal of Extension* 38(1).
- National Research Council (1993). *Sustainable agriculture and the environment in humid tropics*. Washington, D. C.: The Academy Press.
- NRC (1989). *Alternative agriculture*. Washington, D. C.: National Research Council; National Academy Press.
- Pirog, R. (1998). *Looking at sustainable agriculture education: Is more better?* Retrieved from <http://www.ag.iastate.edu/centers/leopold/newsletter/98-4leoletter/98-4susaged.html>
- Roling, N. (1988). *Extension science: Information systems in agricultural development*. Cambridge University Press, Cambridge, UK.
- Sustainable Agriculture Educational Project*. (2002). Retrieved November 26, 2002, from <http://www.msu.edu/user/dunnjef1/rd491/project.htm>
- Sustainable Agriculture Network. (2002). *What is sustainable agriculture?* Retrieved October 9, 2002, from <http://www.sare.org/htdocs/docs/SANandSARE.html>
- Sustainable Agriculture Research and Education Program. (2002). *Partnering with farmers to implement biologically integrated farming practices*. Retrieved November 26, 2002, from <http://www.sarep.ucdavis.edu/about/overvoew3.htm>
- Taylor, D. C. & Dobbs, T. L. (1990). Sustainable agriculture: focus on producers. *South Dakota Farm and Home Ranch*, 40(1), 15-18.
- Timmer, J., and Rafferty, K., & Berquist, J. (n.d.) *Education in sustainable agriculture*. Retrieved October 28, 2002 from <http://www.uwyo.edu/plants/sustag/group5.html>
- Warner, P. D. & Christenson, J. A. (1984). *The cooperative extension service; A national assessment*. Boulder, Colorado: Westview Press.
- Watkins, G. (1990). Participatory research: a farmer's perspective. *American Journal of Alternative Agriculture*, 5(4), 161-162.

## APPENDICES

APPENDIX A:  
Survey Instrument



Knowledge and Dissemination of Sustainable Agriculture  
Practices by County Extension Agents  
In Ohio, Pennsylvania, Virginia and West Virginia

## Knowledge and Dissemination of Sustainable Agriculture Practices by County Extension Agents in Ohio, Pennsylvania, Virginia and West Virginia

**Instructions:** Using a Likert scale ranging from 1 to 6, please indicate your *level of agreement* with each of the following statements about **your understanding of sustainable agriculture**. Indicate your agreement by circling the number that best corresponds to your response. Use the following scale: 1 = Very Strongly Disagree, 2 = Strongly Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree, 6 = Very Strongly Agree.

**Note:** The central concept of sustainable agriculture is the three-legged stool consisting of environmental soundness, economical viability and social acceptability.

Objective: Do Extension educators have a clear understanding of sustainable agriculture?						
	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
<b>When I hear the term sustainable agriculture.....</b>						
1. Profitability readily comes to mind.	1	2	3	4	5	6
2. Productivity readily comes to mind.	1	2	3	4	5	6
3. Small-scale agriculture readily comes to mind.	1	2	3	4	5	6
4. Environmental protection readily comes to mind.	1	2	3	4	5	6
5. Organic farming readily comes to mind.	1	2	3	4	5	6
6. Low chemical input readily comes to mind.	1	2	3	4	5	6
7. Non-animal agriculture readily comes to mind.	1	2	3	4	5	6
8. I do not consider it a priority for present clientele interactions.	1	2	3	4	5	6
9. I do not consider it a priority for future clientele interactions.	1	2	3	4	5	6
Objective: How do Extension educators perceive the availability of research findings on sustainable agriculture?						
10. If farmers are provided information on sustainable agriculture, it will increase the likelihood they will adopt the concepts.	1	2	3	4	5	6
11. There is scientific proof that sustainable agriculture is environmentally sound.	1	2	3	4	5	6

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
12. There is scientific proof that sustainable agriculture is economically feasible.	1	2	3	4	5	6
13. There is scientific proof that sustainable agriculture is socially acceptable.	1	2	3	4	5	6
14. Research on sustainable agriculture is still in its infancy.	1	2	3	4	5	6
15. If researchers make innovations available on sustainable agriculture, I will communicate the information to farmers.	1	2	3	4	5	6
16. I do not know where to get information on sustainable agriculture.	1	2	3	4	5	6
17. I do not know enough about sustainable agriculture to inform others.	1	2	3	4	5	6

Objective: What professional development opportunities on the concepts of sustainable agriculture have Extension educators participated?

18. What types of professional development have you participated on the central concepts of sustainable agriculture? (Please check all answers that apply)

- a. Conferences
- b. Workshops
- c. Dinner meetings
- d. Other (please specify) \_\_\_\_\_

19. I have participated in professional development events dealing specifically with environmental soundness.

- a. yes      Number \_\_\_\_\_
- b. no



20. I have participated in professional development events dealing specifically with economic viability.

\_\_\_\_\_ a. yes            Number \_\_\_\_\_

\_\_\_\_\_ b. no

21. I have participated in professional development events dealing specifically with social acceptability.

\_\_\_\_\_ a. yes            Number \_\_\_\_\_

\_\_\_\_\_ b. no

Objective: How do Extension educators use the information and skills that they have gained through their professional development experiences?

22. Please complete the following sentence: Most of my education on agricultural practices ... (check the statement that best applies)

\_\_\_\_\_ a. is in direct conflict with my perception(s) of sustainable agriculture.

\_\_\_\_\_ b. has sustainable agriculture implications.

\_\_\_\_\_ c. used sustainable agriculture examples.

23. Have you presented any workshops or other meetings based on what you have learned about the concepts of sustainable agriculture?

\_\_\_\_\_ a. yes

\_\_\_\_\_ b. no

24. Who participated in these workshops and/or meetings on the concepts of sustainable agriculture? (check all that apply)

\_\_\_\_\_ a. Farmers / ranchers

\_\_\_\_\_ b. Rural agriculturists

\_\_\_\_\_ c. Part-time agriculturists

\_\_\_\_\_ d. Urban residents

\_\_\_\_\_ e. College students

\_\_\_\_\_ f. High school students

\_\_\_\_\_ g. Public

\_\_\_\_\_ h. Other Extension Agents

25. Please complete the following sentence: The concepts of sustainable agriculture ...
- a. were the subject of at least one workshops and/or meetings that I have conducted.
  - b. were addressed, although not the major topic, in workshops and/or meetings that I have conducted.
  - c. were never addressed in workshops and/or meetings that I have conducted.
26. Have you developed fact sheets or publications based on the concepts of sustainable agriculture?
- a. yes
  - b. no
27. Have you used these fact sheets or publications on the concepts of sustainable agriculture in your educational activities?
- a. yes
  - b. no
28. Who was the audience for the educational activities where the fact sheets or publications on the concepts of sustainable agriculture were used? (Check all that apply)
- a. Farmers / ranchers
  - b. Rural agriculturists
  - c. Part-time agriculturists
  - d. Urban residents
  - e. College students
  - f. High school students
  - g. Public
  - h. Other Extension Agents

29. Of the three major concepts of sustainable agriculture (three-legged stool), how is your work proportioned? (Check the statement that best describes your situation.)
- a. I spend more time and focus addressing environmental aspects.
  - b. I spend more time and focus addressing social aspects.
  - c. I spend more time and focus addressing economic aspects.
  - d. I spend an equal amount of time and focus addressing environmental and social aspects.
  - e. I spend an equal amount of time and focus addressing environmental and economic aspects.
  - f. I spend an equal amount of time and focus addressing economic and social aspects.
  - g. I spend approximately the same time and focus on all three aspects.
  - h. I dedicate very little time and focus to any of the three sections.
30. What percentage of full-time agriculturists in your county/community applies the concepts of sustainable agriculture?
- a. Less than 5%
  - b. 6-15%
  - c. 16-30%
  - d. 31-45%
  - e. 46-60%
  - f. Over 60%
31. What percentage of part-time agriculturists in your county/community applies the concepts of sustainable agriculture?
- a. Less than 5%
  - b. 6-15%
  - c. 16-30%
  - d. 31-45%
  - e. 46-60%
  - f. Over 60%

Objective: What areas of sustainable agriculture do Extension agents desire training?

**Instructions:** Using a Likert scale ranging from 1 to 6, please indicate your level of agreement with each of the following statements about **your training needs on sustainable agriculture's central concepts**. Indicate your agreement by circling the number that best corresponds to your response. Use the following scale: 1 = Very Strongly Disagree, 2 = Strongly Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree, 6 = Very Strongly Agree.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I am interested in training on the following topics....						
32. Integrated insect pest management.	1	2	3	4	5	6
33. Sustainable agriculture farm management practices.	1	2	3	4	5	6
34. Natural resource conservation.	1	2	3	4	5	6
35. Organic matter management.	1	2	3	4	5	6
36. Water quality with respect to agrichemicals	1	2	3	4	5	6
37. Innovative farming systems.	1	2	3	4	5	6
38. Crop rotations.	1	2	3	4	5	6
39. Food safety and pesticide residues.	1	2	3	4	5	6
40. Recycling farm waste.	1	2	3	4	5	6
41. Economics of sustainable agriculture.	1	2	3	4	5	6
42. Educational, communication/extension in sustainable agriculture.	1	2	3	4	5	6
43. Restoration of the family farm.	1	2	3	4	5	6
44. System theory including biological systems.	1	2	3	4	5	6
45. Marketing of sustainable agricultural products.	1	2	3	4	5	6
46. Composting.	1	2	3	4	5	6
47. Grazing/forage management.	1	2	3	4	5	6
48. Grass fed livestock.	1	2	3	4	5	6

## Demographic Information

49. In what age category are you?
- a. Less than 20 years old
  - b. 20 to 29
  - c. 30 to 39
  - d. 40 to 49
  - e. 50 to 59
  - f. 60 and over
50. Including the current year, how many years have you worked in the Cooperative Extension Service?
- a. Less than 1 year
  - b. 1 to 5 years
  - c. 6 to 10 years
  - d. 11 to 15 years
  - e. 16 to 20 years
  - f. 21 to 25 years
  - g. 26 to 30 years
  - h. 31 to 35 years
  - i. 36 to 40 years
  - j. Over 40 years

51. What is your highest level of education? (Please check only one)
- a. 4-year college degree
  - b. Master's degree
  - c. Master's degree plus
  - d. Doctorate degree
52. Do you have a professional relationship with any of the following? (Please check all that apply)
- a. Your SARE (Sustainable Agriculture Research and Education) regional representatives?
  - b. Appropriate Technology Transfer for Rural Areas (ATTRA)
  - c. Your university Extension specialists working in the area of sustainable agriculture.
  - d. Other university faculty working in sustainable agriculture.

APPENDIX B:

Initial Cover Letter Mailed with Questionnaire

January 26, 2004

«Name»

«Title»

«Add»

«City», «State» «Zip»

Dear Extension Agent:

My undergraduate degree in environmental biology as well as my agricultural background coupled with my interest in sustainable agriculture played a major role in the selection of a topic for my Master's thesis research. My varied agricultural and environmental experiences have provided insight into the complexity of today's agricultural farming systems.

Today's agricultural research must consider environmental implications, social issues, and overall economic growth within the agriculture sector. The Extension service must be at the forefront of delivering this information to the local farmer. The purpose of my thesis research is to determine **the relationship of knowledge and preparation that Extension educators possess about sustainable agriculture compared to the amount of information they offer their clientele concerning this topic.** The results of the research will be used to complete my thesis focused on sustainability in the agricultural industry that will partially fulfill the requirements for a Master of Science Degree in Agricultural Education. Determining the impact that sustainable agriculture has on today's society and being able to assist small scale farmers will allow for continued competition in marketing of agricultural commodities. In turn, Extension programs and other educational initiatives can be developed to aid in ultimately keeping today's families on the farm.

Participation in this research study, while voluntary, will only take a few minutes of your time. You may skip any question you are not comfortable answering. Please be assured that all information will be held as confidential as possible. Survey results will be reported in a summary format and individual responses will not be identifiable. You will notice a code number at the top right of the first page of the survey. This code will be used to identify non-respondents for follow-up and will be destroyed before the data are analyzed. A postage-paid self-addressed return envelope is provided for your convenience.

**Participation in the research by returning the questionnaire before February 13, 2004 will be greatly appreciated.**

Sincerely,

Erin M. Hersman  
Graduate Student

Harry N. Boone, Jr., Ph.D.  
Assistant Professor



APPENDIX C:

Follow Up Letter Mailed with Questionnaire

May 5, 2004

«First\_Name» «Last\_Name»  
«Company»  
«M\_1st\_Address»  
«M\_2nd\_Address»  
«City», «State» «Zip\_Code»

Dear Extension Agent:

You recently received a questionnaire regarding Extension education and its role in sustainable agriculture. As of today, I have not received your response. Your response is crucial to the success of this research project, therefore, I have contacted you a second time with the hopes that you will participate in the project by completing and returning the questionnaire.

My undergraduate degree in environmental biology as well as my agricultural background coupled with my interest in sustainable agriculture played a major role in the selection of a topic for my Master's thesis research. My varied agricultural and environmental experiences have provided insight into the complexity of today's agricultural farming systems.

Today's agricultural research must consider environmental implications, social issues, and overall economic growth within the agriculture sector. The Extension service must be at the forefront of delivering this information to the local farmer. The purpose of my thesis research is to determine **the relationship of knowledge and preparation that Extension educators possess about sustainable agriculture compared to the amount of information they offer their clientele concerning this topic.** The results of the research will be used to complete my thesis focused on sustainability in the agricultural industry that will partially fulfill the requirements for a Master of Science Degree in Agricultural Education. Determining the impact that sustainable agriculture has on today's society and being able to assist small scale farmers will allow for continued competition in marketing of agricultural commodities. In turn, Extension programs and other educational initiatives can be developed to aid in ultimately keeping today's families on the farm.

Participation in this research study, while voluntary, will only take a few minutes of your time. You may skip any question you are not comfortable answering. Please be assured that all information will be held as confidential as possible. Survey results will be reported in a summary format and individual responses will not be identifiable. You will notice a code number at the top right of the first page of the survey. This code will be used to identify non-respondents for follow-up and will be destroyed before the data are analyzed. A postage-paid self-addressed return envelope is provided for your convenience.

**Participation in the research by returning the questionnaire before March 5, 2004 will be greatly appreciated.**

Sincerely,

Erin M. Hersman  
Graduate Student

Harry N. Boone, Jr., Ph.D.  
Assistant Professor

VITA

**Erin M. Hersman**

May 2000 – May 2001	Research Assistant Supervisor: Dr. Larry R. Eckroat Penn State University Erie, PA
May 2001 – August 2002	Education Assistant Pennsylvania Sea Grant Supervisor: Eric Obert Penn State University Erie, PA
December 2001	Bachelor of Science Biology Penn State University Erie, PA
August 2002 – May 2003	Graduate Teaching Assistant Agricultural and Environmental Education Supervisor: Dr. Kerry S. Odell West Virginia University Morgantown, WV
May 2003 – May 2004	Graduate Research Assistant WVU Extension Service Supervisor: Professor Thomas R. McConnell West Virginia University Morgantown, WV
May 2004	Master of Science Agricultural and Environmental Education West Virginia University Morgantown, WV