

Perceptions Of Agricultural Education Teachers Toward Sustainable Agricultural Practices

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Abstract

The purpose of this study was to determine the perceptions of selected agricultural education teachers toward sustainable agricultural practices. Teachers' perceived levels of knowledge regarding sustainable agricultural practices were also examined, along with sources of information they used related to sustainable agriculture. The population included all agricultural education teachers in the state who taught the Agricultural Production and Management curriculum ($N = 92$). The results of the study showed that agricultural education teachers had generally positive views related to sustainable agricultural practices, especially as they related to environmental issues. However, concerns did exist about the amount of labor and management required to implement sustainable agricultural practices and whether sustainable agricultural practices were cost effective. Teachers perceived themselves as knowledgeable concerning sustainable agricultural practices, most often preferring to receive information on the subject from farm magazines and from information available from land-grant universities. Agricultural education teachers who had participated in five or more sustainable agriculture activities had significantly higher perceptions of sustainable agriculture on some items than those who had attended fewer than five activities.

Introduction/Theoretical Framework

Agricultural education teachers have the dual responsibility of imparting knowledge about agricultural subjects, as well as helping learners solve problems and build personal skills required to be productive members of society. To achieve this end, they have to first identify and develop an effective strategy for disseminating agricultural subject matter. Agricultural knowledge, so developed, has the potential to satisfy the needs of the learner, the agricultural society, and the larger society. In order to succeed in this endeavor, agricultural education teachers need a complete understanding of the agricultural industry and how it impacts the environment (Birkenholz and Craven, 1996).

The application of modern agricultural science and technology has contributed to increased productivity of American agriculture in the last half-century. The successes of American agriculture, however, have been accompanied by many ecological problems. Today, both rural and urban inhabitants feel threatened by dangers posed to the environment by modern agricultural practices such as the heavy use of chemicals. An alternative farming strategy called sustainable agriculture promises remedies to the problems created by industrialized chemical-based agriculture—if sustainable agriculture can be shown to be viable and becomes widely accepted (Stauber, Hassebrook, Bird, Bultena, Holgberg, MacCormack, & Menanteau-Horta, 1995).

The concept of sustainable agricultural practices is of concern for farmers, extension agents, agricultural education teachers, and others working in agricultural related occupations. Sustainability requires a holistic approach in order to understand the whole as an aggregation of interwoven parts working together (Hartfield & Karlen, 1994). The performance of sustainable agricultural practices is judged not in terms of how each practice works separately, but in terms of how the individual practices fit together and relate to each other, and how the systems that result relate to their environment and to other systems in the environment. While this is an important topic; there has been little opportunity for professionals to convene and discuss issues related to sustainability and to sustainable agriculture (Roling & Wagemakers, 1998).

The role of the agricultural education teacher in the community in the context of a changing agricultural environment and an increasingly informed consuming public demands that a teacher's skills, attitudes, and perceptions conform to the context of the cultural change (Somers, 1998). Agricultural education teachers have the knowledge and skills for preparing students to become agriculturists who will pass on knowledge to future generations through teaching and practicing the principles acquired at school. Their role becomes increasingly important when coupled with the fact that the number of people in the United States and the rest of the world who participate in and understand agriculture is shrinking (Birkenholz & Craven, 1996). Those who understand and participate in sustainable agricultural activities are even fewer. Thus, the role of agricultural educators is becoming increasingly important as the need for agricultural literacy becomes more urgent and public concern about food safety and environmental sustainability increases. In addition, agriculture teachers have the potential to create awareness of sustainable agriculture practices among students and their communities and raise interest in the use of sustainable agriculture practices. Agriculture teachers are regularly sought for advice in the farming community since they are thought to be exposed to direct information sources through land grant universities (Lionberger & Gwin, 1982).

Agriculture teachers need a greater understanding of sustainable agricultural practices, as well as leadership and support at both state and national levels in agricultural education in teaching this topic in the public schools. According to Nunnery (1996), agriculture teachers must build a framework for understanding agriculture from a variety of perspectives and sensitize their students and the farming community around their schools to the history of agriculture and its impact on land, the environment, and to human welfare. The agricultural industry realizes that sustainable agricultural practices are applicable in many settings. However, there are limitations on the teaching of sustainable agricultural practices, including lack of an appropriate curriculum and instructional materials (Straquadine, 1997).

The theoretical basis for this study was taken from work done by Hartfield and Karlen (1994), who suggested that emphasis must be placed on education in order to effect behavioral changes. Their work suggested that the transition from conventional to sustainable agricultural systems required a shift in values and adjustments in institutional and organizational arrangements in agriculture. Just as an increase in education in agriculture facilitated the transition from subsistence agricultural systems to commercial agricultural systems, an increase in literacy must be among the intervention strategies to be utilized in initiating a self-sustaining growth for the transformation of agriculture to sustainable agricultural practices. A more literate population is less likely to rely on tradition as the dominant factor to justify a particular action

and will be more likely to invoke rational decision making approaches. The agricultural education teacher is seen as an important factor in providing the appropriate education on this subject.

Previous research in this area shows that perceptions of agricultural educators may play an important role in the adoption of sustainable agricultural practices. A study by Conner and Kolodinsky (1997) of New England extension agents who had attended a conference on sustainable agriculture found that preconceived opinions of the participants had a large influence on the perceived usefulness of the information presented at the conference. Agunga (1995) found that a majority of extension agents in Ohio felt they should not be expected to provide information on sustainable agriculture to farmers. In doing so, they felt their credibility would be undermined. In a study involving agriculture teachers in 18 states, Straquadine (1997) found that agriculture teachers had positive opinions toward many sustainable agriculture concepts, but he concluded that agricultural education teachers needed to be trained in the use of printed materials on sustainable agriculture and needed to be provided follow up and support in the classroom and laboratory. Whent (1997) concluded that high school students who participated in a sustainable agriculture project involving hands-on experiences developed positive attitudes toward sustainable agriculture. Minarovic (1995) found that extension agents in North Carolina had an overall positive attitude toward sustainable agricultural practices.

Secondary agricultural education teachers are expected to serve as change agents in their agricultural communities and to provide information to their students on changing concepts in agriculture, as well as current issues. However, little is known about their perceptions of this growing movement toward sustainable agricultural practices.

Purpose and Objectives

The primary purpose of this study was to determine the perceptions of agricultural education teachers toward sustainable agricultural practices and the implications of their perceptions toward the dissemination of sustainable agriculture information. A secondary purpose of the study was to determine the level and sources of information about sustainable agricultural practices among the selected agricultural education teachers. The link between the primary and secondary purposes was established by determining how the level of knowledge and the sources of information were related to agricultural education teachers' perceptions toward sustainable agricultural practices. The following research questions provided a focus for the study:

1. How do agricultural education teachers perceive sustainable agricultural practices?
2. What is the self-perceived level of knowledge of agricultural education teachers on the topic of sustainable agricultural practices?
3. What sources of information are used by agricultural education teachers for sustainable agricultural topics?
4. What demographic characteristics of agricultural education teachers would influence their perceptions toward sustainable agricultural practices?

Methodology

This study utilized a descriptive research design to enable the researchers to describe the perceptions of agricultural education teachers toward sustainable agricultural practices. Factors proposed to have influenced these perceptions were explored to determine their degree of influence on the teachers' perceptions of sustainable agriculture. These factors included (a) agricultural education teachers' level of knowledge about sustainable agricultural practices, (b) their degree of use of sources of sustainable agricultural information, (c) sustainable agricultural practice in their agricultural education programs, (d) their fields of specialization in college, and (e) the number of educational activities on sustainable agricultural practices they had attended.

The population for this study consisted of the agricultural education teachers in the state who were teaching Agricultural Production and Management courses ($N = 92$). The list of teachers who were teaching the Agricultural Production and Management curriculum was provided by the state agricultural education staff. Those teachers were included in the population because the curriculum included both livestock and crop production practices and were most likely to influence sustainable agriculture practices in their communities. The entire population was surveyed.

Information from the review of the literature was used to develop the questionnaire used in this study. Extension Associates working in the area of sustainable agriculture at two land grant universities assisted with the development of the questionnaire, assuring content validity. The instrument was pilot tested for clarity and reliability, using agriculture teachers from Virginia. The Cronbach's Alpha coefficient of internal consistency for the items measuring the teachers' perceptions toward sustainable agriculture was .64. Minor revisions were made to the questionnaire to improve clarity, and two items were deleted to improve the internal consistency of the instrument. The instrument assessed the agriculture teachers' (a) perceptions toward sustainable agriculture practices, (b) perceptions of their knowledge level of sustainable agriculture practices, (c) degree of usage of information about sustainable agriculture, and (d) inclusion of sustainable agriculture practices in their curriculum.

The questionnaire was distributed to the agriculture teachers who taught the Agricultural Production and Management curriculum at the annual summer conference for agricultural education teachers. Teachers who were not present at the conference or who failed to complete the questionnaire at the conference were mailed a questionnaire following the conference. Two telephone follow-ups and one mailed follow-up of nonrespondents resulted in 80 responses, or 85% of the population. Due to the high response rate, nonresponse error was not a concern (Gall, Borg, and Gall, 1996).

Descriptive statistics were used to describe the data, including percentages, mean scores, and standard deviations for individual items. Analysis of variance was used to determine if agriculture teachers' perceptions about sustainable agricultural practices were significantly different based on their areas of college specialization and the number of sustainable agricultural education activities they had attended.

Results

The agricultural education teachers in this study were asked to describe their perceptions of sustainable agricultural practices on a scale of 1 to 5, with 5 representing very favorable perceptions, and 1 representing very unfavorable perceptions (see Table 1). Negatively stated

Table 1

Perceptions Toward Sustainable Agricultural Practices

Sustainable agricultural perception	<u>M</u>	<u>SD</u>
Sustainable agricultural practices may require additional management beyond conventional practices ^a	1.91	0.83
There may be insufficient labor for the workload required in sustainable agricultural systems. ^a	2.42	1.03
Economic gains when employing sustainable agricultural practices are not convincing ^a	2.57	0.82
Net farm income may decrease when a producer implements sustainable agricultural practices ^a	2.73	1.01
Recommended pest control methods for sustainable agricultural systems have potential for more pests in the long term. ^a	2.74	0.99
Recommended practices in sustainable agriculture have not been embraced by mainstream agriculture. ^a	2.78	1.07
The slow rate of adoption is due to lack of motivation among farmers. ^a	2.97	1.05
The adoption of sustainable agricultural practices is slow because farmers lack the knowledge to implement them. ^a	3.03	1.14
Recommended sustainable agricultural practices are not new and only need refinement to increase profit and protect the environment.	3.45	0.74
Sustainable agricultural systems should produce an adequate food supply to feed the world population.	3.56	1.06
An advantage of sustainable agricultural practices is reduction in the use of chemical fertilizers.	3.62	0.86
Environmental balance is one basis for sustainable agricultural practices.	3.83	0.62

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

^aNegatively stated item was reverse coded for analysis.

items were reverse-coded for analysis. Therefore, mean scores above 3.0 indicate more positive perceptions of sustainable agricultural practices, while mean scores below 3.0 indicate more negative perceptions of sustainable agriculture. Environmental concerns of agricultural

education teachers resulted in the areas of strongest support for sustainable agricultural practices. Over 80% of the teachers agreed or strongly agreed that environmental balance provided a strong basis for use of sustainable agricultural practices. In addition, 72.7% of the teachers also agreed or strongly agreed that the use of chemical fertilizers could be reduced with the use of sustainable agricultural practices. The teachers in this study were not concerned about sustainable agriculture's effect on the world food supply. Less than 20% of the teachers in the study disagreed or strongly disagreed that sustainable agricultural systems had the ability to produce an adequate food supply to feed the world population. The teachers did have concerns with some of the economic aspects of sustainable agricultural practices. Over 90% of the respondents agreed or strongly agreed that additional management practices are required when using sustainable agricultural systems. Also, 70% of the teachers felt that there may be insufficient labor available to meet the demands of sustainable agricultural systems. Slightly over half the teachers felt the potential economic gains from sustainable agricultural practices were not convincing.

Agricultural education teachers' self-perceived levels of knowledge of specific sustainable agricultural practices were assessed by asking teachers to respond on the following scale: 1 = Not informed; 2 = Slightly informed; 3 = Moderately informed; 4 = Well informed; and 5 = Highly informed. As shown in Table 2, agricultural education teachers in this study, as a whole, reported they were above the Moderately informed category for each of the sustainable agricultural practices identified.

Table 2

Agricultural Education Teachers Self-Perceived Knowledge of Sustainable Agriculture Practices

Practice	<u>M</u>	SD
Nutrient management plan which is a best management practice for improving water quality.	3.34	0.93
Animal production systems that emphasize disease prevention.	3.43	0.98
Crop rotations that reduce weed, disease, and pest problems	3.66	0.87
Integrated pest management practices that reduce the need for pesticides.	3.68	0.85
Scouting the field to determine if weed and insect control are needed.	3.70	0.86
Crop rotations that increase soil nitrogen and reduce the need for purchased fertilizers.	3.71	0.90
Crop rotations that reduce soil erosion.	3.95	0.78
Conservation tillage practices that reduce soil erosion and conserve water.	4.00	0.74

Note: 1 = Not informed; 2 = Slightly informed; 3 = Moderately informed; 4 = Well informed; 5 = Highly informed.

The agricultural education teachers were asked how often they used several potential sources of information about sustainable agricultural practices. The mean scores reported in Table 3 were computed from responses reported on a five-point scale, ranging from 1 = Never

and 5 = Always for each of the potential sources of information. The most frequently used sources of information about sustainable agriculture were farm magazines, with 64.9% of the teachers reporting they frequently or always used farm magazines as their source of information about sustainable agricultural practices. Slightly over half the teachers reported using information on sustainable agriculture from land-grant universities at least on a frequent basis. County extension agents and publications received from county extension offices were used frequently or always as a source of sustainable agriculture information by 41.6% of the agriculture teachers in this study. Private agriculture consultants were seldom used by agriculture teachers as a source of information on this topic.

Table 3

Sources of Sustainable Agriculture Information

Potential Source	Never	Seldom	Sometimes	Frequent	Always	<u>M</u>	<u>SD</u>
Private Ag. Consultants	24.7	42.9	19.5	7.8	5.2	2.26	1.08
Agribusiness Dealers	2.6	24.7	36.4	33.8	2.6	3.09	0.89
Area Extension Specialists	2.6	24.7	32.5	29.9	10.4	3.21	1.02
Soil Conservation Service	1.3	18.2	39.0	33.8	7.8	3.29	0.09
Other Ag. Ed. Teachers	2.6	13.0	41.5	32.5	10.4	3.35	0.93
County Extension Agents and Publications	0.0	9.1	49.4	36.4	5.2	3.38	0.75
Land Grant Universities	0.0	11.7	35.1	46.8	6.5	3.48	0.79
Farm Magazines	0.0	3.9	31.2	55.8	9.1	3.70	0.69

Participants in this study were drawn from several agricultural disciplines. The largest number of teachers had concentrated their undergraduate studies in the area of animal science (40.3%), followed by 20.8% in the area of horticultural science. Fewer teachers reported their agricultural specializations as crop science (10.4%) and soil science (3.9%). Several teachers reported a dual focus for their agricultural studies, combining disciplines such as agricultural engineering, agricultural economics, and biological sciences with animal science, horticultural science, or crop science disciplines. For the purpose of determining if the primary agricultural discipline of the teachers influenced their perception of sustainable agriculture, teachers were grouped into the following discipline areas: (a) animal science, (b) horticultural science, (c) crop science, (d) soil science, and (e) other disciplines, including combinations of disciplines. Results of analyses of variance tests showed no difference in perceptions of agriculture teachers on sustainable agricultural principles based upon agricultural disciplines studied in college.

Of the 77 teachers who provided data for this item, 72 had attended at least one educational activity on the subject of sustainable agriculture. The largest number of teachers (39%) had attended only one educational activity on the subject, but the majority of the teachers had attended more than one activity. Almost 25% of the teachers had attended five or more educational activities in which the focus was on sustainable agricultural practices. For the purpose of examining possible effects of participating in educational activities on the teachers' perceptions of sustainable agricultural practices, teachers were divided into four groups, based upon attending educational activities related to sustainable agriculture: (a) those who had attended no educational activities, (b) those who had attended only one educational activity, (c) those who had attended from 2 to 4 educational activities, and (d) those who had attended 5 or more educational activities. For 10 of the 12 perception items, no difference in the perceptions of agricultural education teachers toward sustainable agricultural practices was found based upon the number of educational activities they attended. Teachers who had attended five or more educational activities did have significantly more positive perceptions of sustainable agriculture than teachers who had attended from two to four educational activities for two items. Teachers who had attended five or more sustainable agriculture education activities felt more strongly that pest control methods recommended in sustainable agriculture systems would not result in increased pest problems in the long term than those who had attended 2-4 activities. Also, teachers who had attended five or more activities felt more strongly that the slow rate of adoption of sustainable agricultural practices was not the result of lack of motivation among farmers.

Conclusions, Discussion, and Recommendations

Based upon the findings of this study, the following conclusions have been developed:

1. Agricultural education teachers who teach the Agricultural Production and Management curriculum in this state have overall positive perceptions of sustainable agricultural principles and practices, especially when related to the potential for sustainable agriculture to improve the environment. However, they have less positive perceptions on the economic feasibility of sustainable agricultural practices.
2. Agricultural education teachers who have the most potential to teach sustainable agricultural concepts to their students believe themselves to be knowledgeable concerning sustainable agricultural practices. Therefore, agricultural education teachers should not be reluctant to teach sustainable agriculture principles based upon a lack of knowledge of the subject.
3. Agriculture education teachers receive information on sustainable agriculture from a variety of sources. Farm magazines and information from land-grant universities are important sources of information on sustainable agriculture for agricultural education teachers.
4. Perceptions of agricultural education teachers regarding sustainable agricultural practices are not influenced by the agricultural discipline in which they focused their studies as a part of their degree programs.

5. With minor exceptions, the number of workshops or educational activities attended by agricultural education teachers did not influence their perceptions of sustainable agricultural practices.

Table 4

Differences in Perceptions of Sustainable Agriculture Based Upon Number of Educational Activities Attended

Sustainable agricultural perception	F	p
Sustainable agricultural practices may require additional management beyond conventional practices ^a	0.25	0.86
There may be insufficient labor for the workload required in sustainable agricultural systems. ^a	1.45	0.23
Economic gains when employing sustainable agricultural practices are not convincing ^a	1.41	0.25
Net farm income may decrease when a producer implements sustainable agricultural practices ^a	0.11	0.95
Recommended pest control methods for sustainable agricultural systems have potential for more pests in the long term. ^a	3.81	0.01
Recommended practices in sustainable agriculture have not been embraced by mainstream agriculture. ^a	2.61	0.06
The slow rate of adoption is due to lack of motivation among farmers. ^a	2.89	0.04
The adoption of sustainable agricultural practices is slow because farmers lack the knowledge to implement them. ^a	0.55	0.65
Recommended sustainable agricultural practices are not new and only need refinement to increase profit and protect the environment.	0.89	0.45
Sustainable agricultural systems should produce an adequate food supply to feed the world population.	1.26	0.30
An advantage of sustainable agricultural practices is reduction in the use of chemical fertilizers.	0.62	0.60
Environmental balance is one basis for sustainable agricultural practices.	1.05	0.38

Note: Groups included 0 educational activities, 1 educational activity, 2-4 educational activities, and 5 or more educational activities.

^aReverse coded.

Agricultural education teachers have the opportunity to reach a wide audience through their secondary school agricultural education curricula. Imparting new agricultural practices to the next generation of agricultural producers cannot be overlooked as a viable way to serve as a change agent in agriculture. As new knowledge and practices related to sustainable agriculture are developed, agricultural education teachers can take the initiative to integrate this information

into their existing curricula. There overall positive perceptions of the benefits of sustainable agricultural practices to the environment may serve as a major influence for them to promote sustainable agriculture. According to Williams and Wise (1997), agriculture teachers need to know how components of sustainable agriculture fit together to impact the environment, farm profits, and the local community. Both Williams and Wise and Whent (1997) found that secondary students were concerned about environmental safety. Teaching sustainable agricultural practices may be an appropriate response to addressing the concerns of students.

Agricultural education teachers reported relatively high levels of knowledge regarding sustainable agricultural practices. Many of the components of sustainable agriculture are not new to conventional agriculture, as single components. It is possible that teachers could have regarded each of these components of sustainable agriculture separately, and not as a total program of sustainable agricultural practices. The high perceived levels of knowledge of sustainable agriculture could have accounted for the minimal impact of educational activities related to sustainable agriculture on the perceptions of the teachers. Perhaps the recommendation of Gamon, Harrold, and Creswell (1994) to the extension educators is relevant with this population. They suggested that extension educators look for new delivery methods and educational approaches for reaching clientele.

The following recommendations are made based upon the results and conclusions of this study:

1. Sustainable agricultural practices differ depending upon the type of agricultural production in a specific situation. In order to implement sustainable agricultural practices into the secondary curriculum, teachers need specific information on sustainable livestock production systems and sustainable crop production systems. This information should include materials that could be infused into the existing agricultural education curriculum and could include agricultural research activities related to sustainable agricultural practices that could be conducted by students.
2. Teachers should be provided information on the economic viability of sustainable agricultural practices. In order for teachers to effectively promote sustainable agriculture programs in their local communities, they must be convinced that the practices will not have an adverse effect on agricultural profitability.
3. Agricultural programs at colleges and universities should provide information on sustainable agriculture programs in a wide variety of agricultural disciplines. Agricultural education teachers come from a variety of agricultural backgrounds, so it is important to infuse sustainable agricultural principles into a variety of agricultural disciplines in order for teachers to be exposed to this information.
4. As with all other emerging areas in the field of agriculture, teachers should be encouraged to keep up-to-date with the latest developments in sustainable agricultural practices. Teachers should be encouraged to utilize local cooperative extension professionals more than they have in the past as a source of information on sustainable agriculture. Attending workshops

and other educational activities related to sustainable agriculture should continue to provide valuable information to agricultural education teachers.

5. Future research on sustainable agriculture should focus on sustainable agricultural systems, rather than components of systems. It is important to know that teachers understand how all of the components fit together into a system of agricultural management if they are to be expected to teach sustainable agricultural management practices to their students.

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