

Perceptions of Iowa Secondary School Agricultural Education Teachers and Students Regarding Sustainable Agriculture

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Abstract

The purpose of this study was to determine the perceptions of Iowa agricultural education teachers and students about sustainable agriculture. The teacher population for the study included all secondary school agricultural education teachers in Iowa (N=248). A stratified random sample of 60 teachers (schools) was selected, 10 from each of the six FFA districts. Teachers in the sample were asked to administer instruments to all eleventh and twelfth grade students in their agricultural education classes, yielding 464 student participants. Likert-type scales were used to measure perceptions related to knowledge and impact of sustainable agriculture. Teachers perceived themselves as having additional things to learn about sustainable agriculture practices and students measured themselves as only "knowing a little" about them. Teachers and students alike perceived sustainable agriculture impacting agriculture and the environment in several ways. Relatively high perceptions of sustainable agriculture were observed for both groups. The findings of this study support the need to integrate sustainable agriculture into the secondary school agricultural education curriculum.

Food and fiber production systems that emphasized high yields have been remarkably effective in making United States agriculture one of the most productive systems in the world. This impressive productivity may be offset, however, by dependence on pesticides and synthetic fertilizers, soil erosion, surface and groundwater contamination, and food safety. The public has reacted strongly to reports of water and food contaminated by agricultural practices, concerns for the health of people who live and work around pesticides, and reports of depletion of our natural resources, including soil, water, forests, wetlands, and native prairies. Since the 1980s, attention has been given to developing agricultural systems so that inputs and returns are optimized, yet protective of our environment (Joint Committee on Sustainable Agriculture, 1991).

Today, agricultural sustainability has become a significant issue in the United States and

internationally. Agricultural systems of the past that focused only on economical goals are now tempered by human needs and environmental issues. Brady (1990) stated that:

"There is a growing awareness that agricultural systems must provide not only what humanity needs today but what the human family will require a decade or even a century from now. Sustainable agriculture is a topic whose time has come (p. 104)."

After studying the writings of others, Firebaugh (1990) proposed that the goals of sustainable agriculture are to: (1) maintain or improve the natural resources base, (2) protect the environment, (3) ensure profitability, (4) conserve energy, (5) increase productivity, (6) improve food quality and safety, and (7) create more viable socioeconomic infrastructure for farms and rural communities (p.674).

In a 1990 Iowa study, a majority of farmers perceived sustainable agriculture as resulting in improved family health, healthier livestock, lower production costs, improved soil conditions, and improved environmental conditions (Lasley and Kettner, 1990).

Scientific, technological, economic, social, and environmental trends have caused some farmers to turn to farming practices that reduce purchased off-farm input cost and the potential for environmental damage through more intensive management and efficient use of natural and biological resources (Board of Agriculture National Research Council [BANRC], 1989). BANRC studied farms across the United States that were using a combination of conventional and sustainable practices.

Enterprises featuring sustainable practices ranged from the production of crops and livestock in Ohio, to tree fruits and vegetables in Florida, to rice production in California. Beus and Dunlap in (1990) advanced that a change from the present paradigm of conventional to sustainable agriculture would require that greater value be given to "humanity," "community," and "nature." A 1995 study of the adoption of sustainable agricultural practices among Iowa farmers found that a majority of the respondents had either adopted or were in the process of adopting the following practices: soil nitrogen testing, spring/summer nitrogen fertilizer application, use of green manure, mechanical weeding, reduced rates of herbicide, banded herbicide, crop rotation, and reduced nitrogen fertilizer rates. Compatibility of the sustainable practices with existing farming systems was a major factor in the level of adoption by farmers. (Alonge and Martin, 1995).

Management of natural resources has been a part of the agricultural education curriculum in secondary schools since federally supported vocational agriculture education was created in 1917. A National Academy Press (1989) report

re-emphasized that sciences related to natural resources should be incorporated into new components of agricultural education in secondary schools and that the curriculum should be expanded to include environmental and resource management.

Marshall and Herring (1991) advocated that: The inclusion of sustainable agriculture in the curriculum is essential. This will probably not occur, at least at the secondary level, as separate courses. Rather as units in agriculture are taught, discussion of these issues will be integrated. This will result in a generation of graduates knowledgeable of the critical issues facing agriculture in the 21st century (p. 12).

Recognizing that additional knowledge and skills will be needed by farmers to adopt new practices, federal, state, and local educational agencies have developed programs ranging from awareness of sustainable agriculture concepts, to on-farm research, to demonstration of specific practices. The Cooperative Extension Service, farmer organizations, schools, colleges, national and state centers focusing on sustainable agriculture, and others have added elements of sustainable agriculture education in their programs. Firebaugh (1990) advanced that "Education--primary, secondary, and higher education, as well as informal education--should take an open view of sustainable agriculture" (p. 676).

To join in the movement to provide sustainable agriculture education, agricultural education at the national, state, and local levels has developed educational materials on sustainable agriculture. Teacher inservice programs have been conducted to disseminate curriculum materials and instructional aids and to strengthen teacher understanding of sustainable agriculture. Now that several years have passed since the initial introduction of sustainable agriculture into the secondary school agricultural education curriculum,

an assessment of student and teacher perceptions is needed to guide further development of educational initiatives in this area.

Purpose and Objectives

The purpose of this study, therefore, was to determine the perceptions of Iowa secondary school agricultural education teachers and students about sustainable agriculture. The specific objectives of the study were to: (1) determine teacher and student self-perceived knowledge of selected sustainable agriculture practices, and (2) determine the impact of sustainable agriculture as perceived by teachers and students.

Methods and Procedures

Population and Sample

The teacher population of the study included all the secondary school agricultural education teachers in Iowa (N=248). Stratified random sampling was used to ensure proportional representation from each of the state's geographical regions. Ten teachers (schools) were randomly selected from each of the six FFA districts in Iowa. Thus, the sample included the 60 agricultural education teachers in these schools and selected students enrolled in agricultural education classes. The study targeted eleventh and twelfth grade students, however, some teachers administered the instruments to all their agricultural education students. Forty-one of the teachers responded (68% return rate) by completing a teacher instrument and involved 464 of their students in completing instruments.

Instrumentation

Two instruments were developed, one for teachers and one for students, even though the items were identical, except for the demographic questions. Likert-type scales were used for the following perception measures: (1) knowledge of

11 sustainable agriculture practices commonly advanced in Iowa and (2) impact of sustainable agriculture on 16 aspects of agriculture and the environment. A panel of faculty and graduate students in the Agricultural Education and Studies Department at Iowa State University who were familiar with sustainable agriculture practices and agricultural education programs in secondary schools reviewed the instruments for clarity and content validity. Cronbach's alpha coefficients for the 11-item knowledge scale were .90 for both the student instrument and the teacher instrument, and .82 and .81, respectively, for students and teachers, for the 16-item impact scale.

Data Collection and Analysis

One teacher instrument and multiple student instruments were mailed to each school in the sample. Accompanying the instruments was a cover letter explaining the purpose of the study and providing directions for teachers to follow in completing the teacher instrument and directions for administering the student instruments to their eleventh and twelfth grade agricultural education students. Telephone calls were made to non-respondents to encourage their participation in the study. No statistically significant difference was observed in the responses of early and late respondents. Descriptive statistical treatments such as percentages, means, and standard deviations were applied to the data.

Results

Demographic Characteristics

Of the teachers responding, 62.5% had taught agricultural education for 10 or more years, 63.4% were 40 years of age or younger, 53.6% had completed education beyond the B.S. level, and 95.1% had farming backgrounds. 76.4% of the student respondents were eleventh or twelfth graders, 83.3% were male, and 63.2% lived on

farms and another 12.4% lived in a rural area but not on a farm.

Knowledge of Sustainable Agriculture

Teachers and students were asked to indicate their level of knowledge of sustainable agriculture practices using a four-point scale: 1=know nothing, 2=know a little, 3=know some, 4=know a lot. The data in Table 1 reveal that teachers and students both feel they have additional things to learn about the 11 selected sustainable agriculture practices. Both teachers and students had the least knowledge of “allelopathy” and “agroforestry.” These means were below 2.0 on a four-point scale. Teachers perceived they know the most about rotational grazing, row banding of herbicides, filterstrips, and narrow strip intercropping. Students know the most about rotational grazing, low input livestock facilities, and narrowstrip intercropping. The composite mean (2.87) for teachers was above mid-point (2.50) on the four-point scale while the composite mean (2.16) for students was below mid-point.

Impact of Sustainable Agriculture

Teachers and students were asked to indicate their perceptions regarding the impact of sustainable agriculture on agriculture and the environment. A five-point scale was used (1= very unlikely, 2=somewhat unlikely, 3=unsure, 4=somewhat likely, 5=very likely) to measure impact perceptions. The data in Table 2 present the means and standard deviations for the two response groups for the perceived impact of sustainable agriculture. The top four impacts teachers perceived from sustainable agriculture were conservation of soil, greater management requirements, reduced use of chemicals, and protection of groundwater. The greatest impacts students perceived from sustainable agriculture were conservation of soil, changes in equipment, protection of groundwater, safer food, protection of wildlife, and protection of woodlands. The composite means (3.82 and 3.60) for the groups were above mid-point (3.0) on a five-point scale, indicated that agricultural education teachers and students perceive

Table 1. Knowledge of Sustainable Agriculture Practices as Perceived by Teachers and Students (N=41 teachers; 464 students)

Practice	Teachers		Students	
	Mean	SD	Mean	SD
Filmstrips	3.15	.79	2.01	.91
Rotational Grazing	3.51	.60	2.80	.87
Narrow strip intercropping	3.10	.66	2.34	1.00
Fall seeded cover crop	3.05	.71	2.33	.98
Allelopathy (cover crop)	1.85	.88	1.31	.59
Low input livestock facilities	2.90	.68	2.52	.94
Row banding of herbicides	3.37	.62	2.22	1.00
On-farm research	2.90	.80	2.32	.90
Integrated pest management	3.02	.72	2.14	.90
Late spring soil nitrate test	2.85	.85	2.14	1.00
Agroforestry	1.90	.86	1.63	.83
Composite	2.87	.74	2.16	.89

Table 2. Impact of Sustainable Agriculture Practices as Perceived by Teachers and Students (n=41 teachers; 464 students)

Practice	Teachers		Students	
	Mean	SD	Mean	SD
Protection of groundwater	4.15	.69	3.89	.88
Lower profits for farmers	3.00	.67	3.13	-.82
Benefits for Iowa citizens	3.95	.67	3.47	.84
Benefits of society	4.07	.72	3.56	-.81
Conservation of soil	4.49	.51	3.97	.97
Reduced use of chemicals	4.18	.98	3.71	-.97
More small farms	2.70	1.04	3.10	-.96
Better rural communities	3.35	.89	3.40	.85
More expensive food	3.35	.77	3.22	.95
Safer food	3.70	1.02	3.81	.87
Increased labor requirements	4.00	.45	3.41	-.94
Changes in equipment	4.03	.70	3.90	.83
More livestock	3.60	.90	3.55	.82
Greater management requirements	4.45	.67	3.78	.84
Protection of wildlife	4.05	.64	3.81	.89
Protection of woodlands	4.00	.68	3.81	.89
Composite	3.82	.39	3.60	-.45

sustainable agriculture impacting aspects of agriculture and the environment.

Conclusions and Recommendations

On the basis of the findings of this study, it was concluded that teachers perceived themselves as having additional things to learn about sustainable agriculture practices and students rated themselves as only “knowing a little” about them. Since some sustainable agriculture practices are relatively new or may be applied in different ways, both students and teachers may not have had first-hand experience with them on their home farms or have had an opportunity to observe them in their communities.

As new knowledge of sustainable agriculture practices is developed, initiatives must be taken to integrate them into the secondary school agricultural education curriculum. Inservice

programs are needed to help teachers understand the new practices and their applications in various farming systems. Curriculum materials, instructional aids, and innovative approaches to teaching, which will allow students to experience sustainable agriculture practices, will be needed to facilitate student learning.

As with other new agricultural practices, agricultural education programs in secondary schools have an opportunity to help with the diffusion and adoption of sustainable agricultural practices in local communities. Alonge and Martin (1995) discovered that a large number of farmers were at the information gathering and persuasion stages with regard to sustainable agriculture practices. Community projects, e.g., on-farm research and demonstration plots, featuring sustainable agriculture practices could enhance learning for both secondary school agricultural education students and adults.

The findings indicate that teachers and students alike perceive sustainable agriculture as impacting agriculture and the environment in several ways. Even though students were positive about the impact of sustainable agriculture, they may not see how various elements of sustainable agriculture fit together. In contrast, teachers may more fully understand how the elements interconnect, recognizing that a change in one practice will affect other areas in the sustainable agriculture paradigm. Students were most positive when it came to specific impacts like “conservation of soil,” “protection of groundwater,” “protection of wildlife,” and “safer food.”

Beus and Dunlap (1993) advanced that concerns for humankind, the community, and nature are important elements of the new sustainable agriculture paradigm. Teachers can build upon student understanding in these areas in teaching the more complex elements of sustainable agriculture. The Board of Agriculture National Research Council (1989) and Alonge and Martin (1995) discovered that farmers are starting to utilize sustainable agriculture practices. As such new practices are applied in farming systems, community resources will become available to support the teaching of sustainable agriculture in the secondary school agricultural education curriculum.

The perceptions of sustainable agriculture by teachers and students found in this study emphasize the need to integrate sustainable agriculture into the secondary school agricultural education curriculum.

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