Secondary Agricultural Teachers Need College Level Instruction on Sustainable Agriculture

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Implications For Higher Education

While this study was concerned primarily with teachers of secondary agricultural education, there are implications for university and college preparation of future agriculturalists and teachers. Findings revealed that many teachers view sustainable agriculture to be an important aspect of the agricultural industry and a necessary part of an education revolving around this industry. This being the case, post-secondary agricultural curriculum components dealing with sustainable agriculture should be developed. This will provide future teachers and practitioners with information upon which to base decisions concerning the inclusion of sustainable agriculture aspects in agribusiness operations as well as agricultural education teaching material. Furthermore, colleges and universities should take the lead in developing and implementing in-service and training programs on sustainable agriculture for teachers and practitioners presently in the field. As educators, we have an obligation to prepare students to think critically about the various concepts of agriculture and make informed decisions concerning the future of the industry. If this task is to be accomplished, education in and about agriculture must include giving students the opportunity to explore the concepts related to sustainable agriculture.

In recent years the agricultural industry has been criticized as being wasteful and harmful to the environment and the whole of society. There is also concern that rural communities and the rural way of life are slowly becoming obsolete because of the lack of practices that conserve and maintain the resources needed for the production and management of agricultural products (Poincelot, 1986). As a result of these criticisms and concerns many people in the field have begun to take a closer look at the production and management practices of modern agriculturalists and have tried to develop a farming model or paradigm that will help American farmers and rural communities survive and thrive as society enters the twenty-first century.

One of the most popular, as well as controversial, farming models being lauded by agriculture professionals is that of sustainable agriculture. Most researchers and experts in the field define sustainable agriculture as a holistic agricultural management philosophy that emphasizes the application of scientific knowledge to produce acceptable long-term economic returns, protect the environment, and promote social values including human health and safety (Texas Agricultural Extension Service, 1989). Before this knowledge can be applied, however, it must be learned and accepted by those who may be in a position to use it later, specifically secondary agricultural education students.

While secondary agricultural education students may have always studied the basic cultural practices that many believe to be the basis for sustainable agriculture, the student who truly studies sustainable agriculture will view the concept as a holistic management scheme to be utilized for the purpose of improving the total farm environment. For example, one of the most important aspects of the economic impact of sustainable agriculture is rural community development and sustainability. Edward, et al. (1990) contended that people in rural communities are beginning to realize how agriculture and the community are interrelated and that there are ways to make the farm work for the community. Woods and Sanders (1987) noted that the relationship between agricultural and non agricultural sectors of local economies implies that agriculture depends on the rest of the economy and the economy depends on agriculture. This holistic concept is often overlooked in many traditional agricultural education programs (Plowman, 1989). Stevens (1967) noted agriculture students must not only be taught to produce, but also to realize their responsibility for promoting family welfare, farm efficiency, community survival, and societal contributions on the part of agriculturalists.

The understanding of sustainable agriculture may be of great benefit to future agriculturalists in maintaining and strengthening the agricultural infrastructure in the U.S.A. and the world (Madden, 1988). Cooper and Gamon (1991) stated:

A knowledge of sustainable agriculture subjects is needed to ensure that each subsystem within the farm system is managed in the best way. Current and prospective agriculture students should be introduced to the application of these subjects in relation to the total farm operation (p.13).

It is for this reason that it appeared to be essential to assess the extent to which sustainable agriculture topics were being taught in secondary agricultural education classes.

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Problem / Purpose

While the subject of sustainable agriculture is currently in the spotlight of the agricultural industry, there has been a lack of evidence that secondary agricultural education instructors were teaching sustainable agriculture in their classes. An assessment of the extent to which sustainable agriculture was being taught in secondary agricultural education classes was needed to determine the course of action that teachers should take to ensure that this new area of agriculture is made available to all students.

The primary purpose of this study was to determine the extent to which Oklahoma agricultural education instructors were teaching sustainable agriculture topics in their classes. A secondary purpose of this study was to assess the availability and usefulness of curricular and teaching materials in this area.

Procedures

In order to survey the utilization of sustainable agriculture concepts as topics for agricultural education classes it was first necessary to identify a representative sample of these concepts that are accepted by the agricultural industry. A primary source used to develop a list of accepted sustainable agriculture concepts and practices was a study completed by Purswell (1991) in which sustainable agriculture practices used by Oklahoma farmers and ranchers were identified. Concepts dealing with sustainable agriculture as it relates to rural community development were derived from extension fact sheets and other publications pertaining to the economic effects of sustainable agriculture. The list of accepted sustainable agriculture concepts included:

- Rural community development
- Alternative enterprises
- Animal manure fertilizer
- Resistant crops
- Cover crops
- Organic gardening
- Parasite monitoring
- Water quality
- Minimum or non-tillage
- Strip cropping
- Green manure crops
- Soil erosion control
- Rural population sustainability
- Alternative power
- Integrated pest management
- Wildlife management
- Range and brush control
- Compatible crops
- Pasture rotation
- Fallow ground
- Crop rotation
- Contour farming
- Drip irrigation
- Mulching

These concepts and practices were categorized into five groups for use in gathering more general information concerning teachers' perceptions. These groups were: Conservation practices, Environmental concerns, Alternative enterprises, Rural development, and Integrated pest management.

A researcher developed instrument was utilized to gather the data necessary for the conduct of this study. Sixteen items were developed to address each of the objectives set forth in the study.

The population for this study included all secondary Agricultural Education instructors in the state of Oklahoma. The entire population (446 teachers) was surveyed. A total of 368 (82.51%) teachers responded. T-tests and Chi-square procedures were utilized to determine no significant difference between early and late respondents.

Results

Emphasis Placed on Sustainable Agriculture

The overall amount of emphasis placed on teaching sustainable agriculture topics, illustrated in Table 1, was observed to be mostly moderate. Of the twenty-three topics listed, only six were shown to be given high emphasis by teachers. These six topics were alternative enterprises, rural community development, pasture rotation, range and brush control, water quality, and soil erosion. Only one of the topics listed, drip irrigation, was shown to be given low emphasis by teachers.

Table 1. Emphasis Placed by Teachers Upon Selected Sustainable Agriculture Topics.

Topics	Mean	SD	Interpretation
Water Quality	3.15	.84	High
Soil Erosion	3.15	.80	High
Pasture Rotation	2.77	.86	High
Alternative Enterprises	2.63	.94	High
Range/Brush Control	2.62	.94	High
Rural Community Development	2.61	.90	High
Parasite Monitoring	2.35	.94	Moderate
Cover Crops	2.17	.89	Moderate
Compatible Crops	2.13	.86	Moderate
Rural Population Sustainability	2.09	.97	Moderate
Integrated Pest Management	2.04	.84	Moderate
Contour Farming	2.04	.88	Moderate
Minimum/No Till	2.01	.92	Moderate
Animal Manure Fertilizer	1.98	.83	Moderate
Mulching	1.97	.87	Moderate
Resistant Crops	1.93	.84	Moderate
Crop Rotation	1.85	.80	Moderate
Strip Cropping	1.81	.82	Moderate
Organic Gardening	1.80	.86	Moderate
Fallow Ground	1.74	.80	Moderate
Alternative Power	1.62	.77	Moderate
Green manure Crops	1.59	.74	Moderate
Drip Irrigation	1.44	.67	Low

(Scale: 1 = Low; 2 = Moderate, 3 = High, 4 = Extreme)

Courses in Which Sustainable Agriculture is Taught

Teachers were asked to identify the sustainable agriculture topics they would most likely teach in specific courses. A summary of the responses to this item is presented in Table 2.

Table 2. Most Frequently Identified Sustainable Agriculture Topics That Would be Taught in Specific Agricultural Education Courses.

Course / Activity	Topic Most Frequently Identified	N = 368	
		N	%
Natural Resources	Wildlife Management	270	(73.37)
Production Management I	Pasture Rotation	144	(39.13)
Agriculture II	Cover Crops	137	(37.23)
Horticulture I	Organic Gardening	123	(33.42)
Agriculture I	Alternative Enterprises	79	(21.47)
Production Management II	Resistant Crops	78	(21.20)
8th Grade Agriculture	Alternative Enterprises	34	(9.24)
Agr. Sales and Service	Rural Community Dev.	21	(5.71)
Employment in Agribusiness	Rural Pop. Sustainability	19	(5.16)
Agricultural Mechanics I	Alternative Power	16	(4.35)
Agr. Products & Mktng.	Alternative Enterprises	16	(4.35)
Agricultural Mechanics II	Alternative Power	15	(4.08)
Ag. Career Orientation	Rural Pop. Sustainability	15	(4.08)
Forestry	Wildlife Management	12	(3.26)
Equine Management	Alternative Power	10	(2.72)
FFA	Rural Pop. Sustainability	23	(6.25)
SAE	Alternative Enterprises	10	(2.72)

Curriculum Material

When asked to rate the adequacy of curriculum material for teaching sustainable agriculture concepts teachers indicated that for most concepts it was fair. One sustainable agriculture concept, conservation practices, was rated as being good in the current curriculum material. Integrated pest management, on the other hand, was rated as being poor in the current curriculum material.

Reasons for Teaching Sustainable Agriculture

Teachers were asked whether or not they would teach or had taught sustainable agriculture topics in their classes. Those who indicated that they had taught or would teach these topics were asked to select, from a list of responses, those reasons that influenced them to teach sustainable agriculture topics in their classes. Of the 368 teachers responding to the survey, 178 (48.37%) stated that they had taught sustainable agriculture because of a personal interest in the area. The next most frequently identified reasons for teaching sustainable agriculture topics were student interest and economic importance with 128 (34.78%) and 127 (34.51%) teachers responding respectively. Personal experience was cited by 110 (29.89%) teachers as the reason that they chose to teach sustainable agriculture topics in their classes.

Reasons for Not Teaching Sustainable Agriculture

The teachers who indicated that they had not or would not teach sustainable agriculture topics in their classes were also asked to identify reasons for this decision. Of the teachers surveyed, 68 (18.48%) indicated that they would not or had not taught sustainable agriculture topics because of a lack of curriculum material available on the subject. Lack of student interest was cited by 50 (13.59%) as being the reason for not teaching sustainable agriculture topics. Forty-seven (12.77%) teaches cited lack of personal interest as the reason for not teaching or planning to teach sustainable agriculture topics. Finally, personal experience was indicated by 38 (10.33%) as the reason for not teaching sustainable agriculture topics.

Importance of Sustainable Agriculture to Students

Teachers were asked to provide reasons, in an open-ended question, for why they did or did not think it was important for students to learn sustainable agriculture. Of the 106 teachers who chose to respond to this item, 25 (23.58%) provided positive environmental responses, 15 (14.15%) positive economic responses were listed, 50 (47.17%) provided positive social responses, 3 (2.83%) gave negative social responses, and 13 (12.26%) gave positive miscellaneous responses.

Teacher Knowledge of Sustainable Agriculture

In order to determine the perceived knowledge level of teachers in sustainable agriculture topics, teachers were asked to rate their knowledge in five broad areas that were identified as being related to sustainable agriculture. Teachers rated their knowledge below average in only one area, integrated pest management. Knowledge in all other areas was rated as average.

Teachers were also asked to rate their comfort level in teaching topics in the various sustainable agriculture areas. Respondents rated their comfort level to be very uncomfortable in the area of integrated pest management and uncomfortable in the area of rural development. Teachers stated that they would be comfortable teaching in the areas of alternative enterprises, conservation practices, and environmental concerns. A Pearson Product Moment correlation confirmed a correlation of .93 between knowledge level and comfort level.

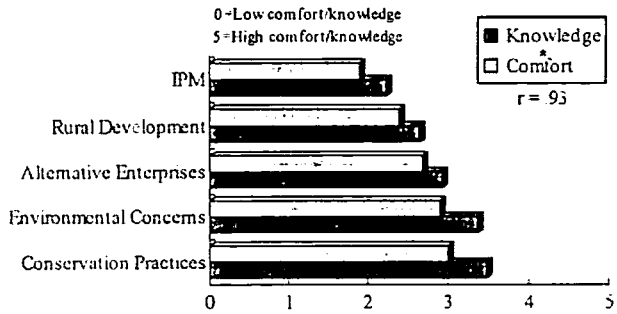

Figure 1. Relationship Between Knowledge of and Comfort Level for Teaching Sustainable Agriculture Topics.

In-Service on Sustainable Agriculture

Teachers were asked to rate the need for in-service on the five identified sustainable agriculture subject areas. All subject areas were rated as having a moderately high need for in-service with the exception of integrated pest management which was rated as having a moderate need.

In order to determine teachers' overall perceptions about sustainable agriculture they were asked to respond to an open ended question concerning their personal opinion of the sustainable agriculture movement. Responses were first categorized by their positive or negative nature and then grouped into one of four categories, environmental responses, economic responses, social responses, and miscellaneous responses. A total of 87 teachers chose to respond to this item.

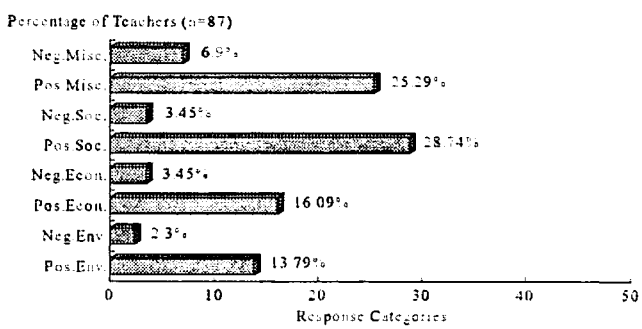

Figure 2. Responses Concerning Teachers' Opinions of Sustainable Agriculture by Selected Category.

Conclusions and Recommendations

1. That teachers taught a variety of the courses offered in the Agricultural Education programs in Oklahoma, but tended to more often teach those courses that could be considered traditional and/or production based.

2. That teachers emphasized those sustainable agriculture topics that could be considered more traditional since many stated that they had always taught the topics, just not under the title of sustainable agriculture. Examples of this

can be seen in Table 2. Most of the sustainable agriculture topics were viewed by teachers as being best suited to the production oriented courses and an effort should be made to in-service teachers on ways to integrate the teaching of these topics into courses in which they have not traditionally been taught.

3. That curriculum material dealing with sustainable agriculture was, in the eyes of the teachers, mostly fair at best and that more curriculum material dealing with sustainable agriculture should be developed. It was further concluded that teachers were somewhat unwilling to teach topics that are not specifically covered in the core curriculum material for a particular course and should be provided in-service on procurement and use of outside resource material on sustainable agriculture.

4. That teachers generally believed that sustainable agriculture should be taught to secondary Agricultural Education students because of personal interest of the teacher, student interest, and economic importance. The main reason that teachers would not teach sustainable agriculture was concluded to be a lack of quality curriculum material over the subject. It was further concluded that teachers believed that the importance of sustainable agriculture was due to the impact that the movement would have on societal and environmental concerns of the agricultural industry.

5. That teachers perceived their knowledge of sustainable agriculture to be average in all areas with the exception of integrated pest management and that they would feel comfortable teaching topics in all areas except rural development and integrated pest management. In-service should be provided in these areas.

6. That teachers perceived that some sustainable agriculture practices were being utilized by the majority of producers in the state. It was further concluded that most of the sustainable practices identified as being important were viewed, by teachers, as those practices that had always been done to meet the demands of a particular enterprise. Materials should be developed to show the wide variety of sustainable agriculture practices that may be used by producers.

7. That teachers were interested in participating in in-service training covering those topics with which they already felt comfortable and perceived their knowledge level to be average. It was further concluded that teachers felt a need for in-service over those sustainable agriculture practices that were commonly used by Oklahoma producers.

8. That teachers generally had a positive opinion of sustainable agriculture, but were somewhat pensive about the long-range value of all of the views and practices included under the sustainable agriculture concept.

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