

## RATIONALE FOR RESEARCH ON INCLUDING SUSTAINABLE AGRICULTURE IN THE HIGH SCHOOL AGRICULTURAL EDUCATION CURRICULUM

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### Abstract

*Sustainable agriculture is a **global** philosophy guiding the development of agricultural systems that address economic, social, and environmental issues in a multidisciplinary manner. Sustainable agriculture requires a holistic, system-oriented approach to solving problems in the food and fiber industry. Agricultural research has been targeted toward developing new technologies and practices which are economically, environmentally, and socially acceptable. Subject matter from a multidisciplinary perspective can be used to support decision making in the food and fiber system from production to consumption. Subject matter featuring multidiscipline knowledge facilitates holistic and integrative approaches to education. Including sustainable agriculture in the high school agricultural education curriculum would allow the agricultural education profession to become a partner in achieving the goals of a sustainable agriculture industry and at the same time enhance the scientific nature of the curriculum; however, research is needed to show the way. Research is needed in all four of the scholarship functions advanced by Boyer (1990) – discovery, integration, application, and teaching.*

### Introduction

Agriculture is a rapidly changing industry. New advancements in science and technology provide dynamic opportunities for agriculture to address economic, social, and environmental issues in a multidisciplinary manner. Developments in agricultural systems that address profitability along with meeting human needs and improving the environment form a global philosophy commonly referred to as sustainable agriculture. Firebaugh (1990) advanced that the goals of sustainable agriculture are to (1) improve natural resources, (2) protect the environment, (3) ensure profitability, (4) conserve energy, (5) improve food quality and safety, and (6) create a more viable socioeconomic infrastructure for farms and rural communities.

The National Research Council (1988) called for new efforts to reform secondary school

agricultural education programs to better prepare students for the agricultural industry. Special emphasis was placed on the need for ongoing efforts to upgrade the scientific and technical content of the program. Including sustainable agriculture in high school agricultural education programs can help meet the goals of sustainable agriculture and enhance the high school agricultural education curriculum.

### Objectives

The purpose of this paper is to develop a rationale for research on including sustainable agriculture in the high school agricultural education curriculum from the perspective of teaching and learning in agriculture, the discipline of agricultural education. The objectives are two-fold: (1) to summarize the challenge of agricultural sustainability and (2) to describe the need for agricultural education curriculum enhancement.

## Procedures

A library search was used to gather data for the study. Special attention was given to searching for priorities of the food and fiber system and opportunities for enriching the high school agricultural education curriculum with sustainable agriculture content. The findings are divided into two major parts that parallel the objectives of the study.

## Findings

### Challenge of Agricultural Sustainability

The historical productivity of the U. S. food and fiber system is offset by dependence on pesticides and synthetic fertilizers, soil erosion, surface and groundwater contamination, and food safety concerns. Since the 1980's more attention has been given to developing agricultural systems that optimize inputs and returns, yet protect the environment (Joint Committee on Sustainable Agricultural, 1991). "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" (Brady, 1990, p. 20).

Americans are becoming increasingly concerned about social and environmental issues, e.g., surface and groundwater contamination, natural resources management, biotechnology application, and food safety. Soil erosion, increased international competition, and changing consumer preferences are also contributing to the need for a more sustainable agricultural system (United States Department of Agriculture, 1997).

Lal (1991) advanced that the challenge facing agriculture is real:

the challenge of agricultural sustainability is neither new nor is it likely to fade away in the foreseeable future. Throughout civilization the human race

has been faced with the dilemma of meeting its current needs while preserving resources for generations to come. In fact, we are confronted by the same challenges more forcibly now than ever before.. Sustainable agriculture and the relevant environmental and socioeconomic concerns are global issues. (p. xi).

In formulating the research agenda for the 1990s, the Experiment Station Committee on Organization and Policy (ESCOP) (1992) named sustainable agriculture as one of five issues of significance to agriculture and foremost in the minds of the U. S. public and envisioned an agricultural industry that accomplishes the following:

- Provides profitability for farmers and others in the agricultural system.
- Provides adequate, affordable supplies of safe, high-quality food.
- Protects and restores natural resources.
- Depends increasingly on the use of renewable resources.
- Supports a high quality of life for farmers and other rural and small town residents.
- Provides adequate economic returns to farmers.
- Plays a positive role in protecting the environment.
- Supports development of alternative production systems.
- Recognizes the increasing global interdependencies of agriculture.

In explaining the importance of research related to sustainable agriculture, ESCOP (1992) reported:

The U. S. needs a major expansion of agricultural research targeted toward (1) documenting and comparing the physical, biological, ecological, economic, and social sustainability of agricultural production systems and technologies; and (2) determining ways to promote the adoption of sustainable systems (p. 10).

In a strategic planning initiative, the Board of Agriculture (1996) of the National Association of State Universities and Land Grant Colleges emphasized the need for agricultural technology that combines economic and environmental payoffs in socially acceptable ways. Agricultural systems “which are economically, environmentally, and socially acceptable are the order of the day” (p. 10). Sustainable agriculture requires a holistic, integrated, interdisciplinary, or systems-oriented approach to agricultural research, education, and practice. The emphasis is on optimizing resource use and sustaining productivity over a period of years (Lal, 1991).

#### Agricultural Education Curriculum Enhancement

The National Council for Agricultural Education (1995) announced that the profession must examine ways to improve the high school agricultural education curriculum to successfully meet the food and fiber challenges of the 21st century. Teaching and learning related to sustainable agriculture provide an opportunity for an integrated approach to agricultural education curriculum development. Rather than studying small parts of agriculture or solving narrow production problems, the study of sustainability issues encourages the use of a holistic and integrative approach to education (Vehoviak, Adams, & Bruening, 1994). Multidisciplinary knowledge allows for curriculum organization

based on societal “..problems and needs of students that demand personal and social understanding and action” (Tanner & Tanner, 1995, p. 391).

Sustainable agriculture organizes subject matter from a multidisciplinary (economic, environmental, and social) perspective that can be used to support decision making in the food and fiber system from production to consumption. Infusion of sustainable agriculture content into the high school agricultural education curriculum, however, lags behind new developments in the agricultural industry. High school agricultural education teachers need help adjusting teaching and learning to social change, e. g., the sustainable era of agriculture. In support of the movement toward a sustainable agricultural industry, Marshall and Herring (1991) concluded that sustainable agriculture must be included in the high school agricultural education program to adequately prepare future graduates to work in the 21st century food and fiber system.

In writing about reinventing high school agricultural education programs for the year 2020, Olson (1997) named sustainable agriculture as a development that will command considerable change in the agricultural education curriculum. New approaches to teaching emerging technologies related to soil conservation, water conservation and quality, wildlife protection, and the production of a safe and healthy food supply will be needed.

Hedlund (1993) believed that youth are an important component in the equation for a healthy future. Youth have a deep relationship with nature and their attitudes toward the environment can be easily changed with educational intervention (Moore, 1977 & Jaus, 1984). Firebaugh (1990) suggests that education, including primary and secondary schools, should look at sustainable agriculture for content to enhance the curriculum.

In a study of the perceptions of Iowa high school agricultural education teachers and students regarding sustainable agriculture, Williams and Wise (1997) found 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” (p 19). Based on their findings, they recommended that

As new knowledge of sustainable agriculture practices is developed, initiatives must be taken to integrate it into the secondary school agricultural education curriculum.. .. Curriculum materials, instructional aids, and innovative approaches to teaching, which will allow students to experience sustainable practices, will be needed to facilitate student learning (Williams & Wise, 1997, p. 19).

In explaining new agricultural education curriculum approaches, Lee & Thomas (1995) advocated that science principles and application will continue to be highly beneficial in the future:

This direction has given renewed credibility to agricultural education. It has enhanced the achievement levels and interests of students who elect to enroll in agriculture classes, especially those that have substantive content in agriscience. A major opportunity is in environmental science and related technology (p. 11).

The National Research Council (1988) recommended that the high schools agricultural education curriculum should be upgraded in science. Cardwell (1995) advanced that the sustainable enhanced era of agriculture, a subset of the biologically enhanced era, provides an opportunity for agricultural education in high schools to connect the applied sciences to the food and fiber system. Including sustainable agriculture in the high school agricultural education curriculum provides an unparalleled opportunity to enrich instruction with science and technology.

Sustainability issues are being addressed on a number of fronts by various organizations, creating opportunities for partnerships to meet mutual goals. The agricultural education profession should take advantage of collaborative ventures to speed the infusion of sustainable agriculture into the high school agricultural education curriculum. Some agricultural researchers are seeking ways to involve education in their activities, e. g., all projects funded by the North Central Regional Association (NCRA) of State Agricultural Experiment Stations must demonstrate how research results will be delivered to the user. Examples given in the NCRA guidelines for users of research results include “FFA programs [high school agricultural education programs]” and “secondary school students” (North Central Regional Association, 1996).

There are many other national, state, and local organizations that support educational initiatives related to sustainable agriculture e. g., Cooperative Extension Service, National Resources Conservation Service, state centers for sustainable agriculture research and education, and commodity groups. Partnering with such organizations can facilitate the infusion of sustainable agriculture into the high school agricultural education curriculum.

Williams (1997, p. 11) advocated that “agricultural education in secondary schools can be a partner in developing the agricultural industry of the 21” century by integrating sustainable agriculture into the curriculum.”

### Summary

Sustainable agriculture embraces a multidisciplinary approach to developing new science and technology to solve problems facing the food and fiber system and society in general. Including sustainable agriculture in the high school curriculum would allow the agricultural education profession to become an active partner in achieving the goals of a sustainable agriculture

industry. The scientific and technical elements of sustainable agriculture have the potential to enrich the high school agricultural education curriculum and align education with current developments in the agricultural industry; however, research is needed in all four of the scholarship functions advanced by Boyer (1990) – discovery, integration, application, and teaching – to show the way.

Examples of research needed to show how to include sustainable agriculture in the high school agricultural education curriculum that fit both Boyer's (1990) definition of scholarship and Buriak and Shinn's (1993) structure for agricultural education research include the following:

- Discovery – investigating metacognitive processes (“knowledge of when and why to use various strategies for problem solving”) (McNeil, 1996, p. 440) in teaching and learning sustainable agriculture.
- Integration – connecting sustainable agriculture technologies with pedagogical processes to design a high school agricultural education curriculum,
- Application – implementing and evaluating a sustainable agriculture curriculum in a high school agricultural education program.
- Teaching – selecting and using pedagogical procedures to “bridge between the teacher's understanding and the student's learning” (Boyer, 1990, p. 23) as related to teaching and learning sustainable agriculture.

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