PERCEPTIONS REGARDING SUSTAINABLE AGRICULTURE: EMERGING TRENDS FOR EDUCATING EXTENSION EDUCATORS

K. S. U. Jayaratne¹, Robert A. Martin², Jerald R. DeWitt³

¹ Graduate Assistant
Department of Agricultural Education & Studies
Iowa State University
Ames, IA 50011
E-mail: ksu@iastate.edu

² Professor and Head
Department of Agricultural Education & Studies
Iowa State University
Ames, IA 50011
Phone: 515 294 0896  Fax: 515 294 0530
E-mail: drmartin@iastate.edu

³ Professor/Interim Director
Agriculture & Natural Resource Extension
Iowa State University
Ames, IA 50011
E-mail: jdewitt@iastate.edu

Abstract

There is a growing public interest in sustainability and environmental conservation. This growing public concern implies the need for focusing extension programs on sustainable agriculture. This emerging trend is developing and continuing. However, the question is whether extension educators have been prepared to carry out this task. The focus of this study was to identify agricultural extension educators’ perceptions regarding sustainable agriculture practices. This study used a survey design and was conducted with a random sample of 415 agricultural and natural resource extension educators in the north-central region of the United States. It was found that the term “sustainable agriculture” as a concept was somewhat ambiguous to many agricultural and natural resource extension educators. However, the respondents had positive perceptions regarding the benefits associated with sustainable agricultural practices. These positive perceptions did not vary with the respondents’ age, gender, level of education, experience or inservice training. Many extension educators perceived that the diffusion of sustainable agriculture practices, such as integrated pest management, is more an educational process than mere delivery of information about a technology. This finding implies the necessity to focus educational programs on subject matter as well as on the teaching and learning process in order to prepare agricultural extension agents to carry out their responsibility as educators rather than being mere information providers. This implication of the study for extension education program planning transcends national boundaries and has meaning to all extension systems.
Introduction

The traditional role of agricultural extension was to help farmers solve their farming problems through various means of education. The cooperative extension service in the USA has served farmers by disseminating unbiased research information generated at the land grant universities (Rasmussen, 1989). Farm operations in the USA are becoming more consolidated and more capital intensive (Bonnen, 1986). Parallel to these changes in the farming sector, very specialized crop and livestock private consultant services have developed. These farm consultant services are becoming popular among farmers. Farmers are not only becoming very specialized, but they represent a smaller percentage of the total population in the USA. If these highly specialized farmers get advice from private consultants, what is the role of publicly funded cooperative extension service? Schuh (1986) reported that the vitality of agricultural extension services has declined for some years, so a new role as facilitators of the educational process could be the image for extension.

US agriculture is also heavily dependent upon external inputs. Production agriculture has contributed to many environmental problems such as soil erosion, water contamination, bio-system degradation, and air pollution. For instance, Handler (1970) reported that an estimated 100 million acres of United States farmland have been severely degraded and abandoned. This data indicate the gravity of the present situation regarding soil erosion from farmland in the United States. Pimentel (1990) reported that each year about 1 billion pounds of pesticides are applied to agricultural land at a cost of more than U.S. $4 billion. Most of the applied pesticide never reaches the target pests and accounts for environmental degradation (Pimentel & Levitan, 1986). It is becoming increasingly clear that agriculture, as an industry, must move toward sustainability for long-term viability (Marshall & Herring, 1991).

The term, sustainable agriculture, has different meanings to different people (Hess, 1991). There is no single definition for sustainable agriculture (Dunlap, Beus, Howell, & Wand, 1992). There are many definitions for sustainable agriculture. However, Benbrook (1991) explained physical, biological, and socioeconomic components as the main elements of a comprehensive definition of sustainable agriculture. According to Benbrook (1991, p.4),

Sustainable agriculture is the production of food and fiber using a system that increases the inherent productive capacity of natural and biological resources in step with demand. At the same time, it must allow farmers to earn adequate profits, provide consumers with wholesome, safe food, and minimize adverse impacts on the environment.

According to this definition, if any agricultural practice increases the production capacity of natural resources while producing foods safely and profitably, it can be considered as a sustainable agriculture practice. Many similar definitions could be cited, but there is a general consensus regarding the essential elements of sustainable agriculture (Benbrook, 1991). All of these definitions of sustainable agriculture have three common elements such as environmental conservation, social desirability and economic profitability. Therefore, it can be considered that any agricultural practice or technology that has these three basic qualities is a sustainable agricultural practice or technology.
Extension agents could play a key role in helping farmers in their decision making process regarding the application of sustainable agricultural practices (Agunga, 1995). But the question is whether extension agents have been adequately oriented themselves toward this responsibility. Agunga (1995) reported that the extension agents in Ohio did not have a firm understanding of sustainable agriculture. They were skeptical of the sustainable agricultural concepts and were less interested in promoting sustainable agriculture. Like in Ohio, Conner and Kolodinsky (1997) reported that extension agents in New England also have skeptical attitude toward sustainable agriculture. Even though, extension agents in Ohio and New England were skeptical about sustainable agriculture, they expressed the need for training in sustainable agriculture (Agunga, 1995; Conner and Kolodinsky, 1997). This finding implies us that sometimes, extension agents’ skepticism toward sustainable agriculture may be due to their inadequate knowledge about sustainable agriculture.

There is a growing public interest in sustainability and environmental preservation (Hess, 1991). This growing public concern over environmental issues implies the need for focusing extension programs on sustainable agriculture. This emerging trend is developing and continuing. However, the question is whether extension educators have been prepared to carry out this task? The focus of this study was to identify agricultural extension educators’ perceptions regarding the sustainable agriculture practices.

**Purpose and Objectives**

The purpose of this study was to identify agricultural and natural resource extension educators’ perceptions about sustainable agricultural practices. The study aimed to address following objectives.

1. To identify agricultural and natural resource extension educators’ general perceptions toward sustainable agricultural practices.
2. To determine whether agricultural and natural resource extension educators’ perceptions toward sustainable agriculture vary with their demographic characters such as age, years of experience, level of education, gender and related inservice training.

**Methods**

**Population and Sample**

This study used a descriptive research design and the target population was agricultural and natural resource extension educators in the 12 states of the north-central region of the USA. There were 897 agricultural and natural resource extension educators in the target population. According to Krejcie & Morgan, (1970) the appropriate sample size for this population is 270 agricultural and natural resource extension educators. However, in pilot-testing the instrument with a randomly selected sample of 50 agricultural and natural resource extension educators, only 65% of these educators responded to the questionnaire. Assuming this return rate for the questionnaire, the required mailing sample size was calculated as 415 extension educators. This sample was randomly drawn proportionate to the total number of agricultural and natural resource extension agents in each of the twelve states. The sampling frame was prepared by using information received from Extension sustainable agriculture state coordinators, web-sites and the 2000-2001 County Agents’ Directory. Multi sources of information were used to ensure that everyone in the target population had a chance to be in the sampling frame.
Instrumentation

A survey questionnaire was designed to collect data for this study. A ten-item instrument was developed to receive extension educators’ perceptions about sustainable agriculture practices. Five items of the instrument were positive statements while the remaining five items were negative statements about sustainable agricultural practices. Extension educators’ perceptions were obtained on a five-point Likert scale ranging from (1) strongly disagree to (5) strongly agree. Extension educators’ general perception about sustainable agriculture practices was obtained by reversing the scale values of five negative statements and adding them together with the values received on the scale for five positive statements. The highest possible value for the general perception in this scale is 50 and the lowest possible value is 10. Higher values indicate positive perceptions toward sustainable agriculture practices. The content validity of the survey instrument was established by receiving the critical views of the agricultural education faculty and the extension sustainable agriculture state coordinator of the State University Cooperative Extension Service. Face validity of the survey instrument was established by incorporating the feedback received from the extension educators during the pilot testing. Reliability of the instrument was verified by obtaining the Cronbach's reliability coefficient from the pilot test data. The Cronbach's reliability coefficient for the instrument was .81 showing that the instrument was reliable for the study.

Data Collection and Analysis

The questionnaire was mailed to the subjects with a cover letter and a return addressed stamped envelope. Respondents were asked to return the completed questionnaire within ten days. After ten days, a reminder letter was sent to nonrespondents requesting their response. A third mailing was sent to nonrespondents.

Non-response error was controlled by conducting a telephone interview with randomly selected sample of nonrespondents and comparing these data with the data received from mailed questionnaires. This is an appropriate procedure to address the non-response error (Miller & Smith, 1983). An independent t-test was used to determine if respondents and nonrespondents differed significantly in their perceptions regarding sustainable agricultural practices. No significant differences (p<.05) were found between the respondents and nonrespondents in their perceptions regarding sustainable agriculture practices. Agricultural and natural resource extension educators completed and returned 336 questionnaires for a response rate of 81%. There were 323 usable questionnaires.

Questionnaire items were coded and entered into the SPSS-Windows computer program for data analysis. Descriptive statistics such as means, standard deviations, and percentages of the variables of interests were obtained.

Results

A majority of the respondents (89.5%) were males. Among the respondents, 68.7% were masters degree holders and 9.6% were doctoral degree holders. The bachelors degree holders represented 21.7% of the respondents. Respondents’ mean age was 45 years. The mean years of experience in the cooperative extension service was 15 years. The mean number of sustainable agriculture related inservice trainings they attended during the last five years was three programs.
### Table 1. Agriculture and Natural Resource Extension Educators' Perceptions' About Sustainable Agriculture Practices (n=323)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>St.d.</th>
<th>SD %</th>
<th>D %</th>
<th>N %</th>
<th>A %</th>
<th>SA %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Farmers should be educated to use sustainable agriculture practices.</td>
<td>4.0</td>
<td>0.71</td>
<td>0.3</td>
<td>3.4</td>
<td>14.6</td>
<td>62.4</td>
<td>19.3</td>
</tr>
<tr>
<td>2. Sustainable agriculture practices are useful to protect the environment.</td>
<td>4.0</td>
<td>0.77</td>
<td>0.9</td>
<td>3.4</td>
<td>16.1</td>
<td>58.8</td>
<td>20.7</td>
</tr>
<tr>
<td>3. Sustainable agriculture is useful to maintain long-term productivity of farming systems.</td>
<td>3.9</td>
<td>0.78</td>
<td>0.9</td>
<td>4.3</td>
<td>15.5</td>
<td>58.7</td>
<td>20.5</td>
</tr>
<tr>
<td>4. Sustainable agriculture practices are beneficial to the whole community.</td>
<td>3.9</td>
<td>0.77</td>
<td>0.9</td>
<td>3.1</td>
<td>17.3</td>
<td>57.6</td>
<td>21.1</td>
</tr>
<tr>
<td>5. Diffusion of sustainable agriculture practices such as Integrated Pest Management (IPM) is more an educational process than a mere delivery of information about a technology.</td>
<td>3.6</td>
<td>0.81</td>
<td>0.3</td>
<td>11.5</td>
<td>21.8</td>
<td>57.6</td>
<td>8.7</td>
</tr>
<tr>
<td>6. Sustainable agriculture is an ambiguous term to me.</td>
<td>3.0</td>
<td>1.17</td>
<td>8.7</td>
<td>33.5</td>
<td>14.6</td>
<td>35.1</td>
<td>8.1</td>
</tr>
<tr>
<td>7. Sustainable agriculture practices are not easy to apply.</td>
<td>2.9</td>
<td>0.94</td>
<td>4.0</td>
<td>32.6</td>
<td>34.8</td>
<td>24.8</td>
<td>3.7</td>
</tr>
<tr>
<td>8. I am not clear which agriculture practices are sustainable.</td>
<td>2.9</td>
<td>1.09</td>
<td>6.2</td>
<td>41.5</td>
<td>20.4</td>
<td>24.5</td>
<td>7.4</td>
</tr>
<tr>
<td>9. Sustainable agriculture is not economically profitable.</td>
<td>2.3</td>
<td>0.84</td>
<td>14.9</td>
<td>50.9</td>
<td>27.0</td>
<td>5.6</td>
<td>1.6</td>
</tr>
<tr>
<td>10. Sustainable agriculture practices can be applied only on small family farms.</td>
<td>1.9</td>
<td>0.80</td>
<td>28.2</td>
<td>58.8</td>
<td>7.4</td>
<td>4.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

(SD)=Strongly Disagree, (D)=Disagree, (N)=Neutral, (A)=Agree, (SA)=Strongly Agree

Sixty-six percent of the respondents agreed that diffusion of sustainable agriculture practices such as integrated pest management (IPM) was more an educational process than mere delivery of information about a technology. Seventy-nine percent of the respondents agreed that sustainable agriculture was useful to maintain long-term productivity of farming systems. Eighty percent of respondents agreed that sustainable agricultural practices were useful to protect the environment. Seventy-nine percent of respondents agreed that sustainable agriculture practices were beneficial to the whole community. Eighty-two percent of respondents agreed that farmers should be educated to use sustainable agriculture practices. Eighty-seven percent of the respondents disagreed that sustainable agriculture practices can be applied only on small family farms. Sixty-six percent of the respondents
disagreed that sustainable agriculture was economically profitable. Forty-three percent of the respondents agreed that the term “sustainable agriculture” was ambiguous. Thirty-two percent of the respondents agreed that they were not clear which agriculture practices were sustainable. Only 37% of the respondents disagreed that sustainable agriculture practices were not easy to apply. The mean value of the general perception of the respondents regarding sustainable agriculture practices was 36.4 on a scale of 10 being low to the 50 being the highest value. The higher the value on this scale, the stronger the positive perception toward sustainable agriculture (Table 1).

Table 2. Comparison of Agriculture and Natural Resource Extension Educators’ Perceptions Regarding Sustainable Agriculture for Age, Gender, Education, Experience and Inservice Training

<table>
<thead>
<tr>
<th>Character</th>
<th>Comparing levels</th>
<th>n</th>
<th>Mean*</th>
<th>t</th>
<th>p(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Less than 30 years</td>
<td>27</td>
<td>37.4</td>
<td>-1.109</td>
<td>0.268</td>
</tr>
<tr>
<td></td>
<td>30 years or more</td>
<td>294</td>
<td>36.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>289</td>
<td>36.4</td>
<td></td>
<td>-0.292</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>34</td>
<td>36.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Bachelors degree only</td>
<td>70</td>
<td>35.6</td>
<td>1.507</td>
<td>0.133</td>
</tr>
<tr>
<td></td>
<td>Masters or Ph.D.</td>
<td>253</td>
<td>36.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>Less than three years</td>
<td>37</td>
<td>37.7</td>
<td>-1.757</td>
<td>0.080</td>
</tr>
<tr>
<td></td>
<td>Three or more years</td>
<td>285</td>
<td>36.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inservice</td>
<td>No sustainable Ag. related inservice training programs</td>
<td>51</td>
<td>35.4</td>
<td>1.532</td>
<td>0.126</td>
</tr>
<tr>
<td></td>
<td>Had one or more related inservice training programs</td>
<td>266</td>
<td>36.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Mean of the extension educators’ general perception regarding sustainable agriculture

Independent t-test results show that extension educators’ general perceptions toward sustainable agriculture practices did not significantly vary with age, gender, levels of education, years of experience in extension or inservice training attended (Table 2).

**Conclusions**

Based on the findings of this study, it can be concluded that the term “sustainable agriculture” as a concept was somewhat ambiguous to many agricultural and natural resource extension agents in the north-central region of the USA. However, agricultural and natural resource
extension agents had a positive perception regarding the benefits associated with sustainable agricultural practices. Most of the respondents perceived sustainable agriculture as a useful means to maintain long-term productivity of farming systems and protect the environment. This positive perception did not vary with the respondents’ age, gender, level of education, experience or inservice training. Many extension educators perceived that the diffusion of sustainable agriculture practices, such as integrated pest management is more an educational process than mere delivery of information about a technology. Increasing awareness may not lead to adoption; but the farmer’s complete comprehension of sustainable agriculture is the first necessary step to adoption (Agunga, 1995). These points emphasize the need for well designed educational programs for diffusing sustainable agricultural practices and technologies.

Implications

This study focused on the agricultural and natural resource extension educators’ perceptions regarding sustainable agricultural practices. The data indicate the need for development of systematic educational and learning approaches to fully understand and use sustainable agriculture practices. Therefore, it is necessary to focus educational programs on subject matter as well as on teaching and learning concepts in order to prepare agricultural extension agents to play their role as educators rather than mere information providers. This implication of the study for extension education program planning transcends national boundaries and has meaning to all extension systems.

List of References


