

Extension Educators' Perceptions Regarding the Limitations to Learning about Sustainable Agriculture

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Abstract

It is obvious that agriculture as an industry must move toward sustainability for long-term viability. Diffusion of sustainable agricultural practices to farmers through extension education is an important task for achieving long-term viability. The effectiveness of this diffusion process depends on the extension agents' ability to learn about sustainable agriculture and educate farmers. The purpose of this study was to identify agricultural extension educators' perceived limitations to learning about sustainable agriculture. This was a descriptive survey research study conducted with the agricultural and natural resources extension agents in the North Central Region of the United States. The study had an 81% response rate. It was found that a lack of available time and opportunity to interact with researchers were the two most important limiting factors for extension agents to learn about sustainable agriculture. Lack of training opportunities, access to research information, clarity about the use of new agricultural technology and net working opportunities were somewhat important limiting factors in learning about sustainable agricultural practices. Lack of available time and networking opportunities were significantly greater constraints in learning about sustainable agriculture for female extension agents compared to male extension Agents. The perceived level of limiting factors did not vary with the extension agents' levels of education or their years of experience. When educational resources and programs are designed for extension agents to learn about sustainable agriculture it is important to consider these limitations and their significance to gender differences for facilitating the teaching learning process involving sustainable agriculture practices.

Key words: Sustainable Agriculture, Extension, Learning Barriers

Introduction

Conventional agriculture is now widely criticized for its adverse environmental and socio-economic impacts (Bultina, 1991; Pimentel, 2005). For example, Frankenberger and Turco reported (2003) that fertilizer and animal waste losses have contributed to the deterioration of fisheries in North America. Research studies have shown that the pesticide residues of various agrochemicals present in wheat and rice are the result of their use in conventional agriculture (Naik & Prasad, 2005). The World Commission on Environment and Development (1987) reported that the incremental grain to fertilizer response ratio dropped from 14.8 in 1934-38 to 11.5 in 1948-52 and 5.8 in 1979-81. This information shows the trend of diminishing agricultural productivity per unit of external input. This increasing dependency on nonrenewable, external resources for farm productivity has become a serious sustainability issue that conventional agriculture faces.

The National Research Council (1993) explained that sustainability is essential to maintain “the productive capacity of natural resources in step with population growth and economic demands while protecting and, where necessary, restoring environment quality” (p.66). Therefore, 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 carries different meanings to different groups (Minarovic & Mueller, 2000). However, Benbrook (1991) explained physical, biological, and socioeconomic components as the main elements of a comprehensive definition of sustainable agriculture. According to his definition (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.

As this definition indicates, sustainable agriculture practices should be economically viable, socially responsible, and ecologically sound (WWF for a Living Planet, 2006).

Conservation of agricultural resources for continuous food supply has become an important task for researchers, extension educators, and farmers worldwide. There is a growing public interest in sustainability and environmental preservation (Hess, 1991). Agricultural scientists have developed environment-friendly sustainable agricultural technologies. Sustainable agriculture has been included in the range of practices offered in extension education programs (Sullivan, 2000). However, it is difficult to expect farmers to follow sustainable agricultural concepts if extension educators are not capable of teaching them (Cecil, 2004). When extension agents are trained “an understanding of the basic framework of sustainable concepts is critical to the success of research and extension activities” (Minarovic & Mueller, 2000, para. 30). Therefore, the first and foremost important task of diffusing sustainable agriculture is educating extension educators on sustainable agriculture. What are the limitations that hinder extension educators learning about sustainable agriculture? Are those limitations varying with the demographic characteristics of extension educators? Finding answers to these two questions provided the focus of this study.

Purpose and Objectives

The purpose of this study was to identify agricultural extension educators' perceived limitations to learning about sustainable agriculture. The study aimed to fulfill the following objectives:

1. Identify the factors that limit extension educators learning about sustainable agriculture.
2. Determine whether extension educators' perceived limitations to learning about sustainable agriculture varies with their demographic characteristics such as gender, levels of education, age and years of experience.

Methods and Procedures

This was a descriptive survey research study. This was an appropriate design because the objectives of this study were exploratory and descriptive. The required data was obtained by using a self-administrated structured mailed questionnaire. This method is time and cost effective (Tuckman, 1978).

Population and Sample

The target population of this study was comprised of agricultural extension educators in the 12 states of the North Central Region of the United States. Stratified random sampling technique was used to ensure proportional representation of agricultural extension educators from each state of the twelve states in the North Central region of the United States. Stratified random sampling gives a more representative sample (Ary, Jacobs, & Razavieh, 1996). There were 897 agricultural extension educators in the target population. According to Krejcie & Morgan, (1970) the appropriate sample size for this population is 270 agriculture extension educators. However, in pilot-testing the instrument with a randomly selected sample of 50 extension educators, only 65% of them 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 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 County Agents' Directory. Multiple sources of information were used to ensure that everyone in the target population had a chance to be in the sampling frame.

Instrumentation

The researchers developed a survey instrument based on literature for collecting data for this study. The instrument focused on extension educators' perceived limitations to learning about sustainable agriculture. In the instrument, eight potential limiting factors for learning about sustainable agriculture were included. Respondents were asked to indicate to what extent each of these factors limited their learning about sustainable agriculture on a five-point Likert-type scale ranging from one being "not at all a limiting factor" to five being "very much a limiting factor". In addition to these limitations, respondents were asked to identify one other limiting factor and rate it on the five-point Likert type scale. Necessary demographic data were collected to achieve the research objectives.

"The most obvious type of scientific validity evidence is content-related, which may be gathered by having some competent colleagues who are familiar with the purpose of the survey" (Ary, Jacobs, Razavieh, 1996, p. 462). 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 Iowa State University Cooperative Extension Service. Face validity of the survey instrument was established by incorporating the feedback received from the extension educators during pilot-testing. Field-testing of the instrument was done with randomly selected 30 agricultural and natural resources extension educators.

Reliability of the instrument was established by obtaining the Cronbach's reliability coefficient from the pilot-test data. The Cronbach's reliability coefficient of the instrument was 0.80.

The validated survey was mailed and two follow-up mailings were conducted to reach non-respondents. The SPSS program was used for data analysis. Descriptive statistics were used to summarize data. Non-response error was controlled by conducting a telephone interview with a randomly selected sample of non-respondents and comparing these data with the data received from the 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 non-respondents differed significantly in their perceptions regarding sustainable agricultural practices. No significant differences ($p < .05$) were found between the respondents and non-respondents in their perceptions regarding sustainable agriculture practices. Agricultural and natural resource extension educators completed and returned 336 questionnaires for a response rate of 81%.

Results

Of the respondents, 89.9% were males. Respondents' ages ranged from 24 years to 65 years with the mean of 45 years. The mean of the respondents' experience was 15 years in the Extension service. During the past five years, respondents had participated, in average, three in-service training programs on sustainable agriculture. Of the respondents, 9% had a doctoral degree, 69% had a master's degree, and 22% had a bachelor's degree.

Limitations to Learning about Sustainable Agriculture

Findings indicated that lack of available time was the most significant limiting factor for the respondents to learn about sustainable agriculture. The mean rating for this factor was 3.99 and it was the highest mean value as summarized in Table 1. Lack of opportunity to interact with researchers was identified as the second most important limiting factor in learning about sustainable agricultural practices with the mean rating of 3.11. Factors such as training opportunities, networking opportunities, access to research information, and clarity about the use of new agricultural technology were identified as somewhat limiting factors in learning about sustainable agricultural practices. Lack of access to instructional materials was identified as the least limiting factor by the mean rating of 2.84.

Table 1

Limiting Factors for Extension Agents Learning about Sustainable Agriculture (N=323)

Limiting Factor	Percentage of the Respondents					M	SD
	1 Not at all	2 Very little	3 Somewhat	4 Much	5 Very much		
Lack of available time	2%	7%	19%	36%	36%	3.99	.9858
Lack of opportunity to interact with researchers.	4%	23%	38%	28%	7%	3.12	.9610
Lack of clarity about the use of new agricultural technology.	4%	24%	40%	28%	4%	3.04	.9229
Lack of training opportunities.	4%	26%	38%	27%	5%	3.03	.9565
Lack of access to research information.	5%	32%	31%	25%	7%	2.99	1.0216
Lack of networking opportunities.	5%	28%	38%	24%	5%	2.98	.9534
Lack of access to instructional materials.	5%	30%	43%	19%	3%	2.84	.8864
Other limiting factors (n=31)	0%	0%	6%	52%	42%	4.35	.6082

By responding to the open-ended question on the instrument, nine extension educators indicated negative attitudes toward sustainable agriculture as a considerable limitation to learning about sustainable agricultural practices. Seven respondents mentioned confusion about the definition of sustainable agriculture as a significant limitation to learn about sustainable agriculture. Lack of interest about sustainable agriculture was another factor limiting learning about sustainable agricultural practices as identified by five respondents. Five respondents mentioned that the lack of clients' demand as an important limitation. One respondent mentioned the lack of opportunities to gain first-hand experience as a limitation to learning about sustainable agricultural practices.

Respondents perceived lack of opportunity to interact with researchers as a somewhat limiting factor for them in learning about sustainable agricultural practices. Similar to this finding, Minarovic and Muellerwere (2000) reported that there were barriers to working collaboratively with research and extension for promoting sustainable agriculture and articulated the need for professional networking. Training opportunities, networking opportunities, access to research information, clarity about the use of new agricultural technology and access to instructional materials were considered to be somewhat limiting factors to learning about sustainable agricultural practices. Some respondents identified a negative attitude toward sustainable agriculture as an important factor in limiting their learning about sustainable agricultural practices. A study done in Ohio revealed a similar finding that indicated extension agents' negative attitudes toward sustainable agriculture steered them away from planning extension programs for promoting sustainable agricultural practices (Agunga, 1995). Confusion about the definition of sustainable agriculture was identified as a very important limiting factor in learning about sustainable agricultural practices as it was reported by previous research studies (Agunga, 1995; Conner and Kolodinsky, 1997). Additionally, some of the respondents indicated that lack of clients' demand and a lack of interest about sustainable agriculture were significant limiting factors in learning about sustainable agricultural practices. One respondent indicated the

lack of opportunities for sharing first-hand experience as an important limiting factor in learning about sustainable agricultural practices.

Comparison of Limiting Factors to Learning about Sustainable Agriculture for Extension Agents' Gender Difference

Three limiting factors to learning about sustainable agriculture indicated significant differences for male and female extension agents as summarized in Table 2. Lack of available time, networking opportunities, and 'other factors' such as negative attitudes towards sustainable agriculture, confusion about the definition of sustainable agriculture and lack of interest were significant different factors for male and female extension agents. The lack of available time and networking opportunities were significantly greater limitations for female extension agents compared to those for male extension agents. 'Other limitations' such as negative attitudes towards sustainable agriculture, confusion about the definition of sustainable agriculture, and lack of interest were significantly greater limitations for male extension agents compared to those for female extension agents. There were only 31 responses for the 'other category.'

Table 2

Comparison of Limiting Factors to Learning about Sustainable Agriculture for Extension Agents' Gender Difference (N=323)

Limiting Factors	Mean		<i>t</i>	<i>p</i>
	Male	Female		
Lack of available time	3.94	4.38	2.470	.014*
Lack of opportunity to interact with researchers.	3.12	3.21	.591	.555
Lack of clarity about the use of new agricultural technology.	3.03	3.18	.888	.375
Lack of training opportunities.	3.00	3.32	1.893	.059
Lack of access to research information.	2.98	3.09	.570	.569
Lack of networking opportunities.	2.92	3.41	2.855	.005*
Lack of access to instructional materials.	2.82	3.06	1.492	.137
Other limiting factors (<i>n</i> =31)	4.41	3.50	2.180	.038*

Note. Statistically significant at $p=.05$ (2-tailed)

Comparison of Limiting Factors to Learning about Sustainable Agriculture for Extension Agents' Levels of Education

None of the limiting factors to learning about sustainable agriculture varied with the extension agents' levels of education as summarized in the Table 3.

Table 3

Comparison of Limiting Factors to Learning about Sustainable Agriculture for Extension Agents' Levels of Education (N=323)

Limiting Factors	Mean		<i>t</i>	<i>p</i>
	Bachelor's Degree	Graduate Degree		
Lack of available time	4.10	3.96	1.050	.295
Lack of opportunity to interact with researchers.	3.10	3.12	.181	.857
Lack of clarity about the use of new agricultural technology.	2.96	3.07	.884	.337
Lack of training opportunities.	3.11	3.00	.823	.411
Lack of access to research information.	3.00	2.99	.057	.955
Lack of networking opportunities.	3.06	2.95	.813	.417
Lack of access to instructional materials.	2.87	2.84	.285	.776
Other limiting factors (<i>n</i> =31)	4.25	4.37	.364	.718

The Relationship between Extension Agents' Age and Limiting Factors to Learning about Sustainable Agriculture

There was a weak positive correlation between respondents' age and the perceived level of limitation to access of research information as summarized in the table 4. This indicates that the older the agents the greater the perceived level of limitation to access to research information. Lack of access to research information was the only limiting factor that differed significantly with the extension agents' age.

Table 4

The Relationship between Extension Agents' Age and Limiting Factors to Learning about Sustainable Agriculture

Limiting Factors	Pearson Correlation Coefficient	<i>p</i>
Lack of available time	-.108	.055
Lack of opportunity to interact with researchers.	.032	.569
Lack of clarity about the use of new agricultural technology.	.100	.075
Lack of training opportunities.	.030	.588
Lack of access to research information.	.121	.031*
Lack of networking opportunities.	-.003	.958
Lack of access to instructional materials.	.107	.057
Other limiting factors (<i>n</i> =31)	.268	.145

Note. Statistically significant at $p=.05$ (2-tailed)

The Relationship between Extension Agents' Years of Experience and Limiting Factors to Learning about Sustainable Agriculture

None of the limiting factors to learning about sustainable agriculture varied with the extension agents' years of experience as summarized in the Table 5.

Table 5

The Relationship between Extension Agents' Years of Experience and Limiting Factors to Learning about Sustainable Agriculture

Limiting Factors	Pearson Correlation Coefficient	<i>p</i>
Lack of available time	-.046	.409
Lack of opportunity to interact with researchers.	.007	.904
Lack of clarity about the use of new agricultural technology.	.028	.623
Lack of training opportunities.	-.007	.901
Lack of access to research information.	.105	.061
Lack of networking opportunities.	.015	.788
Lack of access to instructional materials.	.091	.105
Other limiting factors (<i>n</i> =31)	.113	.547

Conclusions and Recommendations

- Lack of available time and opportunity to interact with researchers were the most important two limiting factors for extension agents to learn about sustainable agriculture. Lack of training opportunities, networking opportunities, access to research information, clarity about the use of new agricultural technology and networking opportunities were somewhat important limiting factors in learning about sustainable agricultural practices. Lack of access to instructional materials was the least limiting factor for learning about sustainable agriculture.
- The lack of available time and lack of networking opportunities were significantly greater constraints in learning about sustainable agriculture for female extension agents compared to male extension Agents.
- The perceived limiting factors did not vary with the extension agents' levels of education or their years of experience.
- The older the extension agents the greater the perceived level of limitation for their access to research information.

When educational resources and programs are designed for extension agents to learn about sustainable agriculture it is important to consider these limitations and their significance with gender and age differences for facilitating the teaching learning process involving sustainable agriculture practices. Extension training programs and resource materials should be designed to efficiently utilize the extension agents' limited available time for educating them about sustainable agriculture. Extension agents should be given adequate opportunities to network with researchers to help extension agents learn about sustainable agriculture. Female extension agents should be given more training and networking opportunities with researchers to facilitate female extension agents' learning about sustainable agriculture within their very limited

available time. Special attention should be paid to assure extension agents have access to current research information for helping them learn about sustainable agriculture.

Educational Importance

This study is significant because it has implications for designing educational materials and training programs for extension agents to facilitate the teaching and learning process focused on sustainable agriculture practices. Findings from this study may have implications to the design of other programs of professional development. In-service education is an important aspect of extension and it must be planned and conducted to meet the needs of extension educators taking in account these limiting factors.

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