

**Extension Agents' Perceptions of Sustainable Agriculture in the Riyadh Region of Saudi Arabia**

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**Abstract**

*Sustainable agriculture extension programs are mandated worldwide to foster the implementation of sustainable agriculture practices. These required sustainable agriculture extension programs are to be conducted by extension agents, therefore understanding extension agents' perceptions toward sustainable agriculture is especially important. This research identified the perceptions toward sustainable agriculture of agricultural extension agents in the Riyadh Region, Kingdom of Saudi Arabia. The findings show that extension agents generally had a positive perception toward sustainable agriculture concepts. No significant differences between overall means of agents' perceptions toward sustainable agriculture concepts and their age, rural/urban background, or educational background were found. Extension agents' positive perceptions regarding sustainable agriculture and the perceived need for providing sustainable agricultural extension programs to farmers provide a basis for sustainable agriculture programs development.*

Keywords: Sustainable Agriculture, Saudi Arabia, Competencies, In-Service Education, Extension Agents

### Introduction

The decline and degradation of natural resources have increased partially because of the conflict between production agriculture and the environment. Currently, farmland worldwide is facing environmental challenges such as soil erosion, desertification, and water shortages. This conflict between agriculture and natural resources has led to many kinds of pollution and contamination (FAO/Netherlands Conference on Agriculture and the Environment, 1991). These factors may eventually contribute to a shortage of food and water, nationally and internationally. The world's natural resources are important and at risk today more than ever (Fridgen, 1995).

The Kingdom of Saudi Arabia has experienced rapid and successful agricultural development since the mid-1980s. As a result of this development, Saudi Arabia has succeeded in achieving self-sufficiency in some botanical and animal commodities, such as wheat, eggs, dates, milk, and some fruits and vegetables. Prior to this period of development, the country's agricultural production sector met less than 10% of its national needs (Ministry of Agriculture, 1999). However, this rapid agricultural development substantially damaged the country's limited natural resources. Serious depletion of underground water supplies, primarily due to the huge amount of water consumed for food production purposes accrued; therefore, Saudi policy makers have recently changed the country's agriculture policy to make it more sustainable.

The Seventh Saudi Development Plan (2000-2004) emphasizes the rational utilization and conservation of natural resources, raising income levels and improving the standard of living of citizens in rural areas, the intensification of agricultural extension programs to raise

awareness among farmers regarding the significance of water conservation and development of manpower in the agriculture sector (Ministry of Planning, 2000). The objectives of the Seventh Development Plan of Saudi Arabia relate to developing sustainable agriculture. This plan also mandates related agricultural extension programs. To reach the goal of conducting successful extension programs in sustainable agriculture requires knowing the current perceptions and knowledge of Saudi extension agents toward sustainable agriculture.

Sustainable agriculture aims to produce healthy and ample food for both the present and the future through the wise use of natural resources. Sustainable agriculture has been defined in many ways and people's views of it depend on their areas of interest and background (Minarovic & Mueller, 2000). Lockeretz (1990) believes that sustainable agriculture was embedded in the older term "organic farming," which started before the 1940s. The impact of industrial agriculture on the environment during the late 1960s and early 1970s forced people to consider sustainable agriculture (Harwood, 1990). According to Schaller (1998), sustainable agriculture is currently a significant component of public policy. Sustainable agriculture is considered a significant component of Saudi strategic plans and recently has become a serious concern among Saudi scientists and professionals (AL Mogel, 1999). In Saudi Arabia, sustainable agriculture is viewed the same as the definition by the FAO.

The FAO defines sustainable agriculture as:

The management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present

and future generations. Such sustainable development (in the agriculture, forestry, and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable. (FAO/Netherlands Conference on Agriculture and the Environment, 1991)

### **Purpose and Objectives**

The purpose of the study was to describe agricultural extension agents' perceptions toward sustainable agriculture. Agricultural extension agents in the Riyadh Region of the Kingdom of Saudi Arabia were the study population. The study addressed the following objectives:

1. To describe the demographic characteristics of agricultural extension agents in the Riyadh Region of Saudi Arabia;
2. To describe agricultural extension agents' perceptions toward sustainable agriculture concepts;
3. To determine if differences exist in agricultural extension agents' perceptions toward sustainable agriculture concepts when examined by age, rural/urban background, and educational background.

### **Methods and Procedures**

#### *Population*

The study was carried out with all 127 agricultural extension agents in the 8 agricultural directorates and 28 agricultural branches with primary responsibility for extension in the Riyadh Region of Saudi Arabia. These extension agents are employed by the Saudi Ministry of Agriculture. All 127 extension agents were surveyed, and all (100%) returned the questionnaire. One survey was not completed. Usable data were provided by

126 extension agents. The study participants are considered a census of the Riyadh Region agricultural extension agents.

#### *Instrumentation*

A questionnaire developed by Sisk (1995) to address agricultural extension agents' perceptions toward sustainable agriculture in the southern region of the United States was partially modified and used to assess the perceptions of agricultural extension agents in the Riyadh Region of Saudi Arabia. Approval to use Sisk's questionnaire was obtained. Questions were also developed by the current investigator to collect additional information regarding extension agents' perceptions toward sustainable agriculture.

The survey contained two sections. Section one had 15 questions to assess agents' perceptions toward sustainable agriculture concepts. For this section, a five-point, Likert-type response scale: 1 = disagree; 2 = slightly disagree; 3 = no opinion; 4 = slightly agree; and 5 = agree, was used. Section two contained demographic information, asking extension agents' age, years of service in extension, highest levels of education, area of specialization for highest levels of education, place of birth, and current residence. The survey was translated into Arabic. The translation to Arabic was reviewed by expert panel members who know both English and Arabic. An expert panel assessed the content validity of the questionnaire. The panel included faculty members from the Department of Agricultural and Extension Education, The Pennsylvania State University; faculty members from the Department of Agricultural Extension and Rural Sociology, King Saud University, Kingdom of Saudi Arabia; and a group of Saudi professionals in extension and sustainable agriculture.

Pilot testing was conducted with 11 extension agents in Qasim and Hail regions (Saudi Regions closest to the Riyadh Region). Reliability of the summated values for section one (perceptions regarding sustainable agriculture) from the pilot-test data was verified by calculating the Cronbach's alpha internal reliability measure. Cronbach's reliability alpha coefficient was .79.

#### *Data Collection and Analyses*

The data were collected with the cooperation of the Directorate of Extension and Agricultural Services in the Saudi Ministry of Agriculture. The Director of Extension and Agricultural Services sent a cover letter to each Agricultural Directorate in Riyadh Region with the questionnaires. In his letter, the Director asked the Agricultural Directors to distribute the questionnaires to extension agents in their directorates as well as to extension agents working in Agricultural Branches in their areas of service. Also, the Director of Extension and Agricultural Services requested the Agricultural Directors in Riyadh Region to return the completed questionnaires to the Directorate of Extension and Agricultural Services.

The questionnaires then were collected by the main researcher from the Directorate of Extension and Agricultural Services. One to three phone calls were made by the researcher to each Agricultural Director to enhance the response rate. Data collection started April 2, 2002 and was completed May 15, 2002 with a 100% return.

The Statistical Package for Social Sciences (SPSS) was used to analyze data. Descriptive statistics (frequency distributions, means, and standard deviations) were used to address objectives one and two. Analysis of variance was used to determine if differences existed for study

objective three. An alpha risk level of  $p < .05$  was set as the critical standard.

### **Findings**

#### *Demographic Characteristics*

The ages of the respondents ranged from 22 to 60. The mean age was 36.19 ( $SD = 7.91$ ;  $N = 124$ ). The majority (52.4%) of the extension agents were 31 to 40 years old. Approximately two-thirds of the extension agents (64.8%) in the Riyadh Region were born in urban communities. Over three-fourths of the extension agents (78.4%) identified urban communities as their current residence. Over one-half of the extension agents (54%) reported a diploma from a Saudi agricultural institute as their highest education level. Just over one-third of the extension agents (34.9%) had a bachelor's degree, and 6.3% reported high school or less as their highest level of education. Only 4.8% of extension agents had a master's degree.

Slightly less than one-third of the extension agents (31%) reported general agriculture as their area of specialization and 27.4% indicated plant production and protection as areas of specialization. Agricultural engineering was the area of specialization for 17.7%. Only 10.5% of the extension agents specialized in the social science. The mean years served in extension were 9.8 ( $SD = 7.03$ ;  $N = 117$ ). Two-thirds of the extension agents (66.6%) had served in extension from 1 to 11 years while one-third (33.3%) had served in extension for 12 to 32 years.

#### *Agricultural Extension Agents' Perceptions toward Sustainable Agriculture*

The mean value of the overall (summated across the 15 items) perceptions of the extension agents toward sustainable agriculture was 3.8; the standard deviation was 0.4. This overall value to sustainable agriculture indicates that the extension

agents generally had a positive perception toward sustainable agriculture concepts. The highest mean value for an item (4.8; *SD* = 0.6) was reported for two statements: “chemical residues on many fruits and vegetables pose a significant health threat to the consumer” and “water conservation methods should be used to save limited water resources” (Table 1).

Table 1

*Descriptive Statistics Summarizing Agents’ Sustainable Agriculture Perceptions (n = 126)*

Sustainable Agriculture Concept	<i>M<sup>a</sup></i>	<i>SD</i>
Sustainable agriculture practices can be successfully implemented.	3.6	1.2
Agricultural system using crop rotation, green manure crops, and animal manures can be economically comparable to a traditional system that uses synthetic fertilizers	3.2	1.5
Chemical residues on many fruits and vegetables pose a significant health threat to the consumer.	4.8	.62
Many insects can be controlled without the use of chemical insecticides.	3.4	1.4
Several fungi diseases can be successfully controlled without the use of fungicides.	2.7	1.4
Most weeds can be controlled economically without the use of herbicides.	3.6	1.4
Crops, with the potential for sustaining or increasing production with limited inputs, should receive more research emphasis.	4.5	.78
Organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution.	4.4	.93
Many sustainable agriculture practices that may be successfully adopted in other Saudi regions are economically feasible in this region.	3.5	1.2
Sustainable agriculture is essential for agricultural development in Saudi Arabia.	4.2	1.0
Water conservation methods should be used to save limited water resources.	4.8	.67
Agroforestry systems (mixed trees with crops) are important in agricultural production.	3.4	1.3
Extension programs in sustainable agriculture are needed to educate farmers.	4.4	1.0
The meaning of sustainable agriculture is not clear for me.	2.1	1.4
Shelterbelts could maintain farms’ soil and water resources.	4.2	1.1

*Note.* <sup>a</sup>1 = disagree to 5 = agree with three = no opinion.

The second highest item mean value (4.5; *SD* = 0.8) was “crops, with the potential for sustaining or increasing production with limited inputs, should receive more research emphasis.” The third highest item mean value (4.4; *SD* = 0.9) was reported for the statements “organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution” and “extension programs in sustainable agriculture are needed to educate farmers.” The lowest item mean value (2.1; *SD* = 1.4) was reported for the statement “the meaning of sustainable agriculture is not clear for me.” In this case, because the word not is in the item, the mean of 2.1 reflects that the agents slightly disagreed with the statement. Thus, the agents in reality communicated they were fairly clear in their understanding regarding the meaning of sustainable agriculture.

*Differences in Agents’ Perceptions by Age, Rural/Urban, and Educational Background*

The findings did not show any significant differences between overall means of agents’ perceptions toward sustainable agriculture concepts and their age, place of birth, current residence, educational level, and areas of specialization (Tables 2 and 3).

Table 2

*ANOVA Comparison of Means for Overall Agents’ Sustainable Agriculture Perceptions by their Age, Highest Level of Education, and Area of Specialization*

Factor	<i>df</i>	<i>F</i>	Sig. (2-tail)
Age	3	1.02	.386
Education Level	3	.54	.655
Area of Specialization	5	.49	.783

Table 3

*Independent t-Test of Means for Overall Agents’ Sustainable Agriculture Perceptions by their Place of Birth and Current Residence*

Factor	<i>df</i>	<i>t</i>	Sig. (2-tail)
Place of Birth	99	-.685	.497
Current Residence	99	-.661	.510

*Differences in Agents’ Perceptions toward Individual Sustainable Agriculture Statements*

*Age.* However, extension agents’ perceptions toward sustainable agriculture differed significantly by agents’ age for the statements “most weeds can be controlled economically without the use of herbicides” (*F* = 3.31; *df* = 3,116; *p* = .022) and “water conservation methods should be used to save limited water resources” (*F* = 7.34; *df* = 3,117; *p* = .001).

Agents 51-60 years of age agreed at a significantly higher level (*M* = 4.9) with the item “most weeds can be controlled economically without the use of herbicides” than did agents in the three other age groups. The means for the other three groups were 3.9 for 22-30 year old agents and 3.4 for both the 31- 40 and 41-50 year old agents. Significant differences for the item “water conservation methods should be used to save limited water resources” were found across age groups. Agents in the 51-60 age group rated that item lower (*M* = 3.71) than did agents in the other three age group levels. The means for the other age groups were 4.9 for 22-30 year and 31-40 year old agents and 4.7 for 41-50 year old agents. Although differences were significant, it is important to note that each of the three age groups (22-30 yrs, 31-40 yrs, and 41-50 yrs) slightly agreed or agreed with the statement. However, the results for age group 51-60

ranged from no opinion to slightly agree with the statement.

Significant differences between agents' age and their perceptions regarding sustainable agriculture concepts were found by Sisk (1995) and Chizari, Lindner, and Zoghie (1999). Sisk (1995) found that the senior agents (34 years and older) perceived sustainable agriculture as less important than younger agents. Chizari, Lindner, and Zoghie (1999) also found that younger extension agents supported sustainable agriculture more than older agents in Khorasan Province, Iran.

*Current Residence.* The results show that mean differences in extension agents' perceptions toward sustainable agriculture varied significantly with current residence (rural and urban) for the statements "organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution" and "sustainable agriculture is essential for agricultural development in Saudi Arabia." Agents currently residing in urban settings agreed at a significantly higher level ( $M = 4.6$ ) compared with agents in rural settings ( $M = 3.9$ ) with the statement "organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution" ( $t = -2.91$ ;  $df = 31.31$ ;  $p = .007$ ). Conversely, agents in rural settings agreed at a significantly higher level ( $M = 4.7$ ) than urban agents ( $M = 4.1$ ) with the statement "sustainable agriculture is essential for agricultural development in Saudi Arabia" ( $t = 3.987$ ;  $df = 72.63$ ;  $p < .001$ ).

Lyson (1998) found that agriculture college faculty in the United States who lived on a farm or in small towns were significantly more concerned about sustainable agriculture than those who had lived in cities. Lyson's findings are similar to the Riyadh Region extension agents' perceptions toward the statement

"sustainable agriculture is essential for agricultural development in Saudi Arabia." Extension agents currently residing in rural communities were significantly more likely to agree with the statement than agents currently residing in urban communities. This finding can be explained in that agents currently living in rural communities are more supportive of the value of developing rural Saudi areas than agents in urban communities. However, Lyson's findings were not consistent with the Riyadh Region extension agents' perceptions toward the statement "organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution." Saudi agents currently residing in urban communities were significantly more likely to agree with this statement. One possible explanation is that agents in urban communities could be more aware of the negative impact of pesticides on the environment than agents in rural communities.

*Highest Level of Education.* The findings show that the means of extension agents' perceptions toward sustainable agriculture differed significantly when examined by their highest level of education for the statements "organic pest control methods would reduce pesticides and contribute to the reduction of non-point source pollution" and "water conservation methods should be used to save limited water resources." Extension agents whose level of education was high school or less were significantly less likely to agree with both statements. Extension agents who had agricultural diplomas, bachelor, or master's degrees were significantly more likely to agree with both statements. Perhaps agents having higher educational levels are more aware of the value of organic pest control methods and the need to conserve limited water resources in Saudi Arabia.

### Conclusions

This study indicated that the extension agents in the Riyadh region generally had a positive perception toward sustainable agriculture concepts. These results were similar to Jayaratne's findings (2001) with extension educators in the North Central region of the United States and Minarovic and Mueller's results (2000) for the overall perceptions of North Carolina Cooperative Extension Service professionals regarding sustainable agriculture. Chizari, Lindner, and Zoghie's (1999) conclusions regarding preferences of extension agents in Khorasan Province, Iran, toward some sustainable agriculture practices, including fertility, crop mix, crop production management, social concern, tillage systems, environmental protection, and variety selection were also similar.

Agents' overall perceptions toward sustainable agriculture concepts did not vary with their age, place of birth, current residence, education level, and areas of specialization. This lack of significant differences between overall extension agents' perceptions toward sustainable agriculture concepts and their age and education level was similar to Jayaratne, Martin, and Witt (2001) findings with extension educators in the North Central region of the United States. Similarly, the lack of significant differences between overall means of agents' perceptions toward sustainable agriculture concepts and their current residence, educational level, and area of specializations was also similar to Sisk's findings (1995) of extension agents' perceptions toward sustainable agriculture in the southern region of the United States.

### Implications and Recommendations

Provision for the professional development of the extension agents in the Riyadh Region requires providing in-service training programs and encouraging agents to attain higher education with an emphasis in extension education and/or technical agricultural fields as well as environmental content. In-service education and multi-year professional development plans need to be developed which include non-credit courses/workshops and credit toward a degree. These professional development programs should be provided sequentially based on different levels of agents' knowledge and experiences. Content should focus on extension education, environmental, and technical agriculture as identified by an advisory planning committee. The advisory planning committee should have representatives from the Ministry of Agriculture, colleges of agriculture, agricultural training centers, and extension agents. These in-service education and professional development plans can be developed through cooperation among the Ministry of Agriculture and Saudi agricultural colleges.

Personnel in both the Ministry of Agriculture and at the agriculture colleges should collaborate to plan and implement sustainable agriculture programming. This collaborative program development effort should be built on the current positive perceptions of extension agents regarding sustainable agriculture concepts and the perceived need for such program initiatives expressed by the agents in this study.

The study implications are consistent with the findings of Sisk (1995), Chizari, Lindner, and Zoghie (1999), and Jayaratne (2001) regarding the need to develop sustainable agriculture programs to educate farmers in sustainable agriculture concepts and technologies. Since the conflict between industrial agriculture and natural resources

is a global issue, the implications of this study for developing sustainable agriculture programs extend beyond Saudi Arabia's boundaries. Determining extension agents' perceptions toward sustainable agriculture, assessing agents' competence level in sustainable agriculture, and their competence in teaching sustainable agriculture in other regions of the world are recommended in order to implement sustainable agriculture programming successfully. Additionally, farmers' perceptions toward sustainable agriculture, factors affecting their adoption of sustainable agriculture practices, and their specific educational needs in sustainable agriculture as well as their preferred learning approaches should be surveyed and known in order to foster the implementation of sustainable agriculture practices in Saudi Arabia as well as in other countries.

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