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Assessing Farmers' Sustainable Agricultural Practice Needs: The Case of Corn Growers in Fars, Iran

H. Sadighi[1] and K. Roosta[2]

ABSTRACT

The primary purpose of this study was to assess farmers' Sustainable Agricultural Practice Needs (SAPN) as determined conversely by their level of technical knowledge and understanding of sustainable corn farming practices. The population of this study consisted of all corn growers in Fars, a southern province of Iran. A questionnaire was developed to gather the information required from 159 randomly selected farmers. Farmer's demographic and professional characteristics, including their level of technical knowledge, access to information sources, and level of mechanization were considered to be independent variables of the study. The SAPN was the dependent variable of the study. The result showed that a considerable numbers of farmers (46%) have a "high" level of needs concerning sustainable agricultural practice. The farmers' level of technical knowledge showed to have a substantial (r= -0.64) and negative association with their SAPNs. Multivariate linear regression analysis indicated that 49.3% (R^2=0.493) of the variance in SAPNs could be explained by the farmers' age, their access to information sources, and their level of technical knowledge. This implied that a substantial amount of variability (about 51%) in SAPNs are explained by other variables that were not studied in this research. Further study is needed to determine factors affecting SAPNs and extend of the impact.

Keywords: Educational needs, Farming system, Sustainable agricultural practice, Technical knowledge.

INTRODUCTION

As the world population continues to grow geometrically, great pressure is being placed on arable land, water, energy, and biological resources to provide an adequate supply of food for the growing population. The major concern today is that while we may be able to feed the world today, future generations may not have adequate food production to satisfy their dietary needs. Based on the evaluations of available natural resources, scientists have stressed their concern about the growing imbalance between the world's population and the resources that support food productions (Kendall and Pimentel, 1994). This implies that our farming practices must be sustainable in order to conserve our natural resources for future generations.

The 1990s witnessed growing concern about the environmental and health risks associated with modern agricultural practices around the world. Strategies aimed at dealing with these concerns have been considered under the umbrella term of `sustainable agriculture` (Absher, 2000b; Saltiel, Bauder, and Palakovich, 1994; Swanson, Bentz, and Sofranko, 1999). The term covers a broad array of practices, including modern technologies that fit well with current farm-

[1] Assistant Professor of Agricultural Extension and Education, College of Agriculture, Tarbiat Modarres University, P. O. Box: 14115-336, Tehran, Islamic Republic of Iran. Email: Sadigh_h@modares.ac.ir
[2] Department of Agricultural Extention and Education College of Agriculture, Islamic Azad University, Birjand, Islamic Republic of Iran.

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ing and traditional methods. Agricultural scientists (Absher, 2000a; Karami, 1995) believe that creating a truly sustainable farming system is a very difficult task to achieve, but farming practices that would lead to higher sustainability in the long term should be encouraged and adopted by farmers.

During the last decades, agricultural production increases have been achieved largely by overuse of chemical fertilizer and pesticides (Karami, 1995) at considerable cost to natural and environmental resource bases. Unsustainable agricultural practices have led to declining soil fertility and desertification in many regions of the world. In contrast, a productive and sustainable agricultural system maintains the integrity of biodiversity while enhancing soil and environmental quality (Absher, 2000b). The diverse goals and wide range of possible sustainable farming practices make it necessary for extension specialists to obtain researched information and disseminate appropriate technology suitable for a variety of farming situations (Sadighi, 2002b). Agricultural educators have been interested in disseminating agricultural practices that are sustainable. The ongoing challenges in this respect have been to convince producers that sustainable practices could involve low risks, are cost effective and could be integrated and adopted on variety of farming conditions according to the individual farmer's situation (Sadighi, 2002a; Sadighi, and Darvishnia, 2002). Another important challenge facing educators has been how best to educate producers so that they will adopt sustainable practices such as minimum tillage and reduce their usage of chemical inputs on farm and utilize them in a more efficient manner (Gamon, 1998; Roosta, 2000). The goal of sustainable agricultural and rural development will not be realized unless farmers adopt sustainable practices.

Studies (Karami, 1999; Roost, 2000; Sadighi, In press) have shown that usage of various chemical fertilizers among farmers in Iran is above the recommended levels. These studies further indicated that farmers' lack of appropriate knowledge and understanding in management and application of various chemical fertilizers are the main cause of their overuse and application on farms. So, in order to ensure sustainability of future farming systems in the region, it is important to train and educate farmers on alternative ways of farming to maintain and protect soil fertility and the integrity of ecosystem against the side effects and hazards of heavy chemical application on farms. For this purpose this study assessed the corn grower's Sustainable Agricultural Practice Needs (SAPN), so that effective educational programs on sustainable practices could be developed and trainings provided based on farmers' educational needs.

PURPOSE AND OBJECTIVES

The primary purpose of this study was to assess the corn farmers' SAPN, in Fars, Iran. The more specific objectives of this study were:

1. to assess their level of technical knowledge related to growing corn;
2. to determine the corn growers' professional and demographic characteristics;
3. to determine the strength of the relationship (correlation) between farmers' SAPNs and their professional characteristics; and
4. to determine how much of the variance in farmers' SAPN characteristics (in Multivariate Linear Regression Analysis) could be explained by farmers' technical knowledge and their professional characteristics.

METHODOLOGY

The design of this study was descriptive-correlational that was carried out (in spring of 2001) by a survey method. The population of this study consisted of all corn growers in Fars province (located in southern region of Iran) whose production yields in the last growing season were more than 8 tons

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per hectare. Local extension office identified 270 farms among the population as the ones satisfying this condition. Using a complete randomized sampling technique, 159 of the farmers were identified as a sample for the study. The sample size was determined on the basis of a study of Krejce and Morgan (1970). A questionnaire was developed to gather the necessary information for the study. In addition to a section on farmers' demographic and professional characteristics the questionnaire consisted of four other sections designed to gather specific information on farmers' SAPNs, technical knowledge, level of farm mechanization practised, and their access to information sources (Sadighi, 2001; Sadighi, Raven, Taylor, 1997).

Farmer's SAPNs was measured conversely by assessing their level of knowledge and understanding on corn producing sustainable practices. The implementation of sustainable agricultural practices was assumed to lead to sustainability of the farming system while maintaining the integrity of the ecosystem and protecting the environment. Twenty questions consisting of multiple choice responses were designed for this purpose. Each correct response worth one-point and farmer's SAPNs scores ranged from 0 to 20, which were obtained by adding the correct responses on this section. Farmer's final SAPNs score was assessed by subtracting their achieved score from a perfect score (20 that is) to determine the deficient level. The mathematical presentation to determine the SAPN is as follows: SAPN = scores achieved on sustainable corn growing practices minus 20. Farmers' technical knowledge was determined by examining their general knowledge concerning agronomic management including land preparation, corn cultivation, maintenance, harvesting, storage and processing of corn. The scores achieved on the technical knowledge section of the questionnaire determined farmers' level of knowledge concerning corn production management.

The level of mechanization practised on the farms was determined by providing the farmers with a list of machinery that could possibly be used on a cornfield and they were asked to determine their level of usage on the basis of hours used per growing season. Hours used were obtained and divided by the hectares of cultivated land to come up with the hours used per hectares of land. Then, if was multiplied by a number, ranging from 1 to 4 (representing the importance of each machine) to determine the mechanization score for each piece of machinery. The sum of the scores achieved for each of the 16 items of machinery (any that was used on the field) determined the mechanization level practiced on each farm.

Farmers' access to information sources was determined by providing the farmers with a list of information sources that farmers could possibly be furnished with regarding corn farming (Farmer's responses to each of the information sources ranged from "not at all" equal to zero, to a "very much" equal to 5). The sum of the 12 information sources determined the farmer's level of access to information sources.

Content validity of the questionnaire was established by a panel of experts in the field of agricultural extension, agronomy, plant breeding, agricultural mechanization and soil and water management. A pilot study was conducted to establish reliability of the instrument for the population of interest. A Cronbach's alpha (a reliability coefficient) of .84, .88, .92, and .81was established respectively for the sections on SAPN, technical knowledge, level of mechanization, and access to information, respectively. According to Pedhazur (1982), a reliability coefficient of above 0.50 is acceptable for a non-experimental study. Data were gathered by interviewing farmers and completing the questionnaires. A uniform technique of interviewing was adopted, in order to reduce data collection errors. Since data gathering was done in person, measures were taken to reduce the response biases of those participants contacted earlier and later. Comparing the responses of those contacted earlier with the later responses on the dependant variables showed no statistically significant differences (Miller and Smith, 1983). A

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ferences (Miller and Smith, 1983). A 94.3% response rate was achieved for the study. Data collected from the participants were analyzed using SPSS (standard version 9.0 for Windows).

RESULTS AND DISCUSSION

Descriptive information showed that the mean age for corn growers (in the population) was about 43 years of age and on average they had about seven years of formal education with eight years of experience in growing corn. The farmers owned 18 hectares of land (on average) and they devoted 6 hectares to corn cultivation. Their mean production yield was 9924 kg/ha, which was significantly above the national average (which is below 8 tons per hectare). The farmers' SAPNs was determined as described on the methodology section and for the purpose of characterization the score was transformed into three levels as "low", "average", and "high". As Table 1 shows, about 46% of the growers had a "high" level of needs regarding sustainable agricultural practices. This makes it necessary for extension personnel to plan appropriate educational programs in order to increase the farmers' knowledge regarding sustainable agricultural practice and lower their SAPNs.

Table 1. Level of Farmers' Sustainable Agricultural Practice Needs.

Educational Needs Level	Frequency	Percent	Cumulative Percent
Low	17	11.3	11.3
Averaged	64	42.7	54.0
High	69	46.0	100.0
Total	150	100	

The correlation between farmers' SAPNs and their professional characteristics showed that there is a direct relation between their SAPNs and farmers' age (r=0.31). This relationship based on the Davis (1971) convention, is characterized as a "moderate association", which means as the farmers get older, their educational needs concerning the sustainable agricultural practices increases moderately. This implies that there should be a continuous training program for farmers in order to update their knowledge level and maintain their motivation and interests in this regard. There was a substantial and negative relationship (r=-0.64) between farmers' technical knowledge and their level of SAPNs. This indicates that increasing farmers' technical knowledge is necessary in order to reduce their educational needs regarding sustainable agricultural practice. The farmers' level of formal education also showed to have a negative and moderate association with their SAPNs. This implied that formal education brought about more knowledge and understanding in sustainable practice and consequently, farmers with relatively higher education had a moderately lower SAPNs.

The result showed a low association (r = -0.27) between the farmers' access to information sources and their SAPNs. As the farmers' access to information increased, their educational needs regarding sustainable agriculture practices decreased at a "low" rate. Theoretically, one should expect a positive association between an individual's level of technical knowledge and their access to information as shown in the literature (Saltiel, Bauder, & Palakovich, 1994). Also, a high negative association between educational needs and level of access to information have been observed in case studies (Sadighi, 2002b; Sadighi, and Darvishnia, 2002). A possible reason for the negative and a "low" association (Davis, 1971) between the SAPNs and a farmer's level of access to information in this study, might be that the information has been written beyond farmers' level of knowledge. It is important to point out that information accessible to farmers must be written and presented at their level of knowledge and understanding in order to be effective. Only then could it impact the farmers' professional knowledge base and as a result lower their educational needs. This implies that if the information

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Table 2. Correlation Level between SAPN and Farmers' Professional Characteristics.

	Sustainable Agricultural Practice Needs	
Variables	r	p
Age (year)	0.316**	0.000
Education (year)	-0.478**	0.000
Land (ha)	-0.215*	0.008
Land Under Corn Plantation (ha)	-0.192	0.180
Technical Knowledge	-0.649**	0.000
Mechanization Level	-0.241**	0.003
Access to Information	-0.276**	0.001
Production (ton)	-0.189*	0.022

**p<.001, *p<.05

Table 3. Characterization of Correlation Strength.

The Magnitude of a Correlation	Characterization
±0.70	A very strong association
± 0.50 to ± 0.69	A substantial association
± 0.30 to ± 0.49	A moderate association
± 0.10 to ± 0.29	A low association
± 0.01 to ± 0.09	A negligible association
0.000	No association

Source: Davis (1971)

accessible presented to farmers had the characteristies mentioned, then we may have observed a stronger relationship between these two variables. Table 2 shows the strength and significant level between SAPNs and farmers' professional characteristics.

The independent variables with interval data were used in multivariate linear regression which included the participants' age, level of education, total land in their possession, the amount of land devoted to corn cultivation, farmers' level of technical knowledge, their access to information sources, mechanization level practised, and total production level. Table 4 provides detailed analysis of the regression result. The result of the linear multivariate regression indicated that 49.3% (R^2=0.493) of the variance in SAPNs could be explained by the farmers' age, their access to the information sources and their level of technical knowledge (as shown in Table 4). This implied that there are other factors that may have contributed to variations in SAPN scores that were not investigated in this study. The regression analysis provided variables with a statistically significant level (as shown in Table 4), so the following predication equation was formulated to estimate the farmers' SAPNs.

$Y = 16.552 - 7.778 (X1) + 0.041 (X2) - 0.045 (X3)$

Y = Sustainable Agricultural Practice Needs

CONCLUSION

The study showed that substantial educational works need to be carried out by the extension specialists in order to increase adoption of sustainable technologies among farmers. Increasing farmers' technical knowledge concerning maize farming is necessary in order to lower the farmers' needs regarding sustainable agricultural practices. The diverse goals and wide range of sustainable practices make it necessary for extension personnel to acquire and disseminate appropriate technology and information suitable for a variety of farming situations. Information sources available to farmers, in order to be effective, must be

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Table 4. Multivariate Linear Regression Analysis (SAPNs as a Dependent Variable).

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	16.552	1.333		12.414	0.00
Technical Knowledge (X1)	-7.778	0.806	-0.588	-9.650	0.00
Age (X2)	0.041	0.011	0.227	3.799	0.00
Access to Information Source (X3)	-0.045	0.019	-0.144	-2.385	0.01

written and presented at farmers' level of ability and understanding. It's important for the extension specialists to realize that the overall sustainable agricultural development is dependent upon individual farmers' sustainable agricultural practices on farmlands as they play a key role in the success of national sustainable agricultural policies and programs. Based on this study the following conclusions are presented:

1. Considerable numbers of farmers (46%) have a "high" level of needs concerning sustainable agricultural practice. This implies that substantial educational work needed to be carried out by the extension personnel in order to disseminate information concerning sustainable agricultural practice and help to lower farmers' educational needs in this regard.
2. There is a moderate and direct association between the farmers' SAPNs and their age. As the farmers get older their SAPNs moderately increase which implies that considerable attention should be paid to older farmers with regard to their sustainable agricultural practice needs.
3. The farmers' level of technical knowledge showed to have a substantial and negative association (r = -0.64) with their SAPNs. This implied that increasing farmers' technical knowledge concerning maize farming is necessary in order to lower the farmers' educational needs regarding sustainable agricultural practice.
4. Accessibility to information sources could effectively lower the farmers' SAPNs. There was a statistically significant and negative relationship found between theses two variables in the study.
5. The result of the multivariate linear regression analysis indicated that 49.3% of the variance in SAPNs could be explained by the farmers' age, their access to the information sources, and their level of technical knowledge. This implied that the still considerable variability in SAPNs scores could be explained by other variables that were not investigated in this study, which could be the subject of further research in this area.

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سنجش نیازهای آموزشی ذرت کاران استان فارس در زمینهٔ کشاورزی پایدار

ح. صدیقی و ک. روستا

چکیده

حفظ و پایداری منابع طبیعی اصول مهمی در کشاورزی پایدار بشمار می رود و سلامت و تداوم تولیدات محصولات کشاورزی در گرو توسعه کشاورزی پایدار می‌باشد. هدف اصلی این تحقیق بررسی نیازهای آموزشی کشاورزان ذرت کار استان فارس در زمینهٔ دانش و اجراء اصول کشاورزی پایدار و شناخت ارتباط و همبستگی عوامل تأثیرگذار بر این نیازها بود. جامعه آماری این تحقیق را ذرت کاران نمونه استان فارس تشکیل داده که ۱۵۹ نفر از آنان بصورت کاملاً تصادفی بعنوان نمونه‌های این تحقیق انتخاب شدند. یافته‌های این تحقیق نشان داد میزان دانش فنّی و دانش کشاورزی پایدار اکثریت ذرت‌کاران نمونه استان فارس در سطح متوسط قرار دارد. بین دانش فنی ذرت کاران و نیازهای کشاورزی پایدار آنان (در سطح ۹۹٪ اطمینان) رابطه‌ای نسبتاً قوی، معکوس، و معنی داری وجود دارد (r= −۰/٦٤٩). از این مطلب می‌توان چنین نتیجه گرفت که لازمه کاهش نیازهای کشاورزی پایدار کشاورزان ارتقاء سطح دانش فنی آنان می‌باشد. آزمون رگرسیون چند متغیره این تحقیق نشان داد که ٤٩/٣٪ از نوسانات در نیازهای کشاورزی پایدار کشاورزان را متغیرهای میزان تحصیلات، و دانش فنّی و میزان دسترسی آنان به منابع اطلاعات تبیین می‌کنند (R^2 =۰/٤٩٣). این مطلب نشان می‌دهد که متغیرهای دیگری نیز در میزان

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نیازهای آموزشی کشاورزان در زمینه کشاورزی پایدار تأثیرگذار هستند که در این تحقیق مورد مطالعه قرار نگرفتند که در مطالعات آتی باید مورد کاوش قرار گیرند.

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