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Full Length Research Paper

Adoption of soil protection technologies in Iran

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Agricultural experts in the Semnan Province in Iran were surveyed in order to explore their perception about the factors influencing the adoption of soil protection technologies by farmers. The total population for this study was 80 experts in the Department of Agriculture in Semnan Province. The data were collected by interviewing the respondents and analyzed by using correlation between the independent variables and the dependent variable. Correlation coefficients have been utilized and include Spearman test of independence. The results of regression analysis by stepwise method show that 60% of the variance in the perception of respondents could be explained by economic adaptability of technology, technical adaptability of technology, farmers' income, knowledge about damages to soil and information sources.

Key words: Soil, semnan province, adoption, technology, agricultural expert.

INTRODUCTION

Soil degradation by accelerated water and wind-induced erosion is a serious problem and will remain so during the 21st century, especially in developing countries of tropics and subtropics. Erosion is a natural geomorphic process occurring continually over the earth's surface. However, the acceleration of this process through anthropogenic perturbations can have severe impacts on soil and environmental quality (Saha, 2003).

Based on the latest statistics, more than 672 million hectares of lands have been facing soil erosion and between 5 to 7 hectares of agricultural lands have been destroyed to the lack of appropriate management practices.

Lang (2006) citing Pimentel has said that soil erosion is second only to population growth as the biggest environmental problem the world faces, while the problem, which is growing ever more critical, is being ignored. In addition, erosion is one of those problems that nickels and dimes you to death: One rainstorm can wash away 1 mm (0.04 inches) of dirt. It doesn't sound like much, but when you consider a hectare (2.5 acres), it would take 13 tons of topsoil or 20 years if left to natural processes to replace that loss.

Radford (2004) reported, more than 99% of food comes from the soil and each year more than 10 million hectares (25 million acres) of crop land are degraded or lost as rain and wind sweep away topsoil. An area big enough to feed Europe about 10 times size of UK.

Soil erosion in different ways prevents the development of agriculture sector to take place, depriving resource poor farmers from better income, increasing sediments in waterways and causing yield losses in irrigated lands.

Pimentel (2006) said that erosion is a slow and insidious process, and controlling soil erosion is really quite simple: The soil can be protected with cover crops when the land is not being used to grow crops.

Results of research by expert group in the Ministry of Agriculture of Iran showed that the rate of destruction of soil in Iran compared with world and Asia average is much higher and it is estimated to be 60%. Therefore, improved soil management by farmers can be effective in improving productivity, increasing quality and quantity of food self-sufficiency, reducing poverty levels, providing food security and stabilizing the sustainability of agriculture (Lal, 2003).

In order to control the destruction of soil, technologies

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Table 1. Variables and their measurement scale.

Variables	Measurement scale
Attitudes about Soil Protection Technologies	Five- point Likert
Knowledge about soil protection technologies	Five- point Likert
Personal characteristics	Categorical
Appropriateness of Technology	Five- point Likert
Information sources	Five- point Likert

Table 2. Personal characteristics of respondents.

Age/year	Mean=40.4
Work Experience/Year	Mean=13.1
Major field of study	Agronomy (n=19)

should be provided to offer the protection of soil. Technologies are categorized in protecting organic matter, soil erosion, contamination of soil and soil monitoring. In protecting organic matter, technologies for conserving soil organic matter and optimizing and increasing soil organic matter is used. Soil erosion could be protected by application of field scale soil conservation technologies and small size catchment scale management. Assessment, characterization, investigation, active and passive prevention and remediation technologies is used to control soil contamination. Technologies that are used for soil monitoring are spatial dada handling (ETAP, 2003).

Araya and Asafu-Adjaye (2001) concluded that knowledge of farmers, extension programs about soil conservation, programs that increase the income of farmers and soil conservation research that can directly bring benefits the farmers would influence the adoption of soil protection measures.

It was found out that access to subsidized programs, technical assistance and information sources of educational programs were determined as the most important social and economic factors influencing adoption of soil conservation practices (Napier and Tucker, 1999).

The results of a study about factors affecting the adoption of soil conservation practices show that access to agricultural machinery and to subsidies, age of farmer, place of birth, main source of income and the use of extension services would influence the adoption of soil conservation practices (Calatrava-Leyva et al., 2005).

In another research by Kessler (2006), factors such as agricultural income, guaranteed price for agricultural products, access to agricultural lands, income from non agricultural activities, knowledge about the importance of natural resources, participation and average age of households had relations with adoption of soil protection measures.

The Province of Semnan is located in central part of country and it has 9.8 million hectares surface area. It is the sixth largest province in Iran and more than 20% of its area is considered national areas, protected areas and wild life.

The major purpose of this study is to determine the key factors that affect the adoption of soil protection technologies by farmers in the Semnan Province, Iran.

MATERIALS AND METHODS

The methodology used in this study involved a three stage combination of descriptive and quantitative research. Stage one involved a series of in-depth interviews were conducted with senior experts in the department of agriculture in Semnan Province to provide a context. A questionnaire was developed based on these interviews and relevant literature. The questionnaire included fixed-choice questions. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used as a quantitative measure.

The final questionnaire was divided into several sections. The first section was designed to gather information about personal characteristics of respondents. The second section was designed to measure the attitudes of agriculture experts about the factors that influence adoption of soil conservation technologies by farmers in the Semnan province. The respondents were asked to indicate their agreements with statements by marking their response on a five point Likert-type scale. The variables and their measurement scale are presented in Table 1.

Content and face validity were established by a panel of soil experts. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts.

Stage two involved a pilot study with 30 experts in the Department of Agriculture of Semnan Province who had not been interviewed before the earlier exercise of determining the reliability of the questionnaire for the study. Computed Cronbach's alpha score was 91.0%, which indicated that the questionnaire was highly reliable.

Stage three involved a survey held in spring 2011. The research population included all expert in the Department of Agriculture in the Semnan Province with at least a degree in agriculture majors (N = 325). Using random sampling and the results of the pilot test, a sample of 80 respondents was constituted.

The data collected by interviewing the respondents and analyzed by using correlation between the independent variables and the dependent variable. Correlation coefficients have been utilized and include Spearman test of independence.

Independent variables in the study included factors influencing the adoption of soil protection technologies by farmers. The dependent variable in this research study was the perception of respondents about the adoption of soil protection technologies.

RESULTS

Table 2 summarizes the demographic profile of respondents. The results of descriptive statistics indicated that mean age of respondents was more than 40 years old. The results also show that mean average work experience was more than 13 years. Majority of respondents studied in the field of agronomy (n=19).

Spearman coefficient was employed for measurement of relationships between the perception of experts about the factors influencing the adoption of soil protection technologies and adoption of soil protection technologies. Table 3 displays the results which show that there were

Table 3. Correlation measures between independent variables and dependent variable.

Independent variables	Dependent variable	Natural resources experts	
		r	p
Knowledge about amount of damages to soil	Adoption of soil Protection Technologies	0.386	0.000**
Knowledge about the soil protection technologies	Adoption of soil Protection Technologies	0.085	0.632
Farmers Income	Adoption of soil Protection Technologies	0.421	0.000**
Feasibility of implementing technologies	Adoption of soil Protection Technologies	0.107	0.050
Economic adaptability of technologies	Adoption of soil Protection Technologies	0.475	0.000**
Technical adaptability of technologies	Adoption of soil Protection Technologies	0.179	0.000**
Contact with extension agents	Adoption of soil Protection Technologies	0.364	0.000**
The role of technologies in protecting environments	Adoption of soil Protection Technologies	0.082	0.174
Simplicity of technology	Adoption of soil Protection Technologies	0.197	0.005*
Information sources	Adoption of soil Protection Technologies	0.21	0.004**

**p<0.01, *p<0.05.

relationship between perception of respondents about adoption of soil protection technologies by farmers and knowledge about amount of damages to soil, farmer's income, economic feasibility of technologies, technical feasibility of technologies, and simplicity of technology and information sources.

Table 4 shows the result for regression analysis by stepwise method. Independent variables that were significantly related to perception of experts about factors influencing the adoption of soil protection technologies were entered. The result indicates that 60% of the variance in the perception of respondents could be explained by these variables.

Among all variables, "economic adaptability of technologies"(Beta coefficient: 0.392, sig.: 0.000); "farmers' income" "(Beta coefficient: 0.371, sig.: 0.000); "knowledge about damages to soil" "(Beta coefficient: 0.301, sig.: 0.002); "technical adaptability of technologies" "(Beta coefficient: 0.210, sig.: 0.009) and "information sources" (Beta coefficient: 0.139, sig.:0.041) influence the adoption of soil protection technologies by farmers positively. Other variables were not statistically

Table 4. Multivariate regression analysis.

Variable	B	Beta	T	Sig.
Constant	6.843	-------	7.141	0.000
Economic adaptability of technologies	0.401	0.392	6.067	0.000
Farmers' income	0.395	0.371	5.861	0.000
Knowledge about damages to soil	0.324	0.301	4.002	0.002
Technical adaptability of technologies	0.267	0.210	3.751	0.009
Information sources	0.173	0.139	2.349	0.041

R^2=0.60.

significant.

DISCUSSION AND CONCLUSION

As the regression analysis showed, the economic adaptability of technologies, farmers' income, knowledge about damages to soil, technical adaptability of technologies and information sources" extension/ education factors caused 60% of variance on the perception of the respondents about soil protection technologies.

The results of this study show that economic adaptability of soil protection technologies were considered as one of the most important economic factors in adopting these technologies. Kagwanja (2001) also reported the same conclusion.

The farmers' income also affected the adoption of the soil protection technologies. The research by Calatrava Leyva et al. (2005), Napier and Tucker (1999) and Mwakubo et al. (2006) confirmed this finding.

Based on the perception of respondents in this study, the knowledge of farmers about damages to agricultural soils would affect the adoption of technologies. This is in accordance with findings of Araya and Asafu Adjaye (2001).

The technical adaptability of these technologies was found to be an important factor which would influence the adoption by farmers. This is in accordance with results of studies by Mwakubo et al., (2006) and Calatrava et al., (2005).

It is important to point out that the importance of soil protection technologies has not been realized by many stakeholders in the agriculture sector. The issue of protecting soil should be a national priority for agriculture sector. So far, the main agenda in agriculture sector has been to increase producing more food without protecting the basic resources such as soil.

Overall, these findings suggest that one of the indicator of selecting appropriate soil protection technologies are their adaptabilities. In order to make a technology adaptable to different condition, it is important to look at location-specific approaches for developing modern technology.

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