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**ORIGINAL ARTICLE**

## **Regression Analysis of Factors Influencing the Adoption of Genetically Modified Crops in Iran**

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### **ABSTRACT**

Agricultural experts were surveyed in order to explore their perception about factors influencing the adoption of genetically modified crops in Iran. The methodology used in this study involved a combination of descriptive and quantitative research. The total population for this study was 350 agricultural experts in the Province of Kermanshah of Iran. Based on the perception of the respondents, 13% of the variance in the perception of experts about the adoption of GM crops could be explained by economic, social, regulatory, extension/education and farming factors.

**Key words:** Adoption, Agricultural Experts, Biotechnology, Genetically Modified crops, Iran, Kermanshah.

### **Introduction**

The latest report shows that production of genetically modified crops since 1996 have grown rapidly and after 12 years, 25 countries in different regions have allocated 125 million ha of their agricultural lands to planting genetically modified crops [7].

A wide range of economic, social, physical and technical aspect of farming influences adoption of agricultural production technology. Wheeler [16] pointed the factors which influence the adoption of new innovations by farmers. She mentioned factors such as perception about risk and profitability; uncertainty and certainty about adoption; amount of required information and attitude about risk and uncertainty.

Several parameters have been identified as

influencing the adoption behavior of farmers and social scientists investigating farmers who adopt the biotechnology showing the demographic variables, technology characteristics, information source, knowledge, awareness, attitude and group influence affect adoption behavior [13]. Reece [14] pointed out that bigger farmers had been the first to benefit from the new varieties, but argued there was evidence to suggest that smaller farmers also eventually could increase their incomes by means of the new varieties.

However, adoption of any new technology and innovations has not been an easy task for extension and sometimes has been counterproductive. Adoption is usually not spontaneous, the technology has to be taught and learned -adopted to existing experience and integrated into production.

As is often the case with technological-innovation potential and expectations

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can outpace reality [6].

Badr [1] felt that any research agenda should be accompanied by training and education for farmers. He suggested that by seeing new technologies applied successfully in field experiments, small farmers would then try to use them. Kambikambi [9] believed that in some countries, small farmers were not able to make informed decisions about biotechnology because of poor understanding of the subject.

Rao and Rao [15] found a positive and significant association between age, farming experience, training, socio-economic status, cropping intensity, aspiration, economic motivation, innovativeness, information utilization, information source, agent credibility and adoption.

Marra *et al.* [11] indicated that quality and source of information influence on adopting the biotechnology by farmers. The information available is a critical factor in influencing farmers and it is provided through sources and channels such as extension officers, scientists, academics, private consultants and other farmers. These sources provide the content of interest to farmers while channels are the methods by which information is transferred [16].

Evidence shows that even small efforts to informing farmers and increasing their knowledge about the biotechnology can have big results. However, the promise has yet to be realized due to the lack of information and access to this technology among rural communities. Therefore, it is necessary to remove the impediments faced by rural population and provide basic information in rural areas to enable the spread of biotechnology.

The current situation in agriculture sector in Iran can not respond to the growing needs for food production. The majority of farmers in Iran are subsistence farmers and the main barrier to empowering them is their lack of knowledge of new methods and technologies.

Kermanshah is located in the western part of the Iran and a major portion of its economy depends upon agricultural activities. It was reported about 950,000 ha of lands is allocated for agricultural activities and more than four million tons of agricultural products is produced in the Kermanshah Province.

Ministry of Agriculture considered this province as one of the important regions in term of agricultural production in country.

Several factors influence the application of genetically modified crops in Iran and there is no single appropriate way to introduce and promote biotechnology in the developing countries: constraints and opportunities vary from country to country and therefore require location-specific approaches.

In this regard, the overall purpose of this study was to analyze the factors influencing the adoption of genetically modified crops by farmers.

## Materials and Methods

The methodology used in this study involved a combination of descriptive and quantitative research and included the use of correlation, regression and descriptive analysis as data processing methods. The total population for this study was 1122 agricultural experts who were member of agricultural and natural resources engineering organization in the Province of Kermanshah. By using random sampling method, 350 experts were selected as the sample population of study. Data were collected through interview schedules.

A series of in-depth interviews were conducted with some senior experts in the department of agriculture in the Kermanshah Province to examine the validity of questionnaire. A questionnaire was developed based on these interviews and relevant literature. The questionnaire included both open-ended and fixed-choice questions. The open-ended questions were used to gather information not covered by the fixed-choice questions and to encourage participants to provide feedback.

Measuring respondents' attitudes towards genetically modified crops has been achieved largely through structured questionnaire surveys. 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 about factors that influencing farmers to adopt genetically modified crops. The respondents were asked to indicate their agreements with 10 statements by marking their response on a five point Likert-type scale.

Content and face validity were established by a panel of experts consisting of faculty members at Islamic Azad University and biotechnology experts in the Ministry of Agriculture. A pilot study was conducted with 30 agricultural experts 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 89.6%, which indicated that the questionnaire was highly reliable.

## Results:

It was reported that 68 percent of respondents were male and the average age of professional was 32 years and slightly more than two third were under 39 years old. The findings also show that nearly 15% of respondent were between 40-47 years old.

More than 72 % of the respondents had earned 4 year degree and 26% had earned a master degree. Of those who responded to question, only six respondents had earned doctoral degree. The results show that more than 39 percent of respondents had earned a degree in the field of agronomy.

Table 6 shows the means of respondents' views about the factors that influencing the adoption of genetically modified crops. As can be seen from this table, the highest mean refers to economic factors (mean=3.98) and the lowest mean to regulatory factors (mean=3.49). Table 7 shows the result for regression analysis by stepwise method. The result indicates that 13% of the variance in the perception of agricultural experts could be explained by four variables of farming, extension/education, social, economic and regulatory factors. Based on the perception of agricultural experts, variables "extension/education factors" (Beta coefficient: 0.291, sig.: 0.005); "social factors" (Beta coefficient: 0.287, sig.:0.008); "farming factors" (Beta coefficient: 0.286, sig.: 0.002); "economic factors" (Beta

coefficient: 0.149, sig.:0.019); and "regulatory factors" (Beta coefficient: 0.138, sig.: 0.024) affect the adoption of genetically modified crops by farmers positively.

In the first step, the variable farming factors was entered and result shows that 8.1% of variance for perception of agricultural experts about factors which influence the adoption of genetically modified crops is accounted by farming factors. In the second step, the variable social factors were entered and along with social factors, these two variables accounted for 9.6% of variance for respondents' perception. In the third step, the variable extension/education factors was entered and along with the above two mentioned variables accounted for 10.9% of variances on dependent variable. In the fourth step, the variable economic factors was entered and along with the above three mentioned variables accounted for 12.1% of variance for respondents' perception. In the last step, the variable regulatory factors was entered and along with four mentioned variables accounted for 13.1% of variance on dependent variable.

**Table 6:** Means of respondents' views about factors that influence the adoption of genetically modified crops (1= strongly disagree; 5 = strongly agree).

Factors	Mean	SD
Extension/Educational Factors	3.72	0.847
Regulatory Factors	3.49	0.884
Economic Factors	3.98	1.197
Social Factors	3.60	0.980
Farming Factors	3.80	0.954

**Table 7:** Multivariate Regression Analysis.

	B	Beta	t	Sig.
Farming factors (X1)	0.312	0.286	2.978	0.002
Social factors (X2)	0.256	0.287	2.619	0.008
Extension/Extension factors (X3)	0.263	0.291	2.821	0.005
Economic factors (X4)	0.124	0.149	-2.769	0.019
Regulatory factors (X5)	0.119	0.138	1.978	0.024

R<sup>2</sup> = .13

$$Y = 0.286 (X1) + 0.287 (X2) + 0.291 (X3) + 0.149 (X4) + 0.138 (X5)$$

**Discussion:**

A wide range of factors influence adoption of agricultural production technology. Based on the perception of agricultural experts, regression analysis showed that extension/education; social; economic; regulatory and farming factors only caused 13% of variance on the perception of the respondents regarding the adoption of genetically modified crops by farmers. The reason could be because agricultural experts in the Province of Kermanshah are not familiar with genetically modified crops yet. The findings is in accordance with a research by Chimmiri and others [4] that those farmers who utilized or planned to utilize GM crop technology had more optimistic perceptions of biotechnology and GM crops than did those who chose not to use the technology.

The findings show that factors such as social

factors should also be considered. Innovation is not only based on the technology's agronomic suitability to specify environments and social and cultural factors affect the perception of producers and customers about the technology [12].

The results also show that extension/education factors affect the adoption of genetically modified crops and in this regard extension organizations should inform public about importance and benefits of biotechnology. This result is in accordance with findings of research by Koch [10] Eknane [5] and Brink [2] that informing farmers and increasing their knowledge about the biotechnology can have positive impacts on the adoption of biotechnology.

Like any other new technology, public confidence, trust and acceptance are likely to be the key factors determining the success or failure of biotechnology applications.

It is well known that uncertainties and lack of knowledge of potential effects and impacts of new

technologies, or the lack of a clear communication of risks and benefits can raise concern amongst public [3].

It is recommend the initiation of a wide range of participatory processes to enable direct input from the general public into new technology assessment and determination of priorities and principles for public policy, R&D and legislation [8].

Based upon the results of this study, it is apparent that there is still need to further research about other factors that could influence the adoption of genetically modified crops in Iran.

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