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Analysis of Factors Influencing Adoption of Sustainable Agriculture Practices Among Greenhouse Cucumber Growers in the Southern of Kerman Province, Iran

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***Abstract* – The purpose of this paper was to investigate and identify the factors influencing the adoption of sustainable agriculture among greenhouse cucumber Growers and for achieve this goal A descriptive correlation design was employed. The population of this study includes 1839 greenhouse growers which among them 320 persons selected as sample by stratified sampling method. The research tool was questionnaire which its validity confirmed by panel of experts and its reliability approved by Cronbach's alpha coefficients. The results of study showed that adoption of sustainable agriculture among greenhouse cucumber grower was relatively low and there were positive and significant relationship among variables such as education, social participations, access to market, rate of using mass media, participation in extension courses, knowledge and attitude about sustainable agriculture with adoption of sustainable agriculture. Based on Regression analysis, 53.9% variance of dependent variable was explained by the five variables including: Knowledge of sustainability, Education level, Attitude toward sustainability, Participation in extension classes, and greenhouse experience of respondents.**

***Keywords* – Sustainable Agriculture, Adoption, Greenhouse Cucumber Growers, Iran, Knowledge.**

I. INTRODUCTION

Destroying the environment, converting forests to farming lands, soil erosion and pollution of waters, also utilizing of sources inordinate and simultaneously rapid growing of population, faced the environment of earth to the majors' challenges.

These items are so important for sustainable development; we know that the importable section of sustainable development is sustainable agriculture, of this process the users play an important role that indeed, they should be considered as sustainable agriculture executors [6]. The sustainable agriculture includes a set of activities that leads to protect the biological sources and least hazards for environment. Also it leads to achieve adequate profit by minimum using the agricultural factors in a farm [12]. According to the Low (2000) sustainable agriculture is as a system that is economic and dynamic which leads to improvement the environment and optimizes using of sources and it can play an important role to supply foods and improve the quality of life of humans.

Greenhouse cultivation system, as one of the manifestations of industrialization and intensive agriculture, is already a major supplier of agricultural products around the world. However, due to the over use of resources and chemical inputs, environmental concerns emerged. Greenhouse production in the near future should reduce significantly its environmental impact. For this purpose, elements such as the structure, glazing materials, climate equipment's and controls have to be developed and wisely managed to reduce the dependence on fossil fuels, achieve maximum use of natural resources such as solar radiation and water, and minimize the input of chemicals and fertilizers [12]. Greenhouse crop production is now a growing reality throughout the world with an estimated 405 000 ha of greenhouses across the world. The degree of sophistication and technology depends on local climatic conditions and the socioeconomic environment. During the last 20 years, countries in the Mediterranean climate area have become increasingly competitive producers of greenhouse vegetables.

During this time, there has been a revolution in greenhouse production technology [18]. The world greenhouse area is estimated approximately 310,000 ha. Vegetable crops are grown in about 65% of greenhouses, and ornamental plants raised in the 35% remaining. Since 1981, the surface areas with greenhouse have increased more than 100%, with an increase of 4.4% per year [19]. Greenhouse production has great importance in Iran, and greenhouse crops are currently grown on 6158 ha mainly in southern and central parts of Iran The greenhouse area allocated to vegetables is about 3483 ha of which 1150 ha is concentrated in south Kerman province-mainly cucumber and tomato with 98.5% ha [20]. Vegetable crops are grown from September to late May in cold and mild climate areas. Due to high value of vegetables in off-seasons, growers are highly interested in producing these crops in greenhouses. Currently greenhouse vegetable growers (GVGs) are consuming more than 64 types of chemical pesticides for producing vegetables including cucumber, tomato, and strawberry [19].

The goal of sustainable production is to reduce environmental degradation, maintain agricultural productivity, promote economic viability, conserve resources and energy, and maintain stable communities and quality of life (Krug et al., 2008). Traditional apprehension of innovation process that is named “adoption” first has been introduced in 1955 by a rural sociologists' committee that includes 5 stages: Awareness, interest, assessment, examination and adoption [9]. As the factors that influenced on adoption as theoretical and potential are various, so we prefer to focus on more important factors.

We can analysis these factors by two aspects as individual aspect and structural aspect:

A) Individual aspect: personality characteristics (age, sex and …), individual factors (knowledge, experience and …), economic state (area of the farm, income and …), reference group, norms, needs and motivation.

B) Structural aspect: these are environmental factors that influence the individuals and included: environmental requirements (way, population and …), social-economic conditions (utilization system, distribution, credits and …) and communicative systems (communication media).

Itharat (1999) in a study of adoption of new ideas about agriculture in Thailand understood that there was a positive correlation with adoption of innovation by the farmers under variables such as participating in social activities, civilization, using the mass media, contact with information sources and advertisers and so on. Also, the farmers who had the larger fields were more experienced and innovative. Igodan and Patric (2000) in a study about instructions of adoption of agriculture technologies understood that there was a positive correlation with adoption of innovation by the farmers under variables such as formal and informal education levels, farmers' cooperation, and access to information sources and connects with advertisers. D' Sousa and et al. (1993) in a study about effective factors to adopt the sustainable agricultural activities understood that there was a positive correlation with adoption of innovation by the farmers of west Virginia – in U.S. - under variables such as age, education, employment, sale, state programs and debts of the farmers and these variables showed that the adoption of agricultural activities has a significant and negative relation with age and employment and has a positive and significant relation with education level and has no relation with other variables.

Alonge and Martin (2001) in a study about evaluation of sustainable agriculture activities adoption reviewed the relation between adoption of sustainable agriculture by Iowa with variables such as age, education, records, area of the farm, access to information sources and understanding the innovative accepting. The results showed that the adoption of sustainable agriculture had a significant and positive relation with access of farmers to information sources, education and understanding the innovation.

Salmon and et al. (2001) in a study about effective factors of adoption of the sustainable agricultural systems understood that there is a positive and significant relation between adoptions of the sustainable agricultural systems and religious activities and extension cooperative services.

Rousta (2002) understood that there is a positive and significant relation between services of agriculture center, technical knowledge, production and the type of agricultural systems and the sustainable agriculture.

Mahboubi (2005) in a study under title "analysis the effective factors on the adoption of technologies for the soil protection in Golestan province" understood that there is a positive and significant relation between relative advantages, compatibility, triability, complexity of soil protection, total of ownership fields, rate of received loans and adoption of protection operations of the soil.

Nowadays, not only wheat is a basic and important foodstuff, but also of political aspect it is as important as oil even more important than oil. It must be said that wheat weapon is more powerful than military [2].

Regarding to that about 30% of Iran's population are farmers, rendering them the agricultural education and extension related to sustainable agriculture can increase their potential to adopt the sustainable agriculture. Jihad Agriculture Organization of Kerman had considered this subject for many years, according to high costs for it, it is necessary to analysis the factors that influences on adoption of sustainable agriculture among greenhouse Cucumber Growers So this paper has analyzed this subject and it can play an important role to adopt the sustainable agriculture effective there.

The purpose of this paper is to analysis and clarifies the factors that influence on adoption of sustainable agriculture among greenhouse cucumber growers of south Kerman province. Objectives are as follows:

- Review of individual & professional characteristics of studied greenhouse cucumber growers
- Determination of the rate of adoption of sustainable agriculture
- Determination of the relation between research variables and adoption of sustainable agriculture
- Determination of the factors that influences on sustainable agriculture.

II. METHODOLOGY

The purpose of this paper was to analysis and clarifies the factors influencing on adoption of sustainable agriculture among greenhouse cucumber growers in some parts of Southern Kerman province. A descriptive-correlation method applied for research and main research tool for collecting data was questionnaire which its validity approved by panel of agricultural extension expert and its reliability was measured by calculating Cronbach's Alpha coefficient, varied from 0.79 to 0.91 that showed a high reliability for the instrument. The population includes 1839 greenhouse cucumber growers. By Morgan& Krejcie table sample size determined as 320 and random stratified sampling applied for collecting information. Data were collected through face-to-face interviews with respondents based on a structured questionnaire. The questionnaire was based on the published literature on related topics in Iran and other countries .The variables are: age, education, records of farming, compatibility, relative advantage, mass media using, social participation, knowledge, attention to sustainable agriculture and so on that were analyzed for adoption of sustainable agriculture. The multivariate regression with stepwise method was used for predicting impacts of independent variables on the dependent variable of adoption of sustainable agriculture among greenhouse cucumber growers in south Kerman province.

III. Results and Discussion

1- First objective: Review of individual & professional characteristics of studied greenhouse cucumber farmers

In this section, the personality characteristics of responders are reviewed such as age, education and records.

1-Age: the result of the table 1 shows that the average age of the greenhouse farmers is 41.65. The most frequency is related to individuals have between 31-40-years old (36.9 %) and the least frequency is related to individuals have less than 30-years old (19.1%). The minimum age was 22 and maximum. Age was 70.

Table 1: Frequency of studied greenhouse farmers in terms of Age (n=320)

Variable	Frequency	Percent	cumulative percent
Age			
Less than 30-year	61	19.1	19.1
30-40	118	36.9	55.9
40-50	71	22.2	78.1
More than 50	70	21.9	100
Average: 41.65, Standard deviation: 11.735, Min.: 22, Max.: 70			

2-Education levels: according to the table 2, only 4.7% of responders were uneducated and about 29.7% of them had been educated up to Diploma that it included the most percent.

Table 2: Frequency of studied greenhouse farmers in terms of education (n=320)

Variable	Frequency	Percent (%)	cumulative percent
Education levels			
Uneducated	15	4.7	4.7
Elementary	22	6.9	11.6
Guidance school	42	13.1	24.7
Diploma	95	29.7	54.4
Technician	58	18.1	72.5
Bachelor	69	21.6	94.1
MS or higher	19	5.9	100

3-Recordes: According to the data of table 3, 43.8% of responders were Less than 5 years. And about 38.1 % of them have been Greenhouse cultivation system for 5-10 years. And about 16.6 % of them have been Greenhouse cultivation system for 10-15 years. And about 1.6% of them have been Greenhouse cultivation system more than 15 years. The min. record was 1 years and max. Record was 19 years. The average was 7.18 years.

Table3: Frequency of studied greenhouse farmers in terms of record (n=320)

Variable	Frequency	Percent	cumulative percent
Records			
Less than 5	140	43.8	43.8
5-10	122	38.1	81.9
10-15	53	16.6	98.4
More than 15	5	1.6	100
Average:7.18, Standard deviation:4.11, Min.:1, Max.:19			

2- Second objective: Determine the rate of adoption of sustainable agriculture

According to table 4, adoption by majority of greenhouse farmers (about 50%) is in a relatively low level and 14.38% is in average level and only about 6% is in high level.

Table4: Frequency distribution of adoption of sustainable agriculture among greenhouse farmers (n= 320)

Adoption S.A.L	Frequency	Percent (%)	Cumulative percent
Low	66	20.62	16.47
Relatively low	157	49.06	68.23
Average	46	14.38	82.34
Relatively high	32	10	92.95
High	19	5.94	100
Mode: relatively low			

3 - Third objective: Determine the relation between research variables and adoption of sustainable agriculture

The correlation of variables is considered that there is a significant relation between adoption of sustainable agriculture and education, social participation, rate of using mass media, knowledge rate, Records and attitude of greenhouse cucumber grower's farmers (99%). And other variables have no significant relation with adoption of sustainable agriculture.

Table 5: Relation between studied variables and adoption of the sustainable agriculture

Row	Variables	Scale	Test Type	Correlation Coefficient
1	Education level	ordinal	spearman	0.214**
2	Social participation	interval	Pearson	0.223**
3	Access to the market	interval	Pearson	0.243**
4	rate of using mass media	ordinal	spearman	0.311**
5	Participation in extension classes	ordinal	spearman	0.448**
6	Knowledge	interval	Pearson	0.318**
7	Attitude	interval	Pearson	0.342**
8	Records	ordinal	spearman	0.306**

The multivariate regression with stepwise method was used for predicting impacts of independent variables on the dependent variable of sustainable agriculture among greenhouse cucumber growers in the southern of Kerman province, Iran. The results of this analysis showed that the variable of “sustainability dependency Knowledge of sustainability” was entered into the equation at the first step. Multiple correlation coefficients (R) were equal to 0.633 resulting in coefficient determination (R2) equal to 0.401: it means that 40.1% of the changes in the variance of the dependent variable are explained by the above mentioned variable.

At the second step, the variable of “Education level” was entered into the equation. The variable increased R and R2 up to 0.692 and 47.9%, respectively; which describes 7.8% of the changes in the variance of the

dependent variable. “Attitude toward sustainability” was entered in the equation at the third step. This variable increased R and R2 up to 0.708 and 50.4%, respectively. Thus, 2.5 of the changes in the variance of the dependent variable were described by the “Attitude toward sustainability”. Thus, among independent variables that have significant correlation with dependent variable, Knowledge of sustainability, Education level, Attitude toward sustainability, Participation in extension classes and greenhouse experience of respondents have entered into the regression equation by five steps. These variables explained 53.9% of variation in sustainability. These results are shown in Table 6.

Table 6: Regression coefficients entered in model

Independent variable	R	R^2	B	Beta	t	Sig.
Constant	-	-	3.134	-	4.753	0.000
Knowledge of sustainability	0.633	0.401	0.365	0.381	4.098	0.000
Education level	0.692	0.479	0.230	0.289	3.851	0.000
Attitude toward sustainability	0.708	0.504	0.271	0.162	3.788	0.000
Participation in extension classes	0.724	0.522	0.412	0.241	3.358	0.001
greenhouse experience of respondents	0.734	0.539	0.242	0.197	2.690	0.008

Taking the above results and those in Table 6 into account, the linear equation resulting from regression analysis is as follows:

Y = 3.134 + 0.365X1 + 0.230X2 + 0.271X3+0.412X4+0.242X5

The components of the equation include:

Y = Sustainability of greenhouse culture,

X1 = Knowledge of sustainability,

X2 = Education level,

X3 = Attitude toward sustainability,

X4= Participation in extension classes,

X5= greenhouse experience of respondents.

According to the results shown in Table 10, the variable “Sustainability ' dependency Knowledge of sustainability” (Beta= 0.381) had the greatest influence on the Sustainability of greenhouse culture; the variables “Education level” (Beta= 0.289) ; “Attitude toward sustainability” (Beta= 0.162) ; “Participation in extension classes” (Beta= 0.241) and “greenhouse experience of respondents” (Beta= 0.197) ;ranked as the 2nd ” 3rd ” 4rd and 5rd most important factors respectively influencing the dependent variable.

IV. Conclusion

Considering the rapid increase of population growth worldwide and corresponding outcomes such as limited supply of arable lands, continuous and increasing demand in food production and a desire for higher standards of living have caused intensive use of energy resources. (Erdal et al., 2007 and Bolandnazar et al., 2014)Greenhouse cultivation system, as one of the manifestations of industrialization and intensive agriculture, is already a major supplier of agricultural products around the world. However, due to the over use of resources and chemical inputs, environmental concerns emerged. Thus, regard to key roles of Southern Kerman province as major producer of greenhouse crops in Iran, This study that its purpose is to analysis and clarifies the factors that influence on adoption of sustainable agriculture among greenhouse Cucumber Growers in the Southern of Kerman province showed that variables such as rate of education of farmers, social participation, access to markets, using the mass media, participation in extension classes, knowledge and attitude of farmers have significant and positive relation to adoption of sustainable agriculture. In addition, adoption of sustainable agriculture among greenhouse Cucumber Growers in the Southern of Kerman province was in a relatively low level. In factor analysis there were 5 factors that affect on adoption of sustainable agriculture, characteristics of Knowledge of sustainability, Education level, Attitude toward sustainability, Participation in extension classes, greenhouse experience of respondents that from first to fifth factors cover about 40.1%, 7.8%, 2.5%, 1.8% and 1.7% of variance of adoption of sustainable agriculture respectively. Also suggested that:

Descriptive information showed that the mean age for greenhouse owner was about 42 years. And 46% had technician and above degree which indicate that education level of owner were higher than other farmer. This can be a positive point in planning for development of sustainability in greenhouse cultivation system.

Since the size of farming units affected by the production structure, Therefore, it is better to determine the optimum size of production units specifically for the greenhouse cucumber product in each region.

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