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Research Article

ANALYSIS OF THE BARRIERS TO RENEWABLE ENERGY UTILIZATION IN GREENHOUSES: CASE STUDY: KHOUZESTAN PROVINCE, IRAN

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ABSTRACT
The purpose of this research was analysis of the barriers to renewable energy utilization in greenhouses of Khuzestan province of Iran. The population of study consisted of 286 greenhouse owners, in which 165 people were selected as a sample size, using Krejcie and Morgan table. In order to gathering the information, the questionnaires' was prepared and validated by the judgment of the experts in agricultural extension. The reliability of the main scales of the questionnaires' was examined by Cronbach Alpha coefficients, which ranged from 0.71 to 0.92, indicating the tool of study is reliable. Based on the results of factor analysis the factors were categorized into six main components, which have been named lack of training and management, lack of support services, inappropriate greenhouse conditions, lack of financial support, lack of technical facilities and lack of awareness and knowledge about renewable energies. The obtained results from the factor analysis revealed that the six mentioned factors explained 76.92% of the variation of barriers to renewable energy utilization.

Keywords: *Renewable Energies, Barriers, Greenhouses Owners, Khouzestan*

INTRODUCTION
Energy is one of the most important factors of development and also industrial society's development is related to it.

The increasing emissions of greenhouse gases (GHGs) into the Earth's atmosphere from fossil fuel burning, deforestation, livestock-farming and other human activities has resulted in complex climate variability leading to an imbalance in the globe's atmosphere, biosphere and oceanic ecosystems. Climate change is already influencing sea level rise, agricultural yield, forest-cover reduction, water resources and phenomena such as storms, cyclones, landslides and floods (IPCC, 2007).

Meanwhile, fossil energy sources, during the past decades and even today have critical role in economic development.

Yet these resources have inflicted serious damage to nature and accept an end to the continued growth and development of human societies always be coupled with energy production and consumption. Of course, due to limited resources and the negative effects on the environment, meet global energy needs for survival and not development (Ahuja and Tatsutani, 2009).

Limited fossil energy resources and the problems caused by greenhouse gas emissions, made the need for more attention to renewable energies clear to everyone and these energies are one of the most important alternatives to fossil fuels which finished politicians concerns about the vulnerability, increase pollution caused by conversion to other energy sources and energy supply and according to favorable potential of renewable energies supply in the country, The logical development of this valuable resource technologies seem justified, Because this can lead us toward the sustainable development goals (Barimani and Kaabinejadian, 2010).

Iran, as a growing country, has a rich and high potential of energy generation including vast energy resources, existence of large oil tanks and the underground resources, and it's one of the pressure growth patterns on natural resources.

According to Iran's energy consumption, it owns the third place of world's energy utilization. This amount is very striking for a country with 75 million of population. According to reports during 1986 to

2011, the consumption of oil and natural gases, increased from 100 million tons in 1986 to 225 million tons and even 350 million tons in 2011 respectively (IEA, 2007).

According to Iran location in the dry and arid regions, the potential for exploitation of renewable energy resources is very rich, but, unfortunately, statistics show that the consumption of renewable energy in Iran is very low.

However, it is anticipated to produce about 20000 megawatts of renewable energies for 2025. In the meantime, Iran Agricultural sector, has a significant role in increasing exports and the country's foreign exchange earnings.

Therefore, the energy consumption issue in this sector is very important, as the most important consumer sector Energy in the country, because it is the main objective of Iran's non-oil exports that intended special features to increase exports of agricultural products (Salehi, 2013).

Among the different agricultural sectors, the most energy consumption per area unit is belonged to greenhouse industry, which is developing rapidly.

Greenhouse owners usually have some problems in energy consumption and other Issues such as the utilization of old heating systems with very low yields, poor and non-homogeneous distribution of greenhouse heating which resulting loss of energy in different ways, are the major problems of greenhouse owners.

But the loss of energy in country greenhouses has not been scientifically studied and due to growing trend of greenhouse industry development, in order to increase efficiency and reduce energy losses, more researches and scientific studies are inevitable (IAMS, 2013).

Keeping this in view, the present study was conducted to investigate renewable energy consumption barriers in Khouzestan province greenhouses. The Greenhouse owners, are mostly uneducated and because of easy access to fossil energy they still use this energy and materials in traditional forms. This study was conducted to identify the barriers in which they use renewable energy and where they need modern technologies to facilitate and improve renewable energy usage. It is hypothesized that Greenhouse systems are an appropriate ground for expanding renewable agriculture. The present study addresses the question whether is this ground still available and to what extent greenhouse owners use renewable energies and materials.

According to researches on some greenhouses in the province, it is shown that the energy consumption was high in these units and the vast majority(about 80%)of it needed to heat the greenhouse and fuel consumption in the machinery, and also in some economic studies, fuel (gasoline) allocated the largest share of costs to itself.

While regarding to geographical and climatic conditions of the area, the maximum usage of renewable energy can reduce costs, increase economic profitability and contribute sustainable development in the environment by the hands of greenhouse units (Ghorbani & Dibayi, 2010).

Khuzestan province, owns the second place of Iran's greenhouses cultivation area, that most of it belongs to flowers and ornamental plants.

The overview of greenhouses of the province shows that energy consumption is many times bigger than their actual needs.

However, in many cases, due to inappropriate tools and systems using in greenhouses and lack of new technologies, production decreased and the energy utilization per production unit will increase more (Eghtedari, 2010).

MATERIALS AND METHODS

The purpose of this research was analysis of the barriers to renewable energy utilization in greenhouses of Khuzestan province of Iran. The population of study consisted of 286 greenhouse owners, in which 165 people were selected as a sample size, using Krejcie and Morgan table. In order to gathering the information, the questionnaires' was prepared and validated by the judgment of the experts in agricultural extension.

The reliability of the main scales of the questionnaires' was examined by Cronbach Alpha coefficients, which ranged from 0.71 to 0.92, indicating the tool of study is reliable. The method of research was a correlative-descriptive and research conducted in 2015. Finally, 140 questionnaires were analyzed.
The data were analyzed by SPSS version 20.0. Appropriate statistical procedures such as frequency, percentage, mean, standard deviation and correlation coefficient were applied to analyze the data. In order to measure the extent of renewable energy use by the farmers, different appropriate scales were developed and included in the final format of the questionnaire.
The responses to each item of the scales were obtained on a five-point continuum viz., very disagree, disagree, no idea, agree and very agree with the scores of, one, two, three, four and five, respectively. Then a total score was calculated for different scales by summing up the item's assigned scores, which indicated overall score for renewable energy use by each subject of study. Along with, the overall score of renewable material use was calculated by summing up the items included in a scale which had been developed for this purpose.
These two overall scores of different renewable energy and material use by the farmers were applied in correlation analysis.

RESULTS AND DISCUSSION

Personal Characteristics (Education and Age)

Results show that the mean of the greenhouse owner's age was about 36 years old with a standard deviation of about 10.64 years old. Table 1 shows the education levels of the farmers. The results indicate that more than 70 percent of the greenhouse owners had low level education, while only nearly 30 percent of them educated in higher levels.

Table 1: Frequency distribution of the farmers based on their educational level

Education level	Frequency	Percent	Cumulative Percent
Primary school	9	6.4	6.4
Junior high school	40	28.6	35.0
Senior high school	49	35.0	70.0
Diploma	25	17.9	87.9
Post diploma	9	6.4	94.3
Bachelor of science and higher	8	5.7	100.0
Total	140	100.0	

Ranking the Barriers

In order to assess the barriers of renewable energy utilization in the province's flowers and ornamental plants greenhouses, 18 statements were designed and asked from greenhouse owners to show their opinions.
Based on the results, table (2) is provided. It presents the mean, standard deviation and then, items were ranked by using the coefficient of variation on respondents' views, and it also shows the frequency responses of entire population of study about each item. This statement "There are no centers to provide services related to renewable energy" is allocated as first priority. In this item, 37.1% of respondents were strongly agree, 31.4% were agree, 22.1% had no idea, 7.9% were disagree and 1.4% were strongly disagree.
The last priority allocated to "We don't have a suitable weather and placement for using renewable energies." Statement, which 17.9% of population were strongly agree with it, 19.3 were agree, 14.3 had no idea, 7.9% were disagree and 40.7% were strongly disagree with it.

Table 2: Distribution of Greenhouse owners in terms of responding to the items and prioritize them based on the coefficient of variation

Statements	Extent of use (percent)					Mean score	Standard Deviation	Rank
	Strongly agree	Agree	No Idea	Disagree	Strongly disagree			
There are nocenters to provide services related to renewable energy	37.1	31.4	22.1	7.9	1.4	3.95	1.2	1
The cost of technology installation is high	40.7	26.6	24.3	5	3.6	3.9	1.08	2
New technology fund borrowing is difficult	30.7	31.4	18.6	16.4	2.9	3.7	1.15	3
I don't know the policies and supports who governments do on renewable energy utilization	39.3	28.6	15.7	11.4	5	3.8	1.2	4
Failure access to facilities and technical information	21.4	25.7	33.6	15.7	3.6	3.4	1.1	5
Failure access to affordable and low price technologies in this field	27.1	25.7	25	20	2.1	3.5	1.15	6
There are no support services in the relevant field	37.1	28.6	17.9	9.3	7.1	3.79	1.23	7
There's no Secure and guaranteed way of this technology implementation in the greenhouse	37.1	27.9	17.1	9.3	8.6	3.75	1.28	8
I have financial problems for using these energies	34.3	20.7	22.1	19.3	3.6	3.62	1.23	9
It takes a long time to Install and commission the relevant technology	32.9	24.3	24.3	10	8.6	3.62	1.27	10
The risk of using renewable energy is high	29.3	23.6	22.1	20	5	3.52	1.24	11
Renewable energy usage is not compatible with the living conditions of greenhouse owners	26.4	23.6	23.6	20	6.4	3.43	1.25	12
I'm not familiar with renewable energy loss and benefits	37.9	22.9	17.9	10.7	10.7	3.66	1.36	13
Technology installation and maintenance is difficult	24.3	30.7	20.7	10	14.3	3.4	1.34	14
Lack of experts for guidance	29.3	22.1	22.9	8.6	17.1	3.37	1.42	15
Energy usage in traditional way is cheaper	27.9	20	22.1	12.1	17.9	3.27	1.44	16
It's hard to use renewable energies	25	20.7	17.9	17.1	19.3	3.15	1.46	17
We don't have a suitable weather and placement for using renewable energies	17.9	19.3	14.3	7.9	40.7	2.65	1.58	18

Factors Analysis

In order to classify the barriers of renewable energy utilization, factor analysis was used. In this term, 18 items were designed and evaluated the statements in the correlation matrix. Bartlett and Kaiser-Meyer-Olkin (KMO) tests, were used to fit the data for factor analysis (Table 3). The KMO coefficient was equal to 748.0 which indicates perfect correlation between the data for analysis. Table (4), shows the number of factors that are statistically significant for the analysis and mentioned 6 factors with eigen values greater than 1.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.748**
Bartlett's Test of Sphericity	df	153.
		1535.241
	Sig.	0.000

Table 4: Initial Eigen values for determine the number of factors

Rank	**Component**	**Initial Eigenvalues**		
		Total	**% of Variance**	**Cumulative %**
1	Lack of training and management,	6.431	35.725	35.725
2	Lack of support services	2.241	12.448	48.173
3	Inappropriate greenhouse conditions	1.489	8.272	56.445
4	Lack of financial support	1.337	7.430	63.874
5	Lack of technical facilities	1.301	7.230	71.104
6	Lack of awareness and knowledge	1.048	5.824	76.928

Variables evaluated based on the time factor and the orthogonal rotation varimax method, explained 76.928 percent of total variance and 23.072 percent of the remaining variance was related to factors that were not identified through factor analysis. These 6 factors were renamed after loading variables as: Lack of training and management, lack of support services, inappropriate greenhouse conditions, lack of financial support, lack of technical facilities and lack of awareness and knowledge about renewable energies (Table 5).

Table 5: Rotated Components Matrixand list of the Barriers (factors) to Renewable Energy Utilization after Rotation

Principal Factors	**Items**	**Components**
Lack of training and management	There are no support services in the relevant field.	0.544
	It takes a long time to Install and commission the relevant technology.	0.73
	Lack of experts for guidance.	0.732
	The risk of using renewable energy is high.	0.801
lack of support services	Failure access to affordable and low price technologies in this field.	0.695
	The cost of technology installation is high.	0.75
	There’s no Secure and guaranteed way of this technology implementation in the greenhouse.	0.93
	Energy usage in traditional way is cheaper.	0.511
Inappropriate greenhouse conditions	Failure access to facilities and technical information.	0.581
	It’s hard to use renewable energies.	0.794
	Renewable energy usage is not compatible with the living conditions of greenhouse owners.	0.67
	There are no providing services centers related to renewable energy.	0.651
lack of financial support	New technology fund borrowing is difficult.	0.714
	I have financial problems for using these energies.	0.815
lack of technical facilities	Technology installation and maintenance is difficult.	0.836
	I don’t know the policies and supports who governments do on renewable energy utilization.	0.582
lack of awareness and knowledge	I'm not familiar with renewable energy loss and benefits.	0.905
	We don’t have a suitable weather and placement for using renewable energies.	0.578

Conclusions

The aim of this study was to identify and analyze factors that preventing the greenhouse owners to use renewable energies in their units. Additionally, the influence of people's status of information was investigated by their agreements or disagreements about the renewable energies barriers. For this purpose, a questionnaire study with 140 participants was conducted. Results give valuable insights for guidelines for the development of renewable energies. First of all, results reveal that greenhouse owners have a low level of education and their knowledge about renewable energy is not desirable. Also, according to interviews with greenhouse owners, there's non-implementation training courses in this field. A deeper factor analysis shows that 6 factors including: Lack of training and management, lack of support services, inappropriate greenhouse conditions, lack of financial support, lack of technical facilities and lack of awareness and knowledge about renewable energies, are strongly affecting the greenhouse owners willingness about renewable energies utilization in their units.

Parallel researches of (Razeqi *et al.*, 2012), (Alimoradian and Ebrahimpour, 2013), (Painuly, 2001) & (Reddy and Painuly, 2004) are associated with the results of this study.

However, lack of access to renewable energy technologies reveals that the country needs to develop and apply appropriate and commercial renewable technologies to harness the potential and capacities of the renewable resources available in agricultural sector. At the same time a strong and growing private market for renewable energy technologies in the agricultural sector should be developed. Agricultural extensionists have to receive training in the appropriate use of renewable energy technologies for empowering local people to make decisions related to their own energy use at a community level. The Iranian government has to enact a variety of incentives, regulations, and programs to encourage the production and use of agriculture-based renewable energy. Also it needs more financial and economic supports with more bank loans and facilities, decreasing the costs related to the provision of relevant equipment in this field.

In addition to these measures, it is recommended to revitalize and modernize indigenous knowledge and technologies of using renewable technologies. However, the promotion of renewable agriculture needs more attention by the government as a basic strategy to develop sustainable agriculture. It should be clearly reflected in the agricultural development plans. The universities and extension offices have to pay due attention to this issue to support renewable agriculture programs by educating the actors of agricultural development.

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