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Farmers' Views on the Factors Inhibiting the Implementation of Soil Conservation Practices in Koohdasht, Iran

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ABSTRACT

One of the dangers that constantly threatens agricultural sector is soil erosion. The purpose of this study was to investigate and categorize farmers' views on the factors inhibiting the implementation of soil conservation practices in Koohdasht Township, Iran. The study was fulfilled by using descriptive-correlation method. A stratified random sample of 377 farmers was drawn from a population of 19531 farmers in the township, based on Krejcie and Morgan Table for determining sample size from a finite population. The research questionnaire was validated by a panel of faculty members of agricultural extension and education at Tarbiat Modares University (TMU) and found to have sufficient content and face validity. Using a pilot study, internal consistency reliability was demonstrated with satisfactory alpha coefficient (0.73). Descriptive and inferential statistics, i.e., factor analysis, were used to analyze the data. Factor analysis produced four factors: "economic-extension", "ecological-farming", "social-structural", and "organizational-management" which accounted for 49% of the total variance. The factors that emerged suggest the need for some executive measures to overcome the problems inhibiting the implementation of soil conservation practices in future programs.

Keywords: Descriptive-correlation method, Ecological-farming, Economic-extension, Factor analysis, Soil protection.

INTRODUCTION

Agriculture, as a dynamic economic sector, plays an integral role in the socio-economic development of countries. (Mosavi, 2014; Najafi Alamdarlo, 2016, a). This sector, like any other, has an ongoing need for competent human resources with knowledge and expertise in related activities. Boosting the agricultural production requires not only the basic inputs, tools, machinery and assets but also an enlightened and active management aimed toward optimal utilization and long-term protection of these resources (Soltani *et al*., 1998; Najafi Alamdarlo *et al.*, 2016). In this regard, one of the professional tasks of agricultural extension agents is awareness about farmers' attitudes toward their problems and barriers in the field of agriculture and natural resources (Moradi *et al.*, 2011; Athrai *et al.*, 2017). One of the problems that humanity must face in the twenty-first century is the escalating consequences of population growth, such as increased and excessive utilization - or in fact destruction of- natural resources (Sadeghi *et al.*, 2006; Mosavi, 2016; Najafi Alamdarlo, 2016, b), which requires appropriate management, especially in the use of water and soil resources (Bijani and Hayati, 2015). The most obvious consequence of population growth is food security problem, which is directly associated with agricultural sector. The world's population has seen a steady increase from 4.4 billion in 1980 to 6 billion

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in 2000, and is expected to increase to 8 billion in 2025 (Ebadi and Majnoonian, 2008). This issue highlights the importance of ongoing attention to protection of basic natural resources needed for agriculture, especially the soil. Undoubtedly, one of the most important challenges in the achievement process of environmental sustainability is soil erosion prevention (Kibblewhite *et al.,* 2014; Noorollah-noorivandi *et al.,* 2009; Ghazani and Bijani, 2016; Bijani *et al.,* 2017). "Soil conservation practices" are a group of activities that support the topsoil against the forces of erosion, thereby contributing to partial control of environmental problems related to agricultural sector (Bekele and Drake, 2003). In fact, a major factor sapping the performance of agricultural activity, especially in low-income countries, is the deteriorating condition of natural resources including the soil quality. Today, land degradation and nutrient depletion due to soil erosion is a major problem limiting the development potential of agricultural sector (Amsula and De Graaff, 2007). The importance of soil as a fundamental factor of agricultural development is a dominantly accepted fact, but different countries have different perceptions about the proper use and management of this resource, and in some countries, a combination of natural and human causes has created a regressive process that will lead to a critical soil condition (Bodagh *et al.,* 2003).

According to estimates, soil erosion in Iran has increased from about 1 billion tonnes in 1976 to 1.5 billion tonnes in 1986 and then to 2.5 billion tonnes in 1996. According to the latest statistics (Statistical Center of Iran, 2013), average annual soil erosion in Iran is about 15 tonnes per hectare. Ranking first in the country in terms of soil erosion is the Lorestan Province with an average soil erosion of 33 tonnes per hectare, which is five to six times greater than global average (5.5 tonnes per hectare). Annual direct losses due to soil erosion and degradation in Iran are estimated to be about three thousand five hundred billion Iranian Rials (about 16 million US Dollars). It should also be remembered that it takes around 500 to 800 years for 1 cm of arable soil to be created (Nourmohammadi *et al.,* 2013). The average rainfall in the Lorestan Province during the cropping year 2010-2011 was 305 mm, which was 33% lower than the local long-term average of similar statistical period and 17% lower than the cropping year 2009-2010 (Hasanvand *et al.,* 2011).

People having a positive attitude toward a subject are more inclined to support or promote it and people having a negative view on a subject are more disposed to undermine it. So, it can be argued that positive or negative attitude of farmers toward soil protection can affect their behavior in regard with application of soil conservation practices. Considering the importance of natural resources and especially the soil, promotion of resource protection measures such as soil conservation practices can make a signification contribution to improvement of production and productivity and development of national economy (Shafiee *et al.,* 2008). In a study on natural resource development strategies in Iran's Markazi Province, the most important environmental challenges were found to be factors such as over-exploitation of resources, lack of attention to livestock grazing schedules suitable for pastures, and low levels of awareness and information among general public and stakeholders in regard with importance and value of natural resources. Factor analysis carried out in that study found that less inclination to abide to law and regulations and limited awareness-raising and public education are the most influential factors explaining the challenges (Haji-mirrahi and Nabaei, 2006). Attitude of farmers toward soil conservation practices can be influenced by income level, education level, frequency of participation in educational-extension programs, frequency of using information and communication sources and channels, and knowledge of farmers about these practices (Shiri *et al.,* 2013). Farmers who had a large land area

under cultivation and high income, access to machinery and farming inputs, and high social participation were more likely to adopt conservation practices (Ashoori *et al.*, 2016a). Also, non-agricultural income and production costs have a direct significant relationship with farmers' soil conservation practices (Ashoori *et al.*, 2016b). Acceptance and use of soil conservation practices by farmers is also influenced by economic factors (access to natural and capital resources, costs, and level of risk-aversion), dissemination of and access to information, knowledge as well as individual factors, human values, and work experience (Posthumus *et al.*, 2010; Ghazani and Bijani., 2016; Abbasian *et al.*, 2016). According to Rasouliazar and Fealy (2013), stepwise regression analysis revealed that 35.30% of the variances in the amount of farmers' adoption of Farming Methods of Soil Management (FMSM) could be explained by the five variables, namely, farm size, knowledge about FMSM, the amount of extension contacts about FMSM, distance between farm and Agricultural Service Centers, and the attitude toward FMSM.

Based on personal experience and studies carried out by the authors in Koohdasht Township, agricultural sector of this township is not immune to the abovementioned problems and, in some cases, faces even more severe challenges. Therefore, proper attention to agricultural sector of this township and, in particular, the effect of farmers' view on soil conservation practices is of significant importance. On this basis, the objective of this study was to evaluate and classify the factors inhibiting the soil conservation practices from the perspective of Koohdasht farmers.

MATERIALS AND METHODS

This study is an applied research based on field data processed via descriptive-correlational analysis. The study was conducted in Koohdasht Township, Lorestan Province, in the west of Iran (Figure 1). The study population comprised of all Koohdasht farmers amounting to 19531 people according to latest report of Koohdasht Township's Jihad-e Agriculture Office, 2013. A proportional stratified random sample of 377 farmers was selected from four districts of Koohdasht Township: Markazi, Tarhan, Kunani and Darb-Gonbad. Using the Table of Krejcei and Morgan

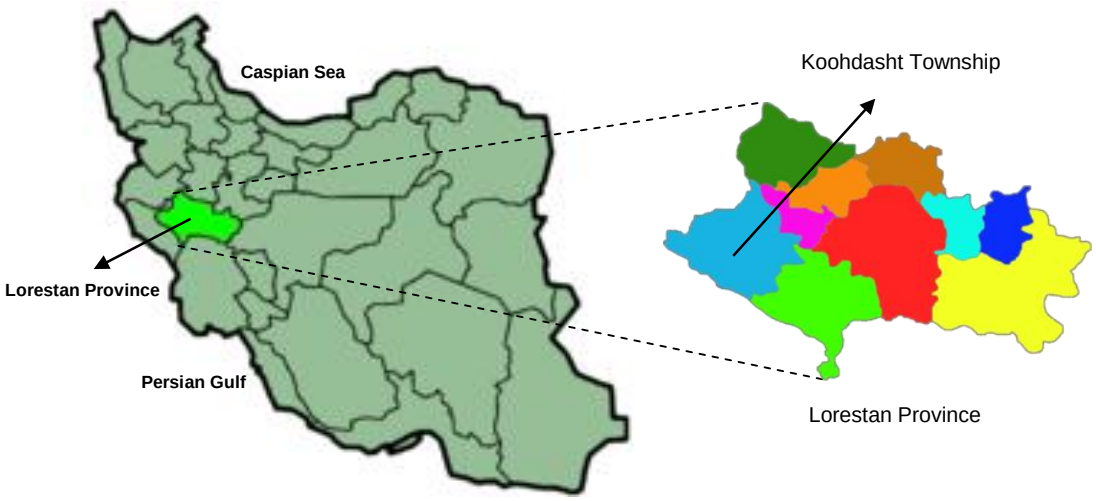

Figure 1. A general map of Iran illustrating the location of the study area.

(Krejcei and Morgan, 1970), for determining sample size from a known population. However, 345 questionnaires were complete and usable and were eventually analyzed using $SPSS_{22}$ software. The questionnaire consisted of soil conservation implementation problems (21 items) measured with a Likert type scale. The questionnaire also enquired about personal and professional characteristics of farmers as well as characteristics of their fields. Validity of the questionnaire was assessed by a number of faculty members of Agricultural Extension and Education Department at Tarbiat Modares University (TMU), and the required revisions were made accordingly. To verify the reliability of the questionnaire, 30 copies of the questionnaire were filled by farmers of Rumeshkan Township in Lorestan Province. Cronbach's alpha of preliminary results confirmed the suitability of the questionnaire items (α= 0.73). Descriptive statistics, i.e. frequency distributions, mean, percentage, standard deviation, coefficient of variation, and inferential statistics, i.e. correlation and factor analysis were used to analyze the data. The factor analysis used the extraction method and Varimax rotation method.

RESULTS AND DISCUSSION

The results of descriptive statistics showed that the average age of the respondents was 49 years. Table 1 exhibits the frequency distribution of the respondents in age groups and shows that age group of 45 to 55 years had the highest percentage (37.4%) and age group of younger than 35 years had the lowest frequency (12.2%). Information obtained from the respondents showed that the average duration of their farming experiences was 23.3 years, with the lowest being 2 years and highest being 65 years. The results showed that farmers having 15 to 30 years of work experience were the most frequent group (47.8%) among the respondents. According to obtained results, respondents had an average income of 7.02 million Iranian Rials (about 227 US Dollars) per month, with lowest monthly income being 1.5 million Iranian Rials (about 48 US Dollars) and highest being 30 million Iranian Rials (about 970 US Dollars). The results showed that of the 345 respondents, 236 (68.4%) were living in village and 109 (31.6%) were living in city. The results pertaining to employment status revealed that 207 (60%) of farmers also had an off farm employment. Research findings showed that the vast majority of respondents (82.9%), were male and the rest were female. Frequency distribution of respondents' education level showed that illiterate farmers (107 people) had the highest frequency and farmers having an associate degree (34 people) had the lowest frequency. It is noteworthy that more than two thirds of the respondents (73%) did not have a secondary school (8^{th} grade) certificate. Average area of land among those farmers who had an irrigated land (160 people) was 2.95 hectares with standard deviation of 2.57; while average area of land among the farmers who had a rainfed land (290 people) was 7.70 hectares with standard deviation of 7.43. Other descriptive statistics are presented in Table 1.

Factors Inhibiting Soil Conservation Practices

Factors inhibiting the implementation of soil conservation practices were assessed with 21 items organized in a Likert type scale. The ratings are based on a scale from 1-5, with 1 representing strongly disagree, 2 for disagree, 3 for no opinion, 4 for agree, and 5 for strongly agree. As Table 2 shows, the problems including "infrequent association between farmers and Service Centers", "insufficiency of government funding and facilities", and "farmers' lack of awareness about correct methods of soil management" were in the top three ranks. Meanwhile, the items "unsuitable geographical conditions", "lack of suitable space for soil conservation", and "lack of governmental policy-making for soil conservation" occupied the lowest ranks.

Table 1. Descriptive statistics of demographic characteristics of the studied farmers and their farms.

Variable	Class/Category	Frequency	Percentage	Cumulative percentage
Age (years) ($\bar{X}$= 49.0, SD= 1.13)	Less than 35	42	12.2	12.2
	35 to 45	76	22	34.2
	45 to 55	129	37.4	71.6
	More than 55	98	2834	100
Experience (Years) ($\bar{X}$= 2.27, SD= 1.17)	Less than 15	112	32.5	32.5
	15 to 30	165	47.8	70.3
	30 to 45	55	15.9	96.2
	More than 45	13	3.8	100
Monthly income (US dollars) ($\bar{X}$= 227, SD= 290)	Less than 16	139	40.3	40.3
	16 to 324	167	48.4	88.7
	324 to 485	29	8.4	97.1
	More than 485	10	2.9	100
Gender	Female	59	17.1	---
	Male	286	82.9	---
Employed in non-agricultural sector	Yes	207	60	---
	No	108	40	---
Place of residence	Village	236	68.4	---
	City	109	31.6	---
Farming style	Traditional	99	28.7	---
	Semi-mechanized	210	68.9	---
	Mechanized	36	10.4	---
Farming type	Agriculture	133	38.6	---
	Horticulture	30	8.7	---
	Agronomy and horticulture	35	10.1	---
	Agriculture and animal husbandry	87	25.2	---
	Horticulture and animal husbandry	31	9	---
	Agriculture, horticulture and animal husbandry	29	8.4	---
Education level	Illiterate	107	31	31
	Elementary school certificate	76	22	53
	Secondary school certificate	38	11	64
	High school diploma	50	14.5	78.5
	Associate degree	34	9.9	88.4
	Higher than associate degree	40	11.6	100

To reduce the number of research variables and find the common factors inhibiting the implementation of soil conservation practices in Koohdasht Township, the 21 items shown in Table 2 were subjected to a factor analysis. Kaiser-Meyer-Olkin (KMO) test value of 0.84 showed that item were suitable for factor analysis, considering that a *KMO* value between 0.8 and 1 indicates that the

Table 2. Ranking of items pertaining to factors inhibiting the implementation of soil conservation practices from the farmers' perspective.

Items: Importance of factors inhibiting the soil conservation practices	Mean	*SD*	*CV*	Rank
Infrequent association between service centers and farmers	3.93	0.84	0.213	1
Insufficiency of government funding and facilities	4.06	0.87	0.214	2
Farmers' lack of awareness about correct methods of soil management	4.00	0.86	0.215	3
Lack of training courses	4.12	0.90	0.218	4
Lack of extension agents with adequate knowledge about soil conservation	4.03	0.88	0.218	5
Farmers need to make the most use of their land	4.00	0.91	0.227	6
Poverty of farmers	3.94	0.93	0.236	7
The cost of implementing soil conservation practices is beyond farmers' financial capabilities.	4.00	0.95	0.237	8
Farmers' low level of education	3.90	0.93	0.238	9
Great distance from service centers	3.76	0.90	0.239	10
The absence of incentives for soil conservation practices	3.86	0.93	0.240	11
Fragmented management of farms	3.62	0.88	0.243	12
Lack of access to appropriate technology	3.88	0.97	0.250	13
Lack of cooperation from farmers to implement soil conservation practices	3.61	0.98	0.260	14
The imbalance between livestock grazing and pasture	3.63	0.95	0.261	15
Small size of farms	3.51	0.94	0.267	16
Lack of government planning	3.71	1.01	0.272	17
The sloped nature of land	3.65	1.00	0.273	18
Unsuitable geographical conditions	3.72	1.02	0.274	19
Lack of suitable space for soil conservation	3.52	0.98	0.278	20
Lack of governmental policy-making for soil conservation	3.70	1.06	0.286	21

sampling is adequate (Mansourfar, 2006). Also, the Bartlett's test rejected the hypothesis that the correlation matrix was an identity matrix (at the level of 0.01), and showed a significant relationship between the variables (Ibid). Table 3 shows the four factors that were extracted from the analysis of the problems hindering the implementation of soil conservation practices, i.e. the factors that met the cut-off criterion with eigenvalues greater than 1. These factors accounted for 48.5% of the total variance, with factor 1 accounting for 26.53% of the total variance and factor 2 accounting for 8.94% of the total variance.

The results showed that all items included in the factor analysis were accepted. Table 4 shows these results after Varimax rotation. The results of factor analysis on the problems inhibiting the implementation of soil conservation practices were classified into four classes of "economic-promotional", "agricultural-ecological", "social-structural", and "managerial-organizational" factors. The study, therefore, underscores the importance of economic

Table 3. Extracted factors and their eigenvalues, percentage of variance, and cumulative variance (df= 210).

Factor	Eigenvalue	Percentage of variance	Cumulative variance[a]
1	5.534	26.352	26.352
2	1.876	8.935	35.288
3	1.490	7.096	42.384
4	1.287	6.127	48.511

[a] One of the criteria to determine factors is measuring the cumulative percentage variance. In social studies, analysts usually extracted continue operating as much as 60 percent of the total variance of variables In some cases lower than 60 percent, especially when the main criteria for factor determination is Eigenvalue (should be more than 1), we can have a cumulative percentage variance lower than 60 percent (Mansourfar, 2006).

factors in the adoption of soil conservation practices besides other ecological, social and managerial factors as presented in Figure 2.

The results of Tables 3 and 4 indicate that economic-extension is the most important factor as it explains 26.35 percent of variance of inhibiting factors. The items of this factor point to farmers' poor economic status and the need for more promotional work aimed at improving soil conservation. The other three factors collectively explained 22.14 percent of variance of inhibiting factors, and all made an almost equal contribution in this respect, which

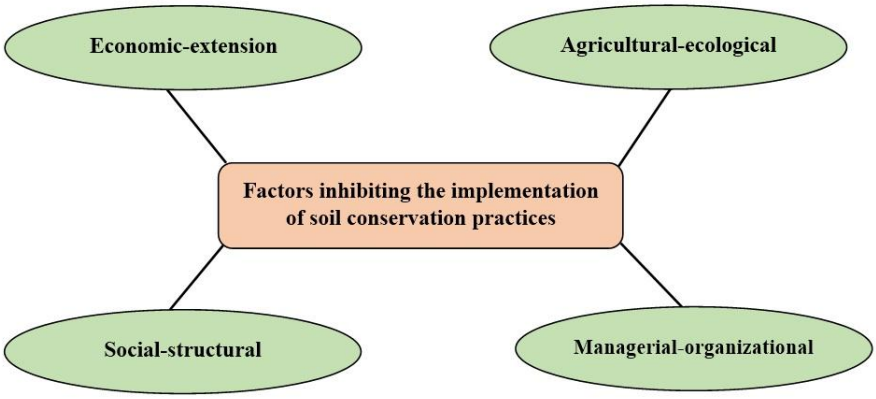

Figure 2. Factors inhibiting the implementation of soil conservation practices from the farmers' perspective (extracted via factor analysis).

Table 4. Details of factors extracted from factor analysis.

Factors		Items	Rotated factor matrix (After Varimax rotation)			
No	Title		Factor and factor loading			
			1	2	3	4
1	Economic-extension	Insufficiency of government funding and facilities	**0.640**	0.312	0.026	0.156
		Farmers need to make the most use of their land	**0.711**	0.152	0.148	0.024
		Poverty of farmers	**0.493**	.370	.208	-0.171
		The cost of implementing soil conservation practices is beyond farmers' financial capabilities.	**0.516**	0.438	0.312	0.112
		The absence of incentives for soil conservation practices	**0.627**	0.240	-0.025	0.155
2	Agricultural-ecological	Great distance from service centers	0.206	**0.388**	-0.124	-0.178
		Lack of access to appropriate technology	0.315	**0.523**	-0.183	0.075
		The imbalance between livestock grazing and pasture	0.373	**0.688**	0.198	0.151
		The sloped nature of land	0.149	**0.702**	0.250	0.196
		Unsuitable geographical conditions	0.129	**0.602**	0.253	0.271
3	Social-structural	Infrequent association between service centers and farmers	0.018	0.165	**0.311**	0.855
		Farmers' lack of awareness about correct methods of soil management	0.067	0.706	**0.338**	0.262
		Farmers' low level of education	0.178	0.362	**0.563**	0.126
		Fragmented management of farms	0.070	0.210	**0.686**	0.020
		Lack of cooperation from farmers to implement soil conservation practices	0.038	0.332	**0.684**	0.024
		Small size of farms	0.133	0.235	**0.773**	0.164
		Lack of suitable space for soil conservation	0.184	0.235	**0.358**	0.115
4	Managerial-organizational	Lack of training courses	0.092	0.138	0.087	**0.370**
		Lack of extension agents with adequate knowledge about soil conservation	-0.068	0.198	0.221	**0.716**
		Lack of government planning	0.212	0.144	0.220	**0.826**
		Lack of governmental policy-making for soil conservation	0.083	0.110	0.078	**0.839**

points to their equal importance. Results of Table 2 also show that, among items falling into economic-extension factor, "lack of extension agents with adequate knowledge about soil conservation" and "farmers need to make the most use of their land" hold the top two ranks and highlight the importance of promotional work.

Comparison of Respondents' Views on the Factors Inhibiting Soil Conservation Practices

The independent *t*-test was used to compare the mean values corresponding to farmers' views on factors inhibiting the soil conservation practices in terms of three variables of gender, place of residence, and employment in non-agricultural sector. This analysis only found a statistically significant difference between the people with exclusive farming career and those who also had a non-agricultural job, as the mean scores pertaining to second group were significantly higher. This may be because the second group had been exposed to more diverse range of conditions and environments and had gained more experience in matters other than agriculture. The absence of any difference in terms of gender and place of residence reflects the unanimous view of respondents on the factors inhibiting soil conservation practices. Actually, the purpose of these comparisons was to compare the mean of "respondents' view on factors inhibiting the soil conservation practices" in terms of their distinctive features. The results showed there were no significant difference in some of their characteristics due to similarity and coherence of the sample. The only significant difference was created from having a second job (non-agricultural), which is typical for people to make more income. This result has an emphasis on respondents' economic issues (as an effective variable) which is consistent with the previous results of the study.

CONCLUSIONS

The results regarding the ranking of problems inhibiting the implementation of soil conservation practices from the farmers' perspective revealed that "infrequent association between farmers and service centers" (alignment with the results of Ghazani and Bijani, 2016), "insufficiency of government funding and facilities" (alignment with the findings of Bijani and Hayati, 2015), "farmers' lack of awareness about correct methods of soil management" (consistent with the results of Rasouliazar and Fealy, 2013), and "lack of training courses in regard with soil conservation" (consistent with Abbasian *et al.*, 2016) are the most important factors inhibiting these practices. This result highlights the farmers need for government-supported financial facilities and training programs. Establishment of an active extension-service center in the studied township not only will

Table 5. Comparison of the respondents' views on factors inhibiting the soil conservation practices in terms of gender, place of residence, and employment in non-agricultural sector by the use the independent *t*-test.

Independent variables	Variable levels	Frequency	Dependent variable	Mean	*SD*	*t*	Sig	Cohen's *d*
Gender	Female	59	View on factors inhibiting the soil conservation practices	80.67	13.08	0.351	0.726	0.045
	Male	286		80.17	9.27			
Place of residence	Village	236		80.36	10.02	2.670	0.787	0.032
	City	109		80.04	10.00			
Employed in non-agricultural sector	Yes	207		81.42	10.65	1.131	0.008	0.257
	No	138		78.51	8.70			

facilitate the provision of services, but will also open more efficient communication channels between farmers and authorities, allowing them to better understand the real needs of farmers and tailor the future programs and policies to these needs. Another benefit of this approach will be the direct participation of farmers in programs, which results in further support for the programs and increased chances of success. The results also showed that, from the farmers' perspective, natural and geographical factors and slope of the land have a marginal importance in inhibition of soil conservation practices. This result is consistent with Posthumus *et al.* (2010); Ghazani and Bijani (2016). From this perspective, it can be argued that in case of presence of favorable conditions and incentives, farmers will have a strong tendency to protect their soil against erosion. Results of factor analysis showed that economic factors along with promotional factors are the most important group of elements affecting the inhibition of soil conservation practices. This result is consistent with Ashoori *et al.* (2016a); Ashoori *et al.* (2016b), and Shiri *et al.* (2013); but was antithetical with Haji-mirrahi and Nabaei (2006). This result highlights the need for due attention to promotion and education programs alongside economic factors. The results obtained by the test of correlation and the t-test showed the commonly shared view of farmers on problems inhibiting the implementation of soil conservation practices. On this basis, the future programs aimed at tackling the problems of farmers in regard with soil conservation are recommended to be as inclusive as possible.

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دیدگاه کشاورزان پیرامون عوامل بازدارنده عملیات حفاظت خاک در شهرستان کوهدشت

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چکیده

یکی از خطراتی که همواره بخش کشاورزی را تهدید کرده، مشکل فرسایش خاک است. هدف این پژوهش، بررسی و دسته‌بندی عوامل بازدارنده عملیات حفاظت از خاک از دیدگاه کشاورزان شهرستان کوهدشت بود. برای انجام این پژوهش از روش توصیفی ـ همبستگی استفاده شد. جامعه آماری، کلیه کشاورزان شهرستان کوهدشت بود (N=۱۹۵۳۱) که به عنوان نمونه، ۳۷۷ کشاورز با استفاده از جدول کرجسی و مورگان با روش نمونه‌گیری تصادفی طبقه‌ای با انتساب متناسب، مورد مطالعه قرار گرفتند. ابزار جمع‌آوری داده‌ها پرسشنامه‌ای بود که روایی آن با استفاده از نظر جمعی از اساتید ترویج و آموزش کشاورزی دانشگاه تربیت مدرس و پایایی گویه‌های مربوط به عوامل بازدارنده عملیلت حفاظت خاک، با استفاده از آزمون آلفای کرونباخ (۰/۷۳) مورد تأیید قرار گرفت. آمار توصیفی و استنباطی برای تحلیل داده‌ها بکار گرفته شد. نتایج تحلیل عاملی نشان داد که عوامل بازدارنده عملیات حفاظت خاک، در چهار گروه "اقتصادی ـ ترویجی"، زراعی ـ بوم‌شناختی"، "ساختاری ـ اجتماعی" و "مدیریتی ـ تشکیلاتی" تقسیم‌بندی شدند که در مجموع ۴۹ درصد از کل واریانس مشکلات اجرای حفاظت از خاک را تبیین کردند. عوامل به دست آمده لزوم انجام برخی اقدامات را در برنامه‌های آینده برای غلبه بر مشکلات اجرای عملیات حفاظت خاک، روشن می‌سازد.