

Araştırma Makalesi/Research Article (Original Paper)

## Determination of the Considerations of the Farmers about Irrigation Organizations by Factor Analysis

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**Abstract:** In this study, the considerations of the farmers who were affiliated to the organizations undertaking the irrigation administration in Edirne, Kırklareli, Tekirdağ and Çanakkale provinces about irrigation organizations were analyzed. Within the scope of the study, surveys were conducted in 70 irrigation cooperatives, 67 municipality and legal entities, 7 irrigation unions and 1 DSI irrigation organization. Total of 567, 113, 227 and 7 surveys were conducted in the irrigation facilities administrated by irrigation cooperatives, irrigation unions, municipality and legal entities and DSI, respectively. Total of 301 surveys in 74 villages of 9 districts in Edirne, 168 surveys in 43 villages of 5 districts in Tekirdağ, 156 surveys in 36 villages of 4 districts in Kırklareli and 289 surveys in 69 villages of 11 districts in Çanakkale were conducted. The conclusions of the farmers were evaluated by using five point likert scale. It was determined that the irrigation organizations did not notice the training of the farmers, did not include these trainings in their working schedules and similarly, they did not conduct studies aimed at the conscious and balanced use of the agricultural inputs. Factor analysis was used for the evaluation of the considerations of the farmers about irrigation organizations. KMO and Barlett test statistics was used in order to examine the convenience of the considerations to factor analysis and KMO value was found as 0.891. According to factor analysis results, 13 variables were gathered in three factor groups named as "Administration", "Ownership and Service" and "Consciousness Raising".

**Keywords:** Irrigation organization, factor analysis, farmer

### Introduction

Water management is defined as the development, distribution and usage of the water sources. The main purpose in the administration of the irrigation organizations is to increase the farmers' incomes and therefore realize the efficient distribution and usage of the water sources. Irrigation management can be defined as an organization which provides the distribution and usage of the water in order to realize the irrigation purposes in the agriculture. The agricultural irrigation management studies in our country include the studies such as the general irrigation planning before irrigation season, preparation, application and observation of the water distribution programs in the irrigations season and the evaluations at the end of the irrigation season (Eminoğlu 2007).

Development of the soil and water sources and determination of the utilization principles are required in order to provide the rural development and increase the production in the agriculture sector. The studies aimed at the composing of the agricultural foundation, efficient management and usage of the sources are significant for the development of the soil and water sources. On the other hand, farmers' full economic and social participation to the irrigation administration and rational management of the irrigation organizations should be provided in order to maintain the sustainability of the utilization from the soil and water sources. Mental, physical and financial participation of the farmers will allow the efficient usage of the farmers. In this regard, determination of the suitable administration types is required for the determination of the policies aimed at the transfer of the irrigation facilities to the users.

Nowadays, irrigation administration is generally done by irrigation unions, irrigation cooperatives and municipalities or legal entities. The problems increased due to the increases in the irrigation areas and the yield expected from irrigation could not reach to the desired levels. Concordantly, the government left the irrigation administration to the unions and other organizations for more efficient and economic irrigation and irrigation administration (Özkan et al. 2011).

**Government Irrigation Administration:** The administration, maintenance and repair of the irrigation facilities are done by the government organizations after the construction of the irrigation facilities. Government irrigation administration in our country is observed in the irrigation facilities constructed by DSI in accordance with the law no 6200.

**Irrigation Cooperative Administration:** Irrigation cooperatives are the organizations which the farmers organize by combining the economic potentials in order to utilize from underground and ground sources due to the law no 1163 (Ertan and Kaya 2006). The management of the irrigation cooperative consists of the general board, board of management and supervisory board. The aim of the irrigation cooperatives is to obtain the water for the agricultural production to the farmers, make equitable distribution and provide the efficient usage of the water.

**Local Government Administration (Municipalities and Legal Entities):** The local governments are significant for the sustainability of the services in spite of the main competent central organizations in water management area. The administration, maintenance and repair of the irrigation facility are carried out by the decisions of the mayor and the councilors. The structure of the personnel differs according to the importance and size of the facility. Generally, water distribution planning is not done in the local governments and irrigation is done as giving water to the farmers according to the reserve (Akıllı 2011).

**Irrigation Union Administration:** The administration of the irrigation facilities is done by the irrigation unions. The irrigation union conducts the administration, maintenance and repair activities of the facility according to the principles in the transfer contract. The responsibilities of the irrigation union are to repay the participation price of the facility, collect the share, water service price and the fine, contribute to the realization of the production targets and pay the administration and maintenance costs for the common facilities.

Süheri and Topak (2005) compared three water user organizations, two irrigation cooperatives and two municipality operated organizations in Konya Plain and indicated that water user associated with organizations measured water at source and delivered points regularly. Sayın et al. (2013) compared 29 irrigation organizations in the province of Antalya using a number of performance indicators. Sufficiency, efficiency, sustainability and producer satisfaction were used as criteria for the productivity of irrigation networks. Aydoğdu et al. (2015) determined the views and perceptions of the presidents' to water management and operations, implemented related to Water User Associations' regularly. Ünver (2016) examined water resources management irrigation cooperatives and cooperatives partners. Administrative and practical operation of irrigation cooperatives were evaluated for this purpose. Environmental awareness was revealed concerning the manufacturer of water resources in the region. The opinions of the farmers who were the partner of irrigation cooperatives were evaluated for water management.

The considerations of the farmers about irrigation organizations in Edirne, Kırklareli, Tekirdağ and Çanakkale provinces were examined in this study. It will be utilized from the results for the solution of the irrigation administration problems, determination and application of the policies related with the subject.

## **Material and Method**

Data were collected from the farmers who utilized from the irrigation organizations operated by irrigation cooperatives and municipalities in Edirne, Kırklareli, Tekirdağ and Çanakkale provinces and irrigation unions in Çanakkale province. This study was mainly carried out in irrigation cooperatives, irrigation unions and municipalities. Besides, one irrigation organization which was managed by DSI was included to the study. Surveys were conducted in 70 irrigation cooperatives, 7 irrigation unions, 67 municipality and legal entities and 1 DSI irrigation organization.

The surveys were conducted in all of the irrigation cooperatives, irrigation unions and municipality and legal entities. The sample size of the producers was calculated according to the sampling method in the previous studies (Alder and Roessler 1977; Aksoy et al. 1996). The sampling unit was composed of the producers who were randomly selected from each irrigation facility. The sample size was determined to be as 4 farmers from each irrigation facility and this number was considered to be enough for each irrigation facility.

Total of 567 surveys were conducted in the irrigation organizations administrated by the irrigation cooperatives. Besides, 113 surveys in irrigation unions, 227 surveys in municipality and legal entities and 7 surveys in the irrigation organization administrated by DSI were conducted.

Total of 301 surveys in 74 villages of 9 districts in Edirne, 168 surveys in 43 villages of 5 districts in Tekirdağ, 156 surveys in 36 villages of 4 districts in Kırklareli and 289 surveys in 69 villages of 11 districts in Çanakkale province were conducted.

Descriptive statistics were applied to the data. For this purpose, it was utilized from averages, frequency distributions, minimum and maximum values. T test was used for the analysis of normally distributed continuous data.

The considerations of the farmers about the irrigation organizations were measured by 5 point likert scale and evaluated by factor analysis. A Likert Scale is a type of rating scale used to measure attitudes or opinions. With this scale, respondents are asked to rate items on a level of agreement.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The aim of factor analysis is to summarize the relationship between the variables. This relationship can be explained with some variables of factors derived from original variables. The aim is to present a comprehensible solution (Gorsuch 1983). Generally, the first step of factor analysis is to explain the interaction between the variables. Correlation coefficient is used for the scale of this relationship. The correlation matrix indicates that the relationship between the variables is positive. Besides, it indicates that whether the correlations can be explained by smaller hypothetic variables or not (Kim and Mueller 1978). Mathematically, factor analysis is similar to multiple regression analysis. The specific variables group by undertaking a factor and the data are grouped by considering the total variance. The conformity of the data to factor analysis is determined by Bartlett Test of Sphericity and Kaiser-Meyer-Olkin test. Bartlett Test of Sphericity tests the probability that there are high ratio correlations between some variables. According to Bartlett Test of Sphericity, factor analysis cannot be done if “Correlation matrix is unit matrix” hypothesis is not rejected (Tucker and LaFleur 1991).

Coefficient of partial correlation is another indicator of the relationship between the variables. Kaiser-Meyer-Olkin (KMO) test is an index which compares the size of the observed correlation coefficients. KMO value limits are as follows;

- > 0.90 perfect,
- 0.80-0.90, excellent
- 0.70-0.80, good,
- 0.60-0.70, normal,
- < 0.60, unacceptable (Pett et al. 2003).

Alpha ( $\alpha$ ) model was used in order to analyze the reliability of the scales. This coefficient is between 0 and 1 and is named as Cronbach Alpha Coefficient. Alpha coefficient limits are as follows;

- $0.00 \leq \alpha < 0.40$  the scale is not reliable,
- $0.40 \leq \alpha < 0.60$ , the reliability of the scale is low,
- $0.60 \leq \alpha < 0.80$ , the scale is rather reliable,
- $0.80 \leq \alpha < 1.00$ , the scale is very reliable (Kalaycı et al. 2005).

## Results

When the age distributions of the farmers were examined, it was determined that 31.2% of the farmers were in 41-50 age interval and 30.9% of the farmers were in 51-60 age interval. Besides, 19.3%, 4.5% and 14.1% of the farmers were in 31-40 age interval, 20-30 age interval and over the age of 60 years, respectively. It was determined that 70.6% of the farmers were primary school graduate and 14.5% and 13.2% of the farmers were high-school and secondary school graduate, respectively. Approximately, 2/3 of the farmers (57.4%) of the farmers had 4-6 persons and 34.5% of the farmers had 1-3 persons in their families.

It was concluded that 25.7% of the farmers participated in the administration of the irrigation organization recently whereas 42.5% of the farmers participated in the administration of the irrigation organization in the past. Besides, 52.5%, 19.1% and 15.6% of the farmers stated that the irrigation administration should be done by irrigation cooperatives, DSI and municipalities, respectively.

Generally, it was concluded that the evaluations of the farmers in terms of some considerations of the irrigation

organizations were not different. The certain two results were determined as that the irrigation organizations did not care the trainings of the farmers, did not include these trainings to the working programs and did not perform studies aimed at the conscious use of the agricultural inputs (Table 1).

Table 1. Considerations of the farmers about irrigation organizations

	Irrigation Organization			DSI
	Irrigation Cooperative	Municipality/Legal Entity	Irrigation Union	
Directors of the irrigation organization are reliable	4.01	4.32	3.64	4.86
Directors of the irrigation organization fulfil the responsibilities	3.85	4.15	3.38	4.29
I feel myself as a piece of the irrigation organization	4.26	4.27	4.00	3.57
I regularly attend to the general assembly of the irrigation organization	4.20	-	2.99	2.00
I find the irrigation organization successful on the decisions.	3.66	3.92	3.18	4.29
Irrigation organization performs training studies adequately.	1.64	1.77	1.58	1.71
My agricultural production increased after participating to the irrigation organization	3.63	3.90	3.73	4.43
My technical knowledge increased after participating to the irrigation organization	2.82	3.10	2.57	3.43
Irrigation organization provides efficient service (irrigation channel construction, repair and maintenance)	3.53	3.28	3.73	5.00
I contribute to the development of the irrigation organization	4.12	3.77	3.54	3.57
I give opinion for the development of the irrigation organization	3.68	3.62	3.11	3.33
Irrigation organization encourages the irrigation organization for conscious agricultural input usage (seed-fertilizer-pesticide)	1.69	1.93	1.60	1.71
I think that irrigation organization is administrated well	3.72	3.89	3.34	4.14
Irrigation organization is in relationship with the other agricultural organizations	3.92	4.27	3.68	4.50

It was utilized from factor analysis on the evaluation of the considerations of the farmers about irrigation organizations. The considerations of the farmers, who were the members of irrigation cooperatives, municipalities and irrigation unions, were evaluated. DSI was excluded from the analysis as it was not sufficient to be considered. The considerations of the farmers were measured by 5 point likert scale. The reliability of the scale was measured by Cronbach's Alpha test and this value was found as 0.848. The scale was accepted as reliable as this value was close to 1.

KMO and Barlett test were used in order to analyze the convenience of the considerations to factor analysis. KMO value was found as 0.891. The values between 0.80 and 0.90 were specified as "good". As seen in Table 2, Bartlett Test of Sphericity significance level value was 0.00. H0 hypothesis was rejected as this value was less than 5% error margin. In other words, Bartlett Test of Sphericity was found significant (

$$\chi^2 = 4559.44, p=0.000).$$

Table 2. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.891
Bartlett's Test of Sphericity	Chi-Square	4559.544
	df	78
	Sig.	0.000

The factor analysis results are given in Table 3. Factor rotation was done for the interpretation of the factors. Varimax method was preferred for factor rotation (Albayrak 2006). Rotated factor loadings matrix which was obtained from 13 variables and 3 factors were given in Table 3.

The first factor group was named as “Administration”. This group indicated how the irrigation organizations were managed and whether the directors were reliable or not. Besides, the relationship of the irrigation organization with the other agricultural organizations” was an important factor for the farmers.

Table 3. Rotated factor loadings matrix

		Component		
		1	2	3
Administration	Directors of the irrigation organization fulfil the responsibilities	<b>0.873</b>	0.124	0.12
	I think that irrigation organization is administrated well	<b>0.868</b>	0.203	0.127
	Directors of the irrigation organization are reliable	<b>0.865</b>	0.123	0.119
	I find the irrigation organization successful on the decisions.	<b>0.816</b>	0.216	0.12
	Irrigation organization is in relationship with the other agricultural organizations	<b>0.688</b>	0.26	0.053
	Irrigation organization provide efficient service (irrigation channel construction, repair and maintenance)	<b>0.621</b>	0.091	0.06
Ownership and Service	I contribute to the development of the irrigation organization	0.067	<b>0.672</b>	-0.186
	I give opinion for the development of the irrigation organization	0.102	<b>0.629</b>	0.147
	I feel myself as a piece of the irrigation organization	0.441	<b>0.578</b>	-0.165
	My technical knowledge increased after participating to the irrigation organization	0.183	<b>0.554</b>	0.468
	My agricultural production increased after participating to the irrigation organization	0.261	<b>0.547</b>	0.22
Consciousness Raising	Irrigation organization encourages the irrigation organization for conscious agricultural input usage (seed-fertilizer-pesticide)	0.028	-0.048	<b>0.8</b>
	Irrigation organization performs training studies adequately.	0.19	0.098	<b>0.717</b>

According to the results, the second factor group was named as “Ownership and Service”. The considerations of the farmers for the development of the irrigation organizations and arrangement of the general meetings by the participation of the farmers were significant subjects. The farmers stated that they agreed with the consideration such as “My agricultural production increased after participating to the irrigation organization”. It was concluded that the irrigation organizations had a significant part in the rural development (Table 3).

The third group was named as “Consciousness Raising”. The considerations such as “Irrigation organization encourages the irrigation organization for conscious agricultural input usage (seed-fertilizer-pesticide)” and “Irrigation organization performs training studies adequately” were gathered under this factor group. According to the results, it was determined that the irrigation organizations were inefficient in terms of the training of the farmers (Table 3).

According to the t test results, the differences between the irrigation organizations managed by irrigation cooperatives and municipality and legal entities in terms of the scores obtained from the factor groups named as “Administration” and “Consciousness Raising” was determined to be statistically significant in 1% confidence level.

The differences between the irrigation organizations managed by irrigation unions and municipality and legal entities in terms of the scores obtained from the factor groups named as “Administration”, “and “Consciousness Raising” were determined to be statistically significant in 1% confidence level and the difference was determined to be statistically significant in 5% confidence level in terms of the factor group named as Ownership and Service”

The differences between the irrigation organizations managed by irrigation cooperatives and irrigation unions in terms of the scores obtained from the factor groups named as “Administration” was determined to be statistically significant in 5% confidence level and the difference was determined to be statistically significant in 1% confidence level in terms of the factor group named as Ownership and Service” (Table 4).

Table 4. t test results

	Administration		Ownership and Service		Consciousness Raising	
	ave.	p	ave.	p	ave.	p
Irrigation Cooperative	-0.021	0.007*	0.071	0.284	-0.076	0.001*
Municipality/Legal Entity	0.186		-0.017		0.212	
Municipality/Legal Entity	0.186	0.000*	-0.017	0.020*	0.212	0.025*
Irrigation Union	-0.257		-0.304		-0.047	
Irrigation Cooperative	-0.021	0.027*	0.071	0.001*	-0.076	0.772
Irrigation Union	-0.257		-0.304		-0.047	

## Conclusions

It was concluded that there were not training and extension activities in the irrigation organizations. The trainings were not performed sufficiently for the farmers in the irrigation organizations under the administration of irrigation cooperatives, irrigation unions and municipality/legal entities. As seen from the results, the confidence of the farmers to the directors and ownership levels of the irrigation organizations were above average and good. However, it was concluded that the farmers could not get enough support from the irrigation organizations on increasing their technical information and use of conscious agricultural inputs. The perceptions and evaluation levels of the farmers on consciousness raising or training from the irrigation organizations were below the average. Then, the irrigation organizations, especially irrigation cooperatives, should train the members with the training and extension activities on the agricultural subjects. Likewise, training subject takes part among the principles of cooperative especially in cooperative organizations.

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