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THE EFFECTS OF AGRICULTURRAL IRRIGATION: AN APPLICATION IN TURKEY

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Abstract

In this study, we examined the Asartepe dam in Ankara province. Economic and social variables impact on agricultural irrigation were researched. Some variables were used as follows: usage of agricultural water, agricultural production, agricultural income, migration and etc. Primary data with related this research were taken from agricultural enterprises between 2015 and 2016 years. Simple Random Sampling (SRS) method was used to determine the selection of sample size. In this research, we had two different groups that one of them was pre-irrigation and the other was after irrigation group. After determining the sample size, this width of the size was 42. First strata was 31 and second strata was 11. SPSS Statistical package program was used during the data analysis environment. During the comparison between pre-irrigation group and after-irrigation group, Discriminant statistical analysis was used for.

Key words**:** *agricultural Irrigation, discriminant analysis, Turkey.*

INTRODUCTION

On an irrigation project for the different calculations of the return on Economic, technical, financial and sociological data are demanded for. Some of this information is to be found in studies done by specialists whose viewpoint is generally more technical than economic perspective [1].

We emphasized on the discriminant analysis of irrigation project in Turkey, in this study. An important part of the used main material includes the area of agricultural holdings engaged in various products from where the questionnaire was done. Sample agricultural establishments were selected by sampling method and questionnaires were filled by making face to face interview method by researcher. All of information were collected with the agricultural establishments from 2015 to 2016 years production period. Under the preliminary study, the characteristics that could represent the Ankara province Ayaş county as purposeful districts respectively were chosen. Simple Random Sampling (SRS) method was used to determine the sample size. Proportional method was used for finding the value of n [3]. At first, n value is founded by formula in the proportional method as follows:

$$n = \frac{N \sum N_h S_h^2}{N^2 D^2 + \sum N_h S_h^2}$$

Irrigation with agricultural establishments are splitted into 2 groups that these are the same. One of them was belong to pre-irrigation group and the other group was belong to after-irrigation according to the planting fields of products. The sample size was determined as 42 via SRS method. The first strata was 31, second strata was 11. 25% of the sample volume of the agricultural establishments has been reserved up.

MATERIALS AND METHODS

Data are gathered from the agricultural establishments via questionnaire by face to face interview method by researchers. Various variables were as follows: planting field, medicine, chemical fertilizer, total payment of water, water technics and diesel invoice and etc.

We used an important statistical analysis that is the Discriminant analysis. Discriminant analysis method is to find a set of prediction equations based on independent variables that

these are used to classify individuals into different groups. In a discriminant analysis, we have two possible objectives: One of this objective is to find a predictive equation for classifying new individuals and the other is to appraise the predictive equation to better understand the relationships that may exist among the variables [2].

In many directions, discriminant analysis similar to multiple regression analysis. The main difference between these two statistical techniques is that while regression analysis deals with a continuous dependent variable, discriminant analysis must have a discrete dependent variable that this punctuation is crucial. Namely, the main difference is about variables. The methodology used to complete a discriminant analysis is similar to regression analysis. During the process, there are many phases for implementing this analysis and these are as follows: First, using by software program, we make plot each independent variable versus the group variable. Second, you often go through a variable selection phase to determine which independent variables are beneficial. And later that, it is very crucial phase that how to conduct and evaluate a residual analysis to determine the accuracy of the discriminant equations [2].

The one-way Multivariate analysis of variance (MANOVA) is subject to very closely to the mathematics of behind the discriminant analysis. Especially, I want to explain what the relation between the discriminant analysis and MANOVA is in this phase. We can explain simply the roles of the variables are reversed. I emphasized strongly the classification (factor) variable in the MANOVA becomes the dependent variable in discriminant analysis. The dependent variables in the MANOVA become the independent variables in the discriminant analysis [2].

MS Office Excel environment was used to entry the information of the questionnaire data. SPSS Statistical package program was selected during the estimations of the discriminant analysis.

RESULTS AND DISCUSSIONS

Assumptions 1:

H_0: Covariance's matrix for groups are equal.

H_1: Covariance's matrix for groups are not equal.

Due to the significance value 0.000 < 0.05, H_0 is reject. That is, Covariance's matrices for groups are equal. When sampling size is high, significance value will be expecting to take a high value. Shortly, null hypothesis test equal population covariance matrices (Table 1).

Table 1. Box's m test results

Box's M		74.786
F	Approx.	74.153
	df1	1
	df2	20172.000
	Sig.	0.000

Df: Degrees of freedom
Sig.: Significance
Source: Own Calculation

Assumptions 2:

There is no problem with multiple connections between variables. For this, correlations between independent variables are examined (Table 2).

Very high correlation values are not available between variables. Therefore, Assumption 2 is provided (Table 2).

Table 2.Pooled within-groups matrices (Correlation)

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	Property	Rent	Watery	Dry	Domatoes	Fertilizer	Medicine	Water	Fuel	Forage	Number of animal
Property	1.000	-.230	.195	.740	-.039	-.001	-.034	.035	.068	.275	.366
Rent	-.230	1.000	.670	.137	.590	-.007	-.055	.378	.248	.235	-.053
Watery	.195	.670	1.000	-.006	.793	.000	.052	.534	.145	.133	.119
Dry	.740	.137	-.006	1.000	-.172	-.004	-.131	-.052	.201	.439	.262
Domatoes	-.039	.590	.793	-.172	1.000	.006	.044	.666	.120	-.140	-.094
Fertilizer	-.001	-.007	.000	-.004	.006	1.000	-.209	.021	-.118	-.178	-.097
Medicine	-.034	-.055	.052	-.131	.044	-.209	1.000	-.001	.052	-.144	-.087
Water	.035	.378	.534	-.052	.666	.021	-.001	1.000	-.129	-.004	-.092
Fuel	.068	.248	.145	.201	.120	-.118	.052	-.129	1.000	.043	.125
Forage	.275	.235	.133	.439	-.140	-.178	-.144	-.004	.043	1.000	.218
Number of animal	.366	-.053	.119	.262	-.094	-.097	-.087	-.092	.125	.218	1.000

Source: Own Calculation

Evaluation of importance for discrimination functions

Canonical Correlation, Eigenvalue and Wilk's Lambda statistics are used to determine how important the discrimination function is.

Canonical Correlation and discrimination scores measured relationship between groups and at the same time showed the total

variance explained. Canonical Correlation value is 0.243.

If we make an evaluation this value, we must take a square this $(0.243)^2 = 0.059$. Namely, our model explains 5.9% of the variance at the dependent variable (before and after irrigation) (Table 3).

Table 3. Eigen values statistics

Function	Eigen value	% of Variance	Cumulative %	Canonical Correlation
1	.062[a]	100.0	100.0	.243

Source: Own Calculation

The fact that the eigenvalue statistic is large indicates that a larger part of the variant for dependent variable will be explained by that function. The Eigenvalue values greater than 0.40 with good precision are good but this proportion value is not exact value (Table 3).

Wilk's Lambda statistic shows the fraction of the total variance in the discrimination scores. It isn't explained by the differences between the groups. In this study, 0.941 (94.1%) of the total variance in the discrimination scores can't be explained by the differences between the groups (Table 4).

Table 4.Wilk's lambda statistics

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.941	4.941	1	.026

Source: Own Calculation

Here, Wilk's Lambda significance statistic is 0.026 < 0.05, then there is significance of eigenvalue statistic and only 1 discriminant function (Table 4).

Evaluation of importance for independent variables in discriminant analysis

If we evaluate the significance of the independent variables, we need to look at the discriminant function coefficients and the load of each independent variable in the structure matrix. The standardized separation function coefficients are given Table 5. The number of animals are an important independent variables that distinguishes in pre- and post-irrigation establishments. The number of animal's coefficient is 1,000. Therewithal, this coefficient is correspond to beta coefficients in the regression analysis. That is, it shows proportional importance of independent variables for estimation of dependent variable. Property, Rent, Watery, Dry, Tomatoes, Fertilizer, Medicine, Water, Fuel, Forage variables are not effective variables to distinguish in pre- and post-irrigation establishments. For that reason, you can't see these variables in Table 5.

Table 5. Standardized Canonical Discriminant Function Coefficients

	Function 1
Number of animal	1.000

Source: Own Calculation

Structure matrix is used for evaluating the importance of independent variable and it shows the correlation of each variable with the discriminant function. In this study, there is only one function due to the one function. When the number of categories at the dependent variable is large, the number of discrimination functions will also be large. Every column shows one function. Correlations in here may be liken factor loadings in factor analysis (Table 6).

Table 6. Structure Matrix Values

	Function 1
Number of animal	1.000
Property[a]	.366
Dry[a]	.262
Forage[a]	.218
Fuel[a]	.125
Watery[a]	.119
Fertilizer[a]	-.097
Tomatoes	-.094
Water[a]	-.092
Medicine[a]	-.087
Rent[a]	-.053

a. This variable not used in the analysis.

Source: Own Calculation

According to structure matrix, number of animal variable has the highest correlation with discrimination function. Property, Rent, Watery, Dry, Tomatoes, Fertilizer, Medicine, Water, Fuel, Forage independent variables are not an important estimators (Table 6).

Discriminant function and remarks

The discriminant function called the

Canonical root is a linear combination of independent variables (Table 7).

Table 7. Canonical Discriminant Function Coefficients

	Function 1
Number of animal	.014
(Constant)	-.368
Unstandardized coefficients	

Source: Own Calculation

That is,

$$Z = \alpha + b_1X_1 + b_2X_2 + \cdots + b_nX_n$$

Here,

Z: Discriminant score

α:Constant

b: Discriminant coefficients

X: Independent variables

The b coefficients maximize the distance between the averages of the independent variables.

Table 8. Classification Results

	Strata	Predicted Group Membership 1	2	Total
Count	1	**37**	5	42
	2	29	**13**	42
%	1	88.1	11.9	100.0
	2	69.0	31.0	100.0

Source: Own Calculation

Unstandardized Discriminant coefficients are given Table 7. These coefficients are correspond to unstandardized beta coefficients. Discriminant function is as follows:

Z= -0.368 +0.014 (Hayvan sayisi)

CONCLUSIONS

Z scores belong to establishments can be calculated by replacing animal numbers for all. It does not matter if the coefficients are plus or minus sign. Expresses whether the relation of the independent variables to the dependent variable is positive or negative.

The success of the analysis in the discrimination analysis is the correct classification percentage. The higher the percentage of correct classification, the more successful the analysis is. As given in the following table, 59,5% of the sample we included in this study were correctly classified. Namely, 50/84=%59,5 (Table 8).

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