

Economic and Social Impacts by Agricultural Irrigations in Turkey

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Abstract

In this study, we examined the Asartepe dam in Ankara province. We evaluated the economic and social effects of agricultural irrigation and selected main variables are determined as a agricultural usage of water, agricultural production, agricultural productivity, income and environment effects, social-cultural design, migration, economical conditions and etc.

A significant portion of the material used in the survey, which was composed of any farming in the area of agriculture to data obtained by the enterprise survey. Survey by interviewing enterprises questionnaire forms have been filled out by going into enterprise.

Data for the period from 2015 and 2016 production of agricultural enterprises are collected by questionnaire. In addition to the primary data obtained well as research findings that are previously made on the subject, which has benefited from the secondary data records and published by various organizations.

Studies and surveys identified and then a set of selected enterprises are to be implemented by the Simple Random Sampling method (SRS). The information in the questionnaire data entry is made in the MS Office environment. The primary data analysis using SPSS and Eviews entered into the computer program and evaluated in the process of statistical tables are prepared.

Keywords: Irrigation, Economic and Social effects, Turkey

1. Introduction

Many technical, economic, sociological and financial data are needed for the various calculations of the return on an irrigation project that some of this information is to be found in studies done by specialists whose viewpoint is generally more technical than economic (Bergmann, 1973). In this study we emphasized on the economic analysis of irrigation project in Turkey.

An important part of the material used in the study includes the area of agricultural holdings engaged in different products from where the survey is done. Sample establishments were selected and questionnaires were filled by making personal interview. Information was collected from the agricultural establishments in this survey from 2015 to 2016 production period. Under the preliminary study, the characteristics that could represent the Ankara province Ayaş county as purposeful districts respectively were chosen. The sample population was drawn by Simple Random Sampling (SRS) method. Proportional method was the formula used for finding the value of n (Yamane, 1967). N value is founded by formula in the proportional method.

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

Agricultural establishments dealing with irrigation are divided into 2 groups and the same: One of them belong to pre-irrigation group and the other group is belong to after-irrigation. Pre-irrigation group is stratified into 2 strata and after-irrigation group is is stratified into 2 strata according to the planting fields of products. According to the SRS method, population, as a result of the withdrawal of the sample size, is 42. As a result of the sample based on the method of proportionate distribution of the first layer n_1=31, second layer n_2=11. In addition, reserve up to 25% of the sample volume of the agricultural establihsments has been identified. Villages to do the survey sample survey were chosen by the operators in the absence of reserves.

The completed survey forms and data entry of information were made in the MSOffice environment. The analysis was carried out using the SPSS and Eviews package program.

Table 1. Average of total planting field according to the pre and after irrigation by products

Products	Pre-Irrigation		After-Irrigation	
	Average of Establishments		Average of Establishments	
	Total planting field	%	*Total planting field*	%
Domatoes	*15,5*	46,6	14,0	36,1
Wheat	*2,0*	6,0	2,2	5,7
Barley	*3,5*	10,4	4,6	11,9
Oat	*0,2*	0,7	0,2	0,6
Corn	*2,4*	7,3	3,0	7,9
Potatoes	*0,1*	0,2	0,1	0,2
Beans	*0,4*	1,2	1,0	2,5
Cucumber	*0,2*	0,6	0,8	2,1
Aubergine	*0,1*	0,3	0,1	0,2
Vetch	*0,1*	0,4	0,8	2,2
Trifolium	*0,8*	2,5	2,5	6,4
Pumpkin	*1,6*	4,7	1,8	4,7
Melon	*0,5*	1,5	0,9	2,3
Onion	*0,2*	0,5	0,4	1,0
Pepper	*0,9*	2,8	1,1	2,7
Cauliflower	*0,5*	1,4	0,5	1,2
Carrot	*0,6*	1,8	0,6	1,5
Fallow (Dry)	*2,0*	6,1	2,1	5,4
Fallow (Watery)	*0,0*	0,0	0,3	0,8
Grassland (Dry)	*0,0*	0,1	0,2	0,6
Grassland (Watery)	*0,0*	0,0	0,0	0,0
Citrus	*0,0*	0,0	0,0	0,0
Apple	*0,4*	1,3	0,3	0,7
Cherry	*0,3*	1,0	0,4	1,0
Pear	*0,0*	0,1	0,0	0,1
Mulberry	*0,9*	2,6	0,8	2,0
Total Field	*33,3*	100,0	38,6	100,0

2. Material and Methods

Data are compiled from agricultural establishments by questionnare through face to face meeting. In this study, we used the various data are as follows: domatoes planting field and the other independent variables are as follows: medicine, chemical fertilizer, total payment of water, water technics and diesel invoice.

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The estimations of models parameters were calculated by The Ordinary Least Squares (OLS) method. The Ordinary Least Squares estimators are defined as a formula that is method of estimate to some unknown parameters. LS model is that $Y = \alpha + \beta X + \varepsilon_i$ and this OLS basic principle is to minimize $\sum_{i=1}^{n} e_i^2$. After that different mathematical techniques applying over α and β and later these implications give us to normal equations for the straight line. We can define Y, α, β, X and ε_i. First of all, Y is the vector of observations and dependent variables. X is the matrix of independent variables, α (intercept term) and β (slope coefficient) are the vector of parameters to be estimated, and ε_i is to be a vector of errors. Thus ε_i is a disturbance vector that we can compute as a difference or discrepancies between actual Y_i and calculated $\hat{Y}_i$ (Draper and Smith, 1966).

Estimations of the models were made by using Eviews 7 Econometrics package program. The purpose of this study is to make a test for relationship between planting field of domatoes and the other independent variables as follows: medicine, chemical fertilizer, total payment of water, water technics and diesel invoice.

In this study, we used the two different models according to two strata. First and second models are the same and examined by strata respectively.

$$dom.field = \beta_0 + \beta_1 med + \beta_2 fer + \beta_3 watpay + \beta_4 wat\,tech + \beta_5 diesel + \varepsilon_i$$

Where;

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are unknown parameters that will be estimated in the models.

Dom.field: Planting field of domatoes (Da)

Med: Medicine (Kg)

Fer: Chemical fertilizer (Kg)

Watpay: Total payment of water (Turkish Liras)

Wattech: Water technics

Diesel: Diesel payment (Turkish Liras)

ε_i: Error (residual) term.

During these model estimations by strata, we try to estimate any different models for instance semi-log, log-log and etc. After that take into considerations how to interpret flexibility about these results. And we decided to fit models relevant that the results of linear model give the best results in our study.

3. Results and Discussion

First of all, The results of the estimated regression model for equation (1) are as follows in Table 2. On the basis of an α risk of 0.05, the least squares equation;

$$dom.field = 23{,}973 - 0{,}267 med - 0{,}175 fer + 0{,}001 watpay - 7{,}178 wat\,tech + 0{,}0001 diesel + \varepsilon_i$$

$$(18{,}691) \quad (0{,}254) \quad (0{,}093) \quad (0{,}0004) \quad (18{,}009) \quad (0{,}0006)$$

is a good predictor and we can evaluate a fitted equation of that form.

Table 2. Statistical values for pre-irrigation model (Eviews output)

Dependent Variable: Dom.field				
Method: Least Squares				
Date: 01/21/17 Time: 14:26				
Sample: 1 42				
Included observations: 42				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23.97338	18.69142	1.282588	0.2078
Med	-0.267031	0.253963	-1.051459	0.3001
Fer	-0.174579	0.092749	-1.882280	0.0679
Watpay	0.001346	0.000407	3.309696	0.0021
Wattech	-7.178137	18.00952	-0.398575	0.6926
Diesel	0.000127	0.000578	0.219343	0.8276
R-squared	0.365312	Mean dependent var		15.52381
Adjusted R-squared	0.277160	S.D. dependent var		15.65518
S.E. of regression	13.31003	Akaike info criterion		8.146477
Sum squared resid	6377.651	Schwarz criterion		8.394715
Log likelihood	-165.0760	Hannan-Quinn criter.		8.237466
F-statistic	4.144149	Durbin-Watson stat		1.155749
Prob(F-statistic)	0.004477			

We can thus write the analysis of F-statistic that F-statistic = 4,144. If we look at uppercentage points of the F(4;37) distribution, we see that the 95% point F(4;37;0.95) = 2,61. Since the calculated F exceeds the critical value in the table that is F = 4,144 > F(4;37;0.95) = 2,61, we reject the hyptohesis $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ running a risk of less than 5% of being wrong. The calculated F value for regression is greater than the tabulated F value (critical value).

$R^2 = 0.3653 = 36{,}53\%$ thus the regression equation obtained explains 36,53% of the total variation.

Second, The results of the estimated regression model for equation (2) are as follows in Table 3. On the basis of an α risk of 0.05, the least squares equation;

$$dom.field = 10{,}039 + 0{,}007 med - 0{,}096 fer + 0{,}001 watpay - 1{,}048 wat\,tech + 0{,}0001 diesel + \varepsilon_i$$

$$(11{,}534) \quad (0{,}176) \quad (0{,}069) \quad (0{,}0002) \quad (5{,}379) \quad (0{,}0002)$$

is a good predictor and we can evaluate a fitted equation of that form.

Table 3. Statistical values for after-irrigation model (Eviews output)

Dependent Variable: Dom.field				
Method: Least Squares				
Date: 01/21/17 Time: 14:32				
Sample: 1 42				
Included observations: 42				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.03953	11.57439	0.867392	0.3915
Med	0.007142	0.176083	0.040563	0.9679
Fer	-0.095566	0.069319	-1.378642	0.1765
Watpay	0.001448	0.000239	6.068143	0.0000
Wattech	-1.047573	5.378988	-0.194753	0.8467
Diesel	0.001125	0.000274	4.107473	0.0002
R-squared	0.590094	Mean dependent var		13.95238
Adjusted R-squared	0.533163	S.D. dependent var		14.75152
S.E. of regression	10.07905	Akaike info criterion		7.590359
Sum squared resid	3657.140	Schwarz criterion		7.838597
Log likelihood	-153.3975	Hannan-Quinn criter.		7.681348
F-statistic	10.36501	Durbin-Watson stat		1.415740
Prob(F-statistic)	0.000003			

We can thus write the analysis of F-statistic that F-statistic = 4,144. If we look at uppercentage points of the F(4;37) distribution, we see that the 95% point F(4;37;0.95) = 2,61. Since the calculated F exceeds the critical value in the table that is F = 10,365 > F(4;37;0.95) = 2,61, we reject the hyptohesis $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ running a risk of less than 5% of being wrong. The calculated F value for regression is greater than the tabulated F value (critical value).

$R^2 = 0.5900 = 59{,}00\%$ thus the regression equation obtained explains 59,00% of the total variation.

The regression analysis of variance is as calculated for two these models and on the basis of an α =0.05 level the least squares equations are good predictor. And that the calculated F for regression values belong these models are greater than the critical or tabulated values. Namely, these models are compatible for straight regression models and we can use these models for any different aims. R^2 is often stated as a percentage that is $100R^2$. The larger R^2 is, the better the fitted equation explains about the variations in the data.

There are many criterions for comparisons about these models that these criterions are Anemiya PC criterion, Mallow's Cp criterion, Akaike Information criterion (AIC) and Schwarz criterion (SC). These criterions are calculated and given as follows in Table 4.

Table 4. Calculated criterions according to the econometric models for pre-irrigation and after irrigation

Criterion	Pre-irrigation model	After-irrigation model
Anemiya PC criteria	192,89	124,58
Mallow's Cp criteria	5	5
Akaike Information criterion (AIC)	8,146	7,590
Schwarz criterion (SC)	8,394	7,839

According to these results, after-irrigation model is fitted to the values and econometrics expectations. Because, all values of these criterion belong to after-irrigation model is less than the pre-irrigation model.

As far as I'm concerned, we have now obtained two empirical models. After calculations of criterions, after-irrigation model can be used for predictive purposes and empirical explanation of the data that may be useful in future work. This model is adequate and any further investigation of alternative variables will not be necessary.

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