Economic Analysis of the Factors Affecting the Adoption of Sub SurfaceIrrigation Technology in Iraq

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Abstract: ***Iraq suffering from leakage in the water resources, therefore it scourging it farmers to adopting new technologies in irrigation.The results showed that the variables (age of farmer, level of education of farmers and source of access to information) have a significant effect on the probability of adoption at the level of %1. The variables (water source, expectation of profit and sale price).Cost Benefit Analysis (CBA)for sub surface irrigation showed that it is economically feasible to use subsurface irrigation technology through a range of indicators, including net revenues which it isID 4.5 million for the plastic house In the case of adopting the technology which is higher than the net returns in case of not adopting. The rate of return to cost %2.27, which indicates that the dinar invested in the use of sub surface irrigation technology is due to the amount of ID 2.27 million. The research drew a set of recommendations based on findings and conclusions, like the lack of rainfall in the central and southern regions of Iraq leads to dependence in these areas on irrigated agriculture from main source (Tigris and Euphrates) rivers. As these two major suppliers continue to decline in Iraq, this requires farmers to adopt modern irrigation techniques reducing the waste of water and improving the productivity of water in the unit area, in addition to the role of these technologies in increasing productivity and reduce production costs. For this, the Ministry of Agriculture collaboration with International Center for Agricultural Research in the Dry Areas (ICARDA)applied the irrigation techniques in Iraq, including the subsurface drip irrigation technique which applied to a group of vegetable growers in Iraq (cucumbers). Given the importance of this technology in developing the reality of the agricultural sector and the lack of knowledge regarding the reasons for the adoption of technology, it is necessary to study the reasons why farmers are not interested in adopting technology.***

Keywords: Adoption, Sub Surface dripIrrigation, Logistic Regression, Cost-Benefit Analysis

1. Introduction

Sub-surface drip irrigation is an advanced method of adding water to soil compared to other irrigation methods, a modern method used in Iraq, although it is one of the ancient irrigation methods developed since 1860. In this method, Roots Zone under the surface of the soil by controlling the level of ground water by channels, or by pipes equipped with holes buried beneath the surface of the soil at a certain depth, separated by specific inter-spaces. The terms used for the expression of subsurface irrigation (SDI), this term refers to the supply of soil with water in the area of the spread of plant roots by controlling and regulating the level of the ground water, or the distribution of water under the surface of the soil through perforated plastic pipes buried beneath the surface layer of soil. This method is also called sub-surface drip irrigation (3), in which the water is added in small quantities in a similar manner at regular intervals below the surface of the soil and the soil characteristic of the soil plays an important role in the transfer of water from the level of ground water to the root zone of the crops, and in this case must be permeability Soil in vertical direction is simple sub-surface drip irrigation requires the addition of water under the surface of the soil within a water management program that controls the quantities of water added. This is done by a specific irrigation scheduling system that is compatible with the conditions and nature of the area and the type of crops cultivated. And the production of vegetable crops, and is easy to apply has proven efficiency in greenhouses, and uses the technique of irrigation under-surface irrigation in abundance in dry areas where there is little water or in areas that complain of increased salinity, as one of the sources of salts is the accumulation of evaporation Pain The method of irrigation has a significant effect on the soil salinization process and the efficiency of washing. In the method of sub-surface drip irrigation, the irrigation efficiency is very high due to the lack of water shortage. Therefore, this method does not contribute to soil salinity or high ground water levels. The movement of water under the precipitators determines the types of moisture distributions in the soil, and when using this modern technique, the quantities of water used in the irrigation are much lower than the surface irrigation (2), and the underground irrigation technology began to be applied in Iraq from During the(WLI) project, which was established by the International Center for Agricultural Research in the Dry Areas (ICARDA). The aim of the project was to find ways and means to raise farmers' incomes and improve their living conditions in arid and semi-arid areas. Applied to a group of farmers and proved their effectiveness and contribution to achieve the desired goals is the technique of subsurface irrigation (SDI), which was used in the cultivation of some agricultural crops, including cucumber, tomatoes, potatoes and eggplant in Iraq, which proved effective in both greenhouses or in Agriculture, However, as a result of poor communication with farmers and poor effectiveness of the agricultural extension system, this technique was not possible among farmers in general. This technique was implemented by a group of Abu Ghraib farmers. Most of the farmers who applied the technology were farmers of cucumber this technique has achieved a good profit for farmers compared to traditional irrigation methods under the same productive conditions. It has led to an abundance of irrigation water as a result of reducing water consumption and reducing the loss of irrigation water used. The reduction of production costs was reflected in the increase in profits, and thus improved the level of farm income. As a result the livelihoods of farmers who applied the technique of(SDI).

2. Background and Research objective

Binary logistic regression is a general statistical method which is probability of a bifurcation (such as adoption or non-adoption) is associated with a set of explanatory variables and has been widely applied in adoption studies(Andesine&Chianu, 2002; Somda& others, 2002; Asfawa&Admassie, 2004; Chianu&Tsujii, 2004). The use of OLS method in estimating the regression model, which includes qualitative dependent variables, may lead to some of the estimated values of the dependent variable being greater than 1or smaller than 0, which are meaningless values because the original values of the dependent variable only take the values 0,1 (1), and see(Bekele& Drake, 2003)The general assumption is there is a desire to maximize the expected benefit of adopting new technologies(4). The aim of maximizing the benefit of individual farmers may be the same for farmers everywhere. However, the determinants affecting farmers' utility and decisions to adopt modern technologies are not very different among them. Suppose farmers in the study area respond to subsurface irrigation Consistent with maximizing utility. In our study, farmers' adoption of subsurface irrigation technology depends on the basic assumptions of the utility function. The second axis of the research is the Cost-Benefit Analysis (CBA) technique that help the decision-maker in the public sector applies the principle of economic efficiency in directing scarce resources. in the costs and returns of alternatives to the decision maker so that he can surround most - if not all - the effects of those alternatives and thus reach the alternative that achieves the principle of economic efficiency (10). This analytical approach is a guiding / normative model(Prescriptive Mode)It includes not only a description of all the results or effects of the alternatives in front of the decision maker, but also specifies some (rules) or criteria to choose from those alternatives in the light of decision maker preferences. The cost-benefit analysis approach can be defined as "estimating and assessing net returns associated with a number of alternatives intended to achieve specific public objectives" (8). Therefore, this method is a set of analytical procedures that lead to a list of costs and returns associated with each alternative that meet the goal or general objectives under study. The aim of this study is to identify the main factors affecting farmers 'decision-making techniques and important factors in interpreting farmers' decisions in the study area and drawing conclusions that may help to develop policies and institutional interventions to encourage adoption of technology.

3. Methodological Framework

3.1. Adoption and Diffusion Outcome Prediction Tool (ADOPT)

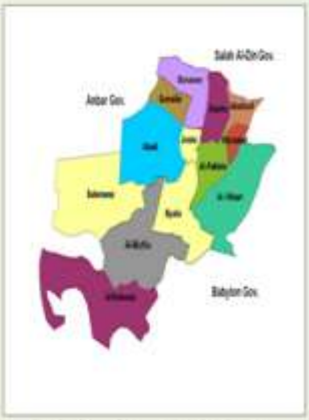
ADOPT (Adoption and Diffusion Outcome Prediction Tool) is an MS Excel-based tool that evaluatesand predicts the likely level of adoption and diffusion of specific agricultural innovations with a particular target population in mind. The tool uses expertise from multiple disciplines to make the knowledge surrounding the adoption of innovations more available, understandable and applicable to researchers, extension agents and research managers. ADOPT predicts the proportion of a target population that might adopt an innovation over time. The tool makes the issues around the adoption of innovations easy to understand. ADOPT is useful for agricultural research organizations and people interested in understanding how innovations are taken up.

Study Area

The results gain from a sample of (266) farmer from the cucumber farmers in the study area were interviewed for adopting and not adopting subsurface irrigation techniquesfrom districts of Abu Ghraib and Yusufiya/ Baghdad Province.

Table1. Distribution of population and agricultural areas according to the districts of Abu Ghraib

District	Total area (ha)	Population	Population %
Al-Shiaar	6179	68800	8
Khirnabat	1055	25800	3
Abadi	15616	86000	10
Akarkoof	1444	43000	5
Almuftia	15502	86000	10
Alfakhria	1259	43000	5
Manaseer	1975	43000	5
Sumailat	1838	51600	6
Alasha	2161	51600	6
Alradwania	19588	361200	42
Total	66617	860000	100



Distribution of districts in Abu Ghraib district

Resource: WLI Project in Iraq, 2016, www.wli.icarda.org/partnering.

The coefficients of the binary logistic regression model were estimated using the Maximum Likelihood method (ML) by SPSS Program. The quality of conciliation was tested using the Hosmer and Lemeshow statistic, which is one of the most reliable tests to reconcile the logistic regression model (9). The results showed that using the Hosmer and Lemeshow test to test the quality of conciliation with degrees of freedom (8 d.f). The P value is 0.698 indicates that we accept the null hypothesis that is no difference between the observed values and the estimated values of the dependent variable, which means the model estimates fit the data very well, see (Sidibe, 2005) thePvalue if it is less than 0.05, it indicates that the double logistic regression model is weak, and the results per unit change in the independent

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variable, Logistics calculates the amount of change in the weighting algorithm of the dependent variable and not the change in the dependent variable itself (7).

Selection of variables and hypothesis testing

Table2 and 3 show the dependent variable and independent variables included in the logistic regression model and can be illustrated as follows:

First: The dependent variable:

ADOP**:** When analyzing farmers' adoption of a particular technique, adoption is usually determined by a binary variable (adoption/non-adoption). The variable **ADOPT** (reference to the Y variable) was defined as a binary variable (1: farmers adopting subsurface irrigation technology and 0: non-adopting farmers).

Second: Explanatory (independent) variables and hypotheses:

There are a number of variables that affect adoption of subsurface irrigation technology by farmers represented by technical, economic, social, institutional and environmental factors. The model included 13 illustrative variables and represented the factors mentioned that are supposed to affect the adoption of subsurface irrigation technology in the study area. These variables are:

Age: is a quantitative variable that measures the life of the target farmers. According to the human capital theory, young farmers have a greater chance of absorbing and adopting new technologies than older farmers who will be less likely to adopt subsurface irrigation technology (9). The variable of age was shown with a negative sign corresponding to the logic of the economic.

FEXP: is a quantitative variable. This variable measures the average of the farmers' experience in crop cultivation and shows a negative sign indicating that as a result of the fact that most of the farmers adopting subsurface irrigation technology are young, those with long experience in crop cultivation are more adhering to traditional methods of farming, and are less receptive to adopting modern technologies.

EDU: is a qualitative variable. This variable measures the educational level of the target farmers and shows a positive sign that corresponds to economic logic. Farmers with higher levels of education are more likely to adopt new technologies than less educated farmers.

INCO: is a qualitative variable that measures whether a farmer has other non-agricultural activity (1: farm income, 0: non-farm income). Empirical studies have shown a negative relationship between non-farm income and the adoption of modern agricultural techniques (6), Showing negative correlation indicating that farmers have farm income only are more likely to adopt subsurface irrigation technology.

LTEN: It is a qualitative variable that measures whether the (tenure) ownership of the agricultural land is private or leased (1: ownership, 0: leased) and has a positive sign indicating the positive relationship between ownership of the private land and the adoption of subsurface drip irrigation technology. The land has a fear of loss of land by the owner of the land gives him this sense of insecurity, and this discourages them from investing in modern technologies and improve their land.

NPH: This is a quantitative variable. This variable measures the number of greenhouses planted with cucumber, and shows a positive sign indicating that by increasing the number of greenhouses, it encourages the adoption of subsurface irrigation technology by reducing the cost of purchasing and installing the technology at wholesale prices.

DMAR: is a quantitative variable that measures the distance to the nearest market to sell the crop. The closer the distance from the markets, the greater the pressure of land use due to population density and economic growth. The variable shows a positive sign indicating that by increasing the distance to the nearest market, surfactant, so as to try to compensate for high transport costs.

FUS: is a qualitative variable that refers to the source of funding (1: self, 0: loan). The positive sign indicates that the cost of technology is commensurate with the material potential of farmers and the possibility of adopting it easily without the need to resort to loans. This variable, suggesting that the availability of loans financed for modern agricultural techniques, increases the likelihood of adopting subsurface irrigation technology.

LAB: is a qualitative variable that measures the ratio of family work to leased work (1: family, 0: leased), and has a negative sign indicating that the adoption of subsurface irrigation technology does not require the availability of large labor in agriculture. The agricultural sector is working to provide manpower for other sectors in the economy.

SINF: is a qualitative variable that refers to the source of information about the technique (1:project manager, 0:others). The communication of information from the project manager to the farmers directly has an effect on the increased probability of adopting the technique.

SWAT: is a qualitative variable that refers to the source of irrigation water (1: river, 0: other) and shows a positive sign indicating that if the source of irrigation water is by river, the probability of adopting subsurface irrigation technology is higher than irrigation because the water of the river is higher than the rest of the sources, which reduces the problems facing the use of this technology.

PPER: is a qualitative variable that refers to the farmers' belief in the technique of profitability (1: yes, 0: no). It is a positive sign and is consistent with the logic of economic theory. By expecting to gain profits by adopting technology, the probability of adopting technology increases. Farmers are aware of the importance of this technology and the possibility of obtaining positive results through the adoption of this technique.

POC: A quantitative variable that measures the selling price of the crop. It has a negative sign. Table2.describes the variables involved in the logistic regression model.

Table 2: Describe the Variables Specified inLogistic Regression Model

Variables	Descript	Variable Type
ADOP	Adopting technique	Qualitative (1: Adopted, 0: Non-Adopted)
AGE	Age of farmer	Quantitative (years)
FEXP	Farmer's experience in crop cultivation	Quantitative(years)
EDU	Farmer Education Level	Qualitative (1: educated, 0: Uneducated)
INCO	Does the farmer have activity (income) other than agriculture	Qualitative(1: farm income, 0: non-farm income)
LTEN	Tenure of the land	Qualitative(1: owner , 0: Rent)
NPH	Number of greenhouses cultivated	Quantitative (House)
DMAR	Distance to the nearest market	Quantitative (km)
FUS	Technology financing source	Qualitative(1: self, 0: loan)
LAB	Type of human labor	Qualitative (1: family, 0: leased)
SINF	Source of knowledge technology	Qualitative(1: Project manager, 0: Others)
SWAT	Source of irrigation water	Qualitative(1: river, 0: other)
PPER	The possibility of making profits	Qualitative(1: Yes, 2: No)
POC	The sale price of the crop	Quantitative (ID / kg)

Source: Prepared by the researchers based on the results of the questionnaire data analysis.

The Exp.(B) column in Table3.shows the expected value of (B) that has been raised to the logistic regression factor, the expected change in the probability of an increase in probability of adoption as a result of the change in the explanatory variable by one unit. Table 3 showed that 6 explanatory variables were found to be significant at the level of %1 and %5. These were AGE, EDU and SINF variables which showed their significance at %1 and SWAT, PPER and POC at %5. The rest of the variables were consistent in terms of reference but did not prove their significance at the level of the model. The logistic regression equation can be expressed in light of the variables mentioned as in the following equation:

ADOP = - 4.592 - 0.056 AGE - 0.040 FEXP + 2.375 EDU - 0.306 INCO +0.028 LTEN + 0.028NPH + 0.061DMAR + 0.386FUS - 0.167LAB + 3.813SINF +1.543 SWAT + 1.526PPER -0.003Poc

These estimates provide information about the relationship between the explanatory variables and the dependent variable ADOP, where the dependent variable is on the Logit scale.

Table 3: Indicators of Logistics equation estimated by Maximum Likelihood method (ML)

Variable	B	S.E.	d.f	Sig.	Exp(B)
AGE	-0.056	0.024	1	0.016	0.945
FEXP	-0.040	0.032	1	0.218	0.961
EDU	2.375	0.643	1	0.000	10.754
INCO	-0.306	0.471	1	0.516	0.737
LTEN	0.028	0.707	1	0.969	1.028
NPH	0.028	0.076	1	0.715	1.028
DMAR	0.061	0.058	1	0.300	1.062
FUS	0.386	0.629	1	0.540	1.471
LAB	-0.167	0.470	1	0.723	0.846
SINF	3.813	1.123	1	0.001	45.297
SWAT	1.543	0.788	1	0.050	4.677
PPER	1.526	0.704	1	0.030	4.600
POC	-0.003	0.001	1	0.026	0.997
Constant	-4.592	2.104	1	0.029	0.010
Hosmer and Lemeshow Test: Chi-Square5.542, d.f, 8; sing, 0.698 . -2log likelihood, 139.589(a); Cox & Snell R^2, 0.373; Nagelkerke R^2, 0.517; overall percentage of right prediction, 82%.					

Source: Prepared by the researchers based on the results of the questionnaire data analysis.

The estimated logistic regression model is consistent with economic logic, namely the logic of the estimated parameters in terms of reference and size, since the increase in the independent variable (age of the farmer) by one year will reduce the logarithm of the weighting coefficient to be the dependent variable equal to Y = 1), Which will reduce the probability of adopting subsurface irrigation technology 0.056 being used once in the logarithm of the dependent variable, consistently affecting the rest of the other variables entering the model. The increase in the independent variable FEXP by one year will reduce the probability of subsurface irrigation technology by -0.040 times in the logarithm of the dependent variable with the stability of the effect of the other variables. The adopting increase in variable EDU (education level of the farmer) by one educational level will increase the probability of subsurface irrigation technology adopting by 2.375 times, and institutional variables such as loans are not effective on adoption (FUS variable is insignificant), SINF was significant at a significant level %1. SWAT, PPER and POC variables, Pvalue was about 0.698 using the accuracy test of Hosmer and Lemeshow and calculated by dividing the Chi-Square on degrees of freedom (8 df).The results showed that there was no significant relationship between the crop cultivation experience and the possible adoption of the technique.

3.2 Cost-Benefit Analysis (CBA)

After studying and analyzing the factors affecting the adoption of subsurface irrigation technology represented by the technical factors, economic and social, the financial advantages of this technique should be study through the using of the monetary values of the production inputs and the returns resulting from adopting this technique to identify the possibility of achieving profits by using this technique. The method of Cost-BenefitAnalysis (CBA), which is a systematic economic analysis method, can be used to evaluate the techniques used to achieve the best economic return and thus improve the living standards of farmers. This method involves a systematic assessment of the social benefits generated by a given project as compared to the social cost of the project. This is a technique that links the costs of the program or project to its main benefits. Both benefits and costs are expressed in monetary units. This approach is taken because previous analyzes have shown that the market system often fails to achieve the optimal allocation of resources because externalities are not taken into consideration. The method of cost-benefit analysis may be one of the most comprehensive methods of economic evaluation, and this approach is used to assist policymakers in decision-making in many different areas of economic and social policies in the public sector. The main difference between this approach and other economic methods of valuation is that it seeks to use the monetary values of both inputs (costs) and outputs (benefits) of the project or technology under study. The calculation of net present value is the most important indicator in CBA. Net present value can give a clearer answer as to whether a project improves social well-being. However, there are two alternative accounts that can be used to supplement the calculation of present value. The first is the ratio of costs and returns, calculated by taking net present value of the proceeds and dividing them into net present value of costs. The cost-benefit ratio is useful: First, it makes it easier to compare similar programs and projects. Second, the decision maker can decide whether the specific return earned per (one Dinar) of the cost is sufficient given other investment or budget alternatives. From an economic efficiency perspective, any program with higher costs or better interest than any other similar project is a better allocation of resources. That decision makers should use interest rates when testing two projects of similar size and scope. Otherwise, the interest rates of variations on scale may disappear, which may lead to an alternative option that provides the largest net benefits to society. The second alternative is Inner Return Rate(IRR)It is used frequently, and can be easily calculated. The IRR is simply the discount rate that would achieve the total Net Present Value (NPV) that is equal to the cost. A government agency or political decision maker can assess the value of a project based on whether a certain percentage of the return is satisfactory given other opportunities available (5).

A cost-benefit analysis was carried out to assess the economic feasibility of the adoption of subsurface irrigation technology. A set of criteria were obtained, the most important of which is net present value and internal rate of return which helps to assess whether the adoption of the technology can make cucumber farmers in the region better off compared to the situation Currently. A CBA of subsurface irrigation technology for technology-based farmers compared to non-adopters in Abu Ghraib district, as shown in Table 3. obtained the following results:

1) Net returns: The net present value of the investment project indicates the difference between the present value of the project's cash inflows and the present value of the outflows. If the net present value is positive - that is, the present value of cash inflows exceeds the present value of the cash outflows, the investment project is profitable. Conversely, an investment project is considered unprofitable if the NPV is negative - i.e., the present value of the cash flows out of the present value of the cash outflows. In the case of more than one investment project, the project that gives the largest net present value is preferred. The results showed that the net returns on the use of technology reached 4537354 dinars/ house, which is higher than the net returns without the use of technology, which reached 2500296 dinars/ house, which indicates the profits of the farmers from adopting subsurface irrigation technology, is higher thanif not adoption of technology.
2) 2- Inner Rate of Return (IRR): It reflects the minimum return on capital that makes the net present value of the inflows equal to the cost of the investment project and represents the minimum return on capital that the farmer accepts in order to invest in technology. According to international standards, if the value of the internal rate of return is greater than %40 it is recommended to apply the technology in order to achieve profitable returns for farmers. 81.47to the total change in the total cost of 1.94, we get the internal rate of return at the adoption of the technology %41.88, indicating that the adoption of the technique of sub- surface irrigation is profitable returns to farmers.
3) Rate of Returns - Cost Ratio:The results showed that the ratio of return to cost when using technology reached %2.27, indicating that the one dinar invested in this technology isreturned byID 2.27. This is a strong incentive for farmers to adopt sub-surface irrigation technology. was calculated by dividing the total return of 8090019 dinars / house to the total costs of 3552665 dinars / house.

Table 3: Cost-benefit analysis (CBA) for adopters and non-adopters

With technology use			
Costs	A	B	C
Input	Quantity	Price	Total
Seeds	1381	171	238201
Fertilizers	192	6444	1241693
Pesticides	9098	38	343312
Labor			1671602
Fuel	46	588	27004
Mechanization	99	312	30853
Total			3552665
Return			
Main output	11759	681	8090019
Secondary output			
Total return			8090019
Indicators			
Net Returns			4537354
(%)Change in TR			81.47
(%)Change in TC			1.94

Without technology use			
Costs	A	B	C
Input	Quantity	Price	Total
Seeds	1353	172	233360
Fertilizers	170	6273	1069758
Pesticides	9286	37	347398
Labor			1777278
Fuel	42	599	25194
Mechanization	106	308	31885
Total			3484873
Return			
Main output	9836	602	5985169
Secondary output			
Total return			5985169
Indicators			
Net Returns		2500296	
(%)Change in TR		-	
(%)Change in TC		-	

IRR	41.88		IRR	-
Returns – Cost Ratio	2.27		Returns - Cost Ratio	1.71

Resource: Prepared by the researchers based on the results of the questionnaire data analysis.

The use of technology results in a slight increase in costs %1.94 while the increase in return is greater %81.47. The technical leads to increased return offset by a small increase in costs and thus an increase in profits.

4. Concluding Remarks

The overall behavioral test showed that the explanatory variables in the model affect the probability of adoption by %82. This indicates conciliation in the selection of the variables affecting the probability of adopting the subsurface irrigation technique.
The results of logistic regression analysis showed a significant change in the life of the farmer at %1. A negative indication confirms the descriptive analysis. The probability of adoption is 0.94 times greater than the farmer's age of one year. This indicates the need to focus on targeting the young farmers segment when promoting a new technology and trying to spread it to the rest of the farmers.

The results of logistic regression analysis showed a significant change in educational level at %1. A positive indication was that by increasing the educational level of farmers, the probability of adoption increased by 10.75 times. This indicator is indicative of the need to pay attention to the educational level of farmers to guide the techniques towards the educated farmers, which positively reflects on the possibility of adopting modern technologies and improving the agricultural reality in the country through increasing production and productivity.

The results of the regression analysis also indicate the significance of the variable source of information about the technology. A positive sign indicates that farmers adopting the information obtained directly from the project manager, the technology is more likely to be adopted 45.29 times. This is an indication of the importance of obtaining accurate and sufficient information on the nature of the work of technology and what benefits can be achieved when using it, which is an incentive to encourage farmers to adopt technology, and that the project manager is the most important source of information on technology.The need to intensify training programs on the use of technologies appropriate to the conditions of the region, including underwater irrigation technology, and the need to transfer its experience to other areas in Iraq, and attention to the effective practices of the Ministry of Agriculture, such as the establishment of field days, a practice of collecting a group of farmers in the region at A new technical experience for the first time, to learn about the technique and see its results, so there is a need to expand in such practices to help spread techniques and modern agricultural methods.

The results showed also that the irrigation water source was positive sign, indicating that the use of river water in irrigation would increase the probability of using the sub-surface irrigation technique by 4.68 times. We conclude from this indicator that farmers who have river water in irrigation are more likely to adopt technology than farmers who use groundwater or piping water in irrigation. This is because of the high purity of the river water, which reduces the problems of blocking the springs of the technology due to high salts and impurities in irrigation water.

The variable expected to obtain profit was significant at %5. It showed positive indication that when the farmer expects that the use of technology will increase the percentage of profits achieved, this will increase the possibility of adopting the technology by 4.6 times more. This variable indicates that it is necessary to establish the conviction among farmers of the ability of technology to achieve profits in the case of use, and this is done by field observations of the rest of the farmers through the technology experience of one of the outstanding farmers in the region.

The results of the logistic regression analysis showed a significant change in the price level at %5.

The results of CBA analysis indicate that net present value in the case of using the technology amounted to 4537354 dinars / house, which is higher than net present value without the use of technology. This indicates that adoption of the technology increases the profits achieved for the farmer, and this effect of this indicator is positive in favor of increasing the probability of adoption of technology.Further, should be develop and implement intensive guidance programs on the use of modern irrigation methods and rationalization of water uses, and improve the operation and operation of extension units by providing these units with qualified and trained guidance elements that can work with the farmers involved.

Through the CBA analysis results, the internal rate of return showed that the return was greater than the cost of capital investment in technology %41.88. This indicates that investment in underground irrigation technology is economically feasible.So should Increasing governmental support for the dissemination of modern irrigation techniques and methods to facilitate farmers' access to them through the provision of modern technologies at subsidized prices. The best solution is to focus the allocation of agricultural loans on the purchase of modern technologies and to facilitate their access through minimizing of routine procedures that require long periods of time, and the need to follow those techniques by specialists.

The results of the analysis (CBA) shows that the ratio of returns to costs amounted to %2.27, which indicates that the dinar invested in this technology is 2.27 dinars. This indicates the importance of this indicator in that the capital invested will achieve a return equivalent to nearly double what has been invested, and this is a strong incentive to encourage farmers to adopt the technique of subsurface irrigation.

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