AN ECONOMIC ANALYSIS OF THE FACTORS DETERMINING THE ROLE OF RURAL WOMEN IN AGRICULTURAL PRODUCTION IN BAGHDAD GOVERNORATE.

M. N. Abed **A. F. Ahmad**
Researcher **Assist. Prof.**
Dept . Agric. Econo, Coll Agric Engin, University of Baghdad
marwa.najm1108a@coagri.uobaghdad.edu.iq dr.aidafawzi@coagri.uobaghdad.edu.iq

ABSTRACT

The study aims to determine the impact of economic and social determinants on the size of women's contribution to agricultural work. The research used qualitative response models to determine the impact of the explanatory variables (age, marital status, educational level, training skills, experience in agricultural work, NGO support, health status, family size, experience in secondary agricultural work, use of agricultural machinery in plant production) and their impact on the variable affiliated with the participation of rural women for a random sample of (384) women in separate rural areas in Baghdad Governorate. The results of the analysis showed that the size of the family and the use of mechanization had a negative and weak effect on the contribution of women. As the increase in the size of the family leads to an increase in its household burdens at the expense of its work in farm work. And because the use of mechanization is limited to men, the increased use of technology, especially modern ones, works to reduce women's working hours on the farm. The rest of the variables had a positive and significant impact on their contribution. Accordingly, the research recommends the provision of health and educational services for women, as well as their involvement in training, extension, and economic and financial empowerment programs to raise their contribution to achieving sustainable agricultural development.

Keywords: Rural women, family size, logistic regression, tobit model, farm labour.
*** Part of Ph.D. Dissertation of the 1st author .**

تحليل اقتصادي للعوامل المحددة لدور المرأة الريفية في مجال الإنتاج الزراعي في محافظة بغداد

مروه نجم عبد عائدة فوزي احمد
الباحث استاذ مساعد
قسم الاقتصاد الزراعي– كلية علوم الهندسة الزراعية – جامعة بغداد.

المستخلص

يهدف البحث تحديد اثر المحددات الاقتصادية والاجتماعية في حجم مساهمة المرأة في العمل المزرعي وكذلك من اجل وضع السياسات والستراتيجيات لرفع انتاجيه المراه الريفية ,واستخدم البحث نماذج الاستجابة النوعية لتحديد أثر المتغيرات التوضيحية (العمر الحالة الاجتماعية، المستوى التعليمي، مهارات التدريب، الخبرة في العمل الزراعي، دعم المنظمات غير الحكومية، الحالة الصحية، حجم الاسرة، الخبرة في الاعمال الزراعية الثانوية، استخدام المكنة الزراعية في الانتاج النباتي) على المتغير التابع مشاركة المراه الريفية، لعينة عشوائية بلغت (384) امراة في مناطق ريفية متفرقة في محافظة بغداد، وقد بينت نتائج التحليل ان حجم الاسرة واستخدام المكننة كان لهما تأثير سلبياً وضعيفاً في مساهمة المراه، إذ أن زيادة حجم الاسرة يؤدي الى زيادة اعبائها المنزلية على حساب عملها في الاعمال المزرعية، ولكون استخدام المكننة ينحصر على الرجال فان زيادة استخدا م التكنولوجيا ولاسيما الحديثة منها يعمل على تقليل ساعات عمل المراه في المزرعة أما بقية المتغيرات فكان لها تأثير ايجابي ومعنوي في مساهمتها، وعلية يوصي البحث بتوفير الخدمات الصحية والتعليمية للنساء فضلاً عن اشراكهن في برامج التدريب والارشاد والتمكين الاقتصادي والمالي من اجل رفع مساهمتها في تحقيق التنمية الزراعية المستدامة.

الكلمات المفتاحية: المراه الريفية، حجم الاسرة، الانحدار اللوجستي, نموذج توبت، العمل المزرعي.

Received:13 /2/2023, Accepted:24/5/2023, Published:December 2025

INTRODUCTION

Agricultural production in Iraq depends on the work of rural women, especially in the field of plant and animal agricultural production and secondary agricultural work, as well as household chores and family care. Women have a major role in raising the level of farm income and improving the standard of living of the family through their participation with men in various agricultural activities (24). However, this role is affected by various factors, the most important of which are the level of education, social status, health status, and customs spread in the country, which can negatively affect their ability and the size of their contribution to agricultural production. This was confirmed by (8), which showed that the low educational level of females in society as a whole, and females in the countryside in particular, led to making their role limited and insignificant in the progress and development of agricultural and human rural development. Therefore, there must be special attention to the education of rural women because it is one of the most important rights that they should enjoy (35). Progress in the educational level opens many fields for women. And she can be able to lead the roles assigned to her if the man is unable to perform them for whatever reason. Thus, the educated woman has a great role in protecting herself and her family from all external factors, whether economic or social. The woman's main work is on the family's farm, and she can work on other farms for wages, but that is on a small scale, And because her role is important in resolving and averting the problems that she and the man face in order to facilitate family affairs and make sound and correct decisions in order to reach a comfortable life, including food and clothing (25)(27). In general, its contribution to agricultural business reaches 70% in the plant field. It is higher in animal production (5). In addition, the number of working hours of women on the farm is more than that of men, reaching 12 to 14 hours per day (22). This work is based on the productive and family side. In addition to her exposure to some diseases that hinder and affect her work in the farm and at home, which leads to a decrease in production (18) However, the percentage of her contribution to the marketing work is very small, and this is a negative indicator for all her efforts (32). Also, the percentage of women who own agricultural lands is very small because of some customs and traditions that deny women their right to own property, despite the existence of legislation and laws that guarantee their right to own agricultural lands (33). This is what deprives them of access to credit and weakens their position in making decisions, whether production or marketing. In addition to facing difficult living conditions, exposure to discrimination, deprivation of education and training, and lack of interest in her health care. And relying on them to work for free or for low wages and under weak social protection. Given the importance of this role played by women in agriculture, this requires strengthening their economic empowerment and improving the social conditions that negatively affect their agricultural activity (40). It should also be necessary to reduce the gap between women and men from the principle of achieving social justice and as one of the development goals of sustainable development, which considers women's access to equality as a prerequisite for achieving sustainable agricultural development, It is one of the most important government efforts to achieve economic growth to reduce class differences and unemployment among members of society (23) , In addition to the importance of governmental and non-governmental organizations investing in the human capital component in order to achieve progress and success in the environment and increase their wealth to develop entrepreneurial projects that increase income for individuals (19).

MATERIALS AND METHODS

The binary qualitative response models (Logit, Probit, and Tobit) are among the most important tools used in standard analysis (28). These models were built to suit the analysis when the dependent variable is mock (7) such as gender, educational status, marital status, ownership status, and other variables. As these attributes take binary values and cannot be analyzed using the usual least squares method (OLS), which leads to the emergence of the problem of instability of variance homogeneity and the problem of linear correlation between

explanatory variables (2). The dependent variable in the qualitative response models takes values between zero and the correct one) (21). It is one of the important models that are applied in various fields, especially in the fields of economic sciences, because of the characteristic that distinguishes it from other models, which is predicting the occurrence of an event or not (17). These models include: Logit model:

This model is based on the cumulative distribution function and the Maximum Likelihood method is used 3 to calculate the parameters of the model (10). The logistic function is a continuous function that takes values (0, 1) for the dependent variable and approaches (y) to zero as the right side of the logistic function approaches (∞ -) (29). And (y) approaches one as the right-hand side of this function approaches (∞). It is a symmetric function when the right side of this function is equal to zero (14). The random error variance is not normally distributed (30). This leads to the fact that the estimated values cannot be interpreted because they are descriptive variables and their values do not range between zero and one (31). As the main objective of using this method is to maximize the log-likelihood. As for the interpretation of logistic regression coefficients, the logit coefficient is used. It is also called the non-normative logistic regression coefficient (9). It is denoted by the symbol (b). It corresponds to the non-normative coefficient (b) in the linear regression. Coefficient (b) is used in logistic regression to estimate the log odds of the weighting coefficient, such that the dependent variable is equal to 1 for every unit change in the explanatory variable, knowing that logistic regression calculates the amount of change in the log odds of the dependent variable and not the change in the dependent variable itself as It is the matter in linear regression (13). The Probit model: it is a similar model and confirms the Logit model in the existence of the binary descriptive dependent variable, which takes two values (0 and 1). Therefore, this model is used instead of the usual regression methods in estimation, when the dependent variable is two-valued, while this descriptive dependent variable depends on the cumulative distribution function (CDF) and probability distribution, (PDF). That is the standard normal distribution. Thus, in the Probit model, the probability of the binary dependent variable changes with the change of the explanatory variable by one unit. One of the most important benefits of this model is that it solves and eliminates the problem of instability of variance homogeneity due to random error. Thus, the relationship between the dependent variable and the explanatory variable is considered a non-linear relationship) (21). The Tobit model: which is used to estimate linear relationships between variables, was created by the world Tobin in 1958, his idea was to modify the probability function. It is a model that is close to the Probit model and has many formulas that the probabilistic logarithm function takes, depending on the nature of the dependent variable (3). As the dependent variable has zero values and other continuous positive values, so that it reflects the probability of unequal sampling for each observation depending on whether the dependent variable is located above or below the specified limit for a sample. That is, there is either control from below or from above. Control from above occurs when you take all cases with a value at or above the lower bound, such that the true value is equal to the lower bound. But it may also be higher. In the case of censoring from below, values that fall at or below a certain threshold are censored. (15). This model alleviates the problem of zero-inflated data and deals with cut samples and other samples that are not randomly selected. The sampling probability for each unbounded observation is simply the height of the density function fitting to the cumulative distribution. That is, the integral is less than zero for the appropriate density function. The probability function is a combination of densities and cumulative distribution functions (10). Therefore, if observations or restricted data are available in one part, it is specified, and this data is in the dependent variable and is not restricted in the other part, as this data is called monitored data. On the other hand, the use of linear regression with these data leads to biased and inconsistent results for the parameters. So the scientist James Tobin proposed a model called the (Tobit) model

(36). The controlled regression model estimates the relationship between such specific data. Determining the model that shows the relationship between the dependent variable with continuous values and the explanatory variables is according to theoretical concepts, indication, and volume of coefficients (20).

Similarities and differences between the logit and probit model: - (16)

The most important points from which the similarities and differences between the two models can be summarized are:

1- The logit curve is similar to the propyte curve, except that the difference between them is that the logit curve does not approach the axes, while the propyte curve approaches the axes faster than the logit counterpart. Thus, the logit curve gives more probabilities for the dependent variable when the independent variables are few or small and fewer probabilities for the dependent variable when the independent variables are large and very large if the distribution is normal (34).

2- The logistic distribution is very similar to the t distribution at 7 degrees of freedom only. While the normal distribution of propite is the same as the distribution of t with degrees of freedom being infinity (37).

3- The distinction between the Logit model and the Probit model is based on the size of the large and very large data (11).

The most important tests used in the model analysis are:

1- Goodness of fit: This test is used to find out how close and far the values of the observations are from the estimation line. Therefore, the coefficient of determination is not suitable for such a test if the data is binary for the dependent variable (38). Rather, the McFadden R^2 test is used about the scientist McFadden, who proposed it in (1974). It is an alternative test for R^2 in linear regression. This test is based on the logarithm of the maximum likelihood function.

2- Hosmer and Lemeshow (H-L) test: This test is used to measure the quality of fit and to see if the model represents the data well or not (39). It is one of the important tests, which shows how close the potential observations are to the predicted potential observations. This test is used to estimate the quality of fit of the model and allows any number of independent variables, which may be continuous or discrete. This test is almost similar to the chi-square test χ^2 in order to evaluate the differences between the observed and possible values and to test the null hypothesis and the alternative hypothesis. As the null hypothesis is in which the observed cases are equal to the predicted case $\Rightarrow$ and this model is representative of the data well, while the alternative hypothesis is in which the observed cases are not equal to the predicted cases χ^2 this model does not represent the data well. Thus, the decision to accept the null hypothesis is made if the probability value of the X2 statistic is greater than the level of significance previously determined by the researcher (12).

3- **Wald test:** This test is used to find out the significance of the parameters of the binary response models that follow the chi-squared χ^2 distributions. By comparing the probability value of Wald's statistic with the predetermined level of significance to see if the variable concerned is significant or not. It is significant if the probability value of Wald's statistic is less than the level of significance. And in the event that Wald's statistics suffer from deficiencies in the event that the absolute value of the regression parameter is large. But if the value of Wald's statistic is small, the reason for this is that the standard deviation value is too large. This leads to making the test result of the variable concerned significant. This test is carried out according to the following hypothesis: (6). Thus, the research sample included (384) women, data was collected through the questionnaire form. The dependent variable (y), the first of the logit model, is the participation of rural women in agricultural work to increase output. It takes a value of 0 for its non-participation in agricultural development projects and farm work 1 for its participation in agricultural work. As for the explanatory variables, they are (x1=age, X2=Social situation(1= Married0= not married) ,X3=educational level(1= Educated,0= uneducated),X4= training skills(1= Trained, 0= untrained) , X5=experience in agricultural work(1= She has experience,0= she has no experience,X6=non-governmental

organization support(1= There is support, 0= there is none) , X7=health status(1= You don't suffer from diseases,0= suffer) ,X8= family size ,X9= experience in secondary agricultural work(1= She has experience,0= she has no experience) , X10= the use of mechanization in vegetable production(1= There is a harvest ,0=There is no harvest), and the second dependent variable (y) for the Tobit model is the degree of participation of rural women in agricultural work.

RESULTS AND DISCUSSION

First : Logit model: It is evident from Table 1. The parameters of the logit model were estimated using the Maximum Likelihood method, using the Eviews 10 program & STATA16.

Table 1. Results of the analysis of the determinants of rural women's participation in agricultural work and development projects according to the Logit model of the agricultural study sample (2021-2022).

Variable	Coefficient	Std.Error	Z - Statistics	Prb.
Age	**0.305698**	**0.098767**	**3.095143**	**0.0008**
Social situation	**0.156629**	**0.075627**	**2.071072**	**0.0022**
Education level	**0.250677**	**0.119862**	**2.091380**	**0.0030**
Training skills	**1.004887**	**0.292546**	**3.434970**	**0.0009**
Experience in agricultural work	**0.229201**	**0.085219**	**2.689552**	**0.0035**
Supporting Non - governmental organizations	**0.355320**	**0.181529**	**1.957372**	**0.0063**
Health status	**1.341135**	**0.384572**	**3.487346**	**0.0005**
Family size	**-0.203002**	**0.132004**	**-1.537847**	**0.0718**
Secondary farm work Experience	**0.180267**	**0.062710**	**2.874613**	**0.0032**
The use of mechanization in plant production	**-0.486567**	**0.296926**	**-1.638681**	**0.0845**
C	**1.517259**	**0.964034**	**1.573865**	**0.0884**
McFadden R-squared	**70.305**		**Akaike info**	**1.157**
LR statistic	**65.574**		**Schwarz criterio**	**1.271**
Prob(LR statistic)	**0.0000**		**Hannan- Quinn criter.**	**1.202**
Log likelihood	**-211.321**		**Avg. Log likelihood**	**-0.550**
Y= Rural Women's participation in agricultural worek.				
Obs with Dep=0=129				
Obs with Dep=1=255				

Source: - The researcher's work is based on the outputs of Eviews10.

The age of the rural woman:

- This parameter of this variable appeared with a positive sign and it is identical to the economic logic. Increasing the age of rural women by one year leads to an increase in the probability of participating in agricultural work and development projects by (0.305), with the rest of the variables included in the model remaining constant while the Z test indicated the significance of this variable at the level of 1%.

Social situation:- This parameter of this variable (quantitative explanatory variable) appeared with a positive sign and it is identical to the economic logic. When the rural woman is single by one unit, it leads to an increase in the probability of participating in agricultural work and development projects by (0.156), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the 5% level.

Education level:- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and is identical to the economic logic. Increasing the level of education of rural women by one unit leads to an increase in the probability of participating in agricultural work and development projects by (0.250), with the stability of the rest of the variables included in the model. , while the Z test indicated the significance of this variable at the level of 5%.

Training skills: - This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and is identical to the economic logic. Increasing the training skills of rural women by one unit leads to an increase in the probability of participating in agricultural work and development projects by (1.004), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the level of 1%.

Experience in agricultural work:

- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and is identical to the economic logic. By increasing the training skills of rural women by one unit, it leads to an increase in the probability of participation in agricultural work and development projects by (0.229), with the rest of the variables included in the model remaining constant, while the Z test indicated the significance of this variable at the level of 5%.

Supporting Non- governmental Organizations:

- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and is identical to the economic logic. Increasing the support of non-governmental organizations for rural women by one unit leads to an increase in the probability of participation in agricultural work and development projects by (0.355), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the level of 5%.

Health status:- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign, and it is identical to the economic logic. When a rural woman is in good health by one unit, it leads to an increase in the probability of participating in agricultural work and development projects by (1.341) with the stability of the rest of the variables included in the model, while the Z test indicated the significance of this variable at the level of 1%.

Family size: - This parameter of this variable (quantitative explanatory variable) appeared with a negative sign and is identical to the economic logic. When the size of the rural woman's family is large and the number of one individual leads to a decrease in the probability of participation in agricultural work and development projects by (-0.203), with the stability of the rest of the variables included in the model. While the Z test indicated the significance of this variable at the level of 5%.

Secondary farm work experience: - This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and it is identical to the economic logic. When there is experience among rural women in secondary agricultural work and by one unit, it leads to an increase in the probability of participation in agricultural work and development projects by (0.180) with the rest of the variables included in the model remaining constant, while the Z test indicated the significance of this variable at the level of 5%.

The use of mechanization in plant production:- This parameter of this variable (a qualitative explanatory variable) appeared with a negative sign and is identical to the economic logic. When mechanization is used in plant production, especially when harvesting wheat, barley, and yellow corn in a low manner, it leads to an increase in the probability of participation in agricultural work and development projects, and vice versa, by (-0.486), with the stability of the rest of the variables included in the model. While the Z test indicated the significance of this variable at the level of 5%. Mc Fadden R^2: It amounted to about (70%), which is similar to the coefficient of determination R^2, which is a fake or unreal and questionable value. This happens when the real spread of the variables is very close around the points. Therefore, in such a case, the predicted values of the dependent variable are close to 1 or close to zero. Therefore, R^2 Mc Fadden was resorted to. It shows that all the explanatory variables explained 70% of the fluctuations in the dependent variable (the variation in the likelihood of rural women participating in agricultural work and development projects). Therefore, it is considered the most important factor influencing its participation in agricultural work and development projects. As for 30%, it is due to other variables and factors that were not included in the model and could not be explained by the random variable. The sign of the intersection limit came with a positive and significant sign, and this means that even in the absence of the determinants, the average participation of rural women in agricultural work was (1.517).

Likelihood Ratio (LR Statistic): Through this statistic, the quality of the Logit model is judged. Therefore, the value of this statistic, which amounted to about (65.57), which

follows the distribution of χ^2 , was compared with the tabular value of χ^2 at a degree of freedom (d.f) (10). This value is greater than the tabular value of χ^2 . Thus, the null hypothesis (H_0) is rejected, which states that rural women do not participate in agricultural development projects and farm work, and the alternative hypothesis (H_1) is accepted, which states that rural women participate in agricultural development projects and farm work. As for the results of Table 2, it has been proven that the Probit model is similar and close to the Logit model.

Wald test : Table (2) show the results of the Wald statistic test, which follows a chi-square distribution at d.f(10) degrees of freedom, and the parameters of the Logit model regression as a whole showed significant (0.000) and this is explained by the explanatory variables (age, marital status, educational level, training skills, experience in farm work , support of non-governmental organizations, health status, family size, use of mechanization in vegetable production) have a significant effect on the probability of the dependent variable (the participation of rural women in agricultural work) and thus accept the alternative hypothesis (H_1) that the parameters of the explanatory variables (bs) of the Logit model are not equal to zero.

Table 2. Wald Statistic testing of Logit model parameters following a chi-square distribution

Test Statistic	Value	D.f	Probability
F-statistic	5.244	(10,373)	0.0000
Chi-square	52.446	10	0.0000
Null Hypothesis C(1)=0,C(2)=0,C(3)=0,C(4)=0,C(5)=0,C(6)=0,C(7)=0,C(8)=0,C(9)=0,C(10)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(1)		0.098767	0.305698
C(2)		0.075627	0.156629
C(3)		0.119862	0.250677
C(4)		60.29254	1.004887
C(5)		0.085219	0.229201
C(6)		0.181529	0.355320
C(7)		0.384572	1.341135
C(8)		0.132004	-0.203002
C(9)		0.062710	0.180267
C(10)		0.296926	-0.486567
.Source: The researcher's work based on the outputs of Eviews10			

Table 3. The results of the Tobit model according to the ML- Censored Normal Method

Variable	Coefficient	Std.Error	- Statistics Z	Prb.
Age	0.507640	0.234126	2.168234	0.0023
Social situation	0.288813	0.149950	1.926062	0.0851
Education level	0.366867	0.097278	3.771346	0.0007
Training skills	0.615976	0.182656	3.372328	0.0009
Experience	0.555024	0.195582	2.837807	0.0029
Supporting Non - governmental organizations	0.401119	0.209956	1.910491	0.0845
Health status	1.304681	0.378342	3.448417	0.0008
Family size	-0.283994	0.119867	-2.369242	0.0038
Secondary farm work Experience	0.448576	0.266001	1.686369	0.0045
The use of mechanization in plant production	-0.250068	0.089575	-2.791716	0.0058
C	0.689696	0.253855	2.716892	0.0066
McFadden R-squared	0.779		Akaike info criterion	1.942
McFadden adj R-squared	0.776			
LR statistic	70.23		Schwarz criterion	2.065
Prob(LR statistic)	0.0000		Hannan- Quinn criter.	1.991
Log likelihood	-360.924		Avg. Log likelihood	-0.939
Y: Rural Women's participation in agricultural work.				
Left censored obs =0	Right censored obs =129			
Uncensored obs =255	Total obs=384			

Source :The researcher worked according to the outputs of STATA 15

The age of the rural woman:

- This parameter explained this variable, as it came with a positive sign, and it conforms to the economic logic. Increasing the age of rural women by one year leads to an increase in the probability of participating in agricultural work and development projects by (0.507), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the level of 1%.

Social situation: - This parameter of this variable (quantitative explanatory variable) appeared with a positive sign and is identical to the economic logic when the rural woman is no single by one unit, which leads to an increase in the probability of participating in agricultural work and development projects by (0.288) with the stability of the rest of the variables included in the model. , while the Z test indicated the significance of this variable at the level of 5%.

Education level:- This parameter indicated this variable (a qualitative explanatory variable), which appeared with a positive sign and is identical to the economic logic. Increasing the level of rural women's education by one unit leads to an increase in the probability of participating in agricultural work and development projects by (0.366), with the stability of the rest of the variables included in the model. While the Z test indicated the significance of this variable at the level of 1%.

Training skills:- This parameter explained this variable (a qualitative explanatory variable), which appeared with a positive sign and is identical to the economic logic. Increasing the training skills of rural women by one unit leads to an increase in the probability of participating in agricultural work and development projects by (0.615), with the stability of the rest of the variables included in the form. While the Z test indicated the significance of this variable at the level of 1%.

Experience:- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign, and it is identical to the economic logic. Increasing the experience of rural women by one year leads to an increase in the probability of participating in agricultural work and development projects by (0.555), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the level of 1%.

Supporting Non-governmental Organizations:

- This parameter explained this variable (a qualitative explanatory variable), which appeared with a positive sign and is identical to the economic logic. Increasing the support of non-governmental organizations for rural women by one unit leads to an increase in the probability of participating in agricultural work and development projects by (0.401), with the rest of the variables included in the model remaining constant. While the Z test indicated the significance of this variable at the level of 5%.

Health status:- This parameter of this variable (a qualitative explanatory variable) appeared with a positive sign and is identical to the economic logic. When a rural woman is in good health, it leads to an increase in the probability of participating in agricultural work and development projects by (1.304), with the stability of the rest of the variables included in the model. While the Z test indicated the significance of this variable at the level of 1%.

Family size: - This parameter of this variable (a quantitative explanatory variable) appeared with a negative sign and is identical to the economic logic. When the size of a rural woman's family is large and the number of one individual leads to a decrease in the degree of probability of participation in agricultural work and development projects by (-0.283), with the remainder remaining constant. The variables included in the model, while the Z test indicated the significance of this variable at the level of 5%.

Secondary farm work experience: - This parameter of this variable (an explanatory and descriptive variable) appeared with a positive sign and is identical to the economic logic. When a woman has one year of experience, it leads to an increase in the degree of probability of participation in agricultural work and development projects by (0.448), with the stability of the rest of the variables included in the model. While the Z test

indicated the significance of this variable at the level of 5%.

The use of mechanization in plant production: - This parameter of this variable (quantitative explanatory variable) appeared with a negative sign and is identical to the economic logic. When the use of mechanization is low, it leads to an increase in the degree of probability of participation in agricultural work and development projects by (-0.130), with the stability of the rest of the variables included in the model. While the Z test indicated the significance of this variable at the level of 5%.

Mc Fadden R-square statistics: - When conducting the analysis, The coefficient of determination shows that 77% of the variation in probability has a positive effect on rural women's participation in agricultural work.

Likelihood Ratio (LR Statistic): - Through this statistic, the quality of the Tobit model is judged. Therefore, the value of this statistic, which amounted to about (-360.92), which follows the distribution of χ^2 , was compared with the tabular value of χ^2 at d.f (10) degree of freedom, and the value of the LR statistic appeared greater than the tabular value of χ^2 . Thus, the null hypothesis (H0) is rejected, which states that rural women do not participate in agricultural development projects and farm work, and the alternative hypothesis (H1) is accepted, which states that rural women participate in agricultural development projects and farm work. As for the tests (Akaike info criterion, Schwarz criterion, Hannan-Quinn criterion), they came with low values (1.94), (.06 2), and (.991), which indicate the quality of the Tobit model. As for the (H-L) test of the Logit model, the value of the H-L statistic was about (16.18) at the degree of freedom (10) for the level of statistical significance (0.000). It is thus greater than 0.05, which means that it is not statistically significant (not significant). Thus, the null hypothesis 0H is accepted, which states that the Logit model represents the data well. That is, the expected (estimated) values in the model are identical or equal to the data values of the study sample for the dependent variable (the participation of rural women in agricultural work). It is thus greater than 0.05. This means that it is not statistically significant (non-significant), and thus the null hypothesis H0 is accepted, which states that the probit model represents the data well. That is the expected (estimated) values in the model match or equal the data values of the study sample for the dependent variable. Therefore, the capabilities of the model fit the data well. As for the Wald Test Tobit the parameters of the regression of the models as a whole showed their significance (0.000), which follows the distribution of χ^2 at d.f (10) degree of freedom. This is explained by the fact that the explanatory variables have a significant effect on the probability of the dependent variable, and thus the alternative hypothesis (H1) is accepted, according to which the parameters of the explanatory variables (bs) of the three models are not equal to zero.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

REFERENCES

1. Abbas, N. J. 2010. Comparison between methods of estimating economic functions with qualitative dependent variables. Tikrit for Administrative and Economic Sciences, Iss(18),vol 6,ppi 102-118.

2. Awf, A. A., E. H. Ali, and A. S. Shukr, 2024. Estimating off–farm labor supply and analysing relationship between risk and farm size. Iraqi Journal of Agricultural Sciences, 55(1), 526-541. https://doi.org/10.36103/afwgrz97

3. Allison, P. D. 2014. Measures of fit for logistic regression. In Proceedings of the SAS global forum 2014 conference (pp. 1-13). SAS Institute Inc. Cary, NC, USA.

4. Ali, A. H. 2016. Using probability regression models to study the factors affecting efficiency of the production of tomato. Euphrates journal of agricultural science. 3rd Agricultural Conference. pp: 111-117.

5. Alex, J. P. 2013. Powering the women in agriculture: Lessons on women led farm mechanisation in South India. The Journal of Agricultural Education and Extension, 19(5), 487-503.

https://doi.org/10.1080/1389224X.2013.817342
6. Al-Bakri ,R. A. R and M. S. M Al-Ezzi. 2017. Distinctive analysis and logistic regression in the presence of the problem of polylinearity (an applied study on anemia), Journal of Economic and Administrative Sciences, 23, 99,pp: 373-397. https://doi.org/10.33095/jeas.v23i99.261
7. Al-Thalabi, S. H. 2019. Analysis of binary data with special attention to the logit model. Economic, Administrative and Legal Sciences, 8(3), 131-157. https://doi.org/10.26389/AJSRP.T310119
8. Arab Organization For Agricultural Development. 1997. Project National Document For Active Rural Women In Rural Development. Sudan, Khartoum.pp:5
9. Teshale, A. B. 2022. Factors associated with unmet need for family planning in sub-Saharan Africa: A multilevel multinomial logistic regression analysis. PloS one, 17(2). https://doi.org/10.1371/journal.pone.0263885
10. Bierens, H. 2004. Introduction to the mathematical and statistical foundations of econometric. Cambridge university press. pp200. https://doi.org/10.1017/CBO9780511754012
11. Chambers, E. A., and D. R Cox,. 1967. Discrimination between alternative binary response models. Biometrika, (54), p573-578. https://doi.org/10.1093/biomet/54.3-4.573
12. Fahmy, M. U. 2005. Statistics Without Suffering, Concepts With Applications Using The Spss Program, Part Two. Kingdom Of Saudi Arabia,pp75.
13. Garson, D. 2006. Logistic Regression. Retrieved From Http:// www2.Class. Ncsu. Edu/ Garson/ Pa765 / Logistic, pp:50.
14. Ghanem, A., and F. X, El-Jaouni,.2011. Using the two-response logistic regression technique in studying the most important economic and social determinants of family income adequacy, an applied study on a random sample of families in Damascus governorate. Damascus University for Economic and Legal Sciences, (1)(27), PP:119-120.
15. Goldberger, A. 1964. Econometric Theory. New York. Wiley, PP:75. https://doi.org/10.1002/nav.3800110213
16. Gujarat .1995. Basic Econometrics ,pp:.567-569.
17. Gujarati, N. D. 2004. Basic Econometrics (Mc-Graw Hill Co.Press.LTD Ed.) ,PP:150.
18. Hussein ,M..J and H.M ,Fayh, 2022. geographical analysis of diseases and epidemics in the world from 1918-2018. Journal Al-ustath of Human and Social sciences (4), Issue 4, pp:257. https://doi.org/10.36473/ujhss.v61i4.1933
19. Hussein, W. H., and, G. D AL-Zubidi. 2021. Employing agile leadership behaviors to enhance investment in human capital. journal of Economics and Administrative Sciences,27, pp:87. https://doi.org/10.33095/jeas.v27i126.2098
20.Jassam, Q. T., Ali E. H., and M. S ,Ghylan,. 2022. Estimating factors affecting wheat marketing efficincy using tobit model. Iraqi Journal of Agricultural Science, 53 (4), 941-949. https://doi.org/10.36103/ijas.v53i4.1606
21. Jawad, A. N. 2010. Comparison between methods of estimating economic functions with qualitative dependent variables. Tikrit for Administrative and Economic sciences, 18 (6), pp:106.
22. Khudair, M. S. 2007. Women between education, training and employment activities in the work sectors. Krbala Scientific University , 2, (5)pp:10.
23. Mahdi, H, S and A, Y Mustafa, 2021 .Social safety nets and sustainable development in fragile environments: a field social study of slums in the city of Baghdad /Al-karkh, 32, Issue 3, 75.
24. Mahmoud Al-Rahim, S. I. 2021. The Reality of iraqi rural women and ways to empower them. Developmental radiance, Issue 27: 475-499. https://www.doi.org/10.51424/Ishq.27.18
25. Nuri, A, Z. 2022 , Reducing the burden of women from the husband in the sunnah ,Journal Islamic Science College, Issue 72 .:539. https://doi.org/10.51930/jcois.21.72.0513.
26. Png, I. P. L, and C.W.J, Cheng,. 2011. China Economic Review, 16, (16)12.
27. Wahhab, N. K, and Y. H Aloisy ,. 2022, The ethical behavioral reasons for happiness in the holy qur'an, produced models, Journal of Islamic Sciences , (72), :411. https://doi.org/10.51930/jcois.21.72.0392.

28. Walsh, A. 1987. Teaching understanding and interpretation of logit regression. Teaching sociology, 178-183. https://doi.org/10.2307/1318033.
29. Wang, H., R. Zhu, and P. Ma, 2018. Optimal subsampling for large sample logistic regression. Journal of the American Statistical Association, 113(522), 829-844. https://doi.org/10.1080/01621459.2017.1292914.
30. Wang, P., and M. L. Puterman, 1998. Mixed logistic regression models. Journal of Agricultural, Biological, and Environmental Statistics, 175-200. https://doi.org/10.2307/1400650.
31. Wasserman, S., and P. Pattison, 1996. Logit models and logistic regressions for social networks: I. An introduction to Markov graphs and p. Psychometrika, 61(3), 401-425. http://dx.doi.org/10.1007/BF02294547.
32. Wells, B. L., and B. O. Tanner, 1994. The organizational potential of women in agriculture to sustain rural communities. Community Development, 25(2), 246-258. https://doi.org/10.1080/15575339409489884
33. Whitehead, A. 2000. Continuities and discontinuities in political constructions of the working man in rural Sub-Saharan Africa: The 'lazy man'in African agriculture. The European Journal of Development Research, 12(2), 23-52. https://doi.org/10.1080/09578810008426764.
34. Wong, G. Y., and W. M. Mason, 1985. The hierarchical logistic regression model for multilevel analysis. Journal of the American Statistical Association, 80(391), 513-524. https://doi.org/10.1080/01621459.1985.10478148.
35. Wright, W., and A. Annes, 2016. Farm women and the empowerment potential in value- added agriculture. Rural Sociology, 81(4), 545-571. https://doi.org/10.1111/ruso.12105.
36. Yang, Y., and M. Loog, 2018. A benchmark and comparison of active learning for logistic regression. Pattern Recognition, 83, 401-415. https://doi.org/10.1016/j.patcog.2018.06.004.
37. Yuan, G. X., C. H. Ho, and C. J. Lin, 2012. An improved glmnet for l1-regularized logistic regression. The Journal of Machine Learning Research, 13(1), 1999-2030. http://dx.doi.org/10.1145/2020408.2020421.
38. Yuen, J., E. Twengström, and R. Sigvald, 1996. Calibration and verification of risk algorithms using logistic regression. European Journal of Plant Pathology, 102, 847-854. https://doi.org/10.1007/BF01877054.
39. Zaidi, A., and A. S. M. Al Luhayb, 2023. Two statistical approaches to justify the use of the logistic function in binary logistic regression. Mathematical Problems in Engineering, 2023(1), 5525675. https://doi.org/10.1155/2023/5525675.
40. Zhang, L., A. De Brauw, and S. Rozelle, 2004. China's rural labor market development and its gender implications. China Economic Review, 15(2), 230-247. https://doi.org/10.1016/j.chieco.2004.03.003.