

Factors Affecting Rural Women in Adopting Agricultural Innovations on Animal Breeding: The Case of TRA1 Region

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Abstract: This study was conducted to determine the factors affecting rural women in adoption of innovations about livestock production in TRA1 Region (Erzurum, Erzincan and Bayburt Provinces). In the study, the data were collected by 158 questionnaires conducted on women actively involved in agricultural activities in 60 villages within the boundaries of 15 districts of Erzurum, Erzincan and Bayburt Provinces. According to the Logistic Regression (LOGIT) Analysis, it has been determined that younger women who have higher education levels, own more animal and larger land, visit city center more often, watch TV, and reside in urban areas, tend to be more willing to adopt innovations such as artificial insemination, milking machine, milking hygiene, and organic agriculture. As a result, priority should be given to training activities for development in rural areas. On the other hand, training programs on special subjects should be organized for women, cooperations and associations should be established and social security services should be provided to support women.

Keywords: Rural Women, Agricultural Innovations, Logit Analysis, Animal Breeding

Kırsal Kadınların Hayvan İslahında Tarımsal Yenilikleri Benimsemesini Etkileyen Faktörler: TRA1 Bölgesi Örneği

Öz: Bu çalışma, kırsal kadının hayvan ıslahında tarımsal yenilikleri benimsemesinde etkili olan faktörleri belirlemek amacıyla yapılmıştır. Çalışmada materyal olarak, Erzurum, Erzincan ve Bayburt illerine ait 15 ilçedeki 60 köyde faaliyette bulunan kırsal kadınlarla yapılan toplam 158 adet anket verileri kullanılmıştır. Çalışmada Lojistik regresyon sonuçlarına göre genç, gelir ve eğitim seviyesi yüksek, tarımsal faaliyetleri ticari amaçla yapan, hayvan sayısı fazla olan, daha fazla sıklıkla ilçe merkezine giden ve televizyon izleyen ve Erzurum ilinde ikamet eden kırsal kadınların suni tohumlamayı, süt sağım makinesini ve sağım hijyenini benimseme konularında daha fazla istekli oldukları tespit edilmiştir. Sonuç olarak, kırsal alanda gelişme sağlanabilmesi için öncelikle eğitim faaliyetlerine önem verilmelidir. Ayrıca kadınların bilgi ve becerilerini geliştirmeye yönelik kurslar düzenlenerek, aynı faaliyetlerde bulunan kadınların örgütlenmelerini sağlayarak, sosyal güvenlik hizmetleri sunarak kendi ayakları üzerinde durmaları ve kendilerini ifade edebilmeleri için ortam sağlanmalıdır.

Anahtar Kelimeler: Kırsal Kadınlar, Tarımsal Yenilikler, Logit Analizi, Hayvan İslahı

1. Introduction

Women in rural areas are vital and indispensable elements of socio-economic sustainability and development processes all around the world. In many developing countries they constitute the backbone of agricultural labor force; and they produce 35-45% of GDP, and more than 50% of the food need of the developing world (Anonymous 2006).

Women form the vast majority of present labor power in rural areas; on the other hand, their participation in agricultural activities are accepted as additional labor force to men and their contribution is accepted as an extension of housework. In fact, rural women participate agriculture as family labor force, agricultural wageworkers, and business managers; and also they support their family by non-agricultural activities. Rural women participate agricultural activities as managers only if their spouses pass away or if they go outside of their village to work. Briefly, although rural women have an important role in agriculture they do not get what they deserve (Kantar 1996).

Education and training of women are insufficient almost in all countries, the situation is even worse in underdeveloped countries. Due to the social and economic reasons women's participation in business life is low at every level of society; therefore, to adopting new social values is hard for them (Gölbaşı 1998). In Turkey literacy level is 93.0% for women and 98.6% for men according to the 2012 data (TurkStat 2013).

Adopting and spreading agricultural innovations has a vital importance for agricultural activities and development of rural society in Turkey. Adoption of new products or applications by the farmers, will affect the profitability in the short-term; and will enhance the living conditions of rural society in the long-term (Boz 2002).

Dissamination of innovation is important for rural woman. Disadvantages of rural life affect rural woman and set them back within society. It is necessary to make behavioral changes in order to disseminate innovations to rural women through extension activities. Therefore, determining factors affective on behaviors or attitude has vital importance (Büyükbay et al. 2006).

In this study, factors affecting rural women in adopting innovations were analyzed and interpreted by using dependent variable model, 'Logit Model', which is limited with LIMDEP packet program.

2. Material and Methods

The material of the study is composed of 158 surveys, which aims to determine the tendency of rural women to adopt innovations. It is conducted in TRA1, in 15 districts of Erzurum, Erzincan, and Bayburt. Participants of surveys were female farmers. Furthermore, records of Turkish Statistics Institute (TSI) and provincial directorates of agriculture in Erzurum, Erzincan, and Bayburt; former researches related with the topic; and data obtained from various institutions have been used.

Collection of data

East Anatolia region was divided into four NUTS-2 provinces. This research has been carried on in provinces TRA1. There are three cities in TRA1 being Erzurum, Erzincan, and Bayburt.

Agro-ecological sub region which is referred in provincial agriculture master plan is also considered in selecting provinces of each city as shown in Table1.

Table 1. Provinces included in the research and their distribution according to agro-ecological sub regions

Cities	Agro-ecological sub regions			
	1 st Sub region	2 nd Sub region	3 rd Sub region	4 th Sub region
Erzurum	İspir	Horasan	Pasinler	Karayazı
	Oltu	Şenkaya	Köprüköy	Tekman
Erzincan	Kemaliye	Merkez	Tercan	Refahiye
Bayburt	Merkez	Aydıntepe	Demirözü	

Two provinces that reflect sub-province of each agro-ecological sub region were selected in Erzurum and one province was selected in Erzincan. The density of agricultural enterprises was considered in selecting the provinces because one woman in each enterprise was interviewed. Since there is no agro-ecological sub region in Bayburt, three provinces of the city were selected being the city center, Aydıntepe and Demirözü.

Opinions of technical staff working in the district directorate of agriculture in the research area were asked. By doing so, four villages were determined from each province that represents agricultural enterprises and has no transportation problem.

The numbers of enterprises in villages in cities and provinces in the TRA1 region were determined by the help of district directorates of agriculture and proportional sampling method was used. The sample size for a finite population was based on known or estimated proportion of the ones that have a certain features according to the following formula.

P value represents the number of elements that have certain features within the population; they can either be obtained through previous researches or estimated intuitively. In order to reach the maximum sample size, p should be equal to 0.5. If p value is smaller or bigger than 0.5, then the sample size decreases. Therefore, in cases where p is not known, using maximum sample size would reduce possible fallacies and should be 0.5 (Miran 2003).

$$n = \frac{N * p * (1 - p)}{(N - 1) * \sigma_p^2 + p * (1 - p)}$$

Formula is;

n : Sample size,

N : Number of enterprises within population,

σ_p^2 : Population variance,

r : Average deviation (%10)

p : Proportion of the number of enterprises within population

$$\sigma_p^2 = \frac{r}{Z_{\alpha/2}}$$

$$\sigma_p^2 = \frac{0.1}{2.576} = 0.0388$$

$$n = \frac{1607 * 0.5 * 0.5}{1606 * (0.0388) + 0.5 * 0.5} = \frac{401.75}{2.668} = 151$$

The number of surveys conducted with female farmers is calculated as, 151.

Percentage distribution of survey numbers according to the cities is determined as,

Number of surveys for Erzurum, 90

Number of surveys for Erzincan, 46

Number of surveys for Bayburt, 15

The number of surveys was increased by 5% due to the fact that some part of the surveys may not reflect the facts and represent the population. Following results were obtained.

Surveys conducted in Erzurum, $90 + (90 * 0, 05) = 94$

Surveys conducted in Erzincan, $46 + (46 * 0, 05) = 48$

Surveys conducted in Bayburt, $15 + (15 * 0, 05) = 16$

Data Analysis

In the research, data for rural women in TRA1 province were transferred to LIMDEP packet program and tabulated by using “crosstab” method.

In the research area, 5 different regression models were estimated to determine the factors effective on adoption of innovation levels among rural women. In these models agriculture insurance, artificial insemination, usage of milking machine, watching for milking hygiene, and adoption of organic agriculture were considered as dependent variables which can all be accepted as ‘innovations’ for the region; and models were formed accordingly. Models were estimated by using logistic regression analysis. However, agriculture insurance, which is one of the five innovations, was adopted by a few women; consequently, no regression analysis was done for this variable.

Since the assumption of normality is ruined when dependent variables are categorical (1, 2, and 3) and dummy (0, 1), classical regression analysis model (Ordinary Least Squares) cannot be applied. OLS can be estimated objectively and efficiently only if dependent variables are continuous. When dependent variables have dummy variables, LOGIT and PROBIT models can be used. In these models discrete variates become continuous with

reference to probability distribution. LOGIT model estimates are more objective and effective than PROBIT model (Gujarati 1995; Greene, 1997; Sarımeşeli 2000). Functional form of regression model that estimates factors effective on adopting agricultural innovations is as follows,

$$Y = f(X_1, X_2, X_3, X_4)$$

Y; Innovation adoption status of rural women

X₁; Characteristics of rural women

X₂; Characteristics of the enterprises

X₃; Usage of communication tools

Next section presents general information about women and enterprises obtained by the evaluation of 158 surveys

3. Results and Discussion

General characteristics of rural women

In order to determine general characteristics of women included in the survey, income levels; education; and frequency of visiting the province center were analyzed. Results are given in Table 2

Table 2. Distribution of rural women according to some general features

General characteristics		N	%
Age	<24	14	8.9
	25-34	27	17.1
	35-44	38	24.0
	45-54	30	19.0
	55-64	30	19.0
	65>	19	12.0
	Total	158	100.0
Income (TL/month)	300-499	25	15.8
	500-699	80	50.7
	700-899	25	15.8
	900-1499	18	11.4
	1500<	10	6.3
	Total	158	100.0
Education	Illiterate	66	41.8
	Literate	5	3.2
	Primary Sch.	71	44.9
	Second. Sch.	10	6.3
	High School	6	3.8
	University	0	0.0
Total	158	100.0	
Frequency of visiting the province center	Once a week or more	47	29.8
	Once a month	59	37.3
	Less	52	32.9
	Total	158	100.0

According to the latter data, approximately 43% of the women surveyed were between 35 and 54 age group. It was determined that 26.0% of them were young women under the age of 35; while 31.0% were older than 55. The older a woman gets the less effective she becomes on production activities; on the other hand, she becomes more dominant in decision-making processes. Furthermore, there was a positive correlation between age and adoption of agricultural innovations (Taluğ 1975; Morris 1999).

In the study it was revealed that the monthly income differs among surveyed families; for instance, almost half (50.6%) of the families earn between 500-699 TL and 15.9% of them earn between 700-899 TL. In addition, it was found that only 6.3% of families earn above 1500 TL. As we know, there is a direct relation between farmer's income and rate of innovation adoption. Due to the fact that adopting and applying agricultural innovations within an enterprise is costly, low-income farmers adopt and apply innovations less (Aydın 1992). High-income increases the interest in and desire for agricultural extension activities (Atsan et al. 2009).

It was determined that among the participants included in the survey 44.9% are primary school graduates and 41.8% are illiterate. The share of secondary school and high school graduates are 6.3% and 3.8% respectively. On the other hand, the percentage of literacy is 3.2%. Previous studies revealed that there is an important correlation between the level of education and adoption of agricultural innovations; and a great majority of participants who adopt agricultural innovation earlier are primary school graduates, and this rate decreases in other groups (Taluğ 1975). In terms of agricultural extension activities, the higher the level of education of farmers, the higher is demand for agricultural extension activities (Atsan et al. 2009).

According to the study, among women who participated in the survey 37.3% go to county once a month; while, 32.9% go less frequently and 29.8% go once a week or more. There is a positive correlation between the frequency of villagers' getting out of the village and development of the rural area. The relation between villages and county towns increases the rate of spread and adoption of new techniques; while the relation with big cities increases the level of social development (Erem Kaya, 2011).

Analysis Results

In TRA1 region, artificial insemination, milking machine, and adoption of milking hygiene, which can all be accepted as 'innovations' by rural women; considered as dependent variables and models were formed accordingly. The results of logistic regression analysis are presented in Table 3.

Table 3. Logistic regression analysis results of artificial insemination

Variables	Coefficient	Standard Error	P value	Marginal Effects	Effects
Stable	-11,849	6,830	0,082	-1,756	
Age	-1,113	0,629	0,077*	-0,165	
Education	0,403	1,343	0,004***	0,571	
Income	3.853	0,522	0,440	0,059	
Being a cooperative member	0,466	1,644	0,776	0,069	
Number of cattle	2,294	1,015	0,023**	0,340	
Education level of the head of the family	0,191	0,953	0,840	0,028	
Age of the head of the family	-1,199	0,729	0,099*	-0,177	
City (Erzurum; 1 others; 0)	2,186	1,321	0,098*	0,292	
Log likelihood: -12,4		McFadden R Square: 0,886	X ² (8): 194.206***		

Resource: Original calculations

Women were taken as dummy variables to analyze the status of adopting artificial insemination and regional differences; and their state of residency in Erzurum was taken as “1” and as “0” in other cities. It was revealed that there is a positive relationship ($P<0.10$) between being in a city and artificial insemination. It was determined that women living in Erzurum are more willing to adopt artificial insemination compared to women living other cities.

Study showed that the age of woman affects acceptance of artificial insemination negatively and with increasing age their tendency to adopt artificial insemination decreases. It was determined that income has positive effect on adopting artificial insemination. In other words, the income level of those who adopt it earlier is higher than those who adopt it later (Aktaş & Özal 2003). High-income increases the interest in and desire to adopt agricultural promotion studies (Atsan et al. 2009). Furthermore, it was determined that life standard, on which income level is effective, and the level of agriculture technique usage are effective on a manager to adopt innovations (Şelli 2001). It was determined that there is a positive relationship ($P<0.01$) between education and adopting artificial insemination. The tendency to adopt artificial insemination is higher among women whose education levels are high. In addition, there was a positive relationship ($P<0.05$) between the number of cattle and adopting artificial insemination. Accordingly, families who have more cattle tend to adopt artificial insemination more. There is a positive relationship between holding a cooperative membership and education level of the head of the family, and adopting artificial insemination. However, there is a negative relationship ($P<0.10$) between the age of the head of the family and adopting artificial insemination. Considering marginal effects of variables, the tendency to adopt artificial insemination is more common (34.0%) among families that have more cattle. Educated women are 57.7 percent more willing to adopt artificial insemination compared to less educated women. Women living in Erzurum are more willing (29%) to adopt artificial insemination compared to women living other cities.

According to Table 4, the age of women has a positive effect on adopting milking machine; and it was determined that older women need milking machine more. It was also revealed that income and education have positive effect on adopting milking machine. It was more common among women who are educated and with higher income to adopt milking machine.

Table 4. Logistic regression analysis for adopting milking machine

Variables	Coefficient	Standard Error	P Value	Marginal Effects
Stable	-3,913	1,482	0,008	-0,775
Age	1,588	0,687	0,020**	0,291
Education	0,309	0,874	0,723	0,061
Income	1,129	0,495	0,022**	0,223
The number of cattle	1,044	0,366	0,004***	0,206
Frequency of watching TV	1,055	0,458	0,021**	0,209
The number of family members	-1,908	0,585	0,001***	-0,378
Aim of stockbreeding (mercantile and both=1, domestic and non-participating=0)	0,537	0,886	0,544	0,102
Log likelihood: -37,549 McFadden R Square: 0,639 X^2 (7): 138,203***				

Resource: Original calculation

As can be understood from the regression analysis, those women who have more cattle, who are in the business of animal husbandry for commercial purposes, and frequently watch television are more willing to adopt milking machine. The number of family members is also an important factor affecting the process of adopting. It was analyzed that bigger families do not really need milking machine. From statistical point of view, the level of significance of the number of cattle and number of family members are 1%. On the other

hand, age and education of women and the frequency of watching television is 5%. Considering marginal effects of variables, the tendency to adopt milking machine is 38.0% higher in families having less number of members than bigger families. Women with higher income are more willing (%22.0) to adopt milking machine compared to woman with lower income. Furthermore, families that have more cattle tend to adopt milking machine 21 percent more than other families having less cattle.

Table 5 shows that educated women with higher income are more concerned about milking hygiene. Naturally, younger women who frequently watch television and visit the county town were more careful about milking hygiene. On the other hand, those women who have a lot of cattle do not care for milking hygiene, because numerous cattle require heavy workload and it can be time-consuming.

Table 5. Logistic regression analysis for adopting milking hygiene

Variables	Coefficient	Standard Error	P Value	Marginal Effects
Stable	-0,923	1,805	0,609	-0,067
Age	-1,210	0,605	0,045**	-0,098
Education	1,334	0,412	0,001***	0,097
Income	0,711	0,540	0,187	0,051
Number of cattle	-0,652	0,348	0,060*	-0,047
Frequency of visiting the province center	-0,587	0,500	0,240	-0,042
Frequency of watching TV	0,959	0,452	0,033**	0,069
City (Erzurum;1 others; 0)	1,579	0,630	0,012**	0,136
Log likelihood: -49,563 McFadden R Square: 0,397 X ² (7): 65,431***				

Resource: Original calculations

In addition, it was determined that there is a positive relationship between adopting milking hygiene and city they live. Study showed that women living in Erzurum were more willing to adopt milking hygiene compared to others living different cities. In terms of statistics, while the significance level of education is %1; the significance level of age of women, frequency of watching TV, and city they live is 5%; and, the number of cattle is 10%. Considering the marginal effects of variables, women who live in Erzurum are 13% more willing to adopt milking hygiene compared to other women living in different cities. Furthermore, adopting milking hygiene is 9% higher among educated women than less educated women. Also the rate of adopting milking hygiene is 6% higher among women who watch TV more frequently than women who watch TV less frequently. Last but not least, those women who have less cattle are 4 percent more willing to adopt milking hygiene compared to those who have more cattle.

4. Conclusion

One of the most prominent characteristics of this age is the rapid change in technology. The techniques and methods of production are constantly developing. In Turkey, new technologies, which are accepted as the primary factors of agricultural development, can provide social benefits only if they are put into practice by producers. Therefore, new technical knowledge that has practical value should be forwarded to producers and they should be promoted to adopt and utilize these innovations.

Education is the key of success in all fields within society. It is primarily necessary to focus on education in rural areas, to accelerate rural development. Courses should be organized for women to help them to increase their knowledge and skills and to help them to stand on their own feet and to be able to express themselves. Women working on similar activities should be united under cooperations; and also social security services should be provided for them. In addition, considering women' contribution to each and every step of the agricultural production, they should be properly provided with knowledge that they

need and should be treated gently and respectfully as they deserve. It is possible to argue that if the activities and projects for women are conducted efficiently, next generations will be more aware of the problems.

Increasing the number of television and radio shows and broadcasting them during winter time, when there is less agricultural activities, will be beneficial in increasing women knowledge and awareness. Helping those women who do not have television or radio in their houses through various women organizations and making them own a television or radio will play a supportive role on their education.

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