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Full Length Research Paper

Factors affecting dairy farmers' utilization of agricultural supports in Erzurum, Turkey

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Due to the nature and strategic importance of agriculture, governments in whole world somehow support agricultural sector. This sector plays an important role in Turkish economy despite the share of industry and services are rising constantly. The sector has basic structural problems such as poor mechanization, small farm size and uncoordinated and unplanned agricultural production. Although Turkey has developed substantial agricultural policy reforms, particularly in animal husbandry sector, to be in line with European Union and World Trade Organization regulations, there are a lot to do to improve the sector. One of the most important aspects of the agricultural supports is to distribute them efficiently and in an equitable way to the sector. This study aims to explore the factors affecting the dairy farmers' utilization of agricultural supports using ordered probit approach. For this end, survey data were used and the results showed that education level, form of farming, breed and roughage usage variables were good predictors of dairy farmers' utilization of agricultural supports. Therefore, in order to have an efficient and equitable agricultural support policy, education level of the farmers can be increased and farmers can be induced to have a more market-oriented production and culture breeds.

Key words: Agricultural supports, dairy farms, ordered probit, Turkey.

INTRODUCTION

The agricultural sector plays an important role in Turkish economy despite the share of industry and services are rising constantly. Around 27% of total employment in Turkey is in agriculture sector and the share of the sector in the GDP is about 9% (Turkstat, 2009). The farming is conducted in all of the regions in Turkey, but it's less practiced in the mountainous Eastern regions where the main activity is based on animal husbandry which has a share of one-fourth of the gross value of the total agricultural production (Anonymous, 2009a).

The rapid industrialization and improper government policies caused agriculture's share to decline in overall income. This caused the fall of economic standards of the farmers and contributed to emigration from rural to urban areas. Main problem of the sector is inadequate productivity levels, which are largely the result of poor mechanization, small farm size and uncoordinated and unplanned agricultural production (Anonymous, 2009b).

Due to the nature and strategic importance of agriculture, governments in whole world somehow support agriculture sector to increase food self-sufficiency, provide hygiene and safe food, develop rural areas, stabilize farmers' incomes and promote exports. Government interventions in Turkish agricultural sector date back to 1932, when a minimum price for wheat was established (Do ruel et al. 2003). Until 2000, price support and input subsidies remained as main policy instruments which cause market distortion. Due to the support structure designated after year 2000, which was prepared based on World Trade Organization (WTO) Agriculture Agreement negotiations and Turkey's European Union (EU) membership process, Turkey's agricultural support policies are becoming more market-oriented (Tekta , 2008; Aksoy, 2008; Tan and Dellal, 2003). Although the composition of support has improved in recent years in Turkey, there are still a lot remains to be done to achieve further progress towards a liberalized and more market

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oriented regime in agricultural trade (Bielik et al., 2007; Tangermann, 2003).

Border measures and budgetary payments are the main policy instruments supporting agriculture in Turkey. The tools of agricultural support in Turkey include direct payments, deficiency payments, compensatory payments, livestock support, crop insurance support, rural development support and environmental set-aside. In addition, funds will be allocated to selected credit supports and research and development (MARA, 2009).

Animal husbandry is an important part of Turkey's agricultural sector and economy. The share of animal husbandry in the total agricultural output is around 25% (Anonymous, 2009a). As of year 2008, the number of cattle totaled approximately 11 million and sheep around 24 million. Total number of dairy cows, on the other hand, was about 4 million heads which produced 11.2 million tones milk (Turkstat, 2009).

Due to high proportion of native breeds[1], small scale subsistence farms and poor animal feeding and shelter conditions, meat and milk production levels in Turkey are quite low as compared to Europe (I ık et al., 2009). While average milk production per cow in EU is 6,234 kg/year, it is 1,888 kg in Turkey. As for carcass weight, it is 279 kg/head in EU-25 while it is 196 kg/head in Turkey. More than 65% of all farms are smaller than 5 hectare (ha) - compared to European average of 20 ha. Approximately 82% of the farms in Turkey have cattle between 1 to 9 heads, while 72% of the farms in EU have at least 30 heads or more (Anonymous, 2006). Another important issue in dairy sector is regarding marketing and processing of produced milk. Only 20% of the milk produced is processed in modern dairy industry while 80% is sold either to simple and small dairy enterprises or directly to households in streets by farmers (Tu rul, 2006).

Recent livestock sector support policies in Turkey include numerous health and quality measures to improve the sector and to meet the EU's sanitary and phytosanitary standards (OECD, 2007). Today, animal husbandry receives state support; fodder crops, artificial insemination, breeding, apiculture, fisheries, milk production and risk-free livestock regions are mainly supported. Livestock and animal husbandry supports have increased substantially from 11 million Turkish Liras[2] (TL) in 2000 to 731 million TL in 2008. In 2006, more than 80% of the total government expenditure on input subsidies was used for improving livestock breeds in Turkey (MARA, 2009).

Although Turkey has developed substantial agricultural policy reforms, particularly in animal husbandry sector, there are a lot to do to improve the sector. One of the most important aspects of the agricultural supports is to distribute them efficiently and in an equitable way to the sector without causing any market distortion. For this end, in this study, it is aimed to explore the factors affecting the dairy farmers' utilization of agricultural supports.

MATERIALS AND METHODS

The data used in this study were collected through face to face survey study. The questionnaires were designed to elicit agricultural support utilization information of dairy farmers. Cattle and dairy farm populations of these districts were obtained from "District Directorate of Agriculture". Based on the population size, 154 dairy farmers were statistically determined from 16 villages in Ispir, Hinis, Pasinler and Karayazi districts of Erzurum Province[3], Turkey.

Intentional sampling method was used to determine the districts and the number of samples for each district based on dairy farming activities, research funding and the accessibility; and simple random sampling was used to determine what villages and villagers to interview (Karasar, 1991; Özdamar, 2001).

To determine the sample size, the following equation was used with 5% significance level and 95% confidence interval.

$$n = \frac{N*\sigma^2}{(N-1)*D^2+\sigma^2} = \frac{1458\times 12.1}{1457\times \frac{10.65}{1.96}\times\frac{0.05}{1.96}^2 + 12.1} = 147$$

Where,

n : Sample size.
N : Number of dairy farms in the population.
σ^2 : Population variance.
d : Type I error (0.05).
z : Table value of Z Standard Normal distribution.
D : d/z value.

Just in case that some of the questionnaires may not represent the population or may be incomplete, the number of questionnaires was increased by 5%.

Total number of questionnaires = 147+ (147*0.05) = 154.

First, the questionnaire was pre-tested with randomly selected dairy farmers outside the sample frame to determine the applicability of some questions in the villages. The result of the pre-test resulted to the revisions of some of the sections of the questionnaire to suit the condition in the villages. Since the literary level of the villagers is low, the questionnaire was implemented with a total of 154 randomly selected farmers on a face-to-face manner in October, 2007.

In the questionnaire, the respondents were asked to obtain information on household socio-economic and demographic attributes such as household size, land and livestock holdings, form of dairy farming, age, education level, membership to any cooperative/union, social security status.

The focus of the survey was to determine and evaluate the utilization of dairy farmers from agricultural supports in Erzurum Province, Turkey. There are four most common agricultural supports that dairy farmers can receive. These government supports are for: 1) Animal identification system, 2) Fodder crop

[1] Average percentage of native breeds in Turkey is about 30% while it is 58% in the research area, i.e., Erzurum province (Turkstat, 2009).

[2] As of September 4th, 2009, exchange rate between the US Dollar ($) and Turkish Liras (TL) was 1.51 TL/$.

[3] Erzurum has the geographic coordinates of 39°45'N latitude and 41°15'E longitude. It is on the Silk Road, and located at the north-east region of Turkey. Erzurum is one of the biggest provinces in the region with a population of 962,000 total and 402,000 in the city centre. Animal husbandry is the main agricultural activity in this province.

Table 1. Definition of explanatory variables.

Age	**Age of the farmer (15-24: 1; 25-34: 2; 35-44: 3; 45-54: 4; 55-64: 5; 65 : 6)**
Education	Education level of the farmer (Illiterate:1; Literate: 2; Elementary: 3; Middle: 4; High: 5; University: 6.
Member	Whether the farmer is a member of a cooperative/union or not: if member: 1; otherwise: 0.
Form of Farming	The form of dairy farming (subsistence: 1; others: 0).
Breed	The breeds the farmer have in his/her farm: Native: 0; Native + Cross Bred: 1; Cross Bred: 2; Cross Bred + Culture: 3; Culture: 4.
Yield	Average milk yield per cow in the farm (liter/day).
Roughage	The ratio of roughage produced to roughage consumed in the farm (%).

Table 2. Dairy farmers' utilization of agricultural supports based on age groups (%).

Utilization level	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65	Total
Low	1.95	4.55	8.44	3.25	7.14	5.19	30.52
Medium	1.95	5.84	8.44	9.74	4.55	4.55	35.06
High	0.65	9.09	16.23	5.84	1.30	1.30	34.42
Total	4.55	19.48	33.12	18.83	12.99	11.04	100.00

production, 3) Calves born from artificial insemination, 4) Milk incentive payment.

The binary logit or probit model in which Y = 1 for receiving agricultural support and Y = 0 for not receiving is too rudimentary for properly evaluating agricultural supports. The multinational logit or probit model, which allows for more than two categories, suffers from the well-known "independence of irrelevant alternatives" assumption (Greene, 2003), as errors are assumed to be independent for each category. To circumvent this problem, the ordered probit model allows the dependent variable (utilization levels of agricultural supports) to assume values which are ordinal in nature. In order to determine the utilization levels of the farmers, they were divided into three groups (low: 0; medium: 1; high: 2). The farmers who receive none or only one government's agricultural supports were considered as low level utilization group (Y = 0). Those benefiting from two different supports were taken as medium level utilization group (Y = 1). And finally, those who utilize more than two were considered as high level utilization group (Y = 2).

Limited dependent variable econometric model was estimated using ordered probit estimation procedure in Limdep Econometric Computer Program (Green, 2003; Yavuz, 2001). The following equation shows the level of agricultural support utilization as a function of socio-economic variables. Hence,

$$y_i^* = \beta_0 + \beta_1 \quad X_{ik} + \varepsilon$$

Where, the left hand side (y_i) is refers to the level of utilization of agricultural supports by the farmer i.

y_i^* = Unobserved agricultural support utilization level. y_i = Level of agricultural support utilization.

y_i = 0 if $y^* \leq 0$, indicating the farmer received none or one support (low).

y_i = 1 if $0 \leq y^* < \mu_1$, indicating the farmer received two supports (medium).

y_i = 2 if $\mu_1 \leq y^*$, indicating the farmer received more than two supports (high).

μ_1 is an estimated threshold value which determines the level of agricultural support a farmer is expected to receive.

The right hand side of the model presents the set of kth explanatory variables, x, plus a constant and the error terms. Table 1 defines the explanatory variables incorporated in the econometric analysis.

RESULTS

Sample profiles

154 farmers were categorized into three groups based on their utilization from government agricultural supports. The ratios of farmers in each group (that is, low, medium and high) are about 31, 35 and 34%, respectively. Table 2 shows the percentage of the farmers' age groups in each utilization level. It appears that low and high level utilization groups had the highest percentages (8.44 and 16.23%, respectively) of (35 - 44) age group, while medium level utilization group had the highest percentage (9.74%) of (45 - 54) age group. While the overall ratios of (15 - 24) age group were the lowest (4.55%), (35 - 44) age group had the highest ratio with 33.12%.

As for the education levels of the farmers, illiteracy

Table 3. Dairy farmers' utilization of agricultural supports based on education levels (%).

Groups	Low	Medium	High	Total
Illiterate	1.30	0.65	0.00	1.95
Literate	5.19	1.95	0.00	7.14
Elementary School	20.78	18.18	7.14	46.10
Middle School	3.25	11.04	12.34	26.62
High School	0.00	3.25	11.69	14.94
University	0.00	0.00	3.25	3.25
Total	30.52	35.06	34.42	100.00

Table 4. Dairy farmers' utilization of agricultural supports based on breeds owned (%).

Utilization Level	Native	Native + Cross Bred	Cross Bred	Cross Bred + Culture	Culture	Total
Low	19.48	1.30	9.09	0.65	0.00	30.52
Medium	9.09	4.55	16.23	3.25	1.95	35.06
High	0.00	0.65	10.39	11.69	11.69	34.42
Total	28.57	6.49	35.71	15.58	13.64	100.00

level was 1.95%. Low level utilization group had the highest level of illiteracy rate and the lowest levels of high school and university graduates, while high level utilization group had the lowest level of illiteracy rate and highest levels of high school and university graduates. This clearly shows that the farmers who receive more agricultural supports are more educated. Another point is that about 46% of the farmers had elementary school diplomas and only 3.25% had university diplomas (Table 3).

The types of breeds farmers have are very important for dairy farms, particularly in terms of yield per cow (I ık et al., 2009). It is well known that culture breeds give the highest yields as native breeds give the lowest yields. As of year 2008, the annual milk yield per cow for native, cross bred and culture breeds in Turkey were 1315, 2714 and 3883 liters, respectively (Turkstat, 2009).

In general, the more farmers have the culture breeds the more they tend to be market oriented. Therefore, it is expected that farmers with culture breeds utilize more from agricultural supports. As a matter of fact, the ratio of farmers with both cross bred + culture and culture breeds together in high utilization group was 23.38%, while it was only 0.65% in low utilization group (Table 4). Low utilization group had the highest level of native breeds with 19.48%, as medium utilization group had the highest level of cross bred with 16.23%.

Farms can be divided into three groups based on their forms of farming: Subsistence farming, semi-subsistence farming and commercial farming. Subsistence farming is a form of farming in which nearly all the crops or livestock raised are used to maintain the farmer and his family, leaving very limited surplus (if any) for sale or trade. A semi-subsistence farm is one which produces enough surpluses, beyond the family's own needs, to sell for regular income. Self-production still remains a very important activity in semi-subsistence farms. The farmers employed in semi-subsistence farms have lower incomes, but a greater sense of stability because they can produce the most necessary goods by themselves (Paiders, 2002). Commercial farm, on the other hand, is the one that produces mainly for sale or trade its products in the market. Hence, semi-subsistence and commercial farms are more market oriented than subsistence farms.

Table 5 demonstrates the percentages of these three forms of farming in agricultural support utilization levels. Firstly, it indicates that the ratio of commercial farms was quite low (only 8.44%). Most common forms of farms in the region (in Turkey, as well) were subsistence (45.45%) and semi-subsistence (46.10%) farms. The ratio of subsistence farming was the highest in low and medium level agricultural support utilization groups while the percentage of semi- subsistence farms was the highest in high level utilization group. This clearly shows that semi-subsistence and commercial farms benefit more from agricultural supports than subsistence farms.

Farmers, in general, have an option to join a cooperative or union in the study area. Most of the subsistence farms, however, do not join any of them and also do not utilize from the government's agricultural supports. Table 6 confirms this notion. Those who be the member of a cooperative/union benefited the most from agricultural supports (high level, 28.57%), while those who not to be a member benefited the lowest (low level, 24.68%). More than half of the farmers in the region did not join any cooperative/union.

Table 5. Dairy farmers' utilization of agricultural supports based on the form of farming (%).

Utilization Level	Subsistence	Semi-subsistence	Commercial	Total
Low	18.83	10.39	1.30	30.52
Medium	18.18	13.64	3.25	35.06
High	8.44	22.08	3.90	34.42
Total	45.45	46.10	8.44	100.00

Table 6. Dairy farmers' utilization of agricultural supports based on membership status in cooperative/unions (%).

Membership Status	Low	Medium	High	Total
Member	5.84	14.29	28.57	48.70
Not member	24.68	20.78	5.84	51.30
Total	30.52	35.06	34.42	100.00

Regression analysis

In order to find out relationships between agricultural support utilization and household level factors, we ran an ordered probit regression model of support utilization level against household socio-economic characteristics. The variables included in the model and the estimation results are shown in Table 7.

Note that the estimated coefficients in ordered probit model have no direct interpretations but can be used to calculate probabilities of getting different agricultural support levels and their corresponding marginal probabilities. The empirical results indicate that the explanatory variables, education, form of farming, breed and roughage, are statistically significant at 1 and 5% levels. These results firstly imply that a farmer's higher level of education leads to greater probability of benefitting from agricultural supports. By the same token, having more productive breeds and using more of produced roughage in the farm leads to higher utilization of agricultural supports by farmers. Form of farming, however, has a negative sign. Here, form of farming is a binomial dummy variable given 1 for subsistence farming and 0 otherwise. Since the number of commercial farms was so low, we treated semi-subsistence farms and commercial farms together as one group. Hence, negative sign here means that the subsistence farms get less agricultural supports than semi- subsistence and commercial farms. In other words, the more farms are market oriented the more they receive the government supports.

Although the variables age, member and yield are statistically insignificant, all have the expected sign. Yield and member affect the dependent variable (agricultural support utilization level) positively while age affects negatively. As the yield of a dairy cow a farmer owned increases (that is, more output and so more market oriented), the farmer's utilization of agricultural supports increases, as well. As for the membership status of the farmers, mostly market oriented farmers (semi-subsistence and commercial farms) tend to join a cooperative/union. In fact, for some agricultural supports, it is a pre-condition of the government to benefit from those supports. Therefore, our result is in line with this notion that the farmers with membership to a cooperative/union utilize more from agricultural supports.

The older farmers get, on the other hand, the less they benefit from the supports. Since old people lose strength to engage in labor demanding jobs (Mamo et al., 2007), they tend to leave the most of the farm to their sons and in most case work like a subsistence farm. Therefore, they demand less government supports.

The estimated threshold variable (μ_1) is very signify-cant (at 1% level) indicating the ordered probit model with 3 different support levels is highly appropriate. The value of (-102.864) for the log likelihood function indicates that the explanatory variables used in the ordered probit model are appropriate. The probability value of 0.00 for chi squared (132.079) indicates that at least one of the parameters of the variables is different than zero (that is, reject the null hypothesis that all parameters equal to zero in the model: no relation between dependent variable and explanatory variables).

Table 7 also reports the marginal effects that an increase of one unit of the explanatory variable has on farmers' utilization of agricultural supports. Hence, if the ratio of roughage consumed in the farm increases by one unit (that is, one percent in this case), the probabilities of obtaining high, medium and low level agricultural supports go up by 0.2%, (- 0.1%) and (-0.2%), respect-tively. This is in line with the statement mentioned above: "Using more of produced roughage in the farm leads to higher utilization of agricultural supports by farmers". This can be associated with the farm size. It is expected that larger dairy farms need more roughage and therefore, consume most of the roughage they produce in their farms rather than selling other farms. It is also reasonable to assume that larger farms in general are more market oriented. Since market oriented farms utilize more from agricultural supports, as mentioned above, the farms using more of the roughage they produce in their farms would benefit more from agricultural supports, as well.

A farmer with higher level of education has a better chance of receiving higher level agricultural support. That

Table 7. Ordered probability model (Probit) estimation results.

Variables	Coefficients	Standard Error	Marginal Effects		
			Prob (y = 0)	Prob (y = 1)	Prob (y = 2)
Constant	-2.105	0.760			
Age	-0.042	0.085	0.010	0.003	-0.013
Education	0.566**	0.155	-0.133	-0.040	0.173
Member	0.310	0.258	-0.073	-0.022	0.095
Form of Farming	-0.739**	0.230	0.179	0.038	-0.218
Breed	0.332**	0.128	-0.078	-0.023	0.101
Yield	0.054	0.046	-0.013	-0.004	0.017
Roughage	0.007*	0.003	-0.002	-0.001	0.002
Threshold Value (μ_1)	1.764**	0.218	Log likelihood function		-102.864
Chi squared ($^{2}_{(7)}$)	132.079		Prob. = 0.000		

* Significant at 0.05 level; ** Significant at 0.01 level.

is, the probability of being in high level agricultural support group is 17.3% compared to (- 13.3%) in low and (-4%) in medium group. Likewise, the farmer with more productive breed (e.g., culture breed) has a better chance of receiving higher level of agricultural support, as well. That is, the probability of being in high level agricultural support group is 10.1% compared to (-7.8%) in low and (-2.3%) in medium group. Finally, as for form of farming, the probability of a subsistence farm being in high level agricultural support utilization group is (-21.8%), compared to 17.9% and 3.8% in low and medium utilization groups, respectively. This clearly shows that subsistence farms gets lower agricultural supports compared to semi-subsistence and commercial farms.

Conclusion

By applying an ordered probit model to a sample of 154 dairy farmers, it was found that education level of the farmer, form of farming, breed and the ratio of roughage used in the farm are significant predictors of farmers' utilization of agricultural supports. Based on qualitative and quantitative analyses presented in this paper, we can draw following conclusions:

i. Common problem of low education level in rural areas exists in this research area, as well. Furthermore, a farmer's higher level of education leads to greater probability of benefitting from agricultural supports.
ii. The ratio of commercial farms was quite low. Most common forms of farms in the region (in Turkey, as well) were subsistence and semi-subsistence farms. Semi-subsistence and commercial farms benefit more from agricultural supports than subsistence farms. In other words, the more farms are market oriented the more they receive the government supports.
iii. The ratio of culture breeds owned was low. Most of the dairy farmers owned native and/or cross breeds. However, farmers with culture breeds utilize more from agricultural supports.
iv. Consuming more of produced roughage in the farm leads to greater probability of benefitting from agricultural supports.
v. Although it was found that the variables age, member and yield were not significantly correlated with agricultural support utilization of dairy farmers, all had the expected sign. While yield and membership status affected the agricultural support utilization level positively, the farmer's age affected negatively.
vi. The organization level is quite low. More than half of the farmers in the region did not join any cooperative/union. Those who are the member of a cooperative/union benefited the most from agricultural supports.

Based on these results and conclusions, following suggestions can be proposed to enhance dairy farmers' utilization of agricultural supports:

i. Education level of the farmers should be increased. For this end, particularly adequate school buildings and staff should be provided. Moreover, agricultural extension services can be carried out in the area to inform and educate the farmers about agricultural practices and agricultural policies.
ii. The number of semi-subsistence and commercial farms can be increased. To do that, farmers can be induced to have more market oriented production. Also, having new employment opportunities in other sectors (that is, industry and services) would decrease the number of farms and agricultural population and this would lead to larger and more market oriented farms. Finally, establishing well organized and efficient markets would cause farmers to produce more for market.
iii. The ratio of culture breeds owned by the farmers

should be increased. Since most of the farms in the region are subsistence and semi-subsistence farms, they mostly cannot afford to buy and feed the culture breeds. Hence, dairy farmers can be supported in this respect. In addition, those who do not use all the roughage they produce in their farms can demand more roughage by having more culture breeds in their farms since culture breeds consume more.

iv. Finally, the institutional capacity of farmer organizations, such as co-operatives and farmers' unions, needs to be strengthened to enhance farmers' utilization of the supports.

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