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RESEARCH ARTICLE

Influence Factors Analysis of Farmers' Participation in Agricultural Machinery Support Using Random Utility Model in the Agri Province of Turkey

Okan Demir*

Atatürk University, Faculty of Agriculture, Department of Agricultural Economics, Erzurum/Turkey

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ABSTRACT

Increase in the level of mechanization in agriculture is a factor that promotes increase in productivity and also helps improve life standards in rural regions. In this study, factors that affect participation in benefiting from machinery and equipment supports were studied through the Ağrı province example. The main material of the study consisted of primary data that was obtained from face to face meetings carried out with agricultural enterprises, which were registered in the Farmer Registration System of Ağrı province. The Probit Regression Analysis method was used to determine participation in benefiting/not benefiting from the support, the relationships between the socioeconomic factors that affect this act, as well as the relationship degrees. According to the results obtained by the model, while the variables of household population, production of arable crops, and the existence of nonagricultural income had a significantly negative effect on participation in benefiting from machinery and equipment supports; the variables of irrigated land size, total amount of agricultural fields in the enterprise, and the existence of tractor(s) in the enterprise had a significantly positive effect.

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Introduction

Turkey is a country with a wide rural geography and population, and has an important economic and human resource potential that can accelerate national development. The awakening of this potential in rural regions requires implementing integrated planning. As part of this, the purpose is to improve the working and living conditions of the rural population in accordance with conditions available in urban areas and to ensure that these conditions are sustained (Anonymous, 2011).

The agricultural sector has a great importance in the economic system of all countries, no matter what their level of development. This sector, which produces the food items required for human nutrition and the raw materials required by the industry sector, creates employment both for itself as well as for other sectors. All countries have implemented comprehensive agriculture policies in order to ensure the development of the agricultural sector. Within these, support policies have an important place (Abay et al., 2005; Erdal et al., 2013; Karakayacı and Oğuz, 2006). A country, which desires to keep the agricultural sector alive, guarantee the food demand, and compete with the global markets, has to maintain the applications of supporting, protecting, and supporting in the agricultural sector (Yorgun, 2006).

The purpose of agricultural support policies in Turkey is to ensure an optimum production structure that is suitable to the country's needs, protect producers and provide them a

* Corresponding author
E-mail address: okandemir@atauni.edu.tr

suitable income opportunity, and thus increase the agricultural sector's contribution in the country's economy (Yalçınkaya et al., 2006). In rural areas, economic activity investments, which aim at processing, utilizing, and marketing the agricultural products of real persons and legal entities, and rural development programs, which aim at promoting organizations' investments made for the rehabilitation of their current infrastructure facilities, are being carried out as part of the National Agriculture Strategy in order to provide economic and social development (Anonymous, 2012).

The Machinery and Equipment Support Program under the Rural Development Investment Support Program (RDISP) finances expenditures, which are made for specific agricultural machinery and equipment in the rural area, in the form of donations. In Turkey, machinery and equipment purchases are being supported since 2007 under the Rural Development Investment Support Program. The program aims at strengthening the agricultural sector with respect to agricultural equipment and machinery infrastructure and developing the income and social standards (Anonymous, 2012, 2014).

Improving the socioeconomic development level of a country or a rural area in a specific region depends on implementing new and modern technologies in agricultural production. Mechanization is an important production tool, which provides higher productivity in agriculture by allowing the application of advanced technologies as well as the effective use of soil, water, manure, biocides, etc. Mechanization has played a key role in increasing the productivity, which took place in the agricultural sector of developed countries. In the current global competition environment, this role will certainly have an increasing importance (Evcim et al., 2010).

Mechanization in agriculture, i.e. agricultural mechanization, means that agricultural processes are being realized using machinery and energy. In this way, a faster production with a greater capacity can be possible. Contrary to other agricultural technology applications, utilization of machinery in agriculture both directly affects productivity increase and also allows the application of new production methods in rural areas (İleri, 2016).

In this study, enterprises in Ağrı province, which benefit and do not benefit from machinery and equipment supports under the Rural Development Investment Support Program (RDISP), were studied and the factors that were influential on benefiting from supports were analyzed. Ağrı is one of the provinces that need the highest amount of rural development investment.

Turkey ranked 79th in the Socioeconomic Development Index, which was prepared in 2011, based on criteria such as demography, education, health, employment, competitive and innovative capacity, financial capacity, accessibility, and life quality (Anonymous, 2013). It is expected that in the support application, the political instruments, which can be determined through research, will be such that they will address the major population in Turkey.

Materials and Methods

Materials

The main material of the study consists of primary data that was obtained from face to face meetings carried out with agricultural enterprises, which were registered in the Farmer Registration System of the Ağrı province. The questionnaire was applied in September and October in 2015. In addition, results from previous research carried out on the subject as well as secondary data obtained from the statistics and publications of national and international organizations such as the Ministry of Development, Ministry of Food, Agriculture and Livestock, and the Turkish Statistical Institute (TSI) were also used in the study.

Methods

Sampling

In the study, first, 50 enterprises, which benefit intensively from machinery and equipment supports, were purposively selected in the villages of the central district (10 villages). In the determination process of the producers who did not benefit from the supports, 50 enterprises were purposively selected from the same villages in order to ensure that their enterprise specific characteristics were similar to those of enterprises that benefited from the support. Although probability sampling methods are mainly used in agricultural economy research, there are also studies that make use of purposive sampling, depending on the purpose of the study and the characteristics of the sampled population (Çiçek and Erkan, 1996). In this way, it will be possible to define the factors, which lead to the act of benefiting/not benefiting from the support, more precisely.

The Model

In the last part of the study, the factors that affected the act of benefiting from the support were examined with an economic approach. In the study, Probit Regression Analysis method was used to determine the act of benefiting/not benefiting from the support, the relationships between the socioeconomic factors that affect this behavior, as well as the relationship degrees.

The Probit analysis is a model that is used as an alternative to logistic regression in order to find the effect of one or more explanatory variables on a categorical response variable. The logistic and the Probit regression analyses are very similar to each other and the probability predictions obtained in these have values that are close to each other. While in the logistic regression analysis log-odds (likelihood ratios) are used, in the Probit analysis, cumulative normal distribution is used. Basically, Probit is the inverse of cumulative distribution function of the standard normal distribution (Arı and Önder, 2013).

The cumulative distribution function that is used to predict the Probit Model is assumed to have a normal distribution (Greene, 2003). The Probit model is generally set with the aid of a utility index that cannot be observed (Karlı et al., 2006). Participation of farmers in benefiting from the machinery and equipment supports was modelled using the random utility model. Entrepreneurs had two options: benefiting or not benefiting from machinery and equipment supports. This can be expressed mathematically as follows:

$$U\,(1, m_1 + P; x) \geq U\,(0, m_0; x) \quad (1)$$

In the formula, 1 refers to benefiting from machinery and equipment supports; 0 refers to not benefiting from machinery and equipment supports; m_1 and m_0 refer to the net income obtained by benefiting or not benefiting from machinery and equipment supports, respectively; x refers to factors that influence the act of benefiting or not benefiting from machinery and equipment supports; P refers to the donation support received when benefiting from machinery and equipment supports and the additional income. The utility function is expressed as $U(i, m_i; x) = V(i, m_i; x) + \varepsilon$ and $V(i, m_i; x)$ reflects the (systematic) deterministic component, while ε reflects the random component (Hubbell et al., 2000; Qaim and De Janvry, 2003). Participation in benefiting from the support can be expressed in a partially observable form as follows:

$$U\,(1, m_1 + P; x) + \varepsilon_1 \geq U\,(0, m_0; x) + \varepsilon_0 \quad (2)$$

The systematic component of the utility can be written as shown below, where i = 0.1 and α is the marginal income:

$$V = x\beta^i + \alpha m_i \quad (3)$$

$$(x^1\beta^1 - x^1\beta^0) + \alpha(m_1 + m_0 + P) \geq \varepsilon_0 - \varepsilon_1 \quad (4)$$

The parameter estimates above can be obtained using the maximum likelihood procedure and with the assumption $\varepsilon = \varepsilon_0 - \varepsilon_1$.

If the $x^1\beta = (x^1\beta^1 - x^1\beta^0)$, $m = m_1 + m_0 + P$, *and* $\varepsilon = \varepsilon_0 - \varepsilon_1$ *equality relations are put in place:*

$$x^1\beta + \alpha m_1 \geq \varepsilon \quad (5)$$

Income can be modified as $n(m_i) = log\,((m_1 + P) / m_0)$.

P refers to incentives that are not received by farmers who do not participate in the support, such as the amount of donations received by participating in the machinery and equipment supports and the extra sold products. Since we cannot observe the payments received by farmers upon participating in the support - denoted with P, we can express the received income implicitly with the x variable. We assume that farmers occasionally know the amount of income that is expressed with P. Compared to the contingent valuation model, the random utility model describes the utility obtained by farmers who participate in machinery and equipment supports better compared to those who do not participate in these. In addition, regardless of the presence of a machinery and equipment scenario, the random utility model calculates the average value of willingness to pay with respect to farmer participation.

Assuming that ε denotes an independent and identical distribution, participation in machinery and equipment supports can be shown with the Probit model as follows (Greene, 2003):

$$Prob\,(Y = 1\,I\,x) = \int_{-\infty}^{x'\beta} \phi(t)dt = \phi(x'\beta) \quad (6)$$

$\phi(t)$ is the notation commonly used for the standard normal distribution. The log likelihood function for probability:

$$ln\,L = \sum_{j=1}^{N} ln[\,\phi(x'\beta)] + (1 - I_j) ln\,[1 - \phi(x'\beta)] \quad (7)$$

In the formula, I_j is the dummy variable, which is 1 for the case of benefiting from machinery and equipment supports and 0 for not benefiting from machinery and equipment supports. Parameter estimates are obtained by maximizing the log likelihood function given above.

In the Probit model that was used in the study, the state of benefiting from the RDISP machinery and equipment support was selected as the dependent variable. For enterprises that benefited from the support, this was given a value of 1, and for those that did not benefit from the support it was given a value of 0. Independent variables, on the other hand, were created using socioeconomic factors.

Table 1. Defining model variables

Variables	Definition
RDISP	1 if benefiting from the RDISP machinery and equipment support; 0 otherwise
nhousehold	Number of individuals in household
irrland	Size of irrigated land in enterprises
covarea	Total area of agricultural buildings (barn, hovel etc.) in enterprises
tractor	1 if tractor in enterprises; 0 otherwise
fieldarea	1if only production of arable crops by the enterprise; 0 otherwise
non-agrinc	1 if presence of a nonagricultural income; 0 otherwise
education	Education level of the entrepreneur (years)

Results and Discussion

Some Socioeconomic Properties of the Enterprises

The act of benefiting from the Machinery and Equipment Support Program, which was used as the dependent variable in the study, is a binary variable and 50% of the participants were selected as benefiting enterprises and the other 50% as non-benefiting enterprises.

In the studied enterprises, the age average of the entrepreneurs was 51.5, the youngest entrepreneur was 31 years old and the oldest was 80 years old. The standard deviation of the age variable was 11.56. The average experience of the entrepreneurs in the farms was 35.06 years. While the entrepreneur with the least experience had been practicing agriculture for 5 years, the most experienced one had been practicing agriculture for 61 years. The average household population in the studied enterprises was 6.45. This average household population is represents the definition of a crowded family. While the average household size in the Ağrı province was 6.7 in 1955, it had increased to 7.6 in 2000. While

the share of Ağrı in the country's population was 0.75 % in 1927, it increased to 0.8 % in 2000 (Arıöz, 2007).

The average education degree of the household head was 3.6 years. In the studied enterprises, there were both uneducated entrepreneurs and entrepreneurs with a university degree. The average residence period for households, which were studied as part of the study, in their villages is 49.3 years. While the oldest family in the village had been residing there for 80 years, the newest family had been residing there for 5 years. In addition, 91% of the studied households resided in the village year round.

While 83% of the entrepreneurs that were included in the study had social insurance, 31% had a nonagricultural income.

The most important production element for agricultural enterprises is the land. The land of the enterprises that were included in the study can be qualified as irrigated or dry and was analyzed under 5 groups. The average irrigated land area per enterprise was 91.18 decare and the average dry land area was 90.99 decare. The average enterprise size in Turkey reached 67.5 decare by 2013 (İleri, 2016). The fact that the average enterprise size in the Ağrı province is higher than the average of Tukey suggests that a higher agricultural mechanization level is needed. With respect to irrigated land, 40% of the enterprises had 50 decare and less land, 22% had 51-100 decare land , 15% had 101-150 decare land, 13% had 151-200 decare land, and 10% had 201 decare and more land. In the studied enterprises, 30% of the enterprises with 0-50 decare irrigated land, 54.5% of the enterprises with 51-100 decare irrigated land, 60% of the enterprises with 101-150 decare irrigated land, 69.2% of the enterprises with 151-200 decare irrigated and, and 80% of the enterprises with 201 decare or more irrigated land benefited from the machinery and equipment support. With respect to dry land, 50% of the enterprises had 50 decare and less land, 18% had 51-100 decare land , 9% had 101-150 decare land, 7% had 151-200 decare land, and 16% had 201 decare and more land. In the studied enterprises, 46% of the enterprises with 0-50 decare dry land, 55.6% of the enterprises with 51-100 decare dry land, 55.6% of the enterprises with 101-150 decare dry land, 28.6% of the enterprises with 151-200 decare dry and, and 62.5% of the enterprises with 201 decare or more dry land benefited from the machinery and equipment support. The high standard deviation of the presence of irrigated or dry land shows that the presence of lands among enterprises has a heterogeneous distribution. The average land plot number per enterprise is 6.26.

Table 2. Sample statistics

Variables	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Benefiting from the RDISP machinery and equipment support (Binary)	0.5	0.50	0	1
Age (years)	51.50	11.56	31	80
Farming Experience (years)	35.06	12.89	5	61
Number of individuals in household	6.45	1.79	3	11
Education level of the entrepreneur (years)	3.60	4.04	0	15
Residence period in villages (years)	49.30	14.74	5	80
Resided in the village year round (Binary)	0.91	0.29	0	1
Social Insurance (Binary)	0.83	0.38	0	1
Nonagricultural Income (Binary)	0.31	0.47	0	1
Irrigated Land (m^2)	91.18	105.41	0	753
Dry Land (m^2)	90.99	120.34	0	500
Number of Land Parts	6.26	4.89	0	33
Livestock units (LSU)	22.30	18.96	0	90
House Area (m^2)	136.94	30.63	64	220
Barn Area (m^2)	116.56	83.31	0	360
Hovel Area (m^2)	30.20	75.86	0	540
Number of Tractor	0.85	0.44	0	2
Number of agricultural machines	4.96	2.94	0	11
Amount of Debt (Turkish Lira)	13 468.10	25 497.31	0	147 000
Amount of agricultural support (Turkish Lira)	3478.18	4785.36	0	32 555
Amount of machinery support (Turkish Lira)	3495.30	4365.81	0	17 500

The presence of animals was estimated in livestock units (LSU). While the number of animals per enterprise was 22.30 livestock units, there were both enterprises without any animals and enterprises with 90 livestock units.

In the studied enterprises, the houses where the household resided had an average area of 136.94 m^2, while the smallest house was 64 m^2, and the largest house was 220 m^2.

The enterprises had an average barn area of 116.56 m^2 and average hovel area of 30.2 m^2. While some enterprises did not have barrens or hovels, the largest barren and hovel had areas of 360 and 540 m^2, respectively.

The presence of tractor(s) is an important factor for agricultural enterprises to demand agricultural equipment and machinery. While 85% of the enterprises had tractors, some had 2 tractors. In previous studies, the ratio of enterprises that used tractors to the total number of enterprises in the Ağrı province was identified as 93%. The ratio of enterprises that use tractors to the total number of enterprises in Turkey is 73% (Arıöz, 2007).

In addition to the presence of tractors, the presence of machinery that work as connected to tractors as well as self-propelled machinery are also very important for agricultural enterprises. In the study, the number of agricultural machines owned by the enterprises was analyzed and enterprises were grouped into 3 groups as enterprises without agricultural machinery, enterprises that had 1-5 agricultural machines, and enterprises that had 6-11 agricultural machines. While in the 15% of the studied enterprises there weren't any agricultural machines, 40% had 1-5 agricultural machines and 45% had 6-11 agricultural machines. Those without agricultural machinery did not benefit from the machinery support, while 47.5% of those with 1-5 agricultural machines and 68.9% of those with 6-11 agricultural machines benefited from the support. In the studied enterprises, there were an average of 4.96 agricultural machines per enterprise. The amount of equipment per tractor in the Agri province in 2004 was 5.6 (Arıöz, 2007).

While the entrepreneurs in the sampled enterprises had an average debt of 13 468.1 TL, the average agricultural support received was 3478.18 TL and the average machinery support received was 3495.3 TL. While there were enterprises that had no debts, there were also enterprises that did not benefit from any supports.

Probit Model Results

The Probit model results and the marginal effects are given in Table 3. As the factors that are influential on farmer's decision in benefiting from machinery and equipment supports in the Ağrı province, the following variables were included in the Probit model: household population, size of irrigated land, the total area of agricultural structures in the enterprise, presence of tractor(s) in the enterprise, production of arable crops by the enterprise, the presence of a nonagricultural income, and the education level of the entrepreneur. According to the model results, all of the variables except the education level of the entrepreneur were found to be statistically significant. While the variables of household population, production of arable crops, and the existence of non-agricultural income had a significantly negative effect on participation in benefiting from machinery and equipment supports; the variables of the amount of irrigated land, total amount of agricultural fields in the enterprise, and the existence of tractors in the enterprise had a significantly positive effect.

The negative relationship between the population variable and the act of benefiting from equipment and machinery is a well-expected result. As the population in the enterprise increased, the income per capita decreased and thus the share from the annual production, which was allocated for investments, also decreased. The equipment and machinery support was applied as part of rural development investments such that it supported 50% of the planned investment. As a result, participation in the supports required that a certain investment is made. As the amount of irrigated lands in the enterprises and the total area of the agricultural structures increased, participation in equipment and machinery supports increased as well. Increase in the size of irrigated lands and agricultural structures in an enterprise means that, compared to enterprises with less lands, both the income per unit area in the enterprise increases and the required machinery labor force increases.

Tractors are the most important agricultural machineries required for agricultural mechanization. The presence of a tractor in an enterprise promotes purchasing of equipment and machinery that work in connection to tractors. The results of the study, which show that the presence of tractor(s) in the enterprise has a very significant and positive effect on the state of benefiting from machinery and equipment supports, is in alignment with this observation. In another study that was carried out in the region, the scantiness of agricultural equipment and machinery used in the enterprises had been shown (Arıöz, 2007). Therefore, agricultural mechanization has not been developed in the region. Among the studied enterprises, the participation degree in benefiting from machinery and equipment supports decreases only for enterprises that have only arable crops production. In enterprises that give place to other agricultural production means (husbandry, growing fruit and vegetables, etc.), the tend to benefit from the support increases.

The presence of nonagricultural income in the enterprise has a negative effect on benefiting from the machinery and equipment support. In the region, entrepreneurs who had nonagricultural income generally met their basic needs from nonagricultural resources and practiced farming as a side income source. In enterprises with nonagricultural incomes, agricultural activities are generally carried out according to family needs, the added-value obtained aside from consumption by the household is transferred outside the agricultural sector. As a result, entrepreneurs whose basic income is provided from agricultural practices tend to benefit from the supports to a greater extent. In a study carried out in China, the factors, which were effective on the participation of farmers in agricultural machinery cooperatives, were determined as cooperative management, the farmer's state of being informed about the machinery, the level of household income received from agriculture, and the support rates (Yin et al., 2015).

Table 3. Original parameter and marginal effect estimates of probit model

Variables	Coefficients	Standard error	Z-value	Marginal Effects
nhousehold	-0.12704**	0.05378	-2.36	-0.04027***
irrland	0.00368*	0.00188	1.96	0.00117**
covarea	0.00241**	0.00117	2.06	0.00076**
tractor	1.05358***	0.36087	2.92	0.33396***
fieldarea	0.87754**	0.42669	-2.06	-0.25150**
non-agrinc	-0.61955*	0.42668	-1.66	-0.19272*
education	0.03044	0.03714	0.82	0.00965
Log likelihood function	-55.88225			
Restricted log likelihood	-69.31472			
Chi squared	26.86495			
McFadden Pseudo R-squared	0.19378			

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

In the Probit model, "marginal effects" were analyzed by increasing the independent variables by 1 unit in order to show how this change affects the dependent variable. Marginal effects show us how the dependent variable is affected by increasing the independent variable by 1 unit (Demir and Yavuz, 2010). The marginal effects of the variables of household population and the presence of tractor(s) have a statistical significance level of 1%; the marginal effects of the variables of the amount of irrigated land, the total agricultural structure area, and the field have a statistical significance level of 5%, and the marginal effect of the variable of nonagricultural income has a statistical significance level of 10%. The marginal effect of the variable of education level is statistically insignificant.

According to the model results, with 1% increase in enterprise population, the probability of participating in machinery and equipment supports decreases by 4%. The 1% increase in the amount of irrigated lands in the enterprises increases the probability of participating in machinery and equipment supports by 0.1%. 1% increase in the area of agricultural structures in the enterprise increases the probability of participating in machinery and equipment supports by 0.076%. The presence of tractor(s) in the enterprise increases the probability of participating in machinery and equipment supports by 33.4% compared to enterprises without tractors. Enterprises that produce only arable crops have 25.2% lower probability of participating in machinery and equipment supports compared to those that produce other products as well. Enterprises that have nonagricultural incomes have 19.3% lower probability of participating in machinery and equipment supports compared to those that do not have nonagricultural incomes.

Conclusion

In Turkey, because of infrastructure problems, the income level in the agriculture sector is lower compared to other sectors. Because of the low income and the challenging life conditions, the agricultural sector has to be supported in order to ensure its sustainability. The agricultural structure of the Agri province, which was selected as the research field, is a typical example of traditional Turkish agriculture. In the studied region, the small and scattered nature of the agricultural enterprises, the low population intensity per enterprise, and the low productivity level result in low agricultural income and the income obtained can solely meet the basic needs of the families. Investments that aim at promoting the development of enterprises can be only realized through supports. Therefore, machinery and equipment supports that target increasing the agricultural mechanization level are an adequate policy.

Machinery and equipment supports result in significant budgetary costs. In the study area, a total of 3.26 million Turkish liras were paid as a support to 527 investors in 2014 - the year during which the research data were obtained (Anonymous, 2015). In order for the supports to reach their goal, the socioeconomic characteristics of agricultural enterprises have to be taken into account and according to these, the target groups; the amount, form, and time of support have to be identified.

According to the Probit model results, while the household population, production of only arable crops, and the presence of a nonagricultural income had negative effect on participation in supports; the presence of irrigated lands, the total agricultural area, and the presence of tractor(s) encouraged benefiting from the machinery and equipment support. The Probit model results showed that generally enterprises that were above a certain economic level, benefited from the support, while enterprises without adequate infrastructure and economic power, enterprises with a major income from nonagricultural activities did not benefit from the support.

According to these results, it can be concluded that the target group of the machinery and equipment supports has to be reevaluated. First of all, those with nonagricultural incomes have to be removed from the group of enterprises that will benefit from the support. The current policy does not include a specific incentive that will allow enterprises, which do not have a certain infrastructure and economic size and have large household population, to benefit from the support. Supports have to be graded according to the infrastructure and economic size of the enterprises.

References

Abay, C., Olhan, E., Uysal, Y., Yavuz, F., Türkekul, B., 2005. Türkiye'de tarım politikalarında değişim. VI. Türkiye Ziraat Mühendisleri Odası Teknik Kongresi Sonuç Bildirgesi 7.

Anonymous, 2011. Kırsal Kalkınma Planı (2010-2013). Ankara, Gıda Tarım ve Hayvancılık Bakanlığı.

Anonymous, 2012. Kırsal Kalkınma Yatırımlarının Desteklenmesi Programı Çerçevesinde Makina ve Ekipman Alımlarının Desteklenmesi Programı Uygulama Rehberi. Ankara.

Anonymous, 2013. Ağrı'nın Sosyo-Ekonomik Durumu ve Uygun Yatırım Alanları, in: Tutar, D.H. (Ed.). T.C. Serhat Kalkınma Ajansı Ağrı Yatırım Destek Ofisi Ağrı.

Anonymous, 2014. Kırsal Kalkınma Yatırımlarının Desteklenmesi Programı Kapsamında Makine ve Ekipman Alımlarının Desteklenmesi Hakkında Tebliğ T.C. Başbakanlık, Ankara.

Anonymous, 2015. Ağrı Gıda Tarım ve Hayvancılık İl Müdürlüğü 2014 Yılı Faaliyet Raporu. Ağrı.

Arı, A., Önder, H., 2013. Farklı Veri Yapılarında Kullanılabilecek Regresyon Yöntemleri.

Arıöz, M., 2007. Ağrı ilinde tarım işletmelerinin tarımsal yapı ve mekanizasyon özellikleri. Yüksek Lisans Tezi, Ankara Üniversitesi, Ankara.

Çiçek, A., Erkan, O., 1996. Tarım ekonomisinde araştırma ve örnekleme yöntemleri. Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Yayınları.

Demir, N., Yavuz, F., 2010. An analysis on factors effective in benefiting from forage crops support. Scientific Research And Essays 5(15), 2022-2026.

Erdal, G., Erdal, H., Gürkan, M., 2013. Türkiye'de Uygulanan Tarımsal Desteklerin Üretici Açısından Değerlendirilmesi (Kahramanmaraş İli Örneği). Uluslararası Sosyal ve Ekonomik Bilimler Dergisi ISSN, 1307-1149.

Evcim, H.Ü., Ulusoy, E., Gülsoylu, E., Tekin, B., 2010. Tarımsal mekanizasyon durumu, sorunları ve çözüm önerileri. Ziraat Mühendisliği VII. Teknik Kongresi, 11-15.

Greene, W.H., 2003. Econometric analysis. Pearson Education India.

Hubbell, B.J., Marra, M.C., Carlson, G.A., 2000. Estimating the demand for a new technology: Bt cotton and insecticide policies. American Journal of Agricultural Economics 82(1), 118-132.

İleri, M., 2016. Türkiye Tarım Makinaları Sektörü Sektör Raporu. TARMAKBİR.

Karakayacı, Z., Oğuz, C., 2006. Konya İli Ereğli İlçesinde Satışa Konu Olan Arazilere Sahip Tarım İşletmelerinin Sermaye Yapısı. Bitkisel Araştırma Dergisi(1), 23-30.

Karlı, B., Bilgiç, A., Çelik, Y., 2006. Factors affecting farmers' decision to enter agricultural cooperatives using random utility model in the South Eastern Anatolian region of Turkey. Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS) 107(2), 115-127.

Qaim, M., De Janvry, A., 2003. Genetically modified crops, corporate pricing strategies, and farmers' adoption: the case of Bt cotton in Argentina. American Journal of Agricultural Economics 85(4), 814-828.

Yalçınkaya, N., Yalçınkaya, M.H., Çılbant, C., 2006. Avrupa Birliği'ne Yönelik Düzenlemeler Çerçevesinde Türk Tarım Politikaları ve Sektörün Geleceği Üzerine Etkisi. Yönetim ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 13(2), 97-118.

Yin, B., Li, W., Huang, Y., Zhu, R., 2015. Influence factors analysis of farmers' participation in agricultural machinery cooperative management. management 5, 6.

Yorgun, A., 2006. Tarımda Doğrudan Ödemeler Yönündeki Politika Değişikliğinin Çukurova Bölgesi Ürün Karlılıkları ve İşletme Gelirleri Üzerine Etkisi. Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Tarım Ekonomisi Anabilim Dalı, Yüksek Lisans Tezi.