An Analysis on Determinants of Farmers' Tractor Purchasing Behavior in Erzurum Province

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ABSTRACT: At present, arable agricultural areas especially in the developed countries have reached to their last limit. This necessitates intensive farming, which requires the use of intense input to meet the growing demand. The most important components of intensive farming in agricultural production are chemical input, qualified work force, high capacity production material and mechanization. In recent years, there has been a significant increase in the level of mechanization in developing countries such as Turkey. This study is carried out to determine the factors affecting tractor brand preference and purchase behavior of farmers in Erzurum province. Material of this study is obtained from the questionnaires conducted in face to face interviews with 185 farmers who are randomly selected from Yakutiye, Aziziye, Palandöken, Hasankale, Aşkale and İspir districts in Erzurum province. According to the results of the study, the average land size of farms is 175 decares, while only 57 % of this lands are irrigated. The average parcel number of the enterprises is 8, while the distance of these parcels to the enterprises is determined to be 3.2 km. 55.1 % of the farmers have purchased brand new tractors. The most important factors that affect farmers' brand selection are fuel consumption, price, spare parts and service network respectively. The least effective factors in brand selection are promotional and advertising activities and after-sales customer visits. According to the results of logit regression analysis, the education level of the farmers and the annual maintenance expenses of the tractor were found to be statistically significant when they preferred any brand.

Keywords: Erzurum, Purchasing behavior, Tractor, Brand preference

Erzurum İlinde Çiftçilerin Traktör Satın Alma Davranışlarının Belirleyicileri Üzerine Bir Analiz

ÖZ: Günümüzde gelişmiş ülkeler başta olmak üzere ekilebilir tarım alanları son sınırına ulaşmıştır. Bu durum, artan talebi karşılamak için yoğun girdi kullanımı gerektiren entansif tarımı zorunlu hale getirmektedir. Tarımsal üretimde entansif tarımın en önemli bileşenleri, kimyasal girdi, kalifiye işgücü, yüksek kapasiteli üretim materyali ve mekanizasyondur. Türkiye gibi gelişmekte olan ülkelerde de son yıllarda mekanizasyon düzeyinde önemli artışlar olmuştur. Çalışma, Erzurum ili çiftçilerinin traktör markası seçimi ve satın alma davranışlarını etkileyen faktörleri belirlemek amacıyla yapılmıştır. Çalışmanın materyalini, Erzurum İli Yakutiye, Aziziye, Palandöken Hasankale, Aşkale ve İspir ilçelerinden tesadüfi örnekleme ile seçilen 185 çiftçiyle yapılan yüz yüze görüşmede anket yoluyla elde edilen veriler oluşturmaktadır. Çalışma sonuçlarına göre işletmelerin ortalama arazi büyüklüğü 175 da iken bu arazilerin % 57'sinde sulu tarım yapılmaktadır. İşletmelerde ortalama parsel sayısı 8 iken parsellerin işletmeye uzaklığı 3,2 km olarak tespit edilmiştir. Üreticilerin % 55,1'i traktörlerini sıfır almışlardır. Çiftçilerin marka seçiminde etkili olan en önemli faktörler sırasıyla yakıt tüketimi, fiyat, yedek parça ve servis ağıdır. Marka seçiminde en az etkili olan faktörler ise tanıtım ve reklam faaliyetleri ve satış sonrası müşteri ziyaretleri şeklinde sıralanmıştır. Logit regresyon analizi sonuçlarına göre, çiftçilerin herhangi markayı tercih etmelerinde, eğitim seviyesi ve traktörün yıllık bakım giderleri istatistiksel olarak önemli bulunmuştur.

Anahtar Kelimeler: Erzurum, Satın alma davranışı, Traktör, Marka tercihi

INTRODUCTION

In parallel with the rapidly increasing human population around the world, there is an increase in basic needs such as nutrition, dressing and accommodation. So, the importance of agricultural production is increasing in terms of meeting these needs. People have been trying to meet their basic needs existing for centuries with the use of sources such as soil and water in agriculture. Besides, agriculture is important for the development of individuals and the country's economy with which more production can be done per unit area thanks to the modern technology and commercial utilization of surplus of the agricultural products can be provided. In Turkey, where the agricultural fields are limited and cannot be expanded more, increasing the productivity per unit area with the use of intensive

farming techniques emerges as the only option. With this purpose, there is a rapid growth of extending the technological implementations in agricultural enterprises (Kasap vd., 1997).

Agricultural mechanization is an agricultural production technology as a complementary element which increases the effectiveness of other agricultural inputs, ensures the economic efficiency and improves the working conditions (Altundaş ve Demirtola, 2004). Mechanization in agricultural enterprises is implemented at different levels depending on the technical and economical conditions of the enterprise (Zeren vd., 1995).

Among the most important indicators that define the agricultural mechanization level of a country are criteria such as qualitative/quantitative

condition of the tractor park, the growth according to years, the relation with agricultural machinery, the density per agricultural unit area and power level. It is quite important to compare these criteria according to the regions to be able to objectively discuss the mechanization of the regions which shows differences in terms of agricultural structure (Evcim vd., 2005).

Fluctuation and decrease in purchasing power of farmers affect our sector which is the most flexible one among the agricultural inputs. Agriculture is a sector which is supported throughout the world. While fuel, seed and fertilizer are the first ones to come to mind as the agricultural supporters, the mechanization which brings these inputs together is not given the necessary importance. About the %35 percent of the production input is the mechanization input. Despite the high cost share of it, the mechanization is seen as less important than seed, fertilizer and fuel. However, if fuel is considered as a mechanization input, it becomes clear how important it is (Özgüven vd. 2010).

In Turkey there is a number of studies on determination of the agricultural mechanization level at regional and provincial level (Baydar ve Yumak 2000; Eroğlu ve Konak 2000; Saral vd., 2000; Özpınar, 2001; Işık vd., 2003; Koçak, 2006; Sezsiz vd., 2006; Koçtürk ve Avcıoğlu 2007; Akar ve Çelik 2017).

Today when the importance of agricultural mechanization and especially tractor park is increasing day by day, actions are important for the determination of the factors for tractor brand preferences of user and producing companies' actions in accordance with these preferences. This study is carried out with the aim to determine the factors affecting tractor brand preference and purchase behavior of farmers in Erzurum region.

MATERIAL AND METHOD
Material
In the study, the data obtained through questionnaires from 185 producers owning tractor in the center and districts of Erzurum province in 2017 is used. While the data obtained through these questionnaires are the primary data of the study; internet, information obtained from local and foreign sources and statistical data about the topic are the secondary one.

Method
The primary material of the study is obtained through the one on one interview with the operators owning tractor in Erzurum province in 2017 by asking questions to the producers so as to determine the factors that are effective in their brand preferences. For this, sample size is determined with proportional sampling method (Newbold, 1995; Miran, 2007; Günden vd., 2008; Şahin vd., 2008).

$$n = \frac{Np(1-p)}{(N-1)\sigma_{px}^2 + p(1-p)}$$

n: sample size
N: The number of enterprises owning tractor in Erzurum province
p: Ratio of the producers preferring the same brand for tractor replacement (taken 0.50 to reach to the maximum sample size)

σ_{px}^2 : Variance. (0.01349)

There is a total of 10,982 registered apiarists in the province. The sample size is found to be 185 in the %90 confidence interval with the %6 error margin. The sample size is calculated according to the population ratio for a finite population. The population rate should be taken as p=0.5 in situations when p is unknown since working with the maximum sample size will reduce the potential errors (Miran 2007).

Socio-economical status and enterprise features related to the operators are given in table form using basic statistics. The correlation between satisfaction with the current tractor to be used and factors affecting it is found by using the Logit method.

RESULTS AND DISCUSSION
In Turkey while the number of tractors in 2004 is 1 009 065, in 2017 the number increases up to 1 306 736. There has been a significant increase in axle and 5 hp in 14 years. While the share of this tractor type in the total number of tractors in 2004 was 1.17 %, this share increases to 5.85 % by 2017 (Table 1). In two axle tractors, while the share of the ones with the power between 11-50 hp is in decrease, the ones with the power between 51-70 hp keep their share. The share of the tractors with and over the power of 70 hp in the total number of tractors increased from 5.58% to 11.6 % in the same period.

Table 1. The number of tractors in Turkey (%)

	One axle		Two axle						Track type	
	Horsepower		Horsepower							
	1-5	**5 +**	**1-10**	**11-24**	**25-34**	**35-50**	**51-70**	**70 +**		**Total**
2004	0.32	1.17	0.39	2.09	7.70	45.46	37.27	5.58	0.02	100.00
2005	0.28	1.32	0.34	1.98	7.55	45.03	37.41	6.09	0.02	100.00
2006	0.31	1.16	0.34	1.90	7.36	44.91	37.68	6.36	0.02	100.00
2007	0.38	1.30	0.41	1.82	7.24	44.43	37.83	6.63	0.02	100.00
2008	0.41	1.36	0.56	1.83	7.16	44.06	37.52	7.17	0.02	100.00
2009	0.44	1.63	0.45	1.91	7.13	43.34	37.64	7.58	0.02	100.00
2010	0.52	2.00	0.49	1.82	6.60	43.00	37.84	7.92	0.02	100.00
2011	0.81	2.70	0.50	1.89	6.46	42.31	37.55	8.13	0.02	100.00
2012	0.94	3.59	0.48	1.76	6.11	41.49	37.23	9.04	0.02	100.00
2013	1.08	4.21	0.49	1.66	5.86	40.66	37.19	9.72	0.02	100.00
2014	1.43	5.10	0.50	1.68	5.57	39.73	37.11	10.10	0.02	100.00
2015	1.47	5.41	0.50	1.68	5.40	39.02	37.14	10.73	0.02	100.00
2016	1.56	5.66	0.51	1.67	5.25	38.45	37.35	11.05	0.01	100.00
2017	1.64	5.85	0.49	1.57	5.04	37.68	37.78	11.64	0.01	100.00

Source: TÜİK, 2018

When the Figure 1 is examined which is about the change in the number of tractors in Turkey and in Erzurum, the trend of change in the number of tractors in Turkey and in Erzurum is observed to be similar in a period of 14 years. The increase in the number of tractors in Erzurum province which was over the average of Turkey between 2009-2011 fell below it after the year 2011.
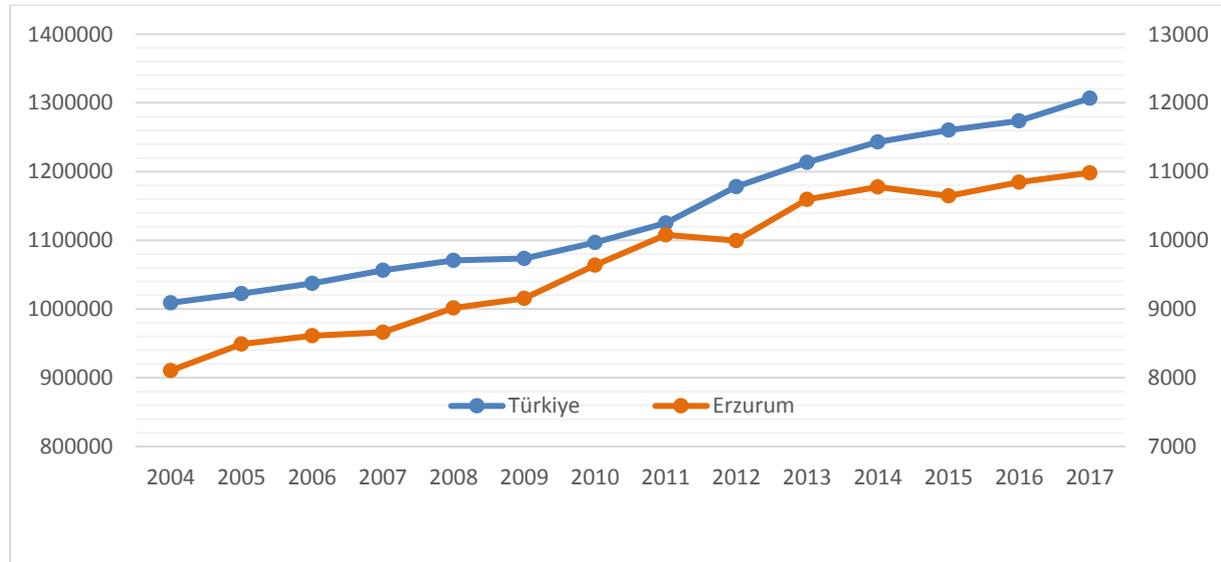

Figure 1.The number of tractors in Erzurum and Turkey (2004-2017)

Manisa province ranks first with the number of 74 433 tractors in Turkey. It is followed by Konya and Bursa provinces with the numbers of 71 615 and 49 786 successively (TUİK, 2018). The share of the tractors in Manisa with a power of 35-50 hp is the largest one while the share of the ones with a 51-70 hp is larger in Konya and Bursa. It is Ankara province where the share of the tractors with and

over 70 hp is the largest one which is followed by Konya. Again, the largest share of the total tractor is the tractor group with a power of 51-70 hp with 55.65% according to the statistics of Erzurum province in 2017 (Table 2).

Table 2. The number of tractors according to the provinces in 2017(%)

Provinces	One axle		Two axle						Track type	Total
	Horsepower		Horsepower							
	1-5	5 +	1-10	11-24	25-34	35-50	51-70	70 +		Total
Manisa	0.58	0.15	0.25	4.47	9.30	45.15	35.53	4.55	0.02	100.00
Konya	2.03	2.79	0.45	0.56	3.06	23.02	41.96	26.06	0.00	100.00
Bursa	0.16	0.79	0.28	0.76	6.18	33.93	42.84	14.96	0.04	100.00
Samsun	0.22	5.86	0.76	2.79	7.23	42.27	33.16	7.54	0.00	100.00
Balıkesir	0.27	0.66	0.82	1.94	3.75	54.18	30.24	7.92	0.00	100.00
Antalya	0.91	2.48	1.23	2.27	11.47	39.59	34.65	6.43	0.01	100.00
İzmir	0.04	0.66	0.58	2.48	9.31	49.48	32.95	4.46	0.00	100.00
Denizli	0.35	1.21	0.04	1.11	6.15	51.60	34.71	4.38	0.00	100.00
Ankara	0.29	1.55	0.05	0.32	4.42	33.58	31.67	27.75	0.00	100.00
Muğla	0.67	10.22	0.02	0.57	3.41	57.83	24.77	1.64	0.00	100.00
Tokat	1.14	5.76	0.20	0.40	6.02	43.65	36.70	4.53	0.00	100.00
Erzurum	0.09	2.87	0.01	0.56	2.61	28.59	55.65	9.08	0.00	100.00

Results of Descriptive analyses

It is observed that the age range of the operators is between 18 and 70 and the average age is 41. According to education level, the producer is at the primary school level on average. 43% of the producers stated that they are doing a non-agricultural business (Table 3). The average land size of the enterprises is found to be 174.5 more than half of which is watery land in addition to enterprises' owning substantial amount of grassland.

Table 3. Results of descriptive analysis

Characteristics of Farmer	N	Min	Max.	Avg.	Std. Dev.
Age of Farmer	185	18	70	41.39	10.806
Education level (1) Illiterate, 2) Literate, 3) Primary, 4) Secondary, 5) High school, 6) College, 7) University)	185	1	7	4.07	1.216
Number of family members	185	1	13	5.71	1.914
Non-agricultural business (Yes:1, No:0)	185	0	1	0.43	.497
Features of enterprise					
Land size (da)	185	5	3000	174.58	253.190
Irrigated land (da)	185	0	550	98.89	113.093
Terra firma (da)	185	0	3000	75.26	236.293
Grassland size (da)	185	0	4500	52.87	331.892
Number of parcel (item)	185	1	35	8.09	5.750
Number of bovine	185	0	300	35.32	44.345
Number of small ruminant	185	0	250	7.74	30.503

All the enterprises surveyed are enterprises owning tractor. The distribution of tractors in the enterprises according to their brand category is given in Figure 2. As shown in the figure, the most popular tractor brand in enterprises surveyed is New Holland with the percentage of 32%. It is followed by Massey Ferguson with 24% and Case with 6% successively. In a study conducted in Muş province, the most popular tractor brand found in enterprises is stated to be New Holland with the percentage 36% which is followed by Turkish tractor and Massey Ferguson (Akar ve Çelik, 2017).
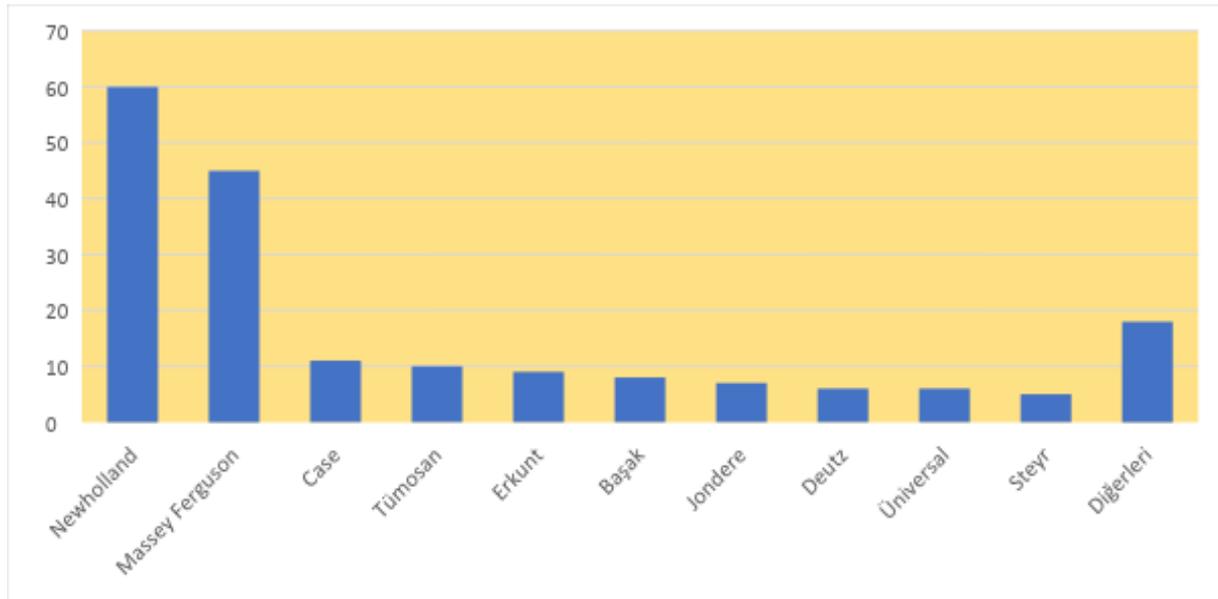
Figure 2. Distribution of tractors in the enterprises according to the brand category

Operators' average age of tractors is 13.5. The distribution of the tractors according to their age category is shown in Table 4. It is noticeable that the share of the tractors between the age of 0-5 is 45 %. Most of the producers use new models of tractors. When the studies stating that economic life of the tractors is 15 years in the conditions of Turkey are considered (Mutaf, 1984; Eren 1991; Akıncı vd., 1997; Sabancı vd., 1999; Sabancı vd., 2003), more than the %21 of tractors in enterprises surveyed are seen to exceed the limit of 15 years.

Table 4. Distribution of tractors in enterprises surveyed according to the age category

Age Groups	Number of tractors (item)	Percentage (%)
0-5	83	44.9
6-10	21	11.4
11-20	42	22.7
21->	39	21.1
Total	**185**	**100.0**

%50 of farmers surveyed in Erzurum use 4wd tractors. Especially in new generation tractor preferences, 4wd tractors are preferred more (Table 5). The average power hp per operator is 69.4 hp. In developing countries like Turkey, recently there has been a significant increase in mechanization level. According to the data of 2017, while the number of tractors per 1000 ha cultivated agricultural land is 55.9, the number of tractors below 50 hp is 50.6%. However, while the number of tractors per 1000 ha cultivated agricultural land is 32.3, the number of tractors below 50 hp is 35.3% in Erzurum where the study is conducted (TÜİK, 2018).

The annual average maintenance expense of tractor owners is 1477 TL while the fuel expense is 8263 TL per year. The producers express that they consider buying a new tractor within 5.8 years on average. In case of a tractor replacement, the ratio of the surveyed producers who prefer the same brand is 80%. 40% of the tractor owners express that they use their tractors as means of transport at the same time. Additionally, 60% of the tractor owners state that they would like to receive practical training on tractor maintenance and use.

Table 5. Features and expenses of tractors that operators own

	N	Min	Max.	Avg.	Std. Dev.
Type (4wd:1, 2wd:0)	185.0	0.0	1.0	0.5	0.5
Power of tractor (HP)	185.0	40.0	110.0	69.4	13.0
Annual maintenance expense (TL/year)	185.0	200.0	6000.0	1477.6	1170.0
Annual fuel expense (TL/year)	185.0	500.0	100000.0	8263.2	11164.3
Time of tractor replacement (year)	185.0	0.0	20.0	5.8	4.4
Preference of the same brand (Yes:1, No:0)	185.0	0.0	1.0	0.8	0.4
Use of tractor as means of transport (Yes:1, No:0)	185.0	0.0	1.0	0.4	0.5
Use of tractor in someone else's job (Yes:1, No:0)	185.0	0.0	1.0	0.3	0.5
Keeping tractor usage record (Yes:1, No:0)	185.0	0.0	1.0	0.1	0.4
Request for training on tractor maintenance and use (Yes:1, No:0)	185.0	0.0	1.0	0.6	0.5

55.1% of the tractors surveyed are new and 44.9% of them are second hand (Table 6). 47% of the farmers have bought their tractors with credit.

Surveyed tractor owners pay attention to fuel consumption as the first criteria (4.8) in brand preferences while paying attention to the price of the tractor (4.7) as the second and to the condition of the spare parts (4.6) as the third criteria (Table 7). The least popular factors in consumers' user preferences are as following; advertisement and promotion, after-sales customer visits, use of the immediate environment and brand image.

Table 6. Distribution of tractors according to purchase type

Purchase Type	N	%
New	102	55.1
Second Hand	83	44.9
Total	**185**	**100.0**
Credit	87	47.0
Cash	98	53.0
Total	**185**	**100.0**

Table 7. Factors influencing the brand preference of current tractor.

Factors	1	2	3	4	5	Avg.
Brand image	7.6	9.7	10.3	17.3	55.1	4.0
Tractor comfort (cabin, air conditioner etc.)	3.2	8.1	8.1	24.3	56.2	4.2
Fuel consumption	0.0	0.0	4.3	8.6	87.0	4.8
Auxiliary part	0.5	4.3	2.2	21.6	71.4	4.6
Service facilities	2.7	4.3	7.0	23.2	62.7	4.4
Taking possession of the product	3.2	4.9	4.9	26.5	60.5	4.4
Dealer network	2.7	7.6	9.2	40.5	40.0	4.1
Advertisement and promotion	14.6	18.9	16.2	29.2	21.1	3.2
Price	1.6	3.2	0.5	9.2	85.4	4.7
Use of immediate environment	5.9	9.7	6.5	33.5	44.3	4.0
After-sales customer visits	9.2	8.6	11.4	29.7	41.1	3.8

1= Not at all important, 2= Slightly important, 3=Neutral, 4=Fairly important, 5= Very important

In case of a tractor replacement the ratio of the surveyed producers who prefer the same brand was high (% 77.8) (Table 8). 78.3% of the farmers using the Newholland brand, which has a significant share in the tractor sector, gave the same brand answer again. This rate was 86.7% for Massey Ferguson users, 81.8 for Case users and 90% for Tümosan users. The least customer royalty is for Newholland which is among the brands comprising a significant share of the sector. The reason why farmers do not prefer the same brand in case of replacing their tractors is the inadequacy of the services facilities, the high fuel consumption, auxiliary parts are very high price or cannot be found and the demand for the second hand is weak.

Table 8. Situation of farmers' preferences of the same brand in case of tractor replacement

Brand	N			%		
	No	Yes	Total	No	Yes	Total
Newholland	13	47	60	21.7	78.3	100.0
Massey Ferguson	6	39	45	13.3	86.7	100.0
Case	2	9	11	18.2	81.8	100.0
Tümosan	1	9	10	10.0	90.0	100.0
Erkunt	3	6	9	33.3	66.7	100.0
Başak	2	6	8	25.0	75.0	100.0
Jondere	0	7	7	0.0	100.0	100.0
Deutz	3	3	6	50.0	50.0	100.0
Üniversal	1	5	6	16.7	83.3	100.0
Steyr	2	3	5	40.0	60.0	100.0
Ford	2	2	4	50.0	50.0	100.0
Hattat	2	2	4	50.0	50.0	100.0
LS	1	3	4	25.0	75.0	100.0
Solis	3	0	3	100.0	0.0	100.0
MC Cormic	0	1	1	0.0	100.0	100.0
Landini	0	1	1	0.0	100.0	100.0
Hars	0	1	1	0.0	100.0	100.0
Total	**41**	**144**	**185**	**22.2**	**77.8**	**100.0**

Model results

Table 9 shows the coefficient, standard error and marginal effects of the variables in the logit model when determining the factors that are effective in preferring the same brand in case of tractor replacement of farmers owning tractor. As a result of regression analysis, when the coefficients of regression is examined, it is seen that the distance of the enterprise to the city center, age of the farmer, his education level and maintenance expenses of tractor influence negatively. Education level and annual maintenance expenses of tractor are statistically found to be significant. Increase in the education level of the tractor owner influences the preference of the same brand negatively. While highly educated farmers are tend to look for different brands and try them, poorly educated ones are tend to use the same brand as long as they don't have an important problem with it. Also, increase in annual maintenance and other expenses leads the user to the other brands.

Table 9. Logit model result

Variables	Coefficient	Standard Error	P value	Marginal Effects
Fixed	4.0063	1.4268	0.005***	-
Distance of the enterprise to the city center	-0.0081	0.0057	-0.157	-0.0013
Age of operator	-0.0082	0.0203	-0685	-0.0013
Education level	-0.4173	0.1775	-0.019**	-0.0658
Non-agricultural business	0.1297	0.3828	0.735	0.0203
Land size (da)	0.0001	00007	0.894	0.0001
Tractor maintenance expense (TL/year)	-0.0003**	0.0001	-0.035**	-0.0001
Log likelihood: -90.480	**Restricted Log Likelihood:-97.856**		X^2 **(6): 14.752**	

Source: Original calculations. ***p<0,001, **p<0,05, *p<0,10

In logit models, the "marginal effects" of the variables are looked at to show how this change affects the dependent variable by increasing the independent variables by 1 unit. Marginal effects

show us how this effect of the dependent variable emerges by increasing the independent variable by 1 unit (Demir ve Yavuz, 2010).

Looking at the marginal effects in Table 9, an increase in the education level of the producer by 1 unit brings about a 6.6% decrease in the preference of the same brand. There is a 0.01% decrease in the preference of the same brand when there is an increase in the maintenance expenses of tractors by 1 unit.

CONCLUSION

According to the results of the study which is conducted with the aim of determination of the Factors Affecting the Purchase Behavior of Tractors of Farmers in Erzurum Region:

In respect to the number of tractors per 1000 ha cultivated agricultural land, it is well below the average of Turkey. It is noticeable that the trend of change in the number of tractors in Turkey and in Erzurum is similar in a period of 14 years. Again, the largest share of the tractors in total is the tractor group with a power of 51-70 hp with 55.65% according to the statistics of Erzurum province in 2017. 45% of Erzurum producers use new tractor.

First criteria of the farmers in brand preferences is fuel consumption while in the second and third one the price of the tractor and the condition of the spare parts are effective. According to the result of the regression analysis, there is a significant correlation between the education level of the tractor owner and annual maintenance/other expenses of tractor. As a result, producers must select tractors economically considering the land size and the annual working hours in order to have tractor parks that meet the provincial and regional needs. In their dealer, guidance of the poorly educated producers to the tractors with the equipment and power that can respond to the needs of them is rather important. Also, for the benefit of the farmers who don't have land to use the tractor economically, such farmers should be provided with access to these machines as part of Agriculture and Rural Development Support Agency IRARD II by renting the machinery parks under the name of machine parks by benefiting from the grant and the number of this kind of machine parks should be increased.

REFERENCES

Akar, M., Çelik, A. 2017. Muş Ovası Tarım İşletmelerinin Tarımsal Mekanizasyon Özellikleri. Türk Tarım ve Doğa Bilimleri Dergisi 4(4): 491-498

Akıncı, İ., Topakçı, M., Çanakçı, M. 1997. Antalya Bölgesi tarım işletmelerinin tarımsal yapı ve mekanizasyon özellikleri. Tarımsal Mekanizasyon 17. Ulusal Kongresi, Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Tarım Makinaları Bölümü, Bildiri Kitabı, s: 45-57, Tokat.

Altundaş, E., Demirtola, H. 2004. Ülkemizin Tarımsal Mekanizasyon Düzeyinin Coğrafik Bölgeler Bazında Değerlendirilmesi. GOÜ. Ziraat Fakültesi Dergisi, 21 (2): 63-70.

Baydar, S., Yumak, H. 2000. Van ve Bitlis İllerinin Tarımsal Mekanizasyon Durumu ve Sorunları Üzerine Bir Araştırma. Tarımsal Mekanizasyon 19. Ulusal Kongresi, 1-2 Haziran, s: 62-67, Erzurum.

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

Eren, Y. 1991. Türkiye'de traktörlerin kullanma süreleri üzerine bir araştırma. Tarımsal Mekanizasyon 13. Ulusal Kongresi Bildiri Kitabı, s: 514-519, Konya

Eroğlu, C.E., Konak, M. 2000. Mardin İli Tarım İşletmelerinin Tarımsal Yapı ve Mekanizasyon Durumunun Belirlenmesi. Tarımsal Mekanizasyon 19. Ulusal Kongresi, 1-2 Haziran, s: 56-61. Erzurum.

Evcim, Ü., Ulusoy, E., Gülsoylu, E., Sındır, K. ve İçöz, E. 2005. Türkiye Tarımı Makinalaşma Durumu, TMMOB Ziraat Odası Etkinlikleri, Ankara

Günden, C., Miran, B., Uysal, Ö.K., Bektaş, Z.K. 2008. İzmir İlinde Gıda Güvenliği, Kalite ve Fiyat Açısından Tüketicilerin Yaş Meyve ve Sebze Satın Alma Yeri Tercihlerinin Analitik Hiyerarşi Süreciyle Belirlenmesi. Finans Politik & Ekonomik Yorumlar, 45(522): 29-40.

Işık, E., Güler, T., Ayhan, A. 2003. Bursa iline ilişkin mekanizasyon düzeyinin belirlenmesine yönelik bir çalışma. Uludağ Üniversitesi Ziraat Fakültesi Dergisi, 17 (2): 125-136.

Kasap, A., Demir, A., Dilmaç, M. 1997. Tokat İlinde Tarımda Makineleşmenin Genel Yapısı ve Sorunları Üzerine Bir Araştırma, Tarımsal Mekanizasyon 17. Ulusal Kongresi, s: 35-44, Tokat.

Koçak, M., 2006. Bitlis İinin Tarımsal Mekanizasyon Durumu, Sorunlar ve Çözüm önerileri. A. U. Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, 84 s, Ankara.

Koçtürk, D., Avcıoğlu, A. 2007. Türkiye'de Bölgelere ve İllere Göre Tarımsal Mekanizasyon Düzeyinin Belirlenmesi. Tarım Makinaları Bilimi Dergisi, 3(1): 17-24.

Miran, B. 2007. Temel İstatistik. Ders Kitabı, ISBN:975-93088-00, İzmir.

Mutaf, E. 1984. Tarım Alet ve Makinaları. Ege Üniversitesi Ziraat Fakültesi Yayınları, 218, 1. Cilt, İzmir, s. 1-25

Newbold P. 1995. Statistics for Business and Economics, Prentice-Hall International, New Jersey.

Özgüven, M., Türker, U., Beyaz, A. 2010. Türkiye'nin Tarımsal Yapısı ve Mekanizasyon Durumu. GOÜ, Ziraat Fakültesi Dergisi, 27(2): 89-100

Özpınar, S. 2001.Marmara Bölgesi'nin Mekanizasyon Özelliklerinin Belirlenmesi. Tarımsal Mekanizasyon 20. Ulusal Kongresi, 13-15 Eylül, s: 41-46, Şanlıurfa.

Sabancı, A., Sümer, S.K., Say, S.M. 1999. Levels and developments of agricultural mechanization in Turkey and the world. 7th Int. Congress on Agricultural Mechanization and Energy, 26-27 May, 1999, s: Adana.

Sabancı, A., Akıncı, İ., Yılmaz, D. 2003. Türkiye'deki traktör parkı ve bazı teknik özellikleri. 21. Ulusal Tarımsal Mekanizasyon Kongresi, 2-6 Eylül, s: 139-146, Konya

Saral, A., Vatandaş, M., Güner, M., Ceylan, M., Yenice, T. 2000. Türkiye Tarımının Makinalaşma Durumu. Türkiye Ziraat Mühendisliği V. Teknik Kongresi, 17-21 Ocak, s: 37-42, Ankara.

Sessiz, A., Turgut, M.M., Pekirhan, F.G., Esgici, R. 2006. Diyarbakır İlindeki Tarım İşletmelerinin Tarımsal Yapı ve Mekanizasyon Özellikleri. Tarım Makinaları Bilimi Dergisi, 2(1): 87-93.

Şahin, A., Cankurt, M., Günden, C. ve Miran, B. 2008. Çiftçilerin Risk Davranışları: Bir Yapısal Eşitlik Modeli Uygulaması. Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 23(2): 153-172.

Zeren, Y., Tezer, E., Tuncer, İ.K., Evcim, Ü., Güzel, E., Sındır, K.O. 1995. Tarım Alet-Makine ve Ekipman Kullanım ve Üretim Sorunları. Ziraat Mühendisliği Teknik Kongresi Tarım Haftası 95 Kongresi, 9-13 Ocak 1995, Ankara.