The Profiles of Tractor Owners and the Criteria of Their Tractor Preference in Aydin Province

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Abstract: *The aim of this study is analyzing the farmers' profiles about tractor and their criteria while buying tractor in Aydın province. For this reason, 731, face to face, surveys have been conducted with the farmers in Aydın. The respondents have been asked to answer the questions under the main titles such as their land size and equipment, agricultural products that they grow their preferred tractor trademark and its technicality, the effects of media and environments on buying tractor. In the research sampling, the effects of the age and the education degrees of the tractor owners to their preference of trademark have been analyzed. At the same time, analyzing the average, standard deviation and correlation values, the effects of age, education degree, family, friend and media on preference of trademark have been found. According to the research results, it can be suggested that farmers who have small lands may use a common tractor. Besides, in our country that has a big market share; government-sector cooperation should be ensured. And also, expectations and problems should be shared with the companies, regarding the expectations of farmers from tractor producer.*

Keywords:*Tractor,Preference criteria, Tractor companies, Trademark*

I.   Introduction

Tractors are the main driving power in the agricultural production. Therefore, the number of tractors purchased in Turkey is increasing as it is the case for all developing countries (Saral, 1997).In Turkey, agricultural machinery sector has a history of 58 years. In this sector, a significant criteria for the level of mechanization is that the tractor power per area (ha), the number of tractor per area (ha), area (ha) per tractor and the number of tractors per 1000 enterprises respectively 2,42 (kW/ha), 56,25 (tractors/1000ha), 17,75 (ha/tractor) and 444,65 (tractor/1000enterprises) stay behind the values for the developed countries for the average number in 2009. The more structural differences among regions are observed, the more increase in the levels of mechanization of the regions (Ozguven at al., 2010).

Aydın province is one of the important agricultural centers of Turkey. Aydın, with its potential in agriculture, tourism and industry, and its qualified manpower is one of the rapidly developing provinces in the Aegean Region and Turkey. It is located on an area of 8.007 km² on the basin of Büyük Menderes which is confined with mountains to the North and South and including fertile plains to the East and the center (Anonymous, 2014a). Olive and fruit plantations constitute the highest share of agricultural activities with its 50% share adding up to 199.533 hectares of 395.494 hectares of agricultural land in total. This is followed by industrial plants with 109.361 hectares and a share of 28%; cereals with 41.032 hectares and a share of 10% and vegetable gardens with 13.100 hectares and a share of 4%. The remaining land of 32.468 hectares which is 8% of the total is being used for various purposes and is suitable for poly-cultural agriculture. It has a robust potential for any kind of agricultural practice. 48% of the population which is 959.757 in numbers is involved in agricultural activities. Given a part of the population living in the city is also involved in agricultural activities, this percentage adds up to 55% of the population. Dominance of agriculture which constitutes the backbone of the economic life is also felt in the industry and trade sectors. Production in industrial facilities depends on agriculture directly or indirectly by 90%. The share of Aydın province in the total agricultural production of Turkey is 3.5%. Vegetative production, stockbreeding and fishery are some of the sub-industries of agriculture industry. Main products of vegetative production are cotton, fig, olive, chestnut and citrus fruits (Anonymous, 2014b).

According to the 2011 data the total number of operational tractors in Aydın amounted to 27.316 while this number has increased approximately to 38.000 by 2014 (Anonymous, 2014c; TÜİK, 2014b).

Consideration is given to the improvement of farm production including the problems of energy shortage and the possibility of replacing some fossil energy through the conversion of biomass. The tractors of today and their future development are considered within three areas:information monitoring and power transfer to give low soil compaction, operating costs and purchase price;the possibilities of versatile application and convenient implement coupling systems and increased driver comfort and improved protection (Göhlich, 1984).

Farm operators prefer tractors with low fuel consumption and high power. These two factors are technical features influencing production costs of farm operations. A tractor with low fuel consumption decreases production cost and a tractor with higher power increases work efficiency. Together these factors have positive effect on economic use of farm machinery and other resources (Aybek and Boz, 2006).

In order to use inputs efficiently and doing farming on timelymanner, and for a better management of farm lands, tractor power and use of machinery is of importance andthey determine level of mechanization in a certain country(Rijk,A.G., 2013).

II.   Materials and Method

Material

Study data is compiled of surveys conducted with 731 tractor owners by face-to-face interviews that were selected using a randomized sampling method from 94 settlements located in Aydın Province and its districts. These people were planting the following fruits and vegetables by the ratio of 45.95% corn, 44.58% olive, 34.29% wheat, 29.22% cotton, 22.08% barley, 19.89% fig, 19.61% vegetables and 17.97% fruits. As it is seen in Table 1, the 0-40 da area of land constitutes the biggest share with 58% in proportion. The values given show that most of the tractor owners who have participated in the survey owned smaller agricultural lands.

Table 1. Land assets of tractor owners

Area of Land	Ratios (%)
0-20 da	30.04
21-40 da	27.98
41-60 da	16.32
61-80 da	7.41
81-100 da	4.66
101+	13.58

85.18% of the tractor owners who have participated in the questionnaire have one tractor operational in their agricultural facilities, while 10.97% have a second tractor and 3.85% have a three or more tractors.

Method

Agricultural enterprises which have participated in the survey were asked 50 questions. Among these questions were the education and income status and age of the owner of the agricultural enterprises; tractor, land and machinery assets; product range and more direct questions about tractors such as purchase date, payment method and features of the tractor. Chi-square analysis was used in order to see if there is a statistical correlation between two variables defined for this study. Chi-square analysis is a technique used to generate results for these kinds of questions. As chi-square analysis is a non-parametric approach, it can be applied to test a hypothesis defined as follows. Here, 'c' stands for the number of columns and 'r' stands for the number of rows (Nakip, 2003).

$$\chi^2 = \sum_{j=1}^{c} \sum_{i=1}^{r} \frac{(G_{ij} - B_{ij})^2}{B_{ij}} \ldots\ldots\ldots\ldots(1)$$

G_{ij} represent observed frequency for i^{th} row and j^{th} columns of the table.
B_{ij}represent expected frequency for i^{th} row and j^{th} columns of the table.
H_0: There is no correlation between two variables.
H_1: There is correlation between two variables.

SPSS 20.0 software was used in order to establish the correlation between variable pairs defined in the study. Chi-square analysis was conducted after eliminating the miscoded questions for each variable pairs. H_0 can be ruled out when the significance found is lower than 0.05. In this case, a significant correlation between two variables is evident.Chi-square analysis was conducted in order to find out the factors affecting the preference of the make of tractor by establishing a statistical correlation between the variables and the makes given in Table 2.

Table 2. Variables according to the make of tractor

Primary Variable	Subsidiary Variable
• Make of the tractor owned	1. Area of the land owned 2. Average monthly income of the family 3. Number of tractors owned 4. Date of tractor purchase 5. If the tractor was purchased second hand or was new 6. Traction of the tractor 7. Number of gears 8. Support services satisfaction for the make of tractor

III. Results and Discussion

43.09% of the tractors owned by the agricultural enterprises participating in the survey were purchased from distributor; 18.60% were purchased from an agent; and 38.31% were purchased from an individual. 38.03% of the tractors owned by the agricultural enterprises participating in the survey were purchased brand new while 61.97% of them were second hand. The make distribution of the tractors operational in Aydın Province in the scope of this study is as follows; Türk-Fiat: 33.33%, Massey Ferguson: 24.96%, New Holland: 19.34%, Steyr: 8.92%, Ford: 4.81%, John Deere: 1.78%, Tümosan: 1.78%, Erkunt: 0.96%, Deutz: 0.82%, Leyland: 0.82%, Case: 0.82%, Üniversal: 0.68%, Maccormik: 0.27%, International: 0.27%, Hattat, Kubato, Sone, Fent: 0.13%.In terms of the dates of purchase of the tractors, 6.99% were purchased before 1979 (inclusive); 8.37% were purchased between 1980 and 1989 (inclusive); 21.81% were purchased between 1990 and 1999 (inclusive); 48.29% were purchased between 2000 and 2010 (inclusive); and 14.54% were purchased between 2011 and 2013 (inclusive).

53.08% of the tractor owners have chosen immediate payment method. Nevertheless, 44.31% of the tractor owners have purchased their tractors from a distributor while 22.08% have purchased from an agent and 33.61% have purchased from an individual.Only 11% of the tractors have an AC installed as auxiliary equipment. 78% of the tractors are two wheel drives while the remaining 22% of them are four wheel drives. 43.62% of the tractors have hydraulic brake systems while the remaining 56.38% have mechanical brake systems. Distributions of mechanical and hydraulic steering systems approximately have an equal share.
When the cabin status is investigated with regards to safety issues; 61.32% of the tractors does not have a cabin; 26.20% of the tractors have a semi-cabin (canvas) and 12.48% of the tractors have a cabin. Tractors with four gears are the most popular ones with regards to number of gears available by 47.46%.

Top three tire brands by their share are as follows: Lassa by 38.82%, Good Year by 24% and Petlas by 16.87%. Tractor owners have stated that the reason for their preference of tire brand was for its durability by 76%, low cost by 22% and advise of other's by 2%.Top three preferences for most important properties to be found in a tractor were fuel consumption by 75.17%, power by 59.67% and durability by 40.61% according to the tractor owners. It is seen in Table 3 that 54.73 of the owners also have a trailer when the equipment used by the tractor owners are investigated. This result indicates that the remaining agricultural enterprises do not need a trailer or they borrow one from others in case of a need. Disc harrow and baler are among the other most commonly purchased agricultural machineries.

Table 3. Agricultural machinery assets of the agricultural enterprises

Type of Agricultural Machinery	Equipment (Number)	Equipment Ratios (%)
Trailer	673	92.06
Plough	629	86.04
Disc Harrow	407	55.67
Land Roller	304	41.58
Cultivator	267	36.52
ManureSpreader	243	33.24
Chisel	239	32.69
Sprayer	176	24.07
Land Leveler	162	22.16
Mower	151	20.65
Thrasher	117	16.01
Baler	107	14.64
PneumaticPrecisePlanter	101	13.82
Universal PreciseSeedDrill	91	12.45
Harvest Machine	74	10.12
Others	67	9.17

According to the analysis results, it can be told that there is a statistically significant correlation between the preferred tractor variable and all other variables other than the size of the land owned at a level of $\alpha = 0.05$. If the correlation degree among the variables dealt with is desired to be calculated, many coefficients are suggested in the literature. The correlation coefficient can be calculated over two or more variables and also

it may vary according to types and numbers of the variables assessed (Akgul&Cevik, 2005). Chi-square values calculated for the variables given in Table 4, Chi-Square test significance levels, correlation coefficients calculated for the binary variables and related significance levels are given in Table-4. The column of NO's in the Table-4 indicates the second variable number corresponding to the first variable.

Table 4. Significance levels of the variables

No	Chi-Square Value	Significance	Correlation Coefficient
1	$\chi^2 = 31.625$	0.169>0.05	-
2	$\chi^2 = 44.220$	0.001<0.05	-
3	$\chi^2 = 42.269$	0.000<0.05	Cramer's V=0.139
4	$\chi^2 = 135.736$	0.000<0.05	-
5	$\chi^2 = 62.576$	0.000<0.05	Cramer's V=0.293
6	$\chi^2 = 85.510$	0.000<0.05	Cramer's V=0.332
7	$\chi^2 = 87.484$	0.000<0.05	Cramer's V=0.173
8	$\chi^2 = 16.589$	0.000<0.05	Cramer's V=0.151

Cramer's V correlation coefficient has been calculated in order to measure the significance of the correlation among the variables given in the Table-4. Variable pairs of which correlation coefficients could not be calculated correspond to the matching where unordered qualitative and ordered qualitative variable types are available. Although there are correlation coefficients that can be calculated according to these two variable types in the literature, there is not any feature with regard to calculation of these coefficients in the SPSS 20.0 pack program. In calculation of the correlation coefficients for these variable types, mostly Rank-Biserial correlation coefficient is used.

As Cramer's V correlation coefficient does not affect from the size of the table, it is commonly used in crosstabs with sizes of 2x2 and more. V-coefficient does not affect from the size of the table and gets value from 0 to 1. When there is not any correlation between two variables, it equals to zero. This coefficient is also called as Cramer Phi coefficient (Oztuna, Elhan, &Kursun, 2008). It can be commented on significance of the correlation according to the value of the Cramer's V. coefficient. And, it can be said that the correlation is at a negligible level if a value is calculated as 0.10 and lower. The values between 0, 10 and 0, 20 are defined as poor correlation; and the values between 0.20 and 0.40 are defined as medium significant correlation (Kotrlik, Williams, &Jabor, 2011). Accordingly, it can be said that the single variable affecting the preference of the brands at medium level is the traction of the tractors. There is a poor correlation with regard to other variables.

Table 5. Number of the tractors per the cultivated land (pcs. /1000 ha)

Place	Cultivated Land (ha)	Number of the tractors (Pcs.)	Number of the tractors (pcs./1000ha)
Aydın Province*	2595	863	332.562
Turkey**	23 811 000	1 213 560	50.96

*Data is received from the tractor users with whom a survey is conducted.
**Data of Turkish Statistical Institute 2013 is based.

Number of the tractors per the cultivated land in province of Aydin is quite higher in comparison with the average in Turkey. As is seen in the Table-5, 332 pcs. tractors are present per 1000 ha. This value is high in comparison with the average value in Turkey for previous years, and that shows an increase.

Table 6. Amount of the lands cultivated per tractor (ha/tractor)

Place	Cultivated Land (ha)	Number of the tractors (Pcs.)	Mechanization Level (ha/tractor)
Aydın Province*	2595	863	2.95
Turkey**	23 811 000	1 213 560	19.62

*Data is received from the tractor users with whom a survey is conducted.
**Data of Turkish Statistical Institute 2013 is based.

In table 6, the amount of the land cultivated per tractor is seen. According to this table, 2.95 ha/tractor value of the cultivated land per tractor in Aydın province is below the-average of Turkey.

IV. Conclusions

The followings were concluded from the study:More than half of the enterprises which are examined within scope of this study are determined to be in the small business class. And it is concluded that the users of these tractors are middle-aged or old, the young population dealing with the agricultural works have a low rate, and this condition is affected by rural-urban migration or they think that the income obtained from the agriculture is lower in recent years. A great majority of the users has one tractor. The ones who have more tractors also have large agricultural lands and so it can be assumed that they deal with poly-cultural agriculture. It appears that the ones having small lands and engaging in agriculture on highlands have low-powered tractors. On the other hand, it is determined that the ones having large and even lands such as Söke plain prefer to purchase more powerful tractors.

Traction of the tractors is in the forefront with regard to the selection of the tractor brands. It is found that a large majority considers fuel consumption while purchasing a tractor. Depending on these results, it can be said that tractor manufacturers should give priority to the matter of fuel consumption. As more than half of these tractors abovementioned has not a cabin in terms of security, awareness of the users on this matter should be raised.Number of the tractors per the cultivated lands is higher in comparison with the average in Turkey and the increase over the years mainly results from the fact that government assistance in the agricultural sector has been adopted in Aydın province. Furthermore, bank loan opportunities in purchasing of the tractors should be considered in preference of the users.

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