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Tractor Brand Preferences of Farmers: An Analytic Hierarchy Process Approach*

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Abstract: Decision making is a process of making a choice among alternatives, in order to achieve the goals and objectives. Farmers' decision-making tractors brand choices are the process of making a choice among alternatives also. The purpose of this study, farmers in the choosing of the tractor brand to determine what criteria they are given priority. And according to these criteria, to determine which brands they preferred. As criteria; low price, durability, fuel economy, dealer's reliability, and brand value are taken into account in the model. Analytical Hierarchy Process (AHP) is used in the analysis of the data. Results indicate that when durability (0.35) took first place among of the purchase criteria, fuel economy (0.28), brand value (0.20), low price (0.09) and the dealer's reliability (0.08) have been following respectively.
Key words: Tractor marketing, brand preference, Analytical Hierarchy Process (AHP)

Çiftçilerin Traktör Markası Tercihlerinin AHP ile Belirlenmesi

Özet: Karar verme, hedeflere ve amaçlara ulaşmak için, alternatifler arasından bir seçim yapma sürecidir. Çiftçilerin traktör markası tercihlerine ilişkin karar verme süreçleri de alternatifler arasından bir seçim yapma sürecidir. Bu çalışmanın amacı çiftçilerin traktör markası seçiminde hangi kriterlere öncelik verdiklerini belirlemek ve bu kriterlere göre hangi markaları tercih ettiklerini ortaya koymaktır. Çiftçilerin, traktör satın alma kararında belirleyici kriterler olarak, düşük fiyat, dayanıklılık, yakıt ekonomisi, bayii güvenirliliği ve marka değeri dikkate alınmıştır. Verilerin analizinde Analitik Hiyerarşi Süreci (AHS) kullanılmıştır. Analiz sonuçlarına göre, satın alma kriterleri arasında dayanıklılık (0.35) ilk sırayı alırken, bunu sırasıyla yakıt ekonomisi (0.28), marka değeri (0.20), düşük fiyat (0.09) ve bayii güvenirliliği (0.08) takip etmekte olduğu belirlenmiştir.
Anahtar Kelimeler: Traktör pazarlaması, marka tercihi, Analitik Hiyerarşi Süreci (AHS)

INTRODUCTION

Although the standards has changed throughout history, human, the basic needs such as nourishment, clothing and shelter have maintained their importance. In this context, the importance of agriculture is further understood that many of the used products which meet the community needs are agricultural products, directly or indirectly (Cankurt, 2008).

All productions need some inputs as like production of agricultural products. In agricultural production, one of the most important input is the mechanization (Evcim et al., 2005). Also the tractor is the most important one in mechanization inputs.

In micro plan, for the decision makers in agricultural production as farmers, tractor preference appears as a major cost factor, despite its many benefits. If tractor preference should be optimum according to the structure of farms, it could be economically. Therefore, tractor choosing has become important for different types of farms, arable land size and other limitation factors. The information of tractor preference of farmers must be a valuable data for both tractor producer-supplier and very active second-hand tractor market.

While farmers are at the supply side as producer, they are at demand side in terms of demanding production inputs. Determination of the consumer decision-making has been the common goal of many researchers until today.

* This study is a part of the doctoral studies of Dr Murat CANKURT

Many theories were put forward on this issue and discussed. Although a very simple proposal, most current models are shown by psychologist Kurt Lewin (Cankurt, 2008). According to this model, behaviour as a function of personal and environmental factors are emerging. As a result of this approach, a "black box" model, or in other words "stimuli-response" model, has developed (Figure 1) (Odabaşı and Barış, 2003).

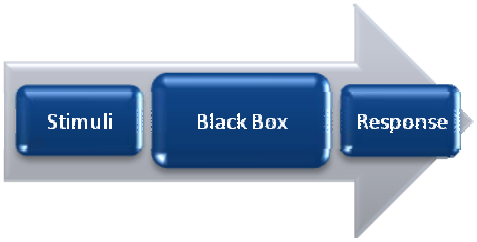

Figure 1. Black Box Model (Odabaşı ve Barış, 2003).

Consumers are influenced by personal and environmental factors then they react to this effect. If stimuli examine in detail, it is noticed that number of stimuli rather than estimated. Until now the common part of default models and approaches is grouping of the variables affecting consumers for facilitating analysis. These factors are affecting decision process of consumer buying and they are causing for consumers to show a specific behaviour that is to react (Odabaşı ve Barış, 2003).

This study examined the buying behaviour of farmers at the tractor. It have been put forward tractor brand preferences of farmers according to some criteria.

MATERIALS and METHODS

Material

The main material of the study is original data which collected through the questionnaire form from farmers that randomly sample selected in the province of Aydın.

Socio-economic information of research area have been obtained from the Provincial and District Directorates of Agriculture, Agricultural Engineers Society, Agricultural Association, the local record keeping institutions, organizations and associations. In addition, It was utilized from relevant results of previously conducted research, the data held by manufacturers, and publications.

Method

The methods that used in the study were collected in two sub-headings. One is used for data collection methods, another method contain the analysis of collected data.

Methods Used in Data Collection

Aydın province has 17 districts included centre of the province. Agricultural structure of Aydın is policultural structure. Taking into account differences between districts, Aydın province has been examined the four agro-ecological sub-regions considered both socio-economic development degree and biophysical properties (Anonymous, 2005).

It was utilized from the proportional approach in order to determine the number of sample that was represented at the best level (Miran, 2003).

The proportional sample size calculation formula could be utilized in case of finite groups and specific characteristics of those known or predicted rate (p) according to the sampling conditions.

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

n: Sample size
N: Number of farmer
σ_{px}^2: Variance
p: Proportion of farmers belong tractor

In light of this information, the total number of farmers in the province of Aydın is 60555 units and amount of tractor is 25118 in the tractor park (Anonymous, 2003). The sample size was calculated 121 as the proportional sampling formula was used 90% confidence interval and 7.5% error margin. Three districts were selected to represent the Aydın province. Calculated sample size has distributed to county and village according to the share of Aydın province. Farms which were obtained data was determined randomly.

Data Analysis Methods Used

Decision making is the process which making a choice among alternative for achieve the goals and objectives (Forman and Selly, 2000). Analytical Hierarchy Process (AHP) was developed by Saaty (1980). It is a decision-making method that solving complex problems with multiple criteria used in. AHP

give to decision-makers an opportunity modelling the relationship between options provides for complex problems, problems of the main objectives, criteria, sub criteria in a hierarchical structure (Saaty et al., 2003). Hierarchical organization of the criteria is widely used in large decision problems. According to the research, it is proved the human brain could not handle more than seven stimuli simultaneously compare more than three criteria (Prakash, 2003; Rommelfanger, 2003). Therefore, pair wise comparisons were found to give more consistent results.

AHS'nin first step is to decompose basic components of decision problems and to form a hierarchical structure. This aids to decision-makers focus on smaller parts of the decision (Braunschweig and Becker, 2004). The main goal exists at the top of the decision hierarchy, the decision criteria at a lower level, and options at the bottom (Figure 11.1). Paired comparisons constitute the second basic step of AHP. It amount to compare with each other the two options / criteria to and is based on opinion of decision makers. If the hierarchy includes n elements, it is required the total n.(n-1)/2 paired comparisons.

FINDINGS

Seven companies are active in tractors manufacturing industries in Turkey, 2006. All of them are private institutions (Cankurt et al., 2009). All organizations except one have domestic capital. These are Türk Traktör, Uzel, Tümosan, Hema Endüstri, Erkunt, Başak, and Yağmur (DPT, 2007). The Türk Traktör and The Uzel companies carry about 2/3 of the tractor supply. Both companies have a high proportion as the tractor park (Cankurt, 2008). Therefore, out of these tractors companies brand, others will be considered as a group.

In this part of the study, preferred degree of tractor brands were determined by farmers in terms of effective factors in buying tractors.

Firstly in this stage, it is necessary to determine the tractors choice hierarchy. Low price, durability, fuel economy, dealer reliability and brand value were taken into consideration as influenced criteria in tractor purchase of farmers. These criteria compared in the same power group of tractor.

1. Low price means the purchase price of the tractor is lower than similar other.
2. Durability means strongness, well made, problem free, stability of the tractor.
3. Fuel economy means less fuel consumption than their peers in the same group.
4. Dealers reliability represents tractor dealer is a reliable person / organization.
5. Brand value represents brand of tractor is itself a value.

BRAND1, BRAND2, and OTHER were considered as tractor brands at options of the hierarchy. When tractor park and sales figures were examined, BRAND1 and BRAND2 brands are sharing the first two rows. The total of all the rest of brands is approximately 1/3 of the market. The other side, the analysis is difficult with too many brands. Therefore, the rest of brands will be considered as a group.

Farmers have preferred the aforementioned tractor brands with they consider the criteria to buying decisions.

Tractor preferences in terms of low price

Among of the tractor brands having a difference statistically significant according to the low prices criteria, when tractor prefers degree were examined Accordingly, the OTHER (0.504) tractor brand is preferred first. BRAND2 (0.312) is preferred second and BRAND1 (0.185) third (Table 1).

Table 1. Tractors prefer in terms of low price

Brands	*Mean**	*Standard Deviation*	*Min*	*Max*
BRAND1	0.185	0.182	0.052	0.798
BRAND2	0.312	0.233	0.052	0.818
OTHERS	0.504	0.282	0.052	0.818

* Statistically significant at the %1 level, Mann-Whitney U

Tractor preferences in terms of durability

Among of the tractor brands having a difference statistically significant according to the durability criteria, when tractor prefers degree were examined. According to the durability criteria, BRAND1 (0.599) takes the first place, so the OTHER (0.202) and BRAND2 (0.199) was followed (Table 2).

Table 2. Tractor Preferences in terms of durability

Brands	Mean*	Standard Deviation	Min	Max
BRAND1	0.599	0.211	0.065	0.818
BRAND2	0.199	0.164	0.052	0.750
OTHERS	0.202	0.225	0.052	0.745

* Statistically significant at the %1 level, Mann-Whitney U

Tractor preferences in terms of fuel economy

The tractor brands having a difference statistically significant according to the durability criteria, when tractor prefers degree were examined. Accordingly BRAND2 (0.442) takes the first place, so the OTHER tractor brands (0.367) and BRAND1 (0.191) was followed (Table 3).

Table 3. Tractor preferences in terms of fuel economy

Brands	Mean*	Standard Deviation	Min	Max
BRAND1	0.191	0.152	0.052	0.746
BRAND2	0.442	0.290	0.052	0.818
OTHERS	0.367	0.280	0.052	0.818

* Statistically significant at the %1 level, Mann-Whitney U

Tractor preferences in terms of dealers reliability

The tractor brands having a difference statistically significant according to the dealers reliability criteria, when tractor prefers degree were examined.

Accordingly BRAND1 (0.565) takes the first place, BRAND2 (0.245) and OTHER tractor brands (0.189) was followed (Table 4).

Table 4. Tractor preferences in terms of dealers reliability

Brands	Mean*	Standard Deviation	Min	Max
BRAND1	0.565	0.228	0.052	0.818
BRAND2	0.245	0.156	0.052	0.818
OTHERS	0.189	0.196	0.052	0.818

* Statistically significant at the %1 level, Mann-Whitney U

Tractor preferences in terms of brand value

Among of the tractor brands having a difference statistically significant according to the brand value criteria, when tractor prefers degree were examined.

According to the brand value criteria, BRAND1 (0637) takes the first place, so the BRAND2 (0253) and OTHER (0.110) was followed (Table 5).

Table 5. Tractor preferences in terms of brand value

Brands	Mean*	Standard Deviation	Min	Max
BRAND1	0.637	0.182	0.091	0.818
BRAND2	0.253	0.169	0.052	0.818
OTHERS	0.110	0.140	0.052	0.818

* Statistically significant at the %1 level, Mann-Whitney U

Following review of the five considered criteria, according to criteria the brand preferences of farmers are generally evaluated.

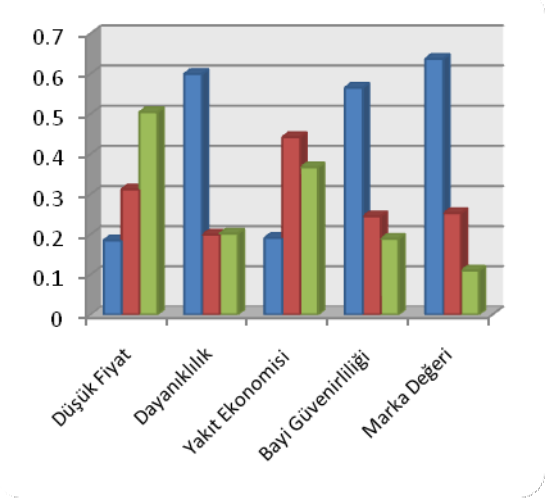

Figure 2. Brand preferences of farmers according to criteria

According to the preferences of farmers, OTHERS brands (except BRAND1 and BRAND2) were preferred in terms of low price. BRAND1 took first place in terms of durability. BRAND2 was preferred in terms of fuel economy. When retailer reliability and brand value were considered, farmers have preferred BRAND1 (Figure 2).

Criteria

Influence criteria when farmers have bought tractor were examined, according to the prefer degrees, among of the criteria having a difference statistically significant. In the purchase criteria, durability (0.350) was ranked first, so fuel economy (0.282) and brand value (0.200) followed it. Low price (0.088) and the dealer reliability (0.081) took place in the last rows (Table 6).

Table 6. Importance degrees of criteria

Criteriar	Mean*	Std Deviation	Min	Max
Low Price	0.088	0.063	0.015	0.390
Durability	0.350	0.118	0.077	0.592
Fuel Economy	0.282	0.118	0.029	0.607
Dealer reliability	0.081	0.086	0.020	0.446
Brand Value	0.200	0.106	0.027	0.519

* Statistically significant at the %1 level, Mann-Whitney U

Final decision

Under the final decision, by multiplying the preference degrees matrix of tractor brand for each criterion with the importance degrees matrix of effective criteria in purchasing decisions, it was determined to brand priorities for farmers.

Table 7. Brand Preference in final decision

Brands	Mean*	Standard Deviation	Min	Max
BRAND1	0.458[a]	0.132	0.131	0.715
BRAND2	0.357[b]	0.141	0.081	0.798
OTHERS	0.338[b]	0.161	0.088	0.761

* Different letters means statistically different groups at %1 level according to Anova (one way) test.

When prefer degrees of tractor brands were examined, among of the tractor brands having a difference statistically significant, according to the all considered criteria.

Consequently, BRAND1 (0.458) is tractor brand which is highest preference degree. When all criteria that influence to the decision of tractor buying were examined, in other words, reach to the top of hierarchy, farmers have preferred BRAND1. Between the ensuing BRAND2 (0.357) and the OTHERS (0.338) brands of tractors are not a statistically significant difference (Table 7).

DISCUSSION and CONCLUSIONS

Which tractor brands preferred of farmers are determined in terms of the influence factors to buy tractors for them. In tractor purchase of farmers, low price, durability, fuel economy, dealer reliability and brand value were taken into consideration as influenced criteria. These criteria as compared to amount groups were evaluated for the same power tractor. The comparisons were analyzed in three groups according to their market share.

Farmers have preferred the aforementioned tractor brands with they consider the criteria to buying decisions. When brand preferences were analyzed in terms of criteria; it is preferred OTHERS for lower prices, BRAND1 for durability, BRAND2 for fuel economy, BRAND1 for dealer reliability and BRAND1 for brand value in the first place.

When all criteria that influencing the decision of tractor buying were examined, in other words, reach to the top of hierarchy, farmers have preferred BRAND1(0.458). It couldn't find a statistically significant difference between the ensuing BRAND2 (0.357) and the OTHERS (0.338) brands of tractors.

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