**Determinations of Factors Affecting Potato Consumption Preferences Behaviors of Consumers by Analytic Hierarchy Process: The Case of Erzurum Province**

**Emine İKİKAT TÜMER**
1Kahramanmaraş Sutcu İmam University, Faculty of Agriculture, Department of Agricultural Economics, Kahramanmaraş, Turkey

**Adem AKSOY**
2Atatürk University, Faculty of Agriculture, Department of Agricultural Economics, Erzurum, Turkey

(“Corresponding author e-posta: aksoy@atauni.edu.tr)

DOI: 10.17097/ataunizfd.466262

**Geliş Tarihi (Received Date): 01.10.2018**  
**Kabul Tarihi (Accepted Date): 05.03.2019**

**ABSTRACT:** The study was conducted in Erzurum province to determine the factors that affect consumers' preferences in potato consumption. For this purpose, 281 consumers were interviewed in 2017 and Analytical Hierarchy Method was used in the analysis of obtained data. According to the results, consumers consumed an average of 10.42 kg potato and spent 10.46 TL per month. Consumers pay more attention to the taste while buying potatoes, followed by palate tastes, color and price. While the consumers in the research region are buying potatoes, they firstly place importance on criteria of “Hasankale”, then “Ahlat” and “Nevşehir” respectively. Potato producers and the institutions and organizations that are active in the sector should make production considering the taste, palate taste, habit and color choices, which affect the purchasing preferences of potatoes, resulting in an increase in producers’ income and in the utility level of consumers.

**Keywords:** Potato, Consumption, Proportional sampling, Analytic hierarchy process

**INTRODUCTION**

It has great importance to consume vegetable and animal origin nutrients, by consisting of carbohydrate, fat, protein, vitamins and minerals on a daily basis in a balanced manner, to get the energy that the individual needs to maintain a healthy life (İkikat Tümer et al., 2017). Potato is one of the main nutrients to be consumed in order to avoid hunger and malnutrition in the growing world population (Sahin, 2003). It has high starch content and high glycemic index (Atkinson et al., 2008).

Potato, which has an important place in human nutrition, contains high quality amino acids with high protein content (Gibson and Kurilich, 2013) in terms of building proteins that people need as a source of energy (Ahokaset al. at 2014). Moreover, 100 g of potatoes meet a minimum of 7% of daily protein needed by a normal person, 10% of iron, 20-50% of vitamin C, 10% of vitamin B1 and 3% of energy (Arşoglu, 2002). Potato, which is equivalent to Turkey’s wheat as the basic food ingredient, is the third most important product after wheat and rice in the world. Potato, which is one-year cultivated plant, also produces more products on a smaller scale than many products (FAO, 2008). With the development of the food industry, it is used as an important raw material in the production of many products such as starch, chips and ready-to-eat foods (Onaran et al., 2010). Food and Agriculture Organization of the United Nations (FAO) has announced the year of 2008 as “World Potato Year” with the slogan “Secret treasure” and many projects have been implemented to disseminate potato farming in underdeveloped countries (FAO, 2008; Çetiner, 2017). According to FAO data for the year 2014, 381.7 million tons of potatoes are produced in the world and China comes first with 95.5 million tons of potatoes, followed by India, Russia, Ukraine and the USA, respectively. Potatoes are seen as food security of rapidly growing populations in different parts of the world. Potato consumption varies according to countries’ eating habits and socio-economic structures. For this reason, in recent years, potato has become an important product on which both production and consumption habits studies are conducted. Potato consumption...
A Simple Pairwise Comparison Method (Torgeson, 1958) was developed based on the comparative basis of the individuals between the paired objectives, resulting in Numerical Size Estimation, Fuzzy Pairwise Comparison and Analytical Hierarchy Process. From these methods, the Analytical Hierarchy Process (AHP) has the ultimate aim at the top. There are criteria for the access to the object under this ultimate aim. Under these criteria, the decision tree, in which the alternatives / options exist, is created. The AHP model uses the AHP assessment scale (Equal preference: 1, even with low preference: 2, low preference: 3 ... absolute preference: 9) when choosing between the criteria, alternatives / options and alternatives / options according to the criterion. "Hasankale", "Ahlat" and "Nevsehir" varieties were presented as criteria for consumers to determine the tendency of consumers to consume potatoes and to determine the type of potatoes they wanted to consume. "Price," "Taste", "Habit", "Color" and "Taste" alternatives are offered to determine the weights of variables that affect consumers' consumption of potatoes under these criteria (Figure 1).

\[
n = \frac{Np(1-p)}{(N-1)\sigma_p^2 + p(1-p)}
\]

In the formula; n: Sample volume, N: Population, \(\sigma^2_p\): Variance of the ratio, p: Ratio of the number of consumers consuming potatoes to the main mass. According to the number of samples (90% confidence interval and 5% deviation), 281 people were identified.

A Simple Pairwise Comparison Method

The study was conducted in 2017 in the province and central districts of Erzurum. A face-to-face interview was conducted with households that consumed potatoes. The number of consumers to be surveyed was determined by using the "Proportional Sampling" method.

**MATERIAL AND METHOD**

The study was conducted in 2017 in the province and central districts of Erzurum. A face-to-face interview was conducted with households that consumed potatoes. The number of consumers to be surveyed was determined by using the "Proportional Sampling" method.

**Potato Consumption Tendency**

- **Hasankale**
  - Price
  - Palatal delight
  - Habit
  - Color
  - Taste

- **Ahlat**
  - Price
  - Palatal delight
  - Habit
  - Color
  - Taste

- **Nevsehir**
  - Price
  - Palatal delight
  - Habit
  - Color
  - Taste

Figure 1. Factors affecting consumers’ tendency to potato consumption.
RESULTS AND DISCUSSION
The average age of consumers participating in the survey is 39.23 and the household size is 4.43. However, monthly average income of the consumers is 4171.35 TL, average food expenditures is 927.15 TL and the share of food expenditures in total income is 22.23%. According to the results of the analysis, daily consumption of potato per capita was calculated as 78.40 g. (Table 1). Potato consumption per capita in the UK is 85-90 g / day (Gibson and Kurilich, 2013; Gibson and Francis, 2015) and 52.21 g / day in the US (Lacy and Huffman, 2015).

Table 1. Descriptive statistics

|                          | Min. | Max. | Mean  | Std. Dev. |
|--------------------------|------|------|-------|-----------|
| Age                      | 19   | 76   | 39.23 | 10.69     |
| Number of individuals in the family | 1    | 11   | 4.43  | 1.50      |
| Income (TL / month)      | 400  | 20000| 4171.35| 2411.00  |
| Food expenditure (TL / month) | 80  | 4000 | 927.15| 570.74    |
| Monthly potato consumption (kg / month) | 1   | 40   | 10.42 | 6.26      |
| Monthly potato spending (TL / month) | 1   | 42   | 10.46 | 6.47      |
| Potato consumption per person (gr / day) | 5   | 333  | 78.40 | 46.28     |

It was observed that 54.8% of the respondents were male, and 84.3% were married (Table 2). The share of respondents have less than eight years of education was 56.9%. On the other hand, 19.9% of the consumer families had diabetes and 6.8% of them had obese individuals (Table 2). The rate of diabetic-patients in the world is 5.68%, while in Turkey it is 7.5% (Anonym, 2017a). Food such as rice and potatoes are not preferred for diabetics because rice and potatoes contain a large number of glycemic index (Memis and Sanlıer, 2009; Anonymous, 2017b). Consumers use potatoes as boiling, frying, baking or cooking; according to the result potatoes were consumed as, fried (47.0%), cooking (37.0%) and boiling16.4%).

Table 2. Socio-demographic characteristics of consumers

| Gender     | Frequency | %    | Being diabetes in the family | Frequency | %    |
|------------|-----------|------|-------------------------------|-----------|------|
| Female     | 127       | 45.2 |                               | No        | 225  | 80.1|
| Male       | 154       | 54.8 |                               | Yes       | 56   | 19.9|
| Marital status |       |      | Being obese in the family     | No        | 262  | 93.2|
| Single     | 44        | 15.7 |                               | Yes       | 19   | 6.8 |
| Married    | 237       | 84.3 |                               | Frying    | 208  | 74.1|
| Education (years) |     |      | The using methods of potato intensively | Boiled    | 73   | 25.9|
| ≤8         | 160       | 56.9 |                               |           |      |     |
| ≥9         | 121       | 43.1 |                               |           |      |     |

Analysis of the potato varieties that the consumers want to consume by AHP method
Potatoes can be grown in all regions of Turkey. Potatoes are produced extensively in Central Anatolia, Black Sea, Aegean and North Eastern Anatolia regions. The average consumption of potatoes per capita is calculated as 54.4 kg / year in Turkey (Anonymous, 2017b). The weight of each of the options and criteria obtained with the help of the AHP method was calculated in accordance with the purpose of the study. According to the weight obtained from the AHP method, the options that are effective in consumers' preference of the potato varieties are listed in Table 3 from large to small according to their weight. However, consumers are most interested in the taste while buying potatoes and then habits and colors. The price is the least important choice for the consumption of potatoes, by which a meal is often made and consumed easily every day. Nevertheless, the consumers give most importance to the taste rather than the price of the potatoes. The Friedman test is used to test whether there is a significant difference between distributions by comparing distributions of two or more related
variables. It was found that there is statistically significant difference between consumers' choices for potato consumption by the Friedman test (P <0.01). The Friedman test has shown that consumers prefer at least one of the choices they take while purchasing potatoes to others.

Table 3. Weight of choices that are effective in consumers' preferences for potato variety

|        | Min | Mean | Max | Std. Dev. |
|--------|-----|------|-----|-----------|
| Taste  | 0.094 | 0.295 | 0.536 | 0.100     |
| Palatal Delight | 0.073 | 0.275 | 0.569 | 0.102     |
| Habit  | 0.020 | 0.154 | 0.489 | 0.094     |
| Color  | 0.015 | 0.141 | 0.517 | 0.108     |
| Price  | 0.020 | 0.135 | 0.493 | 0.103     |

* Friedman test is statistically significant for p <0.01.

According to the weight obtained from the AHP method, consumers' purchasing criteria for potatoes are listed in Table 4. When consumers buy potatoes in the research region, they place the "Hasankale" criterion in the first place; thereafter, "Ahlat" and "Nevsehir" come. The Friedman test, which was used to determine whether at least one is preferred to another of the criteria offered as a variety of potatoes they wanted to buy, was statistically significant (P <0.01). With this test it was determined that consumers preferred at least one of the potato variety criteria they wanted to buy.

Table 4. Consumers' weights of potato purchasing criteria

|        | Minimum | Mean | Maximum | Std. Deviation |
|--------|---------|------|---------|----------------|
| Hasankale | 0.052 | 0.614 | 0.818 | 0.228 |
| Ahlat | 0.052 | 0.199 | 0.818 | 0.176 |
| Nevsehir | 0.052 | 0.187 | 0.818 | 0.205 |

* Friedman test is significant for p <0.01.

All interviewed consumers gave most importance to taste of potato regardless of potato variety. The least attention is given to the price of potatoes produced in Hasankale while least importance is given the color of potatoes produced in Ahlat and Nevsehir (Table 5). Consumers prefer the potatoes produced in the region where they live, which are suitable for their taste, regardless of the price.

Table 5. Weights of options according to consumer purchasing criteria of potatoes

|        | Price | Palatal Delight | Habit | Color | Taste |
|--------|-------|----------------|-------|-------|-------|
| Hasankale | 0.117 | 0.286 | 0.154 | 0.143 | 0.299 |
| Ahlat | 0.187 | 0.242 | 0.141 | 0.140 | 0.290 |
| Nevsehir | 0.194 | 0.244 | 0.136 | 0.132 | 0.293 |

CONCLUSIONS

The Analytical Hierarchy Process method has been used in the study to determine the factors that affect the consumers' attitude and behaviors on purchasing potato, which is the most important protein source of the people in Erzurum. According to the results of the analysis, while the consumers in the research region are buying potatoes, the "Hasankale" type criterion is the first place and then "Ahlat" and "Nevsehir" are the criteria. Consumers pay more attention to the taste when purchasing potatoes, then palatal delight, habit, color and price options come in order of priorities. People who consume potato, whose food is often made and consumed comfortably at every meal of the day, give most importance to the taste of the potatoes rather than price of the product while purchasing the delicious product.

In the study, per capita consumption of potatoes in Turkey, it seems to be far behind the European countries. In order to increase the consumption of potato, which is a source of protein throughout the country, production should be directed by giving importance to the factors that are effective in consumption of potatoes. Ahlat and Nevsehir
potatoes are not preferred because of the different taste in the study area.

Potato producers, sellers and other companies that are operating in the sector may be advised to carry out the production taking into consideration factors that affect the preference for buying potatoes. In this respect both producers will gain and consumers will get more benefits from the products.

REFERENCES
Abong, G.O., Okoth, M.W., Imungi, J.K., Kabira, J.N., 2010. Consumption patterns, diversity and characteristics of potato crisps in Nairobi, Kenya. J. Appl. Biosciences, 32: 1942-1955.
Ahokas, M.A., Välimaa, L., Lötjönen, T., Kankaala, A., Taskila, S., Virtanen, E., 2014. Resource assessment for potato biorefinery: Side stream potential in Northern Ostrobothnia. Agronomy Research, 12, 695-704.
Ajmair, M., Akhtar, N., 2012. Household consumption in Pakistan (A Case Study of District Bhimber, AJK), European Journal of Scientific Research, 75: 448-457.
Anonymous, 2017a. Verilerle Türkiye ve Dünya’da diyabet http://www.tdhd.org/pdf/VER%C4%80LERLE%20D%C3%A7%C9NÝADA%20VE%20T%C3%8CRKÝYEDE%20D%C4%B0YABET.pdf. (Accessed Date: 29 November 2017).
Anonymous, 2017b. Glisemik indeks tablosu. http://www.diyet.com/glisemik-indeks-tablosu/ (Accessed Date: 27 October 2017).
Aroğlu, H.H., 2002. Nisasta ve Seker Bitkileri Ders Kitabı. Genel Yayın No: 188, Ders Kitapları Yayın No:A-57, Adana, 234 s.
Atkinson, F.S., Foster-Powell, K., Brand-Miller, J.C., 2008. International tables of glycemic index and glycemic load values. Diabetes Care, 31, 2281-2283.
Cook, K.A., Toensmeyer, U.C., German, C.L., Bacon, J.R., 2000. An analysis of household consumption of fresh potatoes in Delaware. Journal of Food Distribution Research, March, 103-111.
Çetiner, S., 2017. Patates dünyaya nasıl yayıldı?. Tarla Sera Dergisi, Ocak, 26-28.
Dukeshire, S., MacPherson, M., Veitch, S., Wang-Pruski, G., 2016. Slicing, Dicing, Spicing, and Pricing: Factors Influencing Purchase and Consumption of Fresh Potatoes. Journal of Food Products Marketing, 22: 240-257.
Engindeniz, S., Karakus, Ö., 2008. Türkiye’nin AB ülkelerine patates dış satınmodationaki gelişmeler. Ege Univ. Ziraat Fak. Derg., 45: 65-75.
FAO, 2008. Hidden Treasure. http://www.fao.org/potato-2008/en/ (Accessed Date: 29 November 2017).
Gibson, S., Kurilich, A.C., 2013. The nutritional value of potatoes and potato products in the UK diet. British Nutrition Foundation Nutrition Bulletin, 38: 389-399. DOI: 10.1111/nbu.12057.
Gibson, S., Francis,L., 2015. An analysis of potato consumption habits and diet quality among adults and children in the UK. British Nutrition Foundation Nutrition Bulletin, 40: 177-186. DOI: 10.1111/nbu.12151.
Ikkik Tümer, E., Bulut, O.D., Seker, E., 2017. Tüketicilerin Maras tarhanası tüketim davranışıların belirlenmesi; Kahramanmaras İl Örneği. Atatürk Univ., Ziraat Fak. Derg., 48: 87-92.
Jonathan, M., Huffman, W., 2017. Consumer demand for low-acrylamide-forming potato products: evidence from lab auctions. American Journal of Potato Research, 1-16.
Karadag, K., Kumlay, A.M., Eyduar, E., Karadag Gursoy, E., 2017. Identification of potato purchasing behaviors and preferences of consumers by means of robust factor analysis. scientific papers series management. Economic Engineering In Agriculture and Rural Development, 17: 193-196.
Karsan, A., Gül, M., 2017. Changes in potato production costs and profitability: the case of Niğde. Turkish Journal of Agriculture-Food Science and Technology, 5: 530-535.
Lacy, K., Huffman, W.E., 2015.Consumer demand for potato products and willingness-to-pay for low-acrylamide, sulfite-free fresh potatoes and dices: evidence from lab auctions. Journal of Agricultural and Resource Economics 41: 116-137.
Lekrsisompong, P.P., Whitson, M.E., Truong, V.D., Drake, M.A., 2012. Sensory Attributes and Consumer Acceptance of Sweet Potato Cultivars with Varying Flesh Colors. Journal of Sensory Studies. 27: 59-69.
Memis, E., Sanlier, N., 2009. Glisemik indeks ve sağlık ilişkisi. Gazi Univ. Endüstriyel Sanatlar Eğitim Fak. Derg., 24: 17-27.
Onaran H., Ünlener, L.A., Doğan, A., 2010. Patates tarımı, sorunları ve çözüm yolları. T.C. Tarım ve Köyleri Bakanlığı, Tarımsal Araştırmalar Genel Müdürlüğü, Niğde Patates Araştırmalar Enstitüsü Müdürüliği Yayınları, 91 s.
Ribeiro, R.C., Pinheiro-Sant, H.M., Pâdua, J.G., Chaves, J.B.P., 2016. Consumer behavior and the effects of the supply of French cultivars of potatoes. Biosci. J. Uberlândia, 32: 308-318.
Rodriguez, E. M., Lupín, B., Lacaze, V., 2012. Factors Affecting the frequency of fresh potatoes’ purchasing: An urban study case in Argentina. Economia agro-alimentare, 139-152.

Srivasta, D.K., Tiwari, A.K., 2014. A study of consumer behavior with reference to Brand Lay’s. Pacific Business Review International, 6: 95-101.

Sahin, K., 2003. Ahlat İlçesinde patates üretimi ve sorunları üzerine bir araştırma. Yüzyüncü Yıl Ün. Tarm Bilimleri Derg., 13: 81-88.

Teweldemedhin, M.Y., Mulonda, G.M., 2016. Factors influencing consumer preference for sweat potato in Namibia, Case Study from Windhoek. British Journal of Economics, Management and Trade, 14:1-9.

Torgerson, W.S., 1958. Theory and methods of scaling. Oxford, England.