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ARAŞTIRMA MAKALESİ **RESEARCH PAPER**

Target Market Selection for Agricultural Products in International Markets Using Fuzzy AHP and Fuzzy COPRAS MCDM Techniques

Hüseyin Fatih ATLI
Department of Production Management and Marketing, Iskenderun Technical University, Hatay, Türkiye

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: https://orcid.org/0000-0002-1397-1514

***Corresponding author:**
Hüseyin Fatih ATLI
Department of Production Management and Marketing, Iskenderun Technical University, Hatay, Türkiye
✉: hfatih.atli@iste.edu.tr

Abstract: Making the right decisions in the process of selecting target markets for agricultural products in international marketing can help reduce the negativities in the complex and costly process. The main purpose of the study is to rank and evaluate alternatives in target market selection for agricultural products in the international markets by using fuzzy AHP and fuzzy COPRAS techniques. Multi criteria decision making (MCDM) methods are widely used in solving target market selection problems. In this study, the importance levels and weights of the evaluation criteria of political environment, economic environment, social environment and technological environment (PEST) were measured by the fuzzy AHP method. The criteria that are important for target market selection were evaluated by taking expert opinions, the uncertain and uncertain opinions of the experts were modeled with the fuzzy AHP approach and the weights of the criteria were determined. Among the PEST criteria, economic factors (EF) have the most weight. Then, alternative rankings were obtained with the fuzzy COPRAS method. Using the criterion weights found with fuzzy AHP, the alternatives of the 6 importing countries with the highest share in the processed agricultural products market were listed with the fuzzy COPRAS method. As a result of listing the alternatives, it is seen that the European Union alternative comes first in choosing the target market for processed agricultural products. This study provides a resource for decision makers to make decisions regarding target market selection of agricultural products in international markets.

Keywords: Agricultural marketing, Marketing, Target market selection, AHP, COPRAS, MCDM.

Uluslararası Pazarlarda Tarım Ürünleri için Bulanık AHP ve Bulanık COPRAS ÇKKV Tekniklerini Kullanarak Hedef Pazar Seçimi

***Sorumlu yazar:**
Hüseyin Fatih ATLI
Üretim Yönetimi ve Pazarlama, İskenderun Teknik Üniversitesi, Hatay, Türkiye
✉: hfatih.atli@iste.edu.tr

Öz: Uluslararası pazarlamada tarım ürünleri için hedef pazar seçimi sürecinde doğru kararların verilmesi, karmaşık ve maliyetli süreçteki olumsuzlukların azaltılmasına yardımcı olabilmektedir. Çalışmanın temel amacı, bulanık AHP ve bulanık COPRAS tekniklerini kullanarak uluslararası pazarlarda tarımsal ürünler için hedef pazar seçiminde alternatifleri sıralamak ve değerlendirmektir. Hedef pazar seçimi problemlerinin çözümünde çok kriterli karar verme (ÇKKV) yöntemleri yaygın olarak kullanılmaktadır. Bu çalışmada değerlendirme kriterleri olan politik çevre, ekonomik çevre, sosyal çevre ve teknolojik çevre (PEST) kriterlerinin önem düzeyleri ağırlıkları Bulanık AHP yöntemi ile ölçülmüştür. Hedef pazar seçimi için önemli olan kriterler uzman görüşü alınarak değerlendirilmiş, uzmanların kesin olmayan ve belirsizlik arz eden görüşleri bulanık AHP yaklaşımı ile modellenmiş ve ölçütlerin ağırlıkları belirlenmiştir. PEST kriterleri içerisinde ekonomik faktörler (EF) en fazla ağırlığa sahiptir. Daha sonra bulanık COPRAS yöntemi ile alternatif sıralamaları elde edilmiştir. Bulanık AHP ile bulunan kriter ağırlıkları kullanılarak bulanık COPRAS yöntemi ile işlenmiş tarım ürünleri pazarında en yüksek paya sahip 6 ithalatçı ülke alternatifleri sıralanmıştır. Alternatiflerin sıralanması sonucunda işlenmiş tarım ürünleri için hedef pazar seçiminde Avrupa Birliği alternatifinin ilk sırada olduğu görülmektedir. Bu çalışma ile uluslararası pazarlarda tarım ürünlerinin hedef pazar seçimine yönelik karar vermeleri için karar vericilere bir kaynak sunulmaktadır.

Keywords: Tarımsal pazarlama, Pazarlama, Hedef pazar seçimi, AHP, COPRAS, ÇKKV.

INTRODUCTION

The processed agricultural products sector has a large share in the food sector with its wide range of products and product groups. This sector, which includes products that are produced and delivered to consumers in many different areas from cocoa to pasta, from bakery products to cereals, from biscuits to capsules used in pharmacy, is constantly growing in line with the increasing population and parallel increasing food demand (MT, 2023). Changing and developing technologies will make a big difference in the processed agricultural products sector both today and in the future. In addition, it is seen that not only companies that adapt to technological innovations, but also companies that best respond to changing consumer expectations will have a say in the sector. Personalized, sustainable and environmentally friendly products will be preferred by consumers in the future, and this can be clearly stated as the points where the sector should invest the most in the coming period. The industry has been affected by the Covid-19 pandemic, for reasons such as closures and social distancing rules. The way of reaching the end user in the sector has changed and an increase in online sales has been observed. In order to respond to this trend, some markets have also established their own delivery systems and started online sales. This trend is expected to continue despite the waning impact of the pandemic. It is thought that food sales will continue to increase through online channels in the coming years. The food market, which includes processed agricultural products with a size of more than 9 trillion dollars, is expected to reach 11.1 trillion dollars by expanding with an average compound growth rate of 4.8% until 2027 (UN Comtrade, 2023). Every year, Turkey is on the way to become a more effective player in the world food and beverage market. Turkey gets its production power in the field of food from agricultural production. While the food and beverage sector has more than 46 thousand businesses in Turkey, it creates employment opportunities for over 489 thousand people. Exports of processed agricultural products in Turkey exceeded 8 billion dollars in 2021 (UN Comtrade, 2023). The largest export market for processed agricultural products exported to over 170 countries is Iraq with 13%, followed by Germany with 8% and the USA with 6% (UN Comtrade, 2023).

The activities of countries and businesses in international markets take place in conditions of much more intense competition than in national markets. In order to be successful in this environment, there is a need for the right goals and objectives, appropriate strategies, and policies, plans and programs that allow the implementation of these strategies. Goals can be achieved through the implementation and control of strategies. International marketing is the application of marketing principles in foreign countries, beyond national borders. The strategies of exporting and importing, producing in a foreign country or countries, forming strategic alliances, and making license agreements are within the scope of international marketing method. Before entering international markets, many businesses focus on their domestic markets and then turn to international markets. While determining the marketing strategy; After segmenting the market and choosing its target market, it arranges the appropriate marketing mix for the target market. It seeks to satisfy customers' wants and needs with products and services that offer competitive value. The fact that these activities are carried out outside the national borders forms the basis of international marketing.

In target market selection, the firm first divides the market into homogeneous consumer segments that need relatively similar goods and services. In the second stage, the enterprise selects the most suitable market segment or segments from the said market segments. Finally, it tries to ensure that its product or brand gains a positive position in the selected target market segment or segments. Businesses in the selection of target market; It can benefit from Undifferentiated Marketing (Whole Market), Concentrated Marketing (Single Division), Differentiated Marketing (Multi Segment) strategies. The increasing competition among businesses has made it necessary for businesses to open up to new markets in order to increase their profitability. Since markets are places that respond to the wishes and needs of consumers, determining the most suitable places for human needs is a strategic decision for managers (Calik, 2020). Mistakes made in choosing the right market may have long-term negative consequences on the future success of companies (Malhotra et al., 2009). The characteristics of the target market also differ due to the characteristics of different economic, cultural, social and legal environments, the maturity and development level of the market, the accessibility of the media in the market, and research opportunities. Markets outside the borders of the country are considered as target markets and international marketing activities are determined for each country or region. It is tried to offer goods and services in accordance with the cultural, economic, political, legal and technological conditions of the countries determined as the target market. The marketing discipline is universal. However, due to the preferences of customers in foreign countries, distribution channels, competitors, and differences in communication tools, marketing practices vary from country to country. Therefore, it cannot be guaranteed that the marketing program implemented in one country will be successful in another country. There are

important decisions waiting for companies that want to open up to international markets. Once the business has chosen its target markets abroad, the question arises of how best to enter these markets. Both choosing target markets and how to enter these markets are of great importance for the success of the company in foreign markets.

Research purpose: When the studies are examined, it is seen that different criteria are applied as an evaluation tool. Studies on the analysis of the market opportunities and target market selection are presented in (Table 1). Generally, expert opinion is needed to evaluate the current situation in order to decide which criteria would be the most appropriate among the proposed criteria. The selection of evaluation criteria is very important in selecting the target market. In this study, it is first aimed to determine the criteria that may be effective in selecting the target market for the business discussed. For this purpose, the criteria that are frequently used in target market selection in the literature and considered to be most important for the sector were evaluated by decision makers. In this study, four criteria were applied that generally show the differences of the alternatives. Then, according to the data of the Ministry of Trade (MT, 2023), the 6 countries with the highest import volume in dollar terms in the market country list were determined as alternatives. Criteria and alternatives are shown in (Figure 3).

This research contributes to the literature as follows: It is the first study in which fuzzy AHP (Analytic Hierarchy Process) - fuzzy COPRAS (COmplex PRoportional ASsessment) methods are applied in the agricultural sector with environmental factors on a macro scale in target market selection. However, there are many modeling studies that examine the target market selection problem on a sector-by-sector basis using classical MCDM methods. In order to make an evaluation in target market selection in the agricultural sector, PEST criteria were determined by taking into account literature review and expert opinions. Fuzzy AHP method, which provides ease of application, was preferred in determining the Criterion Weights. The ranking of alternative markets was found by evaluating the fuzzy COPRAS method, which is a new MCDM method compared to classical methods. The research proposes a framework for determining the weights of appropriate criteria and ranking alternatives for target market selection through the integrated approach of fuzzy MCDM.

Table 1. Studies on analysis of market opportunities and target market selection.

Autors	Research Purpose
Stokes (2000); Hitt et al. (2000); Buhalis (2000); Dow (2000); Danneels and Kleinschmidtb (2001); Brouthers and Brouthers (2001); Kotler (2001); Leisen (2001); Fligstein (2002); Kotler (2002); Moen and Servais (2002); Brouthers (2002); Delgado et al. (2002); Andersen and Buvik (2002); Narver et al. (2004); Smith and Taylor (2004); Anderson (2004); Pride and Ferrell (2004); Crick and Spence (2005); Anderson et al. (2006); Adner (2006); Slater and Mohr (2006); Zain and Ng (2006); Hollensen (2007); Capron and Shen (2007); Albaum et al. (2008); Kotler and Lee (2008); Leonidou et al. (2010); Håkanson and Ambos (2010); Dann (2010); Kindström (2010); Heckman et al. (2010); Kontinen and Ojala (2010); Varadarajan (2010); Gubbi et al. (2010); Kotler et al. (2010); Cooper and Kleinschmidt (2011); Eisenmann et al. (2011); Smith (2011); Zeschky et al. (2011); Keegan (2011); Toksarı and Toksarı (2011); Kontinen and Ojala (2011); Kotler (2012); Terpstra et al. (2012); Clow (2012); Harford et al. (2012); Pike (2012); Mammadov (2012); Morgan et al. (2012); Kotler et al. (2012); Morgan (2012); Sheng and Chen (2012); Cop et al. (2012); Özbey (2012); Sparrow (2013); Özdemir (2013); Schiffman et al. (2013); Christopher et al. (2013); Weinstein (2013); Lukitaningsih (2013); Rao (2014); Aguezzoul (2014); Ghauri and Cateora (2014); Shank and Lyberger (2014); Senyard et al. (2014); Roberts et al. (2014); Armstrong et al. (2014); Leekha Chhabra and Sharma (2014); Jones et al. (2015); Kraus et al. (2015); Reymen et al. (2015); Boone (2015); Kotler et al. (2015); Birdir (2015); Mete (2015); Yavuz (2016); Başak (2016); Aaker and Moorman (2017); Corsello et al. (2017); Yilmaz et al. (2017); Demirağ (2017); Tosun (2017); Bala and Verma (2018); Altan (2018); Pride and Ferrell (2019); Ünal and Çetin (2019); Yüceer Yıldız (2019); Calik (2020); Tidd and Bessant (2020); Kotler et al. (2021); Evans et al. (2021); Grewal and Levy (2021); Kotler (2021); Ferrell et al. (2021); Çakıcı and Yılmaz (2021); MacMillan et al. (2022); Czinkota et al. (2022); Kotabe and Helsen (2022); Tuten (2023); Aaker and Moorman (2023); de Vicuña Ancín (2024).	Market opportunity analysis & target market selection

MATERIAL AND METHOD

The main purpose of the study is to determine the importance level weights of the criteria that are important for target market selection for agricultural products in international markets and to rank the alternatives by using MCDM techniques. With the results of the study, a guide was created for investors as well as other stakeholders. It is also thought that this study will be encouraging for domestic producers. For each of the six alternatives, decision makers have the task of identifying potential criteria that will complete that decision-making process. The flow chart of the MCDM process is shown in Figure 1.

Target market selection decisions are inherently MCDM problems. Today, various studies on MCDM methods have focused on target market selection problems. Target market selection poses a complex problem due to the influence of many factors. In the methodology section, fuzzy AHP and fuzzy COPRAS techniques and application steps used in the study with fuzzy numbers are given. Additionally, the scales used to convert numbers into fuzzy ones are presented. The weights of the criteria were calculated by the fuzzy AHP method. Then, target market selection alternative rankings were obtained using the fuzzy COPRAS method.

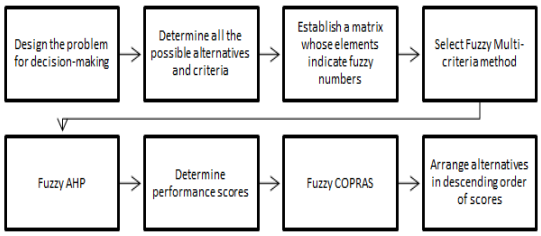

Figure 1. Research flowchart for target market selection.

Fuzzy logic and fuzzy numbers: Fuzzy logic is a logic structure formed by the article "fuzzy sets and systems" published by Zadeh (1965) and the article "fuzzy logic and approximate reasoning" by Zadeh (1975). Fuzzy sets, basic operations, concepts and properties are given in this article. According to Zadeh (2015: 4), one of the main contributions of fuzzy logic is to provide a basis for progress from binarization to gradation, from binary to pluralism, from black and white to shades of grey. Fuzzy logic theory offers a number of methods and rules that take into account the uncertainty, indecision and imprecision in verbal expressions and express them numerically. According to Sergi (2021), such imprecise linguistic terms, which are quite suitable for the human mindset, are used in people's decision-making mechanism in the face of an event or situation.

Fuzzy logic; It is based on the concepts of fuzzy set and subset. The fuzzy set characterizes each object with a membership function with a membership degree varying between 0 and 1 (Zadeh, 1965: 338). There are membership functions in different forms that define fuzzy sets analytically and represent their membership degrees, and the most commonly used among the various forms of fuzzy membership functions are triangular, trapezoidal, Gaussian and generalized bell curve membership functions (Sergi, 2021: 56). In this study, triangular fuzzy numbers were used. Triangular fuzzy numbers were created to maximize the accuracy of the evaluations in uncertain evaluations when making decisions (Arslankaya and Göraltay, 2019:56). Equation (1) is given in (Hudec, 2016), and the graph drawn for the function is given in Figure 2.

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & if\ x \le l \\ \dfrac{x-l}{m-l}, & if\ l \le x \le m \\ \dfrac{u-x}{u-m}, & if\ m \le x \le u \\ 0, & if\ u \le x \end{cases} \quad (1)$$

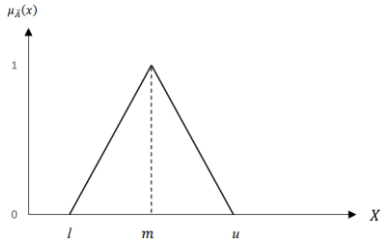

Figure 2. Triangle membership function

Calculation of criterion weights with the fuzzy AHP method: AHP was first proposed by Myers and Alpert (1968). Method is a MCDM method based on pairwise comparison developed by Thomas L. Saaty (1977 and 1982) for the solution of complex measurement and decision-making problems involving a large number of criteria and alternatives. Method; It offers a hierarchical structure that expresses the connection between the purpose of the problem, its criteria and alternatives. Since it is not sufficient to evaluate situations of uncertainty and imprecision (Deng, 1999); The AHP method was combined with fuzzy logic and the fuzzy AHP approach started to be used as a new method. There are many studies based on fuzzy AHP techniques in the literature (Chan and Kumar, 2007; Subramanian and Ramanathan, 2012; Keršulienė ve Turskis, 2014a, 2014b; Xu ve Liao, 2014; Ghadikolaei and Esbouei, 2014; Nguyen et al., 2015; Turskis et al., 2015; Mavi, 2015; Zavadskas et al., 2015; Shafiee, 2015; Prakash and Barua, 2016; RazaviToosi and Samani, 2016; Wang et al., 2016; Kubler et al., 2016; Soberi and Ahmad, 2016; Nguyen et al., 2016; Emrouznejad and Marra, 2017; Turskis et al., 2019; Liu et al., 2020; Wang et al., 2021; Fu et al., 2021; Bakır and Atalık, 2021; Atlı, 2024a).

In the structure of the AHP method; First of all, there is the decision maker, this decision maker has a goal/target set and has many alternatives to choose or rank. Of course, the criteria to be used in evaluating these alternatives and the weights of these criteria should be determined. As a result, a "decision matrix" should be created using these values and implemented (Eren, 2021). In this study, the fuzzy AHP application method, which is more practical and easier to apply, was used. The application steps of the fuzzy AHP approach are as follows (Soberi and Ahmad, 2016; Atlı, 2024b):

Step 1: Creating the Hierarchical Structure: The hierarchy consists of different levels that allow decision makers to view their problems from a comprehensive framework, ranging from the purpose of the problem to a set of various criteria and alternatives.

Step 2: Pairwise comparison matrices between criteria: After the hierarchical structure is created, binary comparison matrices are created in line with the opinions of the decision makers. In cases where there is more than one decision maker, the pairwise comparison matrices created by the decision makers are converted into a

combined pairwise comparison matrix.

Step 3: Normalized relative weights of criteria: In creating the dual pairwise comparison matrix, fuzzy geometric means and fuzzy weights of each criterion are determined by using the geometric mean method of Buckley (1985). In this step, the fuzzy comparison value is found using Equation (3). Then, the geometric mean of the fuzzy comparison value is taken. The geometric mean of the fuzzy values is then converted to relative weight fuzziness using Equation (4). Finally, (M_i) is calculated by averaging the fuzzy numbers for each criteria. (N_i) is calculated by dividing the each value of relative fuzzy weight with the total of all criteria's value.

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ \tilde{a}_{21} & 1 & \dots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \dots & 1 \end{bmatrix} = \begin{bmatrix} 1 & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ 1/\tilde{a}_{12} & 1 & \dots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/\tilde{a}_{1n} & 1/\tilde{a}_{2n} & \dots & 1 \end{bmatrix} \quad (2)$$

$$\tilde{a}_{ij} = \begin{cases} \tilde{1}, \tilde{3}, \tilde{5}, \tilde{7}, \tilde{9} & \text{Criterion } i \text{ is more important than criterion } j \\ 1, & i = j \\ \tilde{1}^{-1}, \tilde{3}^{-1}, \tilde{5}^{-1}, \tilde{7}^{-1}, \tilde{9}^{-1} & \text{Criterion } i \text{ is less important than criterion } j \end{cases}$$

$$\tilde{r}_i = \left(\prod_{j=1}^{n} \tilde{d}_{ij} \right)^{1/n} \quad (3)$$

$$\tilde{w}_i = \tilde{r}_i \otimes [\tilde{r}_1 \oplus \dots \oplus \tilde{r}_i \oplus \dots \tilde{r}_n]^{-1} \quad (4)$$

Table 2. In linguistic terms, their corresponding triangular fuzzy scale.

Linguistic terms	Fuzzy Triangular Scale	Triangular Fuzzy Correspondence Scale	Saaty scale
Equally Important (Eq. Imp.)	(1, 1, 1)	(1, 1, 1)	1
Weakly Important (W. Imp.)	(1, 3, 5)	(1/5, 1/3, 1/1)	3
Fairly Important (F. Imp.)	(3, 5, 7)	(1/7, 1/5, 1/3)	5
Strongly Important (S. Imp.)	(5, 7, 9)	(1/9, 1/7, 1/5)	7
Absolutely Important (A. Imp.)	(7, 9, 9)	(1/9, 1/9, 1/7)	9

Sources: Chang, (1996); Atlı, (2024b)

Ranking of alternatives with the fuzzy COPRAS method: Zavadskas and Kaklauskas (1996) developed the COPRAS method. In the COPRAS method, treating alternative and criterion values as net values is uncertain and insufficient for decision-making in the real world. In order to eliminate this uncertainty and inadequacy, the fuzzy COPRAS method was developed by Zavadskas and Antucheviciene in 2007. There are studies based on the fuzzy COPRAS technique in different fields and according to the purpose of application (Zavadskas and Antucheviciene, 2007; Antucheviciene et al., 2011; Yazdani et al., 2011; Fouladgar et al., 2012; Chatterjee and Bose, 2013; Nguyen et al., 2015).

To rank alternatives with the fuzzy COPRAS method, criterion weights must be available. In this study, criterion weights were calculated with the fuzzy AHP method. Fuzzy numbers were used to evaluate alternatives for target market selection in agricultural products. Fuzzy numbers are used to represent the decision makers' decision in linguistic expression. Fuzzy COPRAS method was used to rank the alternatives using the criterion weights obtained by fuzzy AHP. Verbal performance values given by decision makers according to the performance of target market selection alternatives in agricultural products will be converted into triangular fuzzy numbers through Table 3. The application steps of the fuzzy COPRAS method are as follows (Yazdani et al., 2011):

Step 1: Creating the decision matrix

Step 2: Creating the combined decision matrix

Step 3: Defuzzify the fuzzy decision matrix and fuzzy weight of eachcriterion into crisp values

Step 4: Creating the normalized decision matrix

Step 5: Determination of the weighted normalized decision matrix

Step 6: Calculating *Pi* and *Ri* values for each alternative

Step 7: Calculating the relative importance of alternatives

Step 8: Calculating the highest relative importance

Step 9: Determining the degree of benefit of alternatives

$$x_{ij} = (x_{ij1}, x_{ij2}, x_{ij3})$$

$$x_{ij1} = \min\{x_{ijk1}\}, \quad x_{ij2} = \frac{1}{K}\sum_{k=1}^{K} x_{ijk2}, \quad x_{ij3} = \max\{x_{ijk3}\} \quad (5)$$

$$BNP = \frac{(x_{ij3} - x_{ij1}) + (x_{ij2} - x_{ij1})}{3} + x_{ij1} = \frac{(u - l) + (m - l)}{3} + l \quad (6)$$

$$\tilde{x}_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (7)$$

$$x_{ij=}\tilde{x}_{ij} w_j \quad (8)$$

$$P_i = \sum_{j=1}^{n} x_{ij} \qquad benefit - oriented\ criteria \quad (9)$$

$$R_i = \sum_{j=1}^{n} x_{ij} \qquad cost - oriented\ criteria \quad (10)$$

$$Q_i = P_i + \frac{\sum_{i=1}^{m} R_i}{R_i \sum_{i=1}^{m} \frac{1}{R_i}} \quad (11)$$

$$K = \max Q_i \quad (12)$$

$$N_i = \left(\frac{Q_i}{Q_{max}}\right) \times 100 \quad (13)$$

Table 3. Conversion rules between TFNs and linguistic variables.

Linguistic Variables	Rating	TFNs		
Very poor(VP) / Very low(VL)	1	0.1	0.2	0.3
Poor(P) / Low(L)	2	0.2	0.3	0.4
Slightly poor(SP) / Slightly low(SL)	3	0.3	0.4	0.5
Fair(F) / Medium(M)	4	0.4	0.5	0.6
Slightly good(SG) / Slightly high(SH)	5	0.5	0.6	0.7
Good(G) / High (H)	6	0.6	0.7	0.8
Very good (VG) / Very high (VH)	7	0.7	0.8	0.9

Source: Liang et al. (2021)

RESULTS AND DISCUSSION

Calculation of criterion weights with the fuzzy AHP method: A hierarchical model has been created that allows decision makers to enter their problems from a comprehensive framework and includes the purpose of the problem, 4 criteria and 6 alternatives. The hierarchy

created for the research problem is shown in Figure 3.

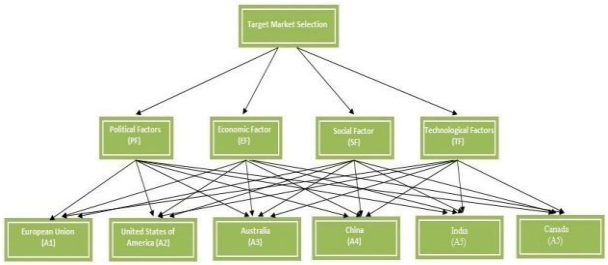

Figure 3. Hierarchical structure.

To create the pairwise comparison matrix, nine experts were interviewed to compare the criteria using the fuzzy AHP method. Experts were asked to make pairwise comparisons of the criteria according to the fuzzy AHP scale (Chang, 1996; Atlı, 2024b) shown in Table 2. Pairwise comparisons between all criteria were made by decision makers. A common opinion was obtained by combining the pairwise comparisons made by the ground transmitters by taking the geometric mean of the collected data suggested by Saaty.

Data on performance values of the criteria were received from decision makers. The verbal performance values determined by the decision makers, converted into triangular fuzzy numbers, are shown in Table 4. Combined values are given in Table 5.

Table 4. DMs' criteria pairwise comparison matrix.

Decision Maker 1 (Comparison matrice)												
CRI	**Political Factors (PF)**			**Economic Factors (EF)**			**Social Factors (EF)**			**Technological Factors (TF)**		
Political Factors (PF)	1	1	1	1/5	1/3	1	5	7	9	1/5	1/3	1
Economic Factors (EF)	1	3	5	1	1	1	7	9	9	5	7	9
Social Factors (EF)	1/9	1/7	1/5	1/9	1/9	1/7	1	1	1	1/7	1/5	1/3
Technological Factors (TF)	1	3	5	1/9	1/7	1/5	3	5	7	1	1	1
Decision Maker 2 (Comparison matrice)												
CRI	**Political Factors (PF)**			**Economic Factors (EF)**			**Social Factors (EF)**			**Technological Factors (TF)**		
Political Factors (PF)	1	1	1	1/9	1/7	1/5	3	5	7	1	1	1
Economic Factors (EF)	5	7	9	1	1	1	1/5	1/3	1	1	1	1
Social Factors (EF)	1/7	1/5	1/3	1	3	5	1	1	1	1	3	5
Technological Factors (TF)	1	1	1	1	1	1	1/5	1/3	1	1	1	1
Decision Maker 3 (Comparison matrice)												
CRI	**Political Factors (PF)**			**Economic Factors (EF)**			**Social Factors (EF)**			**Technological Factors (TF)**		
Political Factors (PF)	1	1	1	1/9	1/9	1/7	1/9	1/7	1/5	1/9	1/9	1/7
Economic Factors (EF)	7	9	9	1	1	1	7	9	9	5	7	9
Social Factors (EF)	5	7	9	1/9	1/9	1/7	1	1	1	1/9	1/7	1/5
Technological Factors (TF)	7	9	9	1/9	1/7	1/5	5	7	9	1	1	1
Decision Maker 4 (Comparison matrice)												
CRI	**Political Factors (PF)**			**Economic Factors (EF)**			**Social Factors (EF)**			**Technological Factors (TF)**		
Political Factors (PF)	1	1	1	1/9	1/9	1/7	1	3	5	1/5	1/3	1
Economic Factors (EF)	7	9	9	1	1	1	7	9	9	5	7	9
Social Factors (EF)	1/5	1/3	1	1/9	1/9	1/7	1	1	1	1/5	1/3	1
Technological Factors (TF)	1	3	5	1/9	1/7	1/5	1	3	5	1	1	1

Table 5. Combined comparison matrix.

CRI	**Political Factors**			**Economic Factors**			**Social Factors**			**Technological Factors**		
Political Factors (PF)	1	1	1	0.13	0.16	0.25	1.14	1.97	2.82	0.26	0.33	0.61
Economic Factors (EF)	3.96	6.42	7.77	1	1	1	2.88	3.95	5.20	3.34	4.30	5.20
Social Factors (EF)	0.35	0.51	0.88	0.19	0.25	0.35	1	1	1	0.24	0.41	0.76
Technological Factors (TF)	1.63	3.00	3.87	0.19	0.23	0.30	1.32	2.43	4.21	1	1	1

In creating the dual pairwise comparison matrix, fuzzy geometric means and fuzzy weights of each criterion were determined by using the geometric mean method of Buckley (1985). In this step, the fuzzy comparison value $\tilde{r}_i$ was found using Equation (3). Then, the geometric mean of the fuzzy comparison value $\tilde{r}_i$ was taken. The geometric means of the fuzzy values were then converted to relative weight fuzziness using Equation 4, as shown in Table 7.

Table 6. Geometric means of fuzzy comparison values.

CRITERIA	$\tilde{r}_i$		
Political Factors (PF)	0.441	0.565	0.813
Economic Factors (EF)	2.484	3.232	3.806
Social Factors (EF)	0.357	0.480	0.694
Technological Factors (TF)	0.801	1.141	1.486
Total	4.083	5.418	6.800
P (-1)	0.245	0.185	0.147
INCR	0.051	0.074	0.122

Finally, (M_i) was calculated by averaging the fuzzy numbers for each criteria. (N_i) were calculated by dividing the each value of relative fuzzy weight with the total of all criteria's value. The averaged and normalized weight of criteria are shown in Table 8 and Figure 4.

Table 7. Relative fuzzy weight of each criteria.

CRITERIA	$\tilde{w}_i$		
Political Factors (PF)	0.023	0.042	0.100
Economic Factors (EF)	0.127	0.240	0.466
Social Factors (EF)	0.018	0.036	0.085
Technological Factors (TF)	0.041	0.085	0.182

Table 8. Averaged and (normalized relative weight of criteria.

CRITERIA	(M_i)	(N_i)	**Rank**
Political Factors (PF)	0.055	**0.114**	**4**
Economic Factors (EF)	0.278	**0.577**	**1**
Social Factors (EF)	0.046	**0.096**	**3**
Technological Factors (TF)	0.103	**0.213**	**2**

TOTAL	0.481

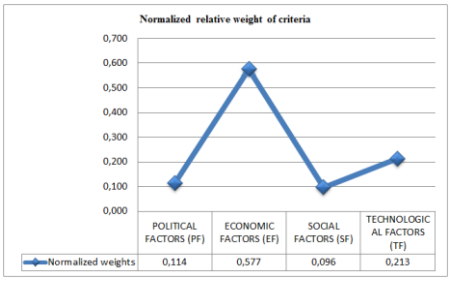

Figure 4. Normalized relative weight of criteria (N_i).

Ranking of alternatives with the fuzzy COPRAS method: Fuzzy COPRAS method was used to rank the alternatives using the criterion weights obtained by fuzzy AHP. Data on the performance values of the alternatives were received from decision makers. These fuzzy numbers form the performance decision matrix $\otimes X$. In cases where there is more than one decision maker, the decision matrices created by the decision makers are converted into a combined decision matrix with the help of Equation (5). After converting the linguistic values of the alternatives into triangular fuzzy numbers, the initial decision matrix was created by taking the geometric mean of the evaluation results and is shown in Table 9.

The values in the resulting combined decision matrix was converted to crips values using Equation (6) and thus BNP (Best Nonfuzzy Performance Value) values was obtained. BNP (Best Nonfuzzy Performance Value) values are shown in Table 10. The values obtained in Table 10 by defuzzifying the fuzzy number values are normalized with Equation (7). The normalized decision matrix is as shown in Table 11. The weighted normalized decision matrix was obtained by multiplying the values in the normalized decision matrix (Table 5.12) with the criterion weights obtained by the fuzzy AHP method (Table 12). Sums of weighted normalized values were calculated for useful attributes. The Pi value for the benefit criteria was obtained using Equation (9) and is shown in Table 13.

The relative importance of the alternatives was calculated using Equation (11), and the highest relative importance value among the relative importance values of the alternatives was calculated using Equation (12). The degree of benefit is calculated using Equation (13). Alternative A1, with a benefit rating of 100%, was chosen as the best alternative. (Table 14, Figure 5). The evaluation results using the proposed method show that the order is A1>A2>A4>A6>A3>A5. The best alternative is A1. This is followed by A2 and A4 respectively. This situation is consistent with the real situation, because it also coincides with the trading volumes.

An initial assessment of the feasibility of target market selection was made using COPRAS. The analysis compared four alternatives based on four weighted decision criteria. A ranking of alternative priorities was compiled based on the judgment of four decision makers (Table 14): priority 1 = A1, priority 2 = A2, priority 3 = A4, priority 4 = A6, priority 5 = A3, priority 6 = A5,. Accordingly, the best alternative for the target market of agricultural products is A1.

Many different MCDM methods have been used in the agricultural sector and other sectors. Atlı and Senir (2024) evaluated five major suppliers of agricultural pesticides. Ünal and Çetin (2019) preferred the integrated AHP-TOPSIS method in the fertilizer producer's target market selection. Fidan (2021) preferred CRITIC and MAIRCA MCDM methods in international target market selection. In this study, Fidan (2021) determined that Romania is the best alternative among the countries where international investments are planned.

Table 9. Combined decision matrix.

Alternatives	Criteria											
	l	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*
	Political Factors (PF)			Economic Factors (EF)			Social Factors (EF)			Technological Factors (TF)		
European Union (A1)	0.57	0.67	0.77	0.67	0.77	0.87	0.48	0.59	0.69	0.54	0.64	0.74
United States of America (A2)	0.54	0.65	0.75	0.54	0.65	0.75	0.43	0.54	0.64	0.62	0.72	0.82
Australia (A3)	0.34	0.44	0.54	0.35	0.46	0.56	0.31	0.42	0.52	0.44	0.54	0.64
China (A4)	0.49	0.60	0.70	0.44	0.54	0.65	0.42	0.52	0.62	0.52	0.62	0.72
India (A5)	0.31	0.42	0.52	0.31	0.42	0.52	0.26	0.38	0.48	0.30	0.41	0.51
Canada (A6)	0.39	0.49	0.60	0.44	0.54	0.64	0.38	0.49	0.59	0.45	0.55	0.65

Table 10. Defuzzification of fuzzy number values.

Alternatives	Criteria			
	Political Factors (PF)	Economic Factors (EF)	Social Factors (EF)	Technological Factors (TF)
European Union (A1)	0.674	0.774	0.585	0.640
United States of America (A2)	0.650	0.650	0.537	0.720
Australia (A3)	0.442	0.455	0.416	0.538
China (A4)	0.596	0.544	0.518	0.619
India (A5)	0.416	0.416	0.374	0.405
Canada (A6)	0.495	0.538	0.486	0.548

Table 11. Normalized decision matrix.

Alternatives	Criteria			
	Political Factors (PF)	Economic Factors (EF)	Social Factors (EF)	Technological Factors (TF)
Max / Min	Max	Max	Max	Max
European Union (A1)	0.206	0.229	0.201	0.184
United States of America (A2)	0.199	0.193	0.184	0.208
Australia (A3)	0.135	0.135	0.143	0.155
China (A4)	0.182	0.161	0.178	0.178
India (A5)	0.127	0.123	0.128	0.117

Canada (A6)	0.151	0.159	0.167	0.158

Table 12. Weighted normalized decision matrix.

Alternatives	Criteria			
	Political Factors (PF)	Economic Factors (EF)	Social Factors (EF)	Technological Factors (TF)
w	0.0456	0.2425	0.0381	0.0859
European Union (A1)	0.0094	0.0556	0.0077	0.0158
United States of America (A2)	0.0091	0.0467	0.0070	0.0178
Australia (A3)	0.0062	0.0327	0.0054	0.0133
China (A4)	0.0083	0.0390	0.0068	0.0153
India (A5)	0.0058	0.0299	0.0049	0.0100
Canada (A6)	0.0069	0.0386	0.0064	0.0136

Table 13. Calculating $\boldsymbol{Pi}$ values for each alternative.

Alternatives	$\boldsymbol{Pi}$ Values
European Union (A1)	0.088
United States of America (A2)	0.081
Australia (A3)	0.058
China (A4)	0.069
India (A5)	0.051
Canada (A6)	0.065

Table 14. Determining the best alternative (fuzzy COPRASoutput).

Alternatives	$\boldsymbol{Qi}$	$\boldsymbol{Ni}$	Rank
European Union (A1)	0.088	100.00	1
United States of America (A2)	0.081	91.11	2
Australia (A3)	0.058	65.13	5
China (A4)	0.069	78.52	3
India (A5)	0.051	57.15	6
Canada (A6)	0.065	74.00	4

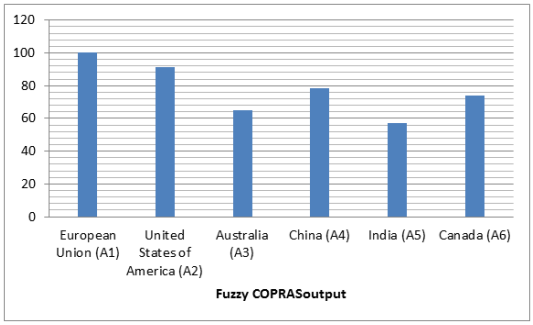

Figure 5. Fuzzy COPRASoutput.

CONCLUSION

Target market selection for the agricultural sector is one of the important problems in international marketing. Selection of the target market for the implementation of correct marketing strategies in agricultural enterprises is a complex task that requires appropriate consideration in business management. The decision requires consideration of various criteria for target market selection and involves a mix of both quantitative and qualitative criteria. To overcome this problem, a model based on fuzzy AHP was developed considering fuzzy COPRAS. In the study, for target market selection, the countries in the global market were evaluated in terms of PEST criteria, the weights of these criteria were found, and the countries were ranked in terms of PEST criteria. The criteria that are important for target market selection were evaluated by taking expert opinions, the uncertain and uncertain opinions of the experts were modeled with the fuzzy AHP approach and the weights of the criteria were determined. Among the PEST criteria, economic factors (EF) have the most weight. Using the criterion weights found with fuzzy AHP, the alternatives of the 6 importing countries with the highest share in the processed agricultural products market were listed with the fuzzy COPRAS method. As a result of ranking the alternatives with the fuzzy COPRAS method, it is seen that the European Union (A1) alternative comes first in choosing the target market for processed agricultural products. The European Union (EU), which has an extremely deep and diversified market structure, offers our country new market opportunities for the agricultural sector. For this reason, it has been at the forefront of decision-makers' preferences.

The choice of target market has a significant impact on agricultural production. In this study, the problem of MCDM in an environment of uncertainty is emphasized. To solve the complexity, the uncertainty arising from four various conflicting criteria and the independent opinions of four decision makers, fuzzy AHP and fuzzy COPRAS method based on linguistic parameters and fuzzy set theory were used in the proposed model. The decision of a group of expert decision makers to make important decisions such as target market selection, location selection for facility installation and supplier selection is more accurate and specific than individual decision. In case of uncertainty, the problem is analyzed by collecting the decisions of the group members with MCDM techniques. In order to demonstrate the practicality and effectiveness of the methodology, a case study in which the A1 alternative comes first is presented. It will provide guidance for businesses and relevant stakeholders to solve the problem in the future. This problem will create a reference point for agricultural producers to use their resources more effectively and efficiently.

This study has several limitations. First of all, the study was conducted in the context of opening up agricultural enterprises in Turkey that want to export to target markets. Target market selection criteria were evaluated by considering only the main factors in the PEST analysis, and sub-factors were not included in the study. In future studies, the results can be compared using different methods in evaluating the criteria. Similar studies can be conducted for markets other than the processed agricultural products market. In this way, information will be obtained whether the study results can be generalized for other sectors. Cultural, political, economic and institutional

differences existing in target markets make the complex decision of selecting a target market difficult (Calik, 2020). Political and economic instability in target countries makes the market selection strategy disadvantageous (Mammadov, 2012). Therefore, economic and political factors are of great importance for the correct definition of the market in entering international markets (Calik, 2020). As a result; in selecting the target market for agricultural products, decision makers should evaluate the criteria in all aspects and make the appropriate decision. The study can provide a different perspective to decision makers by using the fuzzy approach in selecting the target market for agricultural products.

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