SELECTION OF SALES DISTRIBUTION CHANNEL IN AGRICULTURAL ENTERPRISE[1]

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Abstract

According to applied TOPSIS multi-criteria decision-making method (*Technique for Order of Preference by Similarity to Ideal Solution*), in paper was selected adequate sales distribution channel in one enterprise active within the agro-food sector at the territory of Semberija (BiH). Decision makers, in this case represented by employed management in enterprise, have been evaluated five sales distribution channels in enterprise in line to previously defined criteria, i.e. products' characteristics, company's financial situation, consumer habits, production costs, geographic concentration, and products' assortment.

The main goal of research was to create a model for optimal selection of sales channels, while derived results have been showed that the model "producer - seller (retailer) - consumer" is the most adequate towards the predefined selection criteria. In addition to the justified role of used method in selection of offered alternatives, article also represents a base that will serve in further research, whose focus would be on modernizing of existing and searching for new distribution channels in agricultural enterprises.

Key words: Distribution channel, sales, TOPSIS method, multicriteria decision-making, agricultural enterprise.

JEL[5]: Q13, M21, D30

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Introduction

Complexity of doing business activities in agribusiness sector requires special attention to the choice of sales distribution channels. One of key goals of any enterprise's business is reliable and cost-effective delivery of final product to the end user (customer). In this supply chain, it is important to preserve the quality of product, as well as to retain current consumers, while on that way to recommend to the new one. As was noted by Harimurti et al. (2019) with appropriate and efficient distribution, the choice of sales channels will lead to situation that consumers will get their products more easily. Today's market imposes certain requirements according to distribution to end consumers. In line to that Siddharta et al. (2017) conclude that all products must be distributed by certain methods and on realistic basis.

Selecting the proper sales distribution channel is a permanent process in any enterprise. Distribution channels are variable and there are many factors that affect making of adequate decision towards them. Thus, regarding the choice of distribution channels Đalić et al. (2020) recommend the constant monitoring of all factors of influence on distribution channel in certain enterprise. Special attention has been given to distribution channels of agricultural products, whether they represent raw materials, semi-processed agro-food products, or final food products. This stems from the very specificity of agricultural production, as well as from the large number of legal entities that appear in observed chain.

In previous research, many authors have been focused to analysis of sales distribution channels. So, Dent (2011) carefully analyzes the concept and importance of sales distribution channels, while Rosenbloom (2012) explains distribution channels and their relationship with other marketing instruments. In his research Singh (2012) claims that business success and competitive advantage of some enterprise largely depends from decisions linked to sales distribution channels. Several authors are seeking for solution of the best method in choosing a distribution channel that will allow the easiest access to the end users in any sector of production (Vasiliauskas et al., 2010; McCabe et al., 2011; Schegg et al., 2013; Thakran, Verma, 2013).

As the subject of this paper is sales distribution channel in one enterprise active in agribusiness sector at the territory of Semberija region in B&H, as well as the paper goal is to create a model for selecting the best distribution channel for enterprise products' assortment, there will be mentioned some previous researches linked to observed sector of economy.

Miljković and Alčaković (2015) emphasize all specificities of distribution channels in agriculture, which are on other side connected with all characteristics of certain

line of agricultural production and legal entities present in channel. Milanović and associates (2020) point up the product's distribution as one of the crucial elements of competitiveness of companies in agriculture, highlighting the specificities that appear during the channel implementation. In their research, Stevanović Tosovic and associates (2020), use the AHP method of multi-criteria decision-making (*Analytic Hierarchy Process*) in order to evaluate distribution channels at small farms. They developed a model that enables a structured and efficient assessment of distribution channel for products delivered from small farms.

In his research Zhu (2020) examines distribution channels in majority of EU member states set at producers of organic agricultural products, while he divides them as direct, indirect and new distribution channels. Also, many other authors make their contribution in analysis and development of distribution channels in agribusiness sector (Ponce-Cueto, Carrasco-Gallego, 2009; Li et al., 2013; Shi et al., 2013; Gajdić et al., 2018).

Methodological Framework

In order to achieve the research goal in paper is used one popular multi-criteria decision-making method TOPSIS (*Technique for Order of Preference by Similarity to Ideal Solution*). Reasons for this lie in fact that the method is simple to apply, as well as its frequently used in research where the emphasis is on decision or choice. Method characterizes that the chosen alternative should has the shortest distance from the positive and the longest distance from the negative ideal solution (Lu et al., 2007). Confirmation of its often use is reflected in many published articles (Ciardiello, Genovese, 2023; Mitra et al., 2023; Azadi et al., 2023; Qin et al., 2023; Nedeljković et al., 2023).

Steps used for method appliance are explained in following paragraphs.

Step 1. Normalization of decision-making matrix

In the first step, there come to normalization of all elements within the matrix, by which all data are transformed and for all criteria are maximizing the set objective function.

$$\begin{matrix} C_1 & C_2 & \dots & C_m \\ w_1 & w_2 & \dots & w_m \end{matrix}$$

$$R = \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_n \end{matrix} \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix}$$

Step 2. Multiplying of normalized decision-making matrix with weighted criteria. In this step it has been multiplied normalized matrix with certain weights of the given criteria, what derive the data needed for further analysis.

$$V = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \cdot \begin{bmatrix} w_1 & 0 & \cdots & 0 \\ 0 & w_2 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & w_m \end{bmatrix} = \begin{bmatrix} n_{11} & n_{12} & \cdots & n_{1m} \\ n_{21} & n_{22} & \cdots & n_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ n_{n1} & n_{n2} & \cdots & n_{nm} \end{bmatrix}$$

Step 3. Determination of ideal solutions

In this step, it is obtained a positive ideal solution (A*) by which it is maximized a desired function, while by obtained negative ideal solution (A^) it is minimized a desired function.

$$A^* = \left(\max n_{ij} \mid j \in V\right), \left(\min n_{ij} \mid j \in V'\right)$$

$$A^{\cdot} = \left(\min n_{ij} \mid j \in V\right), \left(\max n_{ij} \mid j \in V'\right)$$

$$V = (j = 1, 2, \ldots, m \mid j \text{ belongs to criteria which are maximising})$$

$$V = (j = 1, 2, \ldots, m \mid j \text{ belongsto criteria which are minimizing})$$

Step 4. Determination of alternative's distances from ideal solutions

In this step, the n-dimensional Euclidean distances of all given alternatives are calculated.

$$S_i^* = \sqrt{\sum_{j=1}^{m} (n_{ij} - n_j^*)^2}$$

$$S_i^- = \sqrt{\sum_{j=1}^{m} (n_{ij} - n_j^-)^2}$$

Step 5. Determination of relative closeness of alternatives to ideal solution. In this step it is determined the relative distance based on the expression where the result should be in range $0 \leq Q_i^* \leq 1$.

$$Q_i^* = \frac{S_i^-}{S_i^* + S_i^-}$$

Step 6. Ranking of alternatives. All alternatives will be ranked by decreasing value of Q_i^-. Chosen alternative will be one that is closest to 1, or equals 1.

All results in case study will be presented by adequate tables and graphs.

Case Study Description

Research was done in form of case study in certain enterprise belongs to the category of small enterprises (up to 20 employees), while it is located at the territory of Bijeljina municipality (BiH). The company is private owned and it was established in 2005. Its main activity is processing of fruits and vegetables (sweet and sour program). In recent years, the enterprise has become widely recognized, primarily thanks to its well-chosen production program and high quality of gained food products.

Through the hot processing of fruits, there are produced different compotes, marmalades, or jams, while through the hot processing of vegetables, company is offering to the market winter salads in sour-salty souse, tomato juice, ajvar and pinjur. The overall foodstuff program is in line to principles of organic production, i.e. besides the organic fruit and vegetables as a raw material, there are no preservatives used, while the food preservation is exclusively done by the process of pasteurization. In addition, the enterprise has available its own vegetable and fruit production, while the part of raw materials is buying at local market from local suppliers, as the enterprise is located in area well recognized by intensive crop and vegetable production.

Using the available resources and previous business experience, enterprise is constantly improving and broadening the products assortment striving to penetrate at new markets. Recently, management has been trying to improve its sales by developing new sales channels, or by modernizing used ones. As this is typical locally or export-sales oriented company (closeness to Serbian border), this research could help in choosing the way of sales that would lower existing sales costs towards the established habits of consumers and make the enterprise business more profitable in upcoming period.

Results with Discussion

All criteria and alternatives considered in research are presented in next tables (Table 1. and 2.). Alternatives were determined based on currently used sales channels in enterprise.

Table 1. Used criteria

Criteria	Description of criteria
Products characteristics	Basic characteristics of products gained in enterprise
Current financial condition in enterprise	Volume of financial assets that company is willing to invest in certain distribution channels
Consumer's habits	Established practice of buying certain enterprise products
Costs	Costs per unit of distributed product

Criteria	Description of criteria
Geographical concentration	Geographical locations at which enterprise is selling its products
Assortment of products	Number of products' lines oriented to selling

Source: Determined by authors.

Table 2. Used alternatives

Alternative	Description of alternatives
Producer-consumer	Producer is selling the products directly to consumers
Producer-retailer-consumer	Producer is selling the products to retailers while he is reselling them to final consumers
Producer-wholesaler-retailer-consumer	Producer is selling the products to wholesaler, while he is then selling them to retailer who is distributing them to final consumers
Producer-selling agent-consumer	Producer is selling the products to final consumers through the selling agent
Other distribution channels (commission, broker, social networks, etc.)	Producer is selling the products through the other distribution channels

Source: Determined by authors.

By the use of Satie's scale with a given explanation, in paper has been determined the weight of selected criteria (Table 3.).

Table 3. Sati scale of values

Importance	Definition	Explanation
1	Equal significance	Two elements have identical importance according to main goal
3	Weak domination	Slightly favorizing one element compared to other
5	Strong domination	Favorizing one element compared to other
7	Demonstrative domination	Dominancy of one element is approved in practice
9	Absolute domination	Dominancy of the highest degree
2, 4, 6, 8	Intermediate values	Compromise required or further division

Source: Puška, 2011.

For that was used the AHP multi-criteria decision-making method (*Analytic Hierarchy Process*), which could be considered highly appropriate method in this case. The evaluation of the criteria's importance was done by employed engineers and managers in enterprise. Criteria "consumers' habits" and "product's characteristics" have the greatest importance/weight towards the statement of evaluators/decision makers (Table 6.). The selected decision-makers made a group decision based on the linguistic scale whose linguistic features are presented quantitatively in next table (Table 4.), that was the base for forming initial decision-making matrix of linguistic values (Table 5.), as well as quantitative ones (Table 6.).

Table 4. Linguistic scale of values

Evaluation of criteria	Linguistic scale
1	VP-Very Poor
2	P-Poor
3	M-Medium
4	G-Good
5	VG-Very Good

Source: Đalić et al., 2020.

Table 5. Linguistic table of initial decision-making matrix

Element	C1	C2	C3	C4	C5	C6
A1	G	M	M	M	G	VG
A2	G	M	G	G	G	M
A3	G	M	M	M	G	G
A4	M	M	M	P	M	M
A5	M	G	M	M	M	M

Source: Determined by authors.

Table 6. Initial decision-making matrix

Weight	***0,24***	***0,05***	***0,26***	***0,05***	***0,2***	***0,2***
Element	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
A1	4	3	3	3	4	5
A2	4	3	4	4	4	3
A3	4	3	3	3	4	4
A4	3	3	3	2	3	3
A5	3	4	3	3	3	3

Source: Determined by authors.

Normalization of the initial decision-making matrix is shown in Table 7., while by multiplying its values with the obtained criteria weights, it was created the weighted normalized decision-making matrix (Table 8.).

Table 7. Normalization of decision-making matrix

Element	C1	C2	C3	C4	C5	C6
A1	0,492368291	0,416031	0,416031	0,437637	0,492368	0,606355
A2	0,492368291	0,416031	0,554708	0,583516	0,492368	0,363813
A3	0,492368291	0,416031	0,416031	0,437637	0,492368	0,485084
A4	0,369276219	0,416031	0,416031	0,291758	0,369276	0,363813
A5	0,369276219	0,554708	0,416031	0,437637	0,369276	0,363813

Source: Determined by authors.

Table 8. Weighted normalized decision-making matrix

Element	C1	C2	C3	C4	C5	C6
A1	0,11816839	0,020802	0,108168	0,021882	0,098474	0,121271
A2	0,11816839	0,020802	0,144224	0,029176	0,098474	0,072763
A3	0,11816839	0,020802	0,108168	0,021882	0,098474	0,097017
A4	0,088626292	0,020802	0,108168	0,014588	0,073855	0,072763
A5	0,088626292	0,027735	0,108168	0,021882	0,073855	0,072763
Vj +	0,11816839	0,027735	0,144224	0,029176	0,098474	0,072763
Vj -	0,088626292	0,020802	0,108168	0,014588	0,073855	0,121271

Source: Determined by authors.

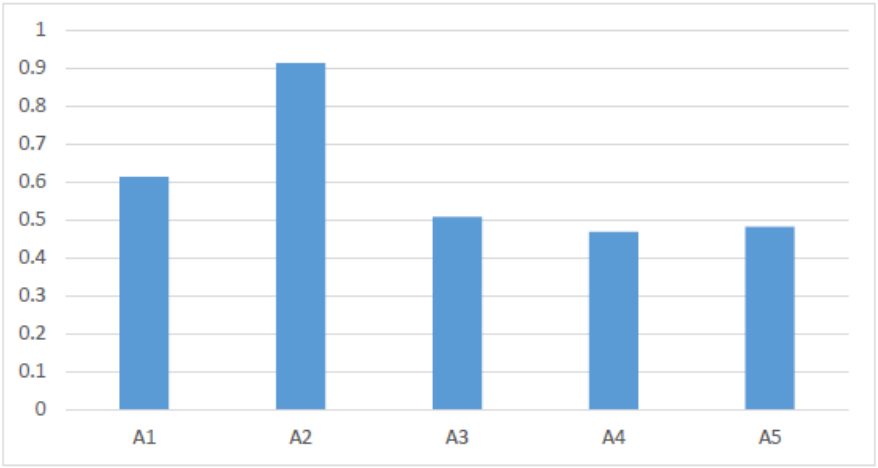
After that, the values for the distances of each of the analyzed alternatives were obtained, where it could be seen that the alternative "producer-retailer-consumer" has the highest value, or the shortest distance from the positive ideal solution (Table 9.). Then there come the values for other evaluated alternatives 1, 3, 5 and 4, what could be seen in Graph 1.

Table 9. Relative closeness of alternatives to ideal solution

S^*_i	S^-_i	$S^*_i + S^-_i$	Q^*_i
0,061274	0,09688	0,158154	0,612567
0,00693	0,073108	0,080038	0,913416
0,044606	0,04604	0,090646	0,50791
0,055137	0,04851	0,103647	0,468031
0,053219	0,04954	0,102759	0,482099

Source: Determined by authors.

Graph 1. Ranking of alternatives



Source: Determined by authors.

Conclusion

In line to previously presented, it could be concluded that the choice of sales distribution channel represents complex issue in every enterprise. Complexity is even greater if enterprise comes from the agribusiness sector. Based to given alternatives in form of currently used sales channels in enterprise, by research is confirmed that in this moment the sales channel "producer-retailer-consumer" represents the optimal solution towards the set selection criteria. It is followed by "producer-consumer" sales method, or direct sales without intermediaries. Gained results are a good basis for further research aimed to development of existing, or searching for new distribution channels/methods of sale, certainly with an accent to modern and the most frequent sales methods in use that would certainly bring the higher profits and lower the current costs to certain enterprise in given conditions of production and with available assortment of products.

Literature

1. Azadi, A., Jalali, S. A. S., Navidi, M. N. (2023). Assessment of Land Suitability for Sugarcane Cultivation Using TOPSIS and Parametric Methods in Southwestern Iran. *Eurasian Soil Science,* 56:818-829.
2. Ciardiello, F., Genovese, A. (2023). A comparison between TOPSIS and SAW methods. *Annals of Operations Research,* 325:967-994, https://doi.org/10.1007/s10479-023-05339-w
3. Đalić, I., Stević, Ž., Erceg, Ž., Macura, P., Terzić, S. (2020). Selection of a Distribution channel using the Integrated FUCOM-MARCOS model. *International Review,* 3-4:80-96.
4. Dent, J. (2011). *Distribution channels: Understanding and managing channels to market.* Kogan Page Publishers, London, UK.
5. Gajdić, D., Petljak, K., Mesić, Ž. (2018). An exploration of distribution channels: Challenges and opportunities for organic food producers in Croatia. *Economics of Agriculture,* 65(4):1461-1482.
6. Harimurti, B. S., Sumarwan, U., Simanjuntak, M. (2019). Analysis of Distribution Efficiency on Bottled Water Product Using Data Envelopment Analysis Method. *Russian Journal of Agricultural and Socio-Economic Sciences,* 94(10):92-99.
7. Li, B., Zhou, Y., Wang, X. (2013). Equilibrium analysis of distribution channel structures under power imbalance and asymmetric information. *International Journal of Production Research,* 51(9):2698-2714.

8. Lu, J., Zhang, G., Ruan, D., Wu, F. (2007). *Multi-Objective Group Decision Making - Methods, Software and Applications with Fuzzy Set Techniques*. Imperial College Press, London, UK.
9. McCabe, A., Seiter, A., Diack, A., Herbst, C. H., Dutta, S., Saleh, K. (2011). *Private sector pharmaceutical supply and distribution channels in Africa: A focus on Ghana, Malawi and Mali.* HNP Discussion Paper, WB, Washington, USA, p. 78.
10. Milanović, J., Nikitović, Z., Garabinović, D. (2020). The impact of customer contact as part of the agricultural products distribution channel on the increase of the competitiveness. *Economics of Agriculture,* 67(2):359-375.
11. Miljković, M., Alčaković, S. (2015). *Kanali distribucije poljoprivrednih proizvoda sa posebnim osvrtom na pijace u Srbiji*. In: International Scientific Conference of IT and Business-Related Research - Synthesis 2015, proceedings, Singidunum University, Belgrade, Serbia, 16-17th April 2015, pp. 599-602.
12. Mitra, R., Jayanta, D., Kamruzzaman, M. (2023). Application of TOPSIS method for flood susceptibility mapping using Excel and GIS. *Methods,* 10(11):1-13, https://doi.org/10.1016/j.mex.2023.102263
13. Nedeljković, M., Puška, A., Vlajković, M., Miletić, V. (2023). Improvement of Rural Tourism in the area of Bosnia and Herzegovina using Multi-criteria analysis. *Economics of Agriculture,* 70(2):553-566, https://doi.org/10.59267/ekoPolj2302553N
14. Ponce-Cueto, E., Carrasco-Gallego, R. (2009). *Distribution Models for Logistics in HORECA Channel*. In: Conference Computers & Industrial Engineering, proceedings, July 2009, Troyes, France, IEEE, NY, USA, pp. 754-759.
15. Puška, A. (2011). *Primjena "TOPSIS" metode u određivanju rang liste investicionih projekata*. BH ekonomski forum, pp. 89-105.
16. Qin, Ya., Rizk, M., Garg, H., Hassanien, A. E., Snašel, V. (2023). Intuitionistic fuzzy-based TOPSIS method for multi-criterion optimization problem: a novel compromise methodology, *AIMS Mathematics*, 8(7):16825-16845, doi: 10.3934/math.2023860
17. Rosenbloom, B. (2012). *Marketing channels*. Cengage Learning, Boston, USA.
18. Schegg, R., Stangl, B., Fux, M., Inversini, A. (2013). *Distribution channels and management in the Swiss hotel sector.* In: Information and Communication Technologies in Tourism, Springer, Berlin, Germany, pp. 554-565.
19. Shi, H., Liu, Y., Petruzzi, N. C. (2013). Consumer Heterogeneity, Product Quality, and Distribution Channels. *Management Science*, 59(5):1162-1176.

20. Siddhartha, T., Nambirajan, T., Ganeshkumar, C. (2017). Distribution Methods Adopted for Self-Help Group Products: An Empirical Analysis. *IUP Journal for Operations Management*, 16(4):25-33.
21. Singh, M. (2012). Marketing mix of 4P's for competitive advantage. IOSR *Journal of Business and Management*, 3(6):40-45.
22. Stevanović Tosovic, A., Ristanović, V., Ćalović, D., Lalić, G., Žuža, M., Cvijanović, G. (2020). Small Farm Business Analysis Using the AHP Model for Efficient Assessment of Distribution Channels. *Sustainability,* 12(24):1-15, https://doi.org/10.3390/su122410479
23. Thakran, K., Verma, R. (2013). The emergence of hybrid online distribution channels in travel, tourism and hospitality. *Cornell Hospitality Quarterly*, 54(3):240-247.
24. Vasiliauskas, A. V., Vilkelis, A., Zinkeviciute, V., Batarliene, N. (2010). Development of automobile distribution networks on the basis of multi-criteria evaluation of distribution channels. *Transport,* 25(4):361-367.
25. Zhu, L. (2020). Supply chain product quality control strategy in three types of distribution channels. *PLoS ONE,* 15(4):e0231699.