



## Evaluation of Sugar Industry in Turkey by Using Porter's Five Forces Analysis

Onur Harun KAMIŞ\*

Department of Agricultural Economy, Faculty of Agriculture, Tekirdağ Namik Kemal University, 59030, Tekirdağ, Turkey

### Review Article

#### Keywords:

Sugar industry  
Five forces analysis  
Competition power

Received: 08.04.2022

Accepted: 26.04.2022

Published: 31.05.2022

DOI: 10.55848/jbst.2022.9

### ABSTRACT

Sugar has been one of the important foodstuffs of people for centuries. A large part of this need arises from the human demand for energy. Until the 18th century, this energy need in the world was met from sugar cane. However, in the 19th century, it is seen that the production of sugar beet, which is a substitute for sugar cane, started in the world. In today's world, 79% of the sugar production is produced from sugar cane and the remaining 21% is obtained from sugar beet. In this context, when the sugar sector is examined, it is seen that around 120 countries around the world produce approximately 160 million tons per year. Considering that the sugar market is the most protected market in Turkey, it is important to examine this sector in terms of agricultural economy. In this study, the competition analysis of the strategically important sugar sector will be made and it is thought that it will be an important resource for new entrants to the sector. For this purpose, the competition conditions of the sector were tried to be analyzed by using Porter Five Forces Analysis in this study. It is seen that there is a lack of such a study on the competitiveness of the sugar sector in Turkey when the literature study is conducted. In this sense, it is thought that this study will contribute to the related literature.

### 1. Introduction

The agriculture sector stands at the center of society, playing a key role in employment, production, and nutrition. The strategic importance of the sector is increasing with each passing day, due to global climate change and intense pressure that human use puts on scarce resources.

The problems in the supply of some strategic agricultural products around the world, due to the recent crisis in Russia and Ukraine, have raised concerns among many countries. Most of the discussions about public opinion show that "Agriculture" has become a widely discussed and important topic, especially since the start of the pandemic in Turkey in 2019.

In this context, sugar and sugary foods are the leading strategic products of the sector. The sugar industry is protected by policies all over the world due to its importance. The increase in sugar consumption worldwide will necessitate an increase in product supply [1-4].

Sugar has had a long historical process of evolution, just like humans. The first sugary food humans used was honey; as they ascended the steps of evolution, and then came the sugar we use today [5].

The main source material for sugar (79%) is sugar cane. One of the main reasons for this is its lower production cost compared to sugar beet. However, due to the climate and geography of Turkey, sugar demand is met by sugar beet cultivation. In addition, sugar beet is an important input for biofuel production, and sugar beet pulp is used as animal feed.

Thus, various measures have been taken for the continuity of sugar beet agriculture for agricultural and social reasons [6-7].

Sugar is obtained from sugar beets in Turkey. With an annual sugar beet production of approximately 19 million tons, Turkey is the fifth largest producer after Russia, the USA, Germany and France. Today, approximately 120 thousand farming families produce sugar beet on an area of 336 thousand hectares [8].

The most important reason for the sugar industry to be the primary sector that gets protection in agricultural economy and policies across the world is that it involves an industrial plant, and provides a raw source for many lines of production [9].

Sugar beet agriculture in Turkey has always had a strategic importance within the framework of agricultural economy in the history of the Republic. This importance has become more understandable with the recent inter-country crisis. In this context, the current situation should be interpreted for new entrants to the sector in order to ensure that this production pattern is sustainable. In this context, Porter's Five Powers Analysis, which offers a strategic perspective in business life, has been used as a method of study and the sugar sector has been interpreted.

When the literature was reviewed, it was seen that the Five Forces Analysis was used in many academic studies. There are also studies using this analysis in the field of agricultural economics in Turkey. This analysis, which is also a guide for

\* Corresponding author: Tekirdağ Namik Kemal University, Faculty of Agriculture, Department of Agricultural Economy, Kampüs Cd. No:1, 59030 Tekirdağ/TURKEY  
E-mail address: [onurharunkamis.mtb@gmail.com](mailto:onurharunkamis.mtb@gmail.com)

managers in the private sector, appeals to everyone in professional business life. For example, in the study of Andriotis in 2004 [10], five competitive power analyses were made on the travel and tourism sector, taking into account the Greek conditions. In this context, a new process management model has been tried to be put forward. In his study in 2010, Rice tried to put forward a new management model by using the five forces analysis in risk management [11]. Yu Zhao et al. (2016) discussed the competitiveness of the biomass energy production industry on a sectoral basis by using the five power analysis in their study [12]. İrfan et al. (2019) conducted a study on the competitiveness of the wind energy sector by using Five Power Analysis methods within the framework of Indian conditions [13].

In this study, the strategic importance of sugar will be examined and an evaluation of the industry will be provided. In this context, findings from information obtained as a result of a detailed review of the literature will be shared, and within this framework a Porter Five Forces Analysis will be made for entrepreneurs working in the industry.

**2. Materials and Methods**

The main source of this study is data obtained from a thorough examination of national and international reports on the sector. The sectoral situation is shown with the help of secondary data obtained from detailed reviews of the related literature.

In this study, it was aimed with the help of this data, and by using the Porter Five Analysis, to guide new entrepreneurs within the industry, along with producers.

In this context, based on information obtained as a result of theoretical studies conducted on the sector in the last part of the study, the “Porter Five Forces Analysis” developed by Michael Porter was used to analyze the competitive conditions in Turkey’s sugar industry, and provide an overall picture of the situation. This will offer a theoretical framework for new entrepreneurs in the industry.

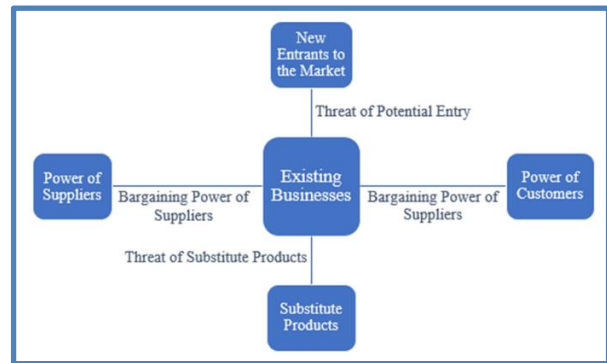
Porter’s analysis includes five forces for analyzing competitive conditions (Fig. 1). These are:

- ✓ Competition between existing businesses in the industry
- ✓ The potential threat of new entrants into the market
- ✓ The threat of substitute products
- ✓ The power of customers
- ✓ The power of suppliers

According to this analysis, strong competitive conditions are a threat, as they make businesses unable to price products as they wish, while weak competition provides new opportunities to businesses, as they will offer more profit opportunities [14].

**3. Results and Discussion**

Turkey is an important player in the global sugar industry. The industry’s competitive nature within the wider agricultural field and the country’s advantageous geographical location.



**Fig.1** Five forces for analyzing competitive conditions [14].

makes Turkey an important country for this strategic product on a global scale

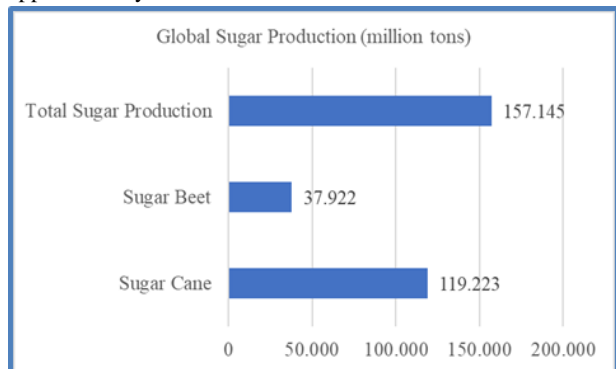
When the sugar market is examined around the world, the following results are obtained. Studies have shown that there is a parallelism between sugar consumption and development levels for countries. Far Eastern countries and India are responsible for 30% of total consumption. The population growth rate and per capita income are among the most important factors affecting consumption.

In developed countries, per capita sugar consumption generally sees steady progress at a certain rate. This rate tends to increase in developing countries, and results in significant economic fluctuations in the world sugar market. The fact that sugar has many uses (oil, commodities, chemistry; etc.) is the main determinant of global sugar prices.

As the sugar supply is not at a sufficient level to meet demand, stocking it is not possible, and this causes prices to rise. Other main factors for price increases are as follows:

- ✓ Changes in the supply/demand equilibrium,
- ✓ Changes in ethanol consumption,
- ✓ Changes in exchange rates,
- ✓ Problems with harvests,
- ✓ Climate conditions,
- ✓ International crises,
- ✓ Inflation rates,
- ✓ Other external factors,

While most agricultural products are traded in line with the free market economy, the sugar trade is subject to state intervention, as it is a strategic sector and is very sensitive [15]. As shown in Fig. 2, the global scale of sugar production is approximately 265 million tons.



**Fig. 2** World sugar production [16-18].

In the world, 21% of the total sugar production is made from sugar beet and 79% from sugar cane. Fig. 3 reveals the strategic position of sugar beet in the market, with a production volume of 38 million tons.

Brazil, India, China and the USA are among the most important sugarcane producers, and the balance between production, supply, and demand in these countries directly affects world sugar markets. As can be seen in Table 1, Russia ranks first in global sugar beet production, while Turkey ranks fifth. Turkey's share in global sugar beet production is approximately 9%.

The volume of global sugar import and export is significant. In this context, Brazil, Thailand, India, and Australia are among the leading exporting countries, and the total export volume is approximately 63 million tons. Among the largest importers, China comes first, followed by Indonesia and the USA (Table 2).

Sugar beet production in Turkey meets the country's domestic sugar demand. Sugar beet production was significantly subsidized until the beginning of 2000; afterwards, however, subsidies were discontinued, and the industry was left with serious problems that have yet to be solved. This has been an important turning point in Turkish agriculture. Sugar beet production in Turkey currently makes it a self-sufficient country [20].

The sector analysis report by Türkşeker (2020) shows that global sugar production decreased from 175 million tons to 166 million tons compared to the previous year. This decrease is the biggest one to be seen on a global scale within the last 10 years. This indicates that the consumption of sugar and sugary foods outstrips production [21].

Based on the sectoral information given so far, there is a global sugar shortage of 9.4 million tons. Sugar cane, which has a large share in this trade, is the determinant of global sugar market prices. That is because obtaining sugar from sugar beets is costlier, and this has led to sugar cane becoming the dominant source in the market (Table 3).

The global pandemic that started in 2019 seriously affected the sugar industry, and consumption saw a major increase. However, the lack of adequate supply to meet demand caused an increase in prices. The sugar market where political interventions are made has a strategic position in trade for the UK-based sugar exchange (Fig. 4).

**Table 1.** World sugar beet production [16].

Countries	Cultivated Land (ha)	Produce Amount (million tons)	Share in World Production (%)
Russia	916.647	33,9	12,8
USA	462.280	30,5	11,5
Germany	386.000	28,6	10,8
France	420.890	26,2	9,9
<b>Turkey</b>	336.348	23,0	8,7

**Table 2.** Important countries in sugar foreign trade (million tons) [17].

Exporting Countries		Importing Countries	
Brazil	30,18	China	6,14
India	7,00	Indonesia	5,17
Thailand	4,65	USA	2,63
Australia	3,00	Bangladesh	2,50
<b>World Total</b>	<b>62,79</b>		<b>62,67</b>

**Table 3.** World sugar balance (million tons) [17].

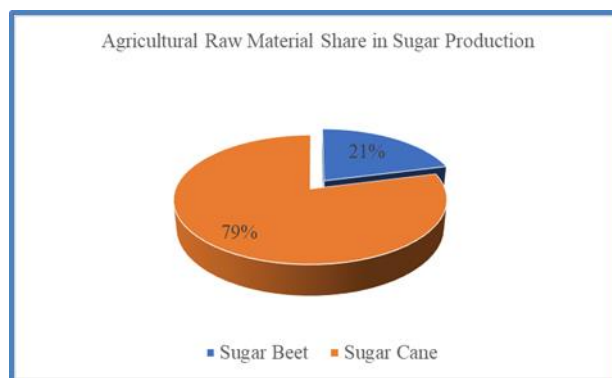
Categories	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Production	164	180	174	171	169
Consumption	170	172	171	170	174
Overproduction / production gap	-6	8	3	1	-5
Imports	66,2	64,8	62,4	57,2	59,7
Export	66,2	62,4	57,2	66,6	62,2

The global pandemic that started in 2019 seriously affected the sugar industry, and consumption saw a major increase. However, the lack of adequate supply to meet demand caused an increase in prices. The sugar market where political interventions are made has a strategic position in trade for the UK-based sugar exchange (Fig. 4).

Up to this point, the situation pertaining to the global sugar industry has been evaluated. Now, the Turkish sugar industry will be examined.

Sugar production in Turkey is carried out according to a quota method. The quotas are determined by the Sugar Department of the Ministry of Agriculture and Forestry. Production is carried out with the contract farming method, and is the main source of income for roughly 120 thousand farming families.

The sector has been a hot issue in Turkey for a long time due to privatization attempts, and has always been open to state intervention and remains at the center of intense discussions. A more detailed examination of the industry and its strategic importance suggests unstable production within the last five years, as can be seen in Table 4.



**Fig. 3** Agricultural raw material share in sugar production [19].

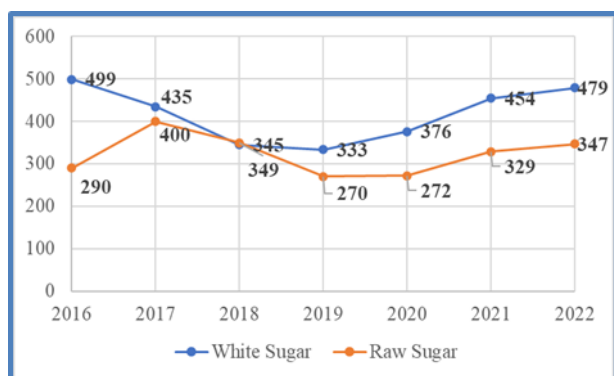


Fig. 4. Sugar market prices (Dollars/Ton) [16-17], [22-23].

There are three different quotas in the industry, where production is carried out with the quota method. These are:

- ✓ A Quota Sugar: The amount of sugar produced according to the demand of the domestic market.
- ✓ B Quota Sugar: The amount of sugar produced for the safety margin corresponding to a certain share in the application of A quota.
- ✓ C Quota Sugar: Sugar produced independently from the A and B quotas that cannot be marketed domestically, along with raw and white sugar exported for processing.

These definitions will make analysis of the sector easier to understand. Table 5 shows sugar quotas and Table 6 shows the production and sales information for the 2021/2022 marketing year in Turkey.

An average of 18 million tons of sugar beet and 2.45 million tons of sugar are produced in Turkey. However, these amounts vary from year to year, depending on climate conditions.

The sectoral-based research report of “Fortune Business Insights” is among the research carried out on the market share estimation of sugar substitutes in the sugar sector in coming years. The 2020 report published by Fortune Business Insights indicates that the global sugar substitute market was worth 6.35 billion dollars in 2018, and is expected to have a market share of 10.27 billion dollars by 2026. Natural sugar substitutes boosting consumers' perception of sweetness are expected to have a faster growth rate than synthetic and artificial sweeteners. The Asia-Pacific region is estimated to be the fastest growing market for sugar substitutes in the period between 2019 and 2026 [26].

In the next part of the study, the related analyses are given to guide new entrepreneurs in terms of the sustainability of the sector, which is of strategic importance due to its sensitivity.

**3.1. Five Forces Analysis (Porter Five Analysis)**

The analysis developed by Michael Porter focuses on five forces that must be examined to analyze the competitive conditions in an industry (Fig. 5). These are:

**Competition Between Existing Businesses in the Industry:** Sugar, which is the raw material of sugary foods in Turkey, is obtained from sugar beets. The sector is managed

domestically with a quota method. The production process is frequently subjected to government intervention through

Table 4. Turkey Sugar Production Amount [24].

Years	Production Area (1000 ha)	Production (million tons)	Yield (ton/da)
2015	274	16,5	5,8
2016	322	19,6	6,1
2017	339	21,1	6,2
2018	291	17,4	6,0
2019	310	18,0	5,8
2020	336	23,0	6,9
2021	300	18,5	6,2

Table 5. Sugar quotas in Turkey (thousand tons) [25].

Products	2021/2022 Marketing Year		
	A quota	B quota	Total
Beet Sugar	2.632,50	131,63	2.764,13
Starch-Based Sugar	67,50	0,00	67,50
<b>Total Country Quota</b>	<b>2.700,00</b>	<b>131,63</b>	<b>2.831,63</b>

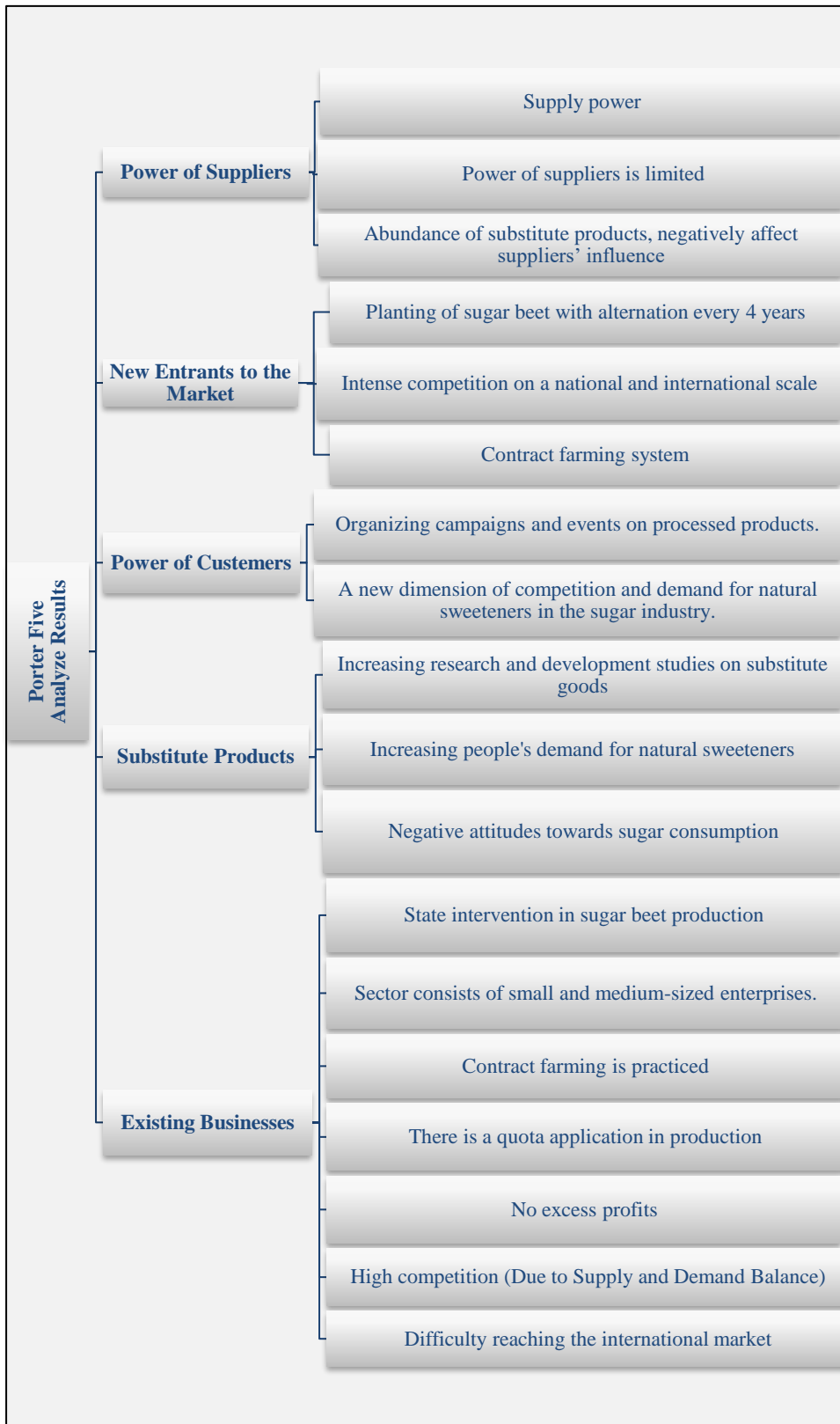
guidance provided by the Sugar Department of the Ministry of Agriculture and Forestry on quotas. Statistical data on domestic production is shared in the sections above.

The dominance of contract farming in the industry protects sugar beet producers from unfair competition. There are 15 factories affiliated with Türkşeker in the industry, and Türkşeker is an important player in the market. Considering this situation for new entrants in the sector, the main factors that determine competition within the sector and play a role in the formation of competition levels, according to the Porter Five analysis, include:

- ✓ The number of competitors,
- ✓ The supply/demand balance,
- ✓ The growth rate of the industry,
- ✓ Fixed and total costs,
- ✓ Idle capacity,
- ✓ Differentiation in products,
- ✓ Increase in costs,
- ✓ Differentiation of competitors,
- ✓ Obstacles to exiting the sector.

Table 6. Sugar beet production and sales [25].

(Thousand tons)	2021/2022 Marketing Year
A quota	2.633
A Quota Generation	2.282
Total Production (A+B+C)	2.314
Domestic sales	950
Overseas Sales (Sugar C)	78
Year-End Stock A Quota	1.332
Year-End Stock B Quota	132
Year-End Stock C Quota	134



**Fig. 5** Porter five analyze results.

In light of these factors, it is obvious that the sugar industry consists of many small and medium-sized enterprises when the number of competitors in the sugary foods industry is also included within the scope of the investigation with their production and processing operations. This makes it difficult to reach international markets.

Turkey has a production potential that is self-sufficient in terms of supply and demand. However, considering total sugar beet production in the world, it is seen that consumption falls short of production on a global scale. The sugary foods industry, on the other hand, experiences the exact opposite. The sugary foods sector, where supply is high and demand is low, has created a highly competitive industry in Turkey. The

situation is the opposite when it comes to sugar beet production. Thus, it is not easy for producers to make large profits.

Another factor, the supply/demand balance, generally shows similar characteristics within the country. Only certain companies fulfill the conditions of the marketing mix with differentiation and branding in the sector.

In addition to these, as mentioned in the report by Fortune Business Insights, a significant growth rate is predicted as substitute goods are added to the market. For centuries, sugar and sugary foods have been strategic agricultural products for states as a result of the human demand for sugar and direct energy.

High input costs in the industry are among the factors that hinder producers. The current number of producers is quite low. If producers halt their agricultural activities, it will be very difficult to make them return to the industry when compared to other industries. Evaluated in this light, the sugar industry requires more strategy and foresight, along with independent planning.

The concept of differentiated products is among the key factors that will determine the future of the sugar industry. Considering global statistics and demand, it can be seen that the tendency towards differentiation in sugar is becoming more prominent, and that leading entrepreneurs in the market are making substitute products a part of this differentiation, thus creating a promising future for the industry.

**Potential Threat of Entrants:** Currently, the sugar industry is among the sectors where competition is intense, on both a national and international scale. Considering that small family businesses are responsible for domestic production, it is very important to protect the competitive balance. The potential threat of new entrants is an important factor protecting the industry. The quota system for sugar, limited production in certain provinces via the cropping system, and four-year contracts are important factors that new entrants to the sector should consider.

Considering the low profit share in this production pattern, and imbalances in the demand structure of the sector, this situation poses a threat for new entrants to the sector.

**Threat of Substitute Products:** Statements by the World Health Organization and other global institutions reveal a negative approach towards sugar consumption. As a result of these statements, it is predicted that consumers will turn to natural sweeteners and reduce their caloric and energy intake in the next 20 years. So the sector will provide an advantage for those who make intense R&D studies on substitute goods.

**Bargaining Power:** Buyers' demand for natural sweeteners in the sugar industry adds a new dimension to the competition. Entities in the industry engage in intense competition, and organize campaigns and activities to position themselves in the market and help processed products find customers, which results in price decreases.

Sellers who can reach international markets have significant influence in the sector, and this creates an obstacle for other small businesses for maintaining their market position. This situation puts intense pressure on prices.

**Power of Suppliers:** The sugar industry is a sector in which production is carried out on a contract basis as a result of privatization and quota applications. In this context, supply power is felt to a great extent in the industry as a result of the effects of contract farming. The abundance of substitute products in the sugar sector, and the diversity of these products, negatively affect suppliers' influence. In the sector, the power of suppliers is limited, and, considering this, producers are weak when compared to strong buyers.

#### 4. Conclusion

Turkey, which is a part of the World Trade Organization and continues its membership negotiations with the European Union. In addition, one of the sectors that Turkey should pay attention to when opening up to international markets is the sugar sector. This is because sugar is a strategic product that affects a large population, along with both producers and consumers, in Turkey and the rest of the world.

The sugar industry is one of the sectors that should be carefully focused on when opening up to international markets and as EU harmonization efforts continue in Turkey, which is part of the World Trade Organization and remains in membership negotiations with the European Union. This is because sugar is a strategic product that affects a large population, along with both producers and consumers, in Turkey and the rest of the world.

The main purpose of the establishment of sugar factories in Turkey is to meet domestic sugar demand and further develop farming activities. Sugar beet farming plays a very important role in the social and economic development of Turkey. In addition, the sugar sector should be considered an important area for the development of agriculture and animal husbandry in our country. For this reason, protection of the sector will play a key role, not only for farmers working in beet farming, but also for economic development in agriculture and animal husbandry.

A preference for advanced quality management systems (ISO, good agricultural practices, etc.), keeping up with the latest technology, ease of access to market information, the creation of new opportunities in the market through differentiated products, support for R&D, promotion and branding efforts in foreign markets, and a focus on promotion and marketing activities to promote a positive image of Turkish products can all result in positive contributions to the future of the industry.

Producers in Turkey's sugar industry are mainly small family businesses. Substitute and imitation goods in the sector may result in unfair competition. The low level of education of producers results in a competitive environment in the domestic market, which is dominated by major companies, and makes it difficult for manufacturers to maintain their position in the market. Minimizing these negative factors is very important for the future of the industry.

As the results of the analyses show, it is necessary to encourage producing families to remain in the industry, adapt quickly to product differentiation, and maintain their strategic position in terms of production. It is important to increase audits in the industry and make contract farming suitable for full-capacity

use. Legal regulations should be reviewed, and procedures that cause unfair competition should be removed. Technology employed at facilities should be adapted to Agriculture 4.0, and production should be increased.

## Declaration

## Author Contribution

Conceive-O.H.K.; Design- O.H.K.; Supervision O.H.K.; Experimental Performance, Data Collection and/or Processing O.H.K.; Analysis and/or Interpretation- O.H.K.; Literature Review- O.H.K.; Writer- O.H.K.; Critical Reviews - O.H.K.

**Conflict of interest :**The author has declared no conflicts of interest.

## Orcid-ID

Onur Harun KAMIŞ  <https://orcid.org/0000-0002-9531-6483>

## References

- [1] A. Ö. Akbay, "Evaluation of Social and Economic Profitability of Sugar Production in Turkey," *Adana Provincial Planning and Coordination Directorate*, Publication no. 104., 2003.
- [2] Z.Erdinç, "Türkiye'de şeker sanayinin gelişimi ve şeker sanayinde izlenen politikalar," *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, vol.17, no. 3, pp. 9-26, 2017.
- [3] Ö. Eştürk, "Türkiye'de şeker performansı ve geleceği açısından bir değerlendirme," *Anadolu İktisat ve İşletme Dergisi*, vol. 2, no. 1, pp. 67-81, 2018.
- [4] V. Voora, S. Bermúdez, and C. Larrea, *Global Market Report: Sugar*. Canada: International Institute for Sustainable Development, Winnipeg, MB, 2020.
- [5] S. Gudoshnikov, L. Jolly, and D. Spence, *The world sugar market*. Elsevier, 2004.
- [6] D. Huntrods, V. Koundinya, and M. Geisler, *Sugarcane profile*. Agricultural Marketing Resource Center, 2018.
- [7] G. C. Abbott, *Sugar*. Routledge, 2022.
- [8] Republic of Türkiye Ministry of Agriculture and Forestry, "Türkiye Şeker Sektörü Raporu," Sugar Department Presidency, 2022. [Online]. Available: <https://www.tarimorman.gov.tr>. [Accessed Mar. 22, 2022].
- [9] G. N. Skaracis, O. I. Pavli, and E. Biancardi, (2010). "Cercospora leaf spot disease of sugar beet," *Sugar Tech*, vol. 12, no. 3, pp. 220-228, 2010.
- [10] K. Andriotis, "Revising Porter's five forces model for application in the travel and tourism industry," *Tourism today*, vol. 4, no. 1, pp. 131-145, 2004.
- [11] J. F. Rice, "Adaptation of Porter's five forces model to risk management," *dtic.mil*, Jul. 1, 2010. Available: <https://apps.dtic.mil>. [Accessed Mar. 12, 2022].
- [12] Z. Y. Zhao, J. Zuo, P. H. Wu, H. Yan, and G. Zillante, "Competitiveness assessment of the biomass power generation industry in China: A five forces model study," *Renewable Energy*, vol. 89, pp.144-153, 2016.
- [13] M. Irfan, Z. Y. Zhao, M. Ahmad, K. Batool, A. Jan, and M. C. Mukeshimana, "Competitive assessment of Indian wind power industry: A five forces model," *Journal of Renewable and Sustainable Energy*, vol.11, no. 6, 2019.
- [14] M. E. Cafferky, "The Porter five-forces industry analysis framework for religious nonprofits: A conceptual analysis," presented to the 25th Annual CBFA Conference, Point Loma Nazarene University, 2005.
- [15] S. Devadoss, and J. Kropf, "Impacts of trade liberalizations under the Uruguay Round on the world sugar market," *Agricultural Economics*, vol. 15, no. 2, pp. 83-96, 1996.
- [16] Food and Agriculture Organization (2020), "Sugar Report," Markets and Trade of Sugar [2020]. Available: <https://www.fao.org.tr>. [Accessed: Feb. 28, 2022].
- [17] International Sugar Organization, "Sugar Report," *International Sugar Organization*, 2022. [Online]. Available: <https://www.isosugar.org/search.php>. [Accessed: Mar.17, 2022].
- [18] U.S. Department of Agriculture, Economic Research Service, "Sugar and sweeteners yearbook table," *U.S. Department of Agriculture, Economic Research Service*, 2022. [Online]. Available: <https://www.ers.usda.gov>. [Accessed: Mar. 23, 2022].
- [19] USDA Foreign Agricultural Service, "Sugar: World Markets and Trade," *USDA Foreign Agricultural Service*, 2022. [Online]. Available: <https://www.fas.usda.gov.tr>. [Accessed: Mar. 23, 2022].
- [20] K. Faruk, "The Effects of the Global and Regional Policies to Sugar Factories in Turkey an Example; Ağrı Sugar Factory," *Coğrafya Dergisi*, vol. 31, pp. 41-61., 2015.
- [21] Türkiye Şeker Fabrikaları Anonim Şirketi, "2020 Yılı Şeker Faaliyet Raporu," *Türkiye Şeker Fabrikaları Anonim Şirketi*, 2022. [Online]. Available: <https://www.turkseker.gov.tr>. [Accessed: Mar. 25, 2022].
- [22] Organisation for Economic Co-operation and Development (2020), "Sugar," *Organisation for Economic Co-operation and Development*. [2022]. Available: <https://data.oecd.org>. [Accessed: Mar. 23, 2022].
- [23] London Exchange, "London Stock Exchange in Sugar," *London Exchange*. [2022]. Available: <https://www.londonstockexchange.com.tr>. [Accessed: Mar. 21, 2022].
- [24] Türkiye İstatistik Kurumu, "Bitkisel Üretim İstatistikleri," *Türkiye İstatistik Kurumu*. [2020]. Available: <https://biruni.tuik.gov.tr>. [Accessed: Mar.26, 2022].
- [25] Republic of Türkiye Ministry Of Agriculture and Forestry, "Dünya Şeker Sektörü," *Republic of Türkiye Ministry Of Agriculture and Forestry Sugar Department Presidency*. [2020]. Available: <https://www.tarimorman.gov.tr>. [Accessed: Mar. 22, 2022].
- [26] Fortune Business Insights, "Sugar Substitutes Market," (2020). *Fortune Business Insights*. Available: <https://www.fortunebusinessinsights.com>. [Accessed: Mar. 25, 2022].