

Araştırma Makalesi

**Food Crisis and Competitive Analysis of Selected Agricultural
Products in Türkiye**

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Abstract

It is known that the agricultural sector affects national income, employment, foreign trade, and industry. Due to compulsory food consumption, the agricultural sector is an essential sector and is important for the current and future situation of the country's economy. It is known that the agricultural potentials of the countries are affected by reasons such as changing consumption habits and the global climate. Global climate change directly affects agricultural areas through extreme weather events such as droughts and floods. It is estimated that global climate change will be the main cause of a possible food crisis in the coming years, so countries need to examine their agricultural structures and take measures against a possible food crisis. Agriculture has an important place in the Turkish economy. It is known that Türkiye is the leading country in foreign trade in some agricultural products. The main purpose of this study is to test whether Türkiye is a competitive country in agricultural products. In the study, the Revealed Comparative Advantages (RCA) index was used to measure Türkiye's competition in agricultural products. The study period covers the years 2000-2021. According to RCA index calculations, it was found that Türkiye has disadvantages in 19 of 46 agricultural products and advantages in 27 of 46 agricultural products. These 27 agricultural products are divided into three categories: weak, medium, and strong advantage levels. Accordingly, Türkiye was found to have a weak advantage in 5 agricultural products, a medium advantage in 9 agricultural products, and a strong advantage in 13 agricultural products.

Keywords: Agriculture sector, revealed comparative advantage index, Türkiye

JEL Classification Codes: Q17, F14, O50

Gıda Krizi ve Türkiye'de Seçilmiş Tarımsal Ürünlerin Rekabet Analizi

Öz

Tarım sektörünün; milli geliri, istihdamı, dış ticareti ve sanayiye etkilediği bilinmektedir. Zorunlu gıda tüketimi nedeniyle tarım sektörü elzem bir sektör olmakta, ülke ekonomisinin mevcut ve gelecek durumu için önem teşkil etmektedir. Değişen tüketim alışkanlıkları, küresel iklim gibi nedenlerle ülkelerin tarım potansiyellerinin etkilendiği bilinmektedir. Küresel iklim değişikliği beraberinde getirdiği kuraklık, sel gibi aşırı hava olayları ile tarım alanlarını doğrudan etkilemektedir. Gelecek yıllarda yaşanacak olası bir gıda krizinde küresel iklim değişikliğinin temel sebep olacağı tahmini edilmektedir, bu nedenle ülkelerin tarımsal yapılarını incelemeleri ve olası bir gıda krizine karşı önlemler almaları gerekmektedir. Türk ekonomisi yapısal olarak incelendiğinde tarım sektörü nispeten önemli bir yere sahiptir. Türkiye'nin bazı tarım ürünlerinde dış ticarete lider ülke olduğu da bilinmektedir. Bu çalışmanın temel amacı Türkiye'nin tarımsal ürünlerdeki rekabetçi ülke konumunda olup olmadığını sınamaktır. Çalışmada Türkiye'nin tarımsal ürün rekabetini ölçmek için Açıklanmış Karşılaştırmalı Üstünlükler (RCA) endeksi kullanılmıştır. Çalışma dönemi 2000-2021 yıllarını kapsamaktadır. Açıklanmış Karşılaştırmalı Üstünlükler endeksi hesaplamalarına göre Türkiye'nin 46 tarımsal ürün çeşidinden 19'unda dezavantaja, 27'sinde ise avantaja sahip olduğu bulunmuştur. Bu 27 tarımsal ürün ise kendi içerisinde zayıf, orta ve güçlü avantaj seviyesi olarak üçe ayrılmaktadır. Buna göre Türkiye'nin 5 tarımsal üründe zayıf, 9 tarımsal üründe orta ve 13 tarımsal üründe güçlü avantaja sahip olduğu bulunmuştur.

Anahtar kelimeler: Tarım sektörü, açıklanmış karşılaştırmalı üstünlükler endeksi, Türkiye

Jel Sınıflandırma Kodları: Q17, F14, O50

Geliş Tarihi (Received): 26.05.2023 – Kabul Edilme Tarihi (Accepted): 09.09.2023

Atıfta bulunmak için / Cite this paper:

Pehlivanoglu, F., Erarслан, C., Yardımcı, M. E. and Köken, M. (2023). Food crisis and competitive analysis of selected agricultural products in Türkiye. *Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 13 (3), 953-975. DOI: 10.18074/ckuiibfd.1303143

1. Introduction

Agricultural trade is an important part of overall economic activity. Domestic agricultural production not only plays an important role in employment but also has an important role in global food security. Countries that do not have a competitive advantage over their trading partners in agricultural products face the difficulties of not being able to compete as well as harbouring threats that may lead to a deterioration of their security. Competitiveness is the cornerstone of the economy for countries to develop or continue the development of their economies. The country that holds the competitive power has a say in foreign trade in that product/product group or sector. With increasing globalisation, it is becoming more and more important for countries to have competitive power.

With the acceleration of globalisation, agricultural trade has increased more especially after 2000s. This has resulted in a reduction in the cost of long-distance transport of bulky and perishable products, the information and communication technology revolution, and an increase in government support for agricultural trade. Therefore, there has been a rapid decline in cross-border trade costs for agricultural products. In addition, these developments have boosted economic growth, reduced extreme poverty globally and, in the process, changed global agricultural production, consumption and hence trade patterns (Anderson, 2010, p. 3007). In the literature, various analyses and methods are used to compare the trade of countries, but one of the most widely used methods when it comes to comparing the competitiveness of countries in a product or sector is the theory of comparative advantage.

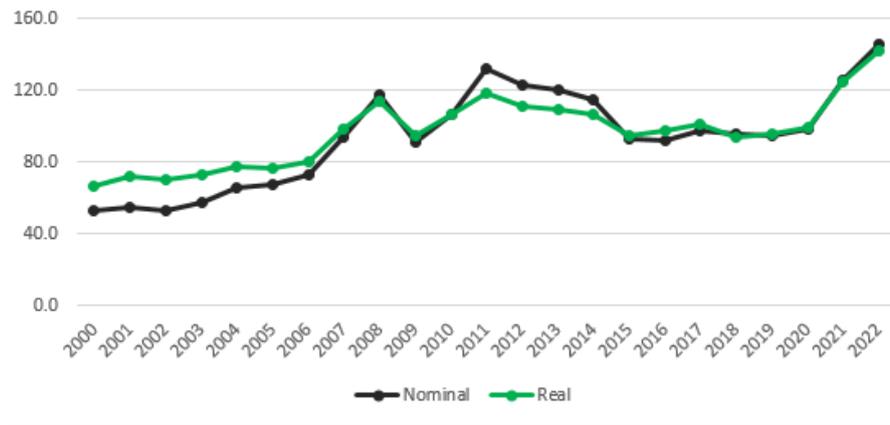
Following the development of the theory of comparative advantage, the issue of assessing comparative advantage has attracted the attention of trade theorists. Comparative advantage can be defined in a wide range of ways, but it is usually measured by the RCA index, first proposed by Balassa. Based on the economic efficiency of an industry, the Balassa RCA index is easily calculated and widely used. In addition, this index reveals a country's weak and strong export sectors and provides a simple way to evaluate a country's trade policy (Zhang and Sun, 2022, p. 3). For this reason, Balassa's RCA index was utilised in this study in order to investigate Türkiye's competitiveness in agricultural products and reveal the current situation.

In this study, the period between 2000-2021 is analysed and the data used in the calculation of the RCA index are obtained from the Food and Agriculture Organisation of the United Nations (FAO) database. Türkiye's competitive position in 46 agricultural products obtained from the FAO database was analysed. In the study, firstly, the emergence of the world food crisis was evaluated, the concept of competitiveness was defined, then the current structure of the situations that would affect Türkiye's agricultural competitiveness was examined and finally an empirical analysis was given. Since the study covers a recent period and agricultural products

show diversity, it is expected to be an indicator for the policies to be formulated to increase the competitiveness of agricultural products and improve the export of agricultural products.

2. World Food Crisis

The world food crisis emerged in 2006-2008, which included a near doubling of international wheat and maize prices in two years and a tripling of international rice prices in just a few months. This rapid increase in the international prices of staple foods has caused concern around the world (Headey, 2013, p. 1). During the world food crisis, agricultural and food product prices increased periodically due to a combination of multiple reasons, and for the first time outside of the global food crisis periods, all basic agricultural products experienced an increase in the same period but at different rates (Kıymaz, 2014, p. 23). This increase in food prices between 2000 and 2022 is shown below on Chart 1 with the help of the food price index.



Graph 1: Food Price Index (2000-2022)

Source: Food and Agriculture Organization (FAO, date of access: November 2022, <https://www.fao.org/worldfoodsituation/foodpricesindex/en/>)

According to the food price index announced by the Food and Agriculture Organisation, both the nominal price index and the real price index increased significantly in 2006. The nominal price index, which was 72.6 in 2006, rose to 94.3 in 2007, while the real price index, which was 80.7 in the same period, rose to 98.8. In 2008, this increase continued and the nominal price index stood at 117.5, while the real price index stood at 114.3. Although there was a decline in 2009, price indices did not fall to levels before the food crisis after this period. In the 2015-2020 periods, price indices followed a partially linear course, but there was an increase in 2021 and this increase continued in 2022. In 2021, the Covid-19 global pandemic crisis is thought to be the reason for this increase.

The causes of the world food crisis in 2006-2007 can be classified in various ways. However, high growth rates in the world, climate change, globalisation and foreign trade, changes in world food and supply demand, and an increase in costs arising from oil prices can be considered among the main reasons. Among these reasons, it is thought that the changes in food supply and demand have the greatest impact.

The main reason for the world food crisis was the change in the balance of supply and demand, which led to an excessive increase in the demand side of the food supply and demand balance (Gürlük and Turan, 2008, p. 72). Supply-side factors of the world food crisis include shortages in food availability caused by a decline in production or diversion of food for non-food use, and increases in the cost of inputs involved in food production, such as rising prices of crude oil and other energy resources. Demand-side factors can be categorised as population growth, a higher use of food, which may result from an improvement in purchasing power or significant changes in the correlation between crude and food prices at different stages of the trend in crude prices (Chand, 2008, p. 116).

3. Competitiveness, Its Importance and Effects

With the rapid globalisation of the economy, the nature of competition has changed radically. This new competition has emphasised the interdependence of globalisation (trade in goods and services, direct investment, technology transfers, and capital movements). Countries have made it a target to increase their market shares in order to achieve competitiveness in this new competitive environment.

One of the fundamental questions in economics is how to allocate resources to ensure social welfare, including full employment and high living standards. Countries are interested in which sector can make the highest contribution to their economic growth and the concept of competitiveness is often used to analyse this situation in the economy.

In the "Framework-Conditions for Industrial Competitiveness" published in 1994, the Organisation for Economic Co-operation and Development (OECD) defines competitiveness as the ability of firms, industries, regions and nations or international regions to be exposed to competition and to generate relatively high levels of factor income and employment on a sustainable basis (Gassmann,1995, p.39).

The concept of competitiveness can be explained at various levels from firm (micro) level to sectoral, regional and national (macro) level. While the concept of competitiveness at the macro level refers to a continuous increase in living standards, the concept of competitiveness at the sectoral level refers to the performance of a particular industry in a particular country or region relative to the same industry in other countries or regions. The labelling of a sector as competitive is shaped by its capacity to grow, innovate, produce more and better quality goods

and services, and gain or maintain market shares in international and domestic markets (European Commission, 2009, p. 106).

Factors affecting international competitiveness have become one of the most controversial issues in the economic literature. The fact that there are too many of these factors has caused the lack of a common point for the subject mentioned. However, there are two main approaches to competitiveness, one of which is the cost-based "traditional approach" based on classical comparative advantages. In this approach, the factor that determines the competitiveness of a country is cheap and abundant labour. The other approach belongs to M.E. Porter, the most important and comprehensive study among the new trade theories. Porter states that in general, competitiveness is not a static but a dynamic phenomenon and that this phenomenon is created by the firms of a country. He emphasised that four factors are important in creating competitiveness. These are factor conditions, demand conditions, support industries and industry structure, and there are also two external factors, namely the role of the state and the system of interactions (Kum, 1999, pp. 165-166).

Factors affecting competitiveness in agriculture include labour force used in agricultural production, the size and productivity of arable land, agricultural subsidies, technological superiority, irrigation, fertiliser prices, and investments in R&D.

4. An Overview of the Conditions That Will Affect Türkiye's Agricultural Competitiveness

The agricultural sector is often an integral part of economic systems. The place of this sector in the national economy is measured by the added value created by agriculture in the general economy. This value-added consists of the output resulting from agricultural activities, agricultural output, foreign trade, employment and input supply to other sectors (Dođan, Arslan and Berkman, 2015, p. 34). On the other hand, whether any unit or group in a market is competitive or not is determined by a comparison with units or groups producing goods or services in the same field (Kıymaz, 2014, p. 27). Before focussing on Türkiye's competitiveness in agricultural products, it is considered useful to look at the general outlook of the conditions that will affect agricultural competitiveness. For this purpose, firstly, Türkiye's arable agricultural areas are provided in Table 1 below.

Table 1: Agricultural Land and Distributions in Türkiye (Thousand Hectares)

	Total utilized agricultural land	Area of cereals and other crop products		Area of vegetable gardens	Area of ornamental plants	Area of fruits, beverage and spice crops	Land under permanent meadows and pastures
		Sown area	Fallow land				
2001	40.967	17.917	4.914	909	-	2.610	14.617
2002	41.196	17.935	5.040	930	-	2.674	14.617
2003	40.665	14.408	4.991	911	-	2.717	14.617
2004	41.210	17.962	4.956	895	-	2.780	14.617
2005	41.223	18.005	4.876	894	-	2.831	14.617
2006	40.493	17.440	4.691	850	-	2.895	14.617
2007	39.504	16.945	4.219	815	-	2.909	14.617
2008	39.122	16.460	4.259	836	-	2.950	14.617
2009	38.912	16.217	4.323	811	-	2.943	14.617
2010	39.011	16.333	4.249	802	-	3.011	14.617
2011	38.231	15.692	4.017	810	4	3.091	14.617
2012	38.399	15.463	4.286	827	5	3.201	14.617
2013	38.423	15.613	4.148	808	5	3.232	14.617
2014	38.558	15.782	4.108	804	5	3.243	14.617
2015	38.551	15.723	4.114	808	5	3.284	14.617
2016	38.328	15.575	3.998	804	5	3.329	14.617
2017	37.964	15.498	3.697	798	5	3.348	14.617
2018	37.797	15.421	3.513	784	5	3.457	14.617
2019	37.716	15.398	3.387	790	5	3.519	14.617
2020	37.762	15.628	3.173	779	5	3.559	14.617
2021	38.089	16.062	3.059	755	5	3.591	14.617

Source: Turkish Statistical Institute [TURKSTAT] (Date of Access: December, 2022)

As can be seen in Table 1, from 2001 to 2021, there was a decrease of 2,878 thousand hectares in Türkiye's total agricultural areas in this 20-year period. During this period, there had been a decrease of 1.855 thousand hectares in both the arable and fallow areas of crops and 154 thousand hectares in the area of vegetable gardens. In the period 2001-2021, there was an increase in some agricultural areas, one of these areas is the area of fruits, beverages and spice plants with 981 thousand hectares, and the other is the area of ornamental plants, which was created with an area of 5 thousand hectares after 2011. In the 20-year period, meadow and pasture land remained constant with an area of 14.617 thousand hectares.

Looking at the sectoral shares in the gross domestic product of a country, one can get an idea about the development of that country. For example, when the agricultural sector has the highest share in a country, it can be interpreted that this country has a low level of development. However, the low share of the agricultural sector in GDP should not be perceived as an indicator of development. The important point here is that the agricultural sector should have a ratio compatible with other sectors. Table 2 shows the values and shares of Türkiye's agricultural sector in GDP.

**Table 2: The Share of Agricultural Products in Gross Domestic Product
 (Thousand TRY)**

	GDP Value (Thousand TRY)	Shares in GDP (%)		GDP Value (Thousand TRY)	Shares in GDP (%)
2000	17 205 761	9.6	2012	121 692 893	7.4
2001	21 729 848	8.3	2013	121 733 979	6.4
2002	36 901 720	9.7	2014	134 744 489	6.3
2003	46 249 933	9.4	2015	161 471 476	6.6
2004	54 365 145	9.0	2016	161 330 969	6.0
2005	62 349 598	8.8	2017	189 232 800	5.8
2006	64 415 593	7.8	2018	217 107 229	5.5
2007	66 197 107	7.2	2019	276 325 464	6.2
2008	74 451 345	7.2	2020	336 623 140	6.4
2009	81 234 274	7.8	2021	401 805 954	5.3
2010	104 703 635	8.6	2022*	676 933 709	5.9
2011	114 838 169	7.9			

Source: TURKSTAT (date of access: December, 2022) (*it includes the first 10 months of 2022)

While the TL value of agricultural products in GDP increased continuously in the 2000-2022 period, the share of agriculture in GDP decreased. In 2000, the GDP value of agricultural products was 17.205.761 thousand TL and the share of agriculture sector in GDP was realised as 9.6%. Although the data for 2022 covers the first 10 months, the TL value of agricultural products in GDP reached the highest value in this period. In 2022, the GDP value of agricultural products was 676,933,709 thousand TL, while its share in GDP was 5.9%. This situation is considered as a natural consequence of the decrease in the share of agricultural products in GDP with the increase in industrialisation.

The theory assumes that the relationship between the agricultural sector and economic development is inverse. The desired tendency in the process of economic development is to decrease the contribution of the agricultural sector to employment. What is important here is the nature of the contribution of the agricultural sector to the labour force and the new employment opportunities created in non-agricultural sectors. Otherwise, the phenomenon of migration may cause serious social and economic problems in cities (Uzundumlu, 2012, p. 36). Although the number of people employed in the agricultural sector is low in developed economies, the yield obtained is expected to be high. However, it is not always certain that this will happen. The number and percentage of people employed in the agricultural sector in Türkiye in the 2014-2021 period are shown in Table 3. Accordingly, the number of people employed in agriculture in Türkiye was 62,636 thousand in 2014, which constitutes 20.22 percent of total employment. Between 2014 and 2021, there was a continuous decrease in the percentage of agricultural employment. In 2021, while the number of people employed in agriculture was 59,439 thousand, this number constituted 17.20% of total employment. Both the share of the agricultural sector in national income and its share in total employment decreased. Nevertheless, the agricultural sector still maintains its important position in Türkiye as well as in the whole world.

Table 3: Agricultural Products Foreign Trade Data and Employment in Agriculture

	Agricultural Exports (Thousand USD)	Agricultural Imports (Thousand USD)	The Foreign Trade Weight in Agricultural	The Number of People Employed in Agriculture (Thousand Person)	Employment in Agriculture (%)
2014	5 350 825	8 775 412	- 3 424 587	62 636	20.22
2015	4 908 465	7 321 655	- 2 413 190	64 279	20.18
2016	5 259 186	7 220 920	- 1 961 734	63 446	19.47
2017	5 112 795	9 275 425	- 4 162 630	64 816	19.24
2018	5 337 306	9 409 530	- 4 072 224	63 387	18.40

Table 4: Agricultural Products Foreign Trade Data and Employment in Agriculture (Continued)

	Agricultural Exports (Thousand USD)	Agricultural Imports (Thousand USD)	The Foreign Trade Weight in Agricultural	The Number of People Employed in Agriculture (Thousand Person)	Employment in Agriculture (%)
2019	5 052 063	9 757 734	- 4 705 671	61 154	18.14
2020	5 383 757	9 777 905	- 4 394 148	56 701	17.71
2021	6 479 332	12 003 492	- 5 524 160	59 439	17.20

Source: TURKSTAT (Date of Access: December 2022)

Looking at the foreign trade weight of Türkiye's agricultural sector, it can be said that agricultural exports followed a fluctuating course in the 2014-2021 period. While the lowest agricultural exports were USD 4,908,465 in 2015, the highest agricultural exports were USD 6,479,332 thousand in 2021. Similar to agricultural exports, agricultural imports also have a tendency to fluctuate. The lowest agricultural imports were 7,220,920 thousand US dollars in 2016, while the highest agricultural imports were 12,003,492 thousand US dollars in 2021. In the post-2014 period, Türkiye has faced a continuous agricultural external deficit.

Agricultural support is important for countries to contribute to the agricultural sector and for the protection and progress of this sector. The main objective of agricultural support policies is to protect producers and consumers against agricultural prices and to eliminate imbalances in income distribution. As secondary objectives, increasing the contribution of the agricultural dimension in increasing economic growth and development and eliminating environmental problems can be counted (Günsoy and Günsoy, 2000, p. 149). The OECD has identified four different indicators to measure countries' agricultural policy support, which are comparable across countries and time, and provide information on the agricultural competitiveness of countries and how and at what level new policies will be implemented.

The broadest of these indicators, the Total Support Estimate (TSE), includes three different factors, firstly transfers to agricultural producers individually, secondly policy expenditures for the primary agricultural sector collectively, and lastly budget support to consumers of agricultural commodities. The Total Support Estimate can be defined as a net transfer indicator that includes both favourable and unfavourable factors (OECD, 2022, p. 84).

In the world, the cost of transfers to agriculture for agricultural support is borne by taxpayers through the budget or by consumers in the case of products where market

prices are higher than world prices due to customs duties. The OECD has defined a variable called PSE for this purpose (Yüceer, Tan and Semerci,2020, p.41). The Producer Support Estimate (PSE) is an indicator that separately measures all transfers to agricultural producers. PSE can be divided into two main types of transfer: 1) Market Price Support (MPS), represents transfers from taxpayers and consumers to agricultural producers at domestic prices higher than international reference prices due to domestic and foreign policies. 2) Budget support is financed solely by taxpayers and is further divided into several categories with different implementations of key policies. PSE is defined as a net transfer indicator that includes both positive and negative factors. The other two indicators are the General Service Support Estimate (GSSE) and the Consumer Support Estimate (CSE). The GSSE measures policy expenditure that recognises the primary agricultural sector as the main beneficiary, but does not go to individual producers (OECD, 2022, p. 84). The CSE shows the transfers from consumers and taxpayers to producers in a given year as a result of the policies implemented. A negative value of the CSE implies a relative tax burden on consumers (State Planning Organization, [SPO], 2000, p. 38).

Table 5: Agricultural Supports in Türkiye (2000-2021)

	Million USD				Percentage of Gross Farm Income
	TSE	GSSE	CSE	PSE	PSE
2000	14156.23	4286.168	-7083.52	8759.893	31.38653
2001	7230.836	3534.337	-2107.19	2941.245	16.18203
2002	9299.32	2699.174	-4349.73	6064.962	25.2367
2003	10799.82	1429.904	-8906.33	10771.03	30.89359
2004	11107.62	1276.021	-9805.31	12524.63	29.73773
2005	13528.23	2671.184	-10238.1	14142.02	28.40576
2006	14960.22	2754.794	-11849.3	16023.01	30.8297
2007	12451.68	1524.246	-11197.1	15521.52	24.8898
2008	14236.97	2389.804	-13347.1	18425.01	26.8859
2009	13967.63	2866.84	-12622.6	16538.03	27.62809
2010	20829.38	2763.161	-17982.6	24823.83	30.19783
2011	17455.32	3366.38	-13728.3	20905.47	24.92496
2012	16494.11	2212.923	-11847.8	18987.57	23.38286
2013	13892.67	3293.832	-8458.7	15148.63	20.91979
2014	15578.59	3038.01	-11144.8	17631.61	26.14784

Table 6: Agricultural Supports in Türkiye (2000-2021) (Continued)

	Million USD				Percentage of Gross Farm Income
	TSE	GSSE	CSE	PSE	PSE
2015	18363.55	2852.441	-11166.4	17518.65	26.39774
2016	19488.03	2685.519	-12863.7	18865.33	29.35619
2017	15567.75	2827.564	-9448.28	14721.33	23.79692
2018	8916.739	2185.36	-4884.75	8338.045	15.18204
2019	9723.893	1089.431	-6106.62	9795.341	17.44894
2020	14631.52	1018.273	-6182.3	15655.03	26.02529
2021	7479.941	1380.244	-5484.48	7465.964	15.12877

Source: OECD data (Date of Access: December 2022,
<https://data.oecd.org/agrpolicy/agricultural-support.htm>)

In Türkiye, the lowest TSE value in the last twenty years was 7230.836 thousand US dollars in 2021. The lowest level after this year was USD 7479,941 thousand in 2021. The highest TSI value was in 2010 and this value was 20829.38 thousand US dollars. The trend in the TSE over the twenty-one year period is mostly between 10-15 thousand US dollars. In the 2000-2021 period, the lowest GSSE was realised at USD 1018,273 thousand in 2020. The year 2000 was the year with the highest level. The CSE has taken a negative value in all years, indicating that the relative tax burden on consumers has increased as a result of the policies implemented.

In Türkiye, the PSE has been mostly in the range of 25-30 percent of agricultural gross farm incomes since 2000. Exchange rate movements after 2018 reduced the importance of market price support and the support was realised at lower levels on average. Overall, nominal support increased from the late 1980s to 2022. Starting with the movement towards unbundled payments in the early 2000s, budgetary payments have increased and maintained their importance through successive reforms that have changed their fundamentals. Budget support increased in 2020 as a result of exceptional expenditures related to COVID-19, mainly concessional loans and interest concessions. Macroeconomic conditions, such as exchange rate and inflation, are likely to be important drivers of support levels in the near term (OECD, 2022, p. 552).

5. Literature Review

Due to the importance of the agricultural sector in Türkiye, there are many studies in the economics literature that investigate Türkiye's agricultural production, competitiveness, and policies. The number of studies investigating agricultural competitiveness has a significant place in the body of literature. In this context,

some of the studies on Türkiye's agricultural products using the comparative advantage index are as follows:

The study (2014) conducted by Şahinli aimed to determine the competitiveness of Türkiye's agricultural sector in the international arena. For this purpose, the Revealed Comparative Advantage Index (RCA) was calculated for 601 agricultural commodities for the years 2000-2011. According to the results of the study, Türkiye was found to have a comparative advantage in 78 agricultural commodities.

Bashimov (2017) analysed Türkiye's comparative advantage in the trade of agricultural and food products. RCA index and Trade Balance Index (TBI) were used in the study. The study is based on secondary data and covers the period 2002-2015. According to the Revealed Comparative Advantage Index, Türkiye has a comparative advantage in 11 product groups and a comparative disadvantage in 13 product groups.

Bashimov, Çiçek and Aydın (2017) analysed the competitiveness of the Turkish food industry and the level of intra-industry trade in the sector. In the study, the RCA Index, Explained Symmetric Comparative Advantage Index, Net Trade Index and Grubel-Lloyd Index were used. The period of 2001-2015 was used in the study. As a result of the research, Türkiye's competitiveness in the food sector was found to be high. Moreover, the level of intra-industry trade in cocoa, edible food preparations, beverages and tobacco products was found to be high.

The study (2020) conducted by Bashimov aimed to determine whether the Baltic countries have a comparative advantage in the export of selected agricultural products. In the study, the calculation was made using the RCA Index. The study covered the period 2001-2018. The study was based on the two-digit product classification of the Harmonised System. As a result of the analysis, it was revealed that Latvia has a comparative advantage in milk and dairy products, cereals and fruit exports, Estonia has a comparative advantage in milk and dairy products and cereals exports, and Lithuania has a comparative advantage in all of the products considered in the Baltic countries.

Tatar (2020) analysed Türkiye's comparative advantage in the fruit and vegetable product group with selected border neighbours (Georgia, Iraq, Syria, Bulgaria and Greece) using the Revealed Comparative Advantage Index (RCA) and Revealed Symmetric Comparative Advantage Analysis (RSCA). The study covered the period 2010-2019. As a result of the study, it was found that the sector in which Türkiye is the most disadvantaged among the country groups in terms of Türkiye-Georgia foreign trade competitiveness is the SITC 54 coded sector (vegetables, dried legumes, etc.). In terms of Türkiye-Syria foreign trade competitiveness, SITC 57 (fresh/dry fruits and nuts) was found to be the most advantageous sector for Türkiye among the country groups.

The study conducted by Yılmaz and Genç (2021) aimed to determine the competitiveness levels of the "Food Products and Beverages" sector and the products within the sector for the period 2010-2019 in Türkiye. For this, Balassa's RCA Index was used, and they identified a quadruple distinction in the competitiveness level of the sector: "Strong Competitive Advantage", "Moderate Competitive Advantage", "Weak Competitive Advantage" and "Competitive Disadvantage". According to the results of the study, while Türkiye was competitive in the Food Products and Beverages Sector according to the RCA index, its competitiveness level was found as "Weak Competitiveness Superior".

The study conducted by Yıldız (2022) evaluated Türkiye's comparative advantage in vegetable production between 2002 and 2020 with the Revealed Comparative Advantage Index (RCA) and Revealed Symmetric Comparative Advantage Analysis (RSCA). According to the results of RCA analyses, Türkiye was found to be more competitive with respect to China, the USA, Belgium, France and Italy and less competitive with respect to Spain, Mexico, and the Netherlands. In the study, it was found that there was a parallelism between the results of RSCA and RCA analyses.

6. Findings

In this study, Türkiye's comparative advantage in agricultural products was measured by the Revealed Comparative Advantage Index (RCA) and it was evaluated whether Türkiye has a level of competition in agricultural products.

Revealed Comparative Advantage (RCA) analysis was first formulated by Balassa (1965). The RCA is also referred to as the Balassa index (Latruffe, 2010, p.7). Since Balassa, the RCA index has been used in numerous applications as a measure of a country's relative ability to produce goods vis-à-vis its trading partners (French, 2017, p. 2). RCA is calculated for i country 's j good as follows:

$$RCA_{ij} = (X_{ij}/X_{ik})/(X_{wj}/X_{wk}) \quad (1)$$

Where, X refers to exports; k , refers to all goods; w , refers to all countries $AK\ddot{U}_{ij}$; refers to i country's declared index of mutual advantage for j good. X_{ij} indicates i country's exports of j good, X_{ik} indicates total exports of i country, X_{wj} ; indicates the world's j goods exports, X_{wk} indicates total exports of countries and commodities other than i country and j good.

A Balassa index greater than 1 is commonly used to identify products/sectors with a comparative advantage. In other words, when the RCA value is greater than 1, that product/sector has a comparative advantage. However, this situation has made comparisons between countries difficult. Hinloopen and Marrewijk (2001) divided the Balassa index into four categories for easy interpretation. Accordingly, an index value greater than 0 and less than or equal to 1 indicates that there is no comparative

advantage. An index value greater than 1 indicates the existence of a comparative advantage. However, the degree of this comparative advantage varies. If the index has a value greater than 1 and less than/equal to 2, it is called "weak comparative advantage", if greater than 2 and less than/equal to 3, it is called "moderate comparative advantage" and if greater than 3 and less than/equal to 4, it is called "strong comparative advantage" (Hinloopen and Marrewijk, 2001, p. 18).

This study covers the years 2000-2021 and the data used in the study were obtained from the database of the Food and Agriculture Organisation of the United Nations (FAO). The export data used is calculated in US dollars. Table 5 shows the RCA index values of selected agricultural products in Türkiye.

Table 7: Türkiye Agricultural Products RCA Indices

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Pistachios, in shell	0.38	3.59	1.50	0.76	0.62	0.60	1.46	1.34	3.00	2.11	0.68
Pears	0.73	0.52	0.78	0.74	0.35	0.46	0.26	0.25	0.34	0.46	0.93
Barley	1.04	1.02	3.18	1.87	0.00	1.35	1.85	0.76	0.00	1.03	2.05
Avocados	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sunflower-seed oil	1.79	1.31	0.42	0.85	0.85	0.93	2.48	0.73	2.81	2.32	2.28
Quinces	0.00	56.0	60.49	45.07	47.14	41.02	33.28	31.58	39.51	39.34	0.00
Almonds, in shell	0.15	0.18	0.06	0.12	0.17	0.36	0.21	0.62	1.40	1.69	1.43
Wheat	2.45	1.32	0.06	0.00	0.00	0.38	0.51	0.02	0.02	0.23	0.83
Walnuts, shelled	0.58	0.47	0.16	0.26	0.36	0.26	0.24	0.64	1.81	1.39	2.79
Rye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tomatoes	1.91	2.31	2.58	2.58	3.02	3.48	3.21	4.01	6.49	6.67	7.31
Apples	0.34	0.43	0.25	0.32	0.30	0.33	0.23	0.08	0.23	0.46	0.64
Beans, dry	0.93	1.21	0.85	2.69	1.38	0.33	0.33	0.16	0.28	0.89	0.14
Hazelnuts, in shell	102.23	111.56	93.09	84.25	94.05	89.10	92.95	79.17	90.51	80.92	96.31
Poppy seed	40.68	56.29	39.64	59.24	44.29	33.55	32.19	20.30	22.62	37.63	37.94
Carrots and Turnips	1.43	1.28	0.96	1.84	1.32	1.26	1.12	1.11	1.27	1.14	1.34
Figs	0.00	39.76	28.98	37.34	34.34	33.96	32.50	28.19	36.08	36.16	0.00
Unmanufactured tobacco	11.07	8.22	6.64	7.54	7.38	8.33	6.85	5.00	5.37	5.16	4.68

Table 5: Türkiye Agricultural Products RCA Indices (Continued)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Squash and gourds	0.00	0.37	0.71	1.33	1.59	1.80	1.81	1.80	2.93	2.99	4.86
Buckwheat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cauliflowers	0.01	0.05	0.02	0.03	0.03	0.08	0.05	0.05	0.03	0.08	0.05
Watermelons	0.57	0.60	0.61	1.66	0.86	0.70	0.50	0.66	1.45	0.67	0.63
Apricots	2.61	3.39	2.82	4.93	5.73	5.39	4.46	4.90	11.42	7.26	9.62
Chestnuts	3.37	4.82	8.62	6.28	5.83	5.83	3.16	0.59	3.07	2.43	2.53
Cherries	10.16	18.74	18.26	19.89	23.91	17.32	17.55	16.29	14.30	14.78	14.58
Cabbages	0.29	0.25	0.26	0.30	0.32	0.23	0.24	0.17	0.33	0.23	0.24
Lemons and limes	13.00	14.48	13.05	9.40	10.79	16.94	13.08	11.75	12.01	18.71	19.90
Mandarins	4.19	6.65	4.42	4.65	5.13	4.90	5.75	4.83	7.43	8.37	10.05
Lentils	11.85	12.27	18.40	26.29	23.77	13.72	24.45	12.70	8.91	12.71	15.78
Flour of maize	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chickpeas, dry	13.94	17.86	12.75	29.86	24.57	23.61	15.11	10.04	14.87	12.55	8.67
Potatoes	0.76	1.01	0.07	1.02	0.80	0.39	0.26	0.91	0.31	0.20	0.35
Eggplants	1.83	1.95	1.77	2.26	1.81	2.25	1.61	1.40	2.03	2.07	2.48
Leeks and other alliaceous vegetables	1.81	2.99	1.73	2.94	2.00	1.94	2.14	0.99	1.80	2.27	2.42
Rice	0.11	0.10	0.07	0.11	0.09	0.09	0.05	0.05	0.04	0.05	0.05
Pomelos and grapefruits	5.92	5.31	6.59	6.60	9.50	8.84	10.01	7.66	12.19	12.45	14.68
Oranges	2.45	3.28	2.66	2.68	2.14	3.44	3.57	2.58	3.28	4.69	4.80
Cucumbers	0.62	1.15	1.12	1.03	1.17	1.51	1.92	2.03	3.57	4.32	4.65
Peaches and nectarines	0.65	0.95	1.17	2.33	1.26	1.90	1.42	0.84	2.11	1.53	1.68
Sugar cane	0.03	0.13	0.33	0.34	0.04	0.13	0.05	0.00	0.00	0.00	0.00
Sugar beet	5.81	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweet potatoes	0.00	0.00	0.46	0.10	0.03	0.00	0.44	0.04	0.00	0.00	0.01
Grapes	1.65	1.80	2.03	2.05	3.09	2.74	2.15	2.40	3.81	3.19	4.26
Blueberries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green chilli	1.78	1.55	1.79	1.84	2.00	2.48	1.92	1.54	2.02	1.99	2.10
Olives	0.00	0.17	0.08	0.26	0.27	1.55	0.14	0.14	0.65	0.11	0.00

Table 5: Türkiye Agricultural Products RCA Indices (Continued)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Pistachios, in shell	1.77	1.71	2.51	0.56	2.00	1.85	1.20	2.11	4.80	4.74	5.68
Pears	0.24	0.43	0.36	0.45	0.43	0.36	0.73	0.76	0.86	1.47	1.54
Barley	0.02	0.38	0.00	0.03	0.00	0.00	0.02	0.04	0.14	0.03	0.32
Avocados	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01
Sunflower-seed oil	4.28	4.02	5.16	8.16	8.22	6.89	4.97	3.81	4.01	5.35	4.78
Quinces	51.48	36.90	32.80	22.34	19.48	34.39	35.60	31.16	32.91	38.94	37.32
Almonds, in shell	1.45	1.52	1.69	1.14	0.92	1.12	1.32	0.95	1.27	1.56	1.39
Wheat	0.01	0.08	0.17	0.07	0.09	0.03	0.04	0.06	0.08	0.08	0.15
Walnuts, shelled	2.99	4.07	3.02	3.18	2.74	1.25	1.36	1.15	1.81	2.17	1.58
Rye	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tomatoes	6.45	5.30	4.69	4.66	4.49	2.95	3.16	2.90	3.07	3.08	2.93
Apples	0.62	0.43	0.65	0.53	0.71	0.53	0.77	1.16	1.18	1.46	1.90
Beans, dry	0.09	0.09	0.20	0.51	0.20	0.13	0.22	0.83	3.89	3.54	3.64
Hazelnuts, in shell	84.67	79.05	71.81	68.40	70.86	64.13	60.73	56.42	61.03	57.66	49.94
Poppy seed	41.21	30.79	35.54	25.83	21.78	34.23	7.98	29.20	29.92	9.25	10.68
Carrots and turnips	1.30	0.91	0.78	0.50	0.58	0.91	0.72	0.87	0.88	1.15	1.18
Figs	37.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unmanufactured tobacco	4.01	4.03	3.73	4.50	3.65	3.42	3.17	3.40	2.41	2.91	2.43
Squash and gourds	5.16	3.45	2.80	4.56	3.84	3.04	2.35	3.02	3.31	3.09	3.77
Buckwheat	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.02	0.00
Cauliflowers	0.03	0.06	0.05	0.09	0.07	0.03	0.10	0.08	0.06	0.10	0.31
Watermelons	1.22	0.61	0.53	0.72	0.94	0.72	0.00	0.82	0.66	1.02	0.96
Apricots	9.91	10.58	9.79	6.33	9.71	6.72	10.20	9.47	9.24	14.00	11.27
Chestnuts	3.83	5.21	5.00	9.48	4.47	7.51	10.84	11.23	10.14	7.78	9.32
Cherries	10.33	9.99	10.38	7.56	7.07	8.08	7.14	5.21	4.74	5.79	3.79
Cabbages	0.33	0.18	0.16	0.16	0.23	0.20	0.22	0.21	0.20	0.21	0.22
Lemons and limes	21.49	14.08	13.16	10.26	10.79	9.55	8.75	8.71	6.80	6.98	6.59
Mandarins	10.86	7.49	8.30	8.13	7.13	8.04	7.84	6.56	6.93	7.80	6.84
Lentils	15.44	11.80	9.62	9.01	9.05	10.64	9.47	10.95	9.48	9.96	7.83
Flour of maize	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chickpeas, dry	4.79	2.23	1.80	1.61	1.29	1.66	1.29	6.87	10.08	12.13	10.87
Potatoes	0.47	0.35	1.00	0.10	0.04	0.62	0.63	0.58	0.77	0.55	0.95

Table 5: Türkiye Agricultural Products RCA Indices (Continued)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Eggplants	2.52	2.30	2.88	2.88	3.05	2.87	2.30	2.71	2.56	3.17	3.09
Leeks and other alliaceous vegetables	1.85	1.50	2.62	0.83	0.99	0.84	1.04	0.53	0.85	0.51	1.64
Rice	0.08	0.04	0.02	0.03	0.04	0.01	0.02	0.01	0.02	0.01	0.01
Pomelos and grapefruits	14.90	13.64	10.86	11.39	9.32	10.95	7.26	8.51	6.98	9.39	7.86
Oranges	6.67	5.80	3.95	4.17	3.73	4.03	3.02	2.80	1.74	2.28	1.67
Cucumbers	3.77	3.45	2.94	3.32	2.27	1.26	1.35	1.41	1.30	1.73	1.84
Peaches and nectarines	1.27	1.30	1.17	1.53	1.76	1.25	3.08	3.70	3.79	6.50	5.85
Sugar cane	0.00	0.00	0.00	7.57	1.38	1.43	1.24	0.70	1.05	0.81	0.31
Sugar beet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
Sweet potatoes	0.02	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Grapes	3.05	2.51	2.51	2.57	1.82	1.41	2.26	1.32	1.55	1.64	1.85
Blueberries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green chilli	2.21	1.84	1.79	1.68	1.72	1.90	1.84	2.02	2.01	2.45	2.57
Olives	0.03	0.06	0.13	0.52	0.51	0.13	0.09	0.14	0.83	0.14	0.18

Source: It was Created by the Authors Using FAO (2022) Data.

Table 5 shows the RCA index values of Türkiye's 46 agricultural products for the 2000-2021 period. The products in which Türkiye consistently enjoyed comparative advantage during this period were tomatoes, hazelnuts, poppy seeds, unmanufactured tobacco, apricots, cherries, lemons and limes, tangerines, lentils, chickpeas, eggplants, pomelo and grapefruit, oranges and grapes. The products in which it does not consistently enjoy comparative advantage are avocados, rye, buckwheat, cauliflower, cabbage, flour of maize, rice, sugar beet, sweet potato, blueberries and olives.

Comparing 2000 and 2021, Türkiye had a comparative advantage in 22 out of 46 agricultural products in 2000, while it had a comparative advantage in 29 agricultural products in 2021. The products in which Türkiye had a comparative advantage in 2000 were barley, sunflower seed oil, wheat, tomatoes, hazelnuts (shelled), poppy seeds, carrots and turnips, unmanufactured tobacco, apricots, chestnuts, cherries, lemons and limes, mandarins, lentils, chickpeas (dry), eggplants, leeks and other alliaceous vegetables, pomelos and grapefruit, oranges, sugar beet, grapes and green chilli. In 2021, barley, wheat and sugar beet were removed from this list and replaced with pistachios, pears, quince, almonds, walnuts, apples, beans (dry), pumpkins and gourds, cucumbers, peaches and nectarines.

Table 8: RCA Averages and RCA Classification Equivalents of Türkiye's Agricultural Products

	RCA Av.	RCA Classification		RCA Av.	RCA Classification
Almonds, in shell	0.94	Disadvantage	Lentils	13.37	Strong
Apples	0.62	Disadvantage	Mandarins	6.92	Strong
Apricots	7.72	Strong	Olives	0.28	Disadvantage
Avocados	0.00	Disadvantage	Oranges	3.43	Moderate
Barley	0.69	Disadvantage	Peaches and nectarines	2.14	Moderate
Beans, dry	1.02	Weak	Pears	0.61	Disadvantage
Blueberries	0.00	Disadvantage	Pistachios, in shell	2.04	Moderate
Buckwheat	0.00	Disadvantage	Pomelos and grapefruits	9.58	Strong
Cabbages	0.24	Disadvantage	Poppy seed	31.85	Strong
Carrots and turnips	1.08	Weak	Potatoes	0.55	Disadvantage
Cauliflowers	0.07	Disadvantage	Quinces	34.85	Strong
Cherries	12.08	Strong	Rice	0.05	Disadvantage
Chestnuts	5.97	Strong	Rye	0.01	Disadvantage
Chickpeas, dry	10.84	Strong	Squash and gourds	2.66	Moderate
Cucumbers	2.17	Moderate	Sugar beet	0.29	Disadvantage
Eggplants	2.35	Moderate	Sugar cane	0.71	Disadvantage
Figs	15.67	Strong	Sunflower-seed oil	3.47	Moderate
Flour of maize	0.00	Disadvantage	Sweet potatoes	0.06	Disadvantage
Grapes	2.35	Moderate	Tomatoes	3.97	Moderate
Green chilli	1.96	Weak	Watermelons	0.78	Disadvantage
Hazelnuts, in shell	79.04	Strong	Walnuts, shelled	1.56	Weak
Leeks and other alliacious vegetables	1.65	Weak	Unmanufactured tobacco	5.18	Strong
Lemons and limes	12.28	Strong	Wheat	0.30	Disadvantage

Source: It was created by the authors using FAO (2022) data.

Table 6 shows the 2000-2021 averages and RCA classification equivalents of Türkiye's agricultural products according to the results of the RCA index values. The products in which Türkiye has a disadvantage are pear, barley, avocado,

almond, wheat, rye, apple, buckwheat, cauliflower, watermelon, cabbage, flour of maize, potatoes, rice, sugarcane, sugar beet, sweet potato, blueberry and olive, in which Türkiye does not have a comparative advantage. The products in which Türkiye has a weak comparative advantage are walnuts, beans, carrots and turnips, leeks and other alliaceous vegetables and green chilli, in which Türkiye has a foreign trade advantage. The agricultural products in which Türkiye has a moderate comparative advantage are pistachios, sunflower seed oil, tomatoes, squash and gourds, eggplants, oranges, cucumbers, peaches and nectarines and grapes. Türkiye has a say in foreign trade in these 9 agricultural products. Türkiye's agricultural products in which Türkiye has a strong comparative advantage are quince, hazelnuts, poppy seeds, figs, unmanufactured tobacco, apricots, chestnuts, cherries, lemons and limes, mandarins, lentils, chickpeas, pomelos and grapefruit. Türkiye is the leading country in foreign trade of these agricultural products.

Figure 1 below shows Türkiye's agricultural products with disadvantage, weak, medium and strong advantage according to the RCA averages for the 2000-2021 period.

Disadvantage	Weak	Moderate	Strong
Pears, Barley, Avocados, Almonds-in shell, Wheat, Rye, Apples, Buckwheat, Cauliflowers, Watermelons, Cabbages, Flour of Maize, Potatoes, Rice, Sugar Cane, Sugar Beet, Sweet Potatoes, Blueberries, Olives	Walnuts shelled, Beans dry, Carrots and Turnips, Leeks and other Alliaceous Vegetables, Green Chilli	Pistachios-in shell, Sunflower-seed oil, Tomatoes, Squash and Gourds, Eggplants, Oranges, Cucumbers, Peaches and Nectarines, Grapes	Quinces, Hazelnuts- in shell, Poppy seed, Figs, Unmanufactured Tobacco, Apricots, Chestnuts, Cherries, Lemons and Limes, Mandarins, Lentils, Chickpeas-dry, Pomelos and Grapefruits

Figure 1: The Degrees of Superiority of Turkish Agricultural Products Compared to the RCA Average

Türkiye has disadvantage in 19, weak advantage in 5, medium advantage in 9 and strong advantage in 13 of the 46 selected agricultural products. In general, Türkiye has disadvantages in 19 of these 46 products and advantages in 27 of them. Türkiye's comparative advantage ratio in world foreign trade in the period 2000-

2021 and in 46 products is calculated as 58.7%. This ratio can express that Türkiye is a competitive country in the world in agricultural products.

7. Conclusion, Discussion and Recommendations

It is important that Türkiye's soils are suitable for agriculture and favourable climatic conditions enable almost every agricultural product to grow. Although natural factors support agriculture, it is an inevitable reality that a powerful phenomenon such as globalisation affects foreign trade between countries. Agriculture in Türkiye not only ensures food security but also constitutes an important part of foreign trade. Having foreign trade in agricultural products can be considered an indicator that the country is and/or can be competitive in this field. In order to investigate whether Türkiye is competitive in agricultural products and, if so, at what level, this study analyses Türkiye's comparative advantage in various agricultural products.

In this study, the comparative advantage of Türkiye's agricultural products is analysed using Balassa's Revealed Comparative Advantage (RCA) index for the period 2000-2021. As a result, 27 of Türkiye's 46 agricultural products (pistachios, sunflower seed oil, quince, walnuts, tomatoes, beans (dry), hazelnuts, poppy seeds, carrots and turnips, figs, unmanufactured tobacco, squash and gourds, apricots, chestnuts, cherries, lemons and limes, tangerines, lentils, chickpeas dry, eggplants, leeks and other alliaceous vegetables, pomelos and grapefruit, orange, cucumber, peach and nectarine, grape, green chilli) and 19 (pear, barley, avocado, almond, wheat, rye, apple, buckwheat, cauliflower, watermelon, cabbage, flour of maize, potato, rice, sugarcane, sugar beet, sweet potato, blueberry, olive).

When Türkiye's comparative advantage in agricultural products is evaluated in general, Türkiye has had an advantage of 58.7 percent in the last 22 years. In light of these results, it can be said that Türkiye has a high agricultural potential, but it is necessary to continue to increase the competitiveness of agricultural products. For this purpose, it is considered that policies to support competition, encouragement and support of product growers, increasing productivity in production, orientation towards products with high added value, practices and policies to prevent unregistered employment in the agricultural sector should be implemented.

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Ethics Statement: The authors declare that ethical rules were followed in all preparation processes of this study. In case of detection of a contrary situation regarding scientific ethical issues, all responsibility belongs to the authors of the study, and Çankırı Karatekin University Journal of the Faculty of Economics and Administrative Sciences has no responsibility.