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# FOOD SECURITY: PAST, PRESENT AND FUTURE. THE CASE OF ROMANIA

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## Abstract

*Food security represents the possibility for every person to have access to a sufficient amount of food with an appropriate nutritional value and at an affordable price (Jef et al., 2022). Thus, according to the Food and Agriculture Organization, in the period 1961-2013 the average calories available per person increased by 31.3%, from 2,196 kcal/day/person in 1961, to 2,884 kcal/day/person in 2013, being more than enough for the population at that time (Navin et al., 2022). However, the average calories available per person are not evenly distributed; for example, in the United States of America, a consumption of approximately 3,680 kcal/day/person was recorded, and in Africa, these values were halved, reaching 1,880 kcal/day/person, while the number of undernourished people worldwide is over 828 million people in 2021; which means 43 times the population of Romania. Taking this into consideration, at the level of 2021, in North America and Europe less than 2.5% of the population was suffering from hunger; in Asia 9.1% of the population was suffering from hunger (about 420 million people), in Africa 20.2% of the population was suffering from hunger (278 million people), and in Latin America and the Caribbean 8.6% of the population was suffering from hunger (56.5 million people). Regarding the food security situation at the national level, 3.7% of the Romanian population was suffering from hunger (700,000 people) (Faostat, 2022). On the other hand, 37% of the world's population is overweight or obese (Navin et al., 2022). Thus, the objective of the study is to approach the topic of food security through indicators that describe the situation of Romania's foreign trade, but also of the agricultural sector, as well as establishing Romania's positioning in terms of food security for cereals (cereals, grains and wheat).*

**Keywords:** Romania, food security, bibliometric analysis

**JEL Classification:** Q17 Agriculture in International Trade

## Introduction

In this context, in which the issue of food security is discussed, climate change plays an essential role, as it represents a global phenomenon, with numerous negative effects on agricultural production, biodiversity, the management of the forestry sector, water resources and implicitly on the socio-economic (Muluneh, 2021). According to (Iniguez-Gallardo et al., 2021),

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climate change is associated with extreme phenomena such as the melting of glaciers, rising sea and ocean levels, floods or drought, which will have a negative impact on the standard of living, but also on the resources used in agriculture. Extreme phenomena caused by global warming such as sudden temperature changes during spring are a challenge in terms of agricultural production worldwide (Jackson et al., 2021).

Thus, climate change will have an impact not only on the agricultural sector, but also on the availability and accessibility of food. It can be stated that food availability will know a downward trend, both quantitatively and qualitatively. According to (Campbell et al., 2016), the production of rice and corn will decrease by 3% and 10%, respectively, for each degree Celsius increase due to the phenomenon of climate change. Given the fact that food security is directly correlated with the system of supply, regulation and support of ecosystems, the fact that they are affected in turn by the phenomenon of climate change will cause a decrease in the productivity and resilience of the world's food systems. Regarding the future scenario that simultaneously targets combating climate change and ensuring food security, it is estimated that by 2050 food production should increase by 60% and greenhouse gas emissions should decrease (Jef et al., 2022). At the same time, an increase in prices for wheat, corn and rice is estimated between 31-106% until the year 2050, which would negatively impact global food security (Myers et al., 2017). Thus, in the scenario in which there is a slow economic growth at the global level, simultaneously with the accentuation of the phenomenon of climate change, it is predicted that 43% of the states will be poorer than they are at present (Myers et al., 2017). Therefore, it can be concluded that measures aimed at the transition to a sustainable agricultural sector must be implemented, which include practices such as carbon sequestration through forestry, increasing productivity, increasing the efficiency of input use and reducing food waste (Campbell et al., 2016).

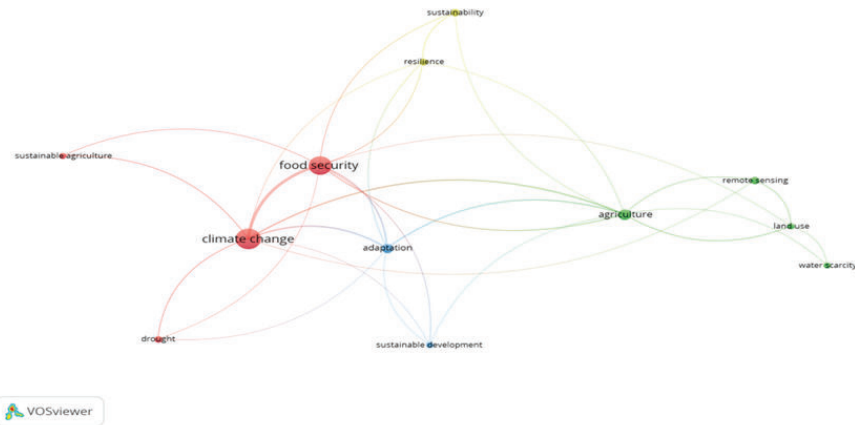
#### **Literature review**

Bibliometric analysis is a statistical method of quantitative analysis of scientific papers, which targets a main subject, through different mathematical methods (Effendi et al., 2021). Thus, in this study, data were collected from the Scopus database by searching the expressions „food security”, „climate change”, „food quantity” in the three aspects: article title, abstract and keywords. Therefore, the search results are represented by a total number of 198 articles published in the period 2015-2022. Data obtained was processed by using VOSviewer software (version 1.6.18), which generated a series of bibliometric maps that can be used to identify aspects related to the most frequently used keywords in the analyzed articles, as well as the countries

with the greater number of publications on the topic of food safety. Thus, Figure 1 presents the Analysis of keywords used in scientific papers.

### Analysis of keywords

Fig.1

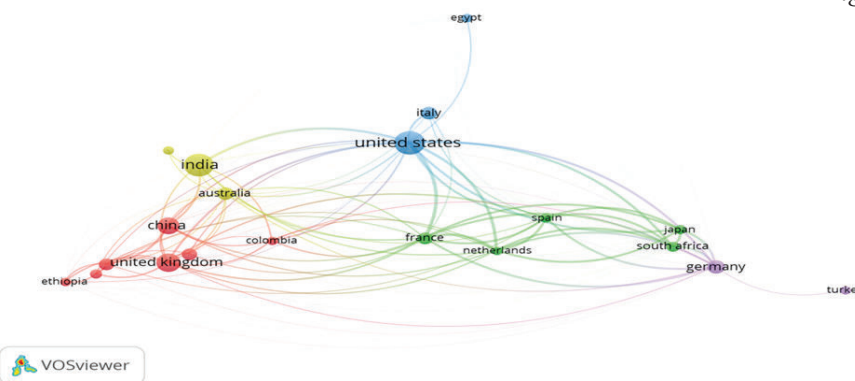


Source: own conceptualization based on Scopus database

The bibliometric analysis presents the keywords used by the authors that appeared more than 5 times in the Scopus database. Thus, from the 791 keywords, 12 words have more than 5 occurrences in the content of the analyzed documents. The most used words are „climate change” - 58 occurrences and „food security” - 47 occurrences.

### Analysis of countries and collaborations between them

Fig.2



Source: own conceptualization based on Scopus database

The study established some limitations in this analysis, a limiting factor being the conditioning of the appearance of states that have at least five published documents. The analysis highlights a number of 68 countries divided into 20 groups. The most published documents are in the USA (36 documents), India (35), followed by the UK (23), China (19) and Germany with 13 published documents.

## Results and discussions

### Analysis of foreign trade in Romania during 2017-2021

Table 1 presents the ranking of the first 10 countries worldwide that import wheat from Romania and the value exported in the period 2017-2021.

#### The ranking of the first 10 countries worldwide that import wheat from Romania and the value exported by it in the period 2017-2021

Table 1

Importers	Exported Value in 2017	Exported Value in 2018	Exported Value in 2019	Exported Value in 2020	Exported Value in 2021
World	999,743	1,035,714	1,136,368	831,297	1,538,548
Egypt	171,818	188,821	266,830	116,198	461,300
Jordan	116,720	132,523	115,372	130,724	134,742
Sudan	65,074	30,956	86,503	60,758	98,389
Republic of Korea	-	-	55,289	22,433	94,381
Israel	45,352	34,419	70,233	74,154	85,175
Italy	51,531	98,070	70,128	31,021	60,388
Spain	105,189	150,050	72,632	29,791	54,801
Ethiopia	32,634	49,257	55,283	6,469	45,537
Vietnam	20,060	9,186	17,438	-	45,459
Pakistan	-	-	-	-	42,350

Source: own conceptualization

It can be observed that Egypt is the state in which Romania recorded the highest value of Export value for wheat, at the level of 2021. Jordan is in the second position, with 134,742 thousand Euro value of wheat exported by Romania in 2021. On the last place is Pakistan with 42,350 thousand Euro value of wheat exported by Romania in the year 2021. Last but not least, it can be stated that Pakistan recorded an export value for wheat approximately 11 times lower than Egypt in the year 2021. In other words, the value of wheat exported by Romania to Egypt represents 29.98% of the value exported by Romania worldwide. Thus, Table 2 presents the Ranking of the top 10 countries worldwide that import wheat from Romania and the amount exported by it in the period 2017-2021.

**The ranking of the top 10 countries worldwide that import wheat from Romania and the quantity exported by it in the period 2017-2021**

*Table 2*

Importers	Exported quantity 2017	Exported quantity 2018	Exported quantity 2019	Exported quantity 2020	Exported quantity 2021
<b>World</b>	5,747,830	5,886,756	6,189,461	4,343,629	6,941,076
<b>Egypt</b>	1,008,869	1,066,595	1,388,086	591,522	2,019,000
<b>Jordan</b>	695,209	755,884	631,884	700,841	658,477
<b>Sudan</b>	388,724	175,438	471,527	318,726	431,358
<b>Republic of Korea</b>	-	-	327,226	120,078	442,440
<b>Israel</b>	250,461	181,773	358,150	377,066	366,772
<b>Italy</b>	274,454	572,502	390,542	163,393	267,133
<b>Spain</b>	653,172	877,710	453,350	171,054	263,843
<b>Ethiopia</b>	207,338	290,383	292,028	35,870	195,244
<b>Vietnam</b>	127,762	56,485	96,337	-	231,816
<b>Pakistan</b>	-	-	-	-	190,685

*Source: own conceptualization*

According to Table 2, the highest amount of wheat exported by Romania in 2021 corresponds to Egypt, with approximately 2 million tons. On the second position is Jordan, with 658,477 tons, and on the last place is Pakistan with 190,685 tons, which means 10.58 times less wheat exported by Romania to Pakistan compared to Egypt.

**Evolution of the average export price in the period 2017-2021**

*Table 3*

Average export price	2017	2018	2019	2020	2021
<b>World</b>	0.17	0.18	0.18	0.19	0.22
<b>Egypt</b>	0.17	0.18	0.19	0.20	0.23
<b>Jordan</b>	0.17	0.18	0.18	0.19	0.20
<b>Sudan</b>	0.17	0.18	0.18	0.19	0.23
<b>Republic of Korea</b>	-	-	0.17	0.19	0.21
<b>Israel</b>	0.18	0.19	0.20	0.20	0.23
<b>Italy</b>	0.19	0.17	0.18	0.19	0.23
<b>Spain</b>	0.16	0.17	0.16	0.17	0.21
<b>Ethiopia</b>	0.16	0.17	0.19	0.18	0.23
<b>Vietnam</b>	0.16	0.16	0.18	-	0.20
<b>Pakistan</b>	-	-	-	-	0.22

*Source: own conceptualization*

The average export price was calculated as the ratio between the Value Export of Wheat and the Quantitative Export of Wheat for the period 2017-2021. Thus, it can be seen that the highest values of this indicator were recorded in 2021. Moreover, the lowest value of the average export price for wheat was recorded in Spain, Ethiopia and Vietnam, 0.16 thousand Euros/tonne of wheat in the period 2017-2018. At the opposite pole, the highest value of the average export price was recorded in Egypt, Sudan, Israel, Italy and Ethiopia, 0.23 thousand Euro/tonne of wheat in 2021.

**The ranking of the first 10 countries worldwide that export wheat to Romania and the value imported by it in the period 2017-2021**

*Table 4*

Exporters	Imported Value in 2017	Imported Value in 2018	Imported Value in 2019	Imported Value in 2020	Imported Value in 2021
<b>World</b>	202,846	115,302	158,219	222,917	217,403
<b>Bulgaria</b>	74,279	70,965	65,845	69,773	119,286
<b>Hungary</b>	107,692	30,686	82,950	140,658	84,269
<b>Republic of Moldova</b>	10,254	6,506	2,380	950	5,298
<b>Slovakia</b>	1,593	80	459	4,177	4,104
<b>Italy</b>	711	743	858	740	1,179
<b>Croatia</b>	651	285	260	1,553	1,136
<b>Austria</b>	4,867	2,196	2,412	893	955
<b>Germany</b>	859	334	501	637	472
<b>France</b>	1,277	705	518	598	412
<b>Serbia</b>	205	2,652	356	2,702	130

*Source: own conceptualization*

According to Table 4, the countries with the highest export activity in Romania in terms of value in 2021 are Bulgaria, which exports wheat worth 119,286 thousand Euros and Hungary with a product value of 84,269 thousand Euros. Bulgaria and Hungary export to Romania wheat worth approximately 93% of the total value imported by it. On the last places in the ranking of the 10 exporting countries are Germany, France and Serbia with a value of wheat exported in a proportion of approximately 0.50% of the total value imported by Romania.

**Ranking of the top 10 countries worldwide that export wheat to Romania and the amount imported by it in the period 2017-2021**

*Table 5*

Exporters	Imported quantity in 2017	Imported quantity in 2018	Imported quantity in 2019	Imported quantity in 2020	Imported quantity in 2021
<b>World</b>	1,249,985	695,333	880,290	-	-
<b>Bulgaria</b>	472,299	448,855	403,585	390,089	567,856
<b>Hungary</b>	662,632	177,055	438,210	777,614	374,825
<b>Republic of Moldova</b>	71,046	41,070	15,027	5,156	25,607
<b>Slovakia</b>	9,509	131	1,682	22,037	19,250
<b>Italy</b>	1,288	1,723	1,702	1,296	2,426
<b>Croatia</b>	4,356	618	655	8,468	5,329
<b>Austria</b>	19,451	8,154	8,447	2,803	2,995
<b>Germany</b>	3,430	1,166	1,495	1,800	689
<b>France</b>	2,424	1,036	720	848	976
<b>Serbia</b>	491	15,050	1,668	15,181	376

Source: own conceptualization

From a quantitative perspective, in Table 5, it can be seen that Bulgaria exports 567,856 tons of wheat to Romania, ranking first among the 10 exporting countries. The next place is occupied by Hungary with a quantity of wheat exported to Romania of 374,825 tons.

**Evolution of the average import price in the period 2017-2021**

*Table 6*

Average import price	2017	2018	2019	2020	2021
<b>World</b>	0.16	0.17	0.18	-	-
<b>Bulgaria</b>	0.16	0.16	0.16	0.18	0.21
<b>Hungary</b>	0.16	0.17	0.19	0.18	0.22
<b>Republic of Moldova</b>	0.14	0.16	0.16	0.18	0.21
<b>Slovakia</b>	0.17	0.61	0.27	0.19	0.21
<b>Italy</b>	0.55	0.43	0.50	0.57	0.49
<b>Croatia</b>	0.15	0.46	0.40	0.18	0.21
<b>Austria</b>	0.25	0.27	0.29	0.32	0.32
<b>Germany</b>	0.25	0.29	0.34	0.35	0.69
<b>France</b>	0.53	0.68	0.72	0.71	0.42
<b>Serbia</b>	0.42	0.18	0.21	0.18	0.35

Source: own conceptualization

The highest average import price in 2021 was registered in Germany, respectively 0.69 thousand euros/ton, and the lowest price, of 0.21 thousand euros/ton, has been registered in several countries: Bulgaria, the Republic of Moldova, Slovakia and Croatia.

**The evolution of the trade balance for the wheat product in the period 2017-2021, as well as the ranking of the first 10 partners that import wheat from Romania**

*Table 7*

Partners	Trade balance 2017	Trade balance 2018	Trade balance 2019	Trade balance 2020	Trade balance 2021
<b>World</b>	769,896	920,412	978,149	608,380	1,321,145
<b>Egypt</b>	171,818	188,821	266,830	116,198	461,300
<b>Jordan</b>	116,720	132,523	115,368	130,724	134,742
<b>Sudan</b>	65,074	30,956	86,503	60,758	98,389
<b>Republic of Korea</b>	-	-	55,289	22,433	94,381
<b>Israel</b>	45,352	34,419	70,233	74,154	85,175
<b>Italy</b>	50,821	97,326	69,270	30,280	59,209
<b>Spain</b>	105,189	150,050	72,628	29,775	54,792
<b>Ethiopia</b>	32,634	49,257	55,283	6,469	45,537
<b>Vietnam</b>	20,060	9,186	17,438	-	45,459
<b>Pakistan</b>	-	-	-	-	42,350

*Source: own conceptualization*

Thus, it is observed that for the wheat sector, the trade balance is positive in the analyzed period for all states. The highest value of the trade balance was recorded for Egypt in 2021, respectively 461,300 thousand Euros, opposing to Pakistan with a trade balance worth 42,350 thousand Euros.

### Conclusions

It was found that Romania has a value export of wheat worth approximately 1.5 billion Euros in 2021, while the value import was approximately 217 million Euros in the same year. Moreover, Romania's trade balance for the wheat product is positive, with a value of approximately 1.3 billion Euros in 2021. At the same time, both the area and the production of grains and wheat have registered an oscillating trend, with increasing trends in the analyzed period. Therefore, it is considered that if Romania maintains a constant production of cereals, simultaneously with the introduction of sustainable agriculture practices, it can offer citizens the guarantee of food



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security for the wheat product, respectively grain cereals. So the future of food security depends on several factors, including population growth, climate change and access to advanced technologies. In this context, it is important that leaders from all sectors work together to find sustainable solutions to ensure sufficient food production for all, while reducing food loss and waste. In other words, investments in research and development, as well as in sustainable agricultural technologies, will be essential to ensure food security. Thus, the objective of the study was achieved. However, the limitation of this research lies in the fact that the data was taken only from the Scopus database. Therefore, future study should use various data sources such as Web of Science or Springer Link.

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