The reality of food security in Algeria according to the Global Food Security Index (GFSI) during the period (2018-2022).

An analytical and evaluative study

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Abstract

This study aims to highlight the reality of food security in Algeria according to the Global Food Security Index (GFSI) during the period (2018-2022). It does so by analyzing and evaluating its performance across its four dimensions. The study also analyses the evolution of Basic Plant and Animal food commodity production in terms of cultivated area, productivity, and output during the period under study and the impact of this on the food gap, using SPSS system.

The study concludes that, despite some signs of improvement, Algeria's performance has not yet reached the desired level to achieve sustainable food security.

Keywords: *Food security, Global Food Security Index, Food Gap, Algeria.*

الملخص

تهدف هذه الدراسة إلى إبراز واقع الأمن الغذائي في الجزائر في ظل مؤشر الأمن الغذائي العالمي(GFSI) للفترة (2018-2022)،من خلال تحليل و تقييم تطور أداءها ضمن أبعاده الأربعة، و كذا تحليل تطور إنتاج السلع الغذائية الأساسية النباتية والحيوانية من حيث مؤشرات المساحة و الإنتاجية و إجمالي الإنتاج و تأثيره على الفجوة الغذائية،بإستخدام نظام SPSS . و قد توصلت الدراسة إلى أنه رغم أن هناك علامات تحسن إلا أن أداء الجزائر لم يرق إلى المستوى المطلوب لتحقيق أمن غذائي مستدام .

الكلمات المفتاحية : الأمن الغذائي،مؤشر الأمن الغذائي العالمي،الفجوة الغذائية،الجزائر.

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Introduction:

The stability of nations and the development of societies depend largely on ensuring sustainable food security. This makes achieving it a strategic priority for all countries, especially in light of the challenges facing the world (climate change, economic crises, global shocks, wars, and conflicts). To measure its achievement, a set of global indicators is used, most notably the Global Food Security Index (GFSI), which allows for understanding and evaluating the food situation in different countries and guiding policies towards improving it based on a set of sub-indicators. Algeria, like other countries around the world, strives to provide sufficient and safe food for all its inhabitants. From here, the research problem emerges, which we formulate as follows.

Has Algeria achieved its food security according to the Global Food Security Index (GFSI) during the period (2018–2022)?

This main research question leads to the following sub-questions:

1)-Has Algeria improved its ranking in the GFSI classification, and has it enhanced its performance across its main dimensions during the period (2018–2022)?

2)-How did local production of basic plant and animal food commodities develop in terms of cultivated area, productivity, and output during the period under study? And what was the impact of this on the food gap ?

To answer to this question, the following hypotheses were proposed:

1- Algeria has achieved relatively significant progress in the GFSI ranking and acceptable performance across its four dimensions.

2- National production of the basic plant and animal food products has shown a clear development in terms of area, productivity, and output during the period between 2018 and 2022, but it was insufficient to cover all domestic consumption, and the food gap persisted for some basic food commodities.

Research Objective:

This study aims to diagnose and evaluate the state of food security in Algeria within the framework of the Global Food Security Index (GFSI) during the period (2018-2022) .

Methodology:

This study employs a descriptive-analytical approach to describe the state of food security in Algeria according to the GFSI during the study period and to analyze the indicators of its achievement and the factors influencing it.

Research Structure:

To fully grasp the various aspects of the topic and achieve the study's objectives, the research was divided into the following sections:

I- The Conceptual Framework of Food Security

II- The Global Food Security Index (GFSI) and its Dimensions

III- The Evolution of the GFSI for Algeria during the Period (2018-2022)

IV- An Analysis and Evaluation of Food Availability Indicators in Algeria during the period (2018–2022)

I-The Conceptual Framework of Food Security:

I-1- Definition of Food Security:

The first official recognition of the right to food for every person as a human right and as a legal and moral principle was made on December 10, 1948, by the United Nations General Assembly, in article 25 of the Universal declaration of human rights. As for the concept of *food security* as a technical, economic, and policy term, it was officially recognized for the first time in 1974 by the Food and Agriculture Organization of the United Nations (FAO) during the World Food Conference held in Rome**,** as a result of the widespread poverty and famine around the world. Several definitions of food security have been provided, the most important of which include the following:

-Definition of the Food and Agriculture Organization (FAO):

The Food and Agriculture Organization of the United Nations defines food security as:"The availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices." (Amel BOUBEKER, 2023, p.420) . According to the World Food Summit held in 1996, food security is defined as: "A situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. "(FAO, World Food Summit 1996, p.2)

-Definition of the World Bank (1986): In its report on Poverty and Hunger, the World Bank defined food security as: "The access by all people at all times to sufficient, safe, and nutritious food to meet their dietary needs for a healthy and active life." (Felfoul Abdelkader, 2024, pp. 100-101)

-Definition of the Arab Organization for Agricultural Development (AOAD, 1993): Food security is the provision of food in sufficient quantity and quality to ensure health and activity, on a continuous basis, for all members of society. It should rely primarily on local production and be based on the principle of comparative advantage in the production of food commodities in each country, while making food available to citizens at prices according to their incomes and financial capacities. (Rahmani, 2021, p.48-49)

-Definition of Algerian Law (2008):

According to Article 3 of Law n°. 08-16 on August 03, 2008, relating to agricultural orientation, the Algerian legislator defines food security as: "Every person's easy and regular access to safe and sufficient food that enables them to enjoy an active life." (Journal official, No. 46, p. 6)

I-2– Terms Related to Food Security:

I-2.1 – Self-Sufficiency:

Self-sufficiency refers to a situation in which a country meets all its food needs through domestic production, without resorting to imports. It represents one of the highest levels of achieving food security. (Rahmani, 2021,p. 54)

I-2.2 – Sustainable Food Security (Amel BOUBEKER, 2022, p. 425)

Sustainable food systems are defined as those that have a **low environmental impact** and contribute to achieving **food and nutrition security**, as well as **healthy lives** for both present and future generations.

I-2.3 – Food Insecurity:

Food insecurity refers to limited or uncertain access to nutritious food and the constrains on the ability to obtain it through socially acceptable means. (Mostefaoui.N, Brahimi.H, 2024, p 73)

I-2.4 – Food Gap:

The food gap is the difference between what a country can produce in terms of food products and commodities and the basic needs required to provide adequate food for the entire population. (Ben Noureen & Oudan, 2021, p. 211) The **food gap** is calculated as follows:

Food Gap = Food Imports - Food Exports

Its **percentage** is determined by the following formula:

Food Gap ratio = 1 –% Self-Sufficiency Ratio

Food Sovereignty : (CHELIGHEM Souad, 2023, p. 208)

Food sovereignty is the right of peoples to define their own agricultural policies in order to meet their food needs and priorities.

I-3-Levels of Food Security (Djamel YAHI & Hadia YAHIAOUI, 2023, p. 893)

Three levels of food security can be distinguished:

- **Absolute Food Security:** Achieved when a country produces all its food needs locally. This is commonly referred to as self-sufficiency or complete food security.
- **Relative Food Security:** Reflects a country's ability to provide some food products for its population, either fully or partially, and to ensure a minimum level of regular food supply for society.

- **Nominal Food Security:** Refers to domestic food production that depends largely on imported raw materials.

I-4 – The Global Food Security Index (GFSI) and Its Dimensions

Food security is one of the major global challenges facing a several countries. To measure its level of achievement, a set of international indicators used to help understand and assess the food situation in different nations and to guide policies aimed at improving food security.

Among the most widely accepted and commonly used indicators is the **Global Food Security Index (GFSI)**, **Global Hunger Index (GHI)**, **Food Insecurity Experience Scale (FIES)**.

I-4.1 – Global Food Security Index (GFSI):

The Global Food Security Index is one of the most important and widely used international indicators for ranking countries according to their level of food security. It was developed by the Economist Intelligence Unit (EIU), a division of The Economist Group.The Economist Group measures the level of food security in 113 countries, including developed, developing, and transitional economies. It is based on a scoring system ranging from 0 to 100 points.

This index is published annually to identify year-to-year changes in the structural factors affecting food security across these 113 countries. The 2022 GFSI represents the tenth edition of the index, following several updates and methodological improvements.

I-4.2 – Dimensions of the Global Food Security Index (GFSI):

The Global Food Security Index (GFSI) evaluates the state of food security in 113 countries based on four principal dimensions that help guide food security and nutrition policies and set their priorities. They are as follows:

-Affordability: This dimension includes the cost of obtaining food and its adequate, continuous accessibility to individuals. It measures people's ability to purchase food, their vulnerability to price shocks, and the availability of policies and programs that support them in times of such shocks. (Amel HEFNAOUI, 2023, pp. 18-19).

Availability: This indicator measures a country's ability to provide sufficient food supplies for its population, whether through domestic production, imports, or food aid.It also assesses the risk of supply disruptions and the research efforts aimed at increasing agricultural production. (Arab Organization for Agricultural Development, 2019, p. 16)

- Quality and Safety: This indicator evaluates the diversity and nutritional quality of average diets, as well as food safety. It reflects how the human body utilizes the various nutrients in food—such as energy, proteins, fats,

and micronutrients—along with the biological use of foods consumed by individuals (Fao, 2021, p37), and all processes related to food use, including storage, handling, transportation, cooking, and preparation. (Sofiane AKROUD,2022,p. 58).

Adaptation and Sustainability: This dimension measures a country's exposure to the effects of climate change, its vulnerability to natural resource risks, and its capacity to adapt to these risks. The stability of food security depends on maintaining all pillars of food security at all times. This means reducing the risk of food supply shortages, ensuring continuous access to and effective utilization of food by consumers, and addressing natural, political, economic, and environmental challenges (Arab Organization for Agricultural Development, 2021,p. 46)

II- The Global Food Security Index (GFSI) for Algeria during the period (2018–2022)

The Global Food Security Index (GFSI) for Algeria during the period 2018–2022 witnessed notable fluctuations, reflecting the challenges faced by the country during a complex economic and health conditions at both the domestic and international levels. As for the year 2023, the GFSI data for Algeria is not yet officially available.

The following table shows the evolution of Algeria's Global Food Security Index (GFSI) as well as the evolution of its ranking at the Arab and African regional levels during the period **(2018–2022)**.

Table no.1: Evolution of Algeria's Global Food Security Index (GFSI) during the period (2018-2022).

Years / Item	2018	2019	2020	2021	2022
Index (Overall value)	52.1	59.8	61.8	63.9	58.9
Global ranking (out of 113 countries)	69	70	58	54	68
Regional ranking – Africa	1	1	1	1	1
Regional ranking – Arab Countries	11	11	8	8	5

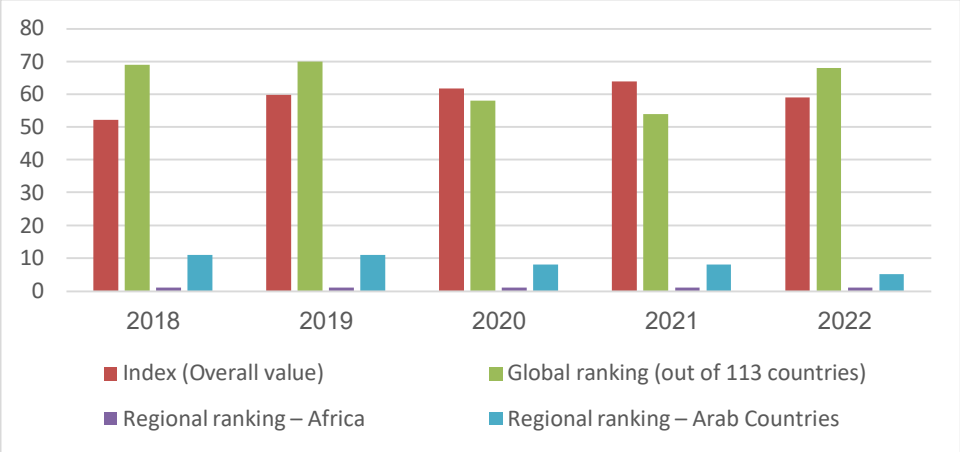
Source : Economist Impact, Global Food Security Index ,2018-2019- 2020- 2021- 2022,Cortiva Agriscience, Kebaili.abdennour,Deghmoum.hichem(2022), p:681, Algerian Radio and Television (RTA)(2021),(2022).

It is evident from the table above that Algeria recorded significant progress in the GFSI ranking during the years 2020 and 2021, ranking 58th worldwide out of 113 countries in 2020 with an overall score of 61.8 out of 100 points. This position was further strengthened in 2021, when Algeria obtain the 54th place globally with a total score of 63.9 points, representing the best ranking achieved since 2015.This progress reflects a significant

improvement compared to the 70th position recorded in 2019. However, Algeria dropped in this ranking in 2022 to the levels of 2018 ,as it ranked 68th worldwide with an overall score of 58.9 points.

The following figure illustrates the evolution of Algeria's global and regional ranking during the period (2018–2022).

Figure no.1 Evolution of Algeria's Global and Regional Ranking in achieving Food Security during the Period (2018–2022).



Source: Done by the researcher, based on the data from table no.1

At the African level, the Deep Knowledge Analytics index ranked Algeria at the top of African countries during the period (2018–2022). However, its decline in the global ranking in 2022, led it to the loss of this leading position.

According to the 2021 report by the World Food Programme (WFP) of the United Nations, Algeria was classified among the countries where the percentage of people suffering from undernourishment was below 2.5% of the total population during the period (2018–2020). Thus, it was the only country in Africa that did not exceed this rate, reflecting an improvement in the food situation compared to many other African nations.

At the Arab level, Algeria ranked 11th in 2018 and 2019, then improved to 8th place in 2020 and 2021, before rising to 5rd place in 2022, which represents a significant improvement and reflects the tangible efforts effectuated by Algeria in achieving its food security.

This improvement in Algeria's GFSI ranking is attributed to the development programs implemented by the country to revitalize the agricultural sector, as well as to the enhancements in agricultural production.

As for the year 2022, global challenges such as inflation and the trade crisis affected the rankings of many countries, including Algeria, whose position declined despite domestic improvements. This highlights the need to strengthen national policies and strategies to ensure sustainable food security.

The following table illustrates the evolution of Algeria's performance within the main dimensions of the Global Food Security Index (GFSI) during (2018–2022).

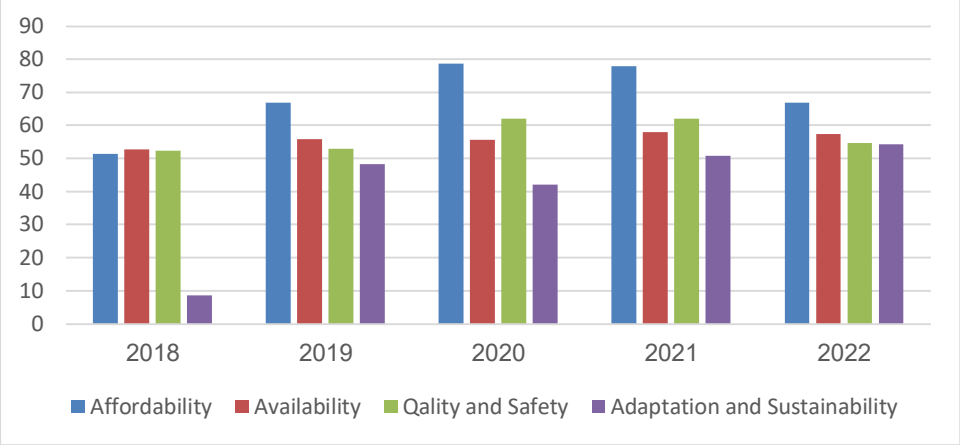
Table no.2 : Evolution of Algeria's Performance within the dimensions of the GFSI during the period (2018–2022).

Dimensions / years	Affordability	Availability	Qality and Safety	Adaptation and Sustainability
2018	51.4	52.7	52.4	57.8
2019	66.9	55.8	53	48.3
2020	78.7	55.7	62	42
2021	77.9	58	62	50.7
2022	66.8	57.3	54.7	54.2

Source: Economist Impact, Global Food Security Index, 2018- 2019- 2020-2021 - 2022, Cortiva Agriscience

The following figure shows the evolution of Algeria's performance within the dimensions of the GFSI during the period (2018–2022).

Figure no.2 : Evolution of Algeria's Performance within the Dimensions of the GFSI during the Period (2018–2022).



Source: Prepared by the researcher based on Table no.2

It appears from Table n°. (02) and Figure n°. (02) that Algeria's performance in the pillars of the Global Food Security Index (GFSI) during the period (2018–2022) was fluctuating, as follows:

In 2018, Algeria delivered an average performance across most GFSI dimensions, with a relatively stronger in the adaptation and sustainability dimension, however, the overall performance indicates persistent challenges particularly in the Affordability dimension.

In 2019, its performance was relatively balanced, recording the best result in the Affordability dimension with 66.9 points. However, its performance in the adaptation and sustainability pillar was the weakest, with 52.1 points. In the availability axe, Algeria achieved a relatively average performance with 55.8 points, while in the food quality and safety axe, the score was below average with 53 points, indicating that the country faces challenges in managing natural resources and adapting to climatic changes.

In 2020, Algeria achieved significant progress in food accessibility, quality and safety; however, it continued to face challenges in the areas of food availability, natural resource use, and resilience. The affordability dimension recorded a notable increase of +17.64% compared to 2019 — the highest rise since 2015. This was mainly due to intensive subsidy policies, as the government doubled its support for basic food products in an effort to protect vulnerable groups during the COVID-19 pandemic, relative control of inflation, rising oil prices, and the relative stability of the Algerian dinar at the onset of the pandemic.

The food quality and safety dimension recorded a significant increase of +16.98% compared to 2019. This improvement is due to the enhancement of quality standards in response to health pressures and the focus of institutions on improving operational efficiency to compensate for shortages in supplies.

Meanwhile, performance in the food availability dimension was significantly affected by the crisis, showing only a slight decrease of -0.18% compared to 2019. This decline was mainly due to disruptions in global supply chains caused by the COVID-19 pandemic, which led to higher import costs, as well as a sudden surge in demand for health, food, and protective products. However, a significant decline recorded in the sustainability and adaptation dimension, with a decrease of -19.38% compared to 2019. This drop is mainly attributed to the freezing of investments in the environmental sector due to the reattributed of resources to confront the pandemic, as well as the reduction in spending on programs related to climate change adaptation.

In 2021, the data revealed that Algeria demonstrated good food affordability, facilitating access and reflecting effective government support policies aimed at maintaining purchasing power. This dimension achieved 77.9 points, making it the best-performing category among the four, though it slightly declined by -1.02% compared to 2020. The adaptation and sustainability dimension, however, registered the lowest score (50.7 points), despite a notable improvement of +17.16% from 2020. This progress remains insufficient and continues to point to challenges in climate resilience and natural resource governance.

Algeria's food availability performance stayed average, just a small increase of +4.13% compared to 2020. This was due to market stability after COVID-19**,** better distribution strategies**,** improved demand management**,** and

more diversified supply sources. The food quality and safety performance also remained stable, as some companies obtained international certifications such as ISO 22000, FSSC 22000 version 5.2 and GMP in addition to Other improvements

In 2022, Algeria's food affordability went back to the same level as in 2019, with a big drop of -14.25% compared to 2021. This happened because of the global rise in food prices caused by the Russia–Ukraine war, currency depreciation, energy shortages, weak subsidy structures, and lower foreign reserves.The food quality and safety axe recorded a notable drop of -11.77% from 2021, with a score of 54.7 points. This decline was due to reduced private sector investment in the supply chain, weak traceability of imported goods, and insufficient post-COVID-19 investment in quality enhancement due to financial constraints.

Algeria's food availability score went down slightly by -1.21% compared to 2021. The main reasons were global market problems, less wheat and corn imported, and lower local production because of drought, lack of water, and little farmland. The results showed a gradual improvement in the Adaptation and Sustainability pillar, with a score of 54.2 points, representing an increase of (+6.9%) compared to 2021. However, it remains the lowest-performing pillar among the four dimensions. The progress achieved in this area is mainly attributed to enhancements in risk and disaster management, pest and disease control.

IV - An Analysis and Evaluation of Food Availability Indicators in Algeria during the period (2018–2022)

Food availability remains a core dimension of food security, highlighting the state's ability to ensure food for its population. Animal products are a major source of protein, that Algeria provides to its citizens and it also works to meet their needs for Cereals (especially wheat and barley), pulses, sugar, vegetable oils, and milk, which represent the main staple foods consumed nationwide.

IV -1. Availability of Crop-Based Food Products in Algeria (2018–2022)

IV -1.1. Production of Crop-Based Food Products in Algeria 2018–2022

The following table shows descreptive analysis of Area, Productivity, and Production Indicators of Basic Plant-Based Food Products in Algeria during the Period (2018–2022).

Table no.3: Descreptive Analysis of Area, Productivity, and Production Indicators of Basic Plant-Based Food Products during the Period (2018–2022).

Area : 1000 Ha **Productivity: Kg/Ha** **Production: 1000MT**

Products	Average Area	Area Std. Dev.	Average Productivity	Productivity Std. Dev	Average Production	Production Std. Dev.	Minimum Production	Maximum Production
Total Cereals	2811,83	502,05	1656,27	205,26	4718,65	1275,13	2783,27	6065,94
Wheat	1712,38	284,87	1783,69	205,30	3226,50	737,91	2168,39	3981,22
Barley	948,40	243,39	1624,81	317,19	1394,80	538,67	555,36	1957,73
Total Pulses	106,93	16,07	1209,40	205,16	121,31	23,82	98,44	146,56
Total Vegetebales	369,34	24,86	26540.65	1386	9688.9	682.8	8619,98	10287,21
Fruits	1189,77	17,63	229,55	479,61	6747,50	4413,00	4540,82	14634,71
Total Oils	Not available	Not available	Not available	Not available	180,17	68,60	101,4	249,9
Sugar	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Source: Prepared by the researcher based on the Arab Organization for Agricultural Development, Agricultural Statistics Year book, volumes 41, 42, and 43 and SPSS System.

Statistical data indicate that the domestic production of basic plant-based food commodities shows a clear disparity between the cultivated area, productivity, and total prodaction.

Cereals:

The average cultivated area for all cereals amounted to 2811. 83 thousand hectares, with a standard deviation of 502.05 thousand hectares, reflecting a relative variation in cultivated areas due to differences in climatic conditions and agricultural policy orientations. The average yield reached 1656.27 kg/ha with a relatively low standard deviation of 205.26 kg/ha, indicating relative stability in per-hectare productivity. This suggests consistent farming methods and a steady level of technology use. On the other hand, the average production reached 4718.65 thousand tons with a high standard deviation of 1275.13 thousand tons, revealing significant annual variation in production, mainly due to changes in cultivated areas rather than in agricultural efficiency. Production values ranged between 2783.27 thousand tons as a minimum and 6065.94 thousand tons as a maximum — a very large gap (3282 thousand tons) — indicating either sharp climatic fluctuations or shifts in agricultural policy priorities.

Wheat:

Wheat represents one of the main pillars of local food security. The average cultivated area reached 1712.38 thousand hectares, with a standard deviation of 284.87 thousand hectares, indicating a certain degree of stability in agricultural expansion. The average yield was 1783.69 kg/ha with a standard deviation of 250.30 kg/ha,

reflecting good productivity with some variation in agricultural efficiency. Meanwhile, the average total production amounted to 3226.50 thousand tons, with a standard deviation of 737.91 thousand tons. Total production shows a noticeable variation between a minimum of 2168.39 thousand tons and a maximum of 3981.22 thousand tons, revealing clear fluctuations due to changes in both cultivated area and productivity, and confirming significant variability between years or regions.

Barley:

Data indicate that the average cultivated area for barley was around 948.40 thousand hectares, with a standard deviation of 243.39 thousand hectares, representing 25.7% of the average. This reflects a moderate variation in cultivated areas, resulting from clear differences between regions and agricultural holdings.

The average yield was about 1624.81 kg/ha, with a relatively low standard deviation of 317.19 kg/ha, corresponding to a dispersion rate of 19.5% of the mean. This suggests relative stability in productivity levels across cultivated regions, which can be attributed to production efficiency despite the differences in cultivated areas. The average total production reached 1394.40 thousand tons, with a standard deviation of 538.67 thousand tons, representing a relatively high dispersion rate (38.6%). This reflects a clear variation in production volume between regions. The large difference between the minimum (555,36 tons) and maximum production (1957,73 tons) is largely related to the differences in cultivated areas rather than differences in productivity.

Total Pulses: Pulses are characterized by an average cultivated area of 106.93 thousand hectares with a relatively low standard deviation of 16.07 thousand hectares, reflecting stability in the volume of agricultural investment in this crop. The average yield reached 1209.4 kg/ha with a standard deviation of 205.16 kg/ha, which is a moderate fluctuation indicating that production is affected by climatic or technical factors while maintaining a good level of production efficiency. Total production averaged 121.31 thousand tons with a standard deviation of 23.82 thousand tons, ranging between 98.44 thousand tons and 146.56 thousand tons, indicating moderate flexibility in agricultural performance

• **Vegetables:** Statistical data shows that the cultivated area for vegetables is relatively stable, averaging 369.34 thousand hectares with a low standard deviation of 24.86 thousand hectares, reflecting consistent agricultural expansion. The average productivity reached 26540.65 kg/ha which indicates the efficiency of agricultural resources utilization, and the standard deviation was 1386kg/ha, indicating relative stability of productivity with some variation between years,due to cimatic factors or agricultural methods.Total production ranges between 8619.98 thousand tons and 10287.21 thousand tons, with an average of 9688.9 thousand tons and a standard deviation of 607.7 thousand tons, indicating a relative stability with limited variation reflecting the impact of climatic and technical factors.

Fruits:

Data indicate that the area cultivated with fruit is relatively stable, with an average of 1189.77 thousand hectares and a low standard deviation of 17.63 thousand hectares**,** reflecting stable agricultural policies and consistent production orientation. In contrast, productivity shows significant fluctuations, with an average of 229.55 kg/ha and a standard deviation of 479.61 kg/ha, which indicates high variability. This suggests that production is influenced more by climatic or technical factors than by changes in cultivated areas. Total production averaged 6747.50 thousand tons, with a large standard deviation of 4413.00 thousand tons, ranging from a minimum of 4540.82 thousand tons to a maximum of 14634.71 thousand tons. This reflects the variability in annual production, often linked to climatic or production conditions.

• **Total Oils:**

The average annual production of total oils is 180.17 thousand tons, with a high standard deviation of 68.6 thousand tons, reflecting significant fluctuations in production between years. Production ranges from101.4 thousand tons to 249.9 thousand tons, indicating that production is affected by seasonal, climatic, or market factors. The coefficient of variation of 38% shows a high level of instability in production performance, although the values remain within statistically acceptable limits, suggesting a relatively normal distribution of production.

Sugar: There is no production, indicating complete reliance on imports.

IV -1.2. The Status of Food Gap of Basic Plant-Based Food Products in Algeria during the Period (2018-2022)

The following table presents the Food Gap of Basic Plant-Based Food Products during the period (2018–2022).

Table no.4: Evolution of the Food Gap for Basic Plant-Based Food Products during the Period (2018–2022).

Value: Million US dollars

Products	2018	2019	2020	2021	2022	% Change in Gap food (2021–2022)
Total Cereals	2858.47	2450.98	2803.04	3437.02	3832.29	11.5
Wheat	1864.47	1477.96	1614.63	2358.1	2680.21	13.66
Barley	82.00	31.00	184.93	168.54	107.52	-36.21
Total Pulses	231.45	198.17	151.83	231.14	272.57	17.92
Vegetables	25.3	34.99	27.36	34.86	22.71	-34.85
Fruits	45.32	68.13	106.92	-0.66	115.97	17.67
Total Oils	823.84	818.38	729.48	1074.33	801.94	-25.35
Sugar	598.93	436.28	149.64	539.51	659.44	22.23

Source: Prepared by the researcher based on the Arab Organization for Agricultural Development, the Arab Agricultural Statistics Yearbook, volumes 41, 42, and 43.

The table no.4 shows that Algeria recorded a noticeable deterioration in the food gap for basic products in 2022, such as cereals (+11.5%), wheat (+13.66%), sugar (+22.23%), and Pulses (+17.92%). Demand exceeded local production, leading to an increase in imports of these products. This situation is mainly due to low production caused by a lack of rainfall, drought, water shortages, reliance on rain-fed agriculture, and weak storage infrastructure. Some western provinces experienced drought rates reaching 100%.

The value of the fruit gap also shifted from a slight surplus (–0.66 million USD) in 2021 to a large deficit (+115.97 million USD) in 2022. This is mainly due to a sharp decline in exports, whose value decreased by 99.3% compared to 2021, as a result of export restrictions imposed, in addition to climatic crises.On the other hand, some products such as barley, vegetables, and oils showed a significant improvement in the food gap. Barley imports decreased from 168.54 million USD in 2021 to 107.57 million USD in 2022, and vegetable imports dropped to 24.76 million USD in 2022.

VI -2. Availability of Animal-Based Food Products in Algeria 2018–2022)

VI -2.1. Production of Animal-Based Food Products during the period (2018–2022).

The following table shows descreptive analysis of Production Indicator of Basic Animal-Based Food Products during the Period (2018–2022) .

Table no.5: Descreptive Analysis of Production Indicator for Animal-Based Food Products during the Period (2018–2022).

Products	Average Production	Production Std. Dev.	Minimum Production	Maximum Production
Red Meat	516.07	8.52	507.67	529.00
Poultry Meat	336.49	114.43	266.64	540.00
Milk and Dairy Products	426.28	58.90	3189.24	3,354.70
Eggs	316.25	14,54	305.24	341.56
Fish	99.19	17 ,03	83.98	120.35

Source: Prepared by the researcher based on the Arab Organization for Agricultural Development, Agricultural Statistics Year book, volumes 41, 42, and 43 and SPSS System.

It is appear from the table no.5 above that:

• **Red Meat**:

It recorded a relatively low standard deviation of 8.52 thousand tons compared to the arithmetic mean of 516.07 thousand tons, meaning that the change in production is limited, which indicates good stability in the production level without significant fluctuations.

The difference between the lowest and highest production, 507.67 thousand tons and 529.00 thousand tons, is a relatively narrow range, which confirms the stability of production performance and the balance of the production level.

• Poultry Meat:

The average production of Poultry Meat reached 336.49 thousand tons, with a standard deviation of 114.43 thousand tons and a coefficient of variation of 34%, indicating medium-scale production with noticeable fluctuations and relative instability. This is further confirmed by the significant difference between the minimum and maximum production (226.64 - 540.00), which is mainly due to the commodity's dependence on variable factors (climate, resources, production technologies, and socio-economic policies).

• Milk and its derivatives:

The average production of milk and its derivatives reached 426.28 thousand tons, with a standard deviation of 58.9 thousand tons and a coefficient of variation of 13.52%, reflecting a low level of dispersion. The difference in production between the minimum and maximum was 165.46 thousand tons, indicating that this commodity enjoys good production stability and stable operational efficiency with moderate annual fluctuations that do not pose a threat to the sustainability of production.

Eggs:

Algeria's average egg production reached 16.25 thousand tons, with a standard deviation of 14.54 thousand tons and a coefficient of variation of 4.6%. Production ranged between a minimum of 305.24 thousand tons and a maximum of 341.56 thousand tons. The country's average contribution to egg production was 12.30% regionally (Arab countries) and 0.34% globally. This indicates that the production of this commodity enjoys a high degree of stability and consistency in performance across the years studied, due to the low level of dispersion around the average.

Fish: The Statistical data shows that the average production of fish reached 99.19 thousand tons, with a standard deviation of 17.03 thousand tons and a coefficient of variation of 17.17%, indicating relative stability in production and low dispersion around the mean. This reflects good efficiency in production managing process and the stability of the factors affecting it. Production ranged between a minimum of 83.98 thousand tons and a maximum of 120.35 thousand tons. It indicates flexible productivity that allows for increased production when conditions are favorable without losing overall balance.

- **IV -2.2. The Status of the Food Gap of Basic Animal-Based Food Products in Algeria during the Period (2018–2022).**

The following table appears the Food Gap of Basic Animal--Based Food Products in Algeria during the Period (2018–2022).

Table No. 6: Evolution of the Food Gap for Basic Animal -Based Food Products during the Period (2018-2022)

Value: (million US dollars)

Years / Products	2018	2019	2020	2021	2022	% Change in Gap food (2021–2022)
Red Meat	187.01	201.58	120.87	26.69	9.06	-66.05
Poultry Meat	-0.4	-1.38	-0.72	0.00	-0.36	/
Milk and Dairy Products	1277.67	1112.55	1269.29	1308.47	1799.73	37.54
Eggs	1.83	2.51	1.86	2.00	0.75	-64.62
Fish	17.84	17.91	5.19	12.33	17.24	39.82

Source: Prepared by the researcher based on the Arab Organization for Agricultural Development, the Arab Agricultural Statistics Yearbook, volumes 41, 42, and 43

The table No. 6 shows that Algeria achieved a clear improvement in some animal-based food products such as red meat and eggs. In 2022, there was a significant decrease in the food gap, exceeding (-64%) compared to 2021. This indicates a significant improvement in the food balance for these two products. However, milk and fish showed a clear deterioration, with the deficit increasing by (+37.54%) and (+39.82%) respectively. This reflects a decline in the ability to meet local demand and problems in production. Meanwhile, Poultry Meat maintained a good situation, moving from self-sufficiency in 2021 to a small surplus (-0.36 million USD) in 2022, indicating an improvement in production compared to consumption.

***Conclusion*:**

This study aimed to address the issue of achieving food security in Algeria according to the framework of the Global Food Security Index (GFSI) during the period (2018-2022). The study concluded that Algeria's performance during the study period was inconsistent. It achieved notable progress in 2020 and 2021, ranking 58th and 54th respectively, compared to the GFSI ranking of 70th in 2019. However, its ranking declined in 2022 to the levels of 2018. While Algeria achieved an acceptable level in the food availability and cost sub-indices of the GFSI, it faced challenges in the quality, safety, adaptation, and sustainability sub-indices, which confirms the validity of hypothesis (1).

Statistical data indicate that the domestic production of basic plant and animal food products shows varying regional and global support, as well as a relative development, with clear differences in cultivated area, productivity, and production in covering national consumption.

The results showed that some food products such as cereals, wheat, barley, fruits, red meat, milk, and eggs achieved relatively high and stable production levels, indicating a positive contribution to reducing the food gap. However, other products such as legumes, vegetables, oils, white meat, fish, and sugar maintained weak, unstable, or even non-existent production levels, suggesting that development has not encompassed all food products and that self-sufficiency has not been fully achieved in these commodities. This confirms that the food gap has persisted in some essential plant and animal food products despite the overall improvement in production, thereby validating hypothesis (2).

The results also revealed that:

- Cereals, wheat, and barley constitute the main foundation of local and food security.

- The vegetable sector requires expanded cultivation areas and improved techniques to enhance its contribution to local food security.

- Legumes are a secondary product but play an important role in dietary diversity.

- Sugar does not contribute effectively to local production, indicating a complete dependence on imports of this essential commodity.

Therefore, it can be said that Algeria has made tangible progress in achieving its food security, but it is insufficient to achieve sustainable food security.

Recommendations:

Based on the results obtained, we recommend the following:

- Developing agricultural infrastructure and supply chains, and reducing the import bill, particularly for sugar.

-Promoting the use of drip irrigation, protected agriculture, and water desalination technologies.

- Improving natural resource management and expanding investment in modern and smart agriculture.

- Encouraging scientific research and innovation in the fields of agriculture and food.

- Establishing a bank to monitor and evaluate commodities that contribute least to national food security and reducing government subsidies.

- Developing forward-looking plans to address climate change and natural disasters.

- Adhering to FSSC22000 and ISO 22000 standards, and complying with HACCP standards, with an emphasis on implementing the system.

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