

**The Food Security in Algeria
An Analytical Study during the Period 2015-2022**

Amina BENKHEZNADJI *¹,

¹ LEZINRU Laboratory, University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, Algeria
amina.benkheznadji@univ-bba.dz

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Abstract:

Food security is one of the most important conditions for achieving development and stability in various societies. Food shortage is no longer just an economic and agricultural problem; it has become a strategic issue linked to national and regional security. Therefore, this study aims to diagnose the reality of food security in Algeria during the period 2015-2022, which witnessed several global crises threatening the global food situation, most notably the COVID-19 crisis and the Russo-Ukrainian crisis.

The study concluded that Algeria has made many efforts to achieve food security through a series of policies and reforms. These efforts have contributed to improving its food security indicators at a time when most countries were suffering from the consequences of food crises.

Keywords: Food security, food production, agricultural sector, food crisis, Algeria.

JEL Classification Codes: Q15,Q18.

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1. Introduction:

Food security is one of the most important conditions for achieving development and stability in various societies. Food shortage is no longer just an economic and agricultural problem; it has become a strategic issue linked to national and regional security. Food has become a strategic weapon in the hands of food-producing and exporting countries, which they use to pressure importing countries. Algeria is one of the countries striving to achieve it despite the challenges it faces. Considering that the agricultural sector is the main artery for achieving food security, Algeria has sought to develop this sector. This has been manifested through its numerous efforts, which have been translated into a series of policies and strategies aimed at optimizing its potential and increasing its food production.

Providing healthy and adequate food for all members of society at all times and according to their capabilities is a concern that various countries seek to achieve. This was highlighted by recent crises that affected global food prices, threatening food security in many countries. In this context, the following question arises:

What is the reality of Algerian food security during the period 2015-2022?

To address the proposed problem, we will start from the hypotheses that we see as fundamental, namely:

- The potential within Algeria is sufficient to achieve its food security.
- The level of food security achieved by Algeria during the period 2015-2022 did not ensure resilience against recent crises.

This research aims to achieve the following objectives:

- Attempting to identify the various potentials available in Algeria.
- Shedding light on the various policies adopted by Algeria and elucidating its strengths and weaknesses.
- Evaluating the food situation in Algeria by presenting the most important food indicators.

2. Food Security:

Food security is a concept deeply intertwined with the culture and values of a society, thus it varies from one community to another. However, there's a near consensus that food security is one of the most, if not the most, critical aspects across all societies. It is closely linked to the majority of them (Mounir, 2008, p. 8).

Food security is defined as: "The state in which a country or a group of countries can provide a sufficient quantity of food for every individual." (Dictionary, 2006, p. 16)

According to the Food and Agriculture Organization of the United Nations (FAO), food security is defined as: "The condition in which all members of a community at all times have the 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. Cases lacking food security are a complex phenomenon associated with various factors, primarily social, economic, and political environments, as well as the scarcity of resources and the economic performance of food production and external trade." ((FAO), 2005, pp. 81-82)

The concept of food security is based on three pillars: (Benkheznadji, 2013, p. 4)

- Abundance of food items in good quantity and quality;
- Availability of food items in the market consistently;
- Food prices should be affordable for citizens.

Therefore, we can define food security as "ensuring the minimum level of healthy, safe, and sufficient food for all members of society to sustain their activities continuously and regularly, according to their capabilities, whether through local production or importation based on self-resources."

3. Global Food Crises:

In recent years, specifically since 2006, signs of a food crisis have emerged worldwide, referred to as the Second Global Food Crisis (with the first occurring in the early 1970s). The international prices of food escalated in 2006, and the food crisis rapidly worsened in 2007, reaching its peak in mid-2008 (Salem, 2009, p. 39). This escalated into a surge in food prices across the globe, leading to increased food insecurity, especially after the financial crisis. While the problem was global, developing countries were most affected, despite the multifaceted causes of this crisis, whether economic, environmental, or demographic. These factors converged to create a situation where supply was less than demand, ultimately resulting in rising food prices.

The significant fluctuations in food prices played a crucial role in the increase in the value of food imports in recent years, worsening the global food situation. The COVID-19 crisis exacerbated the situation further by disrupting most activities and food supply chains. Just as the world began to recover from the impacts of the COVID-19 crisis, it faced the Russo-Ukrainian crisis, leading to a rise in global crop and food prices since mid-2020. Due to the war, Ukraine, one of the major grain-exporting countries, experienced a significant decrease in its exports, raising significant concerns about the food security of millions of people worldwide. Measures taken by the European Union and the United Nations helped mitigate price increases, but the outlook remains challenging. (Council of the European Union, 2024)

4.The components of food production in Algeria:

The components of food production in Algeria include several factors:

4.1: Natural Resources:

We will attempt to outline the most important natural resources of Algeria, mainly manifested in climatic and topographic characteristics, agricultural lands, pastures, forests, and water resources.

4.1.1. Climatic and Topographic Characteristics:

a. Climate: Algerian climate is characterized as hot and dry in the summer, and mild and rainy in the winter in the north, while it's continental, hot, and dry in the south.

b. Topographic Characteristics: Geological and climatic factors have played a significant role in shaping Algeria's terrain and dividing it into various topographic regions in terms of structure and appearance. These terrains have numerous characteristics that have bestowed importance and a clear influence on economic and human life throughout the ages. (Boutaleb, 2005, p. 21)

4.1.2. Agricultural Lands, Pastures, and Forests: According to Table (1), Algeria's total area is approximately 2,381,471 square kilometers, with cultivated land estimated at 850,957 square kilometers, which is relatively small, accounting for approximately 35.72%. However, compared to the population of approximately 44,178,000, it is somewhat reasonable, where the per capita share of the total cultivated area is estimated at 19.3%.

Table 1. The cultivated area during the year 2022.

Statement	Total Population (Individuals)	Geographic Area (1000 Ha)	Cultivated Area (1000 Ha)	Percentage of Cultivated Area (%)
Algeria	44903225	238174.1	8509.57	35.72

Source: (AOAD, 2022, p. 4) & (WDI, 2023)

The cultivated area (refer to Table 2) can be divided into the area allocated for perennial crops, representing 17.61% of the cultivated area, and the area allocated for seasonal crops, representing 55.02% of the same area. Both are further divided into irrigated and rainfed lands. Additionally, there

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is a percentage of agricultural land, estimated at 6.89%, known as fallow land, which consists of agricultural lands not utilized in one or more seasons due to insufficient irrigation water, the need to restore their productivity, or other reasons.

In addition to cultivated areas, there are areas designated for pastures, accounting for 13.7% of the total area, and forests representing 0.8% of the same area. The cultivated areas are primarily concentrated in the northern regions surrounding the southern Mediterranean basin.

Table 2. Land Use in Algeria in 2021

Statement (1000 Ha)	Perm. Crops Area		Seasonal Crops		Fallow Area	Forests	Pastures
	Rainfed	Irrigated	Rainfed	Irrigated			
Algeria	520.28	978.9	3762.1	919.9	2848.6	1958.3	32806.5

Source: (AOAD, 2022, p. 5)

4.1.3. Water Resources: Algeria does not differ much from most Arab countries in its relatively dry and low rainfall climate. The hydrographic appearance of the region's surface is characterized by a scarcity of water resources, with the most important being rivers and groundwater.

4.2. Human Resources and Agricultural Research:

4.2.1 Human Resources: The human resources are considered one of the most important factors for achieving food production in any country. Agricultural research is also of great importance in contributing to its improvement.

The population of Algeria exceeds 45 million according to 2022 statistics. The rural population, which is of importance to the agricultural sector, accounts for about 25.6% of the total population, which is somewhat low due to various factors such as the decline in living standards and lower income levels compared to urban areas, leading to increased internal migration.

4.2.2 Agricultural Research: The development of productivity and agricultural production, both plant and animal, is largely linked to technological modernization, which in turn depends on various types of scientific and applied agricultural research. Agricultural research centers in Algeria lack many of these technologies, despite their active role in coordination and collaboration with international research institutions, notably the International Center for Agricultural Research in the Dry Areas (ICARDA), which has made significant progress in this field over the past two decades through research programs implemented in cooperation with the Arab Fund for Economic and Social Development (AOAD, Food Security Conditions in the Arab World, 2022).

4.3. Animal Wealth and Financial Resources:

4.3.1. Animal Wealth: Algeria possesses a considerable wealth of animals, primarily in cattle due to the vast pastures it has, in addition to fish due to its substantial coastal strip.

a. Livestock: Despite Algeria having a considerable wealth of Livestock, it relies heavily on nomadic and semi-nomadic herding, as well as commercial nomadism (Mabrouki, 2011, p. 196). This system makes it difficult to monitor, quantify, and manage livestock, leading to their exposure to stress, diseases, and reduced growth rates under difficult climatic and environmental conditions. Natural pastures are publicly owned and suffer from neglect and misuse, such as early grazing, overgrazing, and lack of proper grazing management. Poultry farming has significantly expanded in Algeria in recent years, contributing effectively to alleviating the deficit in animal food products, along with cattle, goats, and camels.

Table 3. The distribution of Livestock in Algeria in 2021

Statement(1000 Head)	Cattle	Sheep	Goats	Camels	Horses
Algeria	1734.48	31126.45	5029.04	448.55	50.23

Source: (AOAD, 2022, p. 125)

b. Fish: Fisheries constitute a fundamental pillar of Algerian agricultural resources and an important element in achieving food security. The cost of obtaining animal protein from fish is relatively low compared to other sources. The fishery resources in Algeria are diverse, including marine sources along the coast, with an estimated length of 1200 km along the Mediterranean Sea, as well as non-marine sources such as inland water bodies like lakes, inland waterways, and fish farms. (Mabrouki, 2011, p. 197)

4.3.2 Financial Resources: In recent years, Algeria has achieved significant financial surpluses from oil and gas exports, along with a considerable increase in exports and remittances from expatriate workers. This has been achieved due to favorable international conditions, coupled with the implementation of economic reform packages. However, maintaining and developing these surpluses and directing them effectively to create real development remains contingent on changes in international political, economic, and security conditions. Tourism revenues and remittances from expatriate workers are directly affected by any security events shaking the world. The volume of oil and gas exports and their prices are tied to international markets. Other exports require high competitive standards controlled by advanced countries. Algerian savings abroad are exposed to monetary inflation factors, exchange rate fluctuations, political manipulation, restrictions, and the possibility of freezing. (Al-Mangoush, 2013, p. 32)

5. Agricultural Policies in Algeria:

During the nineties, Algeria adopted several reforms as part of a structural adjustment program. The main axes of these reforms included restructuring agricultural land and reclaiming expropriated lands by their owners, abandoning support policies except for some basic commodities like bread and milk, price guarantee at production for strategic crops, liberalizing foreign trade and markets. However, these measures failed to achieve their intended goals. The removal of subsidies encouraged imports at the expense of local production due to the increased production costs, resulting from subsidy removal. This led to a shift towards alternative food items, negatively impacting local production and investment in agriculture, in addition to other accompanying factors such as financial incapacity, political climate, and poor security situation in Algeria at the time, which contributed to the decline of the agricultural sector and increased the gap between consumption and production. (AOAD, Agricultural Policies in the 1990s Decade, 2002, p. 36)

Following agricultural reform operations, the National Agricultural Development Program (PNDA) was established in 2000 as a key tool for promoting and developing Algerian agriculture sustainably, with the primary goal of improving food security (Berkane & Moussaoui, 2010). This program was expanded in 2002 to include rural development, becoming known as the National Agricultural and Rural Development Program (PNDAR). The implementation criteria of the program are summarized in three levels: economic feasibility, ecological sustainability, and social acceptance.

Within the framework of this program, the National Fund for Agricultural Regulation and Development (FRNDA) was established to finance activities falling under its scope. The total budget allocated to the sector in all its facets, including management, equipment, and support funds for basic commodities, amounted to 399.7 billion Algerian dinars between 2000 and 2006. The investment allocation was estimated at 284 billion Algerian dinars over seven years, equivalent to 40.5 billion Algerian dinars annually. At the time, this program was considered one of the most important programs relied upon by Algeria for the development of the agricultural sector.

The main objectives of the National Agricultural and Rural Development Program (PNDAR) are as follows (Madani & M'tai, 2008):

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- Establish advanced and sustainable agricultural development to increase production, income, and achieve self-sufficiency in food for the population.
- Combat significant environmental degradation and desertification.
- Adapt agriculture to climate change, particularly severe droughts, and protect the environment.
- Improve food security for rural families, prioritizing families in isolated areas.
- Train and support agricultural investors and enhance their agricultural activities.
- Promote and valorize rural crafts by focusing on development activities and rural populations.
- Create favorable and sustainable conditions for the return to original areas.
- Promote development in rural areas to improve the daily lives of rural inhabitants.

The most significant intervention programs outlined within the program include:

- Adapting production systems and agricultural production.
- Improving production and productivity for farmers.
- Developing branch activities in the agricultural field and valorizing agricultural production.
- Conserving and developing agricultural genetic resources, both animal and plant.
- Land reclamation, afforestation, and reforestation.
- Combating desertification and developing agriculture in desert areas and mountainous agriculture.
- Developing pastures, steppe pastures, and semi-desert pastures, and expanding them.

Since 2004, Algeria has also adopted the National Strategy for Sustainable Rural Development (SNDRD), primarily embodied in the Rural Development Neighborhood Projects (PPDR). These projects aim to achieve sustainable rural development by improving living conditions for rural populations and enabling them to rationally exploit natural resources, valuing them and ensuring their sustainability for future generations. Subsequently, Algeria embraced a rural and agricultural renewal policy in 2008, which served as support for sustainable agricultural policies. The basis of this policy revolves around achieving national consensus on food security to ensure national sovereignty and social cohesion. This policy is anchored in the Agricultural Guiding Law issued in August 2008, which outlines its framework with the aim of enabling national agriculture to contribute to improving the country's food security and achieving sustainable agricultural development. (AOAD, Investments and Partnerships in the Agricultural Field "Algeria", 2010, p. 3)

This policy was further reinforced by a structured economic growth support program during the fifth five-year plan (2010-2014). It sought to achieve sustainable national food security, addressing medium-term changes and significant impacts on infrastructure that establish the foundation for food security. It fosters a partnership between the public and private sectors, focusing on the impact of all stakeholders in the development process and the emergence of new governance for agriculture and rural areas. The pillars of this program include: (Talebi, 2011, p. 154)

- Agricultural renewal through the launch of intensification, modernization, and integration programs for wide consumption fields, field application of the treatment system after securing a stable supply of widely consumed goods, and ensuring agricultural income protection, creating an attractive and secure climate through modernization and financial support.
- Rural renewal through support for integrated rural development programs, identifying areas and production conditions that are most challenging for farmers. These programs consist of five programs that are goals in themselves, focusing on:
 - Protecting water basins and forest heritage and combating desertification.

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- Protecting biodiversity and protected areas, valuing land value, integrated and multi-sectoral intervention at the grassroots level, supporting human resources, and providing technical assistance to producers.

Furthermore, this policy was reinforced by a consolidated growth program during the fifth five-year plan (2015-2019), prioritizing economic diversification and agricultural and rural development due to their contribution to food security and diversification. This aimed to achieve comprehensive development in the agricultural sector to improve productivity, sustainability, and the living standards of farmers. The plan focused on several objectives, including:

- Increasing agricultural productivity and diversifying crops to meet the needs of the domestic market.
- Improving agricultural infrastructure, including developing agricultural irrigation and enhancing rural infrastructure.
 - Enhancing agricultural technology and expanding the use of modern techniques in agricultural production.
 - Supporting farmers through providing training, financial assistance, and technical support.
 - Promoting environmental sustainability through implementing environmentally friendly agricultural practices and preserving natural resources.

These pillars are an integral part of Algeria's five-year agricultural plan, aiming for a comprehensive transformation towards improving the agricultural sector and boosting the national economy.

After 2022, programs have been implemented to support the agricultural sector by implementing several measures with a tangible impact on various levels. This includes supporting many key agricultural sectors and boosting production in the south, which is considered a new focal point for developing various agricultural types and related activities (Ministry of Agriculture and Rural Development, 2024). Additionally, the establishment of what is known as the "Industrial Agriculture Development Office" in desert lands has occurred. This office serves as a tool to execute the national policy for enhancing and developing strategic industrial agriculture in desert lands. The aim is to develop desert lands to enhance national agricultural and industrial capacities.

A new strategy in grain production has been adopted, targeting the development of mechanization, irrigation, and storage operations. This strategy is overseen by a joint task force from the agriculture, industry, and irrigation sectors.

The government has also raised grain purchase prices to encourage investment and incentivize farmers to increase national production. These price increases cover durum wheat, soft wheat, barley, and oats. Regarding the harvest campaign and to enable the Algerian Professional Grain Board to harvest crops, bank financing allocated amounted to 128 billion DZD in 2022, compared to 59.5 billion DZD in 2021. Additionally, financing granted by the Agricultural and Rural Development Bank, exclusively targeted at small and medium-sized farmers, excluding interest within the framework of the "Companion" loan for exploitation, amounted to 205 billion DZD, covering 182,766 approved files. (Algerian News Agency, 2022)

Finally, agricultural policies are the means of managing the agricultural sector to achieve planned objectives, and thus they change according to circumstances and vary from one country to another. Algeria, in turn, has implemented various policies in line with the conditions it has faced. These policies were manifested in the 1990s through agricultural reform and structural adjustment programs, followed by the National Agricultural Development Plan after 2000, which aimed at increasing agricultural production and improving agricultural productivity to achieve food security and move the country away from food dependency. This structured program for agricultural development aimed to improve the performance of the agricultural sector, where the state

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implemented various mechanisms in the form of developmental programs, mainly supporting and developing agricultural production, with the National Agricultural Development Plan being the most significant. Therefore, it can be said that since 2000, Algeria has been planning to develop the agricultural sector with the aim of achieving sustainable agriculture to ensure food security for its population and sovereignty dominance. It should be noted that Algeria has implemented many agricultural policies since its independence, each time failing to achieve its objectives and fulfill its endeavors.

6. The food situation in Algeria during the period 2015-2022:

After presenting Algerian capabilities and agricultural policies, we will attempt to identify the key indicators through which we can understand the status and volume of food production in Algeria, as well as its nature and food gap.

6.1. Indicators of Algerian food production:

The most important indicators of food production used to assess the productivity situation in Algeria are as follows:

6.1.1 Contribution of agricultural GDP to total GDP: The percentage contribution of agricultural GDP to total GDP is modest, ranging from 11.81% in 2015 to 12.7% in 2022, not exceeding 12.5% on average during the period (2015-2022) (AOAD, 2022, p. 12). This indicates the weak contribution of agricultural GDP to the economic activity of Algeria, reflecting the effectiveness of production elements in the agricultural sector and their contribution to forming the value of GDP.

6.1.2 Per Capita of Agricultural Product: As for the per capita of agricultural product, it reflects the level of economic welfare enjoyed by individuals in a country. Through our observation of the Algerian per capita share of agricultural output according to table number (4), we find that it ranged from \$595 as a maximum in 2015 to \$450 as a minimum in 2021. Additionally, the average per capita of agricultural product as a percentage of total GDP remains low, not exceeding 14.77%.

These indicators shed light on the challenges facing Algeria in enhancing agricultural production and improving economic and food welfare for individuals.

Table 4. The evolution of the average per capita of GDP and agricultural product during the period 2015-2022

Statement	2015	2016	2017	2018	2019	2020	2021	2022
Contribution of agricultural GDP to total GDP (%)	11.81	12.21	12.27	10.15	14.77	14.05	12.17	11.58
Per Capita GDP (\$)	4154.1	3920,33	4016,56	4080,10	3980,42	3337,60	3700,32	4270
Per Capita Agri. Product(\$)	595.4	478,78	492,92	487,55	588,16	469,07	450,54	457.29
average per capita of agricultural product to total GDP (%)	14.33	12.21	12.27	11.94	14.77	14.05	12.17	10.70

Source: (AOAD, 2022, p. 11) and (AOAD, Food Security Conditions in the Arab World, 2022, pp. 29-30)

6.2. Evolution of the Production Volume of Food Commodities in Algeria during the Period (2015-2022)

Algeria aims to achieve self-sufficiency in basic commodities by developing its production. Hereafter, we will present the evolution of trade balances for the main food groups.

6.2.1. Cereals and Legumes Group:

a. Cereals: Cereals are of great importance in the dietary composition. The production volume of this commodity in Algeria has been fluctuating. During the period (2015-2022), it reached its highest value in 2018 at 6065.9 thousand tons and its lowest value in 2021 at 2783 thousand tons.

b. Legumes: The total Algerian production of legumes is fluctuating. It reached its peak in 2019 at 146.6 thousand tons, declining in the following years, and hitting its lowest point at 77.3 thousand tons in 2016.

6.2.2. Production of Vegetables and Fruits:

a. Vegetables: Vegetables are a traditional subsistence farming activity in Algeria, often practiced alternately with cereals, especially in hilly areas. The production has been continuously fluctuating, reaching its highest level in 2015 at 12745.4 thousand tons, dropping to its lowest value in 2019 at 8620 thousand tons, and then rising to 10106.7 thousand tons in 2021.

b. Fruits: Fruits are one of the most important sources of vitamins for Algerian consumers. The total production of fruit in Algeria during the period (2015-2022) remained relatively stable, ranging from 4962.4 thousand tons in 2015 to 5006.1 thousand tons in 2019, reaching its lowest value in 2021 at 4685.9 thousand tons.

6.2.3. Meat Production:

a. Livestock Meat: The total Algerian production of meat has been fluctuating, with its highest production in 2017 at 1073.7 thousand tons and its lowest in 2020 at 505.9 thousand tons.

b. Fish Production: Fisheries constitute a fundamental component of Algerian agricultural resources and an important element in achieving food security. Fish production witnessed a significant decline during the period (2015-2022), dropping from 105.2 thousand tons in 2015 to 84 thousand tons in 2021, indicating weak fish production considering the available resources.

7. Evolution of Food Security Indicators in Algeria for the Period 2015-2022:

7.1. Food Production Index:

The food production index witnessed continuous growth from 100.26 in 2015 to 112.5 by the end of 2020. This can be attributed to the government's efforts in supporting agriculture, improving production techniques, and increasing investments in agricultural infrastructure. However, it experienced a decrease to 104.83 in 2021 due to adverse weather conditions and some agricultural issues. In 2022, the food production index saw a significant recovery due to improved agricultural conditions and the implementation of new government policies to support the agricultural sector.

Table 5. The evolution of the Food Production Index for the Period 2015-2022

Statement	2015	2016	2017	2018	2019	2020	2021	2022
Food production index (2014-2016 = 100)	100,26	102,79	102,87	108,63	112,36	112,5	104,83	111,22

Source: (WDI, 2023)

Indeed, the fluctuations in the food production index observed in the table are influenced by various factors including weather conditions, political situations, changes in the global market, price volatility, and external factors like weather and prices. This analysis underscores the significance of external factors such as weather and prices.

7.2. Hunger Index:

It is evident from the following table a decrease in the hunger index from a score of 8.7 in 2015 (moderate hunger level) to a score of 6.9 in 2022 (low hunger level). Several factors have contributed to this improvement, including increased agricultural production, improved access to food and nutrition, implementation of government policies to combat hunger and poverty, as well as overall economic improvement and increased household income.

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Table 6. Hunger Index during the period (2015 - 2022)

Statement	Hunger Index(0-100)		The absolute change in the hunger index
	2015	2022	Since 2015
Algeria	8.7	6.9	-1.8

Source: (AOAD, Food Security Conditions in the Arab World, 2022, p. 39)

7.3. Prevalence of undernourishment:

The percentage of the undernourished population has reached a low level, with a prevalence rate of less than 3%.

Table 7. Prevalence of undernourishment during the period (2015 - 2022)

Statement	2015	2016	2017	2018	2019	2020	2021	2022
Prevalence of undernourishment (% of population)	2,7	2,6	2,6	2,6	2,5	2,5	2,5	2,5

Source: (WDI, 2023)

Algeria has seen an improvement in its food situation, reflected in a decrease in the prevalence rate of malnutrition. Despite the slight changes observed in this indicator from 2015 to 2018, it remained stable at a value of 2.5% of the population over the past four years.

7.4. Prevalence of stunting, height for age:

This is known as stunting, which results from chronic or recurrent malnutrition and is usually associated with poor social and economic conditions, and/or maternal ill health and malnutrition, and/or recurrent illness, and/or inadequate infant and young child feeding and care practices in early childhood. Stunting hinders children from reaching their full physical and cognitive potential. (The World Health Organization, 2024)

Table 8. Prevalence of stunting, height for age during the period (2015 - 2022)

Statement	2015	2016	2017	2018	2019	2020	2021	2022
Prevalence of stunting, height for age (modeled estimate, % of children under 5):	2,7	2,6	2,6	2,6	2,5	2,5	2,5	2,5

Source: (WDI, 2023)

We observe a gradual decrease in the percentage of children under 5 years suffering from stunting in Algeria during the period 2015-2022. The percentage decreased from 10.7% in 2015 to 8.6% in 2022. The reduction in the stunting rate is considered a positive sign indicating improvement in the health and nutritional status of children in Algeria over the past years. This is a result of efforts in the field of public health and proper nutrition, such as providing early medical check-ups, health education for families, and improving access to nutrient-rich food, and this indicator reflects investment in human resources that ensures sustainable development.

7.5. Prevalence of severe food insecurity:

Table 9. Prevalence of severe food insecurity during the period (2015 - 2022)

Statement	2015	2016	2017	2018	2019	2020	2021	2022
Prevalence of severe food insecurity in the population (%)	13	12,7	11,4	9,3	6,9	6,2	5,6	5.2

Source: (WDI, 2023)

While the prevalence rate of severe food insecurity has risen globally from 21.7% in 2015 to 29.6% in 2022 (an increase of 36.4%), data from the previous table shows a continuous decrease in the prevalence of severe food insecurity among the population in Algeria over the study period. This

decline reflects an improvement in the food situation of the population, as the number of people suffering from severe food insecurity decreases. This is a positive indicator of improvement in food production, distribution, efforts to combat poverty, and efforts to enhance food security and provide adequate nutrition. This improvement is the result of efforts by the government, non-governmental organizations, and civil society in implementing policies and programs aimed at combating hunger and improving food security.

7.6. Some other food security indicators in 2022:

Below is a presentation of the development of the main food security indicators in Algeria during the year 2022.

Table 10. Some Food Security Indicators in Algeria in 2022

Food quality and safety index (score)	Food security index (1-10)	Average per capita protein intake (grams/person/day)	Average per capita fat intake (grams/person/day)	Average per capita calorie intake (calories/person/day)	Percentage of underweight children	Prevalence of child malnutrition	Food consumption as a percentage of household expenditure
54.7	6.76	90.3	94.4	3463	7.19	7.5	43.1

Source: (AOAD, Food Security Conditions in the Arab World, 2022, pp. 33-39)

From the previous table, we notice that Algeria is characterized by an acceptable indicator of food security, which places it in the top ranks compared to its Arab counterparts. This position relatively reflects Algeria's significant stability at various levels, in addition to its ample resources for advancing the agricultural sector.

As for the other indicators, we noticed that they were mostly average. Food expenditure accounted for 43% of total household expenditure, primarily due to the high prices of commonly consumed food items at the expense of purchasing power improvement. The rate indicating the percentage of children suffering from malnutrition in Algeria can be considered relatively acceptable, but there is still a need to continue and enhance efforts to reduce this percentage.

Finally, the food quality and safety index (54.7 points) assess a range of factors related to the safety and quality of food in Algeria. It reflects the level of trust in available food and its safety for human consumption.

8. Algeria's food gap:

After presenting its food production, we will attempt to assess to what extent Algeria has been able to meet its food needs by examining its food gap.

8.1. The reality of the food gap in Algeria:

Algeria is experiencing a food crisis due to the weak performance of the agricultural sector, both in terms of its contribution to the gross domestic product (GDP) and the agricultural balance, which has shown negative values in all years. Additionally, agricultural exports have not been able to cover the increasing agricultural imports, leading to a growing food gap between Algeria's food production and consumption, especially for strategic commodities like grains, meats, and dairy products. This is reflected in the continuous increase in food imports year after year. We can classify the aforementioned groups into two categories as follows:

8.1.1. Deficit food groups: These include grains, legumes, and meats, characterized by a food deficit and an inability to provide the necessary quantities for consumption, leading to a decrease and low self-sufficiency rates. The grain group topped these groups, and the reason for this significant gap is the substantial increase in imports of this group. Looking at the available consumption quantities for this group, they remain below the required level to achieve food security, especially when compared to the production volume and the total available consumption of grains. As a result of this fluctuation,

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this is reflected in the self-sufficiency rate of the grain group, which fluctuated between 17.7% as a minimum in 2021 and 26.6% as a maximum in 2018.

Regarding the legume group, it achieved considerable self-sufficiency rates, with the smallest being 29.6% in 2021 and the highest reaching 51.4% in 2016. There is an average convergence between the production of legumes and the available consumption for most of the period, reducing the size of the food gap for this group.

As for the meat group, it has relatively little importance in the size of the food gap. The meat group achieved high self-sufficiency rates, with the smallest being 92.4% in 2015 and the highest reaching 99% in 2021. There is a convergence between the production of meats and the available consumption for most of the period, reducing the size of the food gap for this group and increasing the self-sufficiency rate. Algeria could achieve a surplus in these two groups if it focuses on production volume and encourages investment in them.

8.1.2. Surplus food groups: These are concentrated in three main groups: fruits, fish, and vegetables. This indicates some available potential for Algerian agricultural exports and an attempt to support its position in global markets and increase its competitiveness.

8.2. Features of Algeria's Food Gap:

From the above, we can highlight the key features of Algeria's food gap as follows:

8.2.1. Imbalance and Inconsistency: Algeria's food gap is characterized by differences between its various food commodity groups, with some experiencing expansion and growth while others contract. Some commodities may have export surpluses, such as vegetables like potatoes, fish, and fruits, while others have very low self-sufficiency rates, such as sugar and oil, for example.

8.2.2. Expansion and Increase: Several factors contribute to the expansion and increase of Algeria's food gap, including:

- Inadequate attention to the agricultural sector and the use of primitive methods.
- Reliance on rainfall for a significant portion of agriculture, making it vulnerable to fluctuations in precipitation rates, resulting in decreased agricultural production.
- The long-standing belief that oil-producing countries are manufacturing, not agricultural, countries, which diminished the importance of agriculture despite the substantial income generated from oil. This led to farmers abandoning their land in search of better livelihoods and higher incomes.

8.2.3. Coincidence with Other Serious Indicators: The most dangerous aspect of the food gap is its large size in essential commodities such as grains, which are crucial for citizens. It is unacceptable for Algeria to remain vulnerable to pressure from advanced countries, especially with the risk of this gap persisting for a long time. Also the growing population in Algeria, implies a decrease in per capita availability of consumption in the future and agricultural output, exposing its economy to a range of difficulties and means of providing the necessary food. This weakens its position in the international arena, especially given the shock caused by the Russo-Ukrainian war primarily on food and global agricultural markets, as it affected two major producers of agricultural commodities in the world.

9. Conclusion:

The food security challenge is considered one of the primary challenges for Algeria. Therefore, it has sought to achieve it through many reforms and the adoption of numerous policies with serious intent since 2000, which have continued beyond 2022. This has yielded positive results reflected in Algerian food security indicators that now approach those of advanced nations. Through our study, we arrived at the following conclusions:

9.1. Results: From our study, we have reached the following conclusions:

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- Given Algeria's resources and based on the collected statistics and rates regarding the reality of food security in Algeria, it can be said that Algerian agriculture can achieve relative self-sufficiency. This fact is supported by data indicating that natural resources such as water resources, agricultural land, forests, climatic characteristics, human potential, and available financial resources can ensure food security, confirming the initial hypothesis of our research.
- The world has experienced several crises that have impacted global food security, especially after the food crisis of 2006, the financial crisis of 2008, COVID-19, and the Russo-Ukrainian crisis, both of which are significant food-exporting resources for various countries worldwide.
- To achieve food security, Algeria has undertaken many reforms and serious policies since 2000, focusing on human resources, especially rural populations, by considering rural development as a means to promote the agricultural sector and achieve food security. Additionally, it has relied on desert agriculture as a crucial strategy for achieving self-sufficiency, which is a positive future initiative.
- Despite the global crises affecting the world and negatively impacting global food security, Algeria has witnessed a significant improvement in its food situation during the period 2015-2022, as reflected in positive food security indicators. This has positioned Algeria at advanced ranks compared to other Arab countries, refuting the second hypothesis of our study.
- Despite Algeria's potential and the positive indicators achieved in food security, it has not succeeded in eliminating the food gap, especially concerning strategic commodities like wheat, which poses a threat to its food security and jeopardizes its independence from external dependence.

9.2. Suggestions: Based on the above results, we can make the following recommendations:

- It is necessary to pay greater attention to improving living conditions in rural areas, particularly by encouraging investment in the agricultural sector.
- There is a need to prioritize water resources by constructing dams and improving irrigation methods to prevent wastage.
- Algeria's focus on investing in desert agriculture is crucial, but it requires the provision of infrastructure, especially improving the north-south transportation network.

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