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FOOD SECURITY IN ALGERIA IN LIGHT OF AGRICULTURAL SECTOR PERFORMANCE INDICATORS

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ABSTRACT

Based on the premise that food security in Algeria – or in any other country – primarily depends on the local agriculture's ability to produce food, this study aims to identify the state of food security in Algeria, by assessing Algeria's agricultural potential and resources, providing a clear picture and an accurate diagnosis of the performance of local agriculture, and determining the extent to which the agricultural sector can achieve food security achieve food security with the available potentials and resources. This will be done through the presentation of some indicative indicators. One of the most important results of the study is that, despite Algeria having the agricultural potential and resources capable of achieving food security, the reality indicates that Algeria suffers from low self-sufficiency rates, high food gap ratios, and difficulty in achieving food security. This is due to the underperformance of its agricultural sector, which has failed to achieve the targeted increases to meet local demand for agricultural products in general and food products in particular.

1 INTRODUCTION

There is no doubt that the concern for achieving food security is not limited to one country or another; rather, it has become one of the foremost challenges facing all countries in the world. It is one of the main issues that has attracted significant attention from researchers, decision-makers, and policymakers at local, regional, and international levels. Achieving food security has also become a strategic goal that both developed and developing countries strive to attain. The interest in the issue of food security has transcended merely addressing poverty, hunger, and the struggle for survival; it has become a problem that presents humanity with a set of challenges with humanitarian, social, economic, political, and even security dimensions that

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threaten state security and sovereignty, and exacerbate regional and international conflicts, disturbances, and tensions. Like all countries of the world, the issue of food security and achieving individual self-sufficiency in food needs, as well as ensuring food independence in Algeria, is a priority in the goals of Algeria's economic policy. There is no doubt that understanding the level Algeria has reached in the field of food security—like all countries of the world—is one of the most important ways to diagnose the roots of the food crisis, analyse the underlying factors, and one of the most important mechanisms to update strategies for securing future food needs, achieving food security, and reducing the severity of food dependency. Understanding the reality of food security in Algeria requires a detailed study of the most important variables that affect achieving this security. Perhaps the most significant of these are those related to the performance of the agricultural sector (agricultural resources and agricultural production), which is the main and sole source of food and one of the most important indicators reflecting the extent of the country's self-reliance.

2 RESEARCH PROBLEM

According to the above, the study problem can be highlighted by posing the following main research question:

RQ: What was the state of food security in Algeria during the period 2010–2023, based on the agricultural sector's performance indicators?

To answer this issue in more detail, it has been broken down into the following sub-questions:

- What is the reality and the situation of the available agricultural potential and resources in Algeria?
- What is the reality of the agricultural sector's performance in Algeria?
- To what extent has Algeria achieved food security, based on the performance indicators of its agricultural sector?

2.1 Research Hypothesis

Based on the posed questions, the following main hypothesis was formulated:

H0 – Algeria has managed in recent years (2010-2023) to secure its residents' food needs based on locally available agricultural and food production quantities without the need for imports, contributing to achieving self-sufficiency and enhancing food security.

2.2 Research Objectives

Through this study, we aim to achieve the following objectives:

- Assessing the available agricultural potential and resources of the available agricultural potential and resources in Algeria.
- Study and analyze the performance of the agricultural sector in Algeria and attempt to reveal the level of plant and animal production in Algeria.
- Highlighting the main challenges and obstacles that prevent the agricultural sector from achieving food security in Algeria.
- Proposing suggestions to help decision-makers address the challenges facing the agricultural sector and find appropriate solutions to overcome the issue of food scarcity.

2.3 Research Importance

The importance of the study can be summarized as follows:

- The issue of food security currently receives international attention that matches its utmost importance at the Arab and national levels in light of the current challenges.
- Attempting to assess food security and take appropriate measures to improve the performance of the agricultural sector, as it represents one of the main pillars to overcome the issue of food shortage.
- Attempting to gather data and studies related to the topic, and rephrasing them in a way that is useful for students and researchers.

2.4 Research Boundaries

In order to study the subject and achieve the desired objectives, the boundaries of this study have been drawn as follows:

- Spatial boundaries: The spatial area designated for the study is Algeria.

- Temporal boundaries: The subject was studied during the period (2010-2023).

2.5 Research Methodology

To study and analyze the topic and address the issues raised by the study, aiming to achieve the desired scientific and practical results, we decided to rely on descriptive and analytical methods. Using the descriptive method, we aim to collect data and facts that reflect the level of food security in Algeria during the period (2010-2023), focusing on some key indicators that reflect the performance of the agricultural sector, including the self-sufficiency index and the food gap index. We also adopted an analytical method, used throughout all research axes, aimed at deepening our understanding and clarifying the components of the topic by analyzing them, determining their effects, and deriving significant interpretations and conclusions. As for the study tools, we relied on a collection of books, journals, specialized reports, and statistics published by reputable organizations.

3 THE THEORETICAL FRAMEWORK OF FOOD SECURITY

3.1 The concept of food security and its various levels:

3.1.1 The concept of Food Security

Since humans inhabited the earth, they have constantly sought to secure food. They have given great importance to food security since ancient times and have strived to meet their nutritional needs to ensure their food and health security. Despite the recent use of the term "food security," it has long garnered the attention of many researchers, experts, and international organizations. It has become one of the most important issues discussed at international seminars and conferences, akin to energy sources, if not more so, since food has no substitute, whereas energy sources have multiple alternatives. The concept of food security originated in the mid-1970s, following the food crisis that the world faced during the period (1972-1974), which led to the first World Food Conference in 1974 in Rome, where the concept of food security was officially and internationally addressed (Mahdy, El Mahdy, Saqr, & El Shafie, 2021, p. 1282).

Opinions have varied regarding the concept of food security, its components, and methods of achieving it. Consequently, its definitions have multiplied, and among the most important, we mention (Jeddou, 2024, pp. 89, 90):

- *The traditional definition of food security:* It refers to achieving self-sufficiency by relying on the country's resources and capabilities to produce its food needs locally.
- *FAO definition:* Food security "is achieved 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, ensuring they can lead a healthy and active life.
- *Definition of the World Bank (WB):* The World Bank defined food security as: the possibility for all people at all times to have sufficient food necessary for their activity.
- *Definition of the World Health Organization (WHO):* The organization defined safety as: all the basic conditions and standards - during the processes of food production, manufacturing, distribution, and preparation - to ensure that food is safe, reliable, healthy, and suitable for human consumption.
- *The Arab Organization for Agricultural Development (AOAD) defines food security as:* providing food in the necessary quantities and qualities for activity and health continuously, for every individual in the population groups, relying first on local production and based on the comparative advantage of producing goods for each country, and making it available to all members of the population at prices that match their incomes and financial capabilities.

And through all the definitions of food security we have mentioned, a precise concept can be derived**:**

Food security means providing the needs of all members of society for food products in sufficient quantity and quality, at prices that match their financial capabilities, either through local production or by importing them from abroad**.**

3.1.2 Levels of Food Security

Two levels of food security can be distinguished: absolute food security and relative food security (Gouissi, 2023, pp. 60, 63).

- Absolute food security: Also known as self-sufficient food security, it refers to the production of food within a single country that meets or exceeds local demand. It is synonymous with the term self-sufficiency. Practically, achieving this type of food security is difficult.
- Relative food security: Unlike absolute food security, relative food security means the ability of a country or a group of countries to provide their food needs partially or completely. In other words, relative food security does not mean that the country produces all the food it needs locally but rather produces as much food as possible locally in an economically rational manner that considers the relative advantage of that country. Additionally, these products must be competitive to be able to compete and generate revenue to import the food that the country cannot produce locally. Therefore, relative food security means securing food in cooperation with others.

3.2 Dimensions and Components of Food Security

3.2.1 Dimensions of Food Security

According to Ghafsi (2020), the concept of food security is based on the definition proposed by the Food and Agriculture Organization (FAO), which is considered the most comprehensive and widely accepted. This concept comprises four main dimensions (pillars): food availability, food access, food utilization, and stability.

- Food availability: It means providing sufficient food supplies to the population, whether from local production or by compensating for the shortfall through imports or through food aid and assistance. Food availability is determined by the level of food production, stock levels, and net trade (Mahdi, 2021, p. 128).
- Food accessibility: It is considered one of the important pillars for achieving food security, and it means the ability of individuals to obtain the material resources that enable them to acquire sufficient quantities of food. This dimension is affected by individuals' purchasing power, market factors, price levels, and employment opportunities.
- Safety:The safety dimension is based on considerations related to quality and specifications that ensure food safety, such as general cleanliness, sanitation, food quality, and the variety of foods.
- Stability: It means the sustainability of achieving the three previous dimensions (availability, accessibility to food, and safety) over different time periods without exposure to fluctuations or crises.

3.2.2 Components of Food Security Related to the Agricultural Sector

According to Khalifa (2023), achieving food security depends on the availability of a set of key components, many of which are directly or indirectly related to the agricultural sector. Since agriculture represents one of the principal determinants of food security, the availability of agricultural resources and agricultural production plays a fundamental role in ensuring an adequate food supply. Based on their relationship to the agricultural sector, these components can be classified into two broad categories: direct components and indirect components.

- *Direct components.* They are represented in:
  - Agricultural land: where agricultural land represents the main element in food production;
  - Water Irrigation: where water is the determining factor in agricultural production;
  - Production inputs: including fertilizers and pesticides, agricultural labor;
  - Climatic conditions;
  - Wildlife and aquatic livestock.

- *Indirect components.* They consist of:
  - Agricultural labor force and its productive efficiency;
  - The use of machinery and agricultural fertilizers;
  - Agricultural marketing;
  - Other components: such as agricultural extension for labor and training, agricultural legislation.

3.3 Food Security Indicators and the Factors Affecting Them

3.3.1 Food Security Indicators

There are many international indicators and standards that aim to estimate the level of food security in both developed and developing countries alike. Among these indicators, some rely on the performance of the agricultural sector, which is considered the backbone of food security. Among the most important of these indicators, we mention:

- *Agricultural GDP Index.* The agricultural GDP is one of the most important indicators that provide a clear picture of the food situation in any country. Changes in the volume of agricultural output affect the food situation in any country, either positively or negatively. An increase in agricultural output may indicate an improvement in the country's food situation, while a decrease, coupled with increased food consumption, leads to a worsening of the food deficit problem (Gouissi, 2023, p. 29).
- *Food Gap Index.* The food gap is one of the main indicators used to measure and determine the reality of food security in any country, and it is one of the most important indicators of food dependency. The food gap reflects the adequacy of local production in meeting the requirements of local consumer demand. It is measured by the difference between what the country produces domestically and what it needs in terms of food. In other words, it represents the quantity of foodstuffs that any country needs but cannot provide locally, and thus resorts to securing them through imports from abroad.

  The food gap (imported quantity) = food consumption - local food production

  That is, the food gap represents the quantity of foodstuffs that a country needs but cannot provide locally (i.e., the net imports of foodstuffs). The larger the gap, the greater the country's inability to meet local food needs, and the greater the country's dependence on foreign food sources.

  The food gap ratio (the dependency ratio on imports) can be measured through the following relationship:

  Food gap ratio = Value of the food gap / Quantity of local consumption × 100

- *Food Self-Sufficiency Index.* Self-sufficiency is considered one of the main indicators used to measure food security. The Food and Agriculture Organization defined it in 1999 as: the ability of a country to meet its residents' food needs through local products without resorting to imports from abroad. In other words, self-sufficiency is achieved when local production equals or exceeds the country's consumption requirements (Clapp, 2017, p. 89). The self-sufficiency index is considered a quantitative indicator that relies on quantities rather than values in its calculation and is not affected by prices and their fluctuations. The larger the self-sufficiency index, the greater the economy's ability to meet its food needs, thereby achieving a higher degree of independence. It is measured through the following relationship:

  Self-sufficiency ratio = Local production quantity / Local consumption quantity × 100

- *Agricultural Output Per Capita Index.* While per capita GDP is an indicator of individuals' economic well-being, per capita food output serves as an indicator of the country's actual food level, reflecting the economy's ability to meet individuals' food consumption needs. Per capita agricultural output can be measured through the following relationship:

  Per capita agricultural output = agricultural GDP / population

3.3.2 Factors Affecting Food Security

There are many factors that influence the level of food security in countries, and generally, these factors can be divided into internal and external.

First, food security is influenced by internal factors related to a country's domestic conditions, including:

- *Natural factors,* including geographical location, climatic conditions, the availability of arable land, rainfall, and water resources.
- *Social factors,* including population density, rural–urban distribution, population growth, education, culture, and access to healthcare.

- *Economic factors,* including GDP, income distribution, monetary and fiscal policies, exchange rates, and subsidy policies.
- *Technological factors,* including the availability of modern agricultural technologies.
- *Financial factors,* including access to financing, low-interest loans, and investment incentives.
- *Political factors,* including political stability, conflicts, crises, and wars.

Second, external factors relate to the external conditions surrounding the country, including economic and financial crises, wars and international conflicts, the availability of global food supply, the degree of price stability in the global food market, and food aid.

4 FOOD SECURITY IN ALGERIA IN LIGHT OF AGRICULTURAL PERFORMANCE INDICATORS

There is no doubt that achieving food security and providing food falls on the agricultural sector. To analyze the state of food security in Algeria, diagnose the roots of the food crisis, and analyze the underlying factors, it is necessary to present and analyze many indicators. Perhaps the most important of these are those related to the agricultural sector, such as self-sufficiency and the food gap, which are among the most important indicators. Through these, one can infer the extent of the local agriculture's ability to produce food with the available agricultural resources and capabilities.

4.1 The Agricultural Potential and Resources in Algeria

The agricultural sector in Algeria – and in any country – is the sole source of food, and the achievement of national food security is determined by the availability of agricultural resources and components with qualitative specifications. Their availability contributes to improving agricultural performance and increasing agricultural productivity, thereby enhancing food security. The following will review the reality of the most important agricultural resources in Algeria.

4.1.1 Agricultural Lands

Agricultural lands are the fundamental base for agricultural production, a primary resource for crop production, livestock production, and forest production, and one of the most important factors supporting agricultural development that helps achieve food security. On a national level, the latest statistical reports issued in 2024 indicate that Algeria ranks first in Africa and eleventh globally in terms of the total area of public lands, estimated at approximately 238 million hectares. The total area of agricultural land is about 41.3 million hectares, while the area of arable agricultural land in use is only about 8.5 million hectares. Table 1 illustrates the development of agricultural land area in Algeria, highlighting the patterns of its utilization and the average per capita share.

Table 1.*Development of Agricultural Land Area in Algeria and Average Per Capita Share from 2010-2023*

Year	Geographical Area (hectares)	Population (million)	Agricultural Land Area (million hectares)					Per Capita Area	
			Exploited				Total	Geographical	Exploited
			Irrigated	Barley	Rested	∑			
2010	238174100	35.66	0.98	4.17	3.27	8.43	-	6.68	0.24
2015	238174100	39.96	1.19	4.19	3.09	8.49	42.1	5.96	0.21
2020	238174100	44.25	1.4	4.1	3.03	8.5	41.35	5.38	0.19
2023	238174100	46.3	1.96	3.76	2.84	8.57	41.34	5.14	0.18

Source: (Arab Organization for Agricultural Development, 2025, 2018 and 2013)

By tracking the data from the previous table, we conclude the following:

- The area of arable land in Algeria is approximately 41.3 million hectares, which represents only 17.3% of the country's total

area. The percentage of agricultural land utilized from the total area of the country is very low compared to many Arab countries, not exceeding 3.5%, and it has not surpassed 20.5% of the area of arable land. This confirms that Algeria is rich in untapped land resources, which provide significant opportunities to enhance agricultural production and achieve agricultural development that contributes to food security.

- When tracking the development of the area of cultivated agricultural land during the period (2010-2023), it becomes clear that the overall situation has not changed, as it has been characterized by a consistently low level of cultivated agricultural land. This is not attributed to the limited and small area of arable land, but rather to the weakness of agricultural policies and land reclamation programs, the lack of agricultural investments, and the low levels of agricultural research and technology.
- Algerian agriculture is characterized by the weakness of irrigated agricultural areas, as they did not exceed one-third of the actually utilized agricultural area in 2022. Two-thirds of the utilized areas depend on rainfall, which exposes these agricultural areas to fluctuations in rainfall and the risks of drought, reflecting on the level of agricultural production.
- The per capita share of utilized agricultural land decreased during the study period (2010-2023), from 0.24 hectares in 2010 to 0.18 hectares in 2023, attributed to population growth, while the growth of utilized agricultural land remained constant.

4.1.2 Water Resources

Water resources are considered one of the crucial factors significantly impacting the performance of the agricultural sector and food security conditions, which remain dependent on the volume of water resources used in agricultural irrigation and the expansion of irrigated areas. When it comes to Algeria, hydrological estimates indicate that Algeria is rich in diverse water resources, which are generally divided into two categories: conventional sources and non-conventional sources.

First, traditional water sources: These sources consist of surface water and groundwater, and their source is rainwater. The total volume of traditional resources in Algeria is estimated at 19.4 billion m³/year, of which 13.8 billion m³ is in the northern region and 5.6 billion m³ in the desert region. These resources are distributed among:

a. *Surface water:* Surface water resources in Algeria are estimated at 12.4 billion m³, geographically distributed with 11.8 billion m³ in the north and 0.6 billion m³ in the south.
b. *Groundwater:* The amount of exploitable groundwater in Algeria is estimated at 7 billion m³ per year, distributed geographically in an unbalanced manner, with 2 billion m³ located in the north, which is currently exploited at a rate exceeding 90%, leading to its depletion. The remaining 5 billion m³ are located in the south, of which only 1.7 billion m³ are exploited, due to various factors, including the low renewability of this water and the high cost associated with accessing it.

Second, non-traditional water sources: Non-traditional alternatives mainly consist of seawater desalination and treated wastewater. Non-traditional water sources represent a small part of the water resources utilized in Algeria.

Despite the diversity of water resource sources in Algeria, many studies and reports indicate that, like all Arab countries, it is one of the most water-scarce countries in the world. This is due to various factors, including natural factors and climatic conditions, demographic pressure, and prevailing local economic and social conditions.

4.1.3 Agricultural Workforce:

Alongside land and water resources, the abundance of agricultural labor represents the main driver for improving agricultural operations, the analysis of which requires knowledge of the size of the rural population, which is the primary source of labor in the agricultural sector. It also reflects the relative importance of the agricultural sector in the national economy of any country (Imran, 2015, p. 40). Table 2 shows the development of rural populations and the workforce in the agricultural sector during the period 2010-2023.

Table 2.Development of the Rural Population and Workforce in the Agricultural Sector in Algeria during the Period (2010-2023)

Year	Population (in millions)		Workforce (in millions)	
	Rural population	Total population	Agricultural workforce	Total workforce
2010	12.03	35.66	3.17	14.96
2015	11.89	39.96	2.54	11.93
2020	11.38	44.25	2.65	12.10
2023	11.17	46.3	2.7	13.17

Sources: Arab Organization for Agricultural Development(2025, 2018, and 2013) and Arab Monetary Fund (2023)

It is evident from the figures in the previous table that:

- The rural population in Algeria reached approximately 11.17 million in 2023, representing 24.12% of the total population of Algeria (equivalent to one-quarter), which is the lowest percentage during the study period from 2010 to 2023.
- The period (2010-2023) witnessed a significant decline in the rural population of Algeria, amounting to approximately 860,000 people, which represents a decrease of about 7% and an annual decline rate of 0.6%. This decrease in the rural population of Algeria is attributed to the continued migration from rural areas to cities due to the low standard of living, the poor level of services (such as education and health) compared to cities, a weak economic environment, and the availability and diversity of job opportunities with higher incomes outside the agricultural sector.
- The number of workers in the Algerian agricultural sector in 2023 reached approximately 2.7 million, which represents 20.5% of the total workforce in Algeria, estimated at around 13.17 million workers.

The size of the workforce in the Algerian agricultural sector during the period (2010-2023) has shown a downward trend, from approximately 3.17 million workers in 2010 to around 2.7 million workers in 2023. This decline is attributed to the decrease in the rural population of Algeria.

4.1.4 Technical Inputs

Technical inputs represent one of the most important means to increase agricultural production and improve food security levels. Technical inputs include agricultural machinery (agricultural machines and equipment), fertilizers, and various types of soil conditioners.

First, agricultural machinery (tractors and harvesters). Agricultural machinery is considered a key tool for the development and enhancement of the supply of agricultural products, providing food in both quantity and quality. Its availability is essential for carrying out agricultural operations optimally and at the right time. By tracking the development of agricultural machinery numbers in the latest reports issued by the Arab Organization for Agricultural Development in 2025, we find that Algeria possesses significant agricultural equipment capabilities, and its numbers evolve from year to year. In 2022, it ranked first in the Arab world in terms of the number of harvesters and agricultural studies, with an estimated number of 11,535 harvesters. Meanwhile, it ranked second in the Arab world after Egypt in terms of the number of tractors, which approached 113,125 tractors. This situation is attributed to Algeria's implementation of an agricultural and rural renewal policy.

Second, the use of fertilizers. It contributes to improving agricultural productivity both quantitatively and qualitatively at the same time. The latest available statistics indicate that the rate of chemical fertilizer use in Algeria – As is the case in most Arab countries- it is still low. It is much lower than the Arab and global average, and the low use of fertilizers in Algerian agriculture is attributed to their high prices, along with their low production (Arab Organization for Agricultural Development, 2022, p. 11).

4.2 Agriculture in Algeria: Output & Production

To analyze the reality of the agricultural sector's performance in Algeria and determine its contribution to food production and thus achieving food security, it was necessary to rely on some indicators that reflect the current situation, including agricultural output and production.

4.2.1 Agricultural Output

The agricultural sector in Algeria is considered one of the most important economic sectors contributing to the Gross Domestic Product (GDP), According to the latest reports issued by the Arab Fund for Economic and Social Development in 2024, the value of agricultural output in Algeria in 2023 was estimated at approximately 23.3 billion US dollars, which represents 12.3% of Algeria's total GDP, Table 3 below illustrates the development of agricultural output at constant prices (base year 2015) and its share of GDP during the period (2010-2023).

Table 3.Agricultural Output at constant prices in million US dollars(base year 2015) and its share of GDP in Algeria during (2010-2023)

	2010	2015	2020	2023
Gross Agricultural Product	13492	19262	21930	23310
Percentage contribution to GDP (%)	9.5	11.6	12.9	12.3

Source: Arab Monetary Fund(2024)

Based on the figures in Table 3:

- The analysis of agricultural Product developments at constant prices in Algeria during the period 2010-2023 indicates that the latter has witnessed continuous growth, with its value increasing from approximately 13.5 billion dollars in 2010 to over 23.3 billion dollars in 2023, nearly doubling. The annual growth rate during the period (2010-2023) was estimated at around 4.3%. This increase is attributed to the efforts made by the Algerian government over the past decades to enhance the development of the agricultural sector.
- The contribution of agricultural output to GDP witnessed a significant increase from 2010 to 2020, peaking at 12.9% (the highest rate in the past ten years). However, it recorded a decline in recent years, with the rate dropping to around 12.3%; this decline can be attributed to the increasing relative importance of the hydrocarbons and services sectors in the national economy.
- Despite the increase in the value of agricultural products in Algeria during the period (2010-2023), its contribution to the Gross Domestic Product, despite its slight improvement, remains relatively weak compared to the scale of Algeria's agricultural potential and resources.

4.2.2 Agricultural Production: Quantitative Features

The reality of the development of agricultural production quantities in Algeria can be diagnosed by highlighting plant and animal production. The following are the most important statistics that reflect the current situation.

First, Plant Production

Plant production occupies an important position in agricultural production and is a fundamental pillar in providing food and achieving food security. Plant production includes a diverse range of agricultural crops, the most important of which are: grains (wheat, barley, rice, corn, etc.), tubers, legumes, vegetables, fruits, sugar crops, and oilseeds. etc.), tubers, legumes, vegetables, fruits, sugar crops, and oilseeds. Table 4 illustrates the development of the main plant-based food products during the period (2010-2023).

Table 4.Development of Major Agricultural Crop Production during the Period (2010-2023)

The Crop	2010		2015		2020		2023	
	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)
Cereals	4558.57	2856.37	3760.95	2686.08	4392.97	2889.38	4207.28	2259.43
Wheat	2952.7	1755.73	2656.73	1814.72	3106	1848.08	3029.36	1573.54
Barley	1503.9	1018.79	1030.56	802.38	1213.14	978.44	1104.21	628.06

The Crop	2010		2015		2020		2023	
	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)	Production (1000 tons)	Area (1000 Ha)
Tubers	3300.31	121.99	4539.57	153.31	5020.5	157.86	3853.65	129.84
Potatoes	3300.31	121.99	4539.57	153.31	4659.48	149.47	3853.65	129.84
Pulsesbroad	72.32	74.2	107.35	104.23	115.05	102.93	84.54	85.35
Beans	36.62	34.21	44.81	39.98	49.86	39.85	39.84	34.56
Chickpeas	23.47	25.52	24.90	25.49	39.98	36.74	23.77	30.51
Vegetables	8640.42	429.35	5906.37	226.03	10287.2	380.16	10935.46	380.39
Fruits	3350.13	366.95	4962.45	459.09	4540.81	454.25	5218.49	479.35
Vegetable oils	178.69	296.72	423.74	408.68	720.63	446.24	-	-

Note: Production in 1000 tons; Area in 1000 Ha.

Source: Arab Organization for Agricultural Development(2025, 2018, and 2013)

The figures in the table above show that the production of various agricultural crops in Algeria has generally seen significant development, despite some disruptions attributed to several factors, including climatic and natural conditions, where:

- *Regarding the cereal sector,* cereals constitute the most important agricultural crops in Algeria, where:
  - The grain crop (wheat and barley) dominated the share of the total cultivated agricultural area in Algeria, occupying an area estimated at approximately 2.26 million hectares in 2023, which represents about 27% of the total cultivated areas;
  - The area planted with cereal crops in general did not witness significant development during the period from (2010-2023), and it did not exceed 3 million hectares throughout the selected period, which explains the weakness of land reclamation programs and the lack of expansion in utilizing arable land resources;
  - The near-total dominance of wheat and barley crops over the area allocated to the cereal sector, exceeding 97% of the total cereal crop area, confirms the importance of wheat and barley in the Algerian food system;
  - Cereals are considered one of the most important agricultural crops in Algeria. Estimates of cereal production during the period (2010-2023) indicate that total production reached its lowest level in 2015, at approximately 3.7 million tons (this decline is attributed, as previously mentioneRegarding tubers, tubers, specifically potatoes, are among the important food commodities in Algeria's agricultural sector.els of cereal production are due to several factors, including: lack of rainfall and drought, reliance on traditional farming methods, and the quality of seeds and fertilizers used;
  - Wheat and barley production has experienced fluctuations between increases and decreases over the period (2010-2023), attributed to several factors, including the lack of rainfall during the agricultural season.

- *Regarding tubers,* specifically, potatoes are among the important food commodities in Algeria's agricultural sector. By following the figures in the previous table, it becomes clear that:
  - The cultivated area reached approximately 130,000 hectares, which represents about 1.5% of the total utilized agricultural area. The total cultivated area of tubers saw a slight increase of about 6.8% compared to 2010;
  - Potatoes accounted for the entire agricultural area allocated to tuber crops in Algeria throughout the selected period (2010-2023);
  - Despite the relatively limited land area devoted to potato cultivation, potato production increased markedly during the study period, from approximately 3.3 million tons in 2010 to more than 4.6 million tons in 2020. This growth was supported by several factors, including the possibility of

year-round cultivation and the crop's high yield per hectare.

- *Pulses sector:* Despite the importance of pulses (lentils, broad beans, chickpeas, etc.) in the Algerian diet but the table figures indicate:
  - The area allocated for the production of pulse crops constitutes a very small part of the total area of cultivated agricultural land in Algeria, and represents the smallest area compared to other agricultural crops;
  - Despite the recorded increases in pulse production levels during the period from 2010 to 2023, where it rose from 74 thousand tons in 2010 to over 85.35 thousand tons in 2023, their production remains below the required level;
  - Broad beans and chickpeas occupy most of the area allocated to the pulses sector, accounting for approximately 77% of the total area. The production of pulses mainly consists of fava beans and chickpeas, which in 2023 represented 48% and 28% of the total production of pulses, respectively.

- *Regarding the vegetable crop:* Vegetables are considered one of the main food commodities that play a pivotal role in food availability, and the figures in the previous table indicate that:
  - Vegetables are among the crops that experienced significant fluctuations and instability in their area during the period (2010-2023), as they generally saw a significant decline, indicating neglect of this type of agricultural crop;
  - Vegetables are among the largest agricultural crops produced in Algeria, and their production has fluctuated, sometimes increasing and sometimes decreasing. The recorded fluctuations in production quantities are attributed to the variability in the agricultural areas allocated to them.

- *As for fruits:* Fruits (citrus, grapes, figs, etc.) are considered one of the most important food commodities in Algeria, and the figures in the previous table indicate that:
  - Fruit trees covered an agricultural area estimated at 480,000 hectares in 2023, which represents about 6% of the total utilized agricultural area;
  - The area allocated for fruit cultivation has generally seen a significant increase, from about 367,000 hectares in 2010 to over 480,000 hectares in 2023, which has led to good results in fruit production.

- *As for vegetable oils:* Vegetable oils are considered one of the main food commodities in Algeria, and they form an integral part of the diet. By reviewing the data in Table4, we can see:
  - The areas allocated for oilseed crops in Algeria have seen significant development compared to the areas of other agricultural crops. In 2010, these areas exceeded 296,000 hectares, rising to over 446,000 hectares in 2020, which is more than half of the total area allocated for oilseed crops. This reflects the efforts made by Algeria to expand the cultivation of oilseed crops;
  - Vegetable oils have seen a significant increase in their yield, with the quantity produced over the past ten years (2010-2020) estimated at approximately 424 thousand quintals, representing a 143% increase. This rise, as previously mentioned, is attributed to Algeria's efforts to elevate the levels of oilseed crop production, which is evident through the expansion of cultivated areas.

Second, Animal and Fish Production

Animal production (red and white meats, eggs, milk and its products) and fish production are an important part of agricultural production, a complementary element to plant production, and one of the most important components of the food system that plays a significant role in enhancing food security. Before discussing the reality of the development of animal and fish production in Algeria, it is necessary to review the reality of the development of livestock, as it is the foundation of animal production. Table 5 illustrates the development of livestock and animal production in Algeria during the period (2010-2023).

Table 5.*Development of Livestock and Animal Production in Algeria during the period (2010-2023)*

Type	2010	2015	2020	2023
Heads: 1000 Head				
Cattle	915.42	2,150	1,740.18	1,285.04
Sheep	22,668.2	28,112	30,905.56	21,690.61
Goats	4,287.30	5,014	4,908.17	3,690.54
Camels	313.99	362.26	435.21	561.41
Horses	43.65	42.36	48.00	56.20
Total Heads	28,228.56	35,680.63	37,989.13	27,227.61
Production: 1000 Tons				
Total Meat	559.66	819.02	798.52	951.01
Red Meat:	263.26	525.58	505.89	547.91
– Cattle Meat	100.58	155.00	144.43	138.00
– Sheep and Goats Meat	154.80	354.48	354.67	398.93
White Meat:	296.40	293.44	292.64	403.1
– Chicken Meat	296.40	257.60	260.27	376.20
Milk	559.66	3,895	3,189.24	2568.19
Eggs	224.53	167.50	308.46	280.99
Fish	130.12	105.20	86.90	82.37

Source: Arab Organization for Agricultural Development (2025, 2018, 2013)

Through the numbers presented in Table5:

First, the Development of Livestock

Algeria possesses a relatively abundant livestock wealth in terms of numbers, and the livestock wealth in Algeria consists of five main types, which are: cattle, sheep, goats, horses, and camels, where:

- Algeria possesses a large and diverse livestock wealth, estimated in 2023 at around 27.3 million heads. This wealth places Algeria in sixth position in the Arab world in terms of livestock numbers, accounting for approximately 8% of the total Arab livestock wealth.
- The livestock sector—especially sheep—in Algeria experienced an unprecedented decline in 2023 compared to previous years, with their numbers stabilizing around 27.3 million heads, a decrease of more than 10 million heads compared to 2020. This decline is attributed to several factors, including drought, the high cost of feed, the indiscriminate slaughter of female livestock, and smuggling operations abroad.
- Sheep hold the most important position in the livestock sector in Algeria in terms of number, reaching approximately 21.7 million heads in 2023, which is equivalent to 80% of the total Algerian livestock. Goats come in second place with a percentage of 13.5%, representing more than 3.7 million heads, followed by cattle with more than 1.2 million heads, equivalent to 4.7%. Camels and horses represent 2% and 0.2% of the total livestock, respectively.
- When examining the development of livestock numbers in Algeria during the period (2010-2023), it becomes clear that the herds of cattle and sheep in Algeria – unlike other types of livestock – experienced a decline in 2023 compared to 2020, this decrease, as previously mentioned, can be attributed to several factors, including: a shortage of pastures due to unfavorable weather conditions and drought waves that led to cattle deaths, rising feed costs, the spread of diseases (such as brucellosis and mad cow disease), and a lack of medical care.

Second, the Development of Livestock and Fish Production

The livestock and fish wealth is utilized in the production of red and white meats, eggs, dairy products, and fish. Livestock and fish production in Algeria during the period (2010-2023) has shown varying performance.

a. *Meat production*:

By tracking the numbers and data of meat production in Algeria, it becomes clear that:

- Algeria's meat production, both red and white, was estimated at around 951 thousand tons in 2023, with red meat constituting the largest portion of Algeria's national meat production, accounting for approximately 57.6% of the total meat production;
- Meat production in Algeria during the period (2010-2023) experienced significant fluctuations between increases and decreases. It rose from over 559 thousand tons in 2010 to 819 thousand tons in 2015, then decreased in 2020 to over 798 thousand tons, and returned to increase to over 951 thousand tons in 2023. The reason for the fluctuations in meat production during the study period is attributed to the fluctuations in red meat production, which, as previously mentioned, is the largest component of meat production;
- National production of red meat in 2023 exceeded 548 thousand tons. Like national meat production, red meat production in Algeria during the period (2010-2023) witnessed significant fluctuations. These fluctuations are attributed to several factors, including the decline in the cattle herd, the decrease in demand for locally produced red meat, the increase in demand for imported red meat, which is characterized by lower prices, and the reduction in the number of slaughtered animals;
- When looking at the sources of red meat production in Algeria during the period (2010-2023), it becomes clear that the overall situation has not changed much; the production of red meat in Algeria continued to rely primarily on sheep and goats, which contributed in 2023 about 75% of the national red meat production , while beef contributed about a quarter of the production.
- The production of white meat in Algeria lacks diversity and is primarily based on poultry. The national production of white meat in 2023 witnessed significant growth, surpassing 400 thousand tons, after being stable at around 290 thousand tons throughout the study period. This development is attributed to several factors, including the provision of support and loans to poultry farmers, and the supply of essential production inputs such as concentrated feed like soybeans and corn, vaccines, and others.

b. *Milk production*:

Despite the significant development in milk production in Algeria following the implementation of the agricultural and rural renewal program, where it increased from approximately 560 thousand tons in 2010 to over 3,8 million tons in 2015, it has experienced a downward trend in recent years (2015-2023). This decline is attributed to the recorded decrease in the cattle herd of various types.

c. Egg production

Algeria's egg production reached approximately 280 thousand tons in 2023, and its production during the study period (2010-2023) experienced fluctuations between progress and decline, attributed to several factors, the most important of which are: climatic conditions affecting laying hens and the support policies implemented.

d. *Fish production* (fisheries and aquaculture)

Despite Algeria having a coastline of 1,200 kilometers and a marine area rich in fish, fish production in Algeria has remained low and has shown a declining trend throughout the study period, from about 130 thousand tons in 2010 to approximately 82 thousand tons in 2023. This confirms that the fish production sector in Algeria, despite the efforts made, faces many challenges that hinder its development, including the aging fleet and the weak fishing techniques used, the depletion of fish stocks due to overfishing, and the lack of adherence to biological rest periods.

4.3 Agriculture and Food Security in Algeria (2010–2023)

To assess the reality of food security in Algeria and determine the extent to which local agriculture can produce enough to meet local food needs, we will measure and analyze the development of the self-sufficiency index and the food gap index for widely consumed agricultural and food crops in Algeria during the period (2010-2023).

4.3.1 Self-Sufficiency Index

Table 6 summarizes the development of self-sufficiency rates for widely consumed agricultural and food products in Algeria during the period (2010-2023).

Table 6. Development of Self-Sufficiency Ratios for Major Agricultural and Food Products in Algeria during the Period (2010-2023)

Products	2010	2015	2020	2023
Cereals	36.48	21.3	25.1	28.6
Potatoes	96.68	96.7	98.2	98.0
Pulses	25.99	31.7	37.5	20.5
Vegetables	99.7	99.6	99.8	99.8
Fruits	90.65	92.0	96.1	97.9
Sugar	0.0	0.0	0.0	0.0
Oils and greases	6.15	7.7	20.0	28.6
Meat	89.92	92.4	95.6	99.1
Fish	84.51	77.1	89.9	89.2
Eggs	99.8	99.7	99.8	99.9
Milk and its products	51.06	82.2	72.5	81.4

Source: (Arab Organization for Agricultural Development, 2025, 2018 and 2013)

By tracking the data from the previous table, it becomes clear that:

- Algeria recorded varying self-sufficiency rates, ranging from achieving self-sufficiency in some goods to a continuous deficit in most strategic goods. This is attributed to the state of agricultural production in various goods. Based on these rates, agricultural and food products can be classified into:
  - *Goods with high self-sufficiency rates:* These goods exceed 90%, indicating that Algeria is self-sufficient in these goods, reflecting a secure food situation. They include: eggs, vegetables, meat, potatoes, and fruits.
  - *As for eggs*: Eggs are the only commodity in which Algeria achieved complete self-sufficiency in 2023 (i.e., 100%). Egg self-sufficiency rates remained stable, exceeding 99% during the period (2010-2023);
  - *Regarding vegetables*: Vegetables have maintained stable self-sufficiency rates exceeding 99% throughout the study period, and this is due, as previously mentioned, to the fact that vegetables are among the largest agricultural crops produced in Algeria;
  - *Regarding meat*: The meat sector in Algeria achieved high self-sufficiency rates, estimated at 99.1% in 2023. Throughout the study period, it witnessed significant development, rising from 89.92% in 2010 to 99.1% in 2023. These rates do not reflect an abundance in meat production but rather a decrease in local demand due to rising prices;
  - *Regarding potatoes*: Potatoes are among the widely consumed food products in Algeria, and they recorded high self-sufficiency rates, exceeding 96% throughout the study period, indicating their abundant production;
  - Fruits: Fruits achieved a self-sufficiency rate of approximately 97.9% in 2023, and during the study period, they witnessed a significant development from about 90.65% in 2010 to about 97.9% in 2023. This confirms that the good results achieved in the field of fruit production enabled the attainment of considerable self-sufficiency rates in this sector.
- *Goods with medium self-sufficiency rates*: These include goods with self-sufficiency rates ranging between 60% and 90%, indicating a safe food deficit, and include:fish,milk and their derivatives.
  - *Regarding fish*: Fish also experienced high self-sufficiency rates, with the lowest being around 77.1% in 2015 and the highest being around 89.9% in 2020. As is the case with meat, the increase in self-sufficiency rates for fish for the Algerian consumer does not reflect an abundance in fish production, but rather the weak

local demand for it due to the low purchasing power of the consumer based on the continuous rise in its prices;

- *Regarding milk and its products*: milk and its products in general witnessed an increase and improvement in self-sufficiency rates during the period (2010-2023), reaching their highest levels in 2015 at approximately 82.2%. This development is attributed to the increases achieved in milk production. Despite the improvement in self-sufficiency rates, local milk production was unable to meet local demand, necessitating reliance on external markets to fill the gap.

- *Goods with low self-sufficiency*: These include goods with self-sufficiency rates of less than 60%, reflecting a serious food deficit, and include: Cereals, Pulses, as well as oils and greases.
  - As for Cereals: Cereals (specifically wheat) are considered one of the most important strategic crops in Algeria and one of the key factors in maintaining national food security, as they represent the basic food that cannot be dispensed with in the Algerian consumer's lifestyle. Despite cereals (wheat and barley) accounting for the lion's share of the total cultivated agricultural area in Algeria, the self-sufficiency rates in cereals remained very low throughout the study period, recording the lowest rate in 2015 at about 21.3% and the highest rate in 2010 at about 36.48%. This indicates that local cereal production, at best, covers only 36.48% of local food needs, and Algeria resorts to importing more than 63.5% of its cereal needs, which poses a real threat to food security in Algeria;
  - Regarding Pulses: The self-sufficiency rates for pulses have fluctuated, but they are generally trending upwards. This improvement is attributed to the increases recorded in pulses production. Despite the recorded improvement in self-sufficiency rates, these rates remain low, which explains the weak local production - despite its increased volume- and its inability to cover national consumption;
  - Regarding oils: Despite the low self-sufficiency rates in oils throughout the study period, there has been significant improvement. The improvement in this commodity category indicates an increase in its production, as a result of the efforts made by Algeria to develop oilseed cultivation (rapeseed, sunflower).

- *Goods with no self-sufficiency*: These are goods for which Algeria is 100% dependent on foreign markets for food supply, including sugar.

4.3.2 Food Gap Index (Food Dependency)

Data in Table 7 indicate the development of the food gap ratio for agricultural and food products in Algeria during the period (2010-2023).

Table 7.*Development of the Food Gap Ratio for Major Agricultural and Food Products in Algeria during the Period (2010-2023)*

Products	2010	2015	2020	2023
Cereals	63.5	78.7	74.9	71.4
Potatoes	3.3	3.3	1.8	2.0
Pulses	74.0	68.2	62.5	79.5
Vegetables	0.3	0.4	0.2	0.2
Fruits	9.3	8	3.9	2.1
Sugar	100	100	100	100
Oils and greases	93.8	92.2	80	71.4
Meat	10.0	7.6	4	0.9
Fish	15.5	22.9	10.1	10.8
Eggs	0.2	0.2	0.2	0.1
Milk and its products	48.9	17.7	27.5	18.6

Source: (Arab Organization for Agricultural Development, 2025, 2018 and 2013)

It is clear from the data in the previous table that, despite recording very low dependency rates in some agricultural and food products, including vegetables, fruits, and meats, etc., Algeria suffers from a continuous deficit and significant dependency on many strategic agricultural and food products. Achieving food security in these products is contingent upon import operations, which costs Algeria a hefty import bill, depletes its foreign currency reserves, and creates food disturbances, as well as economic, social, and even security problems, especially with the rising prices of these goods in global markets. These products include:

- Sugar: A complete nutritional dependency gap (100%) was recorded throughout most of the study period;
- Cereals, Pulses, and oils: Algeria recorded a very high food gap exceeding 63% throughout the study period.

Based on the above, it is clear that despite Algeria recording high self-sufficiency rates in some goods such as vegetables and fruits, the overall picture does not hide the fact that there is a clear shortfall in food self-sufficiency for basic food groups such as grains, Pulses, and sugar. This has continuously reflected in the widening food gap rates for these goods, which clearly indicates that Algeria faces difficulty in covering the basic and essential food needs of its population from local production. The food situation in Algeria is not secure, hindered by many challenges related to the weakness and insufficiency of local agricultural production, resulting from several factors, the most prominent of which are:

1- High population growth rates: Population growth is one of the most significant challenges facing efforts to achieve food security in Algeria. While local agricultural production of basic food commodities experienced significant fluctuations during the study period (2010-2023), the population of Algeria increased markedly from 35.6 million in 2010 to over 46 million in 2023, with an annual growth rate of about 2%. This has created a deficit and shortfall in meeting local food needs, making it difficult to achieve self-sufficiency and food security.
2- Unfavorable natural conditions related to: the limited agricultural land resources, water scarcity, fluctuations in rainfall, and the spread of recurrent droughts;
3- The decrease in the number of workers in the agricultural sector, and the increase in migration from rural areas to cities;
4- Poor management of agricultural resources, weak agricultural policies, and agricultural reclamation programs;
5- The low levels of modern agricultural production inputs in terms of quantity and quality, such as chemical fertilizers and pesticides;
6- The lack of agricultural investments and the non-use of modern agricultural technologies.

5 CONCLUSIONS

The issue of food security is one of the most important contemporary issues that attracts the attention of all countries in the world, whether developed or developing. The problem of food is no longer just an economic issue; it has become a political and security issue that threatens the security and sovereignty of nations. It is well known that achieving food security and food sovereignty in all countries and regions primarily depends on the ability of local agriculture to produce food and ensure the stability of its supply to the local market. Undoubtedly, Algeria – like all countries in the world – has made significant efforts over the past decades to develop the agricultural sector and enhance food security. However, despite these efforts and the availability of substantial agricultural resources that enable Algeria to meet its food needs, the reality indicates that Algeria suffers from a difficult food situation and a low level of food security. This is due to the underperformance of its agricultural sector, which has failed to achieve the targeted increases to meet local demand for agricultural products in general and food products in particular. This situation necessitates a reevaluation of the agricultural policies pursued by Algeria and the development of strategic plans to improve the performance of the agricultural sector and overcome the challenges that hinder agricultural development and increase self-sufficiency rates to achieve food security.

Through the study we conducted, we reached many conclusions, the most important of which are:

1. Algeria has vast agricultural potential and resources (land, water, human resources, etc.)... ...etc.), providing great opportunities to meet local food needs and enhance food security. However, the failure to optimally exploit these resources has prevented the sector from achieving the desired results.
2. Despite the developments in agricultural production levels for many crops, evidence indicates that the Algerian agricultural sector is unable to meet the local market's food needs.
3. The Algerian agricultural sector faces many obstacles that hinder its growth and development, including: the limited area of

cultivated land compared to the total area, water scarcity and drought, lack of qualified labor, rural-urban migration, weak land reclamation programs, poor agricultural technologies, low volume of agricultural investments, and lack of funding sources.

4. The inability of Algerian agricultural production to meet the local market's needs for most strategic food commodities (such as cereals and pulses) has led to a decline in self-sufficiency levels and an increase in food dependency, which in turn has made it difficult to achieve food security and hindered economic development in Algeria.

According to the results obtained in this study, the following recommendations have been proposed:

1. Reviewing agricultural policies and working on adopting comprehensive reform program plans to enhance agricultural performance and improve agricultural yield;
2. Working on developing and improving the utilization of available agricultural potential and resources, and addressing the problems that hinder them;
3. Introducing modern agricultural technologies and machinery, providing improved agricultural inputs, and working on training and developing agricultural labor;
4. Providing financing on favorable terms and increasing the volume of public and private investments directed toward the agricultural sector;
5. Attention to university research institutions and centers working to promote agricultural development, with the provision of material, technical, and moral support for them and fostering a spirit of cooperation among them.

Despite our efforts to cover most aspects of the topic, the complexity and breadth of the research elements have revealed many important and relevant aspects worthy of further investigation, especially since this field remains fertile for research and promising in attracting the attention of scientific and practical studies. For example, we mention studies on: agricultural policies and their effectiveness in achieving food security in Algeria, the macroeconomic implications of food security in Algeria, and the obstacles to sustainable food security in Algeria.

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