

Agricultural Development in Algeria between the Imperative of Sustainability and Environmental Risks: A Study of Constraints and Objectives

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Abstract

This study aims to analyze the state of agricultural development in Algeria in light of the increasing environmental risks and the growing need to adopt a sustainable development approach. The agricultural sector is no longer evaluated solely based on its ability to increase production, but also on its capacity to adapt to environmental challenges and ensure the sustainability of natural resources. The study addresses the main environmental constraints facing this sector, namely climate change, desertification, soil degradation, water scarcity, and biodiversity loss, in addition to the impact of rural marginalization and weak local development on the stability of agricultural activity. It adopts a descriptive-analytical method by examining concepts related to sustainable agricultural development and analyzing the relationship between the environment and the agricultural sector. The study concludes that environmental risks represent a real obstacle to achieving sustainable agricultural development, as they affect not only agricultural production but also extend to the social and economic aspects of rural areas. This highlights the necessity of integrating the environmental dimension into agricultural policies, improving natural resource management, developing sustainable farming practices, and reducing rural marginalization while promoting local development.

Keywords: Agricultural development, sustainability, environmental risks, Algeria, climate change, desertification, water scarcity, rural development.

Introduction

In the contemporary era, agricultural development has become one of the most critical issues receiving growing attention, due to its fundamental role in ensuring food security and supporting both economic and social stability. However, this sector is no longer assessed merely by its ability to increase production and achieve self-sufficiency; it is also closely linked to the extent to which it respects sustainability principles and preserves environmental balance. Unregulated agricultural expansion, excessive exploitation of natural resources, and the intensive use of chemicals and modern technologies have all contributed to environmental imbalances that threaten the future of agricultural activity itself.

Nevertheless, this vital sector faces a set of environmental, economic, and social challenges, which raises the issue of whether sustainable agricultural development can truly be

achieved. From an environmental perspective, the sector suffers from soil degradation, desertification, climate change, and water scarcity, all of which directly reduce farm productivity and increase farmers' vulnerability to natural risks. On the economic and social levels, limited financing, insufficient technical support, inadequate infrastructure in certain regions, and rural-to-urban migration all further complicate efforts to improve agricultural productivity and ensure its continuity.

In this context, discussing sustainable agricultural development has become an urgent necessity. Sustainable development refers to achieving agricultural production that meets present needs without compromising the ability of future generations to meet their own needs, through the preservation of natural resources, efficient use of water and soil, and reduction of harmful environmental impacts. It also involves improving farmers' living conditions, enhancing their skills, and training them to use modern agricultural technologies, thereby increasing productivity and reducing losses. Based on the above, the following research question can be raised: **How can Algeria achieve sustainable agricultural development in light of environmental, economic, and social challenges?**

Sub-questions: Based on the main research question, the following sub-questions can be formulated:

- What is meant by the concept of agricultural development?
- What are the main environmental constraints that threaten the achievement of agricultural development?
- How do the objectives of agricultural development interact with the requirements of environmental protection and natural resource sustainability?

Hypotheses: To address the main research question, the following hypotheses can be proposed:

- Sustainable agricultural development achieves a balance between economic and social objectives and the requirements of environmental protection.
- Environmental constraints significantly affect the possibility of achieving sustainability in the agricultural sector, even when supportive policies are in place.
- Establishing clear and sustainable objectives for the agricultural sector contributes to enhancing the long-term preservation of natural resources.

Significance of the Research: This study is important because of the central role played by the agricultural sector in achieving food security and promoting both economic and social development in Algeria, especially under the growing environmental pressures that threaten the long-term sustainability of natural resources. It also sheds light on the link between agricultural development and environmental sustainability requirements, while seeking to identify the key challenges that prevent the establishment of a balanced and sustainable agricultural system. In addition, the study emphasizes the need for adopting sustainable farming approaches that protect the environment, ensure the efficient use of natural resources, and maintain a balance between increasing agricultural productivity and preserving the rights of future generations.

Research Aim: This research seeks to analyze the current state of agricultural development in Algeria in relation to environmental constraints and sustainability demands. It focuses on identifying the main difficulties facing the agricultural sector, exploring the relationship

between agricultural growth and natural resource conservation, and underlining the importance of implementing sustainable strategies that reconcile productivity growth with environmental protection.

Study Delimitation: Based on the main research question and hypotheses, and considering the importance of the topic, the study is geographically limited to Algeria. Its thematic scope concentrates on sustainable agricultural development, with particular attention to environmental, economic, and social constraints affecting the sector, as well as sustainability-oriented goals aimed at preserving natural resources and ensuring long-term agricultural viability.

1. Empirical Framework of Agricultural Development

1.1. Concept of Agricultural Development

Agricultural development can be defined as a set of policies and measures aimed at transforming and restructuring the agricultural sector in a way that ensures the optimal use of agricultural resources. It seeks to increase both production and productivity in order to raise the rate of national income growth and improve living standards for society across different generations. This process must be achieved without causing harm to the environment, which implies reaching economic efficiency while maintaining fairness both between current generations and those to come, as well as within the same generation (Belhussein, 2021, p. 88). It may be described as a set of actions designed to expand agricultural production in a way that supports economic development. It represents a form of growth management that aims to enhance long-term real income per person by increasing capital investment and incorporating continuous technological advancements into the sector (Bazzazi, 2021, p. 72). It can be described as a process aimed at improving agricultural production both in quantity and quality in order to achieve food security and reduce imports. This can be accomplished through a technical transformation in the methods and means of production used, as well as through social, cultural, and health changes within rural society, alongside the technical revolution and the adoption of appropriate technologies (Krush, 2019, p. 522). It refers to the use of available resources to bring about a continuous increase in agricultural production. These resources include human and financial resources, natural agricultural resources, and agricultural technology.

1.2 The significance of agricultural development is manifested in the following aspects (Aisha, 2020, pp. 157-158):

- It contributes to increasing agricultural national income, which is part of the overall national income, thereby improving the average real income per capita. This is achieved through sustained growth in agricultural output and productivity.
- It helps expand food production to satisfy the rising needs of a growing population, while also enhancing export capacity, reducing reliance on imports, and generating new employment opportunities by supporting other economic sectors.
- It supports economic development through the advancement of agricultural production, relying on scientific research and the adoption of modern agricultural technologies.

- It raises the standard of living, particularly in rural regions where populations depend heavily on agriculture, by improving access to essential goods such as food and clothing, as well as enhancing access to social services like healthcare and education.
- It promotes the expansion of productive structures through the establishment of new production units or the modernization of existing ones across various agricultural branches, including both crop and livestock production.

1.3. The dimensions of agricultural development can be summarized as follows (djelmoudi & Saïd, 2025, p. 804) :

- Environmental protection: by safeguarding the natural environment and limiting the depletion of soil nutrients.
- Economic feasibility: through enabling farmers to achieve a level of self-sufficiency while securing acceptable profits.
- Social justice: by ensuring that the basic needs of all individuals within society are adequately met.
- Adaptive capacity: by responding effectively to ongoing changes affecting the agricultural sector.

In this context, agricultural sustainability is understood as a balance among economic, social, and environmental performance. It is therefore grounded in the following principles:

- Agricultural production should achieve high yields and strong nutritional value to satisfy present and future demand, while keeping resource inputs as low as possible.
- The adverse impacts of farming activities on soil fertility, water resources, air quality, and biodiversity should be minimized, while encouraging positive environmental contributions whenever possible.
- The use of renewable resources should be maximized, while dependence on non-renewable resources should be reduced.
- Local communities should be enabled to safeguard and enhance both their well-being and their surrounding environment.

1.4 Objectives of Agricultural Development

The importance of agricultural development is reflected in the following points (benazza, labdi, & boussekar, 2022, p. 119) :

- Increasing national income through the enhancement of agricultural production, which contributes to raising real per capita income and, consequently, improving individual welfare.
- Providing the necessary inputs for the development of local industry by supplying essential raw materials for processing activities.
- Reducing the import bill of food products while increasing exports, thereby strengthening national food security and improving the trade balance in particular, and the balance of payments in general.
- Creating permanent and decent employment opportunities, as well as adequate income levels and suitable living and working conditions for all those involved in agricultural production.
- Preserving the overall productive capacity of natural resource bases, maintaining and enhancing the regenerative capacity of renewable resources whenever possible, without

disrupting ecological cycles or natural balances, and without damaging the social and cultural characteristics of rural communities or polluting the environment.

-Developing measures aimed at achieving sustainable agricultural and rural development adapted to local conditions and to the skills and aspirations of farmers and other rural populations.

-Providing foreign currency.

2. The State of the Agricultural Sector in Algeria

The agricultural sector is considered one of the most important strategic sectors in Algeria due to the abundance of natural and human resources that qualify it to play a central role in the country's economic development. These key assets can be summarized as follows (talbi, 2021, p. 566):

-Natural Resources: Algeria is located in the northern part of the African continent and occupies a central position within the Greater Maghreb region. It covers an area of approximately 2,381,741 square kilometers, making it the largest country in Africa and the Arab world, and the tenth largest country globally. In addition, its Mediterranean coastline extends for more than 1,200 kilometers, providing diverse environmental and climatic conditions that support a wide range of agricultural activities.

-Financial and Technological Support: Financial resources constitute a fundamental pillar for agricultural development, as the growth and sustainability of farming activities largely depend on the availability of adequate investment capital. Recognizing the strategic importance of agriculture, the Algerian government allocates annual budgetary resources to support the sector according to its evolving needs and development priorities. In addition, private stakeholders, including farmers and agricultural investors, contribute significantly to expanding the capital base required for agricultural production and modernization.

Technological advancement has also become a decisive factor in enhancing agricultural output and improving production efficiency. Consequently, Algeria has increasingly emphasized the mechanization of farming operations through the acquisition and deployment of modern agricultural equipment. This trend is reflected in the continuous growth in the number of machines and tools used across the agricultural sector, helping to improve productivity and optimize resource utilization

-Agricultural Education and Research: Human capital development plays a vital role in strengthening agricultural performance by facilitating the adoption of innovative techniques and modern farming practices. To support this objective, Algeria has established a comprehensive network of agricultural training institutions, including thirteen centers dedicated to training technical assistants, eleven institutes for technician-level education, and four higher institutes specializing in advanced agricultural training.

Furthermore, the country has invested in agricultural research through the creation of numerous research laboratories and experimental stations, most of which are concentrated in northern regions where agricultural activities are more intensive. Despite these efforts, the contribution of agricultural research remains below expectations. This situation may be attributed to challenges such as insufficient strategic planning, unclear research priorities, and a relatively limited number of researchers and trainees engaged in the field.

-Cultivated Agricultural Land: According to the 2019 Agricultural Statistics Yearbook published by the Arab Organization for Agricultural Development, cultivated land represents a substantial proportion of Algeria's territory. Agricultural areas account for approximately 62.3% of the country's total agricultural domain, while nearly 53.19% of the land considered suitable for cultivation is effectively utilized for agricultural production. These figures underline the significance of land resources in supporting national agricultural activities.

-Agricultural Reform in Algeria: At the time of Algeria's independence, the agricultural sector was characterized by a dual structure. On one side stood a traditional farming system covering roughly four million hectares and marked by limited productivity and modest resources. On the other side existed a modern agricultural sector inherited from colonial rule, extending over approximately three million hectares and primarily devoted to vineyards, citrus plantations, and vegetable production.

Following the departure of European settlers, the management of these large agricultural estates was gradually assumed by Algerian workers and farmers through a system of self-management. During this period, the state played a supervisory and supportive role aimed at preserving production levels, maintaining productivity, and preventing the concentration of agricultural assets in the hands of a privileged minority. The authorities also sought to avoid the fragmentation of large farms in order to preserve efficient collective production units.

In 1963, a series of institutional measures were introduced to regulate the sector. These reforms involved appointing qualified personnel, defining management procedures, establishing financing mechanisms, and organizing income distribution within agricultural enterprises. The implementation of these measures generated relatively positive outcomes and paved the way for additional reforms focused on improving self-management practices, adapting cropping patterns to domestic needs, intensifying agricultural production, and strengthening marketing structures through cooperative networks.

During the early 1970s, public policy shifted toward supporting and modernizing the traditional agricultural sector by channeling part of the surplus generated by the modern sector into rural development programs. This phase included the recovery of lands owned by absentee landlords, the establishment of limits on farm size, the redistribution of excess land to tenants and small farmers, the creation of various forms of agricultural cooperatives, and the reinforcement of service institutions designed to assist producers and improve agricultural performance.

3. Major Constraints Facing the Agricultural Sector in Algeria

The Algerian agricultural sector continues to face numerous structural and operational challenges that have hindered its development and limited its contribution to economic growth. Among the most significant obstacles are the following (Aisha, 2020, pp. 167-168):

-Shortage of Skilled Agricultural Labor: Although Algeria possesses considerable human resources due to its growing population, agricultural investments often suffer from a lack of qualified and experienced workers. The sector faces difficulties in recruiting labor capable of applying modern production techniques and operating advanced agricultural technologies. Consequently, the availability of skilled labor remains a critical requirement for the success of agricultural development projects.

-Limited Demand for Agricultural Machinery: The agricultural sector also encounters financial constraints related to the acquisition of farming equipment. High prices of agricultural machinery, including tractors and irrigation engines, have reduced farmers' purchasing capacity and created marketing difficulties for manufacturers and suppliers. This situation has slowed the modernization process within the sector.

-Supply and Financing Challenges: Agricultural production frequently suffers from delays in the delivery of essential inputs, equipment, and production materials. These delays are often linked to the complexity of administrative and bureaucratic procedures governing procurement and distribution systems. As a result, farming activities are negatively affected, leading to lower crop yields and reduced overall productivity.

Rural Exodus and Declining Agricultural Workforce

The emphasis placed on industrial development by public authorities has contributed to a significant decline in agricultural employment. Over time, rural-to-urban migration has intensified, reducing the availability of labor in agricultural areas. Several factors explain this trend, including:

-Higher wages offered in the industrial sector compared to agricultural employment;

Better working conditions and social benefits available in industry;

-Greater access to public services and social amenities in urban and industrial centers.

The reduction in agricultural labor has adversely affected production capacity and weakened the sector's ability to meet increasing food demand.

-Marketing Difficulties: Inefficiencies in the agricultural marketing system have led to substantial post-harvest losses. Delays in transportation, distribution, and commercialization procedures, combined with administrative complexities, often result in the deterioration and waste of large quantities of agricultural products before they reach consumers.

-Export-Related Constraints: Agricultural exports in Algeria are characterized by irregular performance and instability. Production levels fluctuate considerably due to the heavy dependence of farming activities on rainfall and climatic conditions. Consequently, export volumes vary from year to year, limiting the sector's ability to establish a stable presence in international markets.

-Risks Affecting the Agricultural Sector: Agriculture is inherently exposed to a wide range of risks that can severely damage crops and significantly reduce farmers' incomes. These vulnerabilities highlight the necessity of strengthening and modernizing the agricultural sector. According to Algeria's National Spatial Planning Scheme, the country's diverse physical geography, combined with geological and climatic factors, makes it particularly vulnerable to natural and environmental hazards. Of the fourteen major risks identified by the United Nations, Algeria is exposed to ten, including:

- Earthquakes;
- Industrial and energy-related hazards;
- Human health risks;
- Animal and plant health threats;
- Air, marine, and water pollution;

Disasters associated with large urban concentrations.

Because agricultural activities depend heavily on weather and environmental conditions, the sector remains highly vulnerable to climatic fluctuations and natural disasters. In 2017, Algeria experienced an unprecedented wave of forest fires that destroyed millions of hectares of land. Similarly, 2018 witnessed numerous natural disasters, particularly flash floods, urban flooding, and severe storms caused by sudden and extreme climatic disturbances affecting various regions of the country.

These recurring events underscore the importance of adopting a comprehensive approach to disaster risk management, improving resilience strategies, and developing more effective mechanisms for preventing and mitigating the impacts of natural hazards on agricultural production and rural livelihoods.

4. Impact of Environmental Risks on Agricultural Development in Algeria

Agricultural development in Algeria represents one of the fundamental pillars for achieving food security and ensuring economic and social stability. However, this vital sector is increasingly confronted with a range of environmental risks that constitute significant obstacles to sustainable agricultural development. Climate change and various environmental pressures have altered the nature of agricultural activities, making them more vulnerable to natural fluctuations, particularly given the sector's heavy dependence on limited natural resources. This concern is highlighted by reports from the Intergovernmental Panel on Climate Change (IPCC, 2021), which indicate that arid and semi-arid regions, including North Africa, are among the areas most exposed to the adverse effects of climate change.

Among the most critical environmental challenges is climate change, which has emerged as one of the most influential global factors affecting agricultural production. Its impacts are reflected in irregular rainfall patterns, prolonged drought periods, and rising temperatures, all of which directly affect both the quantity and quality of agricultural output. In Algeria, many agricultural regions experience recurring climatic disturbances that lead to fluctuations in crop yields, particularly in rain-fed farming systems that rely heavily on precipitation. This observation is supported by studies conducted by the Food and Agriculture Organization of the United Nations (2020), which associate declining agricultural productivity in North Africa with ongoing climatic changes. Consequently, farmers face persistent uncertainty, limiting their ability to engage in long-term agricultural planning.

In addition, desertification and soil degradation constitute some of the most serious environmental threats to agricultural development. Algeria is considered highly vulnerable to desertification due to both natural and human-induced factors, including excessive land exploitation, overgrazing, and inadequate soil conservation practices. According to the United Nations Environment Programme (2019), these factors accelerate land degradation and reduce soil fertility. As a result, the productive capacity of agricultural land declines, negatively

affecting crop yields and reducing the amount of arable land available for cultivation. Reports from the World Bank (2021) further identify land degradation as one of the primary causes of weak agricultural performance in arid countries.

Water scarcity represents another major challenge, as water is an indispensable resource for agricultural production. Algeria faces an uneven distribution of water resources, coupled with declining precipitation levels in several regions, which has increased pressure on groundwater reserves. Reports issued by the Food and Agriculture Organization of the United Nations (2022) highlight the growing water-related challenges facing North African countries. Moreover, inefficient water management and the limited adoption of modern irrigation technologies contribute to worsening the situation, leading to a reduction in irrigated agricultural areas and directly affecting agricultural productivity.

Another issue of growing concern is the loss of agricultural biodiversity. The expansion of unsustainable conventional farming practices has contributed to the decline of many local crop varieties and increased dependence on a limited number of agricultural species. Empirical studies suggest that the reduction of agricultural biodiversity weakens the resilience of farming systems, limiting their ability to adapt to environmental changes and increasing their susceptibility to pests and diseases.

Alongside these environmental threats, rural marginalization and inadequate local development exert an indirect but profound impact on agricultural activities. Many rural regions in Algeria continue to suffer from insufficient infrastructure and limited access to essential services, encouraging rural populations, particularly young people, to migrate toward urban areas. Reports from the African Development Bank have linked weak rural development with declining agricultural performance. This rural exodus contributes to labor shortages in agriculture and threatens the continuity of farming activities.

Furthermore, the insufficient integration of environmental considerations into agricultural policies has compounded these challenges. Despite efforts undertaken through national agricultural development programs, some farming practices continue to rely on traditional methods that are poorly adapted to current environmental realities, as indicated in reports issued by the Ministry of Agriculture and Rural Development of Algeria. In this context, environmental risks affect not only agricultural production directly but also the broader social and economic structure of the agricultural sector. Contemporary sustainable development literature increasingly emphasizes the strong relationship between environmental vulnerability and economic fragility in rural areas.

Therefore, addressing the impact of environmental risks on agricultural development in Algeria requires the adoption of a comprehensive approach based on integrating environmental considerations into agricultural policies, improving natural resource management, and promoting sustainable farming techniques. Such measures are essential for enhancing the resilience of the agricultural sector and ensuring alignment with the objectives of sustainable development established by the United Nations.

Conclusion:

This paper demonstrates that agricultural development in Algeria is no longer solely associated with increasing production or achieving quantitative growth. Today, it has become

conditional on the ability to strike a balance between economic development requirements and the necessity of environmental protection, especially in the context of rising environmental risks that threaten the sustainability of the sector. The study shows that the Algerian agricultural sector is currently under increasing environmental pressure, mainly driven by climate change, desertification, soil degradation, water scarcity, and biodiversity loss. Together, these factors directly affect agricultural productivity and stability.

The findings also indicate that these environmental challenges do not only impact production levels but extend to the social and economic structure of rural areas. This is particularly evident in contexts marked by marginalization and weak local development, which contribute to the intensification of rural migration and the decline of agricultural labor. Therefore, the relationship between the environment and agricultural development is one of interdependence and mutual influence: environmental degradation weakens development, while weak development further increases environmental vulnerability.

Based on the results of this study, several recommendations can be proposed:

- Strengthen the integration of the environmental dimension into agricultural policies by adopting a sustainable development approach that prioritizes the protection of natural resources .
- Combat desertification and soil degradation through reforestation programs, protection of vegetation cover, and the adoption of soil-conserving agricultural practices .
- Improve water resource management by rationalizing consumption and expanding the use of modern irrigation techniques such as drip irrigation to reduce waste .
- Support agricultural scientific research to develop innovative solutions adapted to climate change .
- Reduce rural marginalization by improving infrastructure and basic services in agricultural areas to encourage rural settlement and stability .
- Train farmers and promote a culture of sustainable agriculture in order to raise environmental awareness and improve farming practices .
- Strengthen coordination between all stakeholders (government, farmers, and research institutions) to ensure the effectiveness and efficiency of agricultural policies.

The Reviewer :

1. Aisha, B. E. (2020). Agricultural development in Algeria: obstacles and challenges. *AFAQ Review of Research and studies* , Vol 3 (N 2), 157-158.
2. Bazzazi, S. (2021). The role of agricultural development in supporting economic development in Algeria: between reality and the need for reform. *Journal of Economic Growth and Entrepreneurship JEGE* , 72.
3. Belhussein, F. Z. (2021). Strategies of Algeria for Achieving Sustainable Agricultural and Rural Development. *Journal of Economic Transformations* , Vol 1 (N 1), 88.
4. benazza, h., labdi, d., & boussekar, r. (2022). Sustainable Agricultural Development In Algeria Reality And Challenges. *Journal of Economic Papers* , Vol 13 (N 2), 117-128.
5. djelmoudi, H., & Saïd, M. (2025). The Role Of Agricultural Support Funds In Achieving Sustainable Agricultural Development - An Analytical Study Of The Reality

Of Achieving Sustainable Agricultural Development In The State Of Souk-ahras From 2015 To 2023-. *AL-Manhel Economique* , Vol 8 (N 1).

6. Krush, N. E.-D. (2019). The role of agricultural financing in achieving sustainable agricultural development. *Djtihad for Legal and Economic Studies Review* , Vol 8 (N 4), 522.
7. talbi, o. (2021). The Role of the Agricultural Sector in Reducing Dependence on the Hydrocarbon Sector and Promoting Economic Development in the Algerian Economy: A Study of the Period 2000–2018.". *Journal of Business Administration and Economic Studies* , Vol 6 (N 4).