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The Legal Framework for Digitizing the Agricultural Sector and Its Role in Strengthening Food Security in Algeria

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Abstract:
The agricultural sector is considered a principal pillar of Algeria's national economy, and the achievement of food security depends on the extent to which this sector can adopt modern technologies and develop production methods. The importance of this study emerges from its focus on the shift toward smart agriculture and the role of digitization in confronting the challenges of fluctuating food supplies, climate change, and water scarcity. The study also aims to shed light on the reality of digital transformation in Algeria's agricultural sector, to monitor the impact of digital platforms and programs in enhancing productivity and rationalizing resources, and to review the legislative framework that regulates the digitization process and its role in strengthening food security and achieving self-sufficiency.
Keywords: Digitization; Digital Transformation; Smart Agriculture; Food Security.

Introduction:

The agricultural sector is one of the most vital and influential sectors in the structure of the Algerian economy, its role extending to intertwined social and economic dimensions. In light of current changes, achieving food security is no longer contingent merely on the traditional availability of agricultural crops in customary quantities; rather, it is conditioned by the sector's capacity to absorb technological developments and modernize the production system to meet contemporary requirements.

This study derives its importance from addressing the qualitative transformation occurring in Algeria's agricultural sector, manifested in the gradual shift toward what has come to be known as "smart agriculture." It also seeks to highlight the pivotal role of digitization as a strategic lever in confronting a set of chronic structural imbalances, foremost among them: fluctuations in the availability of foodstuffs, the escalating repercussions of climate change, and the worsening crisis of water scarcity.

The study aims to achieve a set of objectives that converge in essence to draw a clear picture of the reality of digital transformation in Algeria's agricultural sector, by tracking its evolutionary path and extrapolating the stages of its emergence and growth within the national map. This is not limited to descriptive aspects only; it also extends to clarifying the legal and regulatory framework that governs the sector's modernization, providing an in-depth analysis

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of the extent to which these frameworks align with the technical and practical requirements of digital transformation, and revealing areas of deficiency or complementarity therein, thereby enabling an objective evaluation of the legislative environment that hosts this transformation.

The study also focuses on the practical side by demonstrating the real effectiveness of the adopted digital programs and platforms, and their central role in raising agricultural productivity levels and rationalizing the use of vital natural resources such as water and soil, through mechanisms of artificial intelligence and data analysis.

Within a broader strategic framework, the study aims to embody the vital role that digitization plays in strengthening national food security and achieving self-sufficiency, by delving into the analysis of the technical mechanisms adopted to regulate the national market, and exploring how they contribute to balancing supply and demand and ensuring price stability, thereby consolidating a comprehensive approach to modernizing Algeria's agricultural sector.

In light of the foregoing, we pose the following problem:

To what extent is the strategy of digitizing the agricultural sector effective in achieving food security and self-sufficiency in Algeria, and to what extent do the technical and regulatory mechanisms adopted to regulate the national market align with the requirements of this transformation?

The study relied on the descriptive method in reviewing and dissecting the digital programs and applications adopted in the agricultural field, and in analyzing the legislative and regulatory system related to the modernization of this vital sector.

We answer the problem in the following two sections:

Section One: The technological strategy for digitizing the agricultural sector in Algeria

Section Two: The regulatory and legal mechanisms for market regulation through digitization

Section One: The technological strategy for digitizing the agricultural sector

Digital transformation in the agricultural sector is considered one of the most important modern strategic orientations aimed at developing agricultural production and achieving food security in a sustainable manner. The technological strategy is based on employing digital technologies and intelligent systems in managing agricultural resources, improving production, marketing, and decision-making processes. Digitization also contributes to raising production efficiency, rationalizing the consumption of water and agricultural inputs, and enhancing the sector's ability to face climate change and economic challenges. From this standpoint, this axis aims to highlight the role of the technological strategy in modernizing the agricultural sector and enhancing agricultural productivity. Accordingly, I will study in this section:

- **Applications of precision agriculture and the modernization of strategic crop sectors (First requirement)**
- **Digitization of logistical supply chains and reduction of post-harvest losses (Second requirement)**

First requirement: Applications of precision agriculture and the modernization of strategic crop sectors

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This requirement addresses the role of precision agriculture applications in modernizing strategic crop sectors such as cereals and potatoes, through the use of big data and geographic information systems to improve agricultural interventions, namely through digital land surveying and governance of reclaimed desert lands (first subsection) and the role of unmanned aerial systems in monitoring the vegetative growth of crops (second subsection).

Subsection One: Digital land surveying and governance of reclaimed desert lands

Under the traditional system, land reclamation operations suffered from weak field monitoring, which historically led to project delays or deviations from their developmental objectives. To address this structural defect, the Ministry of Agriculture and Rural Development, in coordination with the Algerian Space Agency (ASAL), activated a unified geographic information system that relies on real-time data from Algerian satellites to conduct precise topographic and cadastral surveys[1].

These updated satellite images make it possible to draw detailed digital maps of investments, accurately determine arable areas, and monitor the extent to which investors comply with the cadastral specifications granted to them under agricultural concession contracts and the projects of the Office for the Development of Industrial Agriculture on desert lands, thereby preventing arbitrary estimates and eliminating unlawful exploitation of state-owned real estate[2]. This ensures multiple technical and legal benefits in implementation of the terms of the specifications, which are:

1. **Precise delineation of areas:** Determining lands suitable for actual reclamation with extreme accuracy and separating them from fallow lands or those with rugged topographic characteristics.
2. **Monitoring compliance with the specifications:** Tracking the extent to which investors adhere to the agricultural plans granted to them under agricultural concession contracts and detecting any breach of contractual obligations[3].
3. **Activating the roles of the Office for the Development of Industrial Agriculture:** Enabling the Office (ODAS) to monitor growth cycles of strategic crops (such as cereals, maize, and oilseeds) and verify actual field-level completion rates via the digital platform.
4. **Eliminating arbitrary estimates:** Replacing traditional paper reports with visual data that leave no room for interpretation.
5. **Protecting state property and cleansing land titles:** Detecting any unlawful use or encroachment on state-owned real estate outside licensed perimeters, which facilitates

[1] Mekhnash, Kenza. "Digital Technology as an Innovative Mechanism for Governance of Agricultural Land and Monitoring Reclamation Projects in Algeria." Proceedings of the First International Symposium on Modernizing Agriculture, Emir Abdelkader University for Islamic Sciences, Constantine, 2025, p. 11.
[2] Technical Report on the Integration of Satellites and Remote Sensing Technologies in Monitoring Southern Crops. Official Publications of the Ministry of Agriculture, National Office of Official Publications Press, 2026, p. 16.
[3] Belamouri, Nadia. "Oversight of the Concession Method as a Pattern for Exploiting Agricultural Lands in Algeria." Sawt al-Qanun Journal, vol. 30, no. 2, 2024-06-28, pp. 187–211.

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administrative annulment of contracts and recovery of lands from non-serious investors in accordance with the law.

Subsection Two: The role of unmanned aerial systems in monitoring vegetative growth of crops

Major investments in the south are witnessing a rapid spread of precision agriculture applications through the integration of unmanned aerial systems[1].

Scientific data confirm that drones, equipped with thermal and multispectral cameras, provide high-resolution near-air surveys of blocks of strategic crops such as durum wheat[2].

This technology allows farmers and technical teams to monitor the vegetation cover index in real time, enabling them to proactively and early detect foci of plant diseases, pests, and signs of water stress or nutrient deficiency in specific parts of the giant circular fields in the south, so that the farmer can intervene surgically and locally instead of spraying the entire investment indiscriminately. This raises yield per hectare and reduces field losses before harvest campaigns[3].

Second requirement: Digitization of logistical supply chains and reduction of post-harvest losses

The post-harvest stage is one of the most critical phases in Algeria's agricultural system, where traditional logistical imbalances cause significant waste of strategic crops before they reach the consumer. Integrating digitization into the management of supply and distribution chains comes as a structural solution to reduce this loss and ensure food security through three main subsections.

Subsection One: Digital tracking systems for agricultural products from farms and cooperatives to wholesale and retail markets

Modernizing agricultural distribution depends on adopting digital tracking platforms that enable monitoring the path of food products, livestock, and wheat in real time from the moment they leave farms or grain and dry legume cooperatives. This system provides digital identification cards and quick response codes that accompany shipments, ensuring absolute transparency in identifying the product's origin, harvest date, and monitoring its quality during transit[4].

These precise data contribute to protecting public health for consumers, prevent diversion of subsidized goods from their legal channels, and facilitate the immediate recall of defective shipments from markets.

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[1] Digital Transformation in Algeria's Agrifood Sector: A Strategic Path to Food Security Achievement. The Cahiers of MECAS, vol. 21, no. 2, University of Tlemcen, 2025, p. 120.
[2] Mekhnash, Kenza, ibid., p. 14.
[3] Technical Report on the Integration of Satellites and Remote Sensing Technologies in Monitoring Southern Crops. Official Publications of the Ministry of Agriculture, National Office of Official Publications Press, 2026, p. 19.
[4] Belkacem, Ahmed, and Sami Bouabdallah. "The Importance of Adopting a Strategy to Digitize the Agricultural Sector to Achieve Self-Sufficiency in Algeria." Namaa Journal of Economics and Commerce, vol. 8, no. 1, University of Tlemcen, 2024, pp. 24–25.

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Subsection Two: Comprehensive Digitization of Strategic Storage Networks and Cold Rooms

Smart storage constitutes the cornerstone for preserving widely consumed products such as wheat, potatoes, and onions from seasonal spoilage caused by misestimation or climatic fluctuations. Algeria has devised a strategy to link the major cold rooms and warehouses belonging to the National Professional Office for Fruits, Vegetables, and Meat to a unified digital network that relies on smart thermal Internet of Things sensors[1].

This system also enables remote control of temperature and humidity levels to prevent product rot, and provides a centralized dashboard that gives decision-makers proactive visibility into available stock volumes, thereby facilitating the diversion of production surpluses to national food processing factories instead of wasting them, which supports price stability and year-round availability of goods[2].

Subsection Three: Modernizing the Agricultural Transport System through Direct Link Platforms between Farmer and Distributor

The proliferation of informal and intermediary links in wholesale markets is one of the main causes of price inflation and spoilage of fruits and vegetables due to repeated random loading and unloading operations. To address this problem, Algeria introduced digital applications and logistical gateways that enable direct and transparent connections between farmers in large investments and cooperatives, and official distributors and owners of large commercial outlets[3].

Section Two: Regulatory Mechanisms for Market Regulation and Combating Speculation through Digitization

This section addresses the regulatory framework that constitutes the fundamental pillar of any effective strategy to confront unlawful speculation, especially in light of rapid digital transformations that have produced new patterns of market manipulation difficult to control with traditional tools. Accordingly, this study seeks to elucidate the mechanisms the state has adopted to modernize market oversight by employing digitization techniques to enhance transparency, track prices, and pursue violations, as well as to establish a deterrent legal framework that keeps pace with the requirements of the digital economy and enshrines the principle of consumer protection and market balance. This is presented in two requirements:

Requirement One: Establishing comprehensive databases and modernizing agricultural administration

Requirement Two: Digital platforms for price regulation and combating monopoly and scarcity

[1] Algerian Ministry of Agriculture, Rural Development and Fisheries. Digital Transformation in Agriculture: Achievements of Precision Farming and Smart Infrastructure. MADR Publishing, 2025, p. 29.
[2] Algerian Ministry of Agriculture, Ibid., p. 32.
[3] Hassan, Karim. "Digitization as the Backbone for Modernizing the Agricultural Sector and Regulating the National Market." Al-Bashaer Economic Journal, vol. 11, no. 2, University Press of the University of Batna, 2025, p. 101.

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Requirement One: Establishing Comprehensive Databases and Modernizing Agricultural Administration

Establishing comprehensive databases and modernizing agricultural administration constitutes a fundamental entry point for developing the agricultural sector and improving its governance. This direction aims to collect, update, and digitize data to facilitate decision-making and increase the effectiveness of administrative services directed at farmers. It also contributes to enhancing transparency, tracking resources, and supporting sustainable agricultural planning[1].

Subsection One: The Regulatory Impact of Launching the National Digital Agricultural Register and the General Agricultural Census in Identifying Actual Farmers

The launch of the General Agricultural Census and the National Digital Agricultural Register represents a decisive legislative and structural step to cleanse the sector of parasitic practices. This system produces a legal effect that obliges any natural or legal person engaged in agricultural activity to register on the Ministry of Agriculture's central digital platform, which has enabled the creation of a live, updated database of national capacities.

This digital linkage has contributed to accurately identifying the "actual farmer" based on the exploited area and type of activity, thereby excluding speculators and owners of unused land from the circle of privileges and legal recognition, which has enabled the state to build precise forward-looking plans for the volume of national production[2].

Subsection Two: The Electronic Farmer Card and Modernizing Mechanisms for Directing Government Support

The electronic farmer card in Algeria falls within the trend of modernizing agricultural administration and improving the targeting of public support, allowing the creation of an accurate database of farmers and linking entitlement to subsidies with updated field information. This approach is supported by Law No. 08–16 on agricultural guidance, which enshrined the modernization of management and support methods and the development of mechanisms for monitoring agricultural activity[3], thereby contributing to enhancing transparency and rationalizing public expenditure within the agricultural sector[4].

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[1] Bouchareb Boujlal, Amal, and Fateh Rezzak. "Digitizing the Agricultural Sector as a Strategic Option to Achieve Food Security in Algeria: An Analytical Study." Journal of Economy and Human Development, vol. 14, no. 2, University of Blida 2, 2023, p. 235.

[2] Laalawi, Munira, and Khair Eddine Lakman. "The Role of Smart Agriculture as a Modern Mechanism to Modernize the Agricultural Sector and Regulate Markets in Algeria." Strategy and Development Journal, vol. 13, no. 3, University of Mostaganem, 2023, p. 154.

[3] Law No. 08–16 dated 03 August 2008 on Agricultural Guidance. Official Journal of the People's Democratic Republic of Algeria, No. 46, dated 10 August 2008.

-See Executive Decree No. 55/24 dated 2024/01/23 amending and supplementing Executive Decree No. 432/21 dated 2021/11/04 defining the conditions and modalities for granting state private property lands for reclamation within the framework of concessions.

[4] Bessaoud, O., Pellissier, J.-P., Rolland, J.-P., & Khechimi, W. (2019). Synthesis Report on Agriculture in Algeria. CIHEAM / HAL Open Science. Link: https://hal.science/hal-02137632/document.

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Replacing the traditional farmer card with a biometric electronic card revolutionized the distribution and socio-economic support system directed at investors. This digital card is linked directly to the farmer's electronic account on the central platform, giving it mobility to track received shares of agricultural inputs such as subsidized seeds and fertilizers.

This protective system eliminated the phenomenon of fertilizer smuggling and diversion to non-agricultural sectors, since the delivery of shares became conditional on the electronic fingerprint and matching the digitized area, ensuring that public support reaches its actual beneficiaries in full to raise yield per hectare and stabilize production costs[1].

Subsection Three: Administrative Digitization to Facilitate Obtaining Well-Drilling Permits, Agricultural Concession Contracts, and Simplifying Agricultural Investment Procedures

The newly introduced administrative digital platforms have accelerated the pace of agricultural investment and eliminated the bureaucracy that used to hinder production[2]. Procedurally, unified electronic portals allow farmers to submit and track applications for water well-drilling permits and agricultural concession contracts in real time without traveling between administrations.

This digital facilitation reduces the legal deadlines for file review through shared digital coordination between the Ministries of Agriculture and Water Resources, which encouraged start-ups and investors to expand reclamation areas in the greater south and attracted capital to strategic projects[3].

Requirement Two: Digital Platforms for Price Regulation and Combating Monopoly and Scarcity

The administrative dimension of agriculture integrates with digital control tools for domestic trade to prevent market volatility and protect citizens' purchasing power from scarcity shocks. This requirement addresses three main subsections as follows.

Subsection One: Activating Government Digital Platforms to Supply the Market and Ensure Transparency and Price Stability

The government has moved toward relying on digital platforms to organize the supply flow to popular markets for widely consumed goods, especially the sectors of red and white meat and livestock. These platforms enable tracking the path of imported and local shipments and their geographic distribution through approved points of sale, which prevents manipulation of price-capped goods by intermediaries.

[1] Maâlem, Walid, and Omar Bouhnik. "Governance of the Agricultural Sector in Algeria through Digital Platforms and the Electronic Agricultural Register." Journal of Law and Human Sciences, vol. 16, no. 1, University of Djelfa, 2024, p. 412.
[2] Maâlem, Walid, and Omar Bouhnik, ibid., p. 412.
[3] Abbabsa, Sanaa, and Fawziya Zaabi. "The Impact of Digital Transformation in the Agricultural Sector on Achieving Food Sustainability in Algeria." Journal of Advanced Economic Research, vol. 8, no. 1, University of Mila, 2023, p. 12.

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This digital system ensures full transparency by providing consumers with real-time data on product availability and locations, thereby achieving a sustainable balance between supply and demand during sensitive periods[1].

Subsection Two: Technological Integration between the Ministry of Agriculture and the Ministry of Commerce's Digital Oversight to Pursue Unauthorized Cold Storage Facilities

The digital coordination between the Ministries of Agriculture and Commerce constituted a major deterrent tool to combat networks of monopoly and unlawful speculation[2]. This integration was achieved by linking the databases of cold rooms and agricultural concessions to the Ministry of Commerce's digital monitoring system, enabling sudden and real-time tracking of inventories. This technical overlap allows detection and prosecution of unauthorized cold stores and warehouses used to conceal agricultural products such as flour, potatoes, and onions to artificially inflate their prices, where violation reports are drawn up and seized goods are immediately redirected into the official market based on the outputs of the joint digital oversight.

Subsection Three: The Role of Real-Time Data and Artificial Intelligence in Early Forecasting of Crop Volumes and Import Needs

Relying on artificial intelligence algorithms and big data analysis represents the pinnacle of modernization in managing food security[3]. The system processes historical and real-time data on sunlight exposure, humidity rates, and digitized cereal areas to provide a digital early forecast of expected crop volumes before the start of harvest and threshing campaigns.

These proactive forecasts give decision-makers the opportunity to determine national market needs precisely and to adjust the import or export mix early, preventing supply gaps or sudden price shocks, thereby consolidating the foundations of national food sovereignty[4].

Conclusion:

This study concluded that digitizing the agricultural sector in Algeria is no longer a secondary technical option but has become a strategic orientation imposed by the requirements of food security and global economic transformations. Adopting modern digital technologies—such as smart platforms, electronic tracking systems, agricultural databases, and remote sensing techniques—can contribute to improving agricultural productivity, rationalizing the use of natural resources, and enhancing transparency of transactions within the national market. The study also demonstrated that digital transformation in agriculture serves as a safety valve for transitioning toward a sustainable agricultural economy capable of achieving food sovereignty

[1] Bouchareb Boujlal, Amal, and Fateh Rezzak. Digitizing the Agricultural Sector as a Strategic Option to Achieve Food Security in Algeria, ibid., p. 240.
[2] Laalawi, Munira, and Khair Eddine Lakman. "The Role of Smart Agriculture as a Modern Mechanism to Modernize the Agricultural Sector and Regulate Markets in Algeria," ibid., p. 159.
[3] Abbabsa, Sanaa, and Fawziya Zaabi. "The Impact of Digital Transformation in the Agricultural Sector on Achieving Food Sustainability in Algeria," ibid., p. 18.
[4] Maâlem, Walid, and Omar Bouhnik, ibid., p. 422.

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and reducing dependence on foreign markets, especially amid international crises and increasing climatic volatility.

The study further showed that newly established digital databases have become the cornerstone in combating bureaucracy and reducing speculation and monopoly in widely consumed commodities, by enabling public authorities to track the path of agricultural products and to regulate storage, distribution, and marketing more transparently and effectively. Digitization also provides accurate, real-time information that helps decision-makers design more efficient agricultural policies responsive to national market needs.

However, the success of this digital transformation remains conditional on providing an integrated legislative, technical, and human environment, based on modernizing digital infrastructure, strengthening cybersecurity, and developing human capacities able to keep pace with rapid technological developments. It also requires establishing a genuine partnership between the state, the private sector, and research institutions to ensure technology transfer and localize digital solutions suited to Algeria's agricultural specificities.

From the foregoing, it can be affirmed that the future of Algerian agriculture is closely linked to the state's success in implementing a comprehensive digital transformation project within the agricultural sector, as an effective tool for achieving sustainable development, raising the competitiveness of national products, and ensuring food security for future generations.

Key Recommendations:

- **Expand connectivity coverage:** Widen communication and internet network coverage in rural areas and remote desert investments, and intensify training programs for farmers, especially small producers, on using digital platforms, smart sensors, and modern agricultural applications.
- **Support local agri-tech innovation:** Encourage Algerian start-ups to develop locally made agricultural technological solutions, and support research projects related to smart agriculture and agricultural artificial intelligence, contributing to building a national digital ecosystem capable of achieving self-sufficiency and food sovereignty.

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