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THE CONTRIBUTION OF MARKET GARDEN PRODUCE TO THE DIVERSIFICATION OF ALGERIAN EXPORT: CASE OF ONIONS

This research evaluates the onion value chain in Algeria to drive export diversification through a multi-level analysis of production trends, price fluctuations, and export performance. The study highlights the strategic role of the onion sector in supporting Algeria's economic diversification goals. Recommendations are proposed for a policy framework aimed at strengthening the resilience, competitiveness, and international integration of this key agricultural value chain.

Keywords: *economic diversification; onion value chain; agricultural policy, export potential; Algeria.*

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Agriculture is a cornerstone of the Algerian economy, serving as an important contributor to gross domestic product (GDP) and national employment. In 2022, the agricultural sector contributed nearly 11.6% to the current GDP and offered jobs to nearly 2.7 million people, or one-fourth of the country's active labor force¹. Under the national strategy for the economic diversification aimed at reducing dependency on hydrocarbons, the development of agricultural exports is of utmost importance. In this strategic sector, horticultural products hold a prime position, not just in meeting a sizeable share of national food demand but also as a strategic lever for export diversification. Although current export volumes are nascent, their increased contribution to non-hydrocarbon exports gives evidence of their economic and strategic weight for the future of the country.

Onion (*Allium Cepa*) is one of those high-potential vegetables crops that is exceptionally important in many ways. As the ministry of agriculture and rural development reports, approximately 12% of the national vegetable crop supply is constituted by onions. This bulb is an essential ingredient in the Algerian cuisine, with annual per capita consumption estimated at 8–10 kg per year (with more precise estimates suggesting 9.2 kg in urban areas and 7.8 kg in rural areas) based on household consumption surveys conducted by National Office of Statistics² and corroborated by MADR production /population balance estimates, positioning Algeria among moderate consumers in the Mediterranean region. This robust domestic demand, when viewed in conjunction with Algeria's substantial production capacity, positions the nation as a major player in the global onion production landscape, ranking among the top producers worldwide³. The onion sector therefore, assumes a pivotal socio-economic function in ensuring food security, a role further reinforced by the sector's proven capacity for exports, as evidenced by the increasing export volumes observed in regional and international markets.

However, the onion sector in Algeria is characterized by the strong instability, mostly marked by extreme price volatility and significant post-harvest losses. This fluctuation is mainly attributable to poor post-harvest storage conditions. In fact, inadequate cold storage capacity and the use of crude methods lead to significant losses, which some analysts estimate to be between 20 and 30% of the total vegetable harvest (Benarfa, Ouchabane, 2023). While intermediaries play a necessary role in the distribution process, their predominance within the market structure tends to generate opaque pricing mechanisms that disadvantages primary producers' and intensify price volatility. Similar structural inefficiencies have been identified in other vegetables value chains, particularly potatoes (Bessaoud, Lefki, 2018). In this context, export channels are considered crucial levers for absorbing production surpluses, which reached almost 800,000 tons of onions in 2022 (Abdel-

¹ Rapport Annual 2022. Bank of Algeria, September 2023. 137 p. URL: <https://www.bank-of-algeria.dz/rapports-annuels/>

² Household consumption surveys (2020–2022). *National Office of Statistics Algeria*. URL: <https://www.ons.dz/> (accessed on: 15.02.2025).

³ FAOSTAT: World agricultural production data. *Food and Agriculture Organization of United Nations*. URL: <https://www.fao.org/faostat/fr/#data> (accessed on: 20.02.2025).

malek, 2023). However, access to international markets remains constrained by logistical and commercial barriers, requiring improved certification systems and stricter compliance with sanitary and phytosanitary standards to overcome non-tariff trade restrictions (Hamzaoui, Mouche, 2020).

Lastly, the strain on water supplies poses a major threat to the sector's environmental sustainability. While the expansion of cultivation into arid regions raises concerns about long-term water sustainability, excessive groundwater exploitation in production areas, especially in northwestern Algeria, is directly linked to the effects of climate change and overexploitation on aquifers (Benmerikhi, Chehma, 2022).

Given the structural challenges facing the Algerian onion sector, an in-depth analysis of the value chain is warranted in order to decipher its dynamics, identify the main bottlenecks, and identify concrete areas of improvement. These problems point to a lack of coordination and efficiency at the various stages of the sector's performance, which casts doubt on its overall performance. In this context, the present study revolves around a central question: How can the onion value chain in Algeria be optimized to ensure better price stability, reduced post-harvest losses, and improved export competitiveness with sustainable growth on national and international markets, thereby contributing to Algeria's agricultural export diversification strategy? To answer this question, it is necessary to examine in detail the various links in the chain, the interactions between actors and the possible levers for actions at technical, organizational and political levels.

The purpose of this article is to conduct a comprehensive diagnosis of the onion value chain in Algeria, with a particular focus on its potential contribution to agricultural export diversification, examining structural weaknesses and strengths. This study aims to formulate targeted recommendations for developing a more resilient, efficient, and export — oriented sector, thereby contributing to Algeria's strategic economic diversification beyond hydrocarbon dependence.

Theoretical framework: agricultural value chain. The concept of value chain, originally developed by M. Porter (1985), has been widely adapted to the agricultural sector to analyze how value is created and distributed from primary production to final consumption. M. Porter (1985), emphasizes the importance of competitive advantage in value chains. According to his perspective, the ability of a firm or an industry to generate value depends on its competitive position, which may stem from products differentiation or cost control. This framework is particularly relevant for assessing the export potential of Algerian onions in international markets.

Expanding on this perspective, R. Kaplinsky & M. Morris (2001) conceptualize the value chain as continuum of activities encompassing creation, production, processing, distribution and final consumption. When applied to the agriculture, this systematic approach enables the analysis not only of observable product flows but also intangible flows (financial, information and actors' interaction). Building on this framework G. Gereffi et al. (2005), introduce the concept of governance, referring to the ways in which relationships among actors within the value chain are organized and coordinated. The typology distinguishes several forms of inter-firm relationships, ranging from hierarchical vertical integration to simple arm's length market

transactions. Between these two extremes, hybrid governance structures such as modular, relational, or captive networks often emerge. These configurations provide a useful analytical framework for understanding the frequently informal power relations and coordination mechanisms that characterize the Algerian vegetable sector.

In transition economies, value chain analysis is becoming the go-to diagnostic method (Webber, Labaste, 2010). Given the difficulties in modernizing Algerian agriculture, it aids in identifying structural barriers and defining levers for action to improve the sustainability and efficiency of food systems (Treinkens, 2011).

Previous works on Algerian agriculture and market gardening. Algeria's shift from a planned economy to market liberalization has reshaped its agricultural sector, yielding uneven sub-sectoral development amid structural reforms and infrastructure privatization (Bedrani, 2008). Market gardening has emerged as a rural economic pillar, with vegetables bolstering food security, value creation, and employment (Laouar, Dugué, 2019; Oumata et al., 2008). Onions stand out for their durability and shelf life, supporting stable domestic and regional demand. Yet international market integration remains constrained, despite geographic proximity to Europe and competitive costs; persistent barriers include weak logistics, inadequate quality standards compliance, and poor traceability (Benmihoub, 2015) exacerbated by mounting water scarcity.

At the institutional level, Bessaoud traces public policies to curb long-term food import dependence through producer organizations and agricultural investment. Yet S. Bouarfa et al. (2020) warn of agro-ecosystem sustainability amid intensification, urging a productivity-resource preservation balance. Quality certification deficits further hinder exports (Haffaf, Bouzadi, 2021; Brabez et al., 2008), driving post-harvest losses and barring access to high-value markets.

Specific studies on the onion sector and international experiences. Despite the paucity of specialized literature on the topic, a number of studies provide insight into regional dynamics of this culture. In terms of the environment, B. Bekkoussa, M. Meddi & H. Jourde (2008) analysed the impact of intensive onion and potatoes cultivation on water resources, particularly in the plain of Ghriss (Mascara); he reported a significant lowering of groundwater levels (up to 60m in 31 years in certain areas). These works highlight the environmental sustainability issues that arise in this cropping system.

The downstream sector was examined by S. Assassi, A. Daoudi, & C. Lejars, (2017), who described an opaque marketing system where wholesale marketplaces struggle to effectively control the flow of perishable items and where the proliferation of intermediaries' obscures price formation.

A unique feature of the Algerian model was highlighted by A. Derderi et al. (2015) through their study of itinerant agricultural entrepreneurs in Tiaret. This phenomenon of land leasing and geographic mobility demonstrates remarkable entrepreneurial flexibility in circumventing land and commercial rigidities, revealing a capacity for self-organization in the face of market imperfections.

At the international level, comparative analysis with other producing countries offers relevant insights for Algeria. Successful export diversification in similar

contexts provides a roadmap. For instance, Peru's aggressive entry into the global onion market was driven by the development of the "sweet onion" niche for the US market, supported by strong producer associations (Asociación de Productores de Cebolla del Perú) that managed quality certification through GlobalGAP and HACCP standards, achieving export growth from 8,000 tons in 2010 to over 45,000 tons by 2020. This model is directly applicable to Algeria's potential in the European off-season market (May — August), where Algerian production cycle could complement rather than compete with European supply.

Senegal's onion policy provides a compelling model. Temporary "market window" import restrictions during harvests (February — June) protected local producers from competition while promoting quality upgrades. Coupled with the 2015 Conseil Interprofessionnel de l'Oignon (CIO), it slashed imports by 60% and boosted farm-gate prices 35% within three years. The CIO's coordination of storage, standards, and exports highlights institutionalized governance's efficacy a blueprint Algeria could adapt for Sahel market entry.

The sub-Saharan experience offers relevant lessons for Algeria. Studies in Nigeria (Wahab et al., 2025) in Nigeria and East Africa (Lenné et al., 2010) highlight that deficiencies in storage infrastructure, marketing, credits and supply consistency are major obstacles to entering high-value markets. Their analysis of vertical and horizontal integration strategies provides guidance for optimizing Algeria's onion value chain. Similarly, a recent study in Ethiopia (Yeshiwas et al., 2024) shows that weak contractual arrangements and limited market access penalize the entire chain a conclusion that applies to the North African context.

India experience, as the world's largest onion producer, also provides valuable insights. Despite high production volumes post-harvest losses remain substantial, stagnating yields (Gulati et al., 2024), R. Saxena et al. (2020) emphasize that a robust market information system is essential to reduce price volatility. Contract farming emerges as a structural tool to boost smallholders' incomes and improve access to finance, while modern practices such as precision irrigation and mechanized harvesting can enhance productivity and consistency.

Morocco provides another relevant regional example with its "Plan Maroc Vert", which successfully integrated smallholders into high-value export chains through aggregation models and rigorous quality certification managed EACCE (Morocco Foodex). Furthermore, Egypt and Turkey offer more advanced models of integration. Studies on the Egyptian sector (Khalaf et al., 2022; El Noby et al., 2024) attribute competitiveness to strict traceability and certification, while N. Selcuk et al. (2015) show how Turkey adds value through post-harvest technologies like modified atmosphere packaging (MAP). These examples illustrate the imperative for Algeria to undertake a two-pronged upgrade: technological and organizational.

In the light of the author's perspective, this study aims to enhance the competitiveness and export performance of Algeria's by examining the agricultural value chain, and identifying the key structural and economic constraints affecting the vegetable sector. Despite the limited literature on the onion value chain in Al-

geria, international experiences provide valuable insights and highlight potential pathways for improvement.

The research methodology. Description of the research. This study uses a mixed-methods approach that combines quantitative and qualitative analyses. The primary objective is to identify export diversification opportunities by analyzing value chain inefficiencies. The quantitative approach aims to measure and analyze trends in production, trade and prices, while the qualitative approach explores the relationships between actors, structural challenges and institutional dynamics that characterize the entire value chain.

Gathering techniques for the research. Quantitative data collection was based on several complementary sources:

- Official statistics from Ministry of Agriculture and Rural Development (MADR), covering the period 2016—2021, including series B (2016—2017—2018—2019) and agricultural statistics (2019—2020—2021). These data mainly concern cultivated areas, production and yields of vegetable crops, including onions;

- Export data from 2012—2023 from Ministry of Trade and Export Promotion, providing informations on onion export volumes and destinations over this period;

- FAO reports and publication: international statistics on onion production, which allows us to place Algeria in a global context (in particular the ranking of producer countries in 2022);

- Data from the Office National of statistics ONS: information on consumer prices and agricultural production indices;

- Articles from economic and trade press: additional data for the 2022—2024 period, notably from TSA Algérie, Algérie Eco, and le Quotidien d'Algérie, providing up-to-date information on production exports and prices.

Qualitative information was gathered from:

- Academic publications: scientific articles and these on algerian agriculture, market gardening water management, and specifically the onion sector, where available;

- Institutional reports: documents produced by MADR, ALGEX, Bank of Algeria, and other national and international institutions;

- Specialized press articles: reports and analysis on onion industry issues (storage, marketing, export), including testimonials from field players;

- The field survey was conducted across major production regions including Mascara, Tiaret, Biskara, and El-Oued, involving semi-structured interviews with 45 farmers (ranging from smallholders to large scale- producers), 12 collectors/intermediaries, 8 wholesalers, 5 storage operators, 3 processing units, and 4 export companies. Additionally, consultations were held with officials from MADR regional directorates and ALGEX representatives.

Data analysis for the research. Quantitative data were analyzed using Python programming language and libraries pandas, and matplotlib, seaborn for:

- Computing descriptive statistics (mean, trend, variation) of onion production, areas, yields, and exports;

- Determining temporal trends over the periods of study (2016—2024) for production and (2012—2024) for exports;
- Analyzing correlations between various variables (production & price).

A SWOT analysis was conducted to systematically assess the internal and external factors shaping the performance and development of the Algerian value chain. This analysis synthesized quantitative and qualitative data allowing the identification of competitive advantages, structural constraints, emerging opportunities, and potential risks.

Value chain mapping, based on the framework of R. Kaplinsky & M. Morris (2001) and adapted to the agricultural sector by C. Webber & P. Labaste (2010), was used to identify critical stages of the chain. This approach involved analyzing the roles, relationships, and power dynamics among stakeholders at each stage, tracing the flow of physical, financial, and informational resources among these entities, and recognizing constraints and opportunities for each tier.

MARKET GARDEN PRODUCE IN THE ALGERIAN ECONOMY

The agricultural sector plays a significant role in the Algerian economy, contributing approximately 11.6% of GDP in 2022 and employing nearly 2.7 million people. Within this sector, horticultural products, particularly vegetables, represent a dynamic and strategically important market. Vegetables are central to food security, wealth creation, rural employment and export diversification. Sector growth has been driven by the expansion of cultivated areas and improvements in the yields, largely supported by increased irrigation and the introduction of modern agricultural techniques (Sahali et al., 2021). Regions such as El-Oued and Biskra have emerged as a key hub, contributing to national supply, especially for strategic products such as potatoes, tomatoes and onions, and enhancing the sector's contribution to agricultural value added.

Despite its strong domestic performance, the vegetable sector remains underexploited in terms of exports. Total vegetables production reached 156 million quintals (15.6 million tons) in 2023, including 42 million quintals (M qx) of potatoes, exceeding domestic demand and eliminating the need for imports. Main crops exhibit annual growth rates of 3—5% and over the period 2010—2024, vegetables production grew by 184%, outpacing other agricultural subsectors. This expansion highlights significant potential for export diversification. However, unlocking this potential requires investments in infrastructure, quality improvement, development of downstream processing and targeted marketing strategy to position fruit and vegetables as a key pillar of sustainable economic diversification beyond hydrocarbons.

Onions are a particularly strategic vegetables in Algeria, both economically and culturally. In 2000, they ranked among the three most important horticultural crops by area and volume, reflecting their structural weight in the national agricultural system (Sahali et al., 2021). Their inclusion in the SYRPALAC regula-

tory system from 2014 demonstrates institutional recognition of their role in market stability and food security. The system also supports the seasonal supply regulation through storage subsidies, helping stabilize consumption supply and secure producers' incomes.

The onion sector is characterized by a specific technical and economic features that determine its competitiveness. Onions have a relatively good shelf life compared to other fresh vegetables, reducing post-harvest losses. Variety diversity requires adaptation to local conditions and production cycles, while mastery of technological practices enhances productivity. However, persistent gaps throughout the post-harvest chain affect commercial quality, and price volatility exacerbated by the vagaries of weather fluctuations and market speculation, reinforces the need for effective regulatory and value chain interventions. Collectively, these factors underscore the importance of an integrated approach to developing the onion subsector.

THE PRODUCTION OF ONIONS IN ALGERIA: EVOLUTIONS AND CHARACTERISTICS

Onion production in Algeria is concentrated in two main agro-ecological zones: traditional northern and high plateau regions and the rapidly expanding Saharan region. The historical production basin includes wilayas such as Mascara, Mostaganem, Chlef, Boumerdes, Tipaza, Blida, Ain Temouchent and Tiaret. In contrast Saharan wilayas particularly Biskra and El-Oued have experienced rapid growth in onion production due to deep groundwater irrigation, plasticulture, and investment in greenhouse horticulture⁴. These developments reflect a national effort to expand vegetable production to strengthen food security and stabilize domestic supply. Data from the Ministry of Agriculture and Rural Development (2016—2024)⁵ indicate that onion production has increased overall, although it remains to subject significant annual fluctuations.

With reference to Fig. 1, the trend generally dictates an increase in onion production in Algeria from 14.5 million quintals to around 17 million quintals between 2016 and 2021. However, in 2022, a significant decline is recorded, with production at 15.2 million quintals — a decrease of 11.3% compared to 2021 (Bank of Algeria, 2023, cited in Algérie Eco, 2023). This fall is part of larger decline in vegetable production in the same year (–7.3%). Fig. 1 show a recovery for 2023, with production estimated at around 1.7 million tons (around 17 quintals), a figure that confirms the FAO's 2022 ranking of Algeria as the 10 the largest producer in the world. Information for 2024 is still preliminary, but initial indications point to high production, which is fueling export considerations.

⁴ Greenhouse horticulture in Algeria. Quick Scan, 2020. 60 p. URL: <https://www.agroberichtenbuitenland.nl/documenten/2023/01/26/sector-study-algerian-greenhouse-horticulture>

⁵ Ministry of Agriculture and Rural Development (MADR) (2016—2021). Agricultural Statistics Series B and Annual Reports. URL: <https://fr.madr.gov.dz/> (accessed on: 10.03.2025).

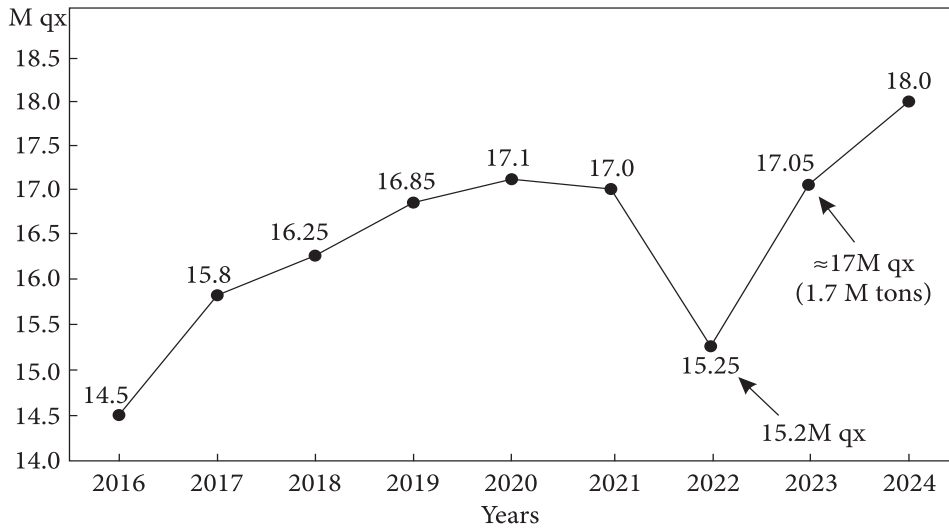


Fig. 1. Evolution of onion production in Algeria (2016—2024), M qx
 Source: compilation by the authors: Ministry of Agriculture and Rural Development (MADR), Statistical Series B (2016—2021). URL: <https://www.madr.gov.dz> (accessed on: 02.03.2025); Bank of Algeria, Annual Report (2022). URL: <https://www.bank-of-algeria.dz> (accessed on: 02.03.2025); Food and Agriculture Organization of the United Nations (FAO), FAOSTAT (2023). URL: <https://www.fao.org/faostat> (accessed on: 02.03.2025); Algérie Eco and El Watan Économie, press reports (2024).

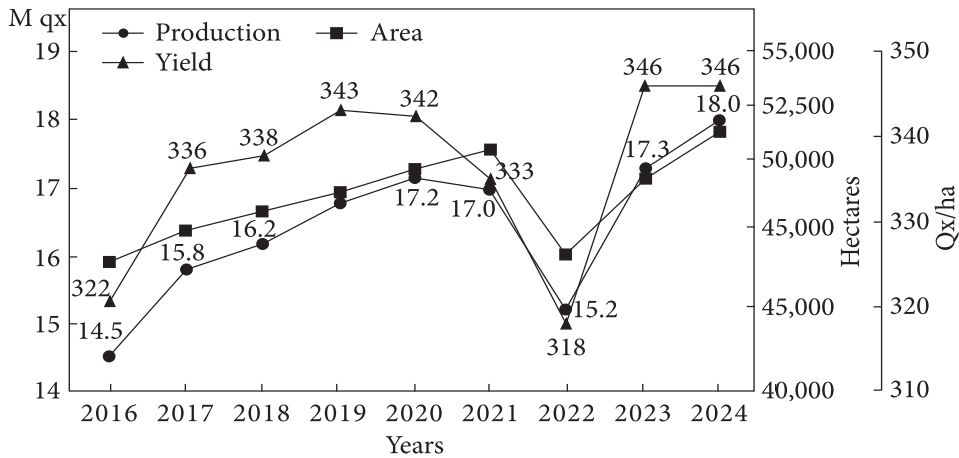


Fig. 2. Evolution of onion production (M qx), area (Hectares) and yields (qx/ha) in Algeria (2016—2024)
 Source: authors' calculations based on: Ministry of Agriculture and Rural Development (MADR), Statistical Series B (2016—2021). URL: <https://www.madr.gov.dz> (accessed on: 02.03.2025); production and yield estimates for 2022—2024 based on FAO (2023). URL: <https://www.fao.org/faostat>, and press sources (Algérie Eco, 2024).

Fig. 2 illustrates the evolution of cultivated areas, yields and onion production in Algeria over the period 2016—2021. The data reveals a dual-phase trajectory characterized by an initial expansion followed by a period of recovery from volati-

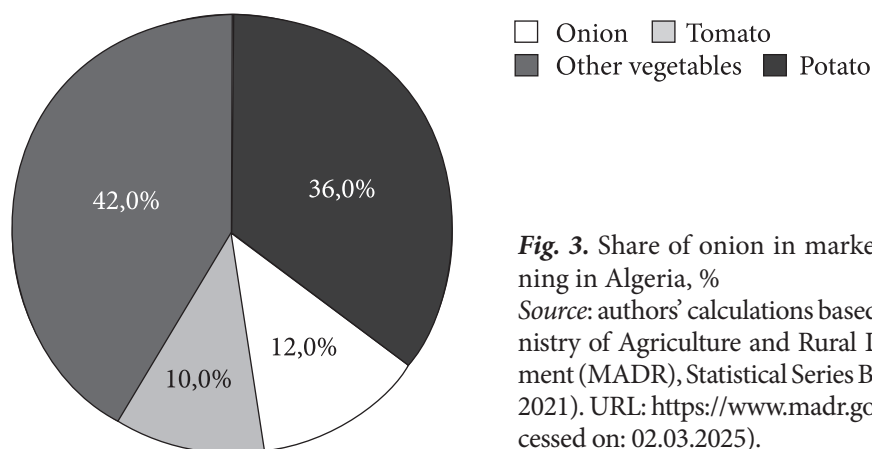


Fig. 3. Share of onion in market gardening in Algeria, %

Source: authors' calculations based on: Ministry of Agriculture and Rural Development (MADR), Statistical Series B (2016—2021). URL: <https://www.madr.gov.dz> (accessed on: 02.03.2025).

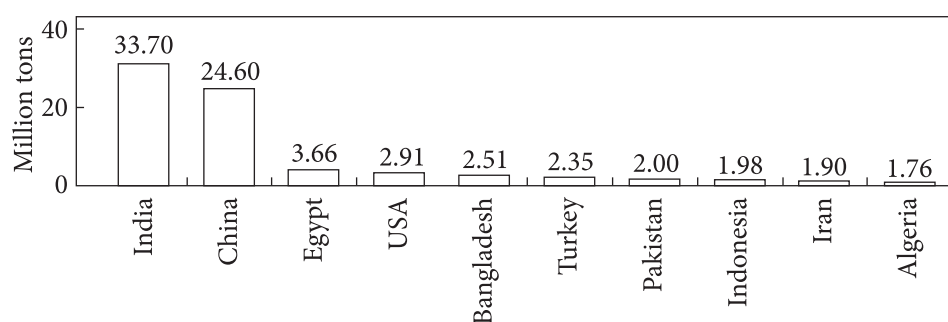


Fig. 4. Top world onion producers (2022), million tons

Source: Food and Agriculture Organization of the United Nations (FAO), FAOSTAT (2022). URL: <https://www.fao.org/faostat/en/#data/QCL> (accessed on: 05.03.2025).

lity. Between 2016 to 2021, production increased steadily from 14.5 million quintals to 17.0 million quintals (M qx) driven not only by an expansion of cultivated area from approximately 45,000 to 55,000 hectares but also by improved productivity, with yields rising from 322 qx/ha in 2016 to a peak of 343 qx/ha in 2019. This period of relative stability was disrupted in 2022, when yields dropped to a period low of 318 qx/ha, likely due to adverse climatic conditions or input supply disruptions. Nevertheless, the sector demonstrated strong resilience with production reaching a record of 18.0 M qx by 2024. Importantly, while early growth was primarily land-driven, the recent production records are increasingly supported by enhanced efficiency, as yields climbed to 346 qx/ha in 2024, reflecting the adoption of a shift towards more intensive management practices and improved technical expertise.

Fig. 3 provides a quantitative indication of the structure of vegetables production in Algeria by major crop class during the period of 2016—2021. A detailed analysis of the relative shares reveals considerable heterogeneity within the sector itself. The aggregated category other vegetables contribute 42% of total vegetable production (in volume). This is followed by potatoes production, which accounts for an important share of 36%, Onion production accounts for 12% of the total

and tomatoes 10%. This distribution demonstrates that onion is a well established component of the algerian landscape, but that its quantitative contribution is overshadowed by other crops like potatoes, this suggests that there is a diversified production of vegetables in the country and onion is one of these key crops.

In 2022, global onion production reached approximately 112 million tons, with India as the leading producer at 31.7 million tons, followed by China with 24,6 million tons Algeria with production of 1.76 million tons, ranks tenth globally, positioning the country as a significant regional producer despite the considerable gap with major Asian producers (Fig. 4).

FOREIGN TRADE OF ONIONS IN ALGERIA: IMPORTS AND EXPORTS

Historically characterized by a high level of self-sufficiency, Algeria's onion sector has undergone a significant structural metamorphosis over the last decade, transitioning from a closed domestic loop toward an increasingly active regional export-trajectory.

Fig. 5 illustrates Algeria's onion trade transformation: imports plummeted since 2015 to under 100 tons annually (2020—2024), reflecting near-self-sufficiency aligned with food security and currency preservation goals. Exports surged tenfold from 100 tons (2012) to 1,000 tons (2024), with peaks in 2017, 2019, and 2023 marked by the 2018 Ivory Coast breakthrough (400 tons) and 2024 expansion to Libya, Tunisia, and Mauritania. While currently representing under 5% of output, exports stabilize markets by absorbing surpluses and curbing volatility, signaling a maturing sector leveraging regional trade potential.

Based on 2013—2016 data, onion exports represented approximately 1,564,112 USD in average annual value, constituting a very small fraction of Algeria's total agricultural exports (which themselves represent approximately 15% of total agro-food exports). Notably, only 0.2% of total domestic onion production is currently exported, with 97% directed to Tunisia, indicating substantial untapped export potential.

PRICE AND VOLATILITY OF ONIONS IN ALGERIA

Price volatility is one of the major problems facing the Algerian onion industry.

Fig. 6 depicts urban retail onion prices, showing steady moderate growth (2016—2019) with narrow min-max gaps, indicating stability. From 2020, steeper raises and widening dispersion singled growing instability, culminating in the 2023 peak at 180 DA/kg due to supply-demand imbalances, climatic hazards, logistics disruptions, production shortfalls, and speculation. The 2024 correction to ~115 DA/kg marks recovery equilibrium though prices exceed pre-2020 levels within a nine-year upward trend and post-crisis normal.

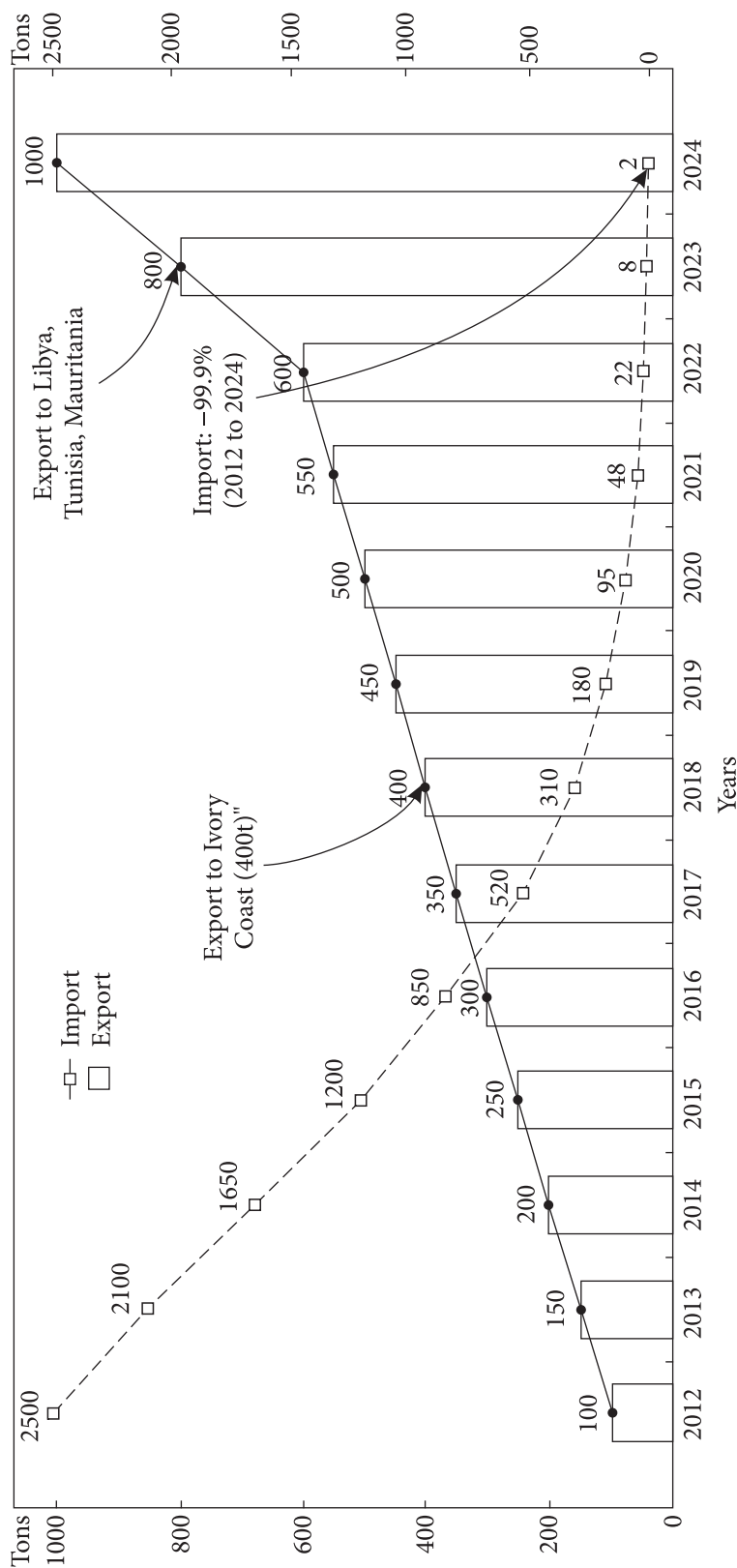


Fig. 5. Evolution of onion export (left scale) and import (right scale) in Algeria (2012–2024), tons
 Source: compiled by the authors from: Ministry of Trade and Export Promotion of Algeria (MTEP), export data on onion volumes and destinations (2012–2023). URL: <https://www.commerce.gov.dz> (accessed on: 05.03.2025); Algérie Eco and El Watan Économie, press reports (2024).

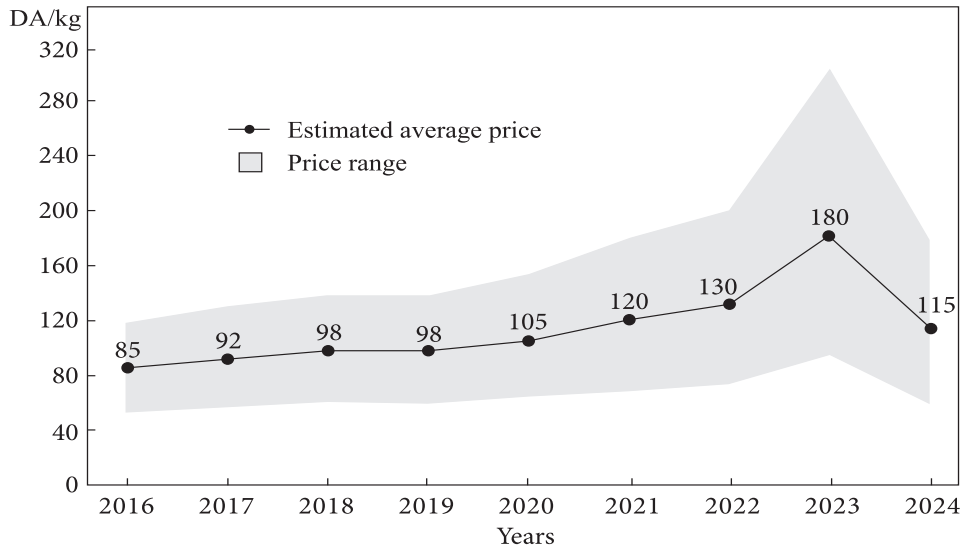


Fig. 6. Evolution of retail consumer prices of onions in Algeria (2016–2024), DA/kg
Source: compiled by the authors from: Ministry of Agriculture and Rural Development (MADR), annual average retail prices (2016–2021). URL: <https://www.madr.gov.dz> (accessed on: 05.03.2025); National Office of Statistics (ONS), consumer price indices (2020–2022). URL: <https://www.ons.dz> (accessed on: 05.03.2025); Algérie Eco and El Watan Économie, press reports (2022–2024).

Swot analysis

STRENGTHS	WEAKNESSES
High production volume (ranked 10 th globally) ensuring self-sufficiency Diverse agro-ecological zones allowing extended harvest seasons (North & Sahara) Low production costs compared to European competitors Rising technical mastery and yields (reaching 346 qx/ha) and Strong domestic demand (8–10 kg/capita/year)	High post-harvest losses (20–30%) due to inadequate cold storage Fragmented supply chain with many small intermediaries Opaque price formation mechanisms Lack of quality certification (GlobalGAP) for exports Limited processing capacity (very few industrial transformation units)
OPPORTUNITIES	THREATS
Export potential to West Africa (via AfCFTA) and neighbouring Maghreb countries Off-season export window to Europe (May-August) Government support for export logistics (ALGEX subsidies) Development of food processing industry (dried onion, Powder) and Adoption of modern irrigation technologies to improve efficiency	Water scarcity and over-exploitation of aquifers in arid zones Climate change leading to unpredictable weather patterns Intense competition from established exporters (Egypt, Turkey, Netherlands) Rising costs of imported inputs (seeds, fertilizers) and Regulatory instability affecting trade policies

Source: compiled by authors.

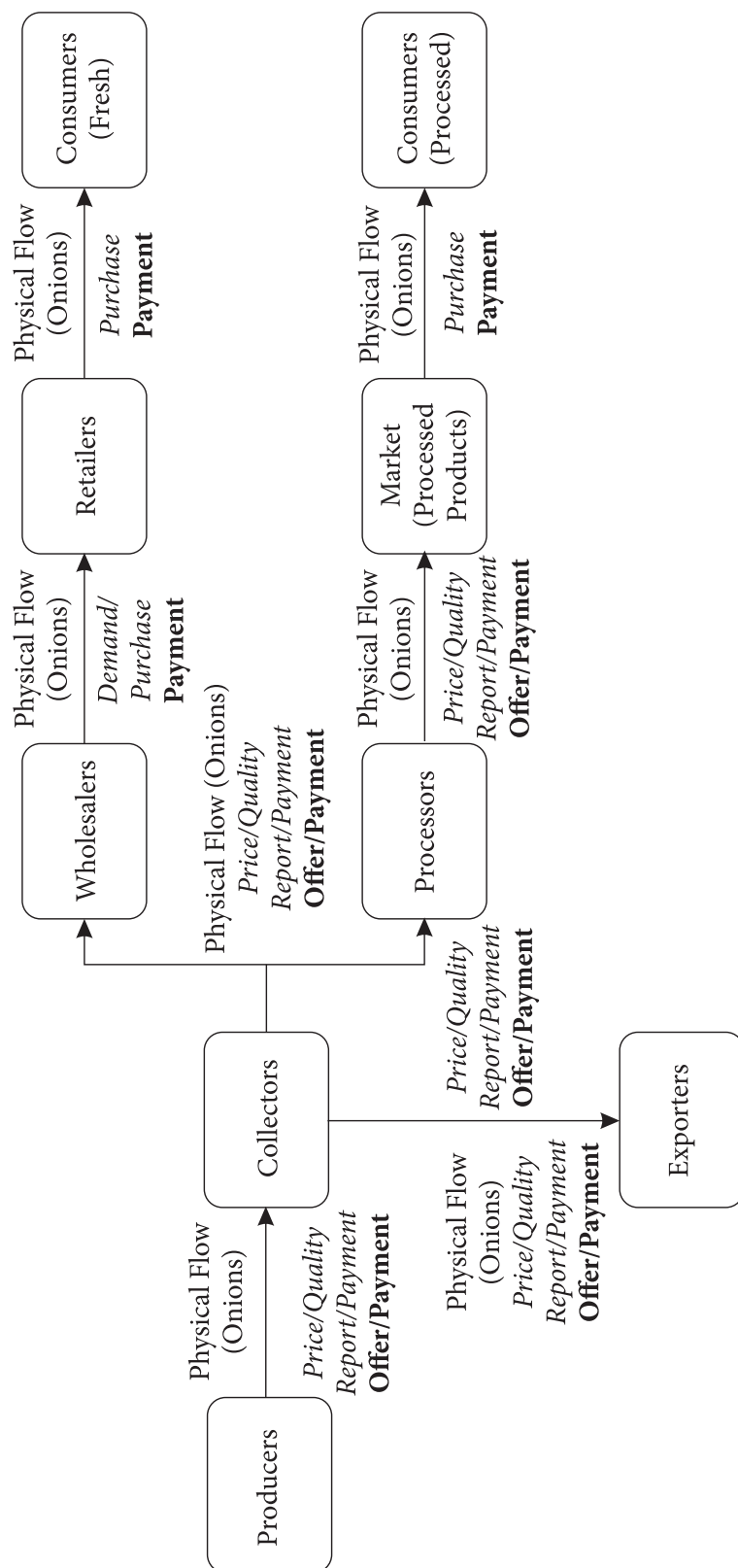


Fig. 7. Onion value chain in Algeria, bold font — Financial Flow (Payments, etc.), italics — Information Flow
Source: compiled by authors from fieldwork.

SWOT ANALYSIS OF THE ALGERIAN VALUE CHAIN

The SWOT analysis (strengths, weaknesses, opportunities, threats) provides a synthesis of the internal and external factors influencing the performance and development of the onion value chain in Algeria. It is based on previously collected information, including statistical data (MADR, FAO, PRESS), which have highlighted a sector with strong production potential and export orientation, but one that faces significant challenges related to stagnating yields, water resource constraints, and price volatility linked to weaknesses in the post-harvest chain.

MAPPING THE ONION VALUE CHAIN IN ALGERIA

The Algerian onion value chain encompasses interrelated stages, from upstream input supply to final consumption. It begins with the provision of essential inputs, such as seeds, fertilisers, pesticides, irrigation equipment and energy, enabling agricultural production through soil preparation, sowing, cultural maintenance and plant maturation. This is followed by harvesting and post-harvest pre-treatment, including drying and conditioning, which facilitate the consolidation of volumes for marketing. Storage, whether traditional, modern cold stores or public facilities such as those managed by ONILEV, plays a critical role in regulating supply. Processing remains marginal while distribution covers domestic wholesale and retail markets, with exports remaining limited.

The value chain involves a diverse set of actors. Input suppliers, including local private companies and importers, provide seeds, fertilisers, pesticides and irrigation equipment, while energy is supplied by operators such as SONALGAZ. Producers are heterogeneous, comprising smallholders, medium-scale or itinerant entrepreneurs supported by seasonal labor. Marketing is largely mediated by collectors and intermediaries, linking producers to wholesalers, storage operators (farmers, private companies or ONILEV) and distributors. Transport is key logistical element connecting production, storage, distribution and export stages. Processors have minimal presence, whereas wholesalers, retailers and exporters dominate product availability in domestic and international markets.

Public institutions including MADR, ONILEV, ALGEX, INRAA and control departments, support or regulate this value chain through planning, research and monitoring functions. The primary product flows across these stages are illustrated in Fig. 7:

Physical flow: the onion flow from agricultural farms storage (farm, private, ONILEV) or to the wholesale via collectors/transport operators. From storage to wholesale markets, they go to the retailers and then consumers. Some of the production, mainly during excess supply, goes towards the ports of Skikda or other border posts for exportation.

Financial flow: consumer pay retailers, who pay wholesalers (or directly, in the case of producer-collectors). Wholesalers-collectors pay producers. Exporters receive payments from foreign buyers and pay producers-suppliers. From these, producers pay input suppliers, labour, transporters and possibly storage fees. There may also be government support (export subsidies).

Information flow: price information flow (often imperfectly) between actors. Technical information comes mainly from agricultural services or input suppliers. Information on regulations and export markets is collected by ALGEX and exporters. Availability and stock information is very important for regulation, but sometimes not transparent⁶.

VALUE ADDITION AND PRICE STRUCTURE ANALYSIS

Field surveys revealed significant price differentiation at each stage of the value chain, highlighting value capture distribution and efficiency gaps:

Farm-gate prices (producer level): During the 2023 season, average farm-gate prices ranged from 25—35 DA/kg during peak harvest (April — May) to 45—60 DA/kg during off-season sales (November — January) from storage. Producers' net margins averaged 15—20% of farm-gate price after accounting for input costs (seeds: 8—10%, fertilizers: 12—15%, pesticides: 5—7%, irrigation: 10—12%, labor: 25—30%, land/equipment: 15—20%).

Collector/intermediary margins: Collectors typically purchase at farm-gate prices and resell to wholesalers at 40—55 DA/kg (peak season) and 65—85 DA/kg (off-season), capturing margins of 15—20 DA/kg (approximately 40—50% markup). This substantial margin reflects their roles in volume aggregation, transport, and market information asymmetry, but also indicates inefficiency and market power concentration.

Wholesale market prices: Wholesale markets (Boufarik, Bir Mourad Rais, Mostaganem) trade at 50—70 DA/kg (peak season) and 80—110 DA/kg (off-season), adding 10—25 DA/kg (15—30% markup) for handling, storage, and distribution logistics.

Retail prices: Final consumer prices (as shown in Fig. 6) averaged 65—90 DA/kg in normal years (2016—2019), spiking to 180 DA/kg in 2023, with retail margins typically 15—30 DA/kg (20—35% markup) covering shop overhead, wastage, and retail services.

Export prices: Export prices for quality-grade onions reached 50—70 DA/kg FOB (2023), higher than domestic farm-gate prices but below retail prices, reflecting quality premiums but also logistical costs (certification, packaging, transport, customs). Export margins for producers were limited (5—10% above domestic sales) due to stringent quality requirements and intermediary costs, suggesting need for direct producer-exporter linkages⁷.

Value chain efficiency analysis: The cumulative markup from farm-gate to retail consumer averaged 150—200% in normal years and exceeded 400% during

⁶ Practical guide for Algerian exporters. National Agency for the Promotion of Foreign Trade (ALGEX), 2021. 99 p. URL: <https://mfa.gov.dz/media/images/PDF/Guide-Exportateur-Algerien-2021.pdf>

⁷ Ministry of Trade and Export Promotion of Algeria (MTEP) (2012—2023). Export data on onion volumes and destinations. *Government of Algeria*. URL: <https://www.commerce.gov.dz> (accessed on: 05.03.2025).

the 2023 crisis. While part of this markup reflects legitimate value addition, including storage, transport, quality sorting, retail services, the predominance of intermediaries and the opacity of market information point to substantial efficiency losses. Farmers capture only 25—35% of the final consumer price, highlighting significant potential for value chain restructuring through producer cooperatives, direct marketing channels, and contract farming arrangements.

STUDY RESULTS AND RECOMMENDATIONS

The in depth of analysis of the onion value chain in Algeria, through a triangulation of official statistical data, academic literature publications, institutional reports and articles in the specialized press, has yielded a number of key insights into the structures, dynamics, challenges and prospects of this strategic sector for Algerian agriculture and economy.

The study reveals a significant growth dynamic in the onion sector in Algeria, which represents around 12% of the country's total volume of vegetable crops. This performance reflects both local agricultural know-how and strong domestic demand. However, this positive trend marks major structural imbalance that are holding back overall growth and compromising the sector's sustainability. Firstly, the high volatility of prices on domestic market reflects the limitations of storage and preservation capacities, which remain largely traditional despite regulatory efforts and emergence of private storage companies. These shortcomings lead to significant post harvest losses and prevent effective regulation of supply throughout the year. Secondly, dependence on intensive irrigation is putting increasing pressure on water resources, with worrying signs of over-exploitation in traditional areas, while areas undergoing conversion are raising new environmental issues against a backdrop of climate change.

Faced with these constraints, exporting is promising way of disposing of surpluses, particularly to the markets in North and West Africa. However, it remains limited by lack of quality standards, logistics infrastructures and high in-depth knowledge of target markets. The SWOT analysis highlights undeniable strengths, such as large volume of production, geographical diversity of growing areas and growing public support, but also structural weaknesses, such as fragmented organisation of the sector, the absence of processing industries and dependence on non-renewable water resources.

Finally, the mapping of the value chain revealed unbalanced relationships between the players and the still marginal role of the agri-food processing, which could nevertheless represent a strategic lever of stabilising farm incomes, adding value to surpluses and boosting exports. Taken together, these findings call for an integrated, coordinated approach to public policy to strengthen and turn the economic, social and environmental onion sector in Algeria into a model of inclusive, resilient and sustainable growth.

Based on our analysis, we recommend a series of coordinated actions for public authorities and private actors along the onion value chain in Algeria to improve its efficiency, resilience and sustainability. Public authorities are urged to invest in

modern, accessible storage infrastructure, promote sustainable water management, and improve export opportunities through logistics development, marketing support and trade agreement negotiation.

In parallel, a transparent market information system should be established, applied research and technical innovation should be encouraged, and regulatory measures against Speculation should be strengthened. Meanwhile, producers should adopt better farming practices, organise themselves into cooperatives, diversify their varieties and improve their post-harvest practices. For their part, storage and processing operators should invest in modern technologies and value added-products, while exporters need to improve their knowledge of target markets and coordinate for optimal logistics. Inter-professionalism, transparency in contracts and training for all actors along the chain would benefit from increased cooperation. An integrated implementation of these recommendations would help transform the onion sector into strategic agricultural driver, supporting price stabilisation, producer income growth and diversification of non-hydrocarbon exports for Algeria.

CONCLUSION

The study of the onion value chain in Algeria has highlighted a strategic industry with strong production potential and sustained domestic demand, but one that is weakened by persistent structural imbalances. The SWOT analysis confirmed the sector's strengths and the challenges it faces, highlighting the need for coordinated action to structure the sector, improve its performance, and strengthen its contribution to food security and diversification of agricultural exports.

The value chain mapping revealed a fragmented sector with opaque information flows. Implementing the proposed recommendations specifically fostering cooperatives, modernizing storage, and establishing interprofessional governance is essential to transforming the onion sector into a strategic agricultural driver for Algeria's economic diversification.

Importantly, the onion sector represents a replicable model for broader market garden export diversification in Algeria. The structural improvements identified are equally applicable to other high-potential vegetable crops such as potatoes, tomatoes, and peppers. By successfully addressing the bottlenecks in the onion value chain, Algeria can establish a blueprint for transforming its entire horticultural sector into a competitive export-oriented industry, thereby significantly contributing to national strategy of reducing hydrocarbon dependence and achieving sustainable economic diversification through agricultural value chains.

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ВНЕСОК ПРОДУКЦІЇ ГОРОДНИЦТВА
В ДИВЕРСИФІКАЦІЮ АЛЖИРСЬКОГО
ЕКСПОРТУ (НА ПРИКЛАДІ ЦИБУЛІ)

Розглянуто ланцюг створення вартості цибулі в Алжирі як стратегічний важіль диверсифікації сільськогосподарського експорту з метою вирішення проблеми надмірної залежності країни від доходів від вуглеводнів. З використанням підходу на основі змішаних методів, який поєднує кількісний аналіз тенденцій у даних щодо виробництва, цін і торгівлі (2012—2024) з якісним картуванням ланцюга створення вартості та SWOT-аналізом, визначено критичні структурні вузькі місця та нереалізований експортний потенціал у цьому секторі. Результати дослідження показують, що Алжир посідає 10-те місце у світі за виробництвом цибулі, обсяг якого сягнув приблизно 18 млн ц на 2024 р., а врожайність збільшилася до 346 ц/га, що відображає зростання технічної майстерності. Однак післязбиральні втрати, які оцінюються у 20—30 %, хронічна волатильність цін, фрагментовані ланцюги постачання з домінуванням посередників і неналежа інфраструктура для зберігання в охолодженому стані відчутно підривають ефективність сектору. Аналіз ланцюга створення вартості також показує, що виробники формують лише 25—35 % кінцевої споживчої ціни, що свідчить про значну асиметрію ринкової влади. Хоча обсяги експорту за досліджуванний період збільшилися в 10 разів, вони залишаються незначними, становлячи менш як 5 % загального виробництва; їх зростання стримують недосконалі сертифікація якості, обмежена логістика та недостатнє дотримання міжнародних санітарних і фітосанітарних стандартів. Спираючись на порівняльний міжнародний досвід (Перу, Сенегал, Марокко, Індія), запропоновано комплексну концепцію політики, зосередженої на організації кооперативів, інвестиціях у сучасні способи зберігання, сталому управлінні водними ресурсами та цільовому сприянні торгівлі. Ці рекомендації спрямовано на перетворення сектору виробництва цибулі на відтворювану модель задля посилення диверсифікації експорту городини в Алжирі.

Ключові слова: економічна диверсифікація; ланцюг створення вартості цибулі; сільськогосподарська політика, експортний потенціал; Алжир.

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