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Developmental transformations in the agricultural sector in southern Algeria: Toward an integrated agricultural region supporting the national economy

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ABSTRACT: In an effort to enhance the agricultural sector in desert regions, Algeria has adopted a range of policies and strategic reforms, including a renewed emphasis on agricultural development. This study examines the implementation of these policies in the regions of Biskra and Oued Souf, drawing on fieldwork conducted in selected farms and agricultural investment sites. These two regions were chosen for their marked agricultural progress and for offering several successful case studies that reflect the impact of national strategies. Our findings suggest that: i) Within a relatively short span of time, the study area has emerged as a vital contributor to national agricultural output. This transformation is largely attributed to the determination of local farmers, supported (though to a lesser degree) by state initiatives and policy frameworks; ii) The area now represents one of the most significant territorial units in Algeria in terms of agricultural productivity and investment potential.
Keywords: developmental transformations; agricultural sector; agricultural development; sustainable development; development transformations.

Transformações desenvolvimentistas no setor agrícola no Sul da Argélia: rumo a uma região agrícola integrada que apoie a economia nacional

RESUMO: Em um esforço para fortalecer o setor agrícola em regiões desérticas, a Argélia adotou uma série de políticas e reformas estratégicas, incluindo uma ênfase renovada no desenvolvimento agrícola. Este estudo examina a implementação dessas políticas nas regiões de Biskra e Oued Souf, com base em um trabalho de campo realizado em fazendas e em locais de investimento agrícola selecionados. Essas duas regiões foram escolhidas por seu notável progresso agrícola e por oferecerem diversos estudos de caso bem-sucedidos que refletem o impacto das estratégias nacionais. Nossos resultados sugerem que: i) Em um período relativamente curto, a área de estudo emergiu como uma contribuidora vital para a produção agrícola nacional. Essa transformação é amplamente atribuída à determinação dos agricultores locais, apoiados (embora em menor grau) por iniciativas e estruturas políticas estatais; ii) A área representa atualmente uma das unidades territoriais mais significativas da Argélia em termos de produtividade agrícola e potencial de investimento.
Palavras-chave: transformações desenvolvimentistas; setor agrícola; desenvolvimento agrícola; desenvolvimento sustentável; transformações de desenvolvimento.

1. INTRODUCTION

The agricultural transformation observed in the region, through the experience of investments and reclamation zones, reflects a concrete expression of development in the Saharan states. This shift results from the state's deliberate efforts to reshape the desert landscape by enacting a series of legal and strategic measures, including the Real Estate Law of 1978 (Chaouch, 2006), the 2000 Concession Law, (Benyoub et al.; 2024) the Economic Growth Consolidation Program CLEGCD (2010-2014), and the Five-Year Development Plan (2014-2019). These initiatives were intended to provide new momentum for agricultural investment, which has become a significant driver of land reclamation, particularly due to its procedural advantages and the speed with which land can be allocated.

This approach has had a marked impact on desert regions. Authorities, confident in the vast potential of the Saharan territories, acted on the premise that their scale alone justified intensified reclamation efforts. These ambitions were translated into concrete projects through the provision of irrigation water (AIDAOUI, 1994). Agricultural farms, investment ventures, and irrigation perimeters were established in both Oued Souf and Biskra, as well as in other desert zones. Two main types of investments emerged: the first consists of small plots, usually no larger than ten hectares, often tied to traditional forms of agriculture rooted in oasis-based systems. The second involves larger-scale investments with commercial objectives, led by entrepreneurial farmers aiming to contribute more directly to national economic growth. This trend has been particularly visible in the expansion of areas devoted to protected agriculture and potato cultivation, alongside the continued preservation of palm groves, which retain considerable historical significance (BEDRANI, 2001).

This agricultural shift has posed real challenges for the region. It has also restructured the local economy, making agriculture a dominant force that increasingly influences labor markets. As a result, many inhabitants have turned toward other sectors such as trade, industry, and services. These transitions have made the region a growing center of economic activity that extends beyond agriculture alone.

The central research problem addressed in this study is the nature of agricultural development and investment in the region. These play a significant role in reinforcing the national economy beyond its traditional reliance on hydrocarbons. These changes and the development of these new territories require the mobilization of production factors (labor, capital, inputs, land, and know-how), which are increasingly difficult to access and increasingly expensive. Farmers, therefore, resort to a series of arrangements, often informal, to access these production factors (AMICHI et al., 2015). On this basis, the following key questions are posed:

i. Are the components of agricultural development available in the region, and in what ways can they contribute to strengthening the national economy?
ii. Does the agricultural policy implemented in the region foster a model of sustainable agricultural development that considers both present and future economic dimensions?
iii. How can governance in agricultural activity be improved so that it meaningfully contributes to both local and national development?

The significance of this study lies in its engagement with a topic that concerns all Algerian citizens, whose aspirations for material and psychological well-being depend heavily on access to a diverse and stable supply of food products. Through data and analysis, the research presents a clear-eyed view of the current state of agriculture in southern Algeria, with a focus on protected cultivation and palm production.

This paper aims to clarify the developmental role of the agricultural sector as a potential alternative to other key economic sectors, particularly hydrocarbons. It explores the capacity of agriculture to attract investment, generate employment, reduce unemployment, and enhance food self-sufficiency and national food security. Furthermore, it highlights the importance of desert regions, which, despite their marginalization in comparison to the north, possess significant natural wealth, vast tracts of arable land, and human capital that has proven resilient in the face of environmental constraints.

Drawing on insights from the study's sample, the research also identifies key mechanisms that could contribute to diversifying the country's exports beyond hydrocarbons, especially in light of the growing geo-economic value of desert regions such as Biskra and Oued Souf.

2. MATERIAL AND METHODS

2.1. Materials

A questionnaire, constructed as a series of methodical questions, served to capture the range of possible responses to the issues under study. Two hundred questionnaires were distributed to Algerian hotels; 180 were returned. Ten were excluded because respondents did not complete them correctly. The final sample, therefore, comprises 170 valid questionnaires, a response rate of 85%. These data are complemented by information on agricultural perimeters, statistical series, cartographic sources, and specialized software.

Data were requested from several administrative and technical bodies:

I. Directorate of Agriculture of Biskra
II. National Bureau of Statistics
III. National Office for Studies on Rural Development
IV. Center for Scientific and Technical Research on Arid Regions

Cartographic support relied on:

i. Topographic Map, Biskra, 1 : 200 000, Sheet N 0-7-8 (Type 1960)
ii. Topographic Map, Tolga, 1 : 50 000, Sheet N 319 (1961)
iii. Map production and data processing employed MAPINFOU 6.5, ARCVIW SIG, and Microsoft Excel.

2.2. Research Scope (Spatial and Temporal)

The analysis targets developmental transformations in the agricultural sector of southern Algeria and assesses the prospects for an integrated, investment-friendly region that can reinforce the national economy. Spatial boundaries are defined by sample farms that illustrate the shift from extensive to protected cultivation:

i. Model farm of Dawiya, municipality of Ghommar (Oued Souf Province)
ii. Model farm of Ben Omar Moussaab, municipality of El Oued (Oued Souf Province)
iii. Large agricultural farms in the municipalities of Loutaya, Tolga, Mziraa, and Lghrous (Biskra Province)

These sites were selected for their agricultural significance and for the notable expansion of intensive protected agriculture and vegetable production, especially potatoes in Oued Souf.

The temporal window extends from 2018 to 2022. The analysis also considers the influence of earlier reform programs, namely the Economic Growth Consolidation Programme (2010-2014) and the Five-Year Development Plan Programme (2014-2019), on agricultural development in Biskra and Oued Souf.

It should preferably be organized in chronological order, avoiding superfluous details and extensive descriptions of techniques in current use (in these cases, present citations).

3. RESULTS

3.1. Transformations Toward an Integrated Agricultural: Farmers and Investors experiences

3.1.1. Land Distribution

The provinces of Biskra and Oued Souf are considered among the most advanced in Algeria in terms of agricultural activity. Several factors have contributed to this status, particularly the creation of favorable microclimates through the use of greenhouses, as well as the natural availability of groundwater and fertile arable soil. These elements have enabled the diversification and intensification of agricultural production, placing both provinces at the forefront of national output (COTE, 2002).

Table 1. Distribution of agricultural lands.
Tabela 1. Distribuição de terras agrícolas.

Land distribution	Biskra	%	Oued souf	%
Total area	215098000	100	4458 680	100
Total agricultural	16629651	77	1768900	37.9
Used agricultural	1 652 751	76,84	105500	5.56
Irrigated area	100.679	54.28	98200	90.80
Non-productive lands for agricultural investment	67.532	4.09	253.400	14.33

Source. Directorate of Agricultural Services of the State of Biskra - Oued Souf 2020.
Fonte: Direção de Serviços Agrícolas do Estado de Biskra - Oued Souf, 2020.

The total agricultural area in Biskra province reached 16,629,651 hectares, representing 77 % of its territory. In Oued Souf, the figure stood at 1,768,900 hectares, amounting to 37.9 %. These proportions underscore the strategic weight of the agricultural sector within the regional economy. Out of the combined total, 1,758,251 hectares are irrigated, a figure that highlights the sector's technical orientation and the substantial potential for further expansion (Ministère de l'agriculture et du développement rural: MADR).

Following the adoption of the Real Estate Ownership Law, the reclamation of desert lands gained momentum (Figure 1). This process excluded former self-managed lands and areas classified under the agricultural revolution, and instead focused on zones deemed viable for productive use (BESSOUD, 2013). As part of this transition, the state actively supported land development by expanding irrigation infrastructure. This included authorizing new drilling operations and issuing licenses for groundwater use. These combined efforts have given rise to a renewed dynamic within the agricultural sector, both at the provincial scale and more specifically within the study area.

3.2. Presentation of model farm and investment experiences in agricultural investment

According to Law No. 08-16 of August 3, 2008, an investment is defined as a production unit encompassing all movable and immovable assets related to orchards, fields, and livestock (AJJA, 2005). More broadly, the term "investment" refers to any form of agricultural enterprise tied to production and productivity (BELKACEM, 1990).

i. Model Farm (Figure 2): Model farms originated under the Agrarian Revolution Law, which established their legal form and defined their objectives. These farms are tasked with preparing and developing agricultural production in collaboration with institutes and specialized offices. Their function is to ensure a steady supply of improved plant and animal material for agricultural users (BOUHDID et al., 2021).

ii. Irrigation Perimeters (Figure 2): These are areas prepared and reclaimed by technical services and the Directorate of Water Resources at the wilaya level. They are allocated to the National Office of Irrigation and Drainage (COTE 2011 s.d.), which oversees the planning, management, and follow-up of irrigation infrastructure.

3.2.1. *Model Farm in the Municipality of Ghomar (Oued Souf Province)*

The model farm located in the municipality of Ghomar is considered one of the most prominent in the region. It specializes in the cultivation of potatoes, palm trees, and olives, and has become a reference point in terms of both yield and innovation.

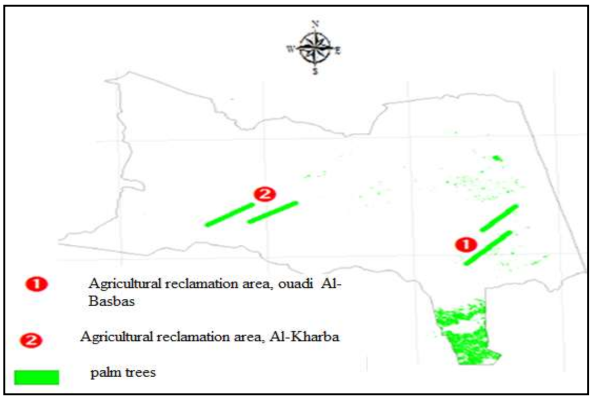

Figure 1. Hydro-agricultural development in Tolga.
Figura 1. Desenvolvimento hidroagrícola em Tolga.

Figure 2. Irrigation perimeters
Figura 2. Perímetros de irrigação.

Table 2. Technical card for the model greenhouse farm.
Tabela 2. Ficha técnica do modelo de fazenda em estufa.

Type	Area H	Number		Production Quantar
Potato	758			160
Palm	550	Deglet Nour	28000	150
Olive	360	Grass	6522	220
Peanut	120	Table Oil	10000	95
		Soybean Oil	23000	90
Total	1105			715

3.2.2. *The Typical Agricultural Perimeter of Ouataya (Biskra)*

The initial surface area of the Ouataya perimeter was determined based on the availability of water resources and an accompanying agricultural development plan. However, this area was later revised due to the difficulty of launching a hydro-agricultural project that would involve a reduction in palm cultivation, which traditionally relies on diverted floodwater and groundwater resources.

It is essential to consider the composition of the agricultural area when assessing such projects. The total gross area of the perimeter is estimated at 943.65 hectares. Of this, 24.05 hectares are occupied by 51.7 kilometers of internal roads, each measuring three meters in width, and 84.89 kilometers of irrigation ditches, each one meter wide.

As a result, the net cultivable agricultural area stands at 919.86 hectares. The division of this area is structured into 51 parts (BOUKHLIFI 2017).

Table 3. The typical agricultural environment of Outaya.
Tabela 3. O ambiente agrícola típico de Outaya.

Exploitation Unit	
Perimeter Location	Outaya
Equipped Area	1137H
Irrigated Area	880H
Exploitation Start Date	2006
Irrigation Source	Gazelle Fountain Dam

Source: Loutaya Exploitation Unit.
Fonte: Unidade de Exploração de Loutaya.

3.2.3. Distribution of Basic Crops and Irrigation Methods

The irrigated area of Ouataya covers approximately 1,137 hectares, of which 880 hectares are actually under irrigation. This represents 77 percent of the total area. The high rate of land utilization highlights the potential for future reclamation and opens up opportunities for expanding the cultivation of a variety of crops. These include palm trees, fruit trees, olives, cereals (such as wheat and barley), forage crops (including barley, corn, and carob), as well as vegetables and potatoes (ANAAT, 2022).

A. Agricultural reclamation perimeters in Tolga (Biskra): New hydro-agricultural development

The Tolga region contains agricultural zones classified as suitable for irrigation, based on their physico-climatic characteristics. These include the reclamation perimeters of Oued Besbas and El Kherba, where irrigation is primarily ensured through boreholes and wells. These perimeters are part of the broader hydro-agricultural development scheme of Ouataya. The following analysis addresses each case individually, focusing on location, natural potential, and irrigation systems, based on field observations and institutional data.

B. Agricultural reclamation perimeter of El Kherba

This perimeter spans an area of 2,260 hectares (CEMALI 2018). Crop distribution within the perimeter is as follows:

i. Annual crops: 1,580 ha, representing 70 % of the area
ii. Protected crops (cultivated under greenhouses): 226 ha, representing 10 %
iii. Palm cultivation: 452 ha, representing 20 %

C. Agricultural reclamation area of Oued El Besbas

This area extends across 1,040 hectares (Figure 1). The distribution of cultivated crops is as follows:

i. Annual crops: 550 ha, accounting for 52 %
ii. Protected crops (under greenhouses): 186 ha, or 17.88%
iii. Palm cultivation: 304 ha, representing 29.12% (ANAAT, 2014).

E - Agricultural reclamation perimeters of Ghrous (Biskra)

The late agricultural reclamation perimeter:

i) Location and area: The late agricultural reclamation perimeter is located north of Ghrous. This perimeter is one of the largest in the municipality, with an area estimated at 13,197 hectares.

i. Annual crops, representing an area of 7,890 ha (59.78%).
ii. Protected crops (inside greenhouses), covering an area of 1,300 ha, representing 9.85%.
iii. Palm cultivation: covering an area of 4,006 ha, representing 230,359%.

F. Agricultural investments in Mziraa and Ain Naqa (Biskra) - the reality of agricultural exploitation: "Transition from extensive agricultural exploitation to protected."

i. Extensive crops, covering an area of 6,921 ha and a production exceeding 141,000 quintals (2022-2023 season).
ii. Protected crops (in greenhouses), covering an area of 2,600 ha (46,000 greenhouses), ranked first nationally
iii. Field crops: 9,200 ha

The agricultural labor force in Biskra and Oued Souf numbered about 75,000 in 2010, out of a total workforce of 119,000 across all sectors (Table 4). Agriculture, therefore, accounted for 63.05 % of employment, a share that includes seasonal as well as permanent workers. Employment in agriculture has steadily increased in recent years, a trend attributed to the growing number of distributed agricultural plots and the continuous rise in crop production. Many of these crops require a considerable amount of both permanent and seasonal labor. It should be noted that the cited statistics reflect the combined contributions of temporary and full-time agricultural workers.

Table 4. Development of protected crop production 2018-2023 (Ha).
Tabela 4. Desenvolvimento da produção de culturas protegidas 2018-2023 (ha).

Years	2018	2019	2020	2021	2022	2023
Tolga	150.854	256.658	265.698	300.695	326.056	400.23
El Ghrous	542.110	562.326	596.325	600.325	623.326	656.695
Outaya	1.504	1.666	1.963	2.365	2.459	2.956
Total production Biskra	694468	822065	863986	903385	951841	1059880
Model farm Daoya	11135	17898	18024	18361	18096	18027
Model farm Ben Omar Messab	111230	111965	112635	113666	114563	115632
Total production Oued Souf	122365	129863	130659	130996	132658	133659
Total production Oued Souf N	816833	951958	994646	1034381	1084499	1193539

Unit: Qantar Source: Researcher's processing based on field trips.
Unidade: Qantar Fonte: Elaboração do pesquisador com base em visitas de campo.

3.3. Developmental transformations that strengthen the national economy through dynamic marketing

3.3.1. Investment in giant multi-chapelle greenhouses (protected agriculture and commercial dynamics)

Initial investments in protected agriculture in the region focused on select crops, aiming to secure a strategic commercial advantage at the national level. However, with the progressive development of the sector (particularly in recent years), investment trends have shifted toward diversification of agricultural output (CEMALI, 2020) (Figures 3 and 4). This transformation reflects the accumulated experience and technical know-how acquired by investors in the field.

The development of protected agriculture, specifically within greenhouses, has expanded considerably. This growth has been supported by reclamation policies and programs designed as the foundation for achieving sustainable development. These initiatives have contributed to:

i. The expansion of cultivable agricultural land,
ii. The development of early and specialized production systems,
iii. The intensification and diversification of crop types.

The results recorded in this sector have positioned the region as a leading hub for production. It has become especially notable for early-season vegetables, with the area allocated to protected agriculture reaching 2,928 hectares and total production exceeding 2,473,321 quintals across agricultural investments in Biskra.

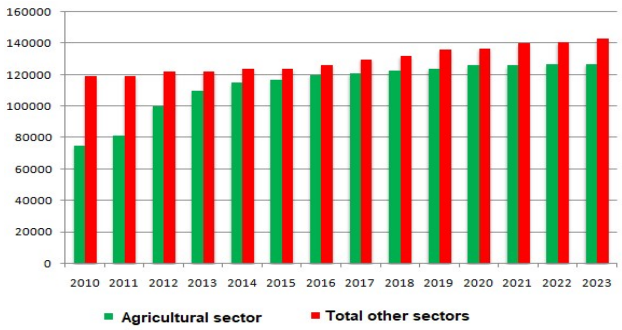

Figure 3. Average distribution of the number of employees according to economic sectors in the Biskra and Oued Souf
Figura 3. Distribuição média do número de empregados por setores econômicos em Biskra e Oued Souf

Figure 4. Development of protected crop production 2018-2023.
Figura 4. Desenvolvimento da produção de culturas protegidas 2018-2023.

Production of protected crops within the selected study samples has experienced a sharp and consistent increase between 2018 and 2023. In 2018, total output stood at 816,833 quintals, while by 2023 it had reached 11,953,539 quintals, that is an increase of 376,706 quintals. This upward trend has been accompanied by growth in the surface areas devoted to these crops, cultivated under plastic greenhouses. This mode of production has come to be recognized as a successful and profitable activity, particularly for early crops, which are in high demand on national markets.

Protected agriculture now represents the core of a new agricultural model based on intensification and diversification. Its commercial appeal and capacity to meet domestic demand underscore its emerging role in the region’s economic dynamics.

3.3.2. Potato Production: A successful model and a strategic challenge

Potato cultivation was introduced in the early 1990s by the agricultural services of El Oued. Farmers quickly adopted it, encouraged by its consistently high yields, ranging between 30 and 40 tons per hectare. In addition, the region's mild winter conditions allowed for off-season production during December and January. This enabled farmers to supply wholesale markets without directly competing with the main production zones located in northern Algeria (BENMIHOUB, 2015).

Today, potatoes have become the leading crop in the Oued Souf region, both in terms of cultivated area and total production. The region is now more widely recognized for its potato production than even for its dates, traditionally its most famous agricultural product. This popularity stems from several advantages, including:

i. The possibility of cultivating two successive potato crops within a single agricultural season: one early crop beginning in September and another later crop planted in March.
ii. The region’s loose, sandy soil favors tuber growth without deformities, thus enhancing both the aesthetic quality and market value of the product.

El Oued ranks first nationwide in both the area devoted to potatoes and overall production volume. In 2022, the province produced approximately 14,980,000 quintals of potatoes, representing 23.30 % of national production. This dominant share places the province at the forefront of Algeria’s potato sector (Table 5 and Figure 5). Projections for seasonal potato harvests, especially those collected in the summer period, estimate production at around 6 million quintals, cultivated over an area of 12,000 hectares.

An analysis of the evolution of potato production shows significant growth in the land area allocated to this crop, which exceeded 490,000 hectares (seasonal and late combined) according to the latest 2023 census. Compared to the national potato-growing area, estimated at 112,000 hectares, Oued Souf alone accounts for 24.48 %, which is a notable figure supported by several structural indicators that underscore its leadership:

i. Horticultural development in the province emerged within a context marked by the decline of the traditional hydraulic system known as the *ghout*, a technique specific to the region. The *ghout* consists of artificial basins in which groups of 20 to 100 palm trees are planted. These trees draw water from the shallow water table (REBAI et al., 2017).
ii. The province produces approximately 75 % white potatoes and 25 % red. White potatoes, in particular, are considered superior in quality and enjoy strong market demand.

Table 5. Potato production development 2019-2023.
Tabela 5. Desenvolvimento da produção de batata 2019-2023.

Years	seasonal potatoes			late potatoes			Potato area and yield		
	Agricultural area	Production	Yield	Agricultural area	Production	Yield	Agricultural area	Production	Yield
2019	11000	3500.000	400-370	27000	8640000	400-370	38000	12140000	400-370
2020	11000	3500.000	400-370	28200	8645000	400-370	39200	12140000	400-370
2021	12100	4200.000	400-370	31000	8795000	400-370	43100	12995000	400-370
2022	12900	4600.000	400-370	36000	9155000	400-370	48900	15555000	400-370
2023	13000	4800.000	400-370	36000	9515000	400-370	49000		400-370

Source: Directorate of Agricultural Services of the Wilaya of Oued Souf 2023.
Fonte: Direção de Serviços Agrícolas da Wilaya de Oued Souf, 2023.

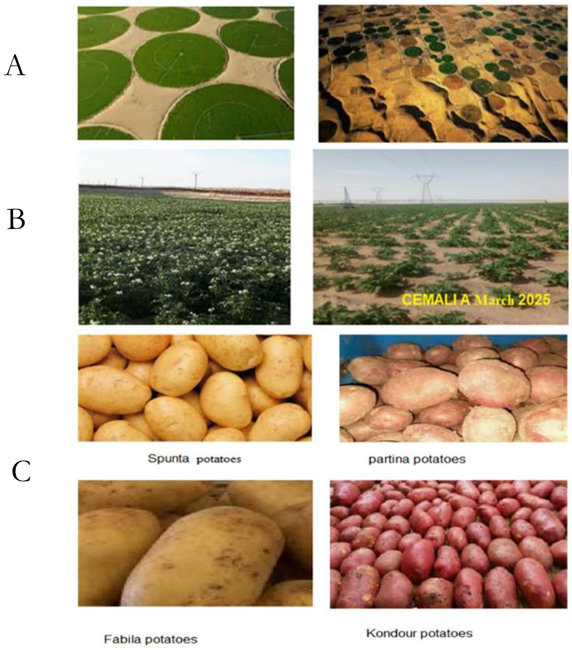

Figure 5. Aerial photos of potato cultivation (A), vast fields of potatoes (B) and varieties of potatoes - Oued Souf (C).
Figura 5. Fotos aéreas do cultivo de batata (A), de vastos campos de batata (B) e de variedades de batata - Oued Souf (C).

i. Late-season potato cultivation, planted between August and September, provides additional coverage for national markets during the fall, helping stabilize supply.
ii. The sandy soil in Oued Souf is well suited to high-quality potato production, unlike the heavier black soils found in regions such as Skikda, El Tarf, and Mostaganem, which yield lower quality crops (BOUFARES, 2012).

3.3.3. Investment in Palm Cultivation: From Subsistence Oasis Economy to Commercial Market Integration

Date-palm cultivation in Algeria spans roughly 167,000 hectares and supports more than 18.6 million trees. Total production, across all varieties, is close to 990,000 tons. Within this national profile, Biskra Province leads with 27.4 % of the cultivated area, 23.1 % of all palm trees, and 41.2 % of national output (Table 6). El Oued Province follows at 22 %, 22.4 %, and 25 %, respectively. Together, the two provinces generate nearly two-thirds of Algeria's annual date harvests (BOUAMMAR, 2010). Globally, Algeria ranks fourth in date production, behind Egypt, Iran, and Saudi Arabia, supplying about 14 % of world output but exporting less than 3 %, well below the global export average of roughly 12 %.

Table 6. General distribution of palm trees in Algeria (area, number and production).
Tabela 6. Distribuição geral de palmeiras na Argélia (área, número e produção).

Province	Area estimated (ha)	%	Palm total	%	Production in quintals
Biskra	42493	25.46	4141927	23.13	2.985.000
Oued souf	36317	21.75	3745183	20.91	2.474.000
Adrar	27804	16.65	3733350	20.84	910.300
Ouargla	21515	12.89	2522695	14.08	1.296.000
Béchar	13945	8.35	1626132	9.08	300.500
ghardaia	10632	6.37	1224810	6.84	565.000
Tamanrasset	7001	4.19	688822	3.84	109.400
Khenchela	770	0.46	124405	0.69	68.200
Tebessa	820	0.49	63900	0.35	20.500
Laghouat	640	0.38	61800	0.34	16.200
Illizi	510	0.30	50600	0.28	15.600
Tindouf	430	0.25	45200	0.25	14.300
El Bayadh	320	0.19	37300	0.20	10.300
Naâma	190	0.11	28700	0.16	10.200
Djelfa	125	0.07	12910	0.07	8.400
Batna	100	0.05	10100	0.05	6.800
	166900	100	17906424	100	9903600

Source: Ziban Chamber of Commerce and Industry and Algerian Chamber of Commerce and Industry, 3rd International Exhibition of Biskra, December 2018.
Fonte: Câmara de Comércio e Indústria de Ziban e Câmara de Comércio e Indústria da Argélia, 3ª Exposição Internacional de Biskra, dezembro de 2018.

Despite the rapid and large-scale agricultural growth observed across the southern regions, particularly in Ziban and Oued Souf, through policies aimed at crop diversification (especially vegetables), palm cultivation continues to hold paramount importance for local farmers. While vegetables have become competitive with, and in many cases have surpassed, those produced in hilly regions (especially in terms of protected crops), the palm tree remains an irreplaceable element of desert agriculture. It is not merely a food source but carries deep-rooted social values passed down through generations, which gives it a unique place in the Algerian desert landscape.

The expansion of palm groves has coincided with the growing economic value of this crop. This is especially evident in the rising demand for *Deglet Nour* (DAOUDI et al., 2010), a variety known for its superior quality and strong position in international markets, where it commands high prices. As a result, the area devoted to palm cultivation has increased year after year.

Biskra and Oued Souf alone recorded a combined area of 78,810 hectares out of the national total of 166,900 hectares, representing 47.21%. In terms of the number of trees, the two provinces together registered 7,887,110 palms, which accounts for 44.06% of the national total. This increase has been made possible through state-led development initiatives in the South, particularly agricultural support programs. The renewal and revitalization of the palm grove were also significantly influenced by the Agricultural Support Law of 2000, which served as a financial catalyst. The liquidity provided by this law encouraged farmers to extend their investments in palm cultivation at the national level, reinforcing the sector's strategic place in both heritage and economy.

3.3.4. Peanut Experience

In recent years, Algeria has introduced peanut cultivation in several regions, including El Tarf in the north, Adrar in the southwest, and Ghardaïa and Oued Souf in the southeast. Among these, Oued Souf stands out as a pioneering region in this experience. The area allocated to peanut cultivation in Oued Souf increased from 3,380 hectares during the 2019/2020 agricultural season to 7,632 hectares in the 2023/2024 season (Table 7).

Table 7. Development of peanut area and yield in the Oued Souf region 2019-2024
Tabela 7. Desenvolvimento da área e produtividade do amendoim na região de Oued Souf 2019-2024

Agricultural season	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
area estimated H	3380	34695	3562	3611	7632
Production in quintals	104200	115321	165325	198562	218432
	First place nationally	First place nationally	First place nationally	First place nationally	First place nationally

Source: Directorate of Agricultural Services of the Wilaya of Oued Souf 2023.
Fonte: Direção de Serviços Agrícolas da Wilaya de Oued Souf, 2023.

This expansion in cultivated area was directly reflected in production levels. In 2019-2020, total peanut production reached 104,200 quintals. By 2023-2024, it had risen to 218,432 quintals - an increase of over 110,000 quintals. This upward trend reflects a growing interest among investors in diversifying agricultural production.

3.4. Contribution to strengthening the national economy

3.4.1. National marketing map

As a natural outcome of the region's local development and its emergence as a leading agricultural center, several associated sectors have expanded. The growth of cultivated areas and the diversification of seasonal and early crops have stimulated the development of related infrastructure, most notably in the fields of transportation, wholesale markets, and local retail markets (Figure 6).

This section outlines the national marketing map for agricultural products, with a particular focus on vegetables. To understand the geographical reach and influence of the wholesale market (referred to here as the Gross market), both at the provincial and national levels, field research was conducted during the months of March through June. This period was chosen due to the heightened activity observed in the market, which receives traders from approximately 33 out of the country's 48 wilayas.

To analyze the spatial distribution of market influence, the territory was divided into four primary directions: eastern, central, western, and southern. The agricultural produce originating in the region is then redistributed from the Gross market to other provinces across the country, forming a dynamic internal marketing network.

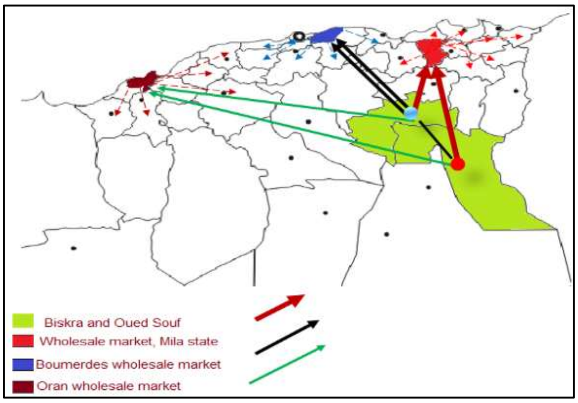

Figure 6. National marketing map.
Figura 6. Mapa de comercialização nacional.

A. Chelghoum El Aid market in Mila Province

The wholesale market for vegetables and fruits in the municipality of Chelghoum El Aid represents a vital economic node at the national level. Its strategic location - at the eastern exit of the municipality on National Road No. 05 - grants it access to a wide network across eastern Algeria. Established by provincial decision No. 104/1990, dated 04/02/1990, the market sits on municipal land and covers a total area of approximately 61,150 m². Of this, 12,920 m² is covered infrastructure. The market consists of 225 trading spaces (squares), of which 214 are currently active, and 11 are inactive. Chelghoum El Aid serves as a redistribution point for agricultural products to the provinces of Batna, Sétif, Béjaïa, Jijel, Mila, Constantine, Oum El Bouaghi, Skikda, Annaba, Souk Ahras, Guelma, and Tébessa. The volume handled ranges between 900 and 1,300 quintals per day, representing approximately 45% of total market activity.

B. Bouzegza market in boumerdès

The Bouzegza market plays a key role in the redistribution of agricultural products, particularly early vegetables, to several central provinces: Bouira, Médéa, Blida, Algiers, and Boumerdès. Although these regions possess agricultural land suitable for protected cultivation, especially of fruits and vegetables, they remain heavily dependent on external supplies for early-season products. This market accounts for approximately 35% of the total redistribution share.

C. Oran wholesale market

Located in western Algeria, the Oran wholesale market is one of the region's largest. It spans 18 hectares, includes nine pavilions, and features a built area of 2,016 m². It functions as a primary supplier for the western provinces, notably Tiaret, Relizane, Chlef, Aïn Defla, Oran, and Mascara. The volume redistributed through this market represents approximately 15% of the national movement in agricultural goods.

D. The region's role in strengthening the national economy through market integration

To gain a clearer understanding of the market's geographic influence, both locally and nationally, field investigations were limited to the period between March and June. This timeframe was selected due to heightened market activity during these months, marked by the arrival of traders from approximately 33 of Algeria's 48 provinces. For analysis, the market's zones of influence were grouped into four primary directions:

i. Eastern Zone: Includes Batna, Sétif, Béjaïa, Jijel, Mila, Constantine, Oum El Bouaghi, Skikda, Annaba, Souk Ahras, Guelma, and Tébessa. This zone accounts for 900 to 1,300 quintals per day, representing 45% of the market's distribution. These provinces are densely populated and relatively close to the wholesale market, which explains the high level of dependency.

ii. Central Zone: Covers the central coastal provinces of Bouira, Médéa, Blida, Algiers, and Boumerdès. This region represents 35% of the total share. Despite the availability of land suitable for protected cultivation, these provinces depend heavily on imported early vegetables to meet market demands.

iii. Western Zone: Encompasses Tiaret, Relizane, Chlef, Aïn Defla, Oran, and Mascara. These provinces collectively receive 15% of the redistributed produce.

iv. Southern Zone: Includes Oued Souf, Ouargla, and Ghardaïa, which together represent 5% of total redistribution volume.

3.4.2. International marketing and competition in agricultural production (potato and date division)

This section aims to shed light on the international marketing dimension, specifically through the export strategies of the potato and date sectors, which are two of the most prominent agricultural products both locally and internationally (Figure7). Their importance stems from their distinctive characteristics, high production value, and the marketing systems adopted by active institutions in both provinces. This section also considers quantitative trends, pricing trajectories, and the future outlook for exports in both sectors.

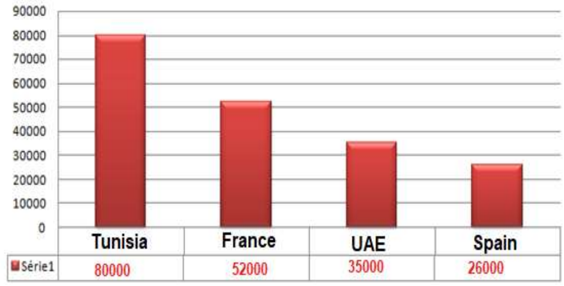

Figure 7. The most important potato-importing countries
Figura 7. Principais países importadores de batata

A. International Marketing of Potatoes

Among the key actors in the export of potatoes, particularly in the province of Oued Souf, are private companies such as Mertiraf Services, International, and Tayeb Canal (Table 8). These companies have played a leading role, with total exports exceeding 149,000 tons.

Table 8. The most important companies operating in the field of export.
Tabela 8. As empresas mais importantes que atuam na área de exportações.

Economic Institution	Quantity - tons	%
Mertiraf Services	115000	68.04
International	26000	15.38
Tari'a Al-Tayeb	28000	16.56
Total	169000	100

Source: Chambers of Commerce and Industry of Wadi Souf

B. International Date Marketing

Date palm cultivation in Algeria extends over an estimated 167,000 hectares, with more than 18.6 million palm trees. The total production of dates, encompassing all varieties, is estimated at approximately 990,000 tons.

Biskra Province leads in this sector, with 27.4% of the total cultivated area, 23.1% of the total number of palm trees, and 41.2% of national date production. It is followed by El Oued Province, which accounts for 22% of the area, 22.4% of palm trees, and 25% of production. Together, these two provinces produce two-thirds of Algeria's dates.

On the global scale, Algeria ranks fourth in date production, after Egypt, Iran, and Saudi Arabia. It contributes approximately 14% of the world's date output. However, less than 3% of this production is exported, compared to a global average of around 12%.

Based on our analysis of production and investment data, dates are emerging as a strategic resource in Algeria's efforts to strengthen its economy beyond hydrocarbons. Several indicators reinforce the importance of the study area:

i. The study area ranks first nationally in land dedicated to date cultivation, with 42,493 hectares. This land supports over 4.1 million palm trees, producing more than 4,000,000 quintals (2015), equivalent to 41.17% of national production.

ii. Institutions active in date packaging and export are heavily concentrated in the Ziban region, particularly in the provincial capital and the district of Tolga, with 155 institutions. In El Oued, 49 institutions are involved, reflecting the region's possession of more than four million palm trees.

iii. There is a balanced relationship between production and export capacity.

The external marketing strategy is grounded in compliance with all international quality standards for dates. Foreign markets are characterized by intense competition, with numerous domestic and international suppliers. This is especially evident in markets like the United States, which competes directly with Algerian date exports, notably *Deglet Nour*, due to its high international standing.

Algerian dates have managed to penetrate diverse global markets, including Canada, Germany, and the Gulf states. In line with current economic strategies aimed at integrating Algeria into the evolving international division of labor, the state is working to develop sectors with a comparative advantage. Among these, the date export sector stands out as a significant contributor to increasing national export volumes.

Our analysis of international marketing channels confirms the regional role in this dynamic. Field investigations and institutional surveys reveal that 70% of Algerian date exports are destined for European Union countries, with France as the primary destination (Figure 8). This is largely due to France's sizeable Muslim population, estimated at nearly 9 million, which forms a key consumer base.

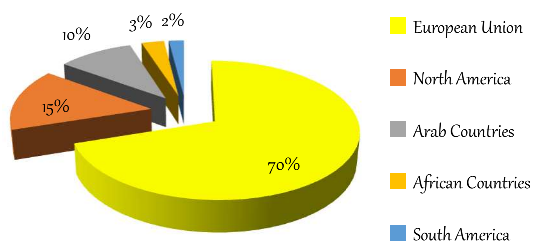

Figure 8. International Marketing of Dates.
Figura 8. Comercialização Internacional de Tâmaras.

International marketing regions for dates: key market characteristics

• First-Tier Markets

These are primarily located in the European Union and represent approximately 70% of total Algerian date exports. The focus is especially on countries with large Muslim communities. Europe is home to more than 45 million Muslims, including over 9 million in France and around 3 million in the United Kingdom.

Exporting institution officials attribute this dominant share to several interrelated factors:

i. Strong demand during religious and harvest seasons.
ii. Low transportation costs, particularly to Mediterranean countries, due to geographical proximity.
iii. High purchasing power in these countries, which positions them among the most significant buyers of Algerian dates.

• Second-Tier Markets

These include North American countries, particularly the United States and Canada. While these markets present considerable economic potential, they also pose substantial logistical and financial challenges:

i. Long shipping times and elevated transport costs.
ii. High market prices.
iii. Limited infrastructure to support consistent and scalable export operations.

• Third-Tier Markets

This category comprises Middle Eastern countries such as the United Arab Emirates, Syria, Lebanon, Bahrain, and Jordan, along with Southeast Asian markets, India, and Russia. These regions are active but not dominant in Algerian date exports.

• Fourth-Tier Markets

South American markets, including Colombia, Cuba, and Venezuela, remain marginal. Exporting to this region is complicated by long transit times and the absence of direct transport links with Algeria. In some cases, shipments can take more than two months to arrive, significantly increasing the risk of spoilage. This is a critical issue, given that dates, especially high-quality *Deglet Nour*, are classified as highly perishable.

• Fifth-Tier Markets

African markets, except the Kingdom of Morocco, are currently viewed as secondary. This is due to two primary constraints:

i. Weak purchasing power across much of the continent.

The premium quality of Algerian exported dates places them outside the price range of many consumers in these markets.

4. DISCUSSION

Through the analysis and interpretation of the statistical data and field-based findings presented in this research, it becomes possible to summarize the state of the agricultural sector in the region. The classification of major agricultural food commodities by their pace of production allows us to draw the following conclusions:

i. Despite the environmental constraints that characterize the region, agricultural production has achieved highly significant results. This is evident in the volume, evolution, and diversification of output, which reflect the determination and resilience of the local farming community.
ii. While numerous challenges persist—whether in terms of production, infrastructure, or marketing—our field investigations confirm the existence of efficient and effective production systems. The region consistently ranks among the national leaders in various agricultural outputs, particularly in the field of protected cultivation.
iii. The sector has the potential to contribute meaningfully to national economic development, particularly through the export of early-season crops and the possibility of maintaining a year-round supply. This enhances the feasibility of sustained export strategies.

The region now represents one of the most significant spatial units in Algeria in terms of consistent and large-scale agricultural production. This sustained output is positioned to support national economic growth by contributing directly to the diversification of Algerian exports.

5. CONCLUSIONS

It can be concluded that the provinces of Biskra and Oued Souf have undergone a profound transformation, emerging as dynamic and open regions across multiple sectors. They have become attractive destinations for investors from various parts of the country, as corroborated by our field investigations. These investors are increasingly turning toward non-traditional sectors in search of stable and alternative investment opportunities, sectors that offer some protection from the sharp and often destructive fluctuations currently afflicting oil-dependent economies, including Algeria.

In response to this new economic reality, the state has embraced a policy of encouraging private initiative and liberalizing investment practices. This includes promoting growth in sectors such as industry, agriculture, and tourism. Such policies are expected to generate wealth, create employment opportunities, and mitigate the adverse effects of declining oil prices, which have historically served as the main funding source for the national treasury.

Observers of the region's recent economic surge anticipate that Biskra, in particular, may evolve into a major economic hub in the coming years. This expectation is based on the substantial inflow of capital, entrepreneurs, and business actors into the region. The notable successes recorded in desert agriculture have already prompted the state to develop a national strategy aimed at creating one million hectares of irrigated land for cereal and dairy production in desert zones by 2020.

Only recently has the distribution of desert lands to joint Algerian-foreign ventures begun. The land parcels offered range in size from 100 hectares to 40,000 hectares, depending on the investor's capacity. These lands are primarily designated for cattle breeding, milk production, and the cultivation of soft wheat and other strategic crops.

Recommendations

i. Investment in the agricultural sector, recognized as both vital and strategic, should be further encouraged through promotional efforts and the expansion of financial and logistical incentives. However, despite existing measures, the sector remains relatively unattractive to the labor force. This can be attributed largely to the lack of accessible information and feasibility studies related to agricultural investment, particularly in agro-industrial projects.

ii. Procedures related to land ownership, groundwater exploitation licenses, and investor support mechanisms must be simplified. This includes enhanced accompaniment by agricultural advisors and engineers, greater support for agricultural electricity infrastructure, and the establishment of essential infrastructure such as roads, railways, and related networks.

iii. Efforts to promote national agricultural products should be sustained and intensified, particularly through active participation in international agricultural exhibitions. Emphasis should be placed on the distinguishing features of Algerian products, packaging, shape, color, reputation, as well as adherence to health standards, proper labeling, codes, and registered trade names.

iv. Algerian date exports should be bolstered through indirect support for active exporting institutions. This may include electricity and water subsidies or interest-free financial grants aimed at strengthening their competitive capacity.

v. The state should continue to reduce customs duties, tax burdens, and administrative constraints. These measures would serve the interests of domestic institutions and encourage the influx of foreign direct investment, thereby injecting greater dynamism into the national market and facilitating access to global markets.

vi. Exchange rate policy mechanisms should be more effectively mobilized to enhance the competitiveness of Algerian products abroad and to stimulate export activity.

vii. A specialized government body should be created to oversee and guide the marketing of Algerian dates. Such an institution would provide strategic direction, market intelligence, and regulatory oversight.

viii. Coordination must be strengthened between active export institutions and Algerian embassies abroad. This would ensure the articulation of a coherent international marketing strategy, prevent unregulated exports, and provide essential information on product specifications, certification requirements, and pricing expectations.

Lastly, the concept of food security should be explicitly linked to the needs of the most vulnerable segments of society, particularly those least able to secure adequate nutrition. This issue must be elevated to the status of a national strategic priority, reflecting its significance as a matter of state sovereignty.

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