

Desert agriculture is the food basket in Algeria

-a case study of some southern provinces-

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ARTICLE INFORMATION

Original Research Paper

Received: 18/12 /2024

Accepted: 22/01 /2025

Published: 21/03 /2025

Keywords:

Keyword.1: desert agriculture.

Keyword.2: food sufficiency.

Keyword.3: agricultural production.

Keyword.4: food basket.

JEL Classification Codes: Q18 , Q17 ,Q1

Abstract :

This study aims to highlight the importance of desert agriculture in reducing food dependence and achieving food sufficiency in Algeria. It is a vital sector that contributes significantly to the national economy by providing food and enhancing the living conditions of the population in dry and desert areas. Algeria has made remarkable progress in the development of a variety of crops, including dates, grains, vegetables, industrial products and fodder in most of the South's States, especially in Arghal, Adrar, Biskra and Wadi. It has been concluded that desert agriculture in Algeria contributes to a proportion of self-sufficiency and diversification of the food basket for Algeria's sustainable development.

الكلمات المفتاحية:

كلمة مفتاحية 1: الزراعة الصحراوية.

كلمة مفتاحية 2: الاكتفاء الغذائي .

كلمة مفتاحية 3: الإنتاج الزراعي .

كلمة مفتاحية 4: سلة الغذاء

تصنيفات JEL (Q18,Q17,Q1):

الملخص : تهدف هذه الدراسة إلى إبراز أهمية الزراعة الصحراوية في الحد من التبعية الغذائية وتحقيق الاكتفاء الغذائي في الجزائر، إذ تعتبر من القطاعات الحيوية التي تساهم بشكل كبير في الاقتصاد الوطني من خلال توفير الغذاء وتعزيز الظروف المعيشية للسكان في المناطق الجافة والصحراوية. وقد حققت الجزائر تقدماً ملحوظاً في تطوير مجموعة متنوعة من المحاصيل تشمل التمور ، الحبوب والخضروات والمنتجات الصناعية والأعلاف في معظم ولايات الجنوب خاصة ورقلة ،أدرار ،بسكرة والوادي ،كما تم التوصل إلى أن الزراعة الصحراوية في الجزائر تساهم في تحقيق نسبة من الاكتفاء الذاتي وتنوع سلة الغذاء من أجل تحقيق التنمية المستدامة في الجزائر.

1- The introduction:

Desert agriculture in Algeria is one of the most important strategic areas to enhance food security and promote economic and social development, helped by the large area of our desert, estimated at 80% of the total area of Algeria .

In recent years, Algeria has begun to pay attention to the agricultural sector, especially in the desert, and has adopted modern strategies to develop that field, which has made it a major challenge in terms of climatic conditions. Therefore, it has sought to establish agricultural projects in desert lands, the most important of which is the 1,000-hectare project with the use of modern irrigation techniques.

The state has recently encouraged private investors in the reclamation and cultivation of desert lands by providing facilities such as granting real estate, providing loans and all these privileges in order to provide new jobs as well as improving the standard of living of the population, enhancing environmental sustainability and most importantly achieving part of food security in Algeria .

Therefore, the following problem can be raised:

Can self-sufficiency and diversification of food basket be achieved in Algeria through desert agriculture?

To answer the research problem, the following hypothesis was used:
Desert agriculture plays a major role in diversifying Algeria's food basket

Research Objectives:

This research seeks to achieve a number of objectives, the most important of which are:

- ✓ Clarify the most important concepts related to desert agriculture.
- ✓ Identify the contributions of the agriculture sector in providing food through desert agriculture.
- ✓ The importance of desert agriculture for the advancement of sustainable development.

Research Methodology:

To get acquainted with the aspects of the topic, the descriptive and analytical approach was relied upon by reviewing the basic concepts of desert agriculture, as well as providing and analyzing data.

The paper was divided into three themes:

- ✓ Concepts about desert agriculture and self-sufficiency.
- ✓ The relationship between desert agriculture and self-sufficiency .
- ✓ The reality of desert agriculture in Algeria .
- ✓ The contribution of desert agricultural production to the achievement of the food basket.

2- Concepts about desert agriculture and self-sufficiency :

2.1.The concept of desert agriculture:It is the reclamation of desert land using agricultural techniques and practices to develop and exploit natural resources for agricultural crop production. These areas have harsh characteristics, including (almanar, 2024):

- ✓ High temperatures
- ✓ Low soil reduction (permeable soil).
- ✓ Water resources are scarce and difficult to extract .

2.2.The importance of désert agriculture: Desert agriculture is one of the most important economic and social activities to achieve food and its importance lies in(mohamed, 2015):

- ✓ Meeting food needs by achieving what guarantees food and food security for the community .
- ✓ Creating job opportunities and improving the standard of living .
- ✓ Resource development by raising arable land.
- ✓ Working on the development of modern technologies such as the use of modern irrigation methods.
- ✓ Promote sustainable development and maintain ecological balance.
- ✓ Developing infrastructure such as irrigation networks, for example.
- ✓ Supporting the local and national economy and the development of manufacturing industries.

2.3. Definition of self-sufficiency: Self-sufficiency is defined as the ability of the state to meet food needs through the local product without relying on imports ,through the promotion, improvement and development of local agricultural production. Food security can be achieved through self-sufficiency and the provision of a food basket by(mahamed sayad, 1998, p. 61):

- ✓ Ensuring the ability of community members to buy food .
- ✓ Continuity of food provision in the long term .
- ✓ Providing healthy food.

3-The relationship between desert agriculture and self-sufficiency : Desert agriculture represents a strategic dimension to achieve food. The relationship between them is as follows(belkacem, benyaba, & miloud, 2021, p. 143):

- ✓ **Improving local production:** Desert agriculture contributes to raising local production in desert areas and thus meeting the needs of the local population.
- ✓ **Reducing imports :** Desert agriculture plays a strategic role in reducing the import bill in the field of food ,which contributes to reducing the risk of fluctuations in the global food market.

- ✓ **Diversity of agricultural crops:** Desert agriculture contributes to the diversity of the food basket and self-sufficiency .
- ✓ **Supporting the local economy:** Desert agriculture stimulates local and rural development and thus economic stability.
- ✓ **Sustainability of water resources:** Desert agriculture relies on distillation irrigation technology and water storage, thus managing water management.
- ✓ **Promoting environmental sustainability:** by reducing desertification and improving soils.

4-The reality of desert agriculture in Algeria :

4.1. Natural potential in desert agriculture in Algeria: Algeria has a lot of natural qualifications that contribute to the promotion and enhancement of desert agriculture, and can be reviewed in the following:

- ✓ **Large areas:** The desert represents about 80% of the total area of Algeria, which is approximately 2 million square meters, and the recoverable area is about 1.4 million hectares .
- ✓ **Groundwater resources:** The desert has groundwater resources such as the Negev Basin and Tuwat formed over hundreds of centuries, but it is located at great depths of the earth's surface up to 2000 meters, and in some areas it is less than 300 meters, such as the state of Adrar(Ati, 2015, p. 79) ,where the government launched a project to exploit water resources by 2050 (6.1 billion cubic meters).
- ✓ **The climate suitable for some agricultural crops:** There are some crops that require high temperatures such as dates, which makes them ideal for the cultivation of those products(Minister, 2024) .

4.2.Availability of renewable energies:There is great potential in solar energy of up to 9 terawatt hours per year and wind energy of up to 35 terawatt hours per year as well as geothermal energies Agricultural expansion in desert areas(mokhnane, adjlane, & khiari, 2023, p. 4):

Agricultural expansion is represented in the most important projects invested in the agricultural field of arable land as well as agricultural investments, as the irrigated agricultural area in the desert reached more than 35,911 hectares, representing 30% of the total irrigated area. The most prominent agricultural projects in the desert areas are (Ministry, 2024):

- ✓ **Palm cultivation project:** Algeria is considered one of the most important countries in the world for the production of dates as well as in terms of their quality , and one of the largest producing states in this type of crops Biskra ,Ouargla, Tamanrasset and Adrar ,where the area allocated to this cultivation is estimated at 167,279 hectares, equivalent to the production of 10,255,000 quintals , led by the Diglat Noor variety by 53%.Algeria also exports the most luxurious types of dates as a light to international markets.

- ✓ **Protected agriculture project (cultivation of greenhouses):** This type of agriculture is widespread in the State of Biskra, Wad Sof, and, as this type of solution is considered one of the most important for desert agriculture because it depends on drip irrigation as well as protection from high temperatures.
- ✓ **Grain cultivation project in the desert:** These projects rely on the reclamation of sandy lands as well as modern irrigation techniques, and one of the most important major projects for the cultivation of grains such as wheat and barley are located in the State of Adrar, Elysee and Wadi.
- ✓ **Desert land reclamation project:** Algeria seeks to reach as much arable land in the desert as possible by using modern technologies such as artificial soil and planting windbreaks through trees.
- ✓ **Industrial crop cultivation project:** Some investments have been directed towards the cultivation of industrial crops such as fodder, peanuts and cotton.
- ✓ **Olive cultivation project:** Olive cultivation was widespread in desert areas such as eggs and Bashar after it was limited to the northern regions, and this agriculture relied on modern and advanced irrigation systems.
- ✓ **Vegetable and fruit cultivation project:** The Valley State is a successful model in the cultivation of this type of crop, as it has achieved a large part of the availability of vegetables and fruits, as well as the export of some of them abroad such as potatoes and tomatoes.
- ✓ **Fish farming project in the desert:** Some areas in fish farming in artificial ponds associated with agricultural projects, the most important of which is the wadi and Biskra.
- ✓ **New Drought Resistant Crops Project:** These types of crops contribute to enhancing food diversity and the environment, where drought-resistant crops such as quinoa, aloe vera and aloe vera are grown.

4.3. Government Policy to Support Desert Agriculture in Algeria :

After the application of the Tenure Law to agricultural real estate ownership in 1983, development measures emerged thanks to the contributions of the state in converting desert lands into agricultural investments and oases using the latest technical means. The technological transformation and the transition from traditional agriculture to modern agriculture contribute to directing investors to invest in the field of desert land reclamation and the establishment of agricultural investors in order to develop those areas as well as to raise the cultivated areas and agricultural crops and obtain self-sufficiency in the field of food. In order to achieve the strategic vision of the state in supporting desert agriculture and upgrading

the agricultural product, Algeria has adopted many strategies, including(Hammache & Zemirli, 2017, p. 326):

- ✓ Putting Decree No. 21-432, signed on November 4, 2021, in the Official Gazette No. 85, concerning a book of conditions for granting land for reclamation on desert land(Journal, Official, 2021);
- ✓ Launching the fourth digital platform of the National Agricultural Land Office, to benefit from agricultural land within the framework of reclamation through concession.
- ✓ Target support towards clustering, supply chains, sponsorship and accompaniment of small farmers and ranchers through rural regeneration programmes;
- ✓ Facilitating procedures for obtaining agricultural land and encouraging investment through reclamation,
- ✓ Insurance and escort for investors;
- ✓ Restoration of unused land;
- ✓ electrification of areas, construction of roads, and relaxation of bureaucratic procedures for investment;
- ✓ Access to financial benefits granted by ANSEJ-CNAC-ANGEM agencies;
- ✓ Loan facilities in the field of reclamation and cultivation of desert lands;
- ✓ Promote a stimulating and safe environment for peasants and agro-industrial operators;
- ✓ Securing and stabilizing farmers' income by supporting control measures such as storage grants;
- ✓ Develop strategies to support desertification control and watershed management;
- ✓ Within the framework of Algeria's strategy to achieve food security and raise the efficiency of agricultural production, the Ministry of Environment and Renewable Energies launched the “Agri-Sol” program, which aims to encourage the use of solar energy in irrigation of agricultural projects(tadamsa, 2024);
- ✓ Encourage the use of solar energy in agriculture as an additional step towards achieving this strategic objective;
- ✓ Support scientific and technical research to improve productivity and efficiency in the desert agriculture sector;
- ✓ Opening export doors by offering incentives and privileges .

4.4. The repercussions of desert agriculture in Algeria :

Enhancing food security is one of the most important national priorities for Algeria,as agricultural investments play a pivotal role in achieving the food basket, especially in desert areas. The size of the agriculture market in Algeria was estimated at 4.64 billion US dollars. The report covers the size

of the agriculture market and it was expected in 2024 that the size of the agriculture market in Algeria would reach 4.86 billion US dollars)mordorintelligence(. The production of vegetables, fruits and grains from desert lands has changed government policies related to the economy, especially in the field of agriculture, as the southern regions contribute 26% to supplying the national market with agricultural products(Minister, 2024). Agriculture in southern Algeria has witnessed a remarkable development in recent years, focusing on several main areas, the most important of which are :

✓ Diversity of crops: A variety of crops such as dates, vegetables, and grains are grown, which enhances food security in the region. These crops are:

- **Dates:** They are considered one of the main crops in areas such as Biskra and the valley, where varieties of high quality are grown, with an annual production of 1.36 million tons for 2023 .

- **Vegetables:** Growing vegetables such as tomatoes, potatoes, and carrots, are common and contribute to meeting the needs of the local market.

- **Grains:** Grains such as wheat and barley are grown, although the areas allocated to them are less compared to other crops, and the average annual production per hectare has reached 50 to 60 quintals and has reached in some lands to 85 quintals /hectare

- **Fruits:** It includes the cultivation of fruits such as apricots, oranges, and lemons, and it is grown in areas that have a favorable climate.

- **Fodder:** Growing fodder to feed livestock is essential to support livestock in the area.

- **Fruit trees:** such as olives, which are grown in some areas and contribute to agricultural production

✓ The use of modern technologies: The introduction of modern farming methods such as drip irrigation and smart agricultural techniques contributed to increasing productivity.

✓ Quality Improvement: Improving the quality of crops through sustainable farming techniques and attention to biotechnologies.

✓ Agricultural enterprise development: Encouraging the establishment of small and medium enterprises in the agricultural sector, which contributes to the creation of new job opportunities.

✓ Government support: Providing government support to farmers through loans and technical assistance.

5-The contribution of desert agricultural production to the achievement of the food basket:

In light of the increasing challenges in the field of food security, Algeria is emerging as a leading model in the development of desert agriculture and the promotion of agricultural investment in the south , where the agriculture sector recorded positive results at the level of several peoples during the past season.To find out the most important situation of agriculture in the Algerian desert, we take a sample from the southern provinces.

5.1. Agricultural production in the State of Ouargla:

The province of Ouargla occupies an area of 13678700 hectares, of which 4278343 hectares are devoted to agriculture, or 31%of the total area,as this area includes 3759870 hectares of pastures ,while the arable area of 40446 hectares is distributed to 13869 agricultural investors (12403 private and 1299 par excellence).The state of Ouargla is one of the most important states in the south in providing agricultural crops and contributing to reducing food dependence.

Table N° 01 : Areas suitable for agriculture in the State of Ouargla

Constituency	Project Area: 1650 hectares	Percentage %
Ouargla	195	3.5
Sidi Khouiled	833	14
Angus	985	17.5
Hassi Messaoud	3789	65

Source :Report of the governorate of agriculture development in the desert region –Ouargla (Cdars Ouargla)for the year 2024.

The State of Ouargla is located on more than 90,000 hectares of arable land,but the actual cultivated area changes with the change in climatic conditions and the extent of exploitation of resources, especially water ,as the State of Ouargla depends on the production of agricultural crops on oases and land reclamation areas as shown in the table above (the Department of Agriculture Development, 2024, p. 16).

Table N° 02: Development of grain production during the period 2020/2024 in the State of Ouargla

The peasant season	Planted area	Number of investors	Production Achieved (s)	Combined production (S)	ASSEMBLY	rate of increase
2020-2021	2784	77	86205	63256	73%	-
2021-2022	5	74	93612	68273	72 %	19%
2022-2023	4222	82	135550	129557	95%	26%
2023-2024	5802	84	277000(Expected)	-		38%

Source :Report of the governorate of agriculture development in the desert region –Ouargla (Cdars Ouargla)for the year 2024.

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From the above table, we note that the development of grain production is on the rise due to the increasing interest in agricultural expansion in the region, which also reflects the growing awareness of farmers in engaging in desert agriculture. The data also show stable annual growth ranging from 19% to 38%, reflecting the state's plans to achieve local development as well as the development of desert agriculture (the Department of Agriculture Development, 2024, p. 18).

TableN° 03 : Plant Production in Ouargla during the Season 2022-2023

Item	Area (Ha)	Production (quintal)
Dates	10790	733255
Grains	4238	136469
FORAGES	6668	752340
Vegetables	2177	625841
Olives	1250	14219
Fruit trees	289	12623

Source : Report of the governorate of agriculture development in the desert region –Ouargla (Cdars Ouargla) for the year 2024.

From the above table, we note that dates are the main crop in the state, where they occupy the largest area. As for grains, the state has allocated more than 4300 hectares for the production of grains from hard wheat by 83%, soft wheat by 6.2%, barley by 7%, and finally beetroot by 3%. The state has also allocated a good area for the cultivation of fodder, and this reflects the livestock breeding in the state. As for vegetables and olives, production is high compared to the area allocated to them as well as to climatic conditions. In the recent period, the state has witnessed a remarkable development in the cultivation of fruit trees, which were the monopoly of the northern states, which will witness a significant increase in production in future seasons (the Department of Agriculture Development, 2024, p. 21).

In the recent period, the State of Ouargla witnessed the cultivation of strategic crops such as maize on a total area of 8090 hectares, as it includes 351 axial sprinklers and 65 sprinklers. The agricultural investors were connected to agricultural electricity at a distance of 346 km. The completed agricultural paths are estimated at 138 km. The number of supported sprinklers reached 187 sprinklers equivalent to 4550 hectares.

5.2. Agricultural production in the State of Adrar:

Adrar Province is an important agricultural area thanks to its desert climate and fertile lands in the oases. It occupies an area of 427,000 square

kilometers and 551,575 hectares of land allocated for agriculture, of which 49,090 hectares are exploited in agriculture and 45,006 hectares are irrigated , containing 230 exploited deep wells and 6,000 exploited normal wells in addition to more than 850 active wells.

Table N°04 :Distribution of Farmland

Distribution of land allocated for	Allocated Area
Exploitable total area	551,575 ha
Exploited agricultural area	49 090 ha
irrigated area	45.006 Ha
Number of established oceans	18 perimeters
Axial spraying	Spray machine
Number of female agricultural investors	34 458 units(49 090 ha)

Source: Ministry of Interior website, Monograph map of the States (Adrar Province)

From the table, we note that there is a good exploitation of land in the field of agriculture ,as the number of agricultural investors is 34 458 units with a total area of 49 090 hectares distributed as follows(interieur, 2023):

- ✓ Traditional sector: 22,575agricultural investors with an area of 16,992 h
- ✓ Acquisition of real estate property by reclamation:6051 invested with an area of 18.205 hectares,
- ✓ Granting the concession 5,832 investors with an area of 6,260,19 hectares.

Table 05 : Agricultural crops of the State of Adrar during the year 2023

Item	Area (Ha)	Production (quintal)
Dates	320	934
Grains	863	515
Vegetables	5186	695
Field tomatoes	671	170
Onion	713	560
Industrial Crops (Tomatoes)	1878	446
Potatoes	411	204
FORAGES	3689	796

Source : Ministry of Interior website, Monograph map of the States(Adrar Province)

From the above table, we note that the largest area has been allocated for the date product, which produced about 934562 quintals during the last agricultural season, and what distinguishes the State of Adrar grain production, the most important of which is hard and soft wheat, as well as following the strategy of producing fodder and seeds such as sunflower seeds.As for vegetables in general, an area of about 8859.8 hectares was allocated, and it is noted that they are few compared to grains and dates, but

this area gave an abundant product because of the strategy adopted by farmers investors. The state has also allocated a space for the cultivation of fodder in order to support the livestock sector.

5.3.Agricultural production in the State of Biskra :

The state of Biskra is one of the leading southern states in the field of agriculture ,with an area of 26,671 square kilometers, of which approximately 76.84% is dedicated to agriculture, or about 75,16520 hectares. One of the qualifications that helped the state to be a farmer of water resources, which is represented in surface and groundwater ,where the water harnessed in the state is 1185 million cubic meters, of which 22 million cubic meters are surface and 1163 million cubic meters are underground, which is more than 98% of the total water. The two largest dams in the state are the Mouth of the Stitch Dam and the Deer Head Dam, which are dedicated to watering ,where 53.10% of the land is irrigated from the arable area. It should be noted that the irrigation process depends mainly on water

Table N°06: Distribution of agricultural land in the State of Biskra

Distribution of land allocated for agriculture	Allocated Area (Ha)
Irrigated lands	3571
Pastoral wastelands	746.003991
Unproductive land dedicated to farming	532.0067
Usable area	473.00185
Total land used for farming	751.006521
Forests	729.1597
The Allies.	864.0013
Unproductive land	635,853

Source : Ministry of Interior website, Monograph map of the states(Biskra Province)

The data on the distribution of land allocated to agriculture in the region show the diversity of available land uses,which indicates the importance of irrigation in improving agricultural production, especially in an area that may suffer from a lack of water. There are vast areas that can be exploited in animal husbandry, which enhances animal resources.

Unproductive land devoted to agriculture: 532,0067 hectares, indicating that there is land that may need to be improved or developed to become productive. Unproductive land is a challenge that must be addressed to increase agricultural efficiency.These data reflect the challenges and opportunities in the agricultural sector, where effective strategies to improve productivity and better use of land are required (interieur, 2023, p. 11).

Table N°07: The most important agricultural crops of Biskra during the season 2023/2024

Item	Area (Ha)	Production (quintal)
Dates	40000	4000
Grains	32532	900253
Protected crops	960	585000
Industrial Agriculture	5285	148770
Forages	3710	493334

Source : Ministry of Interior website, Monograph map of the states(Biskra Province)

Through the above table, the dates produced are essential in the State of Biskra in terms of area and production, which reflects the importance of the crop economically and socially, as the number of palms is estimated at about 7 million palms .As for grains, they occupy a good area due to the improvement of cultivation techniques and the provision of water. As for protected crops, they show high efficiency and high productivity compared to the area, using agricultural technology. It is also noticeable to support livestock breeding through the cultivation of fodder(Directorate of Peasant Interests, 2024, p. 19) .

5.4. Agricultural Production in State Elouadi :

Located on an area of 44,586.80 square kilometers, this state is rich in natural resources and is characterized by its unique geographical location in the middle of the Sahara desert. The wadi state has a total agricultural area of 1,047,000 hectares, of which about 91,000 hectares have been exploited, while the area allocated to pastures is about 700,000 hectares(interieur, 2023, p. 12).

TableN° 08:Area allocated to agriculture in Wadi Province

Distribution of land allocated for	Allocated Area
Irrigated lands	98200 ha
Pastoral wastelands	1,410,000 ha
Unproductive land dedicated to farming	253,400 ha
Usable area	105,500 ha
Total land used for farming	1768900 ha
Total unproductive and unused land	2689.780 ha
Unproductive land	253,400 ha

Source: Ministry of Interior website, Monograph map of the States(Valley State)

The data in the above table refer to the distribution of agricultural land in the wadi state,where the land used for cultivation is distributed as ploughed land: 56,370 hectares, grass cultivation: 7,300 hectares, permanent

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cultivation (vine cultivation 140 hectares, fruit trees 418 hectares, citrus fruits: 25 hectares, olives 3,100 hectares, palms 38,147 hectares
Total arable land: 105,500 hectares, of which irrigated land: 98,200 hectares.
As for the grazing lands 1,410,000 hectares is an indication of the great interest in raising livestock (interieur, 2023, p. 13).

TableN° 10 : The most important agricultural crops of the Valley State during 2023/2024

Item	Area (Ha)	Production (quintal)
Dates	153,000(1.5 million palm	1200000
Grains	9800	370000
Potatoes	37500	12000000
Field tomatoes	3.6	2500000
Peanuts	3760	115,000

Source: The interests of the Directorate of Agriculture of the Valley State

From the table, we note that the share of dates occupies the largest area and achieves abundant production, which reflects the importance of this agriculture in the valley, and that potatoes are the most important product in terms of abundance and quality compared to the cultivated area, which reflects the high productivity. As for field tomatoes, the state is known at the national level for the quality of its produce in vegetables, especially tomatoes. Once the area is compared to the crop, we see that there is a great capacity in production due to protected agriculture and the use of greenhouses in the production of tomatoes. The wadi state is the first at the national level to produce peanuts in industrial products and is counting on increasing the crop every year.

6-The challenges of desert agriculture and the most important solutions programmed to promote them in Algeria :

6.1. Challenges faced by desert agriculture in Algeria:

The agricultural sector in Algeria faces many obstacles and obstacles that have become an obstacle in the development of agricultural agriculture in the southern regions. The most important greetings are the following:

- ✓ **Extreme climate:** Southern Algeria is characterized by a dry desert climate, with high temperatures in summer and low temperatures in winter, which negatively affects crop production.
- ✓ **Water scarcity and difficulty in extraction :** Water is a scarce resource in this area, limiting irrigation capacity and affecting agricultural production.
- ✓ **Soil:** The soil in some areas suffers from salinization and degradation, which reduces its fertility and makes it difficult to grow some crops.
- ✓ **Infrastructure:** Lack of adequate infrastructure such as roads, warehouses and cold rooms where cold rooms and warehouses located in

the north are most often used, which hinders the marketing of agricultural products.

✓ **Agricultural technologies:** Weak use of modern technologies in agriculture, leading to low productivity.

✓ **Financial problems:** Lack of government financial support for farmers, especially since desert land requires large funds to be reclaimed .

In addition to some social problems such as the scarcity of agricultural labor due to migration from rural areas to cities, as well as the absence of social development in the southern regions, especially the far south .

6.2. Proposed solutions to address the problems hindering the development of desert agriculture in Algeria:

To address the obstacles and challenges that hinder the development of agriculture in the southern regions of Algeria ,it is necessary to adopt comprehensive strategies that include improving the following:

❖ **6.2.1.Improving water management in southern Algeria:** The Algerian government as well as private farmers must develop the irrigation sector and exploit groundwater in the south by (Minister, 2024, p. 14):

✓ Development of irrigation systems: using drip irrigation techniques to reduce water waste and increase efficiency of use,as well as the use of modern spraying techniques that allow water to be distributed evenly.

✓ Rainwater harvesting:by building reservoirs to store rainwater and use it in dry periods.

✓ Water reuse:by encouraging the use of treated water in agriculture and industries, which reduces pressure on freshwater sources.

✓ Improving groundwater management:Implementing programs to monitor and sustainably exploit groundwater, including thoughtfully drilling wells.

✓ Infrastructure development: by improving the water distribution network and modernizing old systems to prevent leakage and waste.

✓ Supporting research and studies in the field of water resources management and developing new technologies to improve water use efficiency.

✓ To benefit from the experiences of other countries in water management, and to exchange knowledge and modern technologies.

❖ **Modern technologies:**Using smart agriculture techniques such as vertical farming and hydroponics, which help achieve higher productivity using less water.

❖ **Agricultural electrification program:** Through the activation of agricultural electricity as well as the use of renewable energies to supply the agricultural sector in the south , the government has developed some strategies, the most important of which are(Ministry, 2024):

- ✓ Replacing traditional direct energies with renewable energies (as an alternative);
- ✓ Conservation of water resources (conservation of water resources);
- ✓ Electrification of scattered clusters (miniature power plant);
- ✓ Establish mechanisms for motivation in particular (support).
- ❖ **Crop diversification:** Focus on the cultivation of drought-resistant crops that are suited to desert conditions, such as cereals and local fruits.
- ❖ **Research and innovation:** By supporting agricultural research to develop new crop varieties, and improve cultivation techniques that are suitable for the desert environment.
- ❖ **Infrastructure development:** Improve infrastructure through road networks, warehouses, markets and cold rooms to facilitate the transport of agricultural products and increase access to local as well as international markets by encouraging and raising the pace of exports.
- ❖ **Cooperation and partnerships:** Encourage partnerships between the public and private sectors, farmers and research centers to achieve sustainable agricultural development, and attract foreign investors in the field of agriculture in general and desert in particular .
- ❖ **Awareness and training:** Organize training programs for farmers on modern farming methods and resource management.
- ❖ **Investing in technology:** Encouraging investment in modern agricultural technologies, such as digital agriculture and the use of drones to monitor crops as well as the use of artificial intelligence techniques in that field .
- ❖ **Benefiting from international experiences :** Studying successful cultivation patterns in other desert areas and applying lessons learned in Algeria, such as the experience of Qatar and Saudi Arabia, for example .
- ❖ **Sustainable development:** Adopting sustainable agriculture practices that reduce environmental degradation, such as organic agriculture, rehabilitation of degraded lands, and the use of urban agriculture.

7- Conclusion:

Desert agriculture in Algeria is a strategic area to achieve the food basket , achieve food security, and support the national economy. The agricultural sector in Algeria has witnessed a remarkable development thanks to desert agriculture, which is considered a promising future to revive the national economy, achieve economic development, and reduce the food gap. This development is due to government programs and directives to investors to invest in desert agriculture.

Findings from the research include :

- ✓ A noticeable increase in agricultural production in the desert areas, especially the State of Ouargla, Adrar, and Biskra of the valley ...Etc.
- ✓ By studying the agricultural crowning of four wilayas (Ouargla ,Adrar,Biskra and Wadi), we note that the wadi state is the first nationally through desert agriculture.
- ✓ The desert became Algeria's food basket.
- ✓ Improving agricultural exports through the export of products grown in the desert.
- ✓ The government provides facilities to investors, such as land grants and financial support for reclamation.
- ✓ Modernization of farms in the southern states through the use of modern equipment while maintaining oasis agriculture.
- ✓ Introduction of advanced irrigation systems to promote desert agriculture .
- ✓ Decouple the isolation of the southern states that have suffered from marginalization since independence.
- ✓ Achieving a qualitative leap in the field of agriculture, which contributed to reducing dependence on foreign food and food dependence.

Among the most important recommendations proposed for the advancement of the agricultural sector and the provision of food through desert agriculture:

- ✓ Working to increase the ingredients to attract investors to the south .
- ✓ Paying attention to improving the product and its quality in order to delve into foreign markets.
- ✓ Expanding the uses of renewable energy in desert agriculture.
- ✓ Providing financial and tax incentives to investors in order to engage in the investment process in the south.
- ✓ Activating Islamic financing methods in the field of agricultural investment in the southern regions.
- ✓ Attracting foreign direct investment in the field of desert agriculture.

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