

The Development of Desert Agriculture as a method of achieving food security in Algeria

Talhi Kaouthar

University of Algiers 3 (Algeria), Talhi_kaouthar@yahoo.fr

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Abstract:

The study's main goal is to highlight food security, which is among the most significant issues that concern decision-makers in many countries around the world, especially developing countries. This includes Algeria, which is striving to achieve self-sufficiency through its efforts to develop the agricultural sector in general and desert agriculture in particular, with the goal of achieving food security by relying on its own local resources.

This study came to the conclusion that Algeria is concentrating all of its efforts to provide all of the financial, material, and human resources needed for agricultural development in the desert areas in order to achieve the necessary goals. However, there are still numerous difficulties and barriers to overcome in order to accomplish these objectives.

Keywords : Food security, Desert agricultural, Self-sufficiency, Agricultural development.

I- Introduction:

In recent years, interest in food security issues has increased in countries around the world, and Algeria has become one of the countries most dependent on food imports and is one of the countries suffering from a deficit in its food security. After dependence on food imports has become one of the prominent features of the Algerian economy, which increases its food dependency on the outside, and this poses a threat to the Algerian economy. This situation requires it to find solutions and policies to confront the problem of food dependency and achieve food security through the development of its agricultural sector, which is considered one of the most important sectors contributing to economic development if it is properly exploited.

Given that most of Algeria's area is desert, attention must be given to the development of agriculture in arid and semi-arid areas. That is, through the restoration and exploitation of desert lands, with the aim of meeting the population's food needs, achieving food security on the one hand, and contributing to the development of the national economy by reducing imports and food dependency on the other hand, why not move Algeria from being an importing country for agricultural products to an exporter.

Therefore, through this framework, we will try, through our research, to answer the following problem:

To what extent does desert agriculture contribute to food security in Algeria?

This study aims to achieve the following:

- Introducing the reality of desert agriculture and the prospects for its development;
- Highlighting the policies and measures taken by the state to support and develop desert agriculture;
- Determining the extent to which desert agriculture contributes to achieving food security in Algeria;

The presented problematic has been attached to a main hypothesis. It is illustrated by the following:

The contribution of desert agriculture to Algeria's food security is very small and almost non-existent.

To answer the previous problem, the analytical descriptive approach was relied upon in order to describe and analyze the study variables represented in desert agriculture as well as food security in Algeria.

1. Theoretical framework for food security

The term "food security" first appeared in the mid-seventies, during the 1974 World Food Conference, where the importance of food supplies was highlighted and the necessity of the availability of basic foods and the stability of their prices as basic conditions for achieving food security was emphasized at the international and national levels. Thus, the issue of food security has become one of the most important issues of concern to countries and organizations in the world, especially in developing countries.

1.1. The concept and levels of food security

Food security is one of the most important issues in the world, as it is linked to the food needs of individuals and the necessity of providing them. Economists and writers differed in

providing an accurate and comprehensive definition, due to their differing opinions. Some of them believe that food security is based on the necessity of providing sufficient food and providing it to the population, and others see that it is a national problem that rests with the state in providing adequate food at all times to its citizens. The degree of severity of food insecurity differs from one country to another, as experts classified the degrees of its severity into levels determined by a set of indicators and factors.

1.1.1. The concept of food security

The concept of food security may overlap with some related concepts, so in the following we will define food security and present the most important terms related to it.

a. Definition of food security: There are many definitions of food security, including:

- According to the World Bank: Food security is the possibility for all people, at all times, to have sufficient food for an active and healthy life. Food security for a country is achieved when this country, with its marketing and commercial systems, becomes able to provide all citizens with sufficient food at all times, even in times of crisis, and even in times of deteriorating local production and international market conditions; (Bouraghda, 2015, p. 4)
- Food security is defined as the society's ability to provide its food needs in the long term, in quantity and quality, at prices commensurate with the income of its members; (Berabah & Souna, 2020, p. 56)
- According to the Food and Agriculture Organization: Food security exists when all people, at all times, have physical, social and economic opportunities to obtain sufficient, safe and nutritious food that meets their nutritional needs and ensures them to lead a healthy and active life. Thus, it becomes clear that the concept of food security is a complex concept that has multiple dimensions and is linked to the availability of four conditions: availability, stability, access to food, and safe food; (Bouraghda, 2015, p. 4)
- It is the ability of society to provide the basic nutritional needs of the people and to ensure a minimum level of those needs on a regular basis. Food security does not necessarily involve the production of all basic food needs or even the greatest part of them, but rather involves providing the necessary resources for the needs through the export of products on which the country has a comparative advantage in their production over other countries, and this general concept can be described as "food security by others" and it includes three components, namely abundance, stability, and access to goods. (Si Youssef, 2021, pp. 03-04)

Through the previous definitions, the elements of food security can be identified as follows: (Berabah & Souna, 2020, pp. 56-57)

- **Absolute food security:** means food production within a single country at a level equal to or greater than what it is, and this level is synonymous with complete self-sufficiency and is also known as self-food security. It is clear that such a broad and absolute definition of food security is subject to many criticisms, in addition to being unrealistic. The concerned country or region misses also the possibility of benefiting from international trade based on specialization, division of labor and the exploitation of comparative advantages;

- **Relative food security:** is the ability of a country or group of countries to provide goods and foodstuffs in whole or in part and ensuring the minimum nutritional requirements of the population. Hence, the concept of relative food security does not necessarily mean the production of all basic food needs. Rather, it is primarily intended to provide the materials needed to make available these needs through other products in which the concerned country or countries have a comparative advantage over other countries. Thus, the relative concept of food security means securing food in cooperation with other countries

b. Some concepts related to food security: There is an overlap in concepts between food security and some other concepts, which we will define in the following:

- **The food gap:** the amount of difference between what the country produces and what it needs of food, and therefore it is the amount of food that a country needs and cannot provide locally, but resorts and seeks to satisfy it by importing from abroad. It is calculated as:

$$\text{Food gap} = \text{food consumption} - \text{local food production}$$

- **Self-sufficiency:** is the ability of any country to meet the basic food needs of the entire population, by allocating the available agricultural resources to produce food locally, regardless of comparative advantage considerations. It means the state's ability to rely entirely on the country's own capabilities to produce all its food needs within the country. Self-sufficiency is a concept that can be measured, with the ratio of local production to national consumption as follows:

$$\text{Self-sufficiency} = (\text{national production} / \text{available food}) \times 100$$

Therefore, the concept of self-sufficiency can be viewed as narrower than the concept of food security, as the first seeks not to resort to the outside world, and attempts to abandon import, while the second seeks to measure the state's ability to provide adequate food for its citizens, through national production or import. (Ben Yaza, 2018, p. 19)

- **Food dependency:** Dependency in general means incomplete sovereignty in a particular field or several different areas, and it may be at the political or economic level, etc., and to get out of the state of dependency, we must work on disengaging, that is, breaking with the capitalist system, and based on the foregoing, the dependency Food means the inability of the state to meet the needs of its population of basic consumables for their daily food, and it is obliged to provide these materials by importing them from abroad, because any imbalance or scarcity exposes the population to undernourishment and thus the spread of disease and famine, and with the presence of international and regional organizations, work has become under its banner within the approved agreements and legislation to alleviate this situation.

- **Food aid:** Food aid is defined as the provision of food commodities from one country to another, free of charge or on concessional terms, to help the recipient country meet its food needs. Aid is used for relief purposes for victims of economic shocks and environmental disasters, or in the framework of projects to support relief activities, or in within the framework of programs that return to the government, food aid is also defined as in-kind, direct or conditional aid, as well as cash resources used to purchase food from local, regional or international markets. The aid is also in the form of a gift and/or on concessional terms, whether it targets needy families or is resold in local markets. (Debar, 2019, pp. 27-28)

- **Food insecurity:** a situation in which people lack access to sufficient quantities of safe and nutritious food to ensure normal growth and development and an active and healthy life. It may come as a result of unavailability of food, insufficient purchasing power, inappropriate distribution or inappropriate use of food at the household level. Food insecurity, along with poor health and sanitation conditions and inadequate care and feeding practices, are the main causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory. (Ben Yaza, 2018, p. 20)

1.1.2. Food Security Levels

From the various concepts we have mentioned of food security, a different set of levels can be deduced, ranging from the minimum represented by the subsistence level, and the maximum represented by the desired or expected level, where the food security strategy aims to move from the lowest level to the highest level. The most important levels are (Debar, 2019, p. 26)

a. Subsistence level (first level):

It means the ability of the state to provide the minimum food needs to keep the individual alive, i.e. providing the minimum amount of calories for each individual according to what is recommended by international standards. This level can be denoted by the concept of the poverty limit. It is the minimum to meet the expenses necessary for life;

b. The middle level (the second level):

This level is centered between subsistence and expected, as it is characterized by the phenomenon of malnutrition that gradually decreases as we reach the expected level, and it means the lack of food components of the basic compounds necessary for the formation of the body, and thus the individual is exposed to malnutrition and not to lack of food. This phenomenon is eliminated by providing an adequate level of biological nutritional needs for all members of the community. The phenomenon of malnutrition is one of the most serious problems that countries suffer from, as statistics issued by the Food and Agriculture Organization indicate that about 820 million people in the world suffer from malnutrition annually. This scourge is exacerbated in developing countries, and its symptoms are manifested in low weight for height, extreme thinness of the body and lack of height for age;

c. Possible level (the third level):

This level represents the state's ability to raise the level of food for members of society to the level that enables them to carry out their productive work to the fullest extent, i.e. providing the desired minimum of calories in accordance with what is recommended by international standards, which guarantees the average individual to be able to carry out his work with the highest possible level of efficiency. Hence, the potential level of food focuses on the two food security equations, which are:

- the supply of food both through production, storage and trade;
- The demand for food and how to obtain it through home production of it, or from buying it from the market, or from food transfers in a different ways.

1.2. Factors affecting food security and indicators for measuring it

There is no doubt that identifying and characterizing the food insecure people is a necessary component of designing or taking any action to improve their situation and reduce their numbers. Therefore, it is necessary to identify the factors affecting food security and its

measurement indicators, to determine the degree of its severity in order to take the necessary measures to confront it.

1.2.1. Factors Affecting Food Security

In general, the factors affecting food security can be classified into internal and external factors, and they are: (Alouani, 2021, p. 228)

a. Internal factors: which are directly related to the internal conditions of the state and are represented in:

- the size of the population and the level of their needs;
- the internal food production capabilities;
- the real income in society and the way it is distributed to individuals.

b. External factors: which are related to the circumstances surrounding the country's economy and are represented in:

- the foreign exchange resources that can be brought in through exports;
- the availability of food on the world market and the degree of price stability;
- the availability of food aid and facilities granted by international bodies.

1.2.2. Food Security Measurement Indicators

There are many indicators to measure the level of food security that can be summarized in eleven indicators, and they include various factors that affect it, among which we mention the following: (Adalla & Oualid , 2014, pp. 122-123)

- **The level of food availability:** this level is mainly related to the development of agriculture, with both side; plant and animal products, the commodity balance of food products (the difference between export and import), and the extent of its preservation from spoilage (storage system);
- **The extent of the development of the marketing system:** this indicator reveals the ability to secure sufficient reserves of various foodstuffs, and to supply the market with them, on a regular basis, in the right quantities and qualities, in the right place and time;
- **The level of food production:** in relation to the increase in population, this indicator reveals the extent of food security stability and its sustainability;
- **Daily nutritional needs:** This indicator reveals the amount of energy that an individual receives daily, and the percentage of plant and animal sources' contribution to it. Daily nutritional needs are defined as the daily amount of energy necessary for each group of individuals to live their normal life, and they are in a good health condition. The amount of daily energy required for each individual varies, according to his age, sex, weight, and the physical activity he engages in. Standard indicators are used in this field, adapted according to the margin of individual differences, between the population. Standard indicators are calculated, as averages of many samples, for the energy obtained by the individual and keeping him in a good health condition, by adding and subtracting the standard deviation limit to it;
- **Distribution of national income:** this indicator reveals the share of the social groups producing it, i.e. the share of wage earners, profit earners, rent owners, and interest owners, and therefore it determines the available purchasing power for each social group;

- **Per capita national income (nominal income):** This indicator reveals the nominal purchasing power available to each individual. Since it takes an average value, it does not take into account the differences between the different social groups in terms of their share in the national income, so purchasing power appears for workers, peasants, and others from the toiling social groups, the purchasing power of the rich, regardless of their categories, is equal, and this is not true;
- **Family budget indicator:** This indicator reveals the distribution of household income to meet its various needs, including, of course, food needs;
- **General prices level:** the level of food prices. This indicator determines the level of demand in general, and the level of demand, for food products in particular.
- **Purchasing power or real income:** This indicator expresses the quantity of goods and services that can be obtained with nominal income. We will present these several indicators in the following axis.

2. The reality of desert agriculture in Algeria and its components

Agriculture in the desert areas is a great challenge to nature, as the desert area in Algeria represents more than 80 % of its total area, and this desert is considered the hottest desert area in the world, extending over more than 3.5 million square miles. The basic nutrients of the soil, the plant loses the ability to grow properly, this did not prevent Algeria from challenging these conditions and going into the adventure of farming in the desert lands.

2.1. The components of Algerian desert agriculture

The desert regions are rich in great resources and capabilities that are able to meet their own needs, in terms of job opportunities and food needs of the population, thus achieving self-sufficiency and improving food security. The agricultural climatic conditions in the regions of the Saharan Atlas, the Lower Desert (Biskra and the El Oued) and even the middle of the desert (Ouargla and Ghardaia) provide the opportunity to develop non-seasonal production people, as these divisions can enhance the sources of supplying the large urban centers in the north with vegetables. The development of various programs has allowed for the development of the southern regions by the supervising ministry, by meeting the necessary conditions to provide job opportunities and improve the living conditions and income of rural residents.

2.1.1. An overview of the agricultural desert areas in Algeria

The Algerian Sahara is of great importance in the national agricultural economy, as it is rich in important agricultural areas represented in: (Ministry of Agriculture and Rural Development)

- The exploited agricultural lands are limited to ten desert provinces, and they are represented in Adrar, Bechar, Biskra El-Oued, Ghardaia, Illizi, Laghouat, Ouargla, Tamanrasset and Tindouf;
- These lands are divided into 188 municipalities, including 141 rural areas, and ten administrative districts, namely: Bordj Badji Mokhtar and Timimoun (Adrar), Beni Abbas (Bechar), Oulad Djalal (Biskra), El Meghaier (El Oued), El Menia (Ghardaia), Djanet (Illizi), Touggourt (Ouargla), Ain Salah and Ain Guezzam (Tamanrasset);

- Fourteen natural areas: El Dhaya, El Ziban, Oued Rig, Oued Mizab, El Ksour, Mizab, Ouargla, Gorara, El Saoura, El Touat, Tassili, Tadikelt ;
- Thus making up a total area of 1,8181,839 hectares, distributed along the border belt: 5,000 km;
- The total active population is estimated at 1,203,725 people, including 465,177 farmers.

2.1.2. The natural resources of the Algerian Sahara

The natural resources in the Algerian desert are: (Ministry of Agriculture and Rural Development)

- **Reclaimable lands:** The reclaimable area is about 1.4 million hectares and is distributed over large areas that were studied in the old palm oases in El Oued, Rahir, El Touat, Gorara and Tadikelt, in addition to the new surroundings of Kassi El Touil, Hassi Messaoud, Ain Amenas and El-Abadla. ;
- **The water revolution:** the exploitable potential of water resources, according to the numerical model of the aquifer system in the northern desert (SASS*), is estimated at 6.1 billion cubic meters by 2050;
- **Renewable energies:** they are solar energy with a capacity of 9 TWh/year, wind energy with a capacity of 35 TWh/year, geothermal energy and warm water layers (ALBIEN**).

The possibilities available in water, soil and energy, in addition to the consolidation of the existing production areas, allow the creation of new areas that will allow, in the medium term, to increase production by 30% in terms of vegetables, grains and red meat, compared to the levels recorded in recent years.

2.2. The reality of agriculture and production in the Algerian Sahara

Desert agriculture in Algeria has witnessed a great development in recent years, as a result of the interest and support it has received, as it is one of the keys owned by the state that may contribute to addressing the problem of food security, and the natural resources that abound in the desert suggest the possibility of developing agriculture further in light of The state harnesses all means and capabilities and challenges obstacles, in order to reclaim desert lands and expand irrigated agricultural areas, as well as develop its livestock production in the desert region, which may raise the contribution of desert agriculture to national production to a level that may allow achieving food self-sufficiency.

2.2.1. The development of irrigated desert agricultural areas

The irrigated agricultural area (IAA) in the desert has expanded over the past decade by more than 106,000 hectares. It currently stands at 35,911 hectares, which represents 30% of the total national irrigated area, and is distributed over the regions of El Ziban, Ouad Rig, El Touat, Mizab, El Souf and Ouargla. (Ministry of Agriculture and Rural Development *) The table below represents the size of the supplementary irrigation areas for the lands designated for growing cereals in the desert states compared to the rest of the homeland.

Table No. 01: Areas of supplementary irrigation for lands designated for growing cereals for the year 2017-2018

1. supplemental irrigation report (2017/2018)			1. Total irrigation report (2017/2018)		
Nbr	County	Total irrigated	Nbr	County	Total irrigated
1	Tlemcen	4580	1	Biskra	27312
2	Tiaret	9604	2	El Oued	12613
3	Saida	7846	3	Ouargla	3542
4	Sidi Belabes	1966	5	Tamanrasset	762
5	Mascara	9087	6	Ghardaia	4862
6	A. Temouchent	1557	8	Adrar	15977
7	Relizane	2416	10	Illizi	102
8	Mostaganem	905	12	Bechar	639
9	Oran	432	13	Batna south	6000
10	Chlef	5587	14	Khenchela south	29922
11	Bejaia	380	15	Tebessa south	4000
12	Blida	300	16	Naama south	3905
13	Bouira	1129	17	M'sila south	9790
14	Tizi Ouzou	411	18	Djelfa south	12707
15	Boumerdes	90	19	El Bayadh south	2555
16	Tipaza	788	20	Laghouat south	10756
19	Medea	2138	Total		145444
20	Alger	120	- This represents 8% of the cultivated area - 43% of the area to be cultivated Grand total for 2017/2018 : 263 557 hectares		
21	Tissemsilet	1585			
22	Ain Defla	13921			
23	Tébessa north	6363			
24	Khenchela north	5587			
26	Skikda	70			
27	Guelma	1251			
28	Constantine	1300			
29	El Tarf	117			
30	Mila	4810			
31	Annaba	37			
32	Sétif	9251			

33	Souk Ahras	500
34	Batna north	12705
35	B..B. Arreridj	1948
36	Oum El Bouaghi	9354
Total		118113

Source: Ministry of Agriculture and Rural Development in Arid and Semi-Arid Zones - Development of Irrigation, online: <http://madrp.gov.dz/agriculture/irrigation/developpement-de-lirrigation>, 06/24/2021.

2.2.2. The nature of desert agricultural and animal products

The agricultural products of plants in desert lands include:

- **Palm cultivation:** Palm cultivation depends on the cultivation of the date palm (consisting of about 1000 varieties) due to its ability to adapt to difficult climatic conditions, which is the mainstay of the ecosystem in the oases. Palm orchards in the period (1960/1980) were known to be abandoned and neglected, which led to the decline in production capacities and the aging of the orchards. However, the situation was remedied starting in 1980, when the activity of palm cultivation was revived thanks to the means provided by the higher authorities of the country. The wealth of the Palm Division is estimated at about 167,279 hectares, equivalent to a production of 10,255,000 quintals, led by the “Deglat Nour” variety with a percentage of 53%. Dates are mainly produced in El-Ziban, El Souf and Oued Rig. These areas are the leaders in the production of dates of the two varieties: White Deglat and El Ghars (dates paste), while Gorara and El Touat are famous for the kind of Takrboucht;
- **Cultivation of cereals:** Despite the harsh desert climate, the Saharan region has witnessed a great development in the field of cereal cultivation, which occupies more than 81,900 hectares, especially in the regions of El Ziban and Mountains of El Dhaya;
- **Vegetable cultivation:** Among other crops that have experienced exceptional growth over the past ten years, vegetable crops currently occupy about 92,736 hectares, of which 41% are devoted to potato production. It is distributed over the areas of El Touat, Oued Rig, Mizab, El Souf and El Ziban;
- **Planting fruit trees:** while planting fruit trees occupies an area of 21,203 hectares, topped by olives occupying an area of 10,800 hectares, followed by apricot and pomegranate trees, where important crops were harvested in the regions of El Ziban and Mizab;
- **Other crops:** As for other crops, 19,196 hectares were allocated for fodder crops and 5,225 hectares for industrial crops such as: tobacco, henna, saffron, and tomatoes; (Ministry of Agriculture and Rural Development)

It is also worth noting that the Algerian farmers tended to experiment with planting tropical fruits such as: mangoes, avocados, pineapples, bananas and nuts such as pistachios, which have been very successful due to the nature of the climate. (Haghhouq)

The animal products include:

- **Livestock breeding:** topped by 69% of sheep breeding, and is concentrated in the areas of Ksor El Dhaya, El Souf and El Ziban. This is in addition to the breeding of camels, which is

the distinctive activity of the southern states with a population of 339,784 heads, which represents the total national wealth; (Ministry of Agriculture and Rural Development)

- **Freshwater fish and shrimp:** Algeria has undertaken an aquaculture project known as aquaculture, such as fish, mollusks, crustaceans and aquatic plants. As Algeria adopted aquaculture activity beginning in 2002 in the state of Ouargla through the completion of a huge project known as the dune fish complex for the breeding of fresh water fish, which came into effect in 2008, and the shrimp breeding complex, which contributed to the diversification and increase of the Algerian animal product of fish and shrimp, including the contribution in achieving self-sufficiency and food security¹. (Salhi & Kaddach, 2017, pp. 383-386)

3. Ways of developing desert agriculture and its role in achieving food security

Despite what the Algerian desert achieved in advancing the economic development wheel thanks to the underground resources, this did not dispense with thinking about the exploitation of the above desert lands in the agricultural fields to contribute to supporting the national economy, as the state focused its efforts on reclamation and exploitation of lands and resources with the aim of covering the local market and achieving self-sufficiency on the one hand, and advancing economic development on the other hand.

The reason for this trend is due to Algeria's inability to achieve self-sufficiency and food security from the crops of the northern non-desert lands. These efforts were crowned with success if Algeria managed to succeed in this challenge, and the crops of desert agriculture made up an important proportion of the agricultural product.

3.1. Ways and prospects for developing desert agriculture

The state has intensified its efforts to develop desert agriculture, by providing the necessary funding to support investment projects, regulating rational consumption of water resources, as well as preserving and caring for livestock. It has also established many scientific centers and institutes framing desert agriculture. The state also created the Office for the Development of Industrial Agriculture in the Desert Lands, pursuant to Executive Decree No. 20-265 of September 22nd, 2020, which aims to develop desert lands by supporting investment in them with the aim of strengthening national agricultural and industrial capabilities. These efforts are represented, according to the statements of the Minister of Agriculture and Rural Development, Cherif Ammari, in: (El-Arab newspaper, 2020)

- **Financial financing of desert agriculture:** Regarding the financial financing, the minister stated that the southern counties benefited in 2018 from a financial envelope estimated at 4.6 billion DZD, while they benefited from 4.2 billion DZD for the development of camel and goat breeding. He added that in the state budget for the year 2020, an amount of 400 million dinars was allocated to support small breeders and agricultural investors in the southern states, as well as 380 million dollars for the development of the livestock industry. He highlighted that the financial resources allocated to the agriculture and rural development sector have been lifted with a total amount of 244 million DZD, of which 174 million DZD is directed to the rehabilitation and equipping of animal health centers in the states of Adrar, Tamanrasset and Tindouf, and another 70 million DZD for the acquisition of air-conditioned vehicles and cars in order to support animal health promotion in the south. The minister also

stressed that despite the severe pressures faced by the public finances, as many initiatives were canceled, the government asserts that agricultural spending, which is estimated at two billion dollars annually, will not decrease;

- **Regarding the water resources:** the government plans to expand the areas that depend on irrigation water from 1.3 million to two million hectares through new dams, which contributes to reducing agricultural land's dependence on rainwater as a result of the drought. In this context, the authorities are constructing 15 new dams in addition to the 80 existing dams to irrigate the lands planted with grain, which is expected to rise from an area of only 60,000 hectares now to 600,000 hectares in the future. He pointed out that his sector, together with the Ministry of Water Resources, seeks to expand the irrigated area to 700 hectares on the horizon of 2035 to enhance the balance of the national production system;

- **Regarding the animal revolution:** The Minister highlights that among the incentive measures there is the provision of health coverage for animals through the veterinary services, by strengthening the monitoring capabilities and establishing veterinary centers, in addition to the provision of fodder, including barley, for the benefit of the loyalists, by bringing the special bodies closer to distributing fodder at points of sale. The minister also explained that the desert regions have many different institutions and bodies specialized in research and development for the development of desert agriculture, including a joint professional council for the Camel Division to be a space for consultation between the various partners and stakeholders to organize the profession, which concerns about 16 counties;

- **Regarding the agricultural means and equipment:** The Minister stated that the agricultural sector constitutes every year a committee to follow up on seasonal harvesting and threshing campaigns at the central and local levels. Its mission is to simplify the procedures for those concerned by establishing a single counter for agriculture and rural development, the insurance fund, grain and dry legume cooperatives, agricultural cooperatives and agricultural directorates to enable grain farmers to obtain various agricultural means of fertilizers, agricultural equipment and material, as well as loans. (Algerian News Agency, 2020)

- **Creation of the Office for the Development of Industrial Agriculture in the Desert Lands:** Based on the directives of the President of the Republic, the Office for the Development of Industrial Agriculture in the Desert Lands was established, pursuant to Executive Decree No. 20-265 of September 22nd, 2020. It is a tool for implementing the national policy for the promotion and development of strategic industrial agriculture in Desert lands, through the development of desert lands with the aim of strengthening national agricultural and industrial capabilities. The Office has identified the industrial crops to be developed that are strategic in nature oriented to transformation aimed at meeting the demands of the national market and reducing import bills, mainly represented in grains, corn, oilseeds, sugar plants and fodder cultivation. (Office for the Development of Industrial Agriculture in Desert Lands)

3.2. Evaluation of the contribution of desert agriculture to achieving food security

Minister of Agriculture and Rural Development Cherif Ammari confirmed during an open session of the People's National Assembly devoted to asking oral questions to a number of ministers, chaired by Slimane Chenine (Chairman of the Assembly), and during several press

interviews, that the agricultural sector in general and desert agriculture in particular have become a major strategic sector in creating wealth, providing positions and contributing to achieving food security, revealing that its sector contributes with 12% of the national economy. He had stated a set of facts and statistics that show the role of desert agriculture in the development of the agricultural sector in particular and the economy in general, as well as achieving food security, which are represented in: (Algerian News Agency, 2020) - Agricultural products have witnessed a remarkable increase in the desert region, where the economic indicators related to the region show that the contribution of desert agriculture to the national agricultural production amounted to about 21.6%, i.e. it contributes by 755 billion DZD to the national production;

- The palm wealth currently occupies an area of 164 thousand hectares, with a production of 11.2 million quintals of dates, while the production of vegetables has reached 35 million quintals, occupying an irrigated area of about 60 thousand hectares;

- Algeria has not imported durum wheat since the beginning of April 2020, achieving self-sufficiency thanks to the efforts of farmers and the support of the state, as the quantity collected during the 2019-2020 campaign amounted to more than 27 million kantars, including 20 million quintals of durum wheat, while the quantity of barley collected was 3.6 million quintals and soft wheat was 3.3 million quintals;

- The Minister also mentioned that the Grain Division belongs to about 600,000 agricultural investors and occupies an area of 3.5 million hectares, which is equivalent to 41% of the areas designated for agriculture, and that grain production has known during the past two seasons a productivity rate that increased by more than 53%;

- Specialists also confirm that the desert waters in Algeria are characterized as helping to produce vegetables and fruits in an early manner that may reach five months, which contributes to the provision of non-seasonal vegetables and fruits, which later helps to export agricultural products prematurely, especially to Europe;

- The creation of the Office for the Development of Industrial Agriculture in the Desert Lands, directed at supporting and supervising large investors in the production of the materials specified by the state (cereals, corn, oil plants, sugar plants and fodder cultivation), will ensure the provision of the state's needs of industrial agricultural products and thus achieve its food sufficiency and reduce the import of these raw materials. (Algerian News Agency, 2020)

It is worth noting that despite the repercussions of the COVID-19 health crisis on the national economy, the value of agricultural production in the country's gross domestic product amounted to \$25 billion in 2020, compared to \$23 billion during the previous agricultural season. Thanks to the human, natural and material resources of the agricultural sector. Agriculture has imposed itself as a strategic sector capable of ensuring food security for the country even in the most difficult circumstances. In addition to the COVID-19 crisis, agriculture has also managed to overcome the lack of rain that marked this year, thanks to the expansion of the areas irrigated by supplemental irrigation. (Algerian News Agency*, 2020)

Conclusion

The agricultural sector is considered one of the main pivotal ways to achieve food security. That is why most countries are working to take all necessary measures to get out of

the food gaps. Algeria is among the countries seeking to confront these challenges with economic, social and political dimensions, which are represented in the lack of food production. In order to bridge this gap or this food problem, Algeria has to develop its agricultural sector. Given that more than eighty percent of Algeria's area is desert lands, the state must pay attention and focus on developing agriculture in these areas, since agricultural lands in the north are unable to meet the increasing local demand. Including the inability to achieve self-sufficiency and food security, forcing the state to confront this growing demand by turning to imports, which burdened its public treasury on the one hand, and brought it into dependence on the other hand in the field of importing consumer products and achieving food security.

Results of the study

Based on what we discussed in this study, we reached the following results:

- During the past two years in particular, desert agriculture was able to partially achieve its goals, as despite the repercussions of the health crisis - Covid 19 - on the national economy, the agricultural sector in general and desert agriculture in particular, took a leapfrogging, as it was able to cover the local market of agricultural products, and increased the volume of its exports of these products compared to previous years, (This proves the wrongness of the main hypothesis.);
- Given the role that desert agriculture has played in recent years, both in terms of providing the population's growing needs of consumables or in terms of its contribution to achieving economic development, the Algerian state has redoubled its efforts to provide all the financial, material and human resources needed by desert agriculture to reach the desired goals;
- The state has established many institutes and scientific centers aimed at framing and regulating desert agriculture, in order to be able to achieve food security and economic development for the country;
- Efforts were focused on the stage of land reclamation and exploitation, but the subsequent stages were neglected, so that this development in production was not followed by effective agricultural marketing that ensures the distribution of agricultural products and their delivery to all national markets, especially the northern ones, including the inability to influence achieving the goals of achieving food security and contributing to food security and agricultural and economic development of the country;
- Failure to provide well-equipped stores for grain and agricultural products, many of which were damaged;

Recommendations

After presenting the results of the study, we will review the following recommendations:

- Focusing more on the agricultural sector, and making it one of the strategic and vital sectors, because of its role in creating the revolution and achieving economic development;
- Raising awareness of farmers in the agricultural field and training them in the field of modern technologies and technologies that support agriculture;
- Creating and activating an effective marketing system that works on marketing products to the local and foreign market;
- Paying attention to water resources and rationalizing their exploitation, especially groundwater, as it is not renewable, in light of the lack of rain in recent years;

- The necessity of constructing new warehouses to increase storage capacities, in line with the increase in production witnessed by desert agriculture;
- Creating a strategic stockpile of the main food commodities in order to achieve price stability, and adopting food awareness policies to rationalize food consumption.

References

* The Groundwater System in the Northern Desert Groundwater (SASS) is a deep, non-renewable aquifer shared between Algeria, Tunisia and Libya. SASS identifies a complex superposition of aquifers, in which there are two main aquifers in two different geological formations: the middle Albien table, which is the deepest (Albien) and the second, the final composite table, which is of medium depth.

** The Alpine Aquifer is an aquifer system that covers most of the Algerian and Tunisian deserts and extends to Libya, and surrounds the entire Great Eastern Race, and is the largest freshwater reserve in the world. It extends over three countries, Algeria, Libya and Tunisia. 70% of this groundwater level is located in the Algerian territory in the southeast of the country.

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