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Desert Agriculture in Algeria: Reality and Challenges

- Adrar Province as a Model -

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Abstract:

In Light of the Algerian State's Challenges and Government Commitments to Developing and Modernizing the Agricultural Sector, Particularly in Desert Areas.

Given the Algerian state's challenges and the government's commitments to developing and modernizing the agricultural sector, especially in desert areas, which are relied upon to reduce import burdens and achieve self-sufficiency, thereby revitalizing the national economy, this study aims to highlight the reality of desert agriculture in Algeria. It does so by examining the agricultural sector in Adrar Province and shedding light on the difficulties and obstacles that pose challenges, which these areas strive to overcome.

The study found that the agricultural sector in Adrar Province has significantly contributed to providing substantial quantities of plant and animal products, leading to the self-sufficiency of the province and creating jobs for many unemployed individuals. Additionally, modern techniques in irrigation and water pumping have been employed.

Keywords: Desert Agriculture, Agricultural Sector, Plant Production, Animal Production, Obstacles.

JEL Classification : Q15, Q10, Q16, Q12, Q01.

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1. Introduction :

Agriculture in desert regions is a significant challenge for nature due to the extreme high temperatures and the lack of essential soil nutrients, which hinder proper plant growth. However, it is possible to cultivate crops in desert areas and improve and increase their production if the necessary elements for their growth, such as water and nutrients, are provided.

As Algeria, like other countries, strives to implement economic strategies aimed at diversifying its economic resources beyond the hydrocarbons sector to achieve development, the agricultural sector is considered one of the most important sectors that can contribute to this diversification. This is in line with the continuity of economic and social activities on one hand and the conditions imposed by this development on the other, especially in desert areas due to the unique economic and natural characteristics of these regions, which enable them to drive the growth of contemporary economic activities.

In light of the above, the research problem can be summarized as follows:

- **What is the current state of desert agriculture in Algeria through a case study of the sector in Adrar province? What are the difficulties and challenges facing this sector?**

To address this topic, we need to raise a series of questions that require special attention:

- What is meant by desert agriculture? What are the pillars of agriculture in the desert? What is the production system followed in desert areas?
- What is the current state of desert agriculture in Adrar province? What are its components?
- What are the main obstacles facing the agricultural sector in desert areas?

1.1 Importance of the Study:

- The study addresses a highly important topic that forms the foundational stage for achieving food security and contributing to sustainable agricultural development in Algeria.
- Studying the subject of desert agriculture is worthy of attention due to the paradox between the reality of food security in Algeria and the immense available potential, especially in the Algerian desert.
- The importance of the topic increases in the face of current international challenges, where food has become a means of political, economic, and cultural leverage to control the capabilities of developing nations suffering from food dependency.

1.2 Objectives of the Study:

This research aims to achieve several key objectives, including:

- Clarifying the basic concepts related to desert agriculture.

- Assessing and analyzing the volume of plant and animal production in the agricultural sector in desert areas.
- Highlighting the main challenges, difficulties, and obstacles facing desert agriculture in the province under study.

1.3 Methodology Used in the Study:

To address the research problem and cover various aspects of the topic, this research relies on the descriptive-analytical method, which aligns with the nature of the subject. Concerning the scientific tools and methods for collecting information, the study primarily depends on:

An academic survey of previous research and studies related to the topic available in libraries and online.

Data regarding the case study of Adrar province obtained from the Directorate of Agricultural Services of Adrar province.

To comprehensively cover this research, we will shed light on the following axes:

- First axis: Desert Agriculture;
- Second Axis: The Current State of the Agricultural Sector in Adrar Province;
- Third Axis: Challenges and Difficulties Facing Desert Agriculture in Algeria.

2. First Axis: Desert Agriculture :

2.1 Basic Concepts Related to Desert Agriculture:

2.1.1 Desert Agriculture:

Desert agriculture refers to the cultivation of crops that are suitable for arid conditions (wikifarmer). This type of farming is prevalent in areas with low rainfall, relying on groundwater in oasis regions or on surface water where rivers originating from rainy areas flow through dry regions, as seen with the Nile River in Egypt (Zouka, 2001). Desert agriculture encompasses the techniques and methods used to achieve the best agricultural yield in desert environments. The term "desert agriculture" is preferred over "land reclamation" because it is a broader and more comprehensive concept that includes all necessary agricultural practices in desert conditions. Land reclamation is a part of desert agriculture and is used when there is a specific issue with the land that needs to be corrected.

2.1.2 Land Reclamation in Desert Areas:

Land reclamation involves all the engineering processes conducted on the land, such as leveling, creating canals and drains of various types, building bridges, establishing irrigation and drainage stations, and other civil works in preparation for agriculture.

2.1.3 Agricultural Development:

Agricultural development is the optimal use of a unit area of land to maximize the return from its use with minimal costs.

2.1.4 Vertical Farming:

Vertical farming techniques are employed to increase space utilization efficiency in desert areas. Plants are grown in vertical columns or inside protected buildings, with artificial lighting and enhanced irrigation systems to meet the plants' needs. These techniques boost crop productivity and conserve water and space resources. Vertical farming is a method of agricultural intensification, aiming to increase production vertically by providing the optimal environmental conditions for the growth of certain vegetables, thus ensuring controlled production during months of crop shortage and unavailability (Gamal El-Din, 2008).

2.1.5 Food Security:

According to the World Food Summit held in 1996, food security is defined as a situation that exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences (worldbank).

2.2 Pillars of Agricultural Development in Desert Provinces:

There is no doubt that the south, with its vast area and geostrategic location, should receive multi-sectoral development programs, not just agricultural, aiming to (Planning., 2020, p. 205):

- Protect the unique environmental balances that characterize the desert environment.
- Achieve more settlement in these areas through the appropriate and balanced utilization of all the resources they possess.
- Integrate these spaces and their inhabitants into the general paths and strategic interests of the country's collective and economic development by improving the living conditions of the citizens and striving for actual understanding regarding the comprehensive development project.

Agricultural development, which cannot be achieved without the availability of necessary resources, primarily depends on:

2.2.1 Soil Resource: Agricultural lands are the cornerstone of the agricultural development process. According to the National Office of Agricultural Lands, the area of agricultural land exceeds 49 million hectares (Development., National Office of Agricultural Lands, 2013, p. number not specified), with 8.4 million hectares currently used for agriculture. This area is divided between 5.9 million hectares of private land and 2.8 million hectares owned by the state. Semi-desert lands represent an area of 12.9 million hectares (Development., 2014, p. 5).

Over the years, climatic factors such as wind, heat, and rain have altered the face of the desert. The common perception of the desert, associated with sand dunes or the highlands of Tassili and Hoggar, has evolved. Scientific studies and research have shown that these provinces vary in the fertility of their soil according to the topography of each area, whether it is an erg (sand desert), hamada (rocky desert), or reg (stony desert). The soils can be classified into two main types based on their terrain:

A. Rocky soil: It constitutes about 70% of the total desert soil and is composed of 50% Ragh. The remaining 20% consists of low-lying areas formed by the Eastern and Western Great Ergs.

B. Clay soil: Characterized by heterogeneous geological composition, it is a mixture of sandy clay, gravelly clay, and rocky clay and is less fertile.

2.2.2 Water Resources: Water in the desert, or elsewhere, is more than a necessity; it symbolizes life; the nature of water in the desert differs from other regions on Earth. Rainfall is scarce and often seasonal. The region experiences sudden flows and floods, unlike the regular river valleys in other areas. Surface water includes flowing streams fed by rainwater and rivers like the Mzab River, which is used for drinking and irrigating small livelihood areas in the desert regions. Groundwater, on the other hand, is crucial for desert agriculture, often found at great depths, reaching up to 2000 meters, except in Adrar where it ranges from 200 to 300 meters deep (The Committee on Agriculture, 2014, p. 9).

2.2.3 Wind Resources: The desert region is characterized by being under the influence of air currents, which can be utilized in agriculture to generate thermal energy for irrigation.

2.2.4 Solar Resources: This refers to the duration during which the surface is exposed to sunlight. The desert region receives high sunlight exposure, sometimes exceeding 12 hours daily, making solar energy crucial for meeting the needs of the inhabitants and for agricultural purposes as a clean energy source that preserves the environment.

2.3 Production System in Desert Regions

Agriculture in desert regions relies on palm cultivation due to the palm tree's natural ability to withstand the climate and adapt to prevailing conditions. This is referred to as the oasis production system, which is not only a source of income, livelihood, and food but also a social system that considers the palm tree's provision of raw materials essential for the social life of the inhabitants, including wood for construction, heating, and crafting items like baskets and mats (Rahmani, 2001, p. 10).

Furthermore, this system allows for a diverse climate conducive to subsistence farming (wheat, vegetables, fruits, etc.) and supports livestock and poultry farming within an integrated production framework dominated by familial aspects. According to the National Palm Grove Statistics, there are approximately 18 million palm trees, including 3 million non-productive trees and 2 million newly planted trees under the Agricultural Property Ownership Law, which supports date production, estimated annually at around 200 thousand tons, with recent statistics indicating about 270 thousand tons. The total area for palm cultivation is estimated at 86 thousand hectares, with around 40% being of the finest and best varieties of dates, such as Deglet Nour (M.A.P, 1996, p. 5).

However, due to social pattern shifts in the region, this agricultural activity has witnessed a decline in production and cultivated areas, with the emergence of industrial sectors competing with the

agricultural sector, offering attractive incentives, especially to the youth, which significantly impacted the renovation of palm groves.

The issuance of Law 18/83 revitalized and reactivated investment towards expanding palm cultivation areas. Despite efforts in the same context, they remain limited considering the paramount importance of this strategic product for the inhabitants of desert regions and its contribution as a resource to the national economy.

3. Axis Two: Agricultural Sector in Adrar Province:

3.1 Introduction to the Agricultural Sector in Adrar Province:

Through this axis, the agricultural sector in Adrar Province can be presented, especially since this province is considered the future destination for many investors in this sector, by highlighting the agricultural qualifications it is distinguished by.

3.1.1 Geographic Location:

The region occupies an important strategic location, in addition to being a border area, and thus the region is divided due to its vast territory into four regions, namely:

- Gourara Region, consisting of four districts: Tertecouk - Timimoun - Chirouen - Aougrout.
- Tamanrasset Region, consisting of five districts: Adrar - Tsabit - Fenoughil - Zaouia Kantara - Reggan.
- Tidikelt Region, consisting of one district: In Salah.
- Tinzouatine Region, consisting of one district: Bordj Badji Mokhtar.

The province experiences a cold desert climate in winter, with temperatures dropping to zero degrees Celsius in the winter months of December (January), and hot summers with temperatures ranging between 45-48 degrees Celsius. The amount of rainfall is less than 50 mm annually, but it is sporadic at times and of low effectiveness. The region is affected by seasonal winds accompanied by sandstorms that reduce visibility, especially in the spring months (March-April).

3.1.2 Components of the Agricultural Sector in the Province:

Adrar Province is rich in resources and capabilities capable of meeting the demand for food products and providing employment opportunities for its residents. These can be summarized in the following points:

- **Natural Resources:** Adrar Province boasts vast agricultural lands, with the total agricultural area estimated at 584,318 hectares as of mid-2020. Previously, agricultural land was limited to oases and orchards, but thanks to the land reclamation policy adopted by the state and the programs and privileges allocated since independence, particularly those directed towards the southern provinces to achieve food security, the area under cultivation has expanded. Various programs implemented within this framework have enabled the utilization of 54,612 hectares of the total agricultural area,

including 47,223 hectares of irrigated land. These mechanisms have also stimulated agricultural activity in the region, with the establishment of 34,459 agricultural investors across different regions of the province, classified as follows:

- Traditional investors: 22,671 investors with an area of 230,054 hectares
- Investors under agricultural privilege: 5,954 investors with an area of 170,009 hectares
- Investors under Agricultural Property Ownership (APFA): 5,829 investors with an area of 113,791 hectares
- Experimental stations and model farms (EPA): 504 investors with an area of 866 hectares.

• **B. Water and Electricity Resources:**Water is the primary factor in agricultural land utilization. Given the arid nature of the region, rainfall is scarce, and therefore, water sources mainly consist of deep wells, shallow wells, and reservoirs. To enhance agricultural production capabilities, the authorities in Adrar Province have provided water resources by drilling more than 495 deep wells with a capacity of approximately 19,800 liters per second. Additionally, over 14,350 shallow wells have been dug, with the German furrow system being reinforced through renovation and maintenance, totaling 706 furrows according to 2020 statistics.

Moreover, over 98 kilometers of agricultural roads have been constructed, and agricultural areas have been connected to electricity, which has become an important factor in supporting agricultural production, with a length of 196 kilometers of power lines installed, in addition to equipping 43 deep wells.

Contribution of Desert Agriculture to Sustainable Agricultural Development in Adrar Province

3.1.3 Plant Production:

There are numerous plants cultivated in Adrar Province; however, in this study, we will focus on the most important ones, namely grains and vegetables.

- **Grain Cultivation:** Grains are among the most important agricultural crops in Adrar Province, including both durum and soft wheat, yellow corn, barley, and oats. Wheat is considered the most important of these crops due to its strategic importance in food consumption. The agricultural area allocated for grains occupies a significant percentage of the total arable land in the province in general, and of the total area dedicated to plant production in particular. Table (01) illustrates the development of cultivated area and total production of grains during the last five agricultural seasons.

Table (1): Evolution of Grain Cultivation across Adrar Province

Agricultural Season	Cultivated Area (Hectares)	Area Under Central Irrigation (Hectares)	Total Production (Quintals)	Overall Yield (Quintals/Hectare)
2015-2016	10576	4360	331386	31
2016-2017	12918	7190	371149	29
2017-2018	17187	11273	531167	31
2018-2019	18864	12737	732514	39
2019-2020	21124	14712	909380	43

Source: Agricultural Statistics Department, Directorate of Agricultural Services for Adrar Province, 2020

The table (01) demonstrates the ongoing development in the cultivated area of grains season after season, showing a consistent increase throughout the study period, reaching its peak during the last agricultural season 2020/2019 with approximately 21,124 hectares, a 100% increase compared to the base season 2016/2015. This increase is primarily attributed to the expansion in land reclamation operations in the Adrar Province, as many farmers acquired concession contracts for state-owned agricultural land, enabling them to apply for bank financing to realize their investments under what is known as the "Challenge Loan" framework.

Additionally, the table also illustrates that the total production of grains increases from one season to another due to the increase in cultivated area and the adoption of central irrigation methods. This method allows for intensive land utilization multiple times a year, alternating between crops such as maize and durum wheat, thanks to the controlled water quantities and effective fertilization provided by central pivot irrigation. Moreover, the purchase of wheat products by the Grain and Legume Cooperative and maize by the National Office for Livestock Feed, along with post-season support from agricultural services in the province, further contribute to this increase.

Furthermore, the overall yield per hectare of wheat has seen a continuous increase over the last three agricultural seasons of the study, especially in the last season 2020/2019, reaching 43 quintals per hectare. This is attributed to the availability of specialized seed suppliers offering high-quality seeds compared to those provided by the Grain and Legume Cooperative.

- **B. Regarding vegetable cultivation:** Adrar Province is characterized by a good variety of vegetables produced on its lands, whether in plastic greenhouses or open fields. Table (02) illustrates the evolution of cultivated area and total production of vegetables during the seasons covered by this study.

Table (2): Evolution of Vegetable Cultivation across Adrar Province

Agricultural Season	Cultivated Area (Hectares)	Total Production (Quintals)	Including Tomatoes
2015-2016	5120	723469	144694
2016-2017	4058	567434	158882
2017-2018	4998	623116	218091
2018-2019	5282	695286	292020
2019-2020	6411	498617	365048

Source: Agricultural Statistics Department, Directorate of Agricultural Services for Adrar Province, 2020.

From Table (02), it is observed that the cultivated area of vegetables experienced a decrease during the second season of the study 2017/2016 by 1062 hectares. This decline was attributed to marketing problems faced by farmers during that period. However, it resumed an upward trend starting from the agricultural season 2018/2017 until the end of the study, due to the distribution of new benefits to investors in the vegetable sector and the high demand for desert vegetables and fruits during certain seasons of the year.

Regarding agricultural production, it was also noticed that it decreased during the season 2017/2016, but it witnessed a continuous increase during the remaining seasons of the study. This increase was primarily due to the expansion of cultivated area and the adoption of modern techniques such as drip irrigation, spray irrigation, and protected cultivation in plastic greenhouses. Tomatoes are considered one of the most important vegetables produced in the province, and it is evident from the previous table that the production quantity continuously increased throughout the study period. This was attributed to the establishment of a tomato processing factory in the municipality of Reggan by one of the specialized investors to accommodate the significant quantities of tomatoes produced in the province, which encouraged farmers to produce without fear of marketing issues as the produced quantities are directly marketed to the factory.

In recent years, the Ougarta region has witnessed significant interest from specialized investors who have converted barren lands into large agricultural hubs, such as cucumber cultivation known for its good quality. The produce is directly marketed to hair wash factories and some creams production facilities, which has led to the employment of dozens of unemployed individuals in the region.

3.1.4 Animal Production

Animal production is considered a vital complement to plant production in terms of demand for diverse feedstuffs or its significant contribution to agricultural income by covering the consumption needs of the population.

The state's animal production is evident through the following table:

Table (3): Evolution of Animal Production across Adrar State"

Agricultural Season	Red Meat (Quintals)	White Meat (Quintals)	Milk (Liters)
2015-2016	60650	11476	13084000
2016-2017	51999	22833	9843000
2017-2018	71855	21183	8523000
2018-2019	66091	16761	12298000
2019-2020	64235	15101	10620000

Source: Agricultural Statistics Department, Directorate of Agricultural Interests for Adrar State, 2020.

Through table number (03), we notice the fluctuation in the production of red and white meat between increases and decreases, with a prevailing decrease. Regarding red meat, it experienced a decline during the 2017/2016 season by 8651 quintals, followed by an increase of 19856 quintals in the subsequent season 2018/2017. Then it decreased again in the last two seasons of the study to stabilize at 64235 quintals in 2020/2019.

As for white meat, it witnessed a significant increase in the 2017/2016 season with a growth rate estimated at 50%, then gradually decreased in the remaining seasons of the study to reach 15101 quintals in the last season 2020/2019.

Milk, on the other hand, also experienced fluctuations between increases and decreases, with its highest value in the 2016/2015 season and its lowest value in the 2018/2017 season. However, the results obtained in the production of this essential substance remain far from the required level due to the state's lack of grazing areas on one hand and the high cost of fodder on the other hand.

It is worth noting that the state has an animal wealth consisting of approximately 1249 heads of cattle, more than 507786 heads of sheep, over 166077 heads of goats, and more than 56602 heads of camels.

4. Axis Three: Difficulties and Challenges Facing Desert Agriculture in Algeria

Despite the government's efforts to increase agricultural production to a level that may allow for food security, the agricultural sector in the desert faces obstacles that prevent it from reaching the desired level. Among the most important of these obstacles are:

4.1 Natural Obstacles: Besides the climate, the quality of agricultural soil and the quantity of water used are natural factors that affect agricultural crops in terms of quantity and type. Their impact varies from one crop to another and from one region to another. Additionally, desert regions suffer from problems such as well dryness, scarcity of irrigation water, and depletion of groundwater due to irrational use of these resources. Consequently, the lack of abundant water

poses a significant barrier to agriculture. Desertification is also a problem leading to drought and decreased productivity, ultimately resulting in the complete loss of the vital area's ability and transforming the land into desert. Desertification often occurs due to the alliance of unstable dry region conditions with human activity. Thus, understanding climatic conditions can help evaluate their role in desertification (Abdel Monem Belba & Maher , 1994, pp. 18-24).

4.2 Human Obstacles: Humans, being the producers, distributors, and consumers, have a significant impact on agricultural production within the limits of natural conditions and the nature of available resources (Haroun, 2000, p. 107). Among the human obstacles, we find a shortage of trained agricultural labor, ignorance of modern agricultural practices by most farmers, dominance of old agricultural work relations, high illiteracy rates in most rural areas, concentrated mostly among farmers, weak agricultural training and advisory programs, and even their complete absence in some areas, as well as a shortage and poor distribution of agricultural technicians (Al-Hamid, 1975-1976, p. 33).

4.3 Technological Obstacles: These obstacles are mainly related to production requirements, including agricultural machinery, various types of fertilizers and pesticides, seeds and seedlings, irrigation equipment, and plastic greenhouses. Desert agriculture suffers from the problem of the unavailability of high-quality seeds, which should ideally be available in seed distribution centers. However, government negligence and lack of supervision have led desert farmers to resort to black markets to purchase the worst types of seeds at exorbitant prices, resulting in decreased product quality and loss of value. Additionally, farmers' inability to acquire modern machinery and equipment, which can save them effort and time, due to their high prices compared to their modest income, is another challenge. Even if they obtain such equipment, they often lack the knowledge of how to use it due to the lack of follow-up and guidance from responsible authorities.

4.4 Regulatory Obstacles: Desert farmers complain about the state's neglect of many important issues, foremost among them being the settlement of agricultural land, which poses a significant obstacle to desert agriculture. It is unreasonable for land to be exploited without the farmers holding ownership or lease contracts. Additionally, farmers face weak agricultural channels and high electricity costs for irrigation water. Despite the state's interest in the agricultural sector and providing incentives for opening agricultural channels, expanding rural electricity networks, and facilitating water exploration procedures, some agricultural areas still suffer from these problems, negatively affecting farmers' productivity. Moreover, desert farmers engaged in animal husbandry struggle to increase production rates due to a lack of support and difficulty in obtaining barley and feedstuff that should be provided by feed distribution centers. This forces farmers to incur exorbitant costs when purchasing them from the market. Furthermore, the absence of suitable facilities for breeding, reproduction, and continuous health monitoring exacerbates the situation.

4.5 Plastic Agriculture Obstacles: In addition to the previous obstacles, plastic agriculture suffers from the problem of winds, which often break many plastic greenhouses and cause losses due to the lack of windbreaks. Furthermore, soil rich in salts is unsuitable for plastic agriculture and requires frequent use of fertilizers, water, and manure, and in some cases, the installation of drainage networks. Plastic agriculture also faces significant fungal and bacterial diseases, as the climate inside plastic greenhouses provides a conducive environment for the growth of pests, fungi, and bacteria. This requires a lot of attention and control to manage plant health problems. Many farmers refrain from using herbicides despite the problems caused by weeds and prefer manual removal (Sabria, 2012/2013 , pp. 23-24).

Considering the increasing importance of developing agriculture in desert areas, especially in Adrar State, this study has shed light on the reality of desert agriculture and its challenges in Algeria. Through deep analysis of the resources and obstacles, it is evident that agriculture in these areas has immense potential but faces significant challenges.

5. Conclusion :

In conclusion, shedding light on the fundamental concepts of desert agriculture and the reality of the agricultural sector in Adrar State highlights the urgent need for intervention and investment in this sector. Desert agriculture is not only a means to achieve food security but also an opportunity to enhance sustainable development and diversify income sources in Algeria.

With the challenges posed by the desert environment, there is a need to develop innovative agricultural techniques and effective marketing strategies to enhance the productivity and sustainability of the agricultural sector. Collaboration between the government, private sector, and local communities is essential to achieve agricultural development goals in desert areas.

Ultimately, achieving self-sufficiency in agriculture and enhancing Algeria's capacity to achieve food security depends on investing in the development and improvement of desert agriculture. Through our collective efforts, we can turn desert challenges into opportunities for sustainable growth and prosperity.

5.1 Study Results:

- The study indicates that agricultural diversification is key to increasing the resilience of desert agriculture to climate change and improving its sustainability. Encouraging the cultivation of a variety of crops and livestock breeding can provide multiple sources of income for farmers.
- Environmental and climatic challenges such as drought and soil degradation are important factors affecting desert agriculture. Therefore, measures should be taken to protect the environment and develop strategies to adapt to climate change.

- The study shows that there is great potential for development in the desert agriculture sector in Adrar State, such as utilizing groundwater resources and adopting modern irrigation techniques.

5.2 Study Recommendations:

- Investment in modern irrigation techniques such as drip irrigation and sprinkler irrigation is recommended to increase water use efficiency and reduce waste.
- Encouraging the cultivation of crops suitable for the desert environment, resistant to drought, and economically valuable.
- Supporting research and development in the field of desert agriculture to develop plant varieties and new technologies suitable for the desert environment.
- Enhancing collaboration between the government, private sector, and local communities to implement strategies to promote desert agriculture and achieve food security.
- Working to increase the attractiveness of resettlement in the south through activating agricultural development programs to increase cultivated and irrigated land.
- Ensuring the quality of seeds and fertilizers and providing necessary resources such as tractors, harvesters, and other machinery.
- Promoting investment in the agricultural sector in desert areas through offering new incentives and privileges.

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