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Afforestation as an Option to Reduce Desertification in Salah al-Din Governorate Challenges and Solutions

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ABSTRACT

Afforestation is one of the most important factors that contribute to combating desertification. It is the first link in destroying or building the ecosystem. The presence of trees is able to enhance the biological capacity of the land. Reduce dust storms. And the determinant in the climate changes that worry the world. Therefore, the enactment of laws that prevent unauthorized cutting of trees, and the holding of conferences and seminars on a global scale began with the necessity of rapid action in the face of the great shortage in numbers of trees. Countries began to establish campaigns to plant millions of trees annually.

And in implementation of the requirements of the United Nations Convention on Desertification, to which Iraq joined in the year 2009, the National Action Program was established in Iraq to draw up the ten-year strategic plan 2008-2018, and it showed great seriousness in finding ways to reduce desertification, as well as to fulfill its obligations towards international environmental agreements. The program concluded that: 92% of the area of Iraq is threatened by desertification, which is considered a warning bell that calls for effective and rapid action to curb this environmental problem.

Salah al-Din governorate, like the rest of Iraq, suffers from the spread of desertification in a large way, as it is among the central governorates north of the capital, Baghdad. It is astronomically located at 43.35 longitude and 34.27 latitude. Its population is about 1,500,000 according to the 2014 census, and its area is approximately 11,000,000 dunums. This is due to the joining of some areas from the neighboring governorates administratively, and sometimes their exit as well. The arable area is 6,085,932 dunums. As for the lands that are desertified and threatened with desertification, they amount to 5,372,334 dunums, and there is a significant deterioration in the natural pastures, which have an area of 1,782,239 acres.

Therefore, this study was to find out the number of trees that should be planted by knowing the area of lands threatened with desertification in the governorate. It was estimated according to the minimum number of trees in each dunum, which was agreed upon by a scientist. It was 58,000,000 trees. When starting to draw up a plan to plant this number of trees, there were three problems. Major, which is that it needs allocations of up to 800 billion and large numbers of human resources. If a million trees are planted, which is what all of Iraq aspires to plant in the field of desertification, we need 58 years to reach the goal. This is if the project was adopted by the government sector

Therefore, there was an option to involve the landowners in the afforestation program, where the state imposes the planting of a certain number of trees annually on each agricultural holding within the areas threatened with desertification, provided that the state supplies the seedlings free of charge with an irrigation system. When studying it, it was found that there are about 40,000 artesian wells distributed throughout the region, and if only 500 trees are planted for each well, it means that we can plant 20 million trees without large financial allocations. The government sector adopted the implementation of planting the same number of trees

This requires developing a program to implement this project with the participation of all ministries and agencies in order to reach a mechanism for implementing this study, and among its procedures is to stop all administrative transactions for the farmer unless the owner of the holding is committed to implementing the planting of the required number of trees.

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KEYWORDS: Salah al-Din Governorate, desertification.

INTRODUCTION

Each country requires mechanisms to combat desertification that differ from one country to another, including many things, the culture of society, the type of general economic activity, the type of land ownership, the level of rainfall, temperatures, and the topography of the country. and his financial capabilities. Therefore, it is wrong to copy the experiences of others and try to apply them in our countries, with the need to study them carefully and benefit from them.

The experiences of the world have proven that the process of stopping desertification in lands threatened with desertification is more feasible than the process of rehabilitating desertified lands. Therefore, preventive plans must be put in place in areas threatened with desertification before they become desertified and it becomes difficult to rehabilitate them.

And because our society lacks the culture of tree planting, which is one of the elements of combating desertification, as it is in countries that plant millions of trees annually with the participation of millions of its citizens, it was necessary to put in place a plan and legal legislation that compels the owner of the land to plant trees and serves as an (environmental tax).

Research problem: There are three major problems that hinder afforestation in combating desertification, which is that we need large financial allocations and armies of human resources, and the size of the problem is large.

The research hypothesis: that every country has a characteristic in ways to combat desertification, and that the work must match the available ingredients, and on the basis of that, mechanisms are put in place according to what is available on the ground, and that there are many mechanisms that help in overcoming these problems, including the involvement of land owners within a plan It is supervised by the Ministry of Agriculture

Our study focuses on the Salah al-Din Governorate, as it focuses on involving the owners of agricultural holdings located in areas threatened with desertification, most of which have artesian wells, so that they are provided with tree seedlings and an irrigation system, provided that he undertakes to serve and irrigate the seedlings and under the follow-up of the competent departments

The process requires a precise plan that contributes to saving billions of dollars.

Research Structure: The research included the following investigations (desertification in Iraq, its causes and degrees, environmental, economic and social effects, the role of afforestation and traditional methods in combating it, and the national program to combat desertification in Iraq as the last international action in Iraq in coordination with the relevant ministries and bodies in Iraq and its results, and desertification in Salah al-Din Governorate, the subject of the research. By calculating the area threatened with desertification, the total number of wells present in these areas, how they can be exploited, and the human resources in providing the government sector with the most important elements of combating desertification, and developing a plan to involve agricultural holders with the government sector in combating desertification, and how to follow up on this plan.

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The first topic / desertification in Iraq

Desertification is the deterioration of lands in arid and semi-arid regions and dry semi-humid regions as a result of various factors, including climatic changes and human activities, which is the definition adopted by the United Nations on desertification 1992. It is also defined as a negative change in the characteristics of the vital environment as a deterioration of the biological capacity of the land. Also as (1)

Deterioration of the ecosystem in general, which leads to a decrease in the productivity of natural resources due to soil erosion, land salinization and waterlogging (2)

Iraq is located in most of its central and southern parts under arid conditions, where the average rainfall does not exceed 400 mm, and in the northern parts it falls within semi-arid conditions, as it is located within the lands covered by desertification, and the sand dunes cover an area of 4 million dunums. As for the percentage of lands threatened by desertification, they represent the majority of the area of Iraq

And the shrinking of the green cover in front of the creeping desert expansion and the intensification of the intensity of dust storms threatens the general health of the population and thus leads to widespread poverty and migration from the desertified areas to the city. Therefore, immediate measures must be taken to implement a long-term program aimed at resisting, stopping and spreading the phenomenon of desertification in Iraq.

The report of environmental statistics for the year 2009 indicates the intensification of desertification in Iraq, as the percentage of lands threatened with desertification is about 92% of the total lands of Iraq, in addition to the emergence of a real and worsening scarcity of water resources due to the scarcity of water resources from neighboring countries, based on the assumption that the temperature rises by 1%. The rate of precipitation increased by 2.4%.

It is expected that climate change will affect the yield of a dunam of the wheat crop by 12.5%, and this will affect food security. It is expected that Iraq's imports of wheat will rise to 76% of the total domestic demand (3)

As for the economic point of view in desertification, the World Food and Agriculture Organization (FAO) defines it as a comprehensive change of economic processes in addition to the natural and human processes that lead to the destruction of the balance in the soil, plants, air and water in the area subject to changes in dry areas, and that the continuation of deterioration leads to deficiency or destruction. The vital force of the earth and then increase the area of the desert (4)

1-1 Causes of desertification in Iraq:

More than 90% of the lands of Iraq are affected, to one degree or another, by one of the processes of desertification in varying degrees. The causes of desertification in Iraq are due to the following factors:

1- Climatic factors

The prevailing climate in a particular area within the arid and semi-arid regions is considered one of the most important factors and influences that lead to desertification, and the climatic factors that have a

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direct relationship and a major role in desertification are the water balance factors, the amount of rainfall, evaporation, thermal balance, solar radiation, and temperatures with wind and air current factors. During recent decades, the country has been exposed to severe droughts, as the rains have receded significantly, especially in the central and southern regions of the country, coinciding with severe global warming during those periods. The erroneous practices of man through logging and agriculture relying on rain and overgrazing also contributed to a significant deterioration of the natural vegetation cover in the country. (5)

2- Human factors

Human intervention in meeting its unlimited needs of natural resources has had a great impact on the exacerbation of the problem of desertification in the region, especially during the period of economic blockade that followed the first Gulf War, which lasted for more than decades, and what happened in the last war (2003) and its aftermath, which led to the destruction Infrastructure for all vital facilities, especially energy, with the citizen's reliance on plants for heating and cooking, and what the military machine has caused and is causing in the destruction of the surface layer of desert soil and the destruction of natural vegetation in desert areas through excessive random cutting of forests, overgrazing and removal of vegetation that reduces the mechanical bonding of soil and works An imbalance in the physical and chemical properties, all due to the poor use of the soil (6)

2-1 Effects of desertification

The most important effects of desertification at the environmental, social and economic levels can be summarized as follows:

1- Dust storms

2- Land degradation due to climatic and human factors

3- The emergence of sand dunes and quicksand

4- Decrease in soil fertility. Decrease in productivity

5- Increase in salinity. Decrease in vegetation cover

6- Loss of original plants.

7- Violence and clan conflict

8- Overfishing in relation to the aquatic environment and air and soil pollution

9- An increase in temperature as a result of climatic changes, as well as there are many economic and social effects of desertification that need a large divergence (2)

1 degrees of desertification

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The United Nations conference held in 1977 identified four solutions to desertification (7)

1- Mild desertification: This is the stage in which signs of slight environmental destruction of the components of the vegetation cover and soil appear, in a way that does not clearly affect the production of ecosystems.

2- Moderate desertification: It is a moderate stage of environmental deterioration represented in the deterioration of vegetation cover, soil erosion and soil erosion, from which some sand dunes and canyons emerge.

3- Severe desertification, which is represented by a clear shortage in the percentage of desirable plants, the increase in the percentage of sand dunes, the enlargement of canyons, and the difficulty of cultivation by traditional methods.

4- Very severe desertification: It is the most dangerous type of desertification, as the environment loses most of its biological capacity and turns it into a pattern of real deserts, where huge sand dunes are formed with a lack of vegetation, with the formation of large valleys and clear climate change.

4-1 Steps to combat desertification

There are many steps to combat desertification, and each of these steps requires programs and action plans, and most of these steps require continuity in work, and any stop goes all the efforts that have been made in this field, and one of the most important steps in combating desertification is

1- Stopping population creep and urban sprawl on agricultural lands

2- Enacting laws that protect the land from human behaviors that cause desertification

3- Stop cutting trees, burning forests, and razing agricultural lands

4- Stopping overgrazing and organizing grazing operations

5- Launching awareness campaigns for the local population about desertification, ways to protect the soil, deal with agricultural lands, and provide water resources

6- Soil stabilization and protection by intensifying the vegetation cover by studied agricultural methods

The second topic / the role of afforestation in combating desertification

1-2 The concept of trees

A tree is a specialized environmental word that means that perennial plant distinguished by its height exceeding 3 m, with one stem and a definite shaped end or top. Trees occupy the largest volumetric area

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within the plant kingdom, so their local and general climatic effect occupies the forefront compared to other plants, as they affect the increase in relative humidity. Blocking sunlight, providing shade, repelling winds, and consuming CO2 gas, in addition to its supposed importance in reducing high temperatures. Trees and other plants perform a vital process called photosynthesis or photosynthesis. Trees and (plants in general) take in oxygen and expel carbon dioxide day and night and at the same time carry out the process of photosynthesis. Since the process of photosynthesis is faster than respiration, the net output for the exchanged gases is the taking in of carbon dioxide and the expulsion of oxygen. Trees get rid of waste in several ways that differ according to the type of trees. Excess water is also eliminated in two ways: the process of transpiration and the process of transpiration. Trees differ in the nature of their growth. They are classified according to the speed of their growth into fast-growing, medium-growing and slow-growing trees.

2-2 The thermal effect of trees

Trees transmit infrared light almost three times as much as visible light. This characteristic makes trees an excellent means of shading, as it prevents 90% of the sun's rays from reaching the ground during the day, while it does not prevent the same percentage of thermal radiation emanating from the ground to the sky, especially during the night, which reduces the total energy gained and increases the energy lost by the radiation of the ceilings. and land the site for cold skies at night. The tree can reduce the intensity of direct solar radiation to which a person who takes shade is exposed to almost a quarter. It is known that the temperature of the leaves of trees is usually lower than the air temperature as a result of evaporation from the surface of the leaf, as they do not store heat, unlike the surfaces of the earth or the roofs of buildings, which have a higher temperature than the air temperature.

3-2 Employment of trees

The function of trees varies according to the place of their cultivation, such as trees on both sides of highways, trees in city belts and windbreaks, landscaping of internal roads in cities, and landscaping of public or private gardens.

1- Afforestation on both sides of highways

Highway afforestation is an important way to protect cities from many problems and pollutants caused by vehicle traffic, as it acts as a separator between residential areas and highways 2

2- Afforestation as windbreaks

Trees used as windbreaks protect the city from many pollutants. They also provide a local climate for the city and purify the atmosphere by producing large amounts of oxygen and absorbing carbon dioxide.

3- Afforestation of internal roads in cities

This type of green spaces is of great importance in the greening system of cities, as it occupies large areas of the city at times, as happened in the design of some Scandinavian cities, and the city became inside a forest or less in another neighborhood and takes a certain area to perform some important functions, which

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is the common formula for greening all cities of the world, Where thinking about the type of tree used is based on major requirements (providing sufficient shade for pedestrians without obscuring the vision of motorists, compatibility with climate conditions, giving an aesthetic appearance to the street, etc.). It should also be fruitless trees (especially deciduous), with moderate stems, free from thorns and gum, fast growing, available, cheap, easy to propagate, with peg roots, resistant to diseases and insects •

4-2 The role of trees in reducing the summer air temperature

Trees play an important role in lowering the air temperature due to their ability to provide shade and block solar radiation from reaching the ground. Because the crown canopy of trees reflects and disperses most of the solar radiation that hits it, so the temperature in the upper part of the crown canopy is higher than the lower one during the day. The air temperature under the trees is higher than in the open areas. The effect of trees in reducing the air temperature occurs through increasing its relative humidity through the process of evapotranspiration that takes place in plants and soil, and the process of transpiration that takes place in the stomata. As 60-70% of the solar energy is consumed during the day in physiological processes. The effect begins to appear with sunrise, and the temperature difference between the shaded and the unshaded increases as the sun rises in the sky and the angle of incidence of the solar rays increases.

5-2 The role of trees in raising the relative humidity in the air

The vegetation cover supplies the air with water vapor through transpiration, which increases the relative humidity in the air. Therefore, we note that the relative humidity between plants and under the cover of trees is higher than the relative humidity above the surface of dry soil. The difference reaches its maximum in the summer, while it is almost non-existent in the winter. The increase in relative humidity under trees varies with different types of trees and with different seasons and months. –

6-2 The role of trees in protection from the effects of wind

Trees have a clear effect on the intensity and speed of winds, and this effect varies according to the type, age, density and height of trees. The vegetation density of trees and shrubs reduces wind speed by 75-85%. Wind also has a significant impact on thermal comfort, making a person feel uncomfortable when wind speed, air temperature, and relative humidity exceed the thermal comfort zone.

7-2 The role of trees in reducing the Earth's surface temperature in summer

Trees reduce the temperature of the shaded ground by blocking direct solar radiation falling on them, which gradually raises its temperature. The floor's ability to absorb the sun's thermal energy depends on its color, texture, and thermal capacity. In the summer, high temperatures are concentrated in the surface layers, while in the winter, they are in the lower layers. (8)

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The third topic / the national program to combat desertification in Iraq (3)

It is the latest program to combat desertification, which was jointly prepared by the Ministry of Environment, the Ministry of Agriculture, the Ministry of Water Resources, the Ministry of Science and Technology, the General Authority for Meteorology and Seismic Monitoring, the Ministry of Higher Education and Scientific Research and the Ministry of Planning, with the support of the United Nations Environment Program - West Asia Office UNEP-ROWA and the Arab Organization for Agricultural Development AOAD is funded by the Global Environment Facility (GEF).

The national action program to combat desertification in Iraq comes in implementation of the requirements of the United Nations Convention on Desertification, especially the alignment of the national action program with the ten-year strategic plan 2008-2018, noting that Iraq joined the agreement in 2009 and is serious about fulfilling its obligations towards international and environmental agreements.

The program concluded that Iraq faces many environmental challenges as a result of its geographical location within the arid and semi-arid regions, as well as the economic, political and security conditions that it faced. Agricultural land account

The program emphasized that international studies confirm that stopping desertification through preventive measures is more feasible than the process of rehabilitating desertified lands, especially in its advanced stages.

The program aims to the following points

1- Restoring environmental systems, preserving natural resources and limiting their degradation

2- Developing and strengthening human institutions and legislative frameworks

3- Improving awareness, education and education at all levels

The program concluded by choosing to develop existing projects at a cost of $175,400 over a period of five years. The implementation of the program is generally supervised by the Higher Ministerial Committee for Combating Dust, Desertification and Dust (National Action Program in Iraq, p. 77).

1-3 The goal of preparing the program

In response to the objectives of the National Strategy for the Protection of Iraq's Environment and its Implementation Plan (2013-2017) and in compliance with Iraq's requirements of the ten-year plan of the United Nations Convention to Combat Desertification (2008-2018), this program has been prepared to be in

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line with Article 10 of the Convention (the program has tried to achieve these elements whenever possible) Which identified the elements that must be available in national programs and strategies, namely:

1. Identify the factors that contribute to desertification and the necessary practical measures to combat desertification and mitigate the effects of drought.

2. Determine the roles of governments, local communities and land users, and identify available and needed resources. It is necessary that the national action programs envisage the following: b

a. Include long-term strategies to combat desertification and mitigate the effects of drought, emphasize implementation, and be integrated with national policies related to sustainable development. Allow adjustments to be made in response to changes in conditions, and be flexible enough at the local level to cope with different socio-economic, biological and geophysical conditions.

c. To pay special attention to the implementation of preventive measures for lands that have not yet degraded, or are slightly deteriorating.

d. To strengthen national capacities in the field of climatic, meteorological and hydrological meteorology, and means of achieving early warning of drought

Promote policies and strengthen institutional frameworks that develop cooperation and coordination in a spirit of partnership between the donor community, governments at all levels, local people and communities, and facilitate local people's access to information and appropriate technology. To allow for the effective participation at the local, national and regional levels of non-governmental organizations and local populations, both women and men, in particular resource users including farmers and pastoralists and their representative organizations, in policy planning, decision-making, implementation and review of national action programmes. g. Require regular review of what is being implemented and progress reports on it.

And that national action programs include, inter alia, some or all of the following measures for drought preparedness and mitigation, as follows:

1- To establish or strengthen, as appropriate, early warning systems, including national local facilities, joint systems at the sub-regional and regional levels, and mechanisms to assist those displaced by environmental deterioration b.

2- Enhancing drought preparedness and management, including creating drought contingency plans at the local, national, sub-regional and regional levels, which take into account both seasonal climate forecasts and year-to-year forecasts. c.

3- Establish and/or strengthen, as appropriate, food security systems, including storage and marketing facilities, particularly in rural areas d.

4- Establishing other alternative livelihood projects that can provide income in drought-prone areas. Establish programs for sustainable irrigation of both crops and livestock, taking into account the conditions and needs that are unique to each region.

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That the national action programs include, as appropriate, inter alia, measures in some or all of the following priority areas, as they relate to combating desertification and mitigating the effects of drought in the affected areas and to their populations: a. Encouraging alternative means of earning a living and improving the national economic environment in order to support programs aimed at eradicating the scourge of poverty and ensuring food security. B . population dynamics c. Sustainable management of natural resources d. sustainable agricultural practices e. Developing various energy sources and using them efficiently. And . Strengthening and developing institutional frameworks g. Strengthening capacities in the areas of assessment and monitoring methodology, including hydrological and meteorological services, building skills, education and public awareness (National Action Program in Iraq, p. 14)

The fourth topic / the most important challenges facing desertification control in Salah al-Din Governorate

1-4 Location and area

Salah al-Din Governorate is located in central Iraq, north of the capital, Baghdad. It is astronomically located at 43.35 longitude and 34.27 latitude. Its population is about 1,500,000, according to 2014 statistics, and its area is approximately 11,000,000 acres. The arable area is 6,085,932 dunums, while the non-arable area is 5,372,334 dunums, according to the statistics of the Salah al-Din Directorate of Agriculture for the year 2021 2-

1- Geographical reality

Salah al-Din Governorate is located within the undulating region between the sedimentary plain and the undulating region. The most important characteristic of the province is the presence of the Tigris River, which enters the province in the district of Shirqat, passing through Baiji, Tikrit, and al-Dur and Dhuluiya. Its regions are dominated by the desert character

The annual average rainfall is 576.7 mm annually for the period 1970-2011

There are also sand dunes in the governorate, the most important of which is the northern sand belt

It extends from the Baiji area - Al-Dur, Salah Al-Din Governorate, to the area confined between the Tigris River and the Iraqi-Iranian border between the cities of Al-Kut and Al-Amarah in the south. This belt extends along the southern side of the Makhoul and Hamrin mountain ranges and the ridge adjacent to the Iraqi-Iranian borders. The most important areas for the existence of sand dunes in this belt are the areas of Baiji and Al-Aith. The area of sand dunes in Salah al-Din is estimated at 906 dunums (Ministry of Planning

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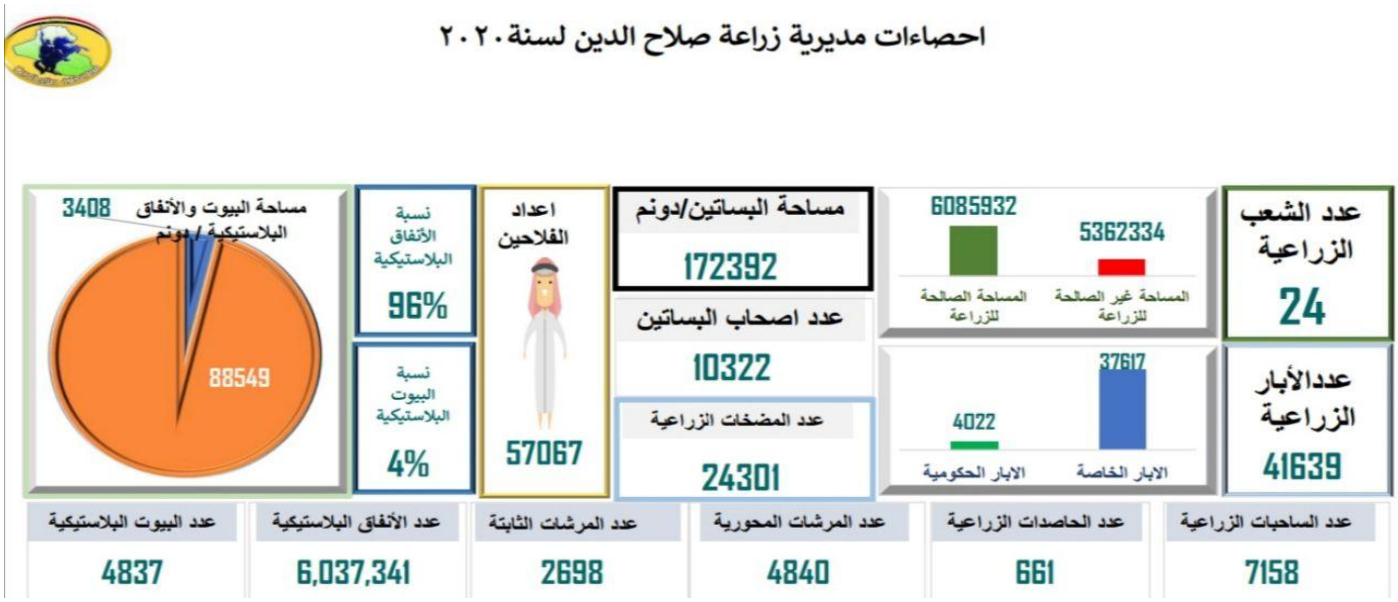
and Development Cooperation, Central Bureau of Statistics Food security, living conditions, and social transformations in Iraq, 2012, p. 14)

The main sources of sand for the region are the Makhoul mountain range, which is exposed to severe water erosion, and has contributed to great degrees in the formation of dunes and sandy flats in the region, starting with rain and torrential erosion, and then wind erosion of these sediments in the dry season. Sand dunes are concentrated on the western side of the Tigris River, bordered to the east and north by the Makhoul Mountains, to the west by the Al-Jazeera region, and to the south by Tharthar Lake and the city of Tikrit. The city of Baiji and Al-Siniyah are directly affected by them, the transportation routes in the region, railway lines and the neighboring agricultural lands. As for the Al-Ayth region, the dunes and sandy flats are concentrated in the Al-Ayth region on the eastern side of the Tigris River, bounded from the north by the Hamrin mountain range, from the east and south by the Al-Atheem River, and from the west by the Tigris River, Al-Dur district and Lake Al-Shari, and as a result of its movement affects both the Al-Azeem River and the Hamrin district And agricultural lands scattered in the region. (3) (p. 57)

Figure No. (1) General information for Salah al-Din Governorate



Source: Saladin Agriculture Directorate, Department of Statistics 2021

Table (1) shows the land areas in Salah al-Din Governorate

Total agricultural land area	orchards area	area of greenhouses	plastic tunnel space	Arable area	The uncultivable area
11712615	172392	3408	88549	6085932	5362334

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Source: Saladin Agriculture Directorate, Department of Statistics 2021

Table No. (2) Desertified lands and those threatened with desertification in Salah al-Din Governorate for the years 2011-2012

Governorate	desertified lands	threatened with desertification	Sand dunes	desertified lands	threatened with desertification	natural pastures
Salahaddin	3.500.000	520000	2320	3.500.000	540000	1.782.239

Source: Ministry of Planning and Development Cooperation, Central Statistical Organization, Food Security, Living Conditions, and Social Transformations in Iraq 2012, pg. 69

Table (3) shows the number of trees in Salah al-Din Governorate

The number of palm trees	The number of fruit trees	The number of olive trees	Total number of trees in Salah al-Din Governorate
516975	27384451	123358	28024784

Source: Saladin Agriculture Directorate, Department of Statistics 2021

Table (4) shows the number of trees to be planted

The total area	green space (orchards)	The area to be afforestation	Total number of trees	The number of trees to be planted At least 5 trees per acre
11712615	172392	11540223	28024784	5770000 Almost 58 million

From the table, it is clear that the entire area of Saladin needs afforestation, except for the nearby lands and on both sides of the Tigris River.

In order to draw up a plan for the afforestation process, three main elements must first be provided, financial allocations, availability of human resources, and finally, on the basis of that, a timetable for the implementation of the plan must be determined.

First: The size of the required financial allocations. This necessitates knowing the time period required to serve each tree. We can explain this in the following table

Table (5) shows the annual cost of planting one tree along with the cost

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Details	Amount	Details	Amount	Details	Amount	Details	Amount	Details
Average price per seedling with cultivation Irrigation system	10005000	Average price per seedling with cultivation Irrigation system	10005000	Average price per seedling with cultivation Irrigation system	10005000	Average price per seedling with cultivation Irrigation system	10005000	Average price per seedling with cultivation Irrigation system

And hereby analyze the price analysis

The cost of the seedling = 500 dinars

Agriculture = 500 dinars

The cost of an irrigation system for 30 dunums is 35 million, and for the number of trees is 7,000 trees = the cost of trees is 5,000 dinars

30 dunums that require 4 services * 12 months = 1,440,000 / 7,000 trees. The cost of a tree is a service = 2,000

From the foregoing and according to Table No. (5), it is clear that:

1- Planting trees as one of dozens of elements that contribute to combating desertification requires large financial allocations. In Salah al-Din alone, we need 14 billion annually, as a minimum estimate.

2- Planting a million trees in Salah al-Din, as an assumption, solidifies large human resources, as every 6,000-7,000 trees need 5 workers, as a minimum estimate, and this means that we need up to 750 workers.

3- Iraq aspires to plant a million trees in the field of combating desertification. In our hypothesis, we plant a million trees, and this cannot be achieved on the ground. Despite that, the time period is about 60 years.

4- The simulation and assumptions that we made are not true, but the truth is that it is not possible to plant more than 250 thousand trees, and this means that we need 230 years to combat desertification in Saladin

2-4 The feasibility of the participation of agricultural holders in afforestation

After we demonstrated the impossibility of reaching the number of trees required to be planted due to the inability to allocate large sums of money and provide manpower, and because the plan is very long and will last for generations, it was necessary to search for an alternative, which is the involvement of agricultural holders. This can be noted through the following table with Table No.

Table No. (7) shows a comparison between implementation by the government sector and the involvement of landlords

the details	**Seedling price**	**Irrigation system**	**Annual**	**guard**	**employees and**	**Total**	**The number**	**total cost**

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	rate with planting		servic e rate		administrato rs fuel and maintenance	costs	of trees to be planted	
Traditional afforestatio n according to the governmen t program	1000	5000	2000	1000	5000	1400 0	58.000.0 00	812.000.000.0 00 ID If a plan is drawn up for 58 years to implement the plan, at the rate of one million trees annually, this requires providing an annual amount of capacity 14,000,000,00 0 Hard to customize
Afforestati on according to the participati on of agricultura l holders	500 without cultivatio n	500 Equippi ng 1000 cubic meters of sound with drippers (200 thousand dinars) for every 500 trees	nothin g	nothin g	2000	3000	58.000.0 00	174.000.000.0 00 D.P. If a plan is drawn up for 58 years to implement the plan, at the rate of one million trees annually, this requires providing an annual amount of capacity 3,000,000,000

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								Customizable

The fourth topic

proposals and solutions

From Table No. (6) it can be noted that many of the paragraphs have disappeared, and that in the end the cost reduction is 75%, in addition to that afforestation is guaranteed by a large percentage because government sector projects may be cut off from the annual allocation or even delayed, which leads to the death of trees due to a generator malfunction or unavailability Fuel or even damage to the $100 control system can thwart a multi-million dollar project

The solution is for the owners of agricultural holdings to participate in planting trees within a plan that necessitates that and according to mechanisms that compel land owners in areas threatened with desertification to plant windbreaks, especially since most of these holdings are agricultural contracts. It is the state and this is considered an environmental tax that the Ministry of Environment can circulate to all sectors of society

Ingredients for success

Table (8) shows the number of wells and the number of farmers in Salah al-Din Governorate

Number of government wells	**The number of wells is a private sector**	**total wells**	**number of peasants**
4022	**37627**	**41639**	**57067**

Table No. 8 indicates that water and human activity are available in 4022 sites in the lands threatened with desertification, and that most of these sites in (Samarra Island, Tikrit, Baiji, and Sharqat, west of the Tigris River) produce the best types of vegetables such as watermelon, watermelon, tomatoes, and onions, as well as areas east of the Tigris River (Al-Naameh, Al-Moaidi, and a wild area Science) It is noticeable, despite this economic activity, that it is rare to see the presence of trees in these areas

Most of these lands are leased according to Law 35, and one of the paragraphs of the contract concluded between the Directorate of Agriculture and the lessor is paragraph IX (the owner of the contract is committed to cultivating wind resources).

What if the owner of the agricultural contract is obligated to plant windbreaks, and according to the concluded contract, and vice versa, the contract is considered null and void for the second party's breach of one of the terms of the contract, which in turn loses the farmer, even if he keeps the land, he will lose many of the privileges that it provides to the farmer, such as the supply of subsidized fertilizers, pesticides, and seeds, as well as, and most importantly, he loses his plan Agricultural crops for the winter crop, which is more important than marketing to the Ministry of Agriculture, within the following conditions

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1- Providing the Department of Forests and Desertification with seedlings, a drip tray and its accessories for free, and the number that is requested, provided that it is not less than the planned number.

2- The holder of the contract is free to choose the type of seedlings available in the department's nurseries

3- The owner of the land is committed to planting, watering and guarding the seedlings, and it is considered his property

4- A committee from the Department of Forests and Desertification and the Salah al-Din Agriculture Directorate prepares lists of the names of those covered by the annual plan, with education and an emphasis on the importance of commitment to agriculture and service

5- Recording the phone number and permanent contact by the supervisor from time to time to define the importance of the project and its seriousness for the owner of the agricultural contract and the formation of a special operations room for permanent communication

6- A work plan and a supposed timetable for the implementation of the program shall be drawn up by the above committee

7- The Department of Forests and Desertification, the Salah al-Din Agriculture Directorate, and the Extension Department are developing an indicative program on the risks of desertification and the importance of planting trees.

8- Appointing engineers to follow up and transfer information to the database

9- Printing agricultural brochures, which explain the importance of afforestation

10- Holding conferences, in coordination with the Agricultural Extension Department, tribal sheikhs and notables of the regions, because of their influence on their clans and regions, by holding banquets for which the sheikhs invite, and through them the mechanisms and objectives of the project are explained.

If the above program was applied and each farmer planted 500 trees, the number could be (500 trees * 41,636, the number of existing and registered wells only = 20,818,000, at a cost of 25%, with a high success rate in follow-up, and the land owner’s knowledge that the issue is of great importance

If a ten-year plan was drawn up and two million trees were planted annually, we would have made a big leap in the field of desertification, especially since the rate of tree planting by the state and organizations in this field does not reach 50,000 trees annually.

The importance of this program can be summarized as follows

1- Reducing dependence on the government sector in combating desertification and restricting a course to management, planning and education by holding conferences and distributing brochures that show the importance of planting trees and the dangers of desertification

2- Reducing the costs allocated to combating desertification, by transferring some agricultural operations from the government sector to the local population and owners of desert contracts, such as

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cultivation, seedling service operations, and guarding, and limiting the role of the government sector to seedling processing and supervision only.

3- The difficulty of implementing plans to combat desertification, since most of the lands threatened with desertification or desertification are leased, or the possessor intends to lease them, so he prevents us from establishing projects, and if he does not do so, he deliberately sabotages through grazing in the project.

4- Reducing property disputes, which often develop into armed conflict on land borders, by directing the planting of windbreaks on the property borders of land owners.

5- Educating the owners of desert contracts (the target group) on the importance of windbreaks in agriculture in reducing dust storms and their contribution to reducing temperatures, which reflects positively on agriculture.

6- Coordinating with the General Authority for Palm and working to introduce date palm cultivation as an important paragraph because of this tree's great economic importance, as planting ten palm trees for each family living in the desert contributes a great future to food security that threatens the world, in addition to being one of the durable trees that contribute to reducing Dust storms and desertification.

7- Planting trees significantly enhances Iraq's global role in its contribution to climate change and combating desertification and drought, for which Iraq has signed these agreements such as (the Paris Climate Agreement, the United Nations Convention to Combat Desertification and the United Nations Framework Convention on Climate Change), which gives it priority in obtaining grants. that help keep this work going

CONCLUSIONS

1- Desertification is a natural and human phenomenon that has environmental and economic effects on the climate and society and threatens thousands of people in all countries of the world.

2- Most areas of Iraq are threatened, as the percentage of areas threatened with desertification is 92%, and Salah al-Din governorate suffers from the same problem of desertification that Iraq suffers from.

3- The availability of the infrastructure of the population and artesian wells, with a number of 40,000 wells in all areas threatened by desertification, which is able to contribute to reducing costs and efforts in preparing afforestation programs.

4- Most of the owners of agricultural holdings have agricultural contracts No. 35, and the ninth paragraph stipulates that the owner of the contract must plant windbreaks around his agricultural contract

5- Dependence on the government sector requires large financial allocations with enormous human resources and a long period of time. Therefore, measures must be taken with the participation of all sectors of society, especially land owners in areas threatened with desertification.

6- Salah Al-Din Governorate needs about 60 million trees, and this requires a great exceptional effort

RECOMMENDATIONS

1- The need for immediate intervention and taking measures that limit desertification, as research centers emphasize that working in areas threatened with desertification outweighs the feasibility of working in desertified areas.

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2- Holding seminars and extension programs to introduce the dangers of desertification and the importance of afforestation as a key era in confronting desertification.

3- Enacting legislation that prohibits unjust cutting of trees while encouraging the establishment of investment projects in the field of planting desert medicinal trees.

4- Involving the cadres working in the Department of Forests and Desertification in the dialogues that require the development of solutions, as they are in direct contact with the problem and are aware of all the challenges.

5- Establishing committees from the competent ministries to find ways to implement the study and solve all legal and administrative obstacles

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