NEW DEVELOPMENT MODEL(S) FOR DESERT AND OASIAN ZONES

LIBYA
NEW DEVELOPMENT MODEL(S) FOR DESERT AND OASIAN ZONES
LIBYA

Amer Megri
Khaled Aisawi
Mohamed Amrani
&Said Helal
Required citation:


The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.


© FAO, 2022

Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO endorses any specific organization, products or services. The use of the FAO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons licence. If a translation of this work is created, it must include the following disclaimer along with the required citation: “This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO is not responsible for the content or accuracy of this translation. The original [Language] edition shall be the authoritative edition.”

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization http://www.wipo.int/amc/en/mediation/rules and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

Cover photograph: Palm trees - Matmata.

©FAO/Daniel Beaumont
## CONTENTS

Acknowledgments iv  
Acronyms and abbreviations v  
Executive summary vii  
I. Introduction 1  
II. Methodology 5  
III. Current development approaches for desert and oases areas 9  
   3.1. Description of the main pillars of current development approach 11  
   3.2. Typology and characterizations of current development approach 11  
   3.3. Challenges and opportunities of current development approach 14  
IV. Transformative development in desert and oasis regions 15  
   4.1. Policy dialogues outcomes analysis 17  
      4.1.1. The national dialogue 17  
      4.1.2. The Regional Dialogue 19  
   4.2. Pillars and accelerators of new development model 24  
   4.3. Innovations benchmarking and their importance for the new development model 24  
      4.3.1. Benchmarking of innovation 24  
      4.3.2. Description of enabling environments for the integration of innovations 25  
V. Description of the new development model 27  
   5.1. New orientation to improve development in desert and oasis regions 29  
   5.2. Vision of the new model 29  
   5.3. Principles of the new model 31  
   5.4. Strategic pillars of the new model 31  
   5.5. Description of enabling environment for the new model 31  
      5.5.1 Innovations' benchmarking 31  
      5.5.2 How to integrate innovations in the new model 32  
VI. Conclusions and recommendations 37  
   6.1. Conclusions 39  
   6.2. Recommendations 40  
Annex 41
Many thanks and appreciations are extended to the Food and Agriculture Organization of the United Nations (FAO) office in Tunisia for providing technical assistance and support in conducting this study. Special thanks are also given to Mohamed Amrani for his follow up actions and support and to all participants in the regional and national policy dialogues for their participation and contribution.
ACRONYMS AND ABBREVIATIONS

FAO  Food and Agriculture Organization of the United Nations
EXECUTIVE SUMMARY
The desert and oases in Libya constitute approximately 95 percent of the country’s total area. Despite some attempts by the government to develop these areas by establishing a number of agricultural projects to be run by the government, mainly in growing grain and legume crops and palm trees, these projects failed due to administrative corruption and the deterioration of the security situation in the country.

The private sector has flourished during the last two decades, but due to randomness, the pursuit of quick profits and the weak control of government agencies, these projects did not achieve the desired results.

The tourism sector, as well as the traditional local industries in desert areas and oases, have begun to recover in recent years, but unfortunately, the deterioration of security during the last decade has caused disruption to the tourism sector in Libya. The spread of oil and gas production fields in the desert areas and oases did not contribute to the development of these areas, but on the contrary, it caused an increase in the pollution of the desert environment.

The main objective of implementing these policy dialogues in these areas is to achieve spatial development and increase population stability and sources of income through investing available local resources. A special questionnaire was designed with the aim of activating the participation of local residents in assessing the current situation of desert areas and oases and hearing their opinions about developing appropriate policies for their areas.

This questionnaire was circulated in important municipalities representing desert areas and oases, and then an analysis of these opinions was evaluated for the purpose of proposing innovations for the development of desert areas. A regional dialogue for the five Maghreb countries was also conducted to share opinions and recommendations for the development of the Sahara and oasis in these countries. The results of these national and regional political dialogues have presented a set of proposed innovations for application in the Libyan desert areas and oases, which can be summarized in some basic pillars such as follows:

1. investment on the cultivation of crops adapted to dry environments, including date
palms, olives, prickly pears, medicinal and aromatic plants, garlic and onion crops;
2. encouraging manufacturing industries for the produced agricultural crops and its raw materials;
3. investment on the desert tourism;
4. reviving local traditional industries.

The main purpose of the above-mentioned investments is to achieve providing job opportunities and reducing unemployment rate, producing goods and services for local and national markets and reducing the rate of migration from desert and oasis to cities.
I. INTRODUCTION
The Libyan Sahara is part of the Sahara, which exists in the eleven African countries, including the countries of the Maghreb Union (Libya, Tunisia, Algeria, Morocco and Mauritania). The area of Libya is about 1.676 million square kilometers, of which arable land represents about 2 percent of the total area, which is equivalent to 3.7 million hectares. In Libya, the areas that receive annual rainfall of less than 50 mm annually are estimated at about 95 percent to constitute about 1.587 million square kilometers, which is the so-called Libyan desert, in which oases, palm forests, dry valleys and desert lakes are spread. The administrative division of the Libyan desert region includes 26 approved municipalities out of 100 municipalities in Libya.

The registered population in Sahara is about 792,335 people according to the general estimate of the population in 2018, which is about 9.5 percent of the total population of the country. In general, the inhabitants of the Libyan desert have not received sufficient development and improved living conditions in recent decades. Surface water is very limited and groundwater constitutes the vast majority of water resources as agricultural production in the Libyan desert depends entirely on permanent irrigation.

In the Libyan desert, there are many reservoirs and water basins, such as the Ghadames, Murzuq, Sarir and Kufra basins, many of which were used in agricultural projects for the production of grains and legumes. It was possible to produce a map of the vegetation cover in the Libyan desert from the agricultural mapping project in 2006 using remote sensing techniques and geographic information systems approved by the FAO. These studies indicated that there are about 9.52 million hectares that can be exploited as follow: 95 percent of grazing lands, 2.7 percent of agricultural lands, 1.8 percent of landscaping and palm trees and 0.5 percent of urban lands.
II. METHODOLOGY
II. METHODOLOGY

The methodology used in this study aims to obtain an overview of the most important natural resources in the desert and oasis regions in Libya and the ways of exploiting these resources at the present time. This methodology also aims to show the problems facing the development of natural resources as well as ways to increase their returns.

To achieve this goal, a special questionnaire was developed and distributed to a group of residents. This questionnaire included information on the distribution of the population in each region, agricultural and industrial activities, the health status and the impact of the COVID-19 pandemic, as well as the problems of migration and poverty, then identifying the problems, obstacles, opportunities and challenges facing each region.

The inductive method was used to examine the theoretical background of this area. This part includes a review of previous literature, collection of data and information available in the official reports published by the Ministry of Agriculture, and other relevant institutions, in addition to the questionnaire sent to some desert residents as mentioned above, and also telephone contacts with some farmers and decision makers. Finally, this report was also based in part on the findings of the first and second political dialogues, as well as the recommendations of the five working groups of the regional policy dialogue. The targeted areas were as follows:

1. The Western Region, which includes ten desert oases: Ghadames, Derj, Brak, Sabha, Ubari, Wadi Al-Bawanis, Wadi Utbah, Murzuq, Traghen and Ghat.

2. The Central Region, which includes three desert oases: Hoon, Waddan and Sokana.

3. The Eastern Region, which includes four oases: Jalo, Awjilah, Tazerbu and Kufra.
III. CURRENT DEVELOPMENT APPROACHES FOR DESERT AND OASES AREAS
III. CURRENT DEVELOPMENT APPROACHES FOR DESERT AND OASES AREAS

3.1. Description of the main pillars of current development approach

The description of the main pillars of the current development approach in desert areas and oases depends mainly on the agricultural sector, with its two types of plant and animal production. This sector has been under the direct supervision of the state during the previous decades, as large budgets were spent in this sector and huge projects were established in the field of grain crops, Legumes date palm, olive, animal production and others. The establishment of these projects were also accompanied by the presence of many factories which contributed to the transformational industries such as grain mills, oil refining, canning tomatoes and some other vegetables, packing and wrapping dates, and dairy factories. However, due to weak and corrupt management, randomness and lack of sustainability, the productivity of these factories was weak and did not achieve their main goals.

The other important main pillar is the oil and gas sector, as most of the oil and gas fields are located in desert areas and oases. There are recent trends in recent years to adopt oil and gas producing companies to contribute to promoting the spatial development of desert and oases areas. The desert and oases areas are also characterized by another pillar, which is the tourism sector and traditional industries.

3.2. Typology and characterizations of current development approach

a- Agricultural production

Plant production sector is the largest agricultural activity in the Libyan desert, and it is confined to irrigated crops in agricultural projects, in which wheat, barley and legumes are grown, as well as sorghum, millet and maize, in addition to some vegetables and fruit trees. The area of palm lands, which covers separate areas of the Libyan desert, is estimated at about 180,000 hectares. They are found in the desert oases in the form of palm plantations. Since the early seventies of the last century, many public agricultural projects have been established for the production of grains, especially wheat, barley, sorghum and legumes such as beans, chickpeas and peas, as well as animal production in many desert areas such as the Maknoussa, Irawan, Ariel and Barjouj projects in the southwestern region of Fezzan, as well as the Kufra and Sarir projects. in the southeast
III. CURRENT DEVELOPMENT APPROACHES FOR DESERT AND OASIS AREAS

region. The main objectives of these projects were to reduce the importing of grain, especially wheat, as well as to achieve spatial development in the Libyan desert, which works to stabilize the population. These projects depended mainly on permanent irrigation water from artesian wells that depend on groundwater. These projects have gone through multiple phases that can be summarized in the following: Firstly, the stage of construction and financing from the government, during the years from 1972 to 1989. Secondly, the stage of self-financing during the years from 1990 to 2002 when the projects covered their facilitation and investment expenses from their own revenues and the government’s support was stopped. And the last stage, the rehabilitation from 2003 to 2010 when a program was prepared to restore lost areas and improve the efficiency of operating assets, and the government took over the allocation and liquidation of an amount of 63 million Libyan dinars to implement the program. After the overthrow of the previous regime in 2011, the state’s support stopped and the governmental authorities no longer had any control over these projects, and thus they switched to applying self-financing policies again by cultivating cash crops, the most important of which is fodder crops. In recent years, these projects have faced many problems, as most of their components were stolen, especially the pivot irrigation pipes, and most of them are now unemployed and need significant financial support to return to production.

b- Oil, gas and minerals

Libya has reserves equal to 84.4 billion barrels of crude oil as well as 26 billion barrels of global reserves of shale oil. The daily production of oil is about 1.424 million barrels today. Libya also has a wealth of natural gas estimated at 55 trillion cubic feet. Natural ores and minerals such as iron, copper, nickel, tin, aluminum and others found in the Wadi Al-Shati desert area, and gold, iron, copper and lead are found in the desert area of Al-Awainat.

c- Tourism

Oases are considered one of the most beautiful and wonderful desert phenomena. They are found in the desert depressions, where the sources of water that help the growth of palm trees in particular. There is a diversity in the terrain of the vast Libyan desert, which is the basis for the development of various types of desert tourism, including sandy and
rocky deserts, deserts with high mountains and dry valleys. Tourist areas in the desert also vary greatly, such as drawings and carvings from prehistoric times, especially in the Acacus Mountains in the southwest. It also has salt lakes surrounded by dunes of sand, as in the Ubari regions, and traces of ancient Libyan civilizations are spread, including the Jarmant civilization, whose center was the city of Germa in the southern of Libya.

d- Traditional industries

Most of the types of the traditional industries that still exist in the desert areas and oases are usually carried out by women. The traditional industries from which many families feed are based on palm tree products such as hand fans, dishes, baskets; on the other hand, most of the traditional industries that were practiced by men such as ropes, traps and shoes, some building requirements such as the roofs of houses made of palm tree trunks and others have become extinct or are close to extinction. Some oases, such as Awjila Oasis, are also famous for making a kind of traditional cloaks of sheep’s wool, and other oases are famous for some clay industries, such as the tandoor, cooking utensils, and others. Some desert cities such as Ghat are also famous for making some types of gold and silver jewelry, knives, daggers, swords, rings, and some leather industries such as bags, shoes and saddles, which are a source of income for every family. All of these industries are suffering from a decreasing number of craftsmen and are therefore threatened with extinction.

f- Food industries

The most important food industries prevalent now in the desert areas are the industries that depend on the production of dates, especially in the southern and central regions, which produce about 75 percent of the total dates produced. These industries include date packaging and the manufacture of the date honey; furthermore, the date paste is used in the manufacture of the traditional sweets. Olive oil presses are also spread in some southern regions, after olive cultivation expanded in many areas. Although the demand for these products is very large; nevertheless, they are facing many difficulties. The most important difficulties facing these industries is the difficulty of its marketing due to the lack of the interest of the government in exporting these industries to the
global markets; moreover, the local population do not receive any support from the government through medium-term loans, nor do they receive any training.

3.3. Challenges and opportunities of current development approach

The main current challenges facing the development approach in the desert and oases areas can be summarized as follows:

1. The huge desert area (1.587 million hectares).
2. Scarcity of water resources.
3. The instability of social and economic security.
4. The demographic change in these areas, which cause many social and security problems.
5. The lack of the government support and encouragement to the traditional and food industries.
6. The educational level of the inhabitants which do not exceed intermediate level.
7. Inhabitants of the desert and oases areas are affected negatively by the COVID-19 pandemic.
8. The spread of various pests such as the red palm weevil and other pests.

In general, various investments in the fields of agriculture, food processing, traditional industries, tourism, oil and gas aim to activate the available capital to achieve the following:

- increasing the gross national income;
- increasing per capita income;
- providing job opportunities and reducing unemployment rate;
- producing goods and services for local and national markets;
- reducing the rate of migration from desert to cities.
IV. TRANSFORMATIVE DEVELOPMENT IN DESERT AND OASIS REGIONS
4.1. Policy dialogues outcomes analysis

4.1.1. The national dialogue

Results of the national dialogue showed that the average area of farms is about 13 hectares adopting a diverse cropping composition that includes field crops, vegetables, dates, olives and fruits. For example, farms producing dates only are 14.3 percent and dates and olives together are 19 percent, while farms producing dates and seasonal crops together are 19 percent, while those producing dates, olives and seasonal crops are 28.6 percent and only seasonal crops are 14.3 percent.

The percentage of farmers who have full-time work on the farm is estimated at 66.7 percent only; therefore, the survey showed that the percentage of farmers who resort to hiring additional labour is 47.6 percent, and the number of these workers ranged between 1 and 4 workers only. Also, one of the factors that increase dependence on additional labour is that some families are supported by a woman only, where the questionnaire showed that 77 families out of 917 (8.4 percent), are families headed by a woman. Owners of private farms tend to have low educational levels.

The survey showed that 38.1 percent of farm owners have basic education only, and 52.4 percent of them have intermediate education, while those with higher education are only 9.5 percent. Despite the poor educational levels of these farmers, 76.2 percent of them indicated that there are no agricultural cooperative societies for support; in addition, 66.7 percent of them mentioned that there is no positive role for the civil society organizations in their areas, and 100 percent of them confirmed that there are no agricultural extension services. Because of the previously mentioned factors (especially the educational level), a very large variation in annual income has been observed between farms. The annual return achieved for the majority of the farms (57.1 percent) was only a family self-sufficiency.

The questionnaire showed that 85.7 percent of farmers were negatively affected by the COVID-19 pandemic, and that the type of impact was mainly represented by the lack of employment and the difficulty of marketing production; furthermore, it appears from that the conditions that the desert areas and oases are exposed to are not the same,
as some of them suffer from instability and mass displacement to coastal cities, while others are witnessing relative stability, for example, the oases regions (Jaghboub, Jalū, Awjila, Ejkhera, Zalla, Waddan, Hoon, Sukona, Derg and Ghadames). It was found from the questionnaire that the percentage of (33.3 percent) of the cases of local migration to these regions, which witness relative stability, was due to the availability of stability and distance from wars. Most of the farmers have indicated that the most important environmental problems that their areas suffer from are the low groundwater level, and although (47.6 percent) of farmers implement the drip irrigation system; nevertheless, (23.8 percent) are still implementing the spate irrigation. Other environmental problems are the spread of agricultural pests, soil degradation and pollution with oil products.

The most important points that can be summarized from the information that was presented and derived from the survey, as well as from the questionnaire, are summarized as follows:

1. The area of the desert lands in Libya is 1.587 million hectares, and there are 26 municipalities representing these desert areas and oases, inhabited by approximately 792 thousand citizens.

2. Most of the activities practiced by the local population in these desert and oases areas are activities that depend on the agricultural sector, such as the production of dates (180 thousand hectares), fodder crops and some types of vegetables.

3. There are great tourist attractions in the desert areas and oases, but due to the instability of the security situation in the country, the tourism sector is almost disabled.

4. The traditional industries vary greatly between desert areas and oases, and they are mostly industries that are mainly carried out by women. These traditional industries face great challenges due to the government’s lack of encouragement.

5. There are many industries based on productive agricultural crops, the most important of which are those based on the production of dates. These industries also face a great challenge due to weak government support.

6. The government established many settlement agricultural projects and spent millions of dollars on them, but most of these projects did not achieve the desired goals due to randomness and lack of sustainability.
7. The private sector farms are adopting wrong strategies, and most of them do not take into account sustainability.

8. The questionnaire indicated that a large percentage of farm owners are not full-time to work on the farm and that most of them have an educational level that does not exceed intermediate education. Therefore, the annual return of most farms does not exceed the family’s self-sufficiency.

9. The questionnaire showed that most farmers were negatively affected by the COVID-19 pandemic, and the most important effects were the lack of employment, the difficulty of obtaining production requirements, as well as the difficulty of marketing production.

10. The vast majority of farmers indicated that the most important environmental problems they are exposed to are the low level of groundwater and the spread of new pests in their areas.

4.1.2. The Regional dialogue

The recommendations of the regional dialogue presented by the working groups are summarized as follows:

Group 1: What governance transformations are needed at the national and regional levels to ensure that areas benefit from sectoral policies, plans and development strategies?

The oasis and desert areas in the five countries acquire a specificity regarding their geographic location, extent, the severe climatic conditions (fragility, vulnerability), remoteness from the decision-making area and security issues (border areas). For these reasons, the ODA requires specific interventions and actions aiming their reintegration and their positioning in the process of sustainable and equitable development of the country.

The approaches:

- A development approach providing multiple opportunities (complementary and integrated), while moving away from working in silos and programs by sectors in isolation.
- Make these regions resilient through capacity development and human resources.
- Aim for territorialization with a vision of NEXUS between energy, water resources, food security, ecosystems, social capital.
IV. TRANSFORMATIVE DEVELOPMENT IN DESERT AND OASIS REGIONS

- Institutionalization of advanced regionalization encompassing large regions that operate with all actors and sectors in a horizontal manner.
- Territorialization of actions and activities carried out in the area.
- The establishment of an institution (structure) of coordination leading the integration of space through all its potentialities.
- Safeguarding diverse heritage (oases, archaeological sites such as ksours, unique landscapes)
- Ensure and exploit the multifunctionality and complementarity of territories based on their potential in terms of natural, human and cultural resources.
- Empowerment of actors, encouragement of decentralization and deconcentrating dynamics and ownership of development by all actors
- Aim to set up advanced regionalization that operates directly with the central office, supported by a clear political will.
- Establish a special fund for the sustainable and equitable development of desert and oasis regions and encouragement of Public and Private Partnership (PPP).
- Establish synergies between local governance and central power.
- At the Maghreb regional level, encourage the exchange of experiences and information within the framework of the network created by the FAO as a catalyst and coordinator.

Group 3: How can we ensure the mobilization of adequate funding (public and private) for the development of these areas?

- Consolidate and further enhance direct public investment towards structuring projects allowing the generalization of social services, job creation, improvement of productivity, social inclusion, human development, and environmental sustainability.
- Improve the partnership mechanism for mobilizing national and international investments, particularly in infrastructure.
- Adopt a resource mobilization strategy with international donors and cooperation for economic and social development and environmental preservation projects.
- Establish incentive mechanisms for the development of rural and female entrepreneurship in these areas.
IV. TRANSFORMATIVE DEVELOPMENT IN DESERT AND OASIS REGIONS

• Create a Development Fund for Saharan and Oasis areas (FDSO).
• Set up eco-conditionality mechanisms for subsidies for agricultural projects in favor of better preservation of water resources.
• Support local development associations and promote the development of the social economy as a lever for the development of IGAs for vulnerable groups.
• Establish budgetary decentralization criteria that ensure more justice and equity for ODA.
• Support and promote the development of local businesses in the green economy.

Group 4: What will be the roles of the sectors of renewable energy and tourism in the development of these areas? are there other sectors?

1. Among the most important sources of renewable energy are solar energy, wind energy, hydro energy, and organic energy. Since these energies are environmentally friendly and widespread in most of the North Africa region, it is necessary for public and private investments in these areas to benefit from them in all economic activities, knowing that this requires advanced technology.

2. Focus on establishing scientific research centers in oases areas.

3. The necessity of the participation of oil companies that extract oil from desert areas in contributing to the financing of economic development programs in these oases.

4. Paying attention to pastures that cover vast areas in the North Africa desert, where many natural plants and grasses are spread. These pastures are considered as grazing areas for camels, goats, and sheep. It can be as a source of livelihood for the inhabitants of these oases.

5. The necessity of investment in the desalination of saline groundwater for use in agriculture.

6. Giving financial and logistic support to universities and research centers for new innovations to improve the standard of living of the inhabitants of the desert and oases.

7. The necessity of circulating mobile phones and internet networks in order to link the inhabitants to each other to strengthening the social relations.

8. Encouraging oases students to study among the countries of the Maghreb to benefit and to transfer knowledge to contribute social and economic development.
IV. TRANSFORMATIVE DEVELOPMENT IN DESERT AND OASIS REGIONS

9. It is necessary to explore the undiscovered tourist attractions in these oases in order to invest in them in order to supply sources of incomes for the residents.

10. There is a huge wealth of medicinal and aromatic plants which God bless us. This wealth constitutes a great economic value for which demand increase both locally and globally due to its multiple uses and therefore it is necessary for public and private sectors to invest in this activity.

Group 5: What innovations: technological, institutional, and social, will be needed to ensure transformations?

Main points raised:

Social innovations

i. Exchange of experiences between Maghreb countries in water resources management in oases and the governance of pastoral systems.

ii. Decentralization of power and ownership of the development model by stakeholders in oases and desert areas (creation of appropriate institutions, like ANDZOA in Morocco, specific banks, etc.).

iii. Adoption of specific development models that break with sectoral approaches to development.

iv. Innovate to develop a model of territorial organization that takes into consideration the specificities of ODA in the Maghreb (dispersed population, low population density, etc.).

v. Scientific research must provide answers to the specific issues of the development of ODA.

vi. Promote specific value chain and economic sector approaches in oases and desert areas.

vii. Set up flexible and effective financing mechanisms specific to ODA.

viii. Diversification of economic systems and economics sectors enhancing the potential of ODA.

ix. Promote economic complementarity between ODA in the Maghreb region.

x. Valorization of natural resources which are not yet exploited or not yet explored (sands, salt water resources, waste water, landscape for ecotourism or cultural, etc.).
IV. TRANSFORMATIVE DEVELOPMENT IN DESERT AND OASIS REGIONS

**Technical and technological innovations**

i. establishment of highly specialized knowledge centers/hubs dealing with ODA issues and providing specialized capacity building;

ii. digital, technology, social, organizational and policy innovations;

iii. creation of remunerative activities with high employability, especially for youth;

iv. mainstreaming the use of the renewable energies (especially photovoltaic) and valorization in the various economic activities and in particular in the field of pumping irrigation water to reduce drainage cost;

v. promote technologies and resource governance models to boost the Climate Chance adaptive capacities of agro-ecosystems and socio-economic systems in ODA.

**Recommendations in the field of FAO/AMU/country partnership**

i. establishment of an FAO/UMA task force on the development of the Saharan and Oasis Regions (RSO) in the Maghreb,

ii. development of a study on the capitalization of experiences in terms of institutional and territorial organization with a view to promoting Nexus between different sectors, resources and technologies.

The most important recommendations that emerged from the fifth working group were as follows:

1. adopting modern technologies such as remote sensing and geographic information systems and their applications in evaluating the problems of desert areas and oases, such as the problems of degradation of vegetation cover and desertification;

2. legalization and control of the random expansion in the establishment of new farms, as well as the rationalization of water use and the adoption of modern irrigation methods such as drip irrigation;

3. adopting (clean) renewable energies such as solar energy to produce energy in desert areas.

4. adopting the modern technologies that monitor groundwater levels in the artesian wells;

5. adoption of research results related to innovative methods applied in scientific institutions in universities and research centers such as the Libyan Center for Desert Research and Development of Desert Communities;
6. activating the role of the plant quarantine and limiting the transmission of pests across local and international borders (the most important of which are palm pests such as the red palm weevil) for the Maghreb region;

7. activating the role of the agricultural extension and civil society organizations in rationalizing towards the optimal and sustainable use of natural environmental resources;

8. requesting the aid from the international organizations to help adopt plans that are applied in environments similar to the desert environments.

4.2. Pillars and accelerators of new development model

The Libyan inhabitants of the desert and oases did not receive sufficient development and improvement of their living conditions in the past decades. Therefore, it is necessary to look for a new development model that suits the needs of the desert and oases inhabitants. Among the most important pillars of this new model are the following: peace, security, public sector reform, rule of low, modernizing agriculture, and managing natural resources.

The only way to accelerate the new development in the desert and oases regions is by the application of the scientific research, which is considered to be the real and the correct entrance to development of society in desert and oases. Therefore, scientific research centers, colleges and intermediate institutes must be established to introduce modern agriculture in these areas. In addition to what is mentioned above, it is also necessary to construct paved roads and railways between oases areas, main cities and public markets.

4.3. Innovations benchmarking and their importance for the new development model

4.3.1. Benchmarking of innovations

The introduction of innovations to desert and oases in order to increase agricultural production for food security and improving the standard of living for reducing poverty must be measured. To ensure the effectiveness of these innovations in the local situation, a period of time may be required, which may be short or long period depending on the outputs of these innovations. The agricultural innovations must be viewed in three dimensions: individual, organization, and enabling environment.
4.3.2. Description of enabling environments for the integration of innovations

Agricultural innovations are essential element that contributed to the agricultural and social development, and plays an important role in achieving food security and reducing poverty in desert and oases regions. These various innovations whether in plant or animal production as in the agricultural industries sector, certainly need an enabling environment that stimulates and support innovations, and this requires strengthening the local capabilities of oases population. There must be partnership and fruitful interaction between the public sector and the local private sectors. In addition, it is preferable that these be a partnership between companies and institutes of the countries of the Maghreb region such as a regional center for Sahara and oases development to benefit from the policies and programs related to agriculture innovations in each country in order to provide an enabling environment to integrate these innovations. The government in countries must provide the incentives, the required resources, and support services in order to motivate individuals and institutions to continue in agricultural innovations to improve the standard of living of people of the desert and oases.
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL
5.1. New orientation to improve development in desert and oasis regions

The new approach for improving and developing desert areas and oases is the best way to address the accumulated problems due to wrong policies that were applied in these areas over long periods, which resulted in the deterioration of desert environments and the migration of their inhabitants to coastal cities.

The new approach for improving and developing desert areas and oases is the best way to address the accumulated problems due to wrong policies that were applied in these areas over long periods, which resulted in the deterioration of desert environments and the migration of their inhabitants to coastal cities.

5.2. Vision of the new model

The vision of the new model aims to create an attractive environment in the desert areas and oases by adopting a set of principles that develop these areas and enhance the stability of the population and provide a safe and stable environment. Most of the previous development models did not achieve the basic objectives for which they were set, despite the large amounts of money spent on them. It is now necessary to propose new models of development that take into consideration the needs and capabilities of the desert and oases region, in order to maximize the use of the available components and opportunities and achieve a better future for future generations. The vision for the new investment model in the Libyan desert and oases lies in the fact that these investments must be in sectors that have a competitive ability to lead social and economic growth, such as investment in the fields of agriculture, food and traditional industries, desert tourism and human development which the private sector can carry out with the support of state institutions, provided that investments in the fields of oil, gas, mining, solar energy and wind energy are left to state institutions as they need huge investments.

These investments in the above-mentioned fields provide great job opportunities for the inhabitants of the desert and oases, and reduce unemployment and migration to large cities.

The vision of the new development model, which should be implemented in the desert and oases region in Libya, should take into account the following:
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL

1. the necessity of studying and evaluating the limited natural resources (land and water) in order to determine the possible investment that does not lead to its depletion, in order to preserve the right of future generations;

2. choosing crops of economic importance which should be adapted for the desert environment, and achieving profitable export return, such as dates, olives, prickly pears, medicinal and aromatic plants, garlic and onions in order to achieve the largest possible degree of food self-sufficiency and the possibility of exporting them to some neighboring countries;

3. enhancing investment in human capital;

4. supporting investment in productive activities that support the agricultural sector, such as making use of crop residues in some manufacturing industries and investing in grading, packaging and cleaning various agricultural crops;

5. activating the role of the Agricultural Bank to contribute to agricultural development in the deserts and oases;

6. mobilizing and encouraging foreign direct investment in the agricultural sector and industries supporting agriculture to achieve economic growth for the desert and oases region;

7. develop agricultural policies that contribute to improving the standard of living of the inhabitants of the desert and oases. The most important of these policies are: the policy of supporting production, the policy of supporting production inputs, the policy of purchasing surplus production, the policy of supporting agricultural commodities and marketing policies;

8. supporting rural women financially and intellectually in order to learn and contribute to increasing agricultural production;

9. establishing scientific research centers as an important base from which all development projects are launched;

10. encouraging the private sector to participate in achieving spatial development in the desert and oases;

11. transfer of modern technologies and knowledge of developed countries and their settlement in deserts and oases in order to increase agricultural production;
12. encouraging investment in the tourism sector due to the presence of natural, environmental, historical and cultural areas in the desert and oases, as well as Libya’s proximity to the European Union countries interested in desert tourism.

5.3. Principles of the new model

The most important principles for implementing the new model are summarized as follows:

1. ensuring the participation of residents of desert areas and oases in adopting the new policies proposed in their areas;
2. preserving the natural resources of desert areas and oases, such as agricultural soil, groundwater, biodiversity, and non-renewable energy sources such as oil and gas;
3. taking into account the environmental and social aspects of development plans and the establishment of new projects and their impact on the medium and long term.

5.4. Strategic pillars of the new model

Spatial development of desert and oases area must have competitive ability to lead economic, social and environmental growth for agriculture sector, food industries, desert tourism, traditional industries and human development. The strategic pillars of the new model depend on adopting ideas that take into account sustainability, by encouraging continuous education and training for the inhabitants of the desert and oases regions, and holding training courses and workshops that contribute to the development of these areas.

5.5. Description of enabling environment for the new model

5.5.1 Innovations’ benchmarking

The most important benefits of new innovations as compared to traditional practices, which are proposed in desert environments and oases are as follows:

• Adopting modern agricultural transactions such as drip irrigation method instead of traditional irrigation methods such as spate or sprinkler irrigation. The application of this technique is working greatly to reduce water consumption, especially in the sandy soil that prevails in these areas.

• Adopting crop cultivation of dry environments such as date palm, olives and prickly pear and also adopt the winter crops and avoid the cultivation of summer crops.
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL

- Activate the role of the agricultural extension sector in desert areas, promote continuous education and training for the population of desert environments, establish training courses and workshops, which will correct some misconceptions and prevailing in farm management methods.
- Ensure the establishment of distribution patterns of production channels such as encouraging manufacturing of producing raw materials.
- Adopting renewable energy sources such as solar energy to reduce power outages and its influence on the development of desert areas.
- Promoting the desert tourism sector and provide complementary facilities such as hotels, tourist police and modern road networks will provide new jobs and contribute to increasing the stability of the population and enhance return migration.
- The revival of local traditional industries by establishing training courses and workshops will provide new sources of income to residents of desert areas.

5.5.2 How to integrate innovations in the new model

Innovations can be integrated in the new model as follows:

First: The sector of water resources, agriculture and food industries

The non-renewable water resources in the Libyan desert have contributed to providing the water needs of various rapid development processes in recent decades, which have been created by agricultural policies based on the concept of self-sufficiency. However, this approach did not take into account the concept of sustainable development and the preservation of the desert environment, and accordingly, the following tools of innovation and development must be followed:

I. Setting agricultural policies by the government in the form of subsidies or loans given to farmers in the oases.

II. Establishment of agricultural cooperative societies for each group of oases located in a geographical vicinity near each other to provide agricultural services to farmers and facilitate their access to agricultural equipment and inputs.

III. Adopting patterns of economic, social and environmental development that are compatible with the available water resources in the desert region, and setting priorities
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL

for agricultural development according to these resources to ensure the sustainability of its bid, and taking into account the rights of future generations.

IV. Libya, which shares underground water basins with its neighbors, is called upon to form joint committees or activate the current committees for cooperation and consultation on the best ways to achieve rational management of the resources of those basins, because their depletion will reflect negatively on all concerned countries.

V. Not to expand in the establishment of new irrigated agricultural projects (public or private) in the desert areas under the pretext of the abundance of water in the region, except after conducting accurate and necessary studies to determine the suitability of the lands for growing crops and studying the rate of safe consumption of groundwater in the basins of the region.

VI. When choosing crops to be grown in the desert areas, they must be characterized by the following characteristics:

1. To have low irrigation requirement, and to withstand drought, salinity and high temperature.

2. To be of great economic importance and profitable export return. Therefore, it is necessary to exclude crops that consume large amounts of water, such as watermelons, melons, tomatoes and summer fodder crops, and replace them with crops that have a competitive advantage locally and internationally, and have a profitable production and export return, such as luxury date palm varieties, specific varieties of olives, medicinal and aromatic plants, prickly pears, onions, garlic and others, to be irrigated with drip irrigation systems.

3. Past experiences have proven that there is a clear developmental imbalance between the efforts to develop agricultural production in the southern regions and those efforts to develop marketing services for this production. Therefore it is suggested that the government should buy the surplus crop from farmers at prices higher than that at the market prices.

4. Encouragement of civil investment in these sectors in the desert areas, provided that its people should find support and encouragement from the government through various financing channels.
5. In the sector of food industries, focus must be placed on investment opportunities in the agricultural and food industries associated with agricultural products that are suitable for desert areas, namely dates, olives, prickly pears, onions and garlic. Therefore, investment must be made in the following areas:

- investing in small projects, to ensure the spatial stability of the residents of those areas, and to create income opportunities that will achieve food security and a decent life for them;
- focus on industrial activities that do not consume large amounts of water;
- benefiting from clean and renewable solar energy in many activities of the food industry;
- focusing on value-added industries for agricultural crops produced, such as packaging, grading and packaging;
- utilizing the wastage of agricultural crops in some manufacturing industries for other uses, such as the production of medical alcohol and vinegar.

Second: The sector of desert tourism

Investments in the field of desert tourism are among the most growing industries in the world. Libya has a desert rich in natural, environmental, historical and cultural potentials. It is a candidate for being among the advanced countries in this industry. Desert tourism can be developed in Libya if a real program of sustainable development is taken into account in order to succeed in managing these tourism resources in a sustainable manner that ensures maximizing the economic, social and cultural returns. To make this the following points must be taken in consideration:

1. implementation of the guidelines for sustainable tourism in deserts, as announced by the World Tourism Organization;
2. dividing the Libyan desert into major tourist areas according to geography, landmarks and activities, provided that they are managed in the form of nature reserves, protected areas or national parks;
3. creating priority tourist areas, by providing technical infrastructure for these areas, including transportation services (land and air), communications, and enacting laws that
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL

preserve this wealth in the Libyan desert, and working to enforce it by creating qualified and trained tourist specialists;

4. determining the paths of tourist importance to be marketed and developing the necessary data for these paths, taking into account the type of tourists to be attracted;

5. encouraging private investors (the private sector) to invest in the field of desert tourism development, specifically in the areas of touristic hotels and providing tourism services, by facilitating the procedures for establishing specialized companies and granting them loans to finance their activities, in addition to providing them with the required exemptions and guarantees;

6. founding the necessary expertise to supervise the implementation of tourism programs, including tourist guides, supervisors of tourist sites, and workers in tourism marketing companies and the provision of tourism services;

7. develop programs to educate citizens and tourists about the importance of historical cities and oases and cultural and civilizational monuments, and to preserve the cultural and civilizational heritage of the oases and make them protected areas.

Third: The sector of human development

Increasing the interest in investing in human development is important in raising the level of capacity of workers, as decision makers. This can be made by focusing on the following points plans:

1. enhancing education at all levels in desert areas, and developing curricula to serve what can be produced under desert conditions;

2. establishment of technical institutes in the various desert regions to serve the economic activities which are practiced by the local population such as institutes or centers of desert agriculture, food industries, desert tourism, desert environment, language centers, technical information institutes, traditional crafts centers and others;

3. supporting and developing the Libyan Center for Desert and Oasis Research and Development, and providing it with adequate funding and specialized experts to carry out scientific and practical research that finds solutions to development problems and obstacles in desert areas;
V. DESCRIPTION OF THE NEW DEVELOPMENT MODEL

4. develop and implement indicative programs for workers in various fields of production, such as those working in the sectors of agriculture, industry, desert tourism, and marketing and exporting products;

5. paying attention to the media as an educational and informative tool in various fields of production, by various well-known means;

6. developing programs to stir the patriotic spirit, especially among young people, in order to keep them away from the outbreak of disputes between members of the same society, and to disappear manifestations of ethnic, tribal and intellectual intolerance.

Fourth: Government cooperation with regional and international organizations in the field of the Libyan desert development

Cooperation with regional and international organizations related to the development of deserts by providing funds to be allocated to the following activities:

1. providing technical support and advice to the Libyan government regarding the development of programs, plans, studies and project documents aimed at stopping the desertification and the comprehensive development of the communities living in the desert;

2. participation with the Libyan government in preparing bankable project documents and submitting them to donors, regional and international funding institutions to ensure the implementation of national plans;

3. providing all support, according to the available capabilities, to the areas most vulnerable to desertification and drought, to support the government in its efforts to maintain the stability of the lives of communities with few resources and at risk, as well as to preserve the distinctive biodiversity of the Libyan desert.
VI. CONCLUSIONS AND RECOMMENDATIONS
VI. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

1. The desert areas and oases constitute a large part of the area of Libya, amounting to approximately 95 percent.
2. Desert areas and oases are characterized by low population density due to the concentration of most of the population in coastal cities.
3. Most of the desert and oases regions suffer from the fragility of the environmental, economic and social systems, as well as the weak infrastructure and the lack of basic services that help to stabilize the population.
4. The government has tried for many years to support desert areas and oases by establishing major agricultural projects, but most of them have failed due to poor planning, administrative corruption and security instability.
5. Most of the private sector farms in desert areas and oases arose as a kind of random expansion accompanied by the cultivation of crops that were not suitable for dry environments and the adoption of wrong agricultural practices, which resulted in the mismanagement of available resources, the most important of which is groundwater.
6. Most of the farmers suffer from the absence of government support, especially with regard to agricultural extension services, frequent electricity power cuts, high cost of agricultural equipment, improved seeds, fertilizers and pesticides. In addition, the spread of new agricultural pests and the difficulty of marketing products.
7. The severe shortage of factories for the products of farms in desert areas and oases, such as factories for packing and packaging dates.
8. The weakness and deterioration of the tourism sector and the lack of supporting facilities such as roads, hotels and tourist guides.
9. The lack of educational facilities and research centers in the desert areas and oases, and the lack of agricultural extension and guidance services.
10. Absence of international cooperation and lack of technical assistance from international organizations and research centers in matters related to the development of desert areas and oases.
VI. CONCLUSIONS AND RECOMMENDATIONS

6.2. Recommendations

The most important recommendations proposed for the purpose of developing desert areas and oases can be summarized as follows:

1. For the success of the investment projects in the Libyan desert and oases, the state must set national development plans to include spending on building roads, providing drinking water, sanitation and electricity, as well as spending on social development projects such as education, health, communications and tourism, and investing in renewable energy such as solar and wind energy.

2. It is necessary to take into consideration all the recommendations mentioned in the item of pillars and accelerators of the new development model related to the development of water resources, agriculture and food resources, desert tourism, human development, and government cooperation with regional and international organizations.

3. The necessity of cooperation and support by regional and international organizations related to the development of deserts.

4. Exchange of information between the North African countries in the field of developing deserts and oases.

5. Establish new programs for the Sahara inhabitants that will take the youth away from social conflicts and racial prejudice.
ANNEX 1: Questionnaire for the Policy Dialogue Program on the Social and Economic Development of Deserts, Oases and Fragile Areas in Libya

1- Name ................................................................. Telephone number .........................................................

................................ Region ........................................................... Academic level .........................................................

2- What is the area of the farm?.......................... Hectare.

3- What are the most important productive activities in the farm? (Plant production - animal production)..............

4- What are the main crops produced?.....................................................................................................

5- What types of the livestock produced?.....................................................................................................

6- What is the irrigation method used?.....................................................................................................

7- What is the annual return of the farm?.....................................................................................................

8- What is the number of family members? Male ............... Female .................................................................

9- What is the number of family members working on the farm? Male .......... Female..........................

10- What is the number of additional non-family workers on the farm?..........................................................

11- Do you have an additional job besides working in your farm?..........................................................

12- What are the most important problems facing the farm? Mechanization, fertilizers, seeds, pesticides, electricity, fuel, water..........................................................

13- What are the proposed solutions to solve the problems facing the farm?..........................................................

14- Are there any agricultural associations in the area?.............................................................................

15- Do you have membership in any civil society organizations? ..........................................................

16- Do you think that civil society organizations play a positive role in promoting development and stability in the region?.............................................................................

17- Are there any agricultural extension services in the area?.............................................................................

18- When was the last visit of agricultural extension staff?.............................................................................

19- Do you store your agricultural products, and what is the method used?..........................................................

20 - How do you market your farm products?.............................................................................

21- What are the region’s most important infrastructure needs?.............................................................................

22- Have you received or requested any support from the government or any other party?..........................................................

23- When was the last time you received support?.............................................................................
24- Has the COVID-19 pandemic affected your activities on the farm?..............................
25- What kind of impact of COVID-19 pandemic on your activity? (production inputs, availability of labour, marketing production...etc.).................................................................
26- Did you get any kind of support to mitigate the COVID-19 pandemic?........................
27- What measures have you taken to mitigate the COVID-19 pandemic?...........................
28- Are there any cases of immigration out of the region?................................................
29- What are the main causes of migration out of the region?............................................
30- Are there cases of immigration to the region?............................................................
31- What are the main causes of migration to the region?................................................
32- What are the most important environmental problems that the region suffers from? Low groundwater level, groundwater salinity, spread of certain agricultural pests, deterioration of soil structure, etc.................................................................