Sustainable Development of Palm Trees in Al-Muthana Governorate

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Abstract:

This study aims at setting plans for sustainable re-cultivating palm trees in Al-Muthana governorate, which are able to face emergent and future changes of the conditions of palm trees cultivation. Such sustainable cultivation will preserve and increase high productivity of rare species and increase the ability to compete with its counterparts in neighboring countries. Moreover, the process may include recycling secondary products and waste. The year 2020 is the starting point and the year 2035 is the target year.

Keywords: palm tree, Al-muthana governorate, and sustainability

التنمية المستدامة لأشجار النخيل في محافظة المثنى

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الخلاصة :

تهدف هذه الدراسة إلى وضع خطط لإعادة زراعة أشجار النخيل بشكل مستدام في محافظة المثنى تكون قادرة على مواجهة التغيرات الطارئة والمستقبلية لظروف زراعة النخيل. وستعمل مثل هذه الزراعة المستدامة على الحفاظ على إنتاجية الأنواع النادرة وزيادة إنتاجيتها العالية وزيادة قدرتها على التنافس مع نظيراتها في البلدان المجاورة. علاوة على ذلك، قد تشمل العملية إعادة تدوير المنتجات الثانوية والنفايات. عام ٢٠٢٠ هو نقطة البداية وعام ٢٠٣٥ هو العام المستهدف.

الكلمات المفتاحية : (شجرة النخيل، محافظة المثنى، والاستدامة).

Introduction:

Palm trees is considered one of the most important trees that used in several food and industrial fields and one of the major sources of national and local economies. Palm trees are main source of food and agricultural exports in addition to its role to decrease unemployment since cultivation needs many employees in the field of services, industry and commerce. Furthermore, palm trees waste can be used as fodder for animals in addition to other economic aspects.

Scientific and field studies affirm that this tree will be more sustainable based on what the waste it gives in case it is invested in leading and sustainable industrial projects. This view is confirmed by recycling palm trees wastes in one of UAE plant in the oases of Al-Ain.

1- The Study Problem

- How can we transform into palm trees sustainability in light of several limitations including limited awareness, limited resources, and climate changes?

2- The Study Hypothesis

The logical analysis of the conditions of cultivating palm trees in Al-Muthana governorate affirms that the choice of sustainability is the ideal one during this critical time. Economic, political fluctuations, and climate changes which their effects and negative aspects are obvious. These effects push towards adopting the choice of sustainability as it is successful in most of its aspects and perspectives. Therefore, a road map is drawn till the year 2035 to track these plans success during this specific period of time.

3- The Study Objective and Significance

The study aims at showing new tendency that needs to be given attention. This tendency, on one hand, starts to invade the world and agricultural countries that plan to preserve their agricultural resources. On the other hand, modern agricultural methods should be followed. So the importance of sustainability will increase and raise the value of this resource over time due to the world's search for organic food in all its forms. So, palm trees could be cultivated in new areas or focus on rare and highly productive species that

could be expanded and developed sustainably especially when the essential requirements are met.

4- The Study Methodology

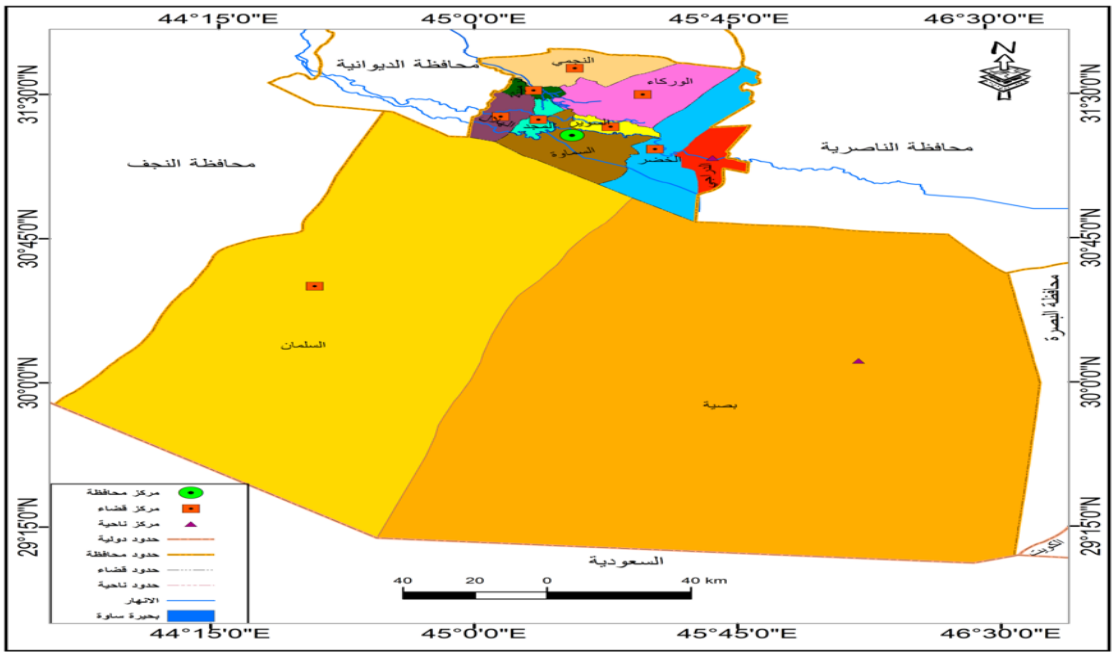
The study adopts the deductive inference approach to analyze all elements that control sustainability conditions discussed in this paper then identify the factors concluded here through using available statistics and data.

5- Limitations of the Study Area

The limitation of the study area is Al-Muthana governorate, which is about (51740 km^2) equivalent to (20696000 dunums) ; (11.9%). The coordinates of the governorate are between the two latitude circles (5 -29° - 31 -42° north) and between the two longitudes (50 -43° - 32- 46° East). The governorate's border from the north is Al-Qadisiyah governorate, Basra governorate from southwest, Dhi Qar governorate from northeast, and Najaf governorate from west. The governorate has international borders with Saudi Arabia from the south, map (1). The study area includes (9) districts, where four of them established recently [(1)]. Table (1)

The duration of the study starts with the year 2020 as a base year due to the availability of data for this year for palm trees cultivation till the year 2035, which becomes a target year.

Map (1) administrative units in Al-Muthana governorate



Source: the researcher depending on Republic of Iraq, Ministry of Water Resources, General Authority of Survey, Dept. of Maps production, Al-Muthana administrative map. Scale: (1:50000) Baghdad, 2018.

Table (1) Area of Al-Muthana governorate based on the administrative units (km^2), 2020

Administrative unit	Area (Km^2)	percentage
Al-Samawa city center	**680**	**1,3**
Al-Swaer district	**261**	**0,5**
Al-Rumetha district	**106**	**0,2**
Al-Majd district	**145**	**0,3**
Al-najmi district	**654**	**0,6**
Al-Hilal district	**321**	**1,3**
Al-warka district	**978**	**1,9**
Al-Khidhir district	**1260**	**2,4**
Al-Daraji district	**407**	**0,8**
Al-Salman district	**22396**	**43,3**
Bsaya sub-district	**24532**	**47,4**
total	**51740**	**100%**

Source: the researcher depending on: Republic of Iraq, ministry of planning and development cooperation, central system of statistics and information technology, annual statistics, Baghdad, 2020.

6- Trends of Traditional Agricultural Development

To know the trends of traditional development of specific area has many positive sides, which gives a clear picture of the geographical area, where the sustainable development will take place to set up the scientific strategy. To know these trends, several statistical methods will be used.

6.1 Changing trends of palm trees orchards in the study area (2010- 2020)

To give a precise and apparent picture of development trends of palm trees orchards in the study area during (2010-2020), Orchards should be studied at the level of administrative units to identify the constraints that will hamper the desired development and follow statistical methods of absolute change, relative change,* and the use of the equation of relative index number [(2)]. To

determine the development trends as shown in table (2), there are two trends of change process of the cultivated study area:

- Positive trend: It represents the higher percent of change in the area of palm trees orchards as seen the district of Al-Rumitha by 194%, Al-Najmi district by 166%, and Al-Hilal district by 122%, respectively.
- Negative trend of change in (Al-Samawa, Al-Warka, and Al-Majd) by (6.8%), (9.2%) and (17.6%), respectively.

*absolute change= year of comparison – base year

Table (2) trends of development change of the orchards area in Al-Muthana governorate (2010-2020)

No.	Administrative unit	Orchards area in 2010	Orchards area in 2020	Absolute change	Relative change	Index No.	Index result
1	Al-Rumaitha	**680**	**2000**	**1320**	**1900**	**294,1**	**194**
2	Al-Samawa	**8050**	**8600**	**550**	**8500**	**106,8**	**6,8**
3	Al-Khidhir	**2225**	**3800**	**1575**	**3700**	**170,7**	**70,7**
4	Al-Warka	**2745**	**3000**	**255**	**2900**	**109,2**	**9**
5	Al-najmi	**424**	**1129**	**705**	**1029**	**266,2**	**166**
6	Al-majd	**1700**	**2000**	**300**	**1900**	**117,6**	**17,6**
7	Al-Swaer	**2015**	**3000**	**985**	**2900**	**148,8**	**48,8**
8	Al-Daraji	**700**	**1010**	**310**	**910**	**144,2**	**44**
9	Al-Hilal	**675**	**1500**	**825**	**1400**	**222,2**	**122**

Source: the researcher depending on Table (1).

6.2. The change of trends of palm trees productivity during (2010- 2020)
*absolute change= year of comparison – base year

- Relative change= comparison year- base year/base year X 100
- Relative index number= comparison year/ base year X 100
- 100 is deducted from the result of index number equation to identify the growth indicator whether it is positive or negative. If the indicator is more than (100), it is positive and vice versa.

Table (3) shows that the change of productivity trends is the following:
- Positive tendency: in Al-Daraji by (1983.5%) and Al-Hilal by (757.5%), the production increased significantly more than the rest of the areas due to the attention given to this sector and the increase in financial allocations, and the loans given to farmers with low interest.
- Negative tendency: in Al-Warka district by (-11%).

Table (3) the change of productivity tendencies in Al-Muthana governorate (2010-2020)

No.	Administrative unit	Dates production in 2010 (ton)	Dates production in 2020 (ton)	Absolute change	Relative change	Index No.	Index result
1	Al-Rumaitha	**2525**	**2822**	**297**	**2722**	**111,7**	**11,7**
2	Al-Samawa	**17780**	**18149**	**369**	**18049**	**102**	**2**
3	Al-Khidhir	**1467**	**1845**	**378**	**1745**	**125,7**	**25,7**
4	Al-Warka	**3431**	**3055**	**-376**	**2955**	**89**	**-11**
5	Al-najmi	**1426**	**1506**	**80**	**1406**	**105,6**	**5**
6	Al-majd	**2257**	**3100**	**843**	**3000**	**137,3**	**37**
7	Al-Swaer	**3688**	**5270**	**1582**	**5170**	**142,8**	**42,8**
8	Al-Daraji	**67**	**1396**	**1329**	**1296**	**2083,5**	**1983,5**
9	Al-Hilal	**73**	**626**	**553**	**526**	**857,5**	**757,5**

Source: the researcher

6.3. The change of productivity trends in the study area (2010- 2020)

Productivity of palm trees fluctuated between stability and decrease. If there are no serious steps taken to increase dates productivity as compared to other governorates as in Wasit governorate, its productivity is about (81.3 kg) or in Baghdad about (72). Also, when we compare the situation with other countries' productivity that is high such as Saudi Arabia, UAE, and Oman, we will know that we need more serious steps.

Generally speaking, the tendency was negative in all administrative units. Table (4) shows that Al-Daraji, Al-Swaer, Al-Hilal, and Al-Majd get (-4,5%), (-5%), (-4, 2%), and (-2%), respectively.

Table (4) the change of trends of productivity development in Al-Muthana governorate (2010-2020)

No.	Administrative unit	Dates production in 2010 (ton)	Dates production in 2020 (ton)	Absolute change	Relative change	Index No.	Index result
1	Al-Rumaitha	**61,4**	**62,4**	**1**	**-37,6**	**101,6**	**1,6**
2	Al-Samawa	**64,5**	**64,6**	**0,1**	**-35,4**	**100**	**0,1**
3	Al-Khidhir	**48,1**	**48,1**	**0**	**-51,6**	**100**	**0**
4	Al-Warka	**50,4**	**51,8**	**1,4**	**-48,2**	**102,7**	**2,7**
5	Al-najmi	**47,6**	**48,7**	**1,1**	**-51,3**	**102,3**	**2,3**
6	Al-majd	**49,3**	**48,3**	**-1**	**-51,7**	**97,9**	**-2**
7	Al-Swaer	**58,1**	**54,9**	**-3,2**	**-45,1**	**94,4**	**-5**
8	Al-Daraji	**45,7**	**43,2**	**-2,5**	**-56,8**	**94,5**	**-5,4**
9	Al-Hilal	**48,2**	**47**	**-1,2**	**-53**	**97,**	**-2,4**

Source: the researcher

7- Strategy of sustainability and it Alternative

There are certain visions, mission, and objectives for each strategy since it represents one of the most important practices and mechanisms to adopt and apply concepts of modern management in any public or private institution in industrial, agricultural or service sector. Drafting detailed strategic plans to

achieve objectives of the strategic plan depends on formulation of the mission and vision of the plan, which are related to content and objectives of the strategic plan.[3]

1- Vision: strategic vision focuses on increasing the area of cultivated land especially the rare and productive species to bolster up the sustainable development of resources to support rapid transformation into advanced levels.
2- Mission: the strategy provides the geographical and informational ground to develop palm tree cultivation. The cooperation between scientific research and the farmers will create model orchards and utilize desert areas in addition to enhance rapid exchange of information and encourage training in all aspects of the process.
3- Objectives: The objective of this strategy confirm with the objectives of the agricultural sustainable development. The objectives can be summarized by the following:

1-Achieve self-sufficient palm shoots and dates of all kinds based on populations' needs to decrease and eliminate the import of all those products.

2-Sustainable supply to various national and non-national industries of basic agricultural raw materials.

3-Develop national potentials to export palm shoots and dates abroad.

4-Create many job opportunities for most different people that contribute to reduce the current and growing workforce that enters the labour market annually.

4- Draw an investment map that takes into consideration geographical, natural, and human aspects in addition to the regional features of the study area to improve production efficiency. This step will help to integrate to reach on the national level to the highest productivity and create policy for crop whether for local consumption, export or manufacturing.

8- Stages of Strategy

The proposed strategy includes several steps of the field findings in addition to the weaknesses of some of these points. The stages are the following:

1-The importance of human development: Human development is of great importance in all areas, including the agricultural sector. The importance can be seen in the following:

- Individuals who enrolled in new jobs need special training to do their duties in a proper way.
- Jobs and businesses are changing continuously, where some individuals move from one job to another, and they do not stick to one job. Therefore, it is necessary to train them on their current jobs.
- The emergence of technology and development have consequences on emerging new jobs or eliminating old ones in the labour market, which require develop, train the individuals for their new jobs.
- Establish new industries that are not existed before, which requires people in charge of these facilities to train and polish workers' skills to meet the requirement of the new jobs. Even if those individuals are highly skilled and competent, they need special training in their new jobs.

Capacity building and development of human resources become urgent needs in agriculture sector. This can be achieved through:

2- Support government institutions by designing and implementing specialized training programmes especially in the following basic fields;
   - Transform agricultural techniques
   - Draft and analyze different policies including agricultural and sound decision- taking.
   - Take the regional and international issues and changes seriously to benefit from similar experience.
   - Develop negotiation skills on the regional and international levels in the issues related to agriculture, water, and environment.
   - Organize and manage agricultural sector to conform to the latest developments in the world.
3- Establish database for human resources working in agriculture to preserve sustainable agricultural development;
   - Farmers
   - Professionals and craftsmen

- Researchers
- Policy- makers and decision- takers
- Enhance university agricultural education and rehabilitation programmes and investigate education outcomes that conform to sustainable agricultural development.
- Allocate sufficient funds to capacity building in different agricultural sectors.
- Find more effective ways of exchanging experience.
- Create friendly environment in the work that helps innovation and creativity, and contributes to stabilize agricultural environment.(4)

The development plan will be in the following;

1- Agricultural Guidance

Agricultural guidance is one of the most important development aspects. The development of the agricultural sector depends on the development of guidance ways that will ensure qualitative transformations in the agricultural process. This can be done through adopting modern agricultural techniques, tools, and scientific visions to apply them wisely and skillfully.

International calls, especially the World Conference on Development in Rome in 1979, confirmed the need of agricultural guidance should reach all producers and beneficiaries. Therefore, all countries adopted agricultural guidance as a tool to develop and improve agricultural sector through specialized guidance systems. Agricultural guidance is based on a process directed to make positive and fundamental changes in the beneficiaries' knowledge, skills, and trends in addition to improve communication on the levels of individuals, collectively and publically and motivate the farmers to propagate and adopt scientific agricultural development, which will be and part of their daily agricultural systems. (5)

Agricultural guidance aims at training and developing farmers' abilities, maximizing his production efficiency, increasing his income, and living standard. Developing guidance plans and programmes should be adopted in the future agricultural programmes. Agricultural guidance can be summarized in the following points:

1.1. Compliance with the palm trees calendar of cultivation

Establish agricultural calendar of palm trees cultivation is highly important and serious. Most farmers are unaware of the global climate changes. These changes bring new features and factors that have effects on the expansion or reduction of agricultural lands in addition to the changing dates of different crops, and palm trees is one of those crops.

1.2. Agricultural scientific research

Scientific research is considered one of the major requirements of implementing effective and continuous agricultural development. It has a prominent role in the development and enhancement of modern agricultural methods that handle the obstacles and problems, which encounter the agricultural march of development. There is a huge gap between agricultural research in the world and between the Arab countries including Iraq. Expenditure of research and experimental development does not exceeded (0.2%) out of gross product in comparison to (2.8%) in the advanced countries. So, the result of applied research is limited and does not have any developmental effect [(6)].

- Develop palm trees tissue culture

There are certain types of palm trees cannot obtain their shoots only in early years especially the good and rare species. This will lead to increase their values and costs in addition to difficulty of cultivating them due to shortage of their shoots. [(7)] The difficulty to reproduce, weak resistance to diseases, severe environmental conditions, the difficulty of hybridization, and the length of the time palm shoots need until they grow and produce.[(8)] All these reasons motivated the tendency towards tissue culture of rare and highly productive types to overcome difficulties of getting appropriate numbers and acquire sufficient number of palm shoots as compared to reproduction based on the traditional way that takes several years. Thousands of shoots can be attained from a single palm during period of time that not exceeds 4 years [(9)].

Palm trees produce (6-15) shoots during their lifetime depending on the palm trees species. These shoots are similar to the original mother, where they are taken and cultivated in the field. Based on this idea, tissue culture method started to reproduce date palm trees, which is largely adopted in some Arab countries like Egypt, Morocco, Iraq, Saudi Arabia and UAE.

There are certain specialized scientific centres established to proliferate palm trees [10].

During last two decades, tissue culture technique developed rapidly to improve plants and get new species. In 1990, Morocco kingdom produced more than 150 palm trees and more than 60 million trees other than palms in France. [11] Tissue culture has several advantages including: [12]

1- Obtain great number of seedlings and saplings using a few tree mothers of good quality and type, and free of viruses.

2-Obtain small size saplings within specific period of time with which is important in sales and transportation at low costs.

3- By using genetic engineering, it is possible to obtain a hybrid with good qualities and features.

4-Obtain shoots of rare palm types that have lost their ability to reproduce or become old.

5-Tissue culture shoots are identical to the original mother tree (100%) [13].

6-There are no loss or damage trees in this method by (100%).

7-Palm trees shoots can be obtained throughout the year.

8-palm tree shoots have a lot of roots unlike other traditional shoots, so they don't need much water for irrigation.

9-Low prices of cultured plants in comparison to traditional shoots.

10-Many ways can be adopted to reproduce palm trees.

The study area is empty of such activity and can be found in limited scope. This process encounters several difficulties including:

- High price of palm shoots because of the increasing demand for specific types of palm trees like Al-Barhi, Al-Majhol, Al- Saq'i, and Daqlat Al-Noor, which make farmers adopt traditional ways of cultivating certain types.
- Transferring palm shoots from laboratory and planting them in the farm needs special attention from specialists in this field.
- Some farmers do not have the will to plant cultured palm trees since they are afraid of their future production, where some types like Al-Barhi due to the lack of fruit setting, where some types unfertilized.

- Some types of palm trees have low percentage of success, which causes losses for farmers.

2- Second Stage: Establish Model Orchards

Although agriculture developed significantly in the world, it is still subject to the influence of changing environmental and climate factors especially the effects of global warming. Therefore, it is necessary to take these factors into consideration for the success of any future agricultural project. To organize the steps of establishing a productive farm in a way that can follow the steps of constructing the farm, it would contribute to save much time and effort to reach a successful model farm in the shortest ways. This project should be preceded by preparatory steps including:

1- Ensure the soil is appropriate for cultivation by taking samples from different spots to determine its salinity level and status as being fit for cultivation.
2- Identify the area for cultivation in the first stage
3- Level the soil and identify the spots of planting palm trees.
4- Prepare the locations of planting palms in straight way.
5- Provide the project with integrated system of drip irrigation.

Rare species of more than 95 types are cultivated like (**Barhi by tissue culture, local Barhi, Balka, Brem, Omrani, Shuaithi, Maktom, Shukar, Khistawi, Zahdi, Fahal, Akht Al-Fahal, Taha Afandi, Khiarah, Khadhrawi, Basrawi, Tabarzal Ahmar, Hasawi, Magawi, Digal Hilwa, Digal Hamra, Mir Haj, Mtawaq, Tabarzal, Awedi, Saay, and Shuaithi Ahmar)**. The most modern and technological agricultural techniques are followed to plant these palm trees, where the project includes nutrition and fertilization programmes with supervision of a specialized company. There are more than 14 thousand palm trees cultivated in this project.

- Project of rehabilitation Palm trees orchards

The project is one of the investment plan projects that was approved by the Council of Ministers to enhance agricultural sector. It is implemented by the State Commission of Plams in 2008, the cost of the project was (90) billion IQD and Al- Muthana governorate share was (1000,450,1000) 1 billion and 4 hundred and fifty million IQD. The project gives farmers loans without

interest for a period of (10 years) to cultivate new orchards, palm stations, and develop and rehabilitate old orchards so that the study area can be self-sufficient from dates, and able to export.

- The Project's goal

1- Improve the agricultural sector to achieve sustainable development by granting all types of agricultural loans from the Agricultural Bank to develop economy and reduce unemployment.
2- Improve palm trees productivity by removing old, weak and infected palms and replace them with new ones.
3- Increase the number of palm trees in the governorate and their productivity and encourage farmers to take care of palm trees, and compensate trees shortage.
4- Increase the number of palm shoots after developing action plan of the project, which includes handing over one palm shoot to farmers, in return, the farmers return four palm shoots after eight years of planting the tree.
5- The project aims to increase rare and good types of palm tree especially the commercial and highly demanded types in local and international markets. Also, guide farmers to adopt scientific and technical methods to run their orchards.

- **Terms of the loans of selected palm orchards**

1- Survey the orchards of the study area to approve the old decaying orchards that have been affected by pests, and trees of 70 years old or those that their height is more than 10 m, and the orchards that affected by natural and human factors.

2. Orchard property deed that is included in the loan should not be state-owned or included in the removal and curettement, and not used for a project. It means that the orchard will remain in the same situation after project execution.

3. The orchard land included the loan should be fertile and near water sources and irrigated by surface or by means irritation, availability of roads, power source. Moreover, there are no legal concerns or heirs' claims or affiliated to any entity.

4. Survey all palm orchards in all administrative units and contact the orchards owners to get their approval to reconstruct, rehabilitate orchards, and cultivate new species.

5- The General commission of Agricultural Guidance and Cooperation implements seminars and training guides and farmers as well.

Affected orchards due to aged, decayed, and infected trees are counted. The orchards that meet the loans terms are subject to follow up after forming supervisory committees.

The project is funded by loans given to the land owner to enable him to get agricultural equipment to prepare the land for planting palm trees. The amount of loan is determined by the survey committee and other sub-committees. The duration of loan disbursement is (10) years on one condition that payment will start after (7) years or as Loan Fund committee decides the way of paying back. The loans that are received will be supplied with materials and supplies, which include:

1- Modern drip irrigation systems that cost 10-12 million IQD.
2- Provide palm trees shoots by local prevailing prices in the markets.
3- Supply palm orchards with organic and fertilizers.
4- Provide palm trees pesticides and control of all pests for all orchards included in the project

After survey and follow-up, the project area should be at least (5) (dunums) and no more than (10) (dunums) then the orchard is defined to start periodical supervision and measure soil salinity (Ec), which should be less than (5 mg/L). The method of planting palm trees depends on the quadruple system and the distances should be (8x 8) equivalent to 40 palm shoots per dunum.

Palm trees species are determined according to certain percentage; for commercial palm is (80%), rare palm (16%), and male palm (4%). So, the orchard land is treated as an uncultivated vacant land that is ready to be planted with palm trees shoots according to the agricultural system. When the project is completed, it is turned into a national program and project's success and results are evaluated in the study area.

1- Al-Khidhr Palm Trees Station

It is one of the agricultural stations to establish mother date palm orchards in Al-Khidhr district. The project started in 2008 in an area of (90) dunums. It was divided into (10) plant nurseries that included many types of local and tissue culture date palms. The district is selected since it is one of the affected areas and has many problems in palm tree cultivation. (14)

The goal of establishing these stations is to increase the number of palm trees, preserve rare and commercial species, improve dates prices, adopt modern methods and technologies in palm cultivation, use modern machines in marketing, production, and control of pests infecting palm trees. Furthermore, the station compensates farmers with new palm shoots and regenerates palms (15). The project can be employed as a genetic bank of palm species to conduct studies, experiments to increase and improve productivity.

3-**Third Stage: Agricultural Sustainable Development**

Generally speaking, sustainable agriculture aims to produce healthy and adequate food through the wise and rational use of natural resources, and it aims to balance agricultural production and preserve natural resources. The balance is between consumption resources and ensure the next generations rights, which depend on essential factors including society, environment, and economic. Moreover, sustainable development is required to think over environmental effects of any human activity that harms human health and natural resources ability to regenerate and sustain (16). One of the studies has concluded that the definition of the term (agricultural sustainability) has three common topics including plant and animal productivity, environmental quality, stability and ecological stability, and the socio-economic system applicability.

Sustainable agriculture is the agriculture that aims to:

- Guarantee reservation and use of natural resources as effectively
- Environment friendly, which preserves the natural environment and causes no harm.
- Economically feasible to ensure realistic incomes that match agricultural investments.

The system of agricultural sustainable development starts by identifying the vision of agricultural sustainable development to divide it to a group of long, medium, and short-term objectives. Also, formulate policies to achieve these goals through master plan and detailed plans, develop programmes, projects, and activities for all agricultural sectors. This system recommends proper mechanisms, means and techniques to implement them in addition to periodical follow up to what is achieved to prevent any defects or mistakes[17].

Among the most important aspect of agricultural sustainable development is to protect the agricultural environment in a way that safeguards the farmers' lives and bio-systems surrounding them. This can be done by reducing water pollution, minimizing pesticides use, and organic fertilizers. Also, an important aspect includes developing systems of geographical distribution by setting up necessary infrastructure to develop agricultural production, and agricultural marketing systems that meet social needs. The aforementioned systems require development of agricultural services supported by scientific research, agricultural guidance, marketing, and structures of agricultural institutions.

Agricultural sustainable development prepares agricultural resources to the best alternative uses and adopts the latest agricultural technology. This step needs to oversee land shoveling, reduce loss of agricultural soil, stop excess water of irrigation, stabilize bio-nitrogen, and expand production of grains, and maintain genetic diversity. The achievement of the above mentioned issues requires successful resources management to avoid the collapse of environmental system, which includes deterioration of land, pollution, loss of biological diversity, deforestation, erosion, and desertification of agricultural lands.[18]

The sustainability of palm trees cultivation may include the following:

1- Utilize the distances between palm trees especially in the early stages of the trees and plant crops of quick growth or trees of good revenues.
2- Benefit from recycling irrigation water to irrigate palm tree especially when surface irrigation is used.

3- Use palms and other trees wastes as a source of organic fertilizer to enhance soil organic properties.
4- Cultivate sustainable or new crops with palms to provide palm trees with fertilizers, irrigation, and soil ploughing.
5- Pesticides- empty control that depends on biological control as the control of dubas by using aphids.

This strategy is manifested in five main goals:

- Develop a renewable and sustainable agricultural system.
- Enhance orchards owners' ability to increase their income by 50%.
- Build up nutritious integration within those orchards.
- Increase palm trees resistance to accelerated climate changes.
- Preserve vital resources and reduce the environmental effects of traditional agriculture.

Palm cultivation is an important source of many secondary products of the tree wastes. The cultivation of palm trees and associated works is an important source of employment. But most orchards follow traditional methods of agriculture. Traditional cultivation practices are prevalent in the study area. The manufacture of secondary products is still traditional in addition that the agricultural systems in remote palms areas is threatened by many changes especially the environmental ones.

Palm trees environmental benefits are not limited to decrease temperature or fight desertification, but it includes the trees' wastes. Each palm tree produces 100 kg of wastes per season. Some types are highly nutritious and organic matter, which includes "composing," a type of environment-friendly organic fertilizer that produced by recycling wastes instead of burn them.

4-Fourth Stage: investment of desert lands:

1- Green belts: they can be defined as large green areas surrounding cities. Also, they are defined a land of an open area used as a buffer zone within urban areas. Due to large and disorganized urban areas and their environmental effects, green belts are introduced as a solution for these problems. So, the main goals of green belts are the following:

- Control and downsize urban development within limited areas that should not be exceeded.
- Stop merging neighboring urban centers.
- Maintain cities distinguished features.
- Provide recreational areas for people in the cities.
- Provide more green cover to cities that has other benefits like:
    - Reduce average temperatures within cities.
    - Reduce air pollutants.
    - Provide wildlife habitats and biodiversity around the cities.

If we discuss these points, we will find that they never discuss the investment opportunities in such area in line with the UN's sustainable development goals. The desert areas that covers large parts of the study area, especially in the absence of palm orchards due to reasons discussed earlier as in Al-Salman and Al-Bsayah districts, They can be invested to create green belts according to Iraqi specifications and transform these areas into productive ones in addition to other aforementioned.

2-Palm trees tissue culture station in Al-Samawa desert

The palm trees tissue culture station Al-Salman district is one of the specialized stations to cultivate local and cultured palm shoots. This project was inaugurated in 2008. The project area is (5000) dunums, which included a number of tissue cultured palms brought from the general commission of palms laboratories in neighboring governorates in addition to some local species.

The project is equipped with modern and advanced irrigation systems through the drilling several artesian wells that provide water by pipes This project's goal is to cultivate tissue culture palms using advanced techniques to produce genetically modified plants free from bacterial diseases and give many palm shoots from one mother within standard time. But, the project closed due to economic and political reasons, where many palm shoots are lost and the remaining ones are taken into Fadak orchards in Karbala governorate [(19)].

- **Conclusions**

1- There are positive and negative tendencies of development in the study area, which contributed directly and indirectly to outline the proposed strategy and development alternatives.

2- The positive tendency: it represents the higher percentage of change in the area of palm trees orchards as seen in (Al-Rumaitha) by (194%), (Al-Najmi) by (166%), and (Al-Hilal) by (122%), respectively.

3- The negative tendency of change in the areas of orchards is in (Al-Samawa, Al-Warka, and Al-Majd) by (6.8%), (9.2%) and (17.6%), repectively.

4- Positive tendency: it appears in the growth of dates production especially in Al-Draji by (1983.5%) and Al-Hilal by (757.5%). The production increased greatly, which exceeds other parts of the governorate. The growth of production was due to the farmers' interest that appears after increasing financial allocations and loans with low interest. The negative tendency is clear in Al-Warka district by (-11%).

5- There is no significant change in the date palm productivity. There are no serious steps to increase date palm productivity in comparison with other governorates; Wasit governorate date palm productivity is (81.3 kg) or Baghdad governorate (72 kg).

The average of change in the date palm productivity was negative in all administrative units as seen in Al-Draji, Al-Swaer, Al-Hilal, and Al-Majd districts productivity by (-5,4), (-5%), (-2,4%), and (-2%), respectively.

Recommendations:

1- Achieve goals of agricultural sustainable development discussed earlier since they cope with national development goals.

2- Conduct fundamental and continuous changes to strategies that are flexible and dynamic to adapt to changes that occur or will occur.

3- Establish research centers to develop date palm species and select more production types that meet farmers' agricultural potentials.

4- Adopt sustainability as an option to ensure reservation of resources and renews traditional methods of cultivating date palms.

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