The phenomenon of desertification in Iraq and its environmental impacts on middle and southern Iraq, Babil Governorate, as a model

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Abstract:

The exacerbation of the problem of sudden climate changes in Iraq threw its weight on the phenomenon of desertification and the effect, especially on agricultural lands. As desertification rates continued since the eighties of the last century and until now, at an increasing pace, as Iraq suffered from the problem of soil salinity, which is still continuing until now, as well as the manifestations of desert encroachment due to the impact of rapid climate change, especially in the elements of temperature and rain, as this led to the expansion of desertification and encroachment towards agricultural and pastoral lands, so desertification began to worry the international community and attract the interest of researchers in a remarkable way since the 1960s, the early interest in desertification contributed to the crystallization of this concept and the growing interest in it.

The area of sand dunes that we are studying is located in the east of Babil Governorate, with an area estimated at one thousand Iraqi dunams (2500000 square meters). In recent years, the issue of treatment for these dunes has been raised, especially in the year 2010 and beyond, by the Department of Forestry and Desertification of the Iraqi Ministry of Agriculture, despite this, there were control operations by the farmers of the region, but on a limited scale. In the year 2014 to 2016 AD we continued work in the region and put forward a set of control operations in the process of stabilizing sand dunes through the cultivation of various crops, including wheat, barley, etc, the process of digging naughty trenches with dimensions of 4 meters, the width of the trench, 3 meters, the depth, and the length depends on the length of the sand dune, as the length of the sand dunes ranged on average between 50-150 meters, as well as planting several types of forest trees that are suitable for the environmental and climatic conditions of the region.

These methods of control in the treatment of sand dunes can have results after a period of time estimated between 5 to 10 years, with good management of the land, either by the farmers of the area or by the concerned departments supervising the control operations, as well as following up the various treatment processes of trenching, planting crops, planting forests and other operations.
Introduction:

According to the United Nations Desertification Conference in 1977 AD, desertification was defined for the first time as diminishing or destroying the biological potential of the land, which ultimately leads to the formation of desert-like conditions, then, in 1991 AD, it was redefined as land degradation in arid and semi-arid regions resulting from harmful human impacts, in 1994, desertification was defined, according to the United Nations Convention to Combat Desertification, as exposing the land to degradation in arid and semi-arid areas, which leads to the loss of plant life and its biodiversity, this results in the loss of the topsoil and then the loss of the land's capacity for agricultural production Support animal and human life.

As desertification affects the lives of nearly one billion people in a hundred countries of the world within the systems of rainfed agriculture and irrigated agriculture, with an area estimated at more than (3.5) billion hectares, as the world annually loses (10) million hectares of land through desertification, according to the statistics of the 1990s, the annual production losses exceeded (42) billion dollars, while the United Nations estimates that the costs of activities to combat desertification such as prevention, repair, and rehabilitation of lands will cost only half of this amount annually, which is approximately 21.4 billion dollars annually, in addition to the social problems associated with desertification, the most dangerous of which are migration from the countryside to the city, cross-border migration and others.

The problem of desertification worsened in the eighties of the twentieth century dramatically, which created negative impacts on all environmental, economic and social levels and in many countries of the world, therefore, the concept of desertification entered international and political forums, especially after the 1977 Nairobi Conference in Kenya (Al-Sha`ab, 1988), with the exacerbation of the problem of sudden climate changes that threw its weight on the increase of desertification, Iraq is among those countries that have been affected by this phenomenon, for several reasons, including climate change, Low rainfall rates, misuse of natural pastures, urban encroachment on agricultural lands, unsustainable agriculture, poor irrigation operations and others (Eulewi et al.,2017).

As most regions of Iraq are affected by desertification in all its forms and drought to one degree or another, the seriousness of this phenomenon has been realized in Iraq, but the means to combat it at the national level have not risen to the level of the threat it poses to confront the phenomenon of drought and combat desertification(Kubba, 2008) , as the area of sand dunes in Iraq, according to satellite data, in 1976 AD represented 4245 km², while in 2009 AD it became 22411 km², an increase of 19% (Al-Husseini, 2013). Although most countries of the world have developed national strategies and programs specialized in them by taking adaptation and mitigation measures to confront the phenomenon of drought and combat desertification.
The aim of the research:

- Taking all possible measures to stop desertification, due to the dangerous consequences it causes.
- Stopping the phenomenon of desertification to a minimum
- Treating other phenomena caused by desertification in one way or another

Work materials and methods:

Through our observation of the research area for a period of two years from 2014 to 2016, and through the many field trips, a clear picture of the research area was formed, with the development of appropriate solutions for treatment. Therefore, the method of work was divided into two stages.

Office work: through meetings in the Babil Environment Directorate to discuss the work mechanism that will be followed to complete the study, including the number of field visits that are required to be conducted in the sand dunes, the number of samples for samples that will be brought, determining the devices that are required to be used in the study, discussing the treatment methods that can be performed in the area and what is the appropriate, least expensive method.

-Laboratory work: included the use of software such as Arc Map 10.2, Arc Catalog, the required data, especially with regard to the space data of the Land Sat satellite, for three periods, 2001, 2006 and 2014, as well as satellite images of the Quick bird for the year 2012.

Through the above-mentioned work steps, satellite programs and data, the locations of desertified areas have been determined, through the Land Sat satellite indication for the year 2014 with a satellite image of the Quick Bird with high spatial resolution, Eleven sites of desertification, represented by sand dunes, have been distinguished within Babil Governorate, with an area estimated at one thousand Iraqi dunams, altitude from 28 to 42 meters above sea level, as shown in figure (1) (Babylon Governorate Environment, 2014).

Location:

Babil Governorate extends between latitudes °32′7″ - °33′8″, and between longitudes °43′42″ - °45′50″ east, the governorate occupies a central location in the central region of Iraq, as it represents the northern part of the central Euphrates region. The area of the province is 5119 km2, representing 1.2% of the total area of Iraq (Encyclopedia of Civilization Hilla, 2012),figures(1,2).
Figure (1) the movement of sand dunes and their shapes in the study area
Preservation soil properties:

Sedimentary soils prevail throughout the whole governorate, as they consist of layers that differ in texture and mineral composition within the soil section. Soil is characterized by depth and is continuously renewed by covering it with light layers of soil transported with river water (Al-Bouradi, 2006), in addition to what the wind
contributes to the formation of the soil through its transfer of silt particles, clay, sand, so it can be said that the soil in the governorate in general is one of the types of soils transferred, this difference in the amount of sedimentation processes has led to differences in some local properties of the soil, so it can be said that the soil texture is mostly between an alluvial mixture to a silty clay mixture (Karbal, 2001).

-Iraq climate:

The nature of the climatic changes that occurred in Iraq played a major role in this aspect, approximately until the period 1970-1979 AD, the climate of Iraq and the world was characterized by ideal humidity and temperature after this period, the process of climate change began in Iraq, especially due to the nature of the events that the country went through, especially the three Gulf wars that Iraq fought (1980 - 1988, 1991 and 2003), which had their effects, especially the radiative effects of the change in temperature, as the average summer temperatures reached between (38-45) degrees Celsius, in the winter between (16-26) degrees Celsius, the period 2001-2010 began to clear the difference in temperatures, as well as rain, the climate of Iraq is warm, with a clear difference in this period in the first period (1970-1979) (Iraqi Meteorology, 2010).

Results and discussion:

The locations of sand dunes in the east of Babil Governorate, which are located along the highway linking middle and southern Iraq, which represent a serious case of desertification in Iraq, have been identified through the space declaration and an area estimated at a thousand Iraqi dunams (2500000 square meters) (Babil Agriculture Directorate data, 2014), it can be increased if the appropriate measures are not taken. It can be said that the soil of the region (agricultural soil) is of a mixture of alluvial type with pH neutral, the Ec values are low to medium and the soil texture of the dunes is a sandy mixture (the sand grains of 59% and the remaining few percent represent the granules of silt, and some other organic residues) which are chemically formed from the same chemical components of the rocks from which they originated. Sand dunes are either homogeneous or heterogeneous, their color is either light yellow due to the presence of quartz mineral and the absence of organic matter or reddish brown due to the presence of iron oxides, PH values are neutral with average (Ec) values.

It can be said that the area we are studying falls within the second world classification of desertification (moderate desertification), as the dunes of the region, whether they are small or medium dunes, have an effect in one way or another through their encroachment, covering the crops planted near them, such as the wheat and barley crops, with some salinity in the area, resulting from either the ground water that rises in the winter, or through abandoned lands Unused due to the lack of water, especially in the spring, summer, with the great role of climate change, especially the amount of rain and high temperatures, in increasing the desertified areas in Iraq.
Through our observation of the treatment methods in the area by the farmers, we found that their methods, despite their simplicity, we find in them the character of determination and will, that setting theoretical chapters on our part in the treatment cannot amount to their methods of treatment, as we met many of them and showed us that follow-up treatment is the best way to eradicate the desertification phenomenon. This actually gave us an incentive to continue and deal with working with them, we also gained experience in some treatment methods (Figures 3, 4).

Figure (3) a space statement for a treatment method through planting crops (green color)
Figure (4) of the treatment methods Cultivation of the wheat crop by farmers

One of the treatment methods that have been proposed by us is to divide the area into sectors of different areas, according to the areas of the dunes, to cover the area in which they are located, as the first step is to dig slit trenches 4 meters wide for the trench, 3 meters deep (figure 6), according to the length of the dune, the way it moves with the direction of the wind, as most of the direction of the winds in Iraq is northwest, these trenches will be the end areas of the dunes, burial or die. This method of treating sand dunes is one of the modern methods applied in America in the last two decades of the twentieth century, as it had good results in this aspect, Figure (5).

Figure (5) Scheme of sand dunes for the study area
After making the above-mentioned trenches with their previous specifications, we come to complete the treatment methods by utilizing the areas between these trenches, which are represented by sectors that differ in widths, lengths according to the lengths and areas of the dunes as they are planted with different crops, whether summer or winter. With the exploitation of the area close to the trench, a distance of one to two meters, by cultivating it with forest types of trees, including (Casuarina equisetifolia, E. camaldulensis, E. gomphocephala, Azaclirachta indica, Acasia Arabica, Terminalia catapa, Tamarix articulate) and others, as these trees represent the second front line of the dune after the trench, at the same time these types of trees provide shade for crops. In the future, various environmental changes may occur, from changes in temperature, humidity, rain, wind, pressure, the most important point in this aspect is with changes in soil preservation.

In similar cases around the world in arid and semi-arid regions (rains 150-300 mm), especially in the Horn of Africa in Kenya, Somalia, and Sudan, to stop the advance of desertification, sand dunes. A bunds and another 20 meters to facilitate surface water runoff and to conserve water, Various crops of yellow corn, millet and others are grown between these bunds. Agriculture is the main economic sector in Kenya and it is the main source of income for about 80% of the population (Van Dijk & Reij, 1994).
Conclusions and Recommendations:

1- Increase the environmental awareness of our societies in general about the phenomenon of desertification and its danger to the environment, through various media.

2- To stop the encroachment of sand dunes and through various means of stabilization, whether mechanical or chemical.

3- Monitor all possible efforts, through various departments from the environment, from agriculture, irrigation and other specializations for cooperation, and work to stop this phenomenon dangerous to the environment.

4- Preparing studies, research on desertification, its effects and activating these studies in various control processes.

5- Relying on practical field experiences, especially for those dealing with this phenomenon, to support them financially and morally, represented by Peasant, farmers as they have an important role in this aspect.

6- A final, important point, to apply the above points, every point must be taken seriously to stop this phenomenon, as every day of delay in the fight means an increase in the scourge of desertification.

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