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THE ECONOMIC COSTS AND CONSEQUENCES OF DESERTIFICATION IN IRAQ

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ABSTRACT: *This paper focuses on the problem of desertification which Iraq is facing, and which is threatening its food security and affecting its social and economic development. The degrees of desertification have increased to the point where it affects %75 of the total land space of Iraq, and particularly the arable areas. This is due to several causes; some of it is caused by natural circumstances, while others are due to human activities which led to the salinization of the soil, deterioration of the plant cover and formation of sand dunes. This intensified the economic consequences in Iraq, and led to reduce of productivity. The state is burdened with large amounts of money in the reclamation of the deteriorated lands. The immigration from rural areas to cities has increased, poverty has spread and unemployment is rife. It also caused the extinction of many plant and animal species in the period 1990 – 2010. This paper indicates that the cost of combating desertification is around 10.3 – 20.5 billion dollars. This is a huge cost which affects the present and future economic situation that leads to decreases the generations in development and progress.*

KEYWORDS: Desertification, Economic Costs, Salinization, Iraq.

INTRODUCTION

Desertification's is a global problem. It harms the environment and damages all aspects of life. It has become one of the most important problems from which many countries around the world suffer this has prompted the international community to draw to its hazards and to combat them through various international, regional and national organizations, since it constitutes an environmental, economic, social and health challenge. Iraq today faces this serious hazard. Statistics reveal that (100) thousand dunams are annually lost in Iraq from its arable lands as a result of desertification. This is produced by a number of natural and human factors. These in their turn caused environmental, economic, social and cultural serious problems, the most prominent of which are: the shrinking of the arable lands, the deterioration of agricultural productivity, the immigration of peasants, the movement of sand dunes and the blowing of sand and dust storm which increases the pollution of the air.

The areas of arable lands in Iraq are estimated at around 44.5 million dunams. This constitutes about 26% of the total area of Iraq, which amounts to 174 million dunams of which 21.8 million dunams at best are exploited in agriculture (Ahmad, 2012). The low figure of agricultural lands in comparison to the total area is due to salinization and desertification. Vast areas are exposed to these hazards, transforming them into sterile and unproductive areas. To grasp the gravity of this situation let us remember that these areas have surpassed 92% of the total statistical area of the country (Haktanir, 2004).

This is the fundamental problem of our research. Desertification is not merely a threat; it is a real catastrophe in environmental and economic terms. The purpose of this paper is to highlight the causes of this hazard and to suggest measures to deal with it.

The starting – point can be summarized as follows:

1. A number of natural and human factors have jointly caused a high rate of desertification in Iraq.
2. The decrease of agricultural productivity in Iraq is due mainly to desertification.
3. This research is based on the descriptive method in collecting data, and their classification.

In this study, a descriptive method was used to collect and analyze the data related to the desertification in Iraq, as well as, evaluating the human efforts to combat this hazard through consulting scientific sources and references, which deal with this subject

THE THEORETICAL FRAMEWORK OF THE RESEARCH

The Concepts of Desertification:

The concept of desertification began to assuming significant importance since the seventies of the 20th Century. It became the center of interest in the international bodies and agencies, especially after the UN conference on desertification in 1977 at Nairobi. The first map of desertification was drawn in the same year by the bodies attached to the UN. In 1994, the UN agreement to combat desertification has defined this concept as "the deterioration of the fertility of the soil in areas which are arid or semi-arid and dry or semi-dry". It is mainly due to climatic changes and human activities. This means that desertification is a process which destroys the vital bio – energy of the land, causing the deterioration of the environmental system by causing it loses its balance. This land to the deterioration of the bio-environmental systems in the dry, semi-dry and semi-moist areas is a result of dryness accompanied by mal-practices of man while using the land. This may lead eventually to conditions similar to those prevalent in the deserts. Also, this deterioration in the environmental systems and the shrinking of the bio-energy of the land will cause effects and problems to the human life. The deterioration of the land includes the erosion of the soil, the disappearance of the plant cover and salinization, which means the accumulation of salt. (UNDP, 1992); (Imeson, 2011); (Kepner, and Mouat, 2003); (Mainguet, 2011); (Kannan, 2012).

Pessimistic studies stipulate that around one third of the cultivated land will go out of cultivation, due to desertification in the 21st century.

The Conditions and Degrees of Desertification

The conditions of desertification and their degrees differ from one area to another. It is so according to the difference in the kind of relationship between the natural environment and the method used by man in exploiting its resources. Each degree of desertification is distinguished by a number of specific characteristics, which are used to measure and define the nature of desertification. (Pastemak, and Schlissel, 2001); (Mainguet, 2011).

The UN conference convened in Nairobi on 1977 distinguished between four kinds of desertification according to their degrees of intensity. It is as follows (Alsaadany, and Almileegy, 2006):

- **Slight desertification:** One of the most prominent characteristics of this kind of desertification is the damage or localized and slight destruction of the plant cover, as well as the reduction of the productivity of the soil.

- **Moderate desertification:** This kind of desertification is characterized by a moderate damage to the plant cover, the formation of small sand dunes and the salinization of the soil reducing its productivity by (10%-50%).
- **Severe desertification:** This kind of desertification is characterized by the extensive spreading of wild grass and undesirable plants. This is accompanied by the increased erosion of the soil. Large gullies are formed. The salinization of the soil is increased to the extent that (50%) of its productivity is lost.
- **Very severe desertification:** This kind of desertification is distinguished by the following characteristics: the disappearance of the natural plants, the formation of large sand dunes and the severe erosion of the soil, so that the rock-bottom will appear with the formation of many deep and large gullies. This is the most serious kind of desertification, as shown in Table 1.

Table 1: The maim physical divisions of Iraq

Area Details	**Area (in Million Dunams)**	**Relative Importance (%)**
Deserts	67.4	38.7
Plains Including Marshes and Lakes	53	30.5
Mountains	36.8	21.1
Terrains	16.8	9.7
Total	**174**	**%100**

Source: Central Statistical Organization-Iraq, statistics book, 1998/1999, Baghdad 2000.

Table 2 shows that most of the total areas of Iraq were exposed to desertification in its different forms and degrees, which represents almost 70% of the whole country. Plant cover was lost, and dunes appeared. Military action had its toll in this respect from 1981 till 2003 and after. Economic blockade did the rest. This left Iraq in ruins as shown in Table 2.

Table 2: The degrees of desertification in Iraq

The Degree of Desertification	**The Estimated Area (in 1000's Dunams)**	**The Percentage**	**Plant and Land Characteristics**
Slight desertification	45.138	25.8	The plant cover is lost
Moderate desertification	99.950	57.5	Plant cover is lost and erosion of soil begins
Severe desertification	22.908	13.5	Increasing appearance of decertified spots
Very severe desertification	5.823	3.2	Appearance of sand dunes and disappearance of upper layer of soil
Total		**%100**	

Source: Ministry of water resources, Baghdad, Iraq, 2010.

The Causes of Desertification in Iraq:

The causes leading to the intensification and the expansion of desertification in Iraq are divided into two groups:

A- The first group includes the natural causes.
B- The second group includes the human causes.

Natural Causes:

These include factors related to the climate and the soil. The following are examples of such factors: the stoppage of rain, and the dry years and the erosion of the soil. Statistical studies indicate that (90%) of the total area of Iraq is included within the zones of dry and semi-dry climate. Heat increases in the summer to about 52^{o} centigrade. The average rate of evaporation rises significantly, and the number of sunny days reaches to (260) per year. In addition to that, the north-westerly winds are dry, hot and bring local dust; it accompanied hot, and dries long summer (Alfarajy, 2001); (Ministry of Planning, 2007)

Human Causes:

It includes the huge increase in the number of population, leading to similar increase in the rate of consumption. The following are some of the most important human factors of desertification:

a) *The growth and increase of population*: it is expected that the Iraqi population will reach about 33.5 millions in 2015; this was affected on the decrease of the share of the individual land from 1.2 dunames in 1970 to 0.43 dunams in 2012 (Bruinsma, 2003).
b) *The casual and haphazard cutting of trees in forests*: A statistics study indicates a continuous shrinking in the areas of Iraqi forests. The area of forests was estimated about 1.9 million hectares in 1970, decreased to 1.5 million hectares in 2005, which means that these areas were lost about 12 Km^2 in average per year. This is due to the human activity in cutting tress to use the wood in house building, heating and cooking. This is in addition to the palm trees which were decreased from 30 million trees to about 11.5 millions because of wars and military operations. (Ministry of planning, 2007); (AOAD, 2011).
c) *The deterioration of pastures*: the area of pastures in Iraq is estimated around 44 million hectares in 2005. It is shrunk to 32.1 million hectares in 2010. (AOAD, 2011).
d) *The decrease in the productivity of the land*: the rate of cultivated lands in Iraq has decreased from (12.2%) of the total area of the country to (8.3%) during the period 1970-2010. The rate of the annual growth of agricultural productivity in the cultivated areas has decreased from 3.7% in the eighties of the last century to 0.2% in the first decade of the present century. (Alfahed, and Abas, 2011).
e) *Urban expansion*: The rapid and vast numerical increase of the population was accompanied by the consequent increase of the area allocated for urban expansion. This was accomplished at the expense of fertile agricultural lands. The rate of urban population in Iraq has increased from 39% in 1957 to 67% in 2010, and it is continues to increase. (Alatraqchy, 2012).

SYMPTOMS OF DESERTIFICATION IN IRAQ AND THEIR ECONOMIC CONSEQUENCES.

The salinization of the soil:

The soil became sterile as a result of incorrect irrigation and the absence of proper drainage (Alhakeem, 2009). This can be shown in Table 3 for areas of salinization in Iraq, and Fig. 2 for the desertification lands in the middle and south of Iraq.

Table 3: Areas of salinization in Iraq

Governorate of District	Area (In Dunams)
Babel	743776
Anbari Saqlawiyah – Ramadi	12500
Anbari Al – Khoura – Rawah	625
Wasit	%75 of the area of the governorate
Al – Muthanna	360325

Source: Ministry of planning, environment statistical (2007).

Figure 2: Desertification lands in the middle and south of Iraq

The Deterioration of the Plant Cover:
This is due to Rap hazard grazing as a result of the increase in the number of animals which surpassed the capacity of the pastures to feed them (Al-Anny, 2013).

The Formation of Sand Dunes:
This is due to several climatic conditions which include the following: the falling rates of rain, the rising rates of heat and the blowing of dry and fast winds. This is specifically true in the southern regions of Iraq, particularly in the summer season. The area affected by the sand dunes in Iraq has reached 30.6% of its total area (**Ministry of Environment, 2008**).

The Economic Consequences of Desertification in Iraq:
The negative consequences **of Desertification** can be summarized as follows:

a) The deterioration in the productivity of the agricultural lands (Table 4).

Table 4: Desertification Areas in Iraq According to the environmental belts (in Dunams)

The Geographical Position	**Decertified Areas**
The upper Euphrates district and Al–Badiyah	6000000
South Al–Basrah governorate and Al–Najaf Governorate	1684000
North west to Karbala governorate and Al–Anbar governorate	380000
Al–Nukhaib district and Anah district	369000
East Tigris and Ali Al–Gharbi district	42600
Between the two rivers Tigris and Euphrates and in the governorates of Al-Muthanna, Babel, Al–Qadisixah and Thi-qar.	448800

Source: Ministry of planning, environment statistical, 2007.

b) Depriving these areas from contributing to the domestic agricultural production and Gross Domestic Production GDP.
c) The large amounts of money burdened by the state in the process of reclaiming these lands, which is costly economically.
d) The immigration of the inhabitants of the desertification lands from rural areas to urban areas, competing with the local population in the available resources of food, housing and work.
e) The advancing sands will have a direct and severe effect on the irrigation projects.
f) The desertification which hinders the development projects.
g) The decrease of the individual share in the planted area, which are below the international rate (1.2 dunams per person).
h) Desertification that has caused a decrease and extinction of numerous plant and animal species during the period 1990–2010, which resulted in destroying six thousand plant species.

Requirements of Combating Desertification:

Desertification has become a serious problem on a global scale; therefore combating desertification has become a fundamental task (Pastemak and Schlissel, 2001).

Measures to Combat Human and Natural Effects of Desertification.

Measures Related to Human Activities:

These included specifying the negative factors and the causes of the deterioration of the natural resources as a result of human mal-practices. It is also to specify the positive factors in dealing with those resources in order to enhance their preservation and continuity. This is in addition to organize the relations between man and the natural resources by legislating proper laws and by amending the existing laws, and finally elevating the social and economic level of the local population.

***Measures Related to the Development of Natural Resources*:**

These include restricting the immigration from rural areas to urban areas. All these measures and their like require national planning in cooperation and coordination with the international community, particularly the UN. This requires building computer data base on desertification (Pandi, Marcello, Selim, & Angel, 2010); (Heshma & Squires, 2013); (Chouan, 1992).

The Costs of Combating Desertification in Iraq:

The first step in the process of combating desertification is the availability of financial resources. The costs are high, but they are by far surpassed by the great gains. This is shown in Table 5, for the estimated annual costs of protective and corrective lands.

Table 5: Estimated annual costs of protective and corrective measures for the degree of land deterioration, for different lands in US Dollar per one Hectare

Degree of Deterioration	Cost of Measures in River Irrigated Lands	Cost of Measures in Rain Irrigated Lands	Cost of Measures in pasture Lands
Slight Deterioration	100 – 300	50 – 150	5 – 15
Moderate Deterioration	500 – 1500	100 – 300	10 – 30
Severe Deterioration	2000 – 4000	500 – 1500	40 – 60
Very Severe Deterioration	3000 – 5000	2000 – 4000	3 – 7

Source: UNEP (U.N. Environment Program) 1992.

This estimation is stressed and emphasized by the fact that 90 percent of the total area of Iraq is exposed to desertification. Cost of direct annual measurers to combat desertification in Iraq according to the nature of using the land and in the condition of very severe desertification is shown in Table 6 (Zedan, 2012); (Al-Heety, 2013).

Table 6: Cost of direct annual measures to combat desertification in Iraq according to the nature of using the land and in the condition of very severe desertification

Types of Land	**Details of Cost of Each Type**	**Cost (US Dollar)**
River irrigated lands	Cost of hectare % 90 of the river irrigate area (hectare)* Total cost (million Dollars)	2000–4000 5143500 20574–10287
Rain irrigated lands	Cost of hectare % 90 of the rain irrigate area (hectare)** Total cost (million Dollars)	500–1500 4860000 2430–2790
Pastures	Cost of hectare % 90 of pastures (hectare) Total cost (million Dollars)	40–60 7233750 434–389

Source: Done by researchers

CONCLUSION

In the light of what has preceded, the following proposals are suggested:

1) Establishment of an accurate updated data base of statistical information related to the environment, climate, land, water, human, and economic resources. This information is vital to the planners of strategies and policies.
2) Pay greater attention to the use and development of technologies related to remote sensing and the geographical information systems as an important dependable method of strategic planning.
3) Exert concentrated efforts in programs related to the reclamation of salinized lands, as well as building green belts to protect the soil and to limit the advance of the desert.
4) Support and encourage scientific research and development of technical and professional skills in the fields of protecting the soil and the environment as well as combating desertification.
5) The necessity of concentrating on vertical development of the agricultural lands to protect them from horizontal expansion.

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