

Analysis the spatial and temporal of environmental desertification in Iraqi Nineveh province

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ABSTRACT

This research conducted in the Institute of Technical / Mosul / Plant Production Department, using the method of analysis of spatial and temporal of the lands covered by the desertification in the province of Nineveh, which were Baaj, Al-Hadar, Telapta and Al-Shemal region . Was reached through a study that desertification is a form of degradation which affects lands in arid and semi-arid regions such as Iraq, including Nineveh province, under the influence of natural factors (environmental) which is not suitable , such as climate factors , which include high temperature , atmospheric drought, low rate of relative humidity, intensity and direction of the wind in summer season , the high value of evaporation , drought of soil , low rates fall Raining in winter , the intensification of solar radiation ,high temperature, great warming disparity between winter and summer and between day and night , changes in atmospheric pressure , addition to the lack of water surfaces , drought of valleys . Thus these factors combined caused the demolition of the soil profile, the soil structure and the cohesion of the particles due to the demise of organic matter which associated the soil particles were represented by humus material, which leads to a decline in the productivity of the land and the impact on food security. Either human factors , they include in mainly form environmental pollution due to excessive exhaust of natural resources , loss of the phenomenon of the natural balance and self-renewal in the biosphere , not rationalize the consumption due to population increase , expansion of human activities , not applying the clean technology , increasing the use of polluted traditional energies , which produced the polluted matter as solid, liquid and gaseous which caused an imbalance in the ecosystem which is global warming, as well as the misuse of the land environmentally and mechanically in the cultivated operations of soil and crop with the following traditional irrigation methods which caused the increase of soil salinity also overgrazing non alternately, methods of deforestation , which forest is green belt , windbreaks to dust and sand storms . As a result of the interaction of environmental with human factors that the reaction is reflected in the form of the ecological imbalance called desertification. Through spatial analysis was evaluated the quality of desertification in the region the situation from medium to severe because the soil is still present despite the deterioration of soil fertility , loss of vegetation , low productivity but requires processed quickly otherwise become an a environmental disaster , because the speed of desertification in the region between 5-10 km / year , through the spatial analysis of desertification can be classified ; Baaj in first place Al-Hadar second place , Telapta third place and the Al-Shemal aspect region fourth place, where areas are represented above 20 % , an area of 1,385,843 dunum from total area of farmland on the level of province . This is clearly evident from the survey and spatial analysis, which caused the displacement, harmed (30000) human, in Baaj 134 village and (70) of the village population in others. The destruction of 75% of the livestock in addition to loss of biodiversity and degradation of soil and vegetation cover. Through the temporal analysis for areas covered by desertification can be seen that the time series between 1941-1985 was rainfall at; 338 ml / year. Can be conclude that during the 44 years the rate of precipitation is not suitable for the needs of agriculture , particularly crops of wheat , barley and natural grassland except with implemental irrigation , which did not witnessing the areas above then the phenomenon of desertification , where continued Londoner rates fall of rain water that reached 130 mm / year for the period of time confined between 1996 to 2000 where not harvested winter cereal crops , between 2002-2012 were the rainfall vibrant, through(11) years reached as average 303,7 ml/ y and the year 2013 increased the rainfall to 472,9 ml/ y ,through the past years increased temperatures rates , increased heat waves, hot days in summer as well as the irregular distribution rainfall , increased frequency of droughts ,increased their intensity in the region , was the very severe of drought in 2008 reached severity -2.48 by techniques of standard precipitation index (SPI) also increased sandstorms in terms of repetition and intensity reached 32 storm , as well as sintering heaven 71 days of dust thick , were critical stage in the water requirement for cereal crops in 2001 , either increased evaporation value in the year 2000 is the highest ,average of relative humidity 52% for years2002-2012,the falling dust was 13gm/m2/month in 2012 and suspended dust in atmosphere as average 1,394 microgram/m3, this was highest rate by comparison with Baghdad & Basrah proninces.The result of non-stability of environmental status and vibrant raining through past years, where decreased groundwater recharge and their levels, also increased their salinity and degraded the quality . The negative impact of climate factors within the time series reflected negatively on soil and deteriorated their physical, chemical, and biological properties, causing desertification which negative reflected on winter farming production and vegetation cover.

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Introduction

Nineveh province, located in the northwestern part of Iraq in the semi-arid region with in the environmental classification of the world between the longitudes (41° - 25°) (44° - 25°) and latitudes (34° - 55°) (37° - 03°) which occupy an area of 7323 km² affected by climate of the Mediterranean Sea. Was dominated by cold weather in winter and low temperature below freezing most in the winter days with snowfall in most areas and survival for a long period, especially in the mountainous regions , their rainfall , moderation of summer climate where was called mother of two springs which make these suitable environmental conditions to rain fed agriculture for cereal crop production (wheat, barley, Lens ...etc.) , cover their lands by natural herbs , mountains with trees and shrubs and breadth of natural pastures . Characterized the province by these environmental status over the past decades, but the province has seen in the last two decades a significant changes in its environmental as flora (cover vegetation) deteriorated , the soil lost their agricultural productivity became desertification threatens their territory. For importance of this environmental problem came interest to preparation this research to diagnose the causes and find appropriate solutions. Cover vegetation and forest is one of the effective environmental systems to achieve the natural balance in the biosphere include all plants, a trees and shrubs whether was natural or planting growing on the surface of the earth which is one of the ecological components, they are lung -breathing land so a source of food to all living organisms, cannot count the importance of vegetation cover it was a basic rule in the food pyramid for the living organisms, vegetation cover is one of the most important ecosystems in carbon dioxide gas absorption , production of the life Soul which was oxygen , prevent global warming , contribute to the filtering and rid the atmosphere from toxic gases this called self-purification or self-cleaning also to rid the air from dust , harmful suspensions and contributes to reduction of thermal difference between night and day , its contribution to the green environmental development so flow of energy to activate the relationship between decomposer , producer and consumer, so its ability to transform mineral soil elements to organic compounds in the process of photosynthesis by the action of solar energy, contributes to the preservation of moisture and the water cycle in the soil and release moisture to the atmosphere by process of transpiration of plants to bring rain, prevent drift and erosion of the soil , helps in regulate the wind and the movement of the clouds , rains and their distribution on the ground surface ,considers a source of food, clothing and medicine ,was base solid for many industries so for trees of forest were aesthetic , tourism and environmental value in maintaining for thermal balance, biodiversity also contributes to lowering temperatures, reduce wind speed and absorbs acoustic pollution . In general form , decline of vegetation cover helps to the phenomenon of desertification which was a big global problem where rapidly expanding an Iraq's share of them, in particular Nineveh province in recent times can explain it to dealing non-rational with the ground, as not follows sustainable environmentally agriculture by suitable crop planting with the proper environmental conditions so repeat the cultivation of the land in the same crop and the neglect of crop rotation according to modern techniques such as zero tillage , environmental farming including organic planting, urban sprawl, logging, deforestation, catastrophic of

forest fires, over grazing, unregulated irrigation. The vegetation cover and green belts were the necessities of the ecosystem to preserve farmland , sustainability of land productivity and their development, which is the protective covering surface of the ground where roots of green cover as arming to surface of soil and working on the cohesion of soil granules so fall leaves on the earth an effective contribution in addition humus to the soil because their loss causes desertification .From this review of importance the vegetation cover and forest should be activated modern techniques to know land features such as: vegetation cover index, drought index, soil surface index, index of land cover type, soil top index, soil cover index, Climate index, rainfall index, indicators of desertification index , Palmer method to assess the variables of drought unit, double Cluster Survey multiple indicators in the data collection and analysis so utilization of space agencies NASA and NOAA which responsible for changes monitoring , environmental observatories , aerial maps and techniques of remote sensitive so requires a survey of vegetation annually with data analysis and assessment cases of degradation and evolution by studying the coverage ratio, types of dominant plants, plant life cycle, plant height, density, adaptation, surface area of vegetative cover [1] .Found researcher in the study of vegetation cover in Dohuk province the coverage ratio 70.1% , rate of plant density 129.9 plant / meter square[2].Researcher found in the evaluation of vegetation cover in three regions of northern Iraq were Atrush and Zawitta characterized by good vegetation cover, while found that Sinjar region in Nineveh province was poor from other in area vegetation instructed reason to overgrazing [3]. In a study of confirmed the researcher that the northern region of Iraq's richest vegetation cover from the central and southern region due to appropriate environmental factors [4]. For the purpose of upgrading in the context of sustainable green development program must be working on the quality of the environment by laying a comprehensive development plans to protect endangered areas the loss cover vegetation , reducing desertification with repeat their rehabilitation through the establishment of projects to control desertification and invest the desert and by linking economic and social development plans alongside environmental protection, including desertification allocate significant funds so that paralleled the problem of desertification to deal with threats to the ground close to relate to the permanence of life human and existence and its association with his land. This environmental disaster necessitated to residents of migration both Baaj, Al-hadar, Telapta and Al-Shemal region to leave the residence and source of livelihood to the safe haven of desertification and livelihood. Therefore requires the situation to intensify scientific community efforts and responsible for more researches , studies, seminars and conferences on level of academic at the provincial , national , territorial and international level to take the recommendations and the exchange of knowledge in the field of combating desertification so benefit from international experiences such as Australia, China, Latin America and countries of Africa such as Kenya, Nigeria and the Arabic Gulf states and Iran to the success of the operation plans in their control, it is noted in stable ecosystems somewhat is non-sensitive which characterized richest in green natural resources, especially the green cover and water resources in wet regions include its environmental balance a kind of flexibility where bear the

amount of natural environmental pressures and the impact of human factors and the possibility of retrieving recovered at the demise of these pressures, but in the fragile ecosystems such as arid and semi-arid lands wellness demise of the difficult pressures somewhat, such as Iraq and regions of study in the province of Nineveh, which requires an additional effort scientific and practical, financial and development plans for reduce both environmental and human pressures all means available for the rehabilitation of environmental life to achieve ecological balance [5]. Through research and previous studies, the sand dunes concentrations fall within the regions where the annual rainfall rate 100-200 mm and a moisture content less than 6.4 g / kg of air in the sand sources, and 7.5 g / kg in the lands of sedimentation. In other meaning, the wind which coming from the west carrying sand and dust are less moisture from the wind coming from the north and east, the dust granules of atmosphere remains long time in four areas of the province. located all regions of sand dune under annual temperatures rate more than 22.5 c, monthly average during the months of July and August 32.5 c, more than 25 c during the month of May 7.5 c during the month of September, increases the maximum temperatures average 40 c through July and August, has reached the maximum temperature some days of July and August during the last two decades to more than 50 c in most parts of Iraq including the province of Nineveh, ranged minimum temperature 26 c during July and August, this highest level of heat due to the deterioration of vegetation, scarceness of water surfaces to interact with the high heat and raise the rate of evaporation of catching the dust from the air and deposited, the dust remains hanging in atmosphere for a long period of hours and days so dust storms sometimes continue for days or weeks [6].

Materials and Methods

To study any problem, especially environmental problems such as desertification will must resort to scientific methods to determine the size of the problem and following of scientific research, technical and advanced means, which is characterized by accuracy and speed where used in this research the spatial and temporal analysis of desertification phenomenon in four regions of Nineveh province in Iraq was most severity regions in land degradation which: Baaj, Al-hadar, Telapta and Al-Shemal region by depending: on Aerial maps data, information of remote sensing and geo-ecology survey using Space Information Systems the two agencies (NASA), (NOAA), environmental monitoring data, General Authority for meteorological and seismic monitoring systems and field survey systems. Among the factors that were used to assess state of desertification in this study spatial analysis was the method to measure the spatial relationship between natural phenomena such as desertification, so as to ensure the scientific explanation of the relationship between spatial and changing factors for benefit in the analysis and evaluation, through understanding the causes of presence the biosphere and its natural balance, distribution of geo-ecology for natural factors on the earth surface in order to ensure sustainable life development of all living organisms interacting with each other in the ecosystem, predict the behavior of natural phenomena such as desertification and the use of spectroscopy detection technique based on the process (Pixel) wise and their dimension on the level of environmental-social-ecological-economic, can say spatial analysis that identify the patterns of spatial changing characteristics to this phenomenon and properties. It gives a

clear form to desertification problem, which affects the land and associated factors that affect the stability of various human activities. Among the most important of adopted indicators in variables land degradation were vegetation cover, green belt, climate, weather topography, water surfaces, valleys, artificial pastures, nature pastures, geomorphological, geological features, natural resources (air, water and soil), soil characteristics, climate location of the land (dry, semi dry, wet), land use method, these investigation in the study, while for the temporal analysis of desertification in the mentioned four regions within the province of Nineveh, has been relying on time-series variables since 1941, a study of climatic factors such as temperature, rainy precipitation, wave of heat and cold, drought coefficient, amount and frequency of droughts, number of dust and sand storms, value of evaporation. It is displayed in charts and tables reflect the temporal representation of different climate factors which contributed in deterioration of lands in the region, depending on the data and special information on the general authority for meteorological and seismic monitoring and scientific interpretation of to the case of interaction between the variable of environmental factors and their involvement with human impact factors of the worsening desertification in the region, data of degraded soil analysis to study the physical, chemical and biological properties in the region, temporal evaluation of environmental phenomena and methods of dealing with ecological variables to mitigate their severity, thus reduce the coming of desert creep from the west to the regions of the province and take advantage of the way Palmer and double cluster network in the evaluation and analysis of data.

Results and discussion

Found during the study and through the spatial analysis of degraded lands because of desertification in Nineveh province, according to the severity of the damage are: Baaj, Al-Hadar, Telapta and Al-Shemal region which occupies an area 1,385,843 dunum and a population of 392400 inhabitant. Table(1) shows the statistical of spatial, population degraded due to desertification can assess the degree of desertification was moderate in the north region, Telapta which is characterized by medium damage of vegetation cover and formation of small sand dunes with survival of soil fertility which can be rehabilitated by demise of reason this kind of desertification reduces production 25%, while the regions Baaj, Al-hadar can assess degree of desertification in moderate to severe by the reason of damage the vegetation cover and their absence, spread of desert plants which were undesirable on account of desired plant species, soil salinization, emergence of sand dunes and this type of desertification causing the lower of production more than 50%. Through the spatial analysis of the investment nature of land in the four regions above is clear that the type of rain-fed agriculture and animal husbandry is dominant, which exploit the land excessively is a far cry from the optimization use of land in a manner sustainable environmentally farming techniques as zero tillage, applications of crop rotation to repeat the soil activity and achieve economic production. Total farmland represents 2,922,220 dunum from total farmland in the province amounting 6,922,728, which constitute 47.42% from total area of the four regions, reaches of total land threatened by desertification 1,385,843 dunum, which account 20% from total land area of the province, shape (1) refers to the spatial analysis of areas threatened by desertification.

Table (1) refers to statistics of spatial and population in the four degraded lands.

therefore concluded that the cause of deterioration of soil due to mechanical methods to serve the earth and the excitement biomechanical to cover the ground as a result of over grazing been observed dust storm behind herds of sheep note that the wind in the dormant state as a result of breaking the dry soil cover through legged sheep during its flight to the low precipitation rates water resources is the main limiting factor in agricultural production, farmers have resorted where to dig wells, surface and groundwater, both to meet and fill the lack of water requirement, through spatial analysis and field survey found 833 underground wells, 423 shallow wells and as a result of laboratory testing of water wells observed a significant increase of sulphates 2900 mg / L, where the standard rate 400 mg / L, with high of total hardness 3,500 mg / L, where the standard rate 500 mg / L, as shown in Table (2).

As well as the observed high salinity where reached the electrical conductivity ratio 7240 ml mhos/ cm which makes water quality assessment not suitability for the human, agricultural using except resistance plants to salinity, the lack of green belt, fruit orchards and forest trees which are one of the most prominent features of desertified lands as battering ram winds. The area of vegetation cover in the four regions 1116 dunum which 1096 dunum in Al-Shemal region, 20 dunum in Baaj and Al-hadar and Telapta regions semi-free zones from green cover these do not constitute an effective factor to limit desertification, which requires their expansion, so for biodiversity the fundamental role to a side of agricultural production in the development of the pension situation for the people region and the national economy which comprising huge numbers of different kinds of animals is other damaged due to the sale and mortality and their numbers declined 75%, also requires the establishment and expansion of natural reserves in the region where there in Sinjar region of province 1200 dunum. For desertification were social dimensions where the proportion of the affected population is estimated 30000 people within 134 affected village and threatened by displacement in the Baaj 7940 family, but in other three regions that 70 villages affected and threatened by displacement due to desertification [7]. From the temporal analysis clear that Iraq in general form and Nineveh province in special form has seen in the last two decades many environmental variables as interpreted by researchers was a global phenomenon that due to global warming at a rate 3.5 c every 100 years that produced the global warming by the reason of carbon dioxide gas density in environmental ocean as a result of pollution that happened because of population growth, lack of rationalizing the consumption of natural resources, lack of investment alternative renewable energies and environmental resources, increasing of human activities and technological progress, which reflected negatively on the environmental ocean over the years after the industrial revolution in 1856 because the absence of honest and cleaning technologies (Eco-friendly). As a result of what happened can assess the degraded four regions as fragile environment unstable due to rising the temperatures across the time series of the last two decades, which caused a lack of rainfall, drought, increased evaporation from the surface of the earth, the deterioration of vegetation, low relative humidity, a large variation in the climate between the four seasons so between day and night. It is clear by temporal analysis for time series

confined between 1941-1985 that the rainfall rates were 338 mm / year [9,10], but the time period confined between 1996-2000 has rainfall fallen to 130 mm / year declined by 38.4% at the level of Nineveh province regions, that fluctuation and the low rainfall for the period of time confined between 2000-2011 so that don't harvested winter cereal crops, which have had a negative impact on the national economy [11], has seen years 2013 - 2014, an improvement in rainfall rates reached in 2013 by rate 451.8 mm / year, in 2014 reached by rate 472.9 mm / year according the report of General Authority meteorological and Seismology monitor [12], so requires exploitation of falling water resources in rain water harvesting by its storing in the form of ground tanks, water surfaces, oases and take advantage of the valleys in operations of water storage to cover water requirement, since the evaporation high in the region therefore requires expansion in green, forest cover to reduce heat and rate of evaporation from the soil by plants which suit on dry climatic environment such as prospis, alhagi, atriplex, wild buckwheat, halaxylon, artemisia, capparis, sesbania and forests trees such as acacia, casuarina, tamarix and eucalyptus, from trees of evergreen olive trees and by using techniques of water keeping compound (Stockosorb) and air agriculture through launchers of air seedlings which planted (900,000) seedlings / day, with followers the way of sustainable ecological agriculture through agricultural operations to ensure its success. As a result of no balanced environmental phenomena through of over the past two decades had a significant deterioration in the territory of the Nineveh province because of desertification, encroachment of the desert, sand dunes and dust, sand storms, which had a negative impact on the sustainable development factors that represented by dimension of environmental-economic-social, where temperatures have increased from rates with increased the heat waves and the number of hot days in the summer. Figure (2) shows the time series of temperatures rates for the years 1950-2000. Figure (3) shows the heat and cold waves in Nineveh province. Figure (4) shows the amount of rainfall for years 1990-2008, Figure (5) shows the severity of drought of time series 1937-2007. Decreased of rainfall amounts with irregular its distribution so delayed its fall then increased frequency of drought cycles and its severity in the region. Figure (6) shows amount of drought and its frequency.

Within temporal analysis for drought years found a year 2008 was drought severe which reached its severity- 2,48 by techniques of standard precipitation index rain (SPI) that sand and dust storms have increased in terms of intensity and repetition which reached 32 storm, as well as sintering sky 71 days dense dust in the same year, figure (7) shows the time series of storms increase for the years 1970-2008. Were identified the year 2001, a critical time period in the water requirements for cereal crops as for the moisture deficit was a year 2000 the highest, reaching $70,191 \times 10^6 \text{ m}^3$ because of increased evaporation rate [11], the relative humidity of years 2002-2012 at a rate 52%, reached falling dust in 2012 at a rate 13 g / m² / month, as for dust granules at a rate 1.394 mg / m³ it was the highest rate compared with Baghdad and Basra [12], groundwater recharge decreased recharge and deteriorated its quality because of increasing the proportion of total soluble solid and increased its concentrations, table (3) refers to a chemical analysis of the water wells, this negative impact of the climate factors on environment ocean for regions within the time series for the past two decades as reflected negatively

by their interaction with the human factors that have been mentioned on the biosphere, including the soil, its surface and vegetation cover where deteriorated its qualities , texture, construction physical, chemical and biological which caused its desertification. These data confirm the dramatically soil degradation in territories Baaj, Al-hadar, Telapta and Al-Shemal region in Sinjar district in Nineveh province , which was estimated desertification creep by speed 5-10 km, so require the attention of the competent researchers to lay a strategy plans and scientific , practical programs to counter the desert encroachment by create stations to desertification control , desert investment method then spatial and temporal coexistence with the problem by an independent administrative institutions under the Ministry of Environment with the achievement of scientific interaction with agricultural and academic foundations so its equipped with all requirements of environmental monitoring devices , remote sensing ,means of air monitoring , its equipped by helicopters, equipment and human resources to motion then conducting of some treatments that the solutions paralleled the problem magnitude for rehabilitation to its productivity civilization frame and not to neglect processed because for being a novel state that its left a disaster because being such as epidemiological illness moving and sweeping and expanding on account the productive land also that completion of southern irrigation project in province was sponsor rehabilitation (re-qualify),the best example of this that Rabia region do not suffer of desertification for sustainability of the green cover in winter and in summer because invest its territory by winter cereal crops (wheat and barley) and vegetables crops in the summer, especially tomatoes, potatoes crops and others, due to executor of northern irrigation project and follows the systematized irrigation method through the use of supplemental irrigation by sprinkler and drip systems of irrigation, should also benefit from scientific experiments of global and territorial in field of combating desertification for purpose of developing solutions to red Phenomenon of desertification.



Figure 1. Explain deserted regions in Nineveh province

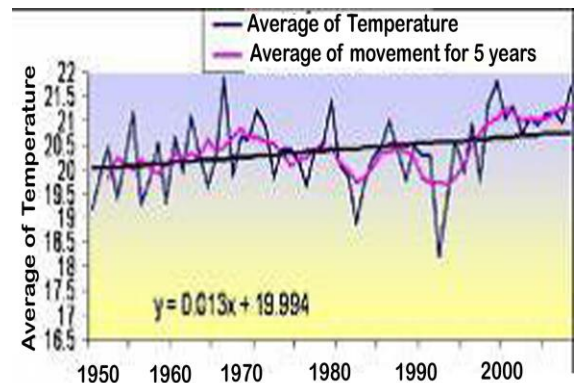


Figure 2. Time series of average temperature

Table 1. Indicate to spatial and population statistic in four deteriorated regions

Degraded regions	Areas degraded by desertification in Dunum=50mx50m	Threatened population
Baaj	539,160	165,000
Alhadder	266,342	30,000
Telappta	432,980	47,400
North region	147,361	150,000
Total	1,385,843	392,400

Table 2. Laboratory test of water wells in deserted regions

Test type	Value	Standard
TDS	4690	1000Mg/L
PH	7,4	6,5-8,5
Ec	7240	250Ml.mohs/Cm
Cl	1190	350Mg/l
So4-2	2900	400Mg/L
TH	3500	500Mg/l
Ca+2	560	150Mg/l
ALK	400	200Mg/l
NaCl	%15	

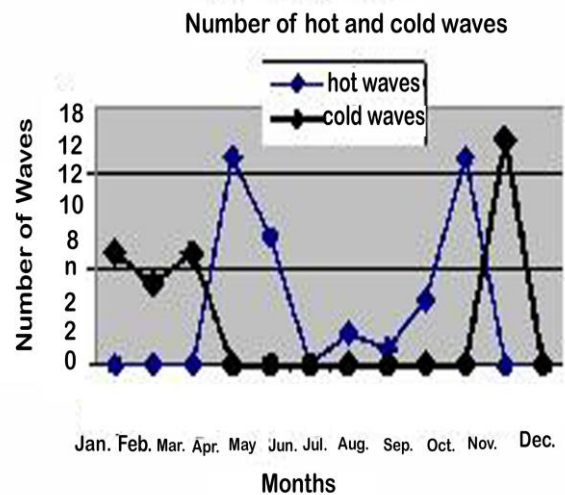


Figure 3. Heat and cold waves in Nineveh province

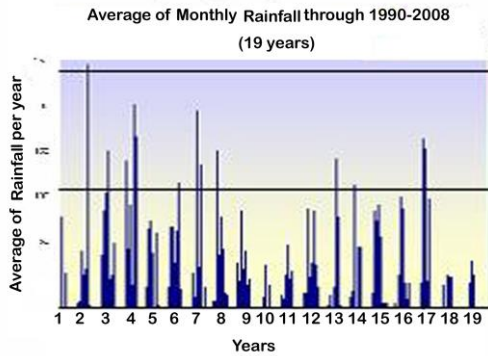


Figure 4. amount of rain fall 1990-2008

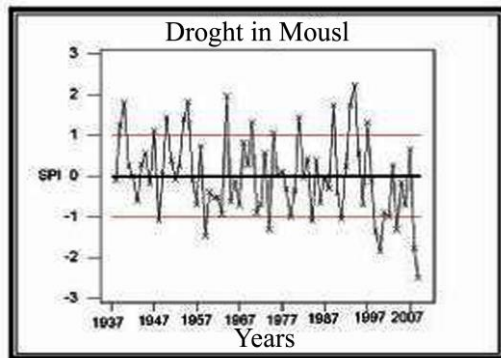


Figure 5. Drought sever of time series 1937-2007

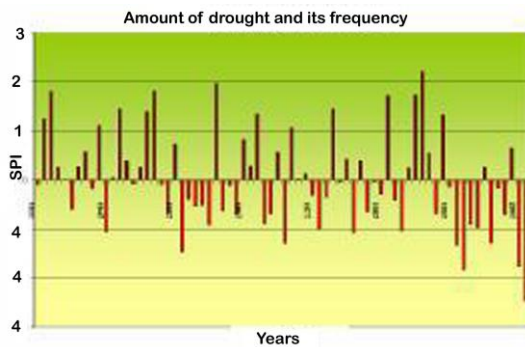


Figure 6. Amount of drought and its frequency

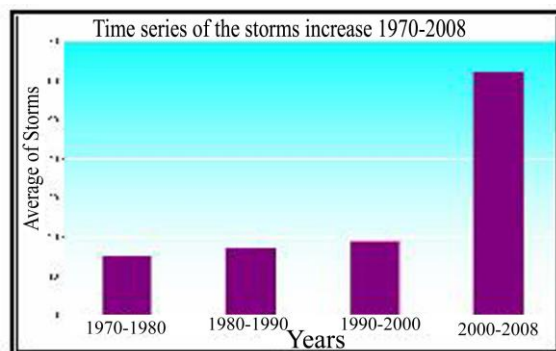


Figure 7. Time series of the storms increase 1970-2008

Recommendations

1-Necessity to use the water rations in agricultural crop management operations such as sprinkler, drip irrigation and prevent the use of surface irrigation because of negative impact on increase the salinity then rise of water table level, which is considered one of desertification causes.

2-Establish the desertification stations and reserves with provided by all the equipment, mechanism requirements, monitors, apparatus of remote sensitivity, meteorology, to determine the proportions of develop and deterioration of lands in both kinds; spatially and temporally then spatial cohabitation with the problem for the possibility of applying all the measures necessary to reduce the phenomenon of desertification.

3-The main cause of desertification was loss of humus and increased soil minerals on account organic ingredients of the soil so requires the development of an agricultural program by scattering seeds green cover during the winter season with first rain to repeat the green cover and humus matter which connect sand granules, as a filler substance, roots of green cover as a arming of the soil and contribute to prevention of air and water erosion.

4-For the purpose of human resource development and the reduction of desertification requires directing the inhabitants of villages to collect all kinds of natural plant seeds in their regions were rich green cover by units, agencies of desertification for a cost to purpose of rotating farming in desertified lands during the winter and in a manner of zero tillage agriculture.

5-restrict the movement of animals in fenced natural pastures and following the manner of rotating grazing for maintain the green cove of soil from deteriorate.

6-Necessity to use soil management operations equipment to suit quality of the soil and not over multiple plowing that effect on all the soil properties because of their softening and compacting.

7-Advantage of idea the rain water harvesting according topography of the earth by create; water surfaces, oases in the desert with the activation of dry valleys and their rehabilitation to establish barriers to confine the water and take advantage of its waters during need.

8-Abolishment all dusty roads for movement of vehicles in desert lands which leave dust storms

their motion, inventory the transport in asphalted roads and furnished by stone or paved.

9-laws legislation, obligate attachment the farmer with his land with the renovation new methods for ownership of the land just like other countries in order to allow farmers to establish strategy agricultural projects without threatening termination of his contract, to associated the farmer with its land in fateful form which reduce the migration from village to city and encourage sustainable agricultural development, prevent rain fed farming to ensure the sustainability of greening the earth in winter and in summer to limit desertification.

10-After the legislation above oblige farmers to establish a green belt around the perimeter of his land several lines of forest or fruit trees, according to the requirements of product favor and the region cultivation directorate exchange for support from the agricultural bank and drafted by law to ensure the right of the State and the beneficiary with the support of the state in the completion of the proposed national green belt by Ministry of Environment so other national greenbelts in the border regions at the provinces level to limit desertification.

11-Continuation by means of desertification control by mechanical methods as accommodation the earth mounds, trenches and iron cages as used by the security authorities so

mechanical spraying of oil derivatives, furnishing the desert lands by gravel and stone and creation of barriers from residue the plants, trees to limit desertification.

12-prevent the use of fire to get rid of plant residue as stubble and straw after harvest of cereal crops because being organic components of the earth nature within the sustainable agriculture as a filler compensatory matter of soil.

13-Re-activating the southern irrigation project that ensures food security and reduce the phenomenon of desertification because the province of Nineveh was basket of cereal and bread Iraq.

14-Follows the sustainable environmentally farming program by zero tillage, organic cultivation of planting suit crop within the appropriate environmental ocean to prevent the cultivation of wheat without the rain line 400 mm / year, where this ratio meets the requirement of barley and advised the cultivation of wheat in secured the rainfall region by rain more than 400 mm / year as well as the legume crops (lentils, chickpeas, peas) with the exception of in the case by follow supplementary irrigation.

15-Cooperation with territorial countries to control desertification because the environmental factors were a sharing and interactive between the countries so to benefit from the experiences of other countries such as Australia, China and countries of Africa, South America and dispatch the researchers, students for acquaintance the Scientific novelties in handling environmental problems, including desertification.

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