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The Concept of Desertification, Its Causes and Effects, and Treatments

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Abstract

Since the United Nations General Assembly passed two resolutions in December 1974, the term "desertification" has become a part of international development discourse: The first is a call to all countries to pay attention to desertification research and work together to explore its causes and find strategies to prevent it. The decision to organize an international conference on desertification in 1977 was the second. From August 29 to September 9, 1977, the conference was held in Nairobi, Kenya. The term "desertification" seems to have taken the place of prior words like "desert encroachment." Perhaps what we witness when desert sand dunes creep over oasis communities and farms and fill them, as well as when sand dunes crawl over paved highways and trains, contributes to this picture. This is a genuine depiction, however it only depicts a small portion of the problem (less than 10%). The word "desertification" refers to the process by which productive land outside of the desert's natural limits deteriorates and loses its capacity to produce (agricultural crops, pastures, timber and fuelwood) and transforms into a desert that resembles a limited resource. Desertification, in other words, impacts productive lands in dry and semi-arid locations, agricultural fields (rain-fed or irrigated), and grazing lands. The degradation begins as little patches that get larger and more like expanding patches until they converge and combine, becoming an arid band that joins the deserts of the surrounding places as it becomes more like them.

Introduction

Desertification Concept

Desertification is a term derived from the term "desertification." It refers to the spread of desert expressions into humid and semi-humid areas, which is known as desertification. It can also be characterized as a process of ecosystem degradation and deprivation. Others define it as the clarity of desert conditions as a result of the structure's life energy load decreasing or deteriorating, reducing its ability to support land uses). Desertification is defined scientifically as the entire or partial deterioration of one or more aspects of terrestrial ecosystems, resulting in a loss of unique traits and a reduction in productive potential , These ecosystems will eventually be unable to support the living animals that inhabit them. Desertification is a phenomena that happens primarily in arid and semi-arid areas. If the causes are known, it can also happen in semi-humid and humid environments. This occurrence is the result of both natural and human factors Al-Jubouri (2014).

The evolution of the problem of desertification across time

Desertification has progressed fast and slightly over the last thousand years as a result of a variety of direct and indirect reasons that have resulted in the continual deterioration of the environment in many locations owing to neglect and lack of early treatment of the problem. And because the lands are available, and because of continuous exploitation and population

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growth, the problem became more complicated or did not become apparent until the twentieth century, when large areas of land deteriorated, necessitating the discovery of new lands for exploitation, urging governments and the general public to address the problem because continuing to ignore it would jeopardize the future of these areas first. The International Organization for Culture, Science, and Education (UNESCO) attempted to conduct a research project on arid areas in the 1950s. This project was finished in 1992 with the publication of a number of desertification research and publications.

From 1973 to 1999, special emphasis was dedicated to the desertification of dry areas in the Sahara. The researchers highlighted the drought that hit six nations on the Sahara's southern frontier, including Mauritania, Senegal, Mali, Niger, Chad, and Volta. This drought lasted from 1911 until 1994, and it was followed by another drought. This drought resulted in a massive environmental calamity that resulted in the deaths of millions of people and animals. As a result of this occurrence, the United Nations called for an international conference on desertification to be held. In August and September 1977, this conference was conducted in Nairobi, Kenya , A total of 100 studies on the subject were presented at this conference. Dregne and Tucker used satellites to study the change in vegetation cover in the arid areas bordering the Sahara desert in 1988, comparing it to the variation in yearly precipitation, and Tucker followed up in 1991 with another study on the same topic. As previously stated by the experts, the threat of desertification on the earth's surface is attributable to the natural water cycle, i.e., the elimination of vegetation cover increased the impact of torrential rain on soil erosion.

As a result of an increase in the temperature of the surface soil, an increase in the temperature of the air near the earth's surface, a high wind speed, and a shortage of moisture, the rate of evaporation and transpiration has increased. In 1993, Philips discovered that the amount of soil moisture in dry places is proportional to the amount of vegetation cover. In the Mesopotamian plain, Abdulla researched one of the elements of the areas impacted by desertification, sand dunes and their pace of movement, as well as the effect of wind speed and direction on the speed of their progress, between 1990 and 1994 , Desertification has been examined by many academics, including Foster et al. in 2003, Lambin et al. in 2003, and Abdulla and Sainuria in 2005 (Abdullah, 2010).

Desertification's causes

At first look, it may appear that nature is mostly to blame for desertification, and that what is accessible alone is to blame for the existence of this damaging phenomenon. However, most interested and specialists in environmental research believe that man increased the number of herds of livestock that used to live in those pastures, worked to increase them, uprooted the vegetation cover, and exposed the surface of the soil to various weather factors such as sudden torrential rain, and that man increased the number of herds of livestock that used to live in those pastures, he worked to increase them, uprooted the vegetation cover, and exposed the surface of the soil to various weather factors such as sudden torrential rain ,and High temperatures, as well as strong winds. Like a result, as in Kashmir, Serengej, Arizona, and Mexico (Ayoubi, 1987), the soil was degraded, and its ability to choose considerable amounts of rainwater was impaired. As a result, there are numerous causes of desertification, some of which are caused by natural factors and others by human factors, as shown below:

First, the natural causes

These are elements that do not involve the human element, the most essential of which are as follows: Unsuitable climatic conditions, large temperature swings, large fluctuations in precipitation amounts, problems distributing water, and other environmental variables are

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among the factors that have contributed to the expansion of drought, drought, and desertification (Al-Sheikh, 2007).

The following are the natural causes that have a significant influence in the occurrence of the phenomena of desertification; (1) The lack of rain and associated erosion characterize dry and semi-arid locations, and rain may not fall for an extended length of time, causing the region's natural vegetation to deteriorate, and the soil to become incoherent due to its dryness, making the erosion process easier in those situations; (2) Flash floods: Although dry and semi-arid regions are characterized by a lack of moisture, large rains can fall unexpectedly, generating flash floods that wash away the soil and kill many cattle and shepherds; (3) Temperature rise and daily and yearly thermal range: Most desertified lands have a climate defined by high temperatures, which result in a significant quantity of soil evaporation, less effective rainfall, and low relative humidity, resulting in a lack or absence of natural vegetation. Most dry and semi-arid environments have a wide yearly temperature variation, which causes soil fragmentation and decreases cohesiveness; (4) Wind direction: The faster the winds blow from dry sides, the more soil particles they can capture and move by crawling ways for large particles like sand, jumping smaller particles like small sand, and hanging on to very small dust and dust particles. Because the soil in the original places is non-testicular and poor in composition, material transferred by wind has a better composition and includes nutrients that help plants, and as a result, the density of vegetation cover decreases for some sites whose soil is sown by the wind و According to studies, the eastern coast of North America receives winds of up to half a millimeter thickness from North African breeding every year. It was stated that the High Dam was built because the irrigation of the Green Mountain region in Libya is primarily dirt that was brought to it from northern Egypt, and that the western shores of Palestine used to receive quite a few fish from the Nile silt. Similarly, the wind covers parts of the farmed regions, or what remains of the soil, with sand it transports hundreds of kilometers, changing the qualities of that soil; (5) Solar radiation intensity: The intensity of solar radiation in dry and semi-arid locations is characterized by the dryness of the air and the clarity of the sky. The sun, which causes a wide daily temperature fluctuation in certain locations, which causes breeding to disintegrate quickly, contributing to the desertification process; (6) High rates of possible evaporation: Due to the intensity of solar radiation, high temperatures, low relative humidity, and wind speed and dryness, one of the reasons of desertification is high rates of possible evaporation و High rates of evaporation lead to a high proportion of salt in the soil, which paves the way for the problem of desertification; (7) Low relative humidity is one of the natural causes of desertification, since it produces a lack of precipitation on the one hand and increased evaporation on the other, as well as a lack of rain effectiveness on the third hand, and therefore a lack of vegetation. Fourth, natural soil drying, and five, erosion pavingو The decline of the land's productive potential and desertification that many arid and semi-arid areas experience as a result of salinization)Al-Jubouri, 2014); (8) Climate Changes: In the future decades, pollution of the Earth's atmosphere owing to carbon dioxide and other greenhouse gases will result in a progressive warming of the climate. Indeed, by the middle of this century, atmospheric mass circulation models predict a 3°C (1.5) increase in air temperature in the lower troposphere, If the carbon dioxide percentage increases from 360 to 700, (parts per million by volume). A three-degree increase in air temperature, and hence the greenhouse effect, will result in the following (Le Houerou) 1993: a rise of roughly 210 mm in yearly potential evapotranspiration, or 70 mm for each annual Celsius degree; Reduced evapotranspiration yield – potential transpiration decreased by 10-20% Due to limited evapotranspiration yield potential yearly transpiration, the degree of desertification processes varies by climate zone, Also, as a result of the shift of the climatic areas stated above, these events have extended

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geographically. Desertification, which occurs when the potential evapotranspiration yield falls below a certain threshold, has important consequences, although these consequences do not always end in a disaster on the agricultural, ecological, or pastoral fronts. Indeed, a hypothetical rain loss of 50 mm in North Africa may be managed by increasing agricultural processes and crop genetic resources, and Improving the efficiency and efficacy of irrigation systems, as well as optimizing the use of pastoral resources. Furthermore, it should be noted that other phenomena such as the greenhouse effect, global warming, and ozone layer loss are deemed less harmful than desertification, which directly impacts people's lives. The contribution of dry areas to atmospheric combustion and greenhouse gas emissions, according to meteorologists and climatologists, is minor and does not surpass 5%. However, depending on climatic circumstances and the greenhouse effect, soil erosion and salinization might be increased or, on the other hand, become less severe (Abdel & Marja', 2014).

Second: human reasons

Rapid population expansion: One of the major causes of desertification is population growth. According to population data, population growth rates in dry, semi-arid, and semi-humid locations, particularly in developing nations, range from 2-4 percent each year, or 2.5 percent on average. Annually, a high population growth rate capable of doubling the population in these places in a record amount of time ranging from 20 to 30 years, a quick growth rate that puts a strain on these key areas' resources, hastening the development and spread of desertification , If the population is forced to expand and intensify the scope of their rural uses due to increasing basic needs for food, fuel, and housing, this will compel them to move to new areas, often marginal, where the degree of sensitivity of these systems to any exploitative pressure is high, even at the population level - the balanced environment for these environments. The United Nations Conference on Desertification (1977) established guidelines for estimating the size of the rural population, This can be used as a reliable predictor of the level of unwelcome population pressure in certain areas. The maximum population size that must be present in dry areas is 7 people per square kilometer, and in semi-arid areas it is 20 people per square kilometer. It does not surpass the population density in these places, and there is little question that the present population density in most desertified rural areas well exceeds these figures, having passed the safe limit and moved into dangerous or critical territory.

Overgrazing: Long-term overgrazing causes temporary or permanent environmental harm. Because the soil without it is easily eroded, and because its erosion as a result of excessive grazing causes indirect harms, such as the deterioration of the value of surface water resources as a result of what affects it as a result of mud deposits and mud drifting to it from grazed and eroded slopes.

Overgrazing (excessive) has been observed in recent years (since the 1960s) as this traditional grazing, which was largely parallel to the capabilities and capabilities of the environment, began to turn into overgrazing (excessive), which is defined as "loading the pasture with large numbers of animals, or with certain types of animals that do not conform to the nature and energy of the pasture." As a result, the pasture is subjected to a high level of animal pressure, which contributes to the rapid destruction of plant cover, severe soil erosion, and a degradation of the environment's biological capacity to adjust or replenish itself(Al-Hiti, 2011).

Over-irrigating crops: Many farmers continue to believe that providing more water to plants results in higher quantity and quality yield. Too much water causes soil waterlogging and poor ventilation, which causes damage to the plant., especially in the root area, such as slow

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deterioration disease, gumming, and root rot, which negatively affects the productivity of plants from fruits, due to the earth's low productive capacity.

Urban sprawl is an issue that many nations throughout the world, particularly emerging countries like Iraq, face. Urban sprawl occurs at the expense of agricultural land, depriving agriculture of fertile lands; additionally, urban sprawl is accompanied by the construction of cement and iron houses, as well as streets paved with asphalt and asphalt, giving these areas a climate that differs from that which existed prior to urban sprawl. High temperatures, poor albedo, low humidity, and higher evaporation accompany this, resulting in a rise in desertified regions at the expense of agricultural land (Al-Jubouri, 2014).

Inefficient land usage in agriculture Land usage for agricultural purposes that is not consistent with its productive capability may be found in a number of places, including; (1) Extensive and ineffective farming; (2) Cultivation of marginal lands or areas; (3) The utilization of agricultural land for the construction of industrial, commercial, and residential facilities.

Agricultural pressure is defined as "intensification of agricultural usage or the loading of soil with crops that exceed its biological capacities (both quantitatively and qualitatively)." The growth of rain-fed agricultural regions sometimes comes at the expense of grazing land, exacerbating the problem of agricultural pressure, They are often agriculturally marginal places, as they have limited (biological) production capacity and are unable to sustain agriculture for multiple years. The strain on the components of the critical environment in such places is a natural result of this agricultural development, as is the acceleration of the deterioration of the ecological balance and the spread of deserts.

The process of desertification is not restricted to rain-fed agriculture, but also includes irrigated agriculture, since these regions are subjected to a kind of desertification characterized by increasing salinization or waterlogging of soils. Despite its importance in the creation of life and the maintenance of agricultural activities, water is often overlooked , The misuse of it (extravagance) becomes a great curse, and unfortunately, it still dominates the minds of the majority of farmers in developing countries false beliefs that lead them to waste water use, such as believing that the more water given to the soil on it, the more production it will produce, and experiments have proven the plan of this belief. It has been demonstrated that an abundance of irrigation water reduces the biological capacity of the soil, both as a consequence of increased soil salinization and as a result of increased soil salinization (the relationship between soil salinization and its biological capacity is an inverse relationship), Or the rise in waterlogging and lack of ventilation, which exposes it to suffocation to the point when it becomes biologically dead soil (a very severe case of desertification).

Around a third of a million hectares of irrigated agricultural fields in Syria's Euphrates and Jazira basins are at risk of salinization, and roughly half of Iraq's agricultural lands, particularly in the lower Euphrates valley, are also at risk (Busty, 2011).

In a study of the African Sahel region, it was shown that for every hectare of new irrigated land, another hectare of current irrigated land is lost due to salinization or waterlogging. This signifies that these soils are rapidly becoming desertified due to salinization or waterlogging. The role of new reclamation projects in the field of food production and other crops is almost zero in solving the food problem, confirming the strong link between desertification and the food problem and confirming that solving the desertification problem is one of the means to solving the food problem (Al-Hiti, 2011).

Removing natural vegetation: If natural vegetation was removed for the sake of human activities and diverse human uses, the land was exposed to the risk of desertification, which is

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to deprive the soil of its natural cover, which would have given it with protection against erosion and erosion. The removal of natural vegetation cover changes the climatic characteristics of the area that was subjected to removal, because vegetation cover has its own local climate with climatic characteristics that differ from those of its neighbors, such as the climate of the forest, in which man destroyed an area of 129,000 km in the Amazon River Basin in South America, The Egyptian delta is one-and-a-half times the size of the woods, resulting in their destruction and allowing the winds to disassemble the upper portion of the soil and transport it away to hurl it into the sea, transforming the region into a desert.

Vertical plowing: This factor is particularly prominent in high areas, as the soil is subjected to a process of erosion and erosion, especially after rain falls, because the vertical plowing method is in harmony with the land's slope, paving the way for desertification by stripping the area of its soil.

Pollution: Pollution occurs for a variety of reasons, some of which are natural and others of which are human, and the natural causes of pollution resulting from nature are in balance with the earth's ecosystem, but the problem lies in the human causes of pollution, which has become a problem that is growing day by day due to the increase in the population and the waste and resulting from their various activities and ways to dispose of these wastes by throwing them on the ground.

During the war, the destruction and operation of cooling towers and oil combustion units, as well as a lack of winds in the region, resulted in the stabilization of smoke rising as a result of the burning of oil and its derivatives, resulting in the formation of thick black clouds that covered the entire atmosphere of the region, causing an environmental imbalance and leaving clouds of smoke that reached far away. It has direct repercussions in Iraq, according to the Director of the World Health Organization's Environmental Health Department, who acknowledged that soot particles that fall on the ground impede sunlight from reaching the ground. for the sun's beams reached a maximum of 11m , Black clouds reduced the quantity of radiation required by plants in the photosynthesis process, resulting in black and acid rains in various parts of northern Iraq and Iran. Water, and thus to the soil, including crops and the food chain, posed a threat to agricultural production due to rains containing nitrogen oxides, carbon, and sulfur, which posed and still pose a great danger to agricultural production, causing damage to crops that are a source of food for humans and animals, as well as damage to buildings, equipment, and machinery, in addition to Long-term risks such as high soil salinity and acidity, and the potential for inundation (Jandal, 2011).

Desertification's Manifestations

Desertification manifests itself in a variety of ways in at-risk places, which can be described as follows; (1) Sand dunes moving towards agricultural and grazing regions, burying plants and the original soil and making the area unfit for cultivation and grazing. This occurs in the agricultural and pastoral regions of the governorates near to Iraq's western plateau, as well as in the areas next to the desert areas that contain these sand dunes. As in the case of the invasion of sand dunes into agricultural regions in the Kingdom of Saudi Arabia, and the southwestern states of the United States of America; (2) Soil erosion and erosion: This occurs in especially in locations where natural vegetation has been deforested and removed in order to accommodate human activities and varied uses. This puts the soil at risk of erosion and erosion, particularly because many natural plants, particularly forests, take a long time to regrow, and this may not happen due to the rapid occurrence of erosion and erosion, which robs those areas of their original soil rich in mineral and organic materials; (3) Soil salinization: Soil salinization and a rise in alkalinity are caused by a number of circumstances, including providing farmed

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plants more water than they require, especially when utilizing the immersion irrigation method. It also happens as a result of the earth's surface's low slope and flatness, as well as the lack of troughs to drain the surplus water. Water evaporates as a result of high temperatures and evaporation rates, leaving salts in the soil and on its surface. The salinization of the soil is caused by the salts delivered by rivers to the irrigated farmland, and it is plainly apparent in the central and southern parts of Iraq inside the sedimentary plain area , It includes soluble salts that grow in the dry season and decrease in the rainy season, especially in dry and semi-arid areas, such as the waters of the Tigris, Euphrates, and Shatt al-Arab rivers, which are the major source for irrigating the alluvial plain area.

As a result, the use of that water for irrigation or infiltration adds additional salts to the soil and subterranean water (about 1.5 tons per hectare in winter agriculture and a ton per hectare in summer cultivation, according to expert Holsius).

Deterioration of soil fertility: This phenomenon occurs as a result of increased pressure on the soil caused by intensive agriculture, which exhausts the soil and reduces its fertility by not allowing the soil to renew its fertility, not using the agricultural cycle, and not using organic fertilizers. Because of the farm's poor management, breeding becomes economically unviable if it continues to be practiced.

Frequency of dust and dust storms: Due to a lack of rain, high rates of evaporation, dry soil, and lack of plant cover, desertified areas are characterized by an increase in the frequency of dust and dust storms, as well as their phenomena from rising and suspended dust (2014).

Degrees of Desertification:

The severity of desertification varies depending on the causes of its creation, as well as its link to the environment and how humans utilise natural resources. In Nairobi, Kenya, in 1977, the World Conference on Desertification recognized four phases or degrees of desertification; (1) a little amount of desertification

It is the stage that has an influence on the lands, but not on their productive ability; (2) Desertification in a moderate state. It is the stage where the plant cover is medium, sand dunes are present on a modest scale, and scattered salt patches are present, resulting in a 10-50 percent reduction in productivity; (3) Lesertification to a high degree

Salinity affects the proliferation of dangerous plants and thorns, the expansion of deep canyons and sand dunes, and the land, resulting in a 50 percent reduction in productivity; (4) Extremely Serious Desertification Barren or entirely devoid of flora, the widespread expansion of deep valleys, and moving sand dunes, in addition to significant salinization, which is a symptom of the presence of a salt crust in which the soil is nearly impervious to water.

In the case of a large proportion of contaminating elements, especially radioactive materials, it is required to place the land in a fifth stage, which is the stage of abnormal or catastrophic desertification , Because radioactive contamination of lands makes it difficult to utilize them in general, and agricultural exploitation in particular (Abdullah, 2010).

According to UN estimates from 1989, the degrees of desertification and the proportion of lands at danger of desertification in the globe are as follows:

Table 1. Degrees of desertification and the percentage of lands at risk of desertification in the world according to United Nations estimates in 1989

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desertification area / degree of desertification		Europe	Australia	Asia	Africa	North America	South America
very high	Km^2	48957	307732	790312	1725165	163191	414195
	%	0.5	4.0	1.8	5.7	0.7	2.3
high	Km^2	-	1722056	7253646	4910503	1312524	1261235
	%	-	22.4	16.5	16.2	5.4	7.1
middle	Km^2	189612	3712213	5607563	3740966	2854293	1602388
	%	1.8	48.3	12.8	12.3	11.8	9.0
real desert	Km^2	-	-	1580624	6177906	32638	200492
	%	-	-	3.6	20.4	0.1	1.1

Source: Qandil, Mr. Ezzat, "The Importance of Forests in Combating Desertification," Journal of Science and Technology, Riyadh, Issue 51, Rajab 1420 A.H.

Desertification's Consequences

Desertification has major effects for the population's economic and social well-being, as well as the ecological balance. These repercussions, on the other hand, are more harmful in emerging nations, such as African and Asian countries that have experienced population relocation and economic and social instability. The following are some of the outcomes:

Fatal Food Security Imbalance:

As land fertility declines, agricultural plant and animal output declines, resulting in a substantial lack of foodstuffs for the people of the desertified country, forcing it to import more of the key commodities.

Because of their low national incomes, some nations are unable to import all of the commodities they require, resulting in a severe food crisis. Somalia, Mauritania, Sudan, Eritrea, Iraq, Libya, Saudi Arabia, and other Arab countries are among those that have established Arab countries that import. The annual quantity of food imported from outside the Arab world is about 22 billion dollars.

Furthermore, most African nations are suffering from a lack of agricultural productivity as a result of desertification, and their inhabitants are also suffering from a severe hunger that has had a negative impact on their health.

Social Factors:

The reduction or failure of agricultural yields, the degradation of pastures, the invasion and development of sand dunes, and the depletion of water supplies all resulted in population relocation, whether temporary or permanent. This movement puts further pressure on natural resource investment in regions that are practically unable to fulfill the needs of the local population, resulting in competition between the displaced and the locals, and the emergence of new social issues. One of the biggest issues that residents in the interior regions of various African countries experience is a lack of money, And it's not just their everyday tasks that don't give them with adequate food; it's also their physical state, which is barely passable.

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Desertification has resulted in a drop in productivity, which has resulted in a drop in income for individuals in these regions as compared to residents in cities, and as a result, there is a significant desire to leave, particularly among the male population.

In addition to the high rate of expansion in the population of cities compared to the countryside owing to migration, the movement of the population of the regions to the cities increases the number of people living in these cities. The number of jobless people rises as a result of this , Even if these immigrants find job, even at a low wage, they are unlikely to return to the countryside.

On the other hand, the state may lose a large number of people who migrate abroad, either to neighboring countries or to more developed countries, and this, in turn, causes them to send some of their earnings back to their home country, resulting in an increase in reliance on external bonds in comparison to limited internal resources. The additional value of imported items rises as well. Furthermore, this phenomena necessitates the disintegration of groupings and the loss of their personnel , This affects local production, growth, and internal independence, as the family circle is damaged by the absence of males, and the difficulty of adjusting begins if the immigrant returns to his homeland, as well as city overpopulation and epidemic transmission (Al-Hiti, 2011).

The Impact of the Environment

The presence of moving sand dunes, which impedes age and reconstruction in areas where these dunes and areas are located on the line of their progress, as well as the occurrence of dust storms from time to time and the removal of varying percentages of the surface of the soil rich in nutrients and vegetation cover is very weak, and the spread of weeds and bad thorns harmful and increase the spread of weeds and bad thorns In low-value plants or when the area is entirely barren of vegetation.

Large grooves on the surface of the soil or the presence of several kinds of erosion degrade the land's surface, necessitating significant expenses in the case of the need to recover these areas, which are commonly referred to as badland. That is, all soils with favorable physical, chemical, and biological qualities that aid in plant establishment under the current climatic circumstances have been eliminated. The existence of a hard salt crust over soil that is nearly impervious to water, as well as the high salinity of the soil, causes crop yield to decline at varied rates, up to more than 50% , and The buildup of items delivered by water or wind in water channels, ports, and reservoirs, resulting in a decline in their efficiency and requiring enormous sums of money to clean them annually. And the existence of poisonous elements or radioactive colors, which obstructs land use due to the significant harm it does to the environment, health, and a variety of environmental phenomena (Abdullah, 2012).

Desertification also affects the biosphere's ecological balance, which is connected by a delicate ecological equilibrium between living (human, animal, and plant) and non-living components (soil, water and air) , Energy and forces (solar energy, wind forces, rushing water, waves, and ocean currents) combine environmental and vital processes that control and fulfill interdependence within a framework of balance that preserves the ecosystem and its health (Al-Hiti, 2011).

Climate Change and Desertification Interactions

With a doubling of atmospheric carbon dioxide content, it is predicted that the worldwide amount of desert land will rise by 17% over expected climatic changes. Changes in precipitation, evaporation, and wind, on the other hand, can have a significant impact on the

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desertification process. Desertification and its accompanying processes, on the other hand, have a large feedback influence on the Earth system. Despite dust storms.

Desertification has the potential to disrupt global geochemical cycles and have a significant impact in climate change. Desertification alters the quantity and characteristics of aerosols that absorb or scatter radioactive radiation on a physical level. Strong Asian dust emissions via glaciers may have prevented the establishment of permanent snow cover in North Asia and controlled the position and size of the final great ice sheets, according to simulations. Desertification might theoretically transmit soil carbon to the atmosphere, resulting in global warming. It causes a direct rise in greenhouse gas emissions.

Because the existing data varies significantly, a quantitative estimate of carbon emissions from desertification should be a focus of future restructuring. For example, total atmospheric carbon output from desertified land in China has been estimated to be 91 MtC and as high as 2.2 MIC during the last 40 years. A research in Hunshandake found that through shrinkage and re-deposition, a considerable amount of the carbon lost at the site was re-depositioned in downwind locations. As a result, the carbon exchange between the atmosphere and desertified land is significantly lower than the total carbon present in the decreasing soil from the start , and Recent research suggests that desert alkaline soils may retain substantial volumes of carbon dioxide in inorganic form in the atmosphere. The Guerbantonggute Desert in western China and the Mojave Desert in the United States were both where this technique was identified. He discovered that the Mojave Desert can absorb the same amount of carbon dioxide as some temperate forests, square meter for square meter. However, the reported CO2 uptake is thought to be driven by the observable increase in plant cover in many deserts due to recent increases in precipitation. Any loss in yearly precipitation in such deserts would liberate carbon that had been stored, resulting in an increase in carbon dioxide in the atmosphere (Dodson, 2010).

Defend Against Desertification

Desertification may be avoided by preserving the regions that generate agricultural products, wood, and logging. According to the United Nations Conference on Environment and Development, continuous (sustainable) land resource development in arid and semi-arid environments involves fulfilling the goal of contributing to the productive ecosystem in order to meet current and future demands. This implies that the word (desertification control) refers to operations that are part of the integrated development of land in arid, semi-arid, and semi-humid environments that attempt to accomplish both of the following; (1) Land degradation prevention or reduction (maintenance); (2) Lands that have been largely deteriorated are being restored (rehabilitation); (4) Reclamation of the first-come-first-served lands (reclamation); (5) A fourth purpose relating to dry lands (limited to Arab nations) is to develop dry and desert lands resources, particularly in new lands reclamation projects, in order to convert desert lands into irrigated agricultural fields whenever irrigation water resources become accessible (as in Egypt, Libya, Saudi Arabia, and others)

As a result, scientific measures must be followed to counteract desertification. The following is a summary of these methods:

First, environmental surveys

Drought in the Sahel area has been a notable example of desertification since 1970, highlighting the sterility of the techniques utilized and the ineffectiveness of land and plant exploitation methods, as well as the imbalance un the environment's components and the degree of its thinness. This condition has been known to recur in the past, and as a result, It is rational to identify which aspects of the environment will be impacted and how to allocate resources based

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on the available capabilities. As a result, it is vital to investigate the factors that contribute to desertification or are similar to its occurrence, namely (Al-Hiti, 2011): climate 2- the soil 3- sources of water 4- the presence of natural vegetation

Second: Anti-desertification technology:

Many researchers consider desertification to be one of the strategic projects related to the sustainable development of an important resource of renewable resources for any country in particular, and we know that neglecting the soil can only be compensated after thousands of years for new soil to form, although this is a long time.

Sand creep must be stopped, and sand dunes must be stabilized.

Because of its influence on diminishing the biological capacity of agricultural areas or ruining meadows and converting them into seas of quicksand, sand encroachment plays a significant part in the creation of sand dunes and desertification. As a result, one of the most effective ways to battle desertification is to limit the invasion of these sands and stabilize sand dunes, and one method to do so is to stabilize sand, which means preventing it from creeping on farms, communities, road networks, and urban areas (Al-Hiti, 2011). Building dwellings on flat land or in locations with minimal slope, draining water in excess of the plant's needs, and preventing subterranean water from rising. Protecting the soil from erosion and erosion by preserving the natural plant and its sensible usage. Stabilizing sand dunes or preventing them from reaching agricultural lands, whether through the use of plant fences or other methods such as digging trenches and streams in front of moving sand dunes, covering them with stones, or spraying them with oil or other petroleum materials that limit their movement. Chemicals such as calcium chloride solution can be used to strengthen the cohesiveness of soil atoms, or Curosol AE can be used to stabilize sand dunes. Seeds and plants that have been buried can breathe and get rainwater. Preserving soil from erosion and erosion by using contour or strip farming or planting terraces in high and sloping locations according to the degree of slope. In agriculture, contemporary irrigation technologies such as drip irrigation and spray irrigation are used in accordance with the plant's water needs to prevent wasting water and giving plants more than they require. Paying special attention to vertical building and avoiding the development of civil infrastructure on agricultural fields. Renewing soil fertility by applying the agricultural cycle technique, organic fertilizers, and biological or integrated pest control to combat agricultural pests. To avoid dumping rubble and residues of human activity on agricultural and pastoral grounds, and to adopt regulations that ensure this. Using garbage, debris, and human waste to create electricity and extract usable liquids like as methanol and methane, rather of dumping them on agricultural and Arab areas, as Western countries do. Soil treatment and salt washing. The techniques listed below can also be used (Al-Jubouri); (1) Incorporating controlled grazing and controlling overgrazing; (2) Leaving marginal or marginal lands as structured grazing grounds for livestock; (3) Determining population growth, particularly in developing nations, particularly those in arid and semi-arid regions with little agricultural and grazing space.

Conclusion

The word "desertification" is defined by the United Nations Convention to Combat Desertification as the deterioration of land in arid, semi-arid, dry, and semi-humid areas as a consequence of a variety of factors, including climate changes and human activity. Most of the regions in the Arab region are affected by desertification to varying degrees and for a variety of causes. The population has suffered major environmental, economic, and social consequences as a result of this crisis. Around two billion people in dryland areas rely on ecosystems, with 90% of them residing in underdeveloped nations. In many undeveloped

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nations, where overcrowding is driving demands to utilize dry regions for agriculture, there is also a fast drop. Overgrazing is occurring in these moderately productive regions, and the soil is being degraded and groundwater is being drained. When rural land can no longer sustain the local population, mass migration to urban areas occurs. Droughts would certainly become more frequent and severe as a result of expected climate change, exacerbating desertification. Low productivity of the majority of natural pastures, which cover the largest area of exploitable lands in the region, forest degradation, decline of vegetation cover, loss of biodiversity, and deterioration of the productivity and characteristics of agricultural lands are all harmful effects of desertification in the Arab region (irrigated and rainfed). Desertification contributes to the growth of poverty and the deterioration of living circumstances in rural regions, forcing males to relocate to cities and increasing the responsibilities faced by women and children in rural communities. Drylands are delicate, and when they degrade, the consequences for humans, cattle, and the environment may be disastrous. Desertification is not a new problem. It has had a significant impact on human history, contributing to the fall of many big empires and the relocation of local populations. However, today's pace of arable land deterioration is projected to be 30 to 35 times that of the past.

Recommendations

There are a number of means to reduce soil erosion and desertification, especially in arid and semi-arid areas, in order to preserve and develop natural resources. Among the most important of these means: (1) Environmental survey to find out the causes that lead to the deterioration of ecosystems; (2) Sand dune stabilization, including: (a) erecting frontal and defensive barriers as first lines in front of the sand advance; (b) erecting small windbreaks; (c) Covering the sand dunes with the following: 1)Dead plant material; 2) Oil derivatives, chemicals or rubber. 3) Afforestation of sand dunes with plants suitable for the middle of sand dunes; (3) Maintaining natural pastures and expanding natural plant cover; (4) Reducing rain-fed agriculture's development at the expense of natural pastures; (5) The use of floodwaters for agricultural purposes; (6) Stop chopping down trees and plants to make electricity; (7) Irrigated agricultural control and an assessment of existing irrigation and drainage systems. Plants that require little water and are drought-resistant are cultivated in dry farming; (8) Adding organic materials to the soil and plowing it with the plants that dwell there to improve its structure; (9) Constructing terraces to eliminate the land's slope. (10) During the first wet season, plowing the ground. (11) Stopping the flow of water by creating ponds and lakes in the canyons. (12) Dams are being built to lessen the force of severe storms. (13) Maintaining plant cover and avoiding overgrazing. (13) Plant trees and shrubs as bumpers around fields and regions that are prone to erosion

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