



Impact of desertification on agricultural land

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ABSTRACT

Desertification is the degradation of land in arid, semi-arid and dry sub-humid areas. It is caused primarily by human activities and climatic variations, It occurs because dry land ecosystems are extremely vulnerable to over exploitation and inappropriate use. Land degradation is a major obstacle militating sustainable use of land resources for agriculture. The relative role of climate, drought and human impact was discussed. This menace which manifested in the forms of soil erosion, desertification, salting of river and ponds, acidification and Stalinization, loss of soil fauna and flora e.t.c. is seriously militating productive parts of the soil, Poverty, political instability, deforestation over grazing and bad irrigation practices also undermine the land's fertility, thus, resulted in a negative effect on the socio-economic status of the inhabitants. These consequences can be properly addressed through the establishment of shelterbelts and woodlots, improvement of agricultural productivity, creation of awareness of the drought-hazard through provision of necessary resources for meteorological services in the area as well as legislation against indiscriminate felling of trees.

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Introduction

Definition of Desertification

The concept of desertification has been defined differently by various scholars in the field and this varies with individual interests, for instance Hare (1983) defined desert as a region from which perennial life is excluded or, at least rendered sparse mainly due to deficient precipitation. However, the FAO/UNEP defined desertification as a process involving all forms of degradation (natural or man-induced processes disturbing the equilibrium of soil, vegetation, air and water) of land vulnerable to severe edaphic or climatic aridity leading to the reduction or destruction of biological potential of the land, deterioration of the living standard and intensification of desert-like condition (WMO, 1985).

Processes of Desertification

In general, the natural vegetation of the desertification prone areas of the world is sparse or scanty due to primarily lack of sufficient precipitation. However; scanty the vegetation in these regions may be, it protects and to a large extent stabilizes the ground surface. Accordingly, where vegetation is not completely degraded, there is always, in arid zone, a diffuse cover of at least 20-40% perennial species, such as shrubs, under-shrub and grasses, which are capable of protective soil surface from erosion. Wind erosion in these conditions is compensated by sand deposits behind obstacles that perennial plants constitute. When, as a result of climatic stress and man's intervention, the species become scattered, wind erosion is no longer compensated by particles deposited behind the obstacles that perennial species constitute and deflation may increase up to the point where patches of land surface are covered by pebbles after the removal of movable materials (Le Houerou, 1977).

Decreased vegetation cover increasingly exposes the surface to the impact of torrential rains that usually succeed drought. Large raindrops accompanying these rains disperse the fine elements of surface soil aggregates to fill up the pores in the

soil surface and, thus, create a sealed surface. Such a surface may reduce the infiltration rate and increase runoff by about 80%, resulting in a much drier soil conditions and death of the remaining plant individuals. With increase in runoff, sheet and gully erosion may set in, especially on sloping grounds, and the top soil and its store may be lost. The overall result is that the regeneration of plant is difficult and there is a general decrease in plant productivity. Patches of land so degraded may slowly grow and link up, eventually joining the climatic desert over areas that, from climatic point of view are not truly deserts (Oladipo, 1989).

Causes of Desertification

Scholars in the field of desertification had classified the causes of desertification in to two major factors namely; the periodic stress of climate on the one hand, and the man's use and occupation of the sensible and vulnerable dry-land ecosystem. Moreover, the concept of desertification as a dynamic phenomenon may be capable of feeding on itself.

Accordingly, Climatic fluctuations with changes in the temporal and spatial distribution of rainfall may result in the lengthening of aridity phases, higher temperatures and winds of greater intensity. Similarly, increasing human pressure on the cultivated area beyond the borders where man-environment equilibrium can be maintained. Such human pressure normally includes the extension of irrigated areas, extensive use of the tree-biomass for firewood and overgrazing of livestock. These factors result in increased water and wind erosion of soil salinization and degradation of the plant cover by wind, man and livestock. In addition, several processes may operate simultaneously, feeding back into the system, intensifying the degradation of the quality of the resource base and the decline of biological productivity (Oladipo, 1989)

Climate and Desertification

The desertification processes have to be viewed in the larger context of climatic fluctuations or change, not only seasonal and annual variations in precipitation, but long-term cycles of

drought and wet period, except for the arid lands in central Asia and North America, desert-prone areas are located in the subtropical and tropical latitudes and they have certain climatic characteristics and precipitation regimes that make them very susceptible to desertification. In these regions of mainly subsiding air, there is not enough rain to support perennial cropping but pastoralism and growth of drought-resistant (between 200-600m isohyets) depending on cultural and moisture-conserving practices.

Characteristics and Dynamics of Desertification

According to Le Houerou (1977), where vegetation is not completely degraded, there is always, in arid zones, a diffuse cover of at least 20 to 40% perennial species such as shrubs and grasses, which are capable of protecting the soil surface from erosion. When as a result of climatic stress and man's intervention, the species become more scattered, wind erosion is no longer compensated by particles deposited behind the obstacles point where patches of land surface are covered by pebbles after the removal of movable materials. At this stage permanent plant life may become impossible because lack of water reserves in the remaining shallow soil may prevent seedlings from surviving the first prolonged drought.

Desertification as a dynamic phenomenon is now believed to be capable of feeding on itself. In this respect, several processes may operate simultaneously, feeding back into the system, intensifying the degradation of the quality of the resource base and the decline of biological productivity especially in the semi-arid and arid regions. The speculation that drought may indeed feed on drought to promote long-term desiccation has led to the postulation of some feedback mechanisms: the cause effect positive feedback mechanism postulated by several investigators as summarized by Sabadell (1982).

Most of these cause-effect positive feedback mechanisms have been extensively tested by the general circulation model experiment and found to provide strong evidence that the concept of positive feedback between the surface and the atmospheres in reinforcing drought and desert like conditions, has been tested operationally (Nicholson, 1983).

The Effects of Desertification

The direct physical consequences of desertification may include increased frequency of sand and dust storms and increased flooding due to inadequate drainage or poor irrigation practices. This can contribute to the removal of vital soil nutrient and bring about a loss of vegetation cover which consequently undermines local food production food Insecurity famine as we as reduced biodiversity.

In addition desertification also initiate regional shift in climate which may enhance climate change due to green house gas emissions, reduced top soil can lead to a fall in water availability. The resulting decrease in local atmospheric humidity and increase in surface albedo (reflectivity of sunlight) has the potential to further reduce the regional precipitation. This alteration of the energy balance and change in land surface can play a part in generation a self sustaining drought.

Furthermore, desertification reduces the availability of removal sinks for carbon dioxides, the main green house gas.

Monitoring and Assessment of Desertification

To be able to developed rational and efficient measures to combat desertification, it's imperative to analyze and monitor in different types desertification processes, their extent and rates. Unfortunately, for many localities theses still not well known yet, and the rate and extent of recovery of vegetation, soil and animals in decertified environment poorly understood.

Because desertification is a phenomenon dynamic in time, space and intensity, its monitoring is concerned both with natural undeveloped areas where ecological trends can be identified and with development project for evaluating environment induced by the development process. The principal objectives of monitoring would be;

To enlarge our knowledge and understanding of the processes, their causes and evolution.

Allow an early detection of areas recently subject to accelerated desertification as a result of climatic vagaries and development of planning programmes by man.

For desertification control, it is not enough to only produce map changes in desert boundaries without investigating the reasons behind the changes, for example, because desertification is a function of man's interaction with a fragile environment subject to extreme year-to-year climatic fluctuation and the resultant water resources variation, Although statistical analysis of rainfall data is of fundamental importance, this will make it possible to establish the variability with rainy season and changing rainfall regime, as an indicator of a possible climatic changes, and the probabilities of the interruption of precipitation over a time period. Similarly, because soil erosion is a major cause and also a result of desertification, quantitative assessment of the erosion capacity of water and wind in accelerating land degradation in arid and semi-arid region will be useful in providing a clear overview of the processes, extent and potential rates of desertification (Oladipo,1989).

Desertification Correction Measures

Some measures for combating desertification as enumerated at the UN conference on desertification (UNCOD, 1977) include;

- Awareness of the Drought Hazard

All vulnerable countries must be aware of the fact that drought will recur in the future and therefore equip themselves with drought plans. In this respect, the recommendations of the expert group on the climatic situation and drought in Africa (WMO, 1983).

- Water Resources Planning Development and Management

Several ways of conserving water, such as drawing irrigation water from the sandy river banks instead of directly from the river, creating shallow reservoir for storing water and using the storage capacity of the sandy sediments for avoiding evapotranspiration need to be encouraged especially in the rural areas as a form of insurance against drought. This will require collection of water resources data and the establishment of data bank on national basis. In addition there must be a good network of meteorological stations.

-Ranged Land and Livestock Development

To convert desertification in pastoral system means to adopt grazing practices that will allow the vegetation to recover within the natural environmental constraints. Thus, overgrazing, over cultivation, excessive wood collection and bush burning which cause much degradation of the dry rangeland that contributes to desertification needed to be counteracted. Other measures to combat desertification in pastoral systems may include surveys to determine the useful productivity of the main varieties of dry land pasture under different seasonal conditions, and surveys to assess the carrying capacity of the rangeland under different conditions. Differed or rotational grazing can be practiced and grazing strategies should incorporate the possibilities for the establishment of protracted reserves as seed reservoirs, grazing reserves in the event of drought, and /plant and wildlife refuges in which genetic variety can be conserved. Other complementary activities for decreasing the pressure on grazing

lands are the development of fisheries, wildlife, handcraft, tourism and small scale industries.

Tree planting in ecologically suitable localities together with other forms of vegetation improvement are essential for combating desertification as well as for supplying present and future requirement of wood and fodder.

Above all, a more appropriate practical approach to the effective management of arid land resources to combat. Desertification is one in which the particular characteristics of the sensitive dry lands are taken in to proper account due to their limited resilience, (Sabadells, 1982). In addition, development and management of resources should be based on strategies that can built from the bottom upwards to take into consideration the local human and natural resources, their diversity and their socio-economic needs and desires. Such a comprehensive systematic approach taking into consideration both the human and the environmental factors of desertification would make the measurement and assessment of cause-effect. Relationship, cumulative stresses and detection of progressive land degradation possible (Oladipo, 1989).

Conclusion

The impact of desertification on agricultural productivity has been found to be highly significant for the incidences of crop failure and continuous decline in productivity with result and effect on the socio-economic activities of the people.

Desertification is characterized by continuous decrease in vegetation cover as a result of high demand for fuel wood, overgrazing, salting of rivers, salinization, loss of soil fauna and flora, soil acidification and soil erosion, expansion of agricultural lands and residential housing demand to shelter the teeming population, deforestation as well as drought which was found to be moderate.

The impact of desert-like condition is also evident through engulfing of sand dunes on roads and houses with a consequent economic effect for rehabilitation and maintenance of the existing infrastructures leading to the underdevelopment of the of the environment.

The absence of surface water and spatial distribution of boreholes indicates the presence of dry conditions posed by the phenomenon of desertification. Shortage of water in the area exacerbates the menace of desertification by making life uncomfortable, absence of irrigation scheme resulting in decline in food supply.

In general, the continuous decrease in biological potential of the land as a result of poor farming practices, overgrazing, deforestation and drought are responsible for the desertification posed on the entire ecosystem.

Recommendation

The phenomenon of desertification has been affecting the ecosystem over a long period of time. Based on this work, the following recommendations are considered very important in controlling and reducing desertification.

(a). Planting of permanent vegetation (trees and shrubs) will stabilized river banks by reducing erosion forces of flowing water.

(b). Stone pitching to check the expansion of river batik.

(c). Ridging across the slope, making terraces and counter bonds will prevent the adverse consequences of erosion.

(d). Planting of crops that are salt loving/tolerant and moderately tolerant crops such a cotton, sorghum and wheat will performed better.

(e) To provide more sources of fuel wood through the establishment of woodlots and other sources

(f) Increase crop productivity through the supply of high yielding and drought-resistant variety of seeds, fertilizer subsidy and establishment of irrigation scheme.

(g) Stabilize soil condition and reduce wind speed through the establishment and expansion of the prominent shelterbelts.

(h) The government should take prompt action to provide necessary resources to their national meteorological services.

(I) Special emphasis should be placed on the keeping rainfall data, records of upper atmosphere and hydrological information

(j). Rangeland and livestock development through adopting grazing practices that will allow the vegetation to recover within the natural environmental constraints.

In conclusion, the problem of desertification is urgent because it result not only in the loss of valuable genetic resources, increase in atmospheric dust with consequent changes in the radiation heating of the earth, disruption of water resources and possible collapse. Negative effects on socioeconomics and peoples livelihood. All hands should be on desk to check the menace of desertification for the betterment of humanity.

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