ANTHROPOGENIC CAUSES OF DESERTIFICATION IN WESTERN SUDAN

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I. Introduction

So far, little has been known about the extent of the drought disaster in western Sudan, although it lies within the Sahelian belt which was severely hit by drought in 1970–1973. The four western provinces of the Republic of the Sudan, Northern Darfur, Southern Darfur, Northern Kordofan and Southern Kordofan have been greatly affected by the drought disaster, whose impact is still felt in the two northern provinces.

The discussion on the Sahelian drought led to a discussion on the problem of desertification in the same zone. Both phenomena are, however, not identical. Undoubtedly, they are closely interrelated and possess many common characteristics, but desertification is much more complex in nature and causes greater and more lasting damage. Droughts are an inherent part of arid and semiarid climates, while desertification is triggered off and controlled by man. Desertification signifies the extension or intensification of desertlike conditions through the destruction of the regeneration ability of the vulnerable ecosystems of semiarid regions. Through the impact of man a severe degradation of vegetation is caused and the soil suffers a drastic decline of productivity. The outcome is a man-made desert. The main cause of desertification is, therefore, man himself through the destruction of the natural resources. Land use practices which are incompatible with the physical geographical preconditions (irrational cultivation, excessive felling of trees and overgrazing) constitute a misuse of the agroecosystem.

Using a schema I should like to illustrate the process complex of desertification (Fig 1):

a) The ecosystem of the endangered areas, before the impact of man, is being displayed as a circle. Within this ecosystem climate, vegetation, relief preconditions and soil form a more or less vulnerable equilibrium.

b) Through the human impact the process of desertification is being set off. Land use methods, which are fairly positive in the humid zones, often prove to be incompatible in the arid zones, especially if they are intensively practised.

c) The desertification forms, examples of which are being displayed here, are to be considered as processes and not as a terminal state. Both soil and vegetation are being affected by these processes.

Speaking of anthropogenic causes of desertification in western Sudan I imply the existence of non–anthropogenic causes as well, namely the natural ones. I should like, therefore, to begin with a brief outline of the natural causes of desertification:

1. Aridity and its Consequences

Aridity only is not enough to release the processes of desertification. But it involves an important precondition for a far-reaching human impact onto the ecosystem. The region of western Sudan, which is severely affected by desertification lies in the zone of the thornscrub savannah ranging between the 200 mm and the 600 mm isohyets.
Fig 1
Desertification Schema

(Fig 2). The number of the arid months is between 8 and 12 annually. The natural vegetation has well adapted itself to this dominant aridity. The human impact, including pastoralism led to the destruction of this sensitive equilibrium. The natural ability of the vegetation to regenerate has been destroyed in vast areas. This is particularly the case in the desert marginal zone: the Sahelian zone.

2. Variability of Precipitation as a Cause of the Vulnerability of the Ecosystems for Desertification

The annual mean deviation of precipitation from the long-term annual mean is between 25–40 % in the Sahelian zone of western Sudan. Maximal deviation can reach 180 % (Fig 3). Only about 10 % of the years “behave normally” and get rain amounts which are comparable with the annual mean. The high variability of rainfall makes land use planning extremely difficult. A more or less exact fixation of the agronomic dry boundary is rendered nearly impossible by the fluctuation of precipitation from year to year (Fig 4). Similarly the boundary of permanent human settlement is strongly affected by the change from periods of a run of humid years to periods of long-lasting droughts. The effects of the yearly fluctuations of precipitation are even more intensified by the local variability.

To sum up, an arid climate of high variability produces a vulnerable ecosystem which reacts extremely sensitively to the processes of desertification. It is probable that long-term climatic changes play a role in the desertification in the Sahelian zone. Our studies in the west of the Republic of the Sudan have shown, however, that the processes of desertification observed there are very young. In many areas they have taken place within a man’s life. In contrast to this, climatic changes usually take place over long spans of time and, therefore, cannot be made responsible for the present desertification.

3. Relief and Soil Preconditions

The ecological sensitivity for desertification depends on the relief and soil preconditions in the different areas. Accordingly the effects of desertification vary greatly within the same climatic zone. Wadis and depressions, for instance, are more resistant to desertification than dunes of loose sandy soils and slopes are particularly exposed to erosion hazards. The irreversibility of desertification processes and the ability of the natural vegetation to rehabilitate itself depends to a great extent on the specific relief and soil conditions in the area. The ecological differentiation of the desertification prone zone in Kordofan and Darfur can be summed up as follows:

a) The Goz areas occupy a great part of that zone. Goz signifies the undulating sand accumulations of the stabilised old dune belt. Thanks to the high infiltration rate and the easy tilling of the sandy soil the Goz has always