

A Study of Climate Change and Anthropogenic Impacts in West Africa (8 pp)

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Abstract

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Background, Aim and Scope:

During the last decades ecological conditions in West Africa have dramatically changed. Very evident is the climate change, which has resulted in a southward shift of the climate zones, e.g. a spread of the desert (Sahara) into the Sahelian zone. After the drought period of the early 1970s and 1980s, livestock density increased resulting in an intensification of grazing pressure. This anthropogenous phenomenon leads to similar landscape changes as those caused by the climate.

Only very few investigations exist on vegetation dynamics, climate changes and land use changes for the Sudanian zone. The paper presents data on changes of precipitation, of land use, of the geographical range of species, and of the composition of the flora, which have to be regarded as proofs of the sahelisation of large areas of the Sudanian zone.

Materials and Methods:

- Area of investigation: Burkina Faso.
- Precipitation data analysis: precipitation data from 67 stations; time series analysis and geo-statistical spatial interpolation.
- Analysis of land use change: Landsat satellite MSS and ETM+ data, acquired for two different dates between 1972 and 2001 analyzed by the software ERDAS/IMAGINE version 8.6 and ArcView 3.2 with the Spatial Analyst extension. Intensive ground truthing (160 training areas).
- Inventory of the flora: based on the data of the Herbarium Senckenbergianum (FR) in Frankfurt, Germany, and of the herbarium of the university of Ouagadougou (OUA), Burkina Faso, as well as on various investigations on the vegetation of Burkina Faso carried out in the years 1990 to 2005 by the team of the senior author.
- Life form analysis of the flora: based on the inventory of permanent plots.

Results:

- Precipitation: Remarkable latitudinal shift of isohyets towards the South translates to a general reduction of average rainfall in great parts of the country. The last decade (1990-1999) shows some improvement, however, the more humid conditions of the 1950's and 1960's are not yet established again.
- Landcover change: In the study region the extent of arable fields and young fallows increased during the last 30 years from 580 km² in 1972 to 2870 km² in 2001. This means an average land cover conversion rate of 0.9% per year for the 6 departments considered.

- Change of the distribution of Sahelian and Sudanian species: Several species, mentioned in older literature as strictly Sahelian, today also occur in the Sudanian zone. Parallel to the spread of former strictly Sahelian species into the Sudanian zone, some former Sahelo-Sudanian species have withdrawn from the Sahel.
- Changes of the life form spectra of the flora: Considering their life form spectra, the flora of heavily grazed and of protected areas in the Sudanian zone show great differences. On areas intensively grazed the percentage of therophytes is evidently higher than on protected areas. Just the opposite is true for the phanerophytes. Their percentage is higher on the protected area than on the grazed zones.

Discussion:

At the first glance, it is obvious to link the changes in flora and vegetation with the climate changes that have occurred during the last five decades (decrease of annual precipitation). However, not only climatic conditions have changed, but also population has increased, the percentage of land intensively used for agriculture and pasturing has increased and the time for soil regeneration today is much shorter than it was some decades ago. Thus, the landscape of the Sudanian zone has become a more Sahelian character. A comparison of the flora of an intensively used area of the Sudanian zone with that of a protected area shows a remarkable change in the life form spectra. The spectrum of the intensively used area is almost identical with that of the typical Sahelian flora. This comparison shows that the anthropogenic influence plays a greater role in the sahelisation of the Sudanian zone than the climate change.

Conclusions:

Climate change and anthropogenic influence both, lead to a sahelisation of landscape and flora. Thus in many parts of the Sudanian zone of West Africa sahelisation phenomena will remain and even increase independently from the reestablishment of the more humid climate conditions of the 1950ies.

Recommendations and

Perspectives:

In order to maintain some parts of the characteristic Sudanian landscape with its characteristic flora and vegetation, the number and size of protected areas should be augmented. For all protected areas it has to be ensured, that protection is reality, i.e. respected and understood by local people, not only fiction. As long as the enlargement of intensively used areas continues the sahelisation of flora, vegetation and landscape will continue too.

Keywords: Acacia; Burkina Faso; climate change; land use; life form spectra; precipitation; sahelisation; Sudanian zone