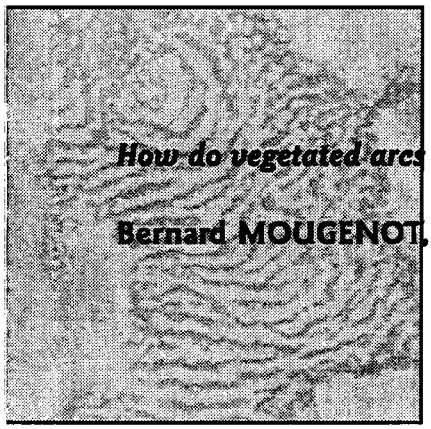

How do vegetated arcs move upwards in Niger

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The dynamic of vegetated arcs in a banded vegetation on plateaux in west Niger is evaluated by multidate aerial photographs. Two methods were used: aerial photographs and dendrochronology.

Aerial photographs are acquired in 1950 (scale = 1:50000), in 1975 (1:60 000) and 1992 (1:50 000 and 1:25 000), 25 et 42 years later. Previous estimations of the vegetation shift by others methods gave velocity of 4 meters for 40 years. The scanning of aerial photographs provides a pixel size between 2 and 5 meters on ground. Bands are 20 - 30 meters large, i.e. 4 - 15 pixels. Geometric corrections for superposition is a prerequisite to obtain a good estimation of spatial dynamic. 1950 photographs are used as references. Localization error for other dates is less than one pixel. Three small plateaux are selected. Their surface don't exceed 1 to 1.5 km2 with a pattern of 6 or 7 bands or more. We generated a classified image with one class of bare soils and two classes of vegetation : high and low coverage by bush and herbaceous mixed. Some confusions remain with gravely surfaces and degraded vegetation bands. The images of the three periods are superimposed and the changes of each initial class to bare or vegetated are studied in 1975 and 1992.

From 1950 to 1975, the first effects of drought since 1970 involved a decrease of the vegetation cover. Human degradation remains limited on these plateaux during this period. We observed also an overall contraction and a smoothing of the vegetation stripe boundaries. The bands are frequently disconnected. On the other hand, some evidences of upslope dynamic of vegetated bands are detected as :

✓ recent connections between vegetation bands,

✓ closing of small bays along the bands,

✓ thickening of bands. These processes are always directed upslope and the vegetation encroachment ranges between 5 and 20 meters. Conversely, band thinning is mainly restricted to the opposite downslope side that suffers insufficient water runon. From 1975 to 1992, the rainfalls are always below average and the system tends to a new equilibrium with a general thinning of vegetation bands mainly downslope. However, some upslope colonization of bare surfaces and at the end of vegetation bands still occur.

Shrubs and trees datation were performed along a transect 20 meters large and 400 meters long, across 6 vegetated arcs. Mean ages were determined for three zones within the arcs:

✓ upslope or pioneer front,

✓ close bush or centre zone and

✓ downslope or degraded zone. These ages are respectively 6 years (max 10), 10-13 (max 41) and 14-15 (max 26). One can thus infer first that the whole band is no more than 40 years old, secondly that an age gradient does exist within the band. Such data might be also interpreted through a whole band migration within less than 50 years. However, such assumption is not supported by the study on aerial photographs and with other temporal indicators of band migration. Rather, such data are interpreted as resulting from internal vegetation turnover within the bands related to life history and life cycle of each species involved.

Due to the relatively short time-span and drought impacts, upslope migration of vegetation bands was not systematically demonstrated in every part of the studied area. However, a partial validation of the model predicting an upslope migration of the banded system (Thiéry et al., 1995) was obtained.