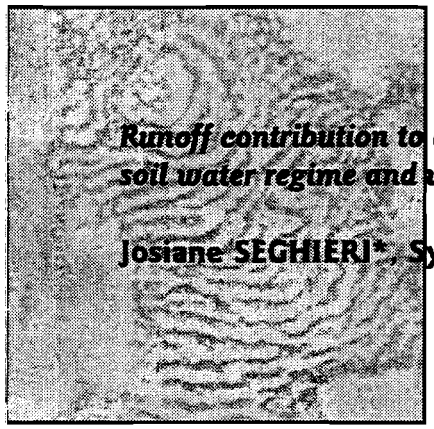

Runoff contribution to a sahelian two-phase mosaic system: soil water regime and vegetation life cycles

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Tiger bush is a particular vegetation pattern with densely vegetated bands alternating with bare areas. It has been reported in many parts of the arid and semi-arid zones. In Niger, bare areas serve as an impluvium for the downslope vegetated bands. The first objective of this paper is to quantify the relationships between the intraseasonal soil water flows and the seasonal vegetation dynamics (e.g. during a rainy season). We verified the need for the run-on from the bare zone to sustain the vegetated stripes. We focused on a zone where the most important gradient in soil water content and rapid changes in vegetation distribution are observed, i.e. the transition zone between the bare soil and the thicket.

Two representative vegetation stripes have been monitored from 1992 to 1995. Data were collected along transects placed perpendicularly to the vegetated bands, from the bare zone to the center of the vegetated thicket, along the line of maximum slope. In this way, the succession of vegetation features have causal relationships and connectance due to the flow of waterand the associated soil surface features such as crusts. Vegetation data include phenology and demography of the two main species of the herbaceous stratum from 1992 to 1994, and evolution of leaf water potential and phenology for the two main species of the woody stratum during the rainy seasons 1994 and 1995. Data on the crust distribution were collected once in 1992 and again in 1994. Soil moisture profiles were measured at depths of between 1 m to 5.6 m using a neutrons humidimeter (Solo) from 1991 to 1995. Pipes for use of the neutron probe were set on the same types of crust occurring from upslope to downslope on each vegetated band. A wall was built during the dry season 1992-93. It was placed just at the herbaceous

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stratum upslope boundary to stop the run-on from the bare zone to the vegetated band.

Data from 1992 allow us to give details of the processes involved and to verify the similarities in the functioning of the two stripes. The data from the following years allow us to compare the effects on the soil water and vegetation dynamics of deleting the run-on. Results show that for the herbaceous strata the distribution of *Michrochloa indica* (Linn.f.) P. Beauv., well adapted to an open environment, closely correlates to the distribution of sedimentation crusts, immediately upslope to the thicket cover, and *Cyanotis lanata* Benth, a shade-tolerant species, closely correlates to the distribution of microphytic crusts inside the thicket. Infiltration occurs first and deepest throughout the rainy season in the centre of the thicket under microphytic crusts. Herbaceous stratum grows simultaneously under the woody thicket. Then from the end of August infiltration increases upslope of the thicket, under the sedimentation crusts which were slightly colonised until this time, while only *Microchloa indica* moves upslope until there are insufficient seeds. The wall has no significant effect on the dynamics of the two main species of the low strata, in relation to the low differences in the soil water flows down to 40 cm. There are no significant consequences on the *Combretum micranthum* G. Don phenology and evolution of the leaf water potential because of the deep and extensive infiltration of the rains inside the thicket where this species is dominant and because of the run-on from the pioneer zone mainly covered by sedimentation crusts during the first part of the rainy season. On the other hand, the period and the extent of the reproduction phases of *Guiera senegalensis* J.F. Gmel are greatly reduced and the leaf water potential increases very quickly after the last rains in relation to a great decrease in the soil water stock of the layers colonised by woody roots located in areas where there are sedimentation crusts and where this species is most abundant. Results are discussed in relation to the existing functioning models.