Session 05 : Biodiversité, fonctionnement et services dans les écosystèmes terrestres

Agroforestry systems : how to conciliate production and biodiversity conservation ?

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Coffee and cocoa trees are perennial crops cultivated in the humid tropics mainly by smallholders, with no mechanization, little or no inputs. These crops are cultivated in agroforestry system (AFS) which are characterized by a strong diversity of tree species, a multistrata structure and an ecological functioning close to that of forests. AFS show a wide diversity of structure resulting from the local conditions and from farmer's practices. Until the last decade, these systems have been largely ignored by agronomists who were focused on productivity improvement, through more intensively led monocropping systems. Environmental concerns raise a new interest in AFS. In the tropical "biodiversity hotspots", it is now widely documented that these systems provide a number of environmental services among which biodiversity conservation. In these regions, AFS are also often one of the main sources of the farmer's income. In order to improve farmers' livelihood, we need to seek designs and management options which combine productive performances and environmental services related to biodiversity conservation. In this paper we analyse the trade offs between the productivity of the main perennial crop and the tree biodiversity in the SAF. This analysis was based on the characterization of the structure of these AFS, i.e. the nature of the components (trees species cultivated or not), and their 2D spatial organization expressed as the level of shade on the perennial crop. This approach was applied in Guinea (West Africa) and in Costa Rica (Central America) on samples of about thirty plots in each area. In each plot, coffee/cocoa production was assessed and inventories of the structure and composition of the tree vegetation were carried out. Shannon and richness indexes were calculated to assess the level of tree biodiversity. Additional inventories were carried out in "natural forests" to serve as reference. Four main types of structure of the AFS in Costa Rica and 3 in Guinea were identified. They induced a high variability in coffee or cocoa yield and in tree biodiversity in both regions. This variability is related to AFS structure: significant differences in yield and levels of tree biodiversity were identified between the most contrasted types of structure. The intermediates types of structure present an interesting trade off between productivity and tree biodiversity suggests that the perennial crop productivity can be increased while keeping a high level of tree biodiversity.

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