The role of biophysical information for the management of fallow systems

Sá, Tatiana Deane de Abreu [1] and Vielhauer, Konrad [2]

[1] Embrapa Amazônia Oriental, Belém, PA, Brasil, [2] ZEF, Universität Bonn, Bonn, Deutschland

Biophysical information may help to improve the management of fallow systems, and to support the formulation of public policies aiming at the sustainable development of areas where the fallow vegetation is an important component of the landscape. A good sequence of key biophysical studies, attempting to space and time scales, associated to features of the particular fallow system scenario represents an important step in research/ development in that context. A good example of that has been practiced by SHIFT Project Env-25 (Secondary forests and fallow vegetation in the Eastern Amazonia- function and management), centered in northeastern Pará state, and is being planned to continue in the next phases of this project, tackling on biophysical aspects of fallow vegetation, in the context of the family agriculture practiced for over a century in that region. During the first phase of the project, when the main goal was to understand the function of fallow vegetation for the sustainability and productivity of the traditional smallholder's system, studies such as the following were carried out: water and nutrient budgets in secondary vegetation under slash-and-burn land preparation; assessment of daily and seasonal patterns of water relations and stomatal conductance in key species from the secondary vegetation; determination of floristic diversity of secondary vegetation of different ages and land preparation histories; understanding of reproductive strategies of common fallow vegetation species; and spectral distribution of light within secondary fallow vegetation.

The results from these studies provided a guideline for developing two lines of fallow vegetation management alternatives: 1) fire-free land preparation, by slashing and mulching, aiming at reducing soil degradation; and 2) fallow improvement by nitrogen fixing leguminous tree enrichment, to shorten the fallow period and to increase crop yield. The water and nutrient budgets also allowed comparison of the results to other vegetation types common in Amazonia. Along the second phase of the project, when the activities were directed towards the development and improvement of these two management alternatives, another set of biophysical studies was performed, including: water and nutrient budgets and soil temperature under slash/mulch land preparation; floristic composition; above/bellow ground carbon accumulation; rainfall partitioning; and light extinction in enriched secondary vegetation; photosynthetic behavior of fallow enriching species; and water relations and stomatal conductance of fallow enrichment and of fallow vegetation of indigenous species. The results of these studies helped to improve and to validate these techniques. Further research includes: biophysical impact assessment of slash/mulch technique as compared to the traditional system, on a watershed scale; monitoring of soil moisture and temperature in a planting date experiment under fire-free land preparation; biophysical interactions between components of the enriched fallow, in different spatial and temporal scales; devising managed schedules for enriching fallow components to maximize benefits. Part of the biophysical information available and/or planned to near future will be used for the non-monetary valuation of the environmental services provided by managing secondary vegetation, and also may be used to feed/validate models aiming at understanding the environmental impact of different land use/land cover changes in local and large scale climate. The understanding of biophysical processes along the fallow based system may provide a sound scientific basis for the improvement of traditional and evolving systems.