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Fallow vegetation and agricultural sustainability in Eastern Amazonia: bringing out ecological features in the present and alternative scenarios*

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Abstract

Over a century, smallholder agriculture has been practiced in Eastern Brazilian Amazonia, alternating cropping periods with fallow periods, when the secondary vegetation develops and allows to restore the soil fertility, with land preparation been made by slash-and-burn. With the population pressure increasing over this old agricultural frontier, reducing the duration of the fallow period and introducing other land uses in the system, sustainability has been threatened and research effort focused in understanding the biophysical and biogeochemical roles played by the fallow vegetation in the traditional and in the recently introduced systems, and in proposing and assessing sustainable alternative technologies taking into consideration ecological roles played by fallow vegetation (i.e. biophysical and biogeochemical processes and biodiversity). Along this process, ecological features of the fallow vegetation have been gradually revealed: the ability of numerous groups of plant species in storing different nutrients (functional biodiversity); the role of their deep roots pumping water and nutrients of deep layers during the fallow phase, and of maintaining the nutrients in the soil, even during the cropping period, by avoiding leaching (the safety-net hypothesis); the effect of this rooting mat associated to the maintenance of the riparian vegetation by the small holders, keeping water quality in a watershed scale; the rates of carbon stocked above and below ground; and the rate of water vapor exchange with the atmosphere found even in young fallow vegetation approaching those found in primary forests. The alternative technologies proposed include: fire-free land preparation (to avoid burning allowing doubling the cropping period) and improved fallow (reducing the fallow period, by planting fast growing tree species). The assessment of the effect of these alternative technologies as compared to the traditional system includes studies of: water and nutrient balances; emission of green house effect associated gases; carbon stocks; and watershed level hydrometeorological and hydrogeochemical aspects.

* Based in results and activities of the “Tipitamba Project”, being carried out by Embrapa Amazônia Oriental and partners in Northeastern Pará State, started by the activities of the SHIFT-Capoeira project, and presently complemented by other initiatives, including some of LBA (LBA-ECO, Milênio LBA).