

Forest or agroforestry systems, farmers value trees for ecosystem services provision in Nicaragua

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In Central Nicaragua, in a rural landscape where trees grow everywhere, we studied the relations between land uses and the perception of ecosystem services (ES) provision by farmers. We worked in 3 municipalities and interviewed more than 100 households distributed among 10 communities, from 2016 to 2018. During gender specific focus groups we produced participatory maps of land uses (following Braslow et al. 2016), localized ES with the Pebble Distribution Method (described by Sheil et al. 2002), and analyzed land tenure issues using the analysis grid for land tenure proposed by Le Roy et al. (1996). Participatory observation (as detailed by Jankowski y Sabourin 2012) and semi-structured interviews (Newing 2010; Sibelet et al. 2013) were used to analyze livelihoods conditions, households' economies (data later analyzed with the support of Olympe software), and determining factors regarding land uses and tree planting.

Results prove no relation between land tenure security and the plantation of trees. Land occupation by any farming system with or without trees, such as food crop or pasture, is informally recognized as proof of ownership. Farmers plant trees around their house, in pastures or on the borders of paths, for the high value they attached to them. Trees provide goods (timber, fuel wood, fruits, medicine...) and services (preservation of soils and water resources, regulation of pests and diseases, action on the local climate), and are also recognized for their social value. With the same logic, both women and men recognized forest as the main land use regarding ES provision. By contrast, they consider it of less interest than agricultural land uses regarding household's income and livelihoods. Logging is not a well-remunerated activity, and the forestry law imposes strong restrictions to timber sale. Women and men farmers perceived that forests are important for soil, water and biodiversity preservation. They may provide fuel wood and timber for family needs, but these are also provided by trees in agroforestry systems and elsewhere in the farm. Indeed, fuel wood is more often collected in agroforestry systems, including sylvopastoral ones, as are fruits and medicines. Timber trees might be preserved when opening new agricultural lands over forests, for later use, and timber species spontaneous regrowth in agricultural lands might be protected by farmers.

Forests poorly contribute to the household's livelihood, trees within agroforestry systems provide the same ES than forests, and deforestation for agricultural land use conversion is a way to gain access to land. For these three reasons forests are converted into agricultural land uses until only remaining in locations of poor agricultural value. Because farmers value trees, these are preserved and even planted within agricultural lands, leading to a rich variety of agroforestry systems. As a result, agroforestry systems replace forests for their higher economic value to farmers.

Keywords: ecosystem services, family income, coffee agroforestry system, sylvo-pastoralism, home garden.

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