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"Resilience of agricultural systems against crises"

Ecosystem Services from Smallholder Agriculture through Slash-and-Mulch Based Agroforestry on Hillsides of Central America

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Abstract

Ecosystem services (ES) can be defined as the benefits that people get from nature. They embrace provisioning (*e.g.*, food and freshwater), regulating (*e.g.*, regulation of climate and maintenance of soil quality); supporting (*e.g.*, primary production and nutrient cycling); and cultural (*e.g.*, educational and inspirational values) services. Generation of ES by smallholder farming communities on hillsides of Central America has been severely affected by the extensive use of traditional-unsustainable practices combined with anthropogenic pressures and climatic variability. The Quesungual Slash and Mulch Agroforestry System (QSMAS) has been demonstrated as a land management strategy with high potential for generating multiple ES in these agroecosystems. QSMAS is a smallholder production system that combines basic management principles applied with simple technologies to improve the use and conservation of vegetation, soil, and water in drought-prone areas of the sub-humid tropics. It has been successfully promoted as an alternative to the traditional slash and burn (SB) agriculture. Research work conducted in Honduras between 2005 and 2009 showed that QSMAS contributes to food security through a sustainable increase in productivity of maize (*Zea mays* L.) and common bean (*Phaseolus vulgaris* L.), and by enhancing the resilience to extreme weather conditions (water deficit and excess), compared to the traditional SB system. In addition QSMAS enhances the generation of other ES at agroecosystem scale by contributing to the restoration of degraded resources (soil and biodiversity) at plot and landscape scales, and by reducing deforestation, soil

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erosion and global warming potential compared to the SB system. Experience from on-farm participatory validation in Nicaragua and Colombia suggests that slash-and-mulch based agroforestry systems have high possibilities of acceptance by local authorities and adoption by smallholders in vulnerable agroecosystems.

Agroecoregions with potential for adaptation and adoption of QSMAS have already been identified, based on site similarity analyses integrating biophysical and socioeconomic conditions. Additional studies are being conducted to evaluate the feasibility of QSMAS' integration with silvopastoral systems in smallholder farms of Nicaragua, and to use the system as a strategy for restoration and conservation of biodiversity in El Salvador.

Keywords: Bean, maize, QSMAS, Quesungual slash and mulch Agroforestry system, slash-and-burn, sorghum