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Economic Instruments to Promote Carbon Sequestration in Silvopastoral Systems in Central America: When and How Much Should Be Paid?

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Abstract

In search of possibilities to reduce carbon dioxide (CO_2) emissions from deforestation and soil degradation caused by cattle production, technology alternatives to extensive grazing are rediscovered which have a less detrimental impact on the integrity of natural resources and human health - those alternatives include silvopastoral practices like dispersed trees in pasture. Extensive research carried out in Central America demonstrates that well designed silvopastoral systems present a win-win situation for farmers and the society since they have the potential to increase cattle productivity and to generate environmental services like carbon (C) sequestration and biodiversity protection. Despite private and public benefits, adoption rates of silvopastoral systems have been low what lead to the use of different economic instruments in the region to compensate farmers for the provision of environmental services on cattle paddocks.

In the first part of our study we develop a model to simulate the incorporation of different tree densities into pastureland through natural regeneration on cattle farms in Costa Rica and Nicaragua, and we determine their C sequestration potential as well as changes in meat and milk yields. Improved pastures with a tree canopy coverage of 20 % have the highest net present values in both countries and sequester 104 t CO_2 ha^{-1} over a 30-year period without the need for compensation payments. In Costa Rica, canopy coverages lower and higher than 20 % require C payments in the range from US$ 0.8 to US$ 4.5 per t CO_2 whereas Nicaraguan farmers are able to carry out the respective land-use changes without payments. In the second part of the paper we analyse the cost-efficiency of different economic instruments which could be or already have been used to remunerate cattle farmers for C sequestration services. Those instruments include: payments for environmental services (PES) offered by Costa Rica's National Forestry Financing Fund for the establishment of agroforestry systems; Global Environmental Facility (GEF) funded PES for C sequestration and biodiversity protection through silvopastoral systems, and Certified Emission Reductions (CER) as they are issued for afforestation and reforestation project activities in the Clean Development Mechanism (CDM) of the Kyoto Protocol.

Keywords: Costa Rica, land-use change, market and non-market based instruments, Nicaragua, payments for environmental services

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