

CONSERVATION MANAGEMENT EVALUATION ON THE ADAPTIVE CAPACITY OF AGRICULTURAL PRODUCTIVE SYSTEMS IN THE STATE OF RIO DE JANEIRO

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Strategies for adapting to and mitigating climate change can be complementary and generate economic and social benefits for the most vulnerable rural population. There are a number of soil and water conservation practices that contribute to increasing the resilience of agricultural systems in the face of extreme weather events and, at the same time, to increasing the carbon stock in the soil and consequently agricultural productivity. Changes in management practices in agricultural and forestry production systems, such as minimum cultivation, crop rotation, green manure, reduction of grazing pressure and suppression of deforestation, can increase agricultural productivity and its economic returns, which may contribute to food security and to reducing the vulnerability of the rural population. In the state of Rio de Janeiro where the majority of rural establishments have an area of less than 100 ha and in a current situation of intense degradation and susceptibility to erosion, the Rio Rural program operated from 2006 to 2018 providing financial incentives, training, participatory research, stimulating social cohesion and supporting the adoption of soil and water conservation practices aimed at increasing resilience and reducing the vulnerability of family farmers to extreme weather events (extreme rains in 2011 and drought in 2014). Embrapa Solos assessed the physical and chemical quality and the carbon stock of the soil in rural properties supported by Rio Rural. Areas with coffee, banana and persimmon plantations that received organic fertilization and/or green fertilization with legumes were evaluated; banana consortium areas with native tree species (SAF); and degraded pasture, recovered with rotational grazing. All areas were compared with reference areas (before and after interventions and/or Atlantic Forest areas) (Figure 1). The beneficial effect of conservation practices on soil quality has increased crop productivity and the resilience of agricultural systems in the face of extreme weather events. Reports from farmers during the drought that occurred in 2014 suggest that the adoption of such practices ensured water autonomy for a longer period than usual. This fact led to a 20% replication of practices through spontaneous adoption and using the farmers own resources without support from Rio Rural. Economic, social and environmental impact assessments carried out by Rio Rural corroborate that the environmental improvements were associated with gains in income and the elevation of the social capital, factors that will soon be integrated to the assessment of the adaptive capacity of rural communities.

RESULTS

- Organic fertilization and green fertilization have been associated with improved physical properties and soil fertility. There was an improvement in the aggregation, of the structured soil, less resistance to penetration, reducing soil compaction, favoring the development of roots and soil conservation, making the soils less susceptible to degradation, especially erosion;
- Rotational grazing favored the improvement of soil quality and the increase of the carbon stock up to 30 cm in depth and contributed to the increase and maintenance of pasture productivity. The increase in the carbon stock in the soil was directly related to the improvement of water retention, the cohesion of soil particles and the minimization of erosion. The carbon stock in a typical Red-Yellow Dystrophic Latosol in an area with (*Brachiaria brizantha*) pasture unmanaged during 20 years was lower than that found in the same area after paddocks were implanted for the establishment of rotational grazing in Varre-Sai, RJ; and
- For the same type of soil under the same physiographic conditions, monitoring data from the Rio Rural program indicated a reduction of 6 – 16 MgC ha⁻¹ in the soil carbon stock up to 30 cm under agricultural use in relation to soils under the remaining Atlantic Forest.

NEXT STEPS AND RECOMMENDATIONS

- There is a growing demand for simplified and low-cost methodologies for assessing the impacts of adopting sustainable management practices and for valuing sustainable agricultural systems. Researchers at Embrapa Solos in Rio de Janeiro are developing a tool to simplify the assessment of multiple ecosystem services promoted by sustainable agricultural systems. The tool adds a set of methodological protocols for simplifying the assessment of ecosystem services for erosion control, water supply and regulation, nutrient

cycling, carbon sequestration and maintenance of bee biodiversity in agroecosystems.

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Continued in Annex

Figure 1: Cultivation of banana with trees, in the community of Faraó, in Cachoeiras de Macacu-RJ



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