Adaptive agriculture strategies to enhance ecosystem services provision in tropical mountain area in Brazil

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Keywords: multifunctional agriculture; agroecosystem; ecosystem services.

Introduction

• The agroecosystem concept provides an approach which analyze food systems as wholes, including their complex sets of inputs and outputs and the interconnections of their components that results in benefits for the whole system.

• The multifuncional capacity of agroecossytems is directed linked with ecosystem services (ES) provision.

• To define, in a reliable manner, the connections between agricultural practices and ES provision, is still a challenge, since it is influenced by many factors, specific for each case.

• The aim of this study is to present some adaptative agriculture strategies to enhance ecosystem services provision in tropical mountains.

Materials and methods

The studied area is a watershed, with around 500 ha, located in the mountainous area of Rio de Janeiro State, Southeast of Brazil (Figure 1,2).

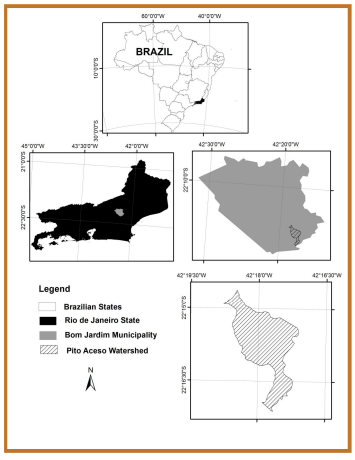

Figure 1: Study area localization – Rio de Janeiro, Brazil.

Figure 2: The area represents a typical rural landscape from Rio de Janeiro mountains region, composed by a mosaic of land use/land cover types, with family farming activity.

Results and Discussion

• The criteria for the agroecosystem development were based on existing knowledge of the area associated with gathered information through interviews with farmers and further stakeholders, and small field studies on social, economic, environmental and agricultural aspects.

•The results were organized in a framework, as presented in Figure 3.

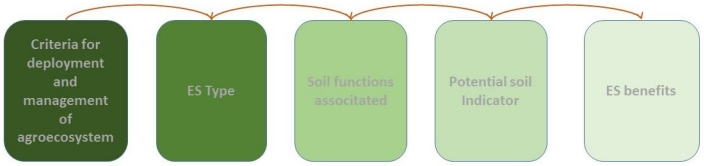

Figure 3: Relation among the criteria for deployment and management of agroecosystems proposed for the study areas with ES type, soil functions, potential soil indicator and ES benefits and policy relevance.

• Some results showed that ES types more affected by deployment and management of agroecosystems are supporting and provisioning services, what demonstrated the potential of agriculture management provide multiple services besides food, fiber and energy.

• "No fire use" and "agricultural consortium" were the criteria for deployment and management of agroecosystems with higher potential for increasing ES provision and biomass stock in soil and litter was the soil parameter (Figure 4).

Criteria for deployment and management of agroecosystem	ES Type			Soil functions associtated	Potential soil Indicator	ES benefits
	Provisioning	Supporting	Regulating			
No fire use	+++	+++	+++	Water infiltration / Habitat	Soil porosity Bulk density Hydraulic conductivity Retention curve Biomass carbon stock in soil and litter Microbial enzymatic activity (carbon cycle) Microbial enzymatic activity (phosphorus cycle) Microbial enzymatic activity (sulfur cycle) Soil macrofauna	Co_2 mitigation Stability in crop production Air purification Biodiversity protection Human health
Agricultural consortium	+	++	++	Nutrient cycling / Carbon sequestration and accumulation / Sediment retention / Habitat	Phosphorus (P2O5) content Potassium (K2O) content Calcium (CaO) content Magnesium (MgO) content Sum of bases = S = Ca + Mg + K + Na Biomass carbon stock in soil and litter Microbial enzymatic activity (carbon cycle) Microbial enzymatic activity (phosphorus cycle) Microbial enzymatic activity (sulfur cycle) Soil macrofauna	Higher food diversity Food security GEE mitigation Biodiversity protection Avoid land use change (LUC)

Figure 4: Relation among the criteria for deployment and management of agroecosystems proposed for the study areas with ES type, soil functions, potential soil indicator, ES benefits and policy relevance Qualitative estimates for each agricultural practice and their impacts on ES types are represents by low impacts (+) to high impacts (+++).

Acknowledgment

This work was supported by Brazilian Agricultural Research Corporation (EMBRAPA).