

Identification of Cocoa-Based Agroforestry Systems in Northern Madagascar: Pillar of Sustainable Management

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Abstract : Madagascar is one of the producer's countries of world's fine cocoa. Cocoa-based agroforestry systems (CBAS) plays a very important economic role for over 75% of the population in the north of Madagascar, the island's main cocoa-producing area. It is also viewed as a key factor in the deforestation of local protected areas. It is therefore urgent to establish a compromise between cocoa production and forest conservation in this region which is difficult due to a lack of accurate cocoa agro-systems data. In order to fill these gaps and to response to these socio-economic and environmental concerns, this study aims to describe CBAS by providing precise data on their characteristics and to establish a typology. To achieve this, 150 farms were surveyed and observed to characterize CBAS based on 11 agronomic and 6 socio-economic data. Also, 30 representative plots of CBAS among the 150 farms were inventoried for providing accurate ecological data (6 variables) as an additional data for the typology determination. The results showed that Madagascar's CBAS systems are generally extensive and practiced by smallholders. Four types of cocoa-based agroforestry system were identified, with significant differences between the following variables: yield, planting age, cocoa density, density of associated trees, preceding crop, associated crops, Shannon-Wiener indices and species richness in the upper stratum. Type 1 is characterized by old systems (>45 years) with low crop density (425 cocoa trees/ha), installed after conversion of crops other than coffee (> 50%) and giving low yields (427 kg/ha/year). Type 2 consists of simple agroforestry systems (no associated crop 0%), fairly young (20 years) with low density of associated trees (77 trees/ha) and low species diversity ($H'=1.17$). Type 3 is characterized by high crop density (778 trees/ha and 175 trees/ha for cocoa and associated trees respectively) and a medium level of species diversity ($H'=1.74$, 8 species). Type 4 is particularly characterized by orchard regeneration method involving replanting and tree lopping (100%). Analysis of the potential of these four types has identified Type 4 as a promising practice for sustainable agriculture.

Keywords : conservation, practices, productivity, protect areas, smallholder, trade-off, typology

Conference Title : ICASP 2024 : International Conference on Agroforestry Systems and Practices

Conference Location : Montreal, Canada

Conference Dates : August 05-06, 2024