

Title: Assessing adoption and sustainability of Agroforestry Systems in the Philippine Uplands using Geospatial Tools and Participatory Approaches: The case of Claveria, the Philippines

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Summary:

In most tropical regions of the world, the dwindling availability of arable land area in the lowlands has drawn people to migrate to the uplands and establish farming communities by clearing out forest areas for agriculture. As the uplands continue to be subjected to inappropriate farming practices, the resulting soil degradation has made the land resource base less productive, thus compromising the food security and sustainability of livelihoods of upland communities. The sustainable development of upland areas remains to be a major policy topic among countries in Southeast Asia, including the Philippines where upland areas are home to more than 25 million dwellers and contain important watersheds as well as most of the remaining forests.

Agroforestry is generally considered as one of the most sustainable alternatives to address the problems of upland areas because it can meet the food and livelihood needs of smallholder farm households as well as provide environmental services. The general objective of this thesis is to assess the sustainability of agroforestry systems in Claveria, the Philippines, within the framework of the three pillars of sustainability (social, environmental and economic) using relevant GIS tools and participatory approaches. Each chapter examines important issues related to the sustainability of agroforestry in the uplands.

Chapter 1 provides an introduction to the study and outlines the research objectives. Chapter 2 introduces the socioeconomic context of Claveria through the assessment of the spatial accessibility of households to services required to maintain livelihoods. Using GIS spatial metrics analysis, Chapter 3 characterizes the parcelization in the study area as being affected by the current land reform policy in the Philippines and its implication to agroforestry promotion.

In Chapter 4, the various social and physical factors of agroforestry adoption were assessed using binomial logistic regression including several spatially-explicit factors in order to understand the dynamics of agroforestry uptake among farmers in Claveria. In general, the outputs from the binomial logistic regression suggest that both spatial and non-spatial factors (farm area, distance to nearest road, farm elevation, multiple household income, and ownership of land) are important determinants of agroforestry adoption in Claveria.

Chapter 5 focuses on the environmental sustainability of agroforestry systems in Claveria assessed by modeling their impacts on the spatial patterns of soil erosion susceptibility in three catchment areas using a spatially distributed soil erosion model (WaTEM/SEDEM). Results of the soil erosion model indicate a large spatial variability in soil erosion susceptibility patterns, with higher erosion occurring on slopes greater than 8% on land under non-agroforestry use. The reduction of soil erosion by practicing

agroforestry may be attributed to the increase in vegetation cover provided by trees, the reduction of slope length due to the establishment of tree barriers, and the stabilization of the slopes as terraces are formed along contour lines.

Using transport network analysis, Chapter 6 examines the economic sustainability of agroforestry in the study area by assessing the farm-to-market accessibility, transport costs and profitability of agroforestry and traditional farming systems in Claveria. Results show that the agroforestry farms incur lower transport costs due to the relatively good accessibility of markets, and have better profit than traditional corn monocropping. Mapping analysis also shows that not all locations have the same access and profit even if they are within the same municipal region due to variations in farm-to-market distances, road network density, and other transport-related factors.

Chapter 7 describes the participatory activities we have conducted in the area to provide support to local-level natural resource planning while at the same time enhancing the geospatial analyses that were carried out and the usability of the GIS outputs after the research has ended. The participatory nature of the research was aimed at enhancing the stakeholders' understanding of the research, integrating their input in the modeling, and incorporating the perceptions of local people in developing the recommendations based on the research outputs.

Finally, the last chapter presents the conclusions derived from the various studies and outlines the study's recommendations on areas for further research. The study highlights how agroforestry can be a sustainable land use option in the uplands, particularly in the study area, because its adoption fits within the promotion of social equity through land reform, provides better financial profit for farmers, and offers an important environmental service through soil conservation. The outcomes of the GIS-based analyses should guide future efforts in promoting agroforestry as an essential part of upland resource management in the tropics.