

Sustainability of tropical Andes agricultural frontiers:
A socioecological integrated assessment of the Cauca river Valley (Colombia)

MARÍA JOSÉ LA ROTA-AGUILERA
Estudiante doctoral en Ecología Terrestre
Universidad Autónoma de Barcelona
Pasaporte: AQ363233
MariaJose.LaRota@uab.cat

JOAN MARULL, PhD
Laboratorio Metropolitano de Ecología y Territorio de Barcelona – IERMB
Universidad Autónoma de Barcelona
Pasaporte: AAE356366
Joan.Marull@uab.cat

At present, agricultural crops and pastures for livestock cover more than a third of the Earth's land surface. This number is predicted to double over the next 30 years due to the food, raw material and energy demands per capita. Although, the Industrial and Green Revolution drove an increase in agricultural products yields, the intrinsic management intensification and land-cover changes of these processes have also been associated to great pressures on the environment. Under the previous scenario, the human species faces one of the ultimate challenges of its history: feeding itself in a sustainable way while maintaining the ecological processes that guarantee its permanence on the planet. Even though the previous problem is of global relevance, the debate on agricultural development models and their sustainability is particularly important for countries such as Colombia, where in addition to the ecological implications of the industrialization of agriculture, social inequality and dynamics of use and land tenure have contributed to the prolonged armed conflict. Additionally, being one of the most diverse countries on the planet both culturally and biologically, Colombia has the challenge of reconciling economic growth with environmental sustainability, conservation, human development and social justice. Grounded on principles of ecological economics and landscape ecology, this research assessed the current contribution of different agroecosystems to the sustainability and ecosystem functioning. This Integrated Socioecological Analysis of Agroecosystems consists of three different analysis carried out for the year 2014, and based on land cover maps (1:100.000) and the National Agrarian Census of 2014. Firstly, a novel typology of agroecosystems of the southern part of the Cauca river valley (Colombia) that includes both

socio-metabolic and sociocultural criteria. This typology was then used to territorialized and evaluate the metabolic efficiency of the socio ecological system. Secondly, an intermediate disturbance-complexity model (IDC) was used to assess the relationship between human disturbance of agroecosystems, understood as the human appropriation of net primary production, and the landscape ecological functionality in relationship to a series of landscape metrics. Finally, the study explored the relationship of the IDC model with the landscape's capacity to provide ecosystem services. The results suggest that landscape transformations associated with the socio-ecological transition of the Cauca Valley due to the implementation of a productive model of agroindustrial monoculture, have contributed to the expansion of the agricultural frontier towards the hillside areas, altering the provision of ecosystem services, deteriorating the landscape functionality and sustainability of these socio-ecological systems. It also suggests that traditionally managed agroecosystems could enhance metabolic efficiency and ecosystem service provisioning. These findings have the potential to enrich the formulation of land policy in highly biological and culturally diverse countries of the global south, where the process towards agricultural industrialization has not been completed, and rigorous scientific studies could be determinant to guarantee new sustainable socioecological transitions and sustainable regional planning of tropical Andes agricultural landscapes.