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“Development on the margin”

## Assessing Multifunctional Agroforestry Systems Applying the Resilience / Vulnerability and Adaptability (RVA) Approach

DANIEL CALLO-CONCHA, FRANK EWERT

*University of Bonn, Institute of Crop Science and Resource Conservation, Germany*

### Abstract

In recent years the paradigm of sustainability has changed its notions of stability and constant behaviour for disruption and change. Thus, several approaches have attempted to operationalize these insights, with the purpose firstly to understand the systems' patterns of change, and then to readdress them towards sustainable pathways. Purposefully we propose the resilience/vulnerability and adaptability (RVA) approach, to assist the assessment of social-ecological systems by stressing on the dynamic interaction of its resilience and vulnerability, and overall adaptability, after/during the occurrence of a disturbing event/process in terms of its composition, structure and function.

Under this approach, we have assessed the multifunctional performance of agroforestry systems in the Brazilian Amazon. Methodologically, we have used the adaptive cycle metaphor to identify relevant loops of decision and change, later applied successively (participatory) multicriteria and sensitivity analyses (Vester® sensitivity analysis) to determine the more sensitive ecological, productive and administrative variables; identified types of roles (critical, buffering, active and reactive) that they perform; and finally draw decisions that ought to impel the sustainability of the system.

The results show that farmers' decisions have concomitantly fit with occurring changes. Three main successive adaptive cycles (panarchy) were identified along 60 years of land-use: a) slash-and-burn /cacao plantation was succeeded by market-oriented horticulture; b) local markets failure and the historical conjuncture (IIWW) triggered the introduction and extensive cultivation of black pepper; and c) *Fusarium* infestation of pepper plants promoted the development of diverse and multipurpose agroforestry systems. From the 31 identified variables, none is critical (capable to bring the system out of control) and the majority -ecological and productive- are buffering. Only four variables – administrative – appear to be active (able to influence on other variables), but reactive variables (able to be influenced) are absent. This suggests a system highly resilient and little vulnerable, but at the same time not very maneuverable. Hence an adaptive management should care most on retaining the ecological and productive functions stable through minimum actions.

**Keywords:** Adaptability, agroforestry systems, amazon, multicriteria analysis, resilience, sensitivity analysis, vulnerability