

## Ad hoc support

### **Landscapes and livelihood changes in the northwestern uplands of Cambodia: Impacts on ecoABSYS services and opportunities for designing resilient farming ABSYSs**

#### **ABSTRACT**

After the national election in 1998, a political and territorial reintegration strategy of the Khmer Rouge population led to an autonomous administration and control the land distribution and management in northwestern Cambodia (Diepart & Dupuis 2014). High land saturation in central areas of dominant rice based farming systems and a peace restoration in the country were important driving forces of mass migrations. The families of demobilized Khmer Rouge soldiers moved to the peripheral areas of the northwestern Cambodia, where degraded forested lands were still available or very cheap.

Over the last 10 years, population migrations along the pioneer front resulted in large-scale forest conversions due to the rapid expansion of annual upland cash crops (Pilgrim et al. 2012). Migrations from rural to rural areas have been also stimulated by flourishing international agribusinesses of cereals and tubers that facilitated farmers' access to agricultural mechanization and agro-chemicals. Massive agricultural land reclamation through unregulated or even illicit tenure transfers led to an expansion of agricultural land from 120,000 ha in 2000 to 800,000 ha in 2012 (MAFF 2013). Small to medium landholders were involved in this rapid conversion of vast degraded forest lands into cultivated land, leading to what can be considered as the first and biggest national social land concession (Boulakia 2010).

Intensive mono-cropping, based on tillage and herbicide use has resulted in significant soil erosion and land degradation. Climate change is expected to increase the frequency of drought and floods with dramatic consequences on annual cash crops that are crucial for smallholders' livelihoods in the uplands (Boulakia et al. 2013). In a general context of labor scarcity, resources-rich farmers cope with these risks by shifting from annual crops to perennial crops. Poorest farmers who cannot afford such strategies may further fall into the poverty trap by selling out their land to the other farmer groups to become wage-earners in their former land. Ultimately, land concentration process may benefit the multinational agribusinesses that are engaged in large-scale land grabbing. It is therefore essential to better understand the impacts of land use changes on livelihoods and ecosystem services, and to explore intervention mechanisms that would help sustain small scale farming systems in the uplands.

A PhD study is scheduled to answer these questions and the proposed study aims to (1) analyze land use changes, their proximate causes and underlying driving forces; (2) assess the impacts of land use changes on local livelihoods and ecosystem services (e.g. carbon, water, biodiversity) at multiple scales, from field and farm up to landscape level; (3) evaluate the capacity of alternative cropping systems based on agro-ecology principles to preserve/restore soil fertility while improving local livelihoods; and (4) assess the potential of conservation agriculture to enhance resilience of farming systems to climate change.

The following activities were identified:

- Analyzing the land use changes over the last 25 years through the use of a chronological series of remote sensing data.
- Exploring proximate causes and underlying driving forces of land use changes and assess their impacts on farmers' livelihood and ecosystem services.
- Developing a participatory method to understand the interactions between human and natural systems and to assess impacts of land use changes on farmer's livelihood, including a narrative conceptual model of land use changes, a role-playing game, and a multi-scale geographic information system (GIS).
- Assessing the impacts of land use changes on ecosystem services selected village territories integrating different scales, from field to landscape (landscape mosaic method).

- Assessing window of opportunities and developing intervention mechanisms adapted to each category of farming systems identified based on conservation agriculture.

Thus, the proposed study will characterize the driving forces and impacts of land use changes on the livelihood systems and ecosystem services in the most dynamic regions, where around 1 million hectares of forest land has been reclaimed. In addition, the study will significantly contribute to the capitalization of all agro-ecology / conservation agriculture works in Cambodia in the last decade both socio-economic and bio-physical aspects and valorize it by highlighting the windows of opportunities and mechanisms of interventions to build resilient farming systems of smallholders based on the annual upland crops.

**Keywords :** Landscape, Farming systems, Ecosystem services, Agroecosystem, Production system

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**Project leader :** Jean-Christophe Castella

**Project leader's institution :** CIRAD

**Project leader's RU :** AIDA

**Budget allocated :** 6000 €

**Total budget allocated ( including co-financing ) :** 6000 €

**Funding :** Labex

## GOAL

The present support from Agropolis Fondation is twofold:

- Analyzing land use changes (1st activity described above) over the last 25 years through the use of a chronological series (1990, 1995, 2000, 2005, 2010, and 2015) of remote sensing data in Rattanak Mondul district, Battambang province (Cambodia).
- Strengthening the connection between UR GREEN, UMR TETIS and UR AIDA on an integrative and transdisciplinary approach combining agronomy, geography, ecology and social science.