



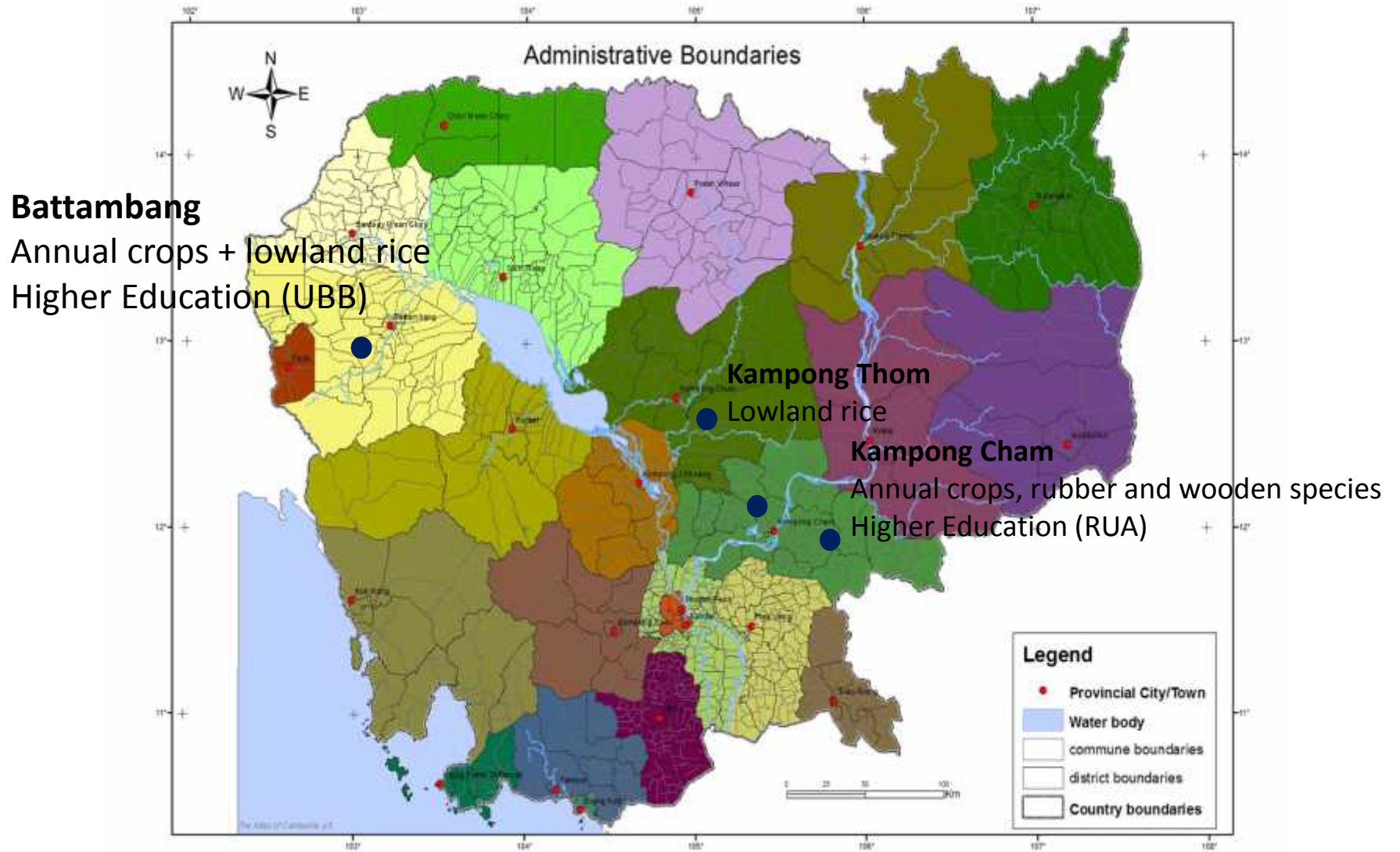
Conservation Agriculture for annual upland crops in Cambodia



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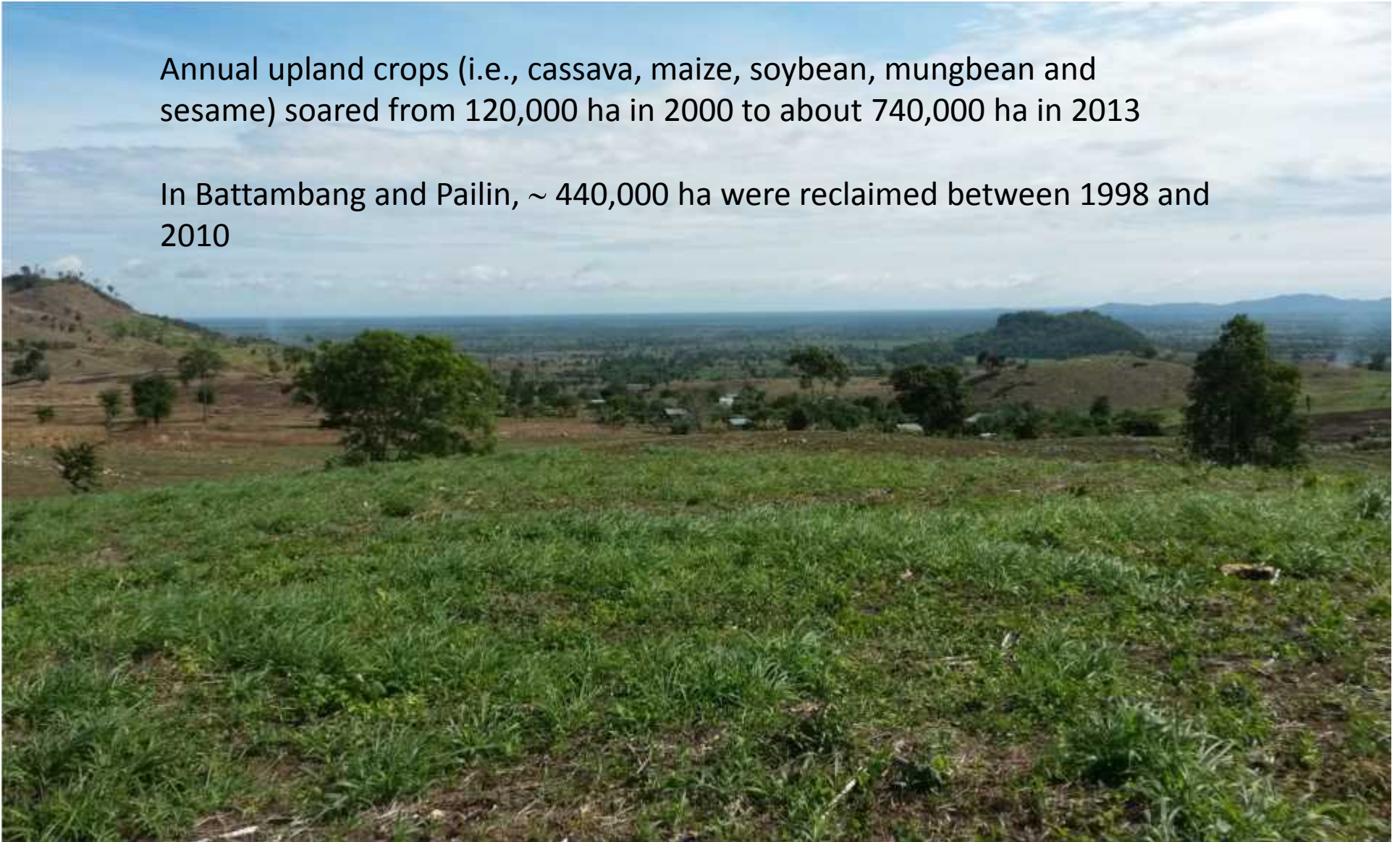
Partnership between the General directorate of agriculture and CIRAD



Battambang, north-western province

Annual upland crops (i.e., cassava, maize, soybean, mungbean and sesame) soared from 120,000 ha in 2000 to about 740,000 ha in 2013

In Battambang and Pailin, ~ 440,000 ha were reclaimed between 1998 and 2010



Cassava and maize, the crops of the pioneers

Biodiversity extinction

High GHG emission from biomass

Rapid soil degradation

No sustainable agricultural development

Subsequent re-appropriation of land by wealthy people

Cambodia, Mondol Kiri, April 2008, S. Boulakia



Reducing mulch- developing systems based on:

- > **Minimum soil disturbance**
- > **Permanent soil cover**
- > **Diversified cropping systems
(rotation, association etc.)**
 - High biomass production
 - A top soil layer of high biological activity
 - Permanent recycling process of nutrients
(minimizing the losses in the soil-plant
system)
 - Secondary species connected to deep
water



Almost all advantages ...

come from the permanent cover of the soil

NT rice on *B. ruziziensis* + pigeon pea mulch, Plain of Jars, Laos

Enhancing ecological processes under diversified direct seeding mulch-based cropping systems in Cambodia



S. Boulakia, R. Kong, V. Leng, V. Sar, K. Soeurng, B. Thy, L. Huot, S. Nhem, S. Pheav, M. Reyes, F. Tivet, L. Séguy



From 3 pillars...



To high and diversified biomass-C inputs from crops and key cover crops ...



... to continuous C flux, above and belowground ...



Bos Khnor station, 15 ha (Kampong Cham)

Research

PhD. thesis of Lyda Hok (North Carolina A&T, UEPG, CIRAD, Royal University of Agriculture): Soil Organic Carbon Dynamics under Short-term Conservation Agriculture Cropping Systems in Cambodia

From S. Boulakia

Diversification



Forages and cover crops (28 species)



Rice (184 cultivars)



Soybean, mungbean, rice-bean and cowpea (60 cultivars)



Assessing maize (18 hybrids) and cassava (10 cultivars)

Engineering: cover crops, some of the key species



From S. Boulakia



Stylosanthes guianensis in April, end of the dry season, Red Oxisol (70% clay), Cambodia



Local Sesbania



Crotalaria juncea



Centrosema pascuorum



Crotalaria spectabilis

Crotalaria ochroleuca

A large range of no-till cropping systems

maize on stylo residues



cassava + stylo / maize + stylo



maize + pigeon pea / soybean + sorghum + stylo



Maize + pigeon pea



Maize + rice-bean

Organic maize and rice + tools of microbial engineering



Stylosanthes guianensis as cover crop for both crops

Stung Chinit, Kampong Thom province Sandy podzolic soil, 80% sand



Farmer's field in Stung Chinit



Iterative approach with smallholders
90 households, 265ha - Battambang



Machinery for small-scale farming



Machinery for small-scale farming



Reasons for the adoption?

- Service – labor scarcity
- Quality of sowing (planter)
- Technical support



Technical issues:
higher yield, saving labor, and profitability



Ecosystem services:

- energy efficiency
- nutrient-saving strategy
- C sequestration
- functional biodiversity
- water retention and quality ...

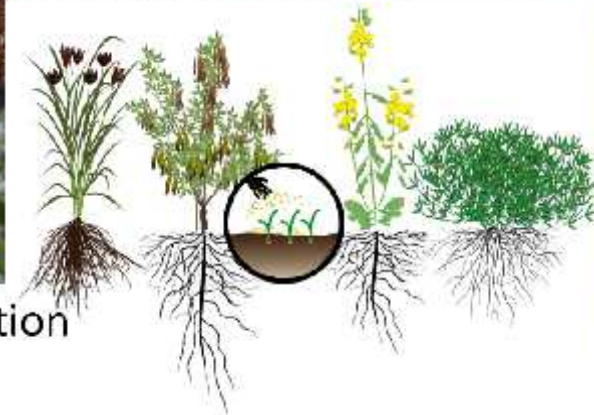


Social, institutional issues:
adoption process, enhancing social resilience

An iterative and integrative approach

... to collective learning through a diversity of scale, from field to village territory

... to a large diversity of stakeholders and objects



From biophysical consideration

....



Thank you for your attention

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