Conservation Agriculture for Food Security in Cambodia and the Philippines

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Introduction

Degraded landscapes are expanding annually in Southeast Asia. Rural poverty in upland communities increases pressure on natural resources like forest, soil and water. These are the last "capital" for the poor and they are rapidly diminishing due to non-sustainable management. Such practices reduce agricultural productivity, which in turn heightens food insecurity and exacerbates poverty.

Objectives

The goal is to promote conservation agriculture production systems (CAPS) as technologically-feasible, environmentally-sustainable, economically-viable, and gender-responsive systems that will contribute to food security of small farms in Cambodia and the Philippines. Conservation agriculture practice involves minimum soil disturbance, continuous mulch, and diverse species rotation. The objectives has an acronym GETS and they are:

Gender: Identify gendered limitations and advantages that can promote adoption of CAPS, and determine if CAPS will increase labor burden on women;

Economics: Identify field-and-farm-level CAPS that will minimize smallholder costs and risks while maximizing benefits and adoption;

Technology network: Quantify the effectiveness of SANREM-supported farmer groups in training knowledge leaders, in being knowledge transmission points, and in facilitating network connections leading to widespread adoption of CAPS; and

Soil quality: Assess soil quality and measure crop yield and biomass from CAPS, and compare them with soil quality and crop yield and biomass from conventional plow-based systems.

Methodology

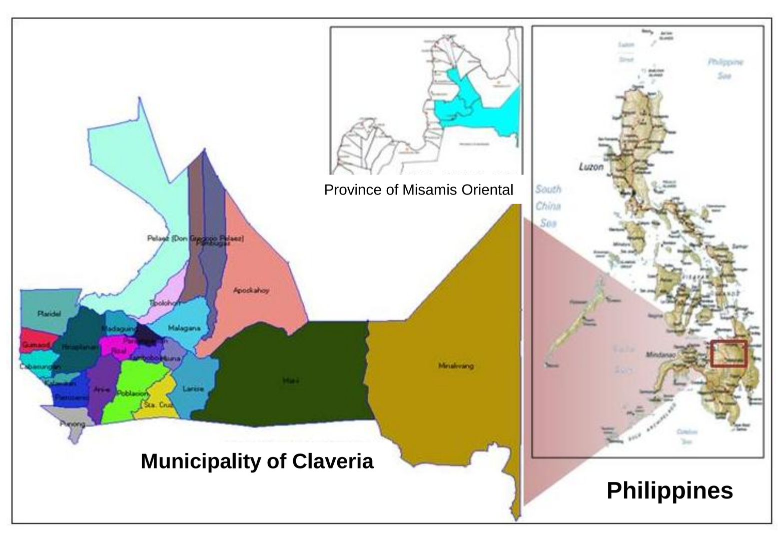
Sites: The project sites are in Rattanak Mondul, Battambang province, Cambodia and Claveria Misamis Oriental province, Philippines.

CREATE approach: CREATE is an iterative process which is on-farm, with farmers, and for farmers. CAPS tested are chosen in consultation with farmer groups, local government, scientists, and other stakeholders in the community. Proposed CAPS are analyzed in terms of farm household accessibility, 'A,' and scientific and economic stability, 'B.' The CREATE protocol is: i) CAPS is proposed; ii) research on proposed CAPS conducted; iii) CAPS with tested and proven prospects diffused; and iv) necessary conditions provided for feasible CAPS to be adapted or adopted.

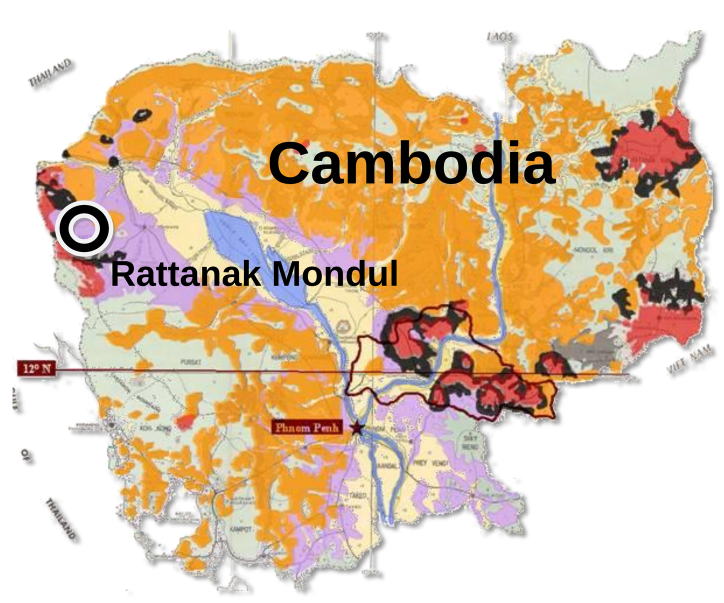
Treatments: Baseline data for each objective were gathered and networks are being established with stakeholders who can implement CAPS adoption when CAPS technology is proven to be successful. Stakeholders are getting involved while CAPS technology is being developed. Synchronization of the Cambodian and Philippines studies was done allowing for an excellent cross-cutting partnership that will benefit both countries. For both sites researcher managed and farmer managed sites were established. Twenty four farmers in Cambodia and 24 farmers in the Philippines are testing various CAPS. Researcher managed experiments for both countries had been established. For the Philippines, five promising cropping patterns were tested in comparison to conventional maize tillage. Table 1 shows the treatments. Treatments 1-5 uses dibble method in sowing maize seeds as well as the associated crops. All treatments were subjected to low and moderate fertility levels. Turn around period are reduced by immediately replanting after each harvest.

Degraded Landscape in Claveria, Philippines

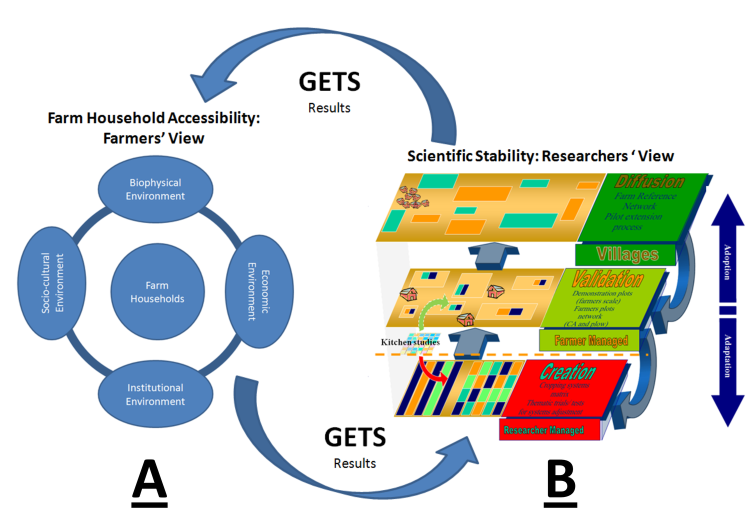
Conservation Agriculture in Cambodia



Claveria, Misamis Oriental, Philippines



Rattanak Mondul, Battambang, Cambodia



CREATE Model Application Approach

Creation-Research-Extension-Action-Teaching-Education

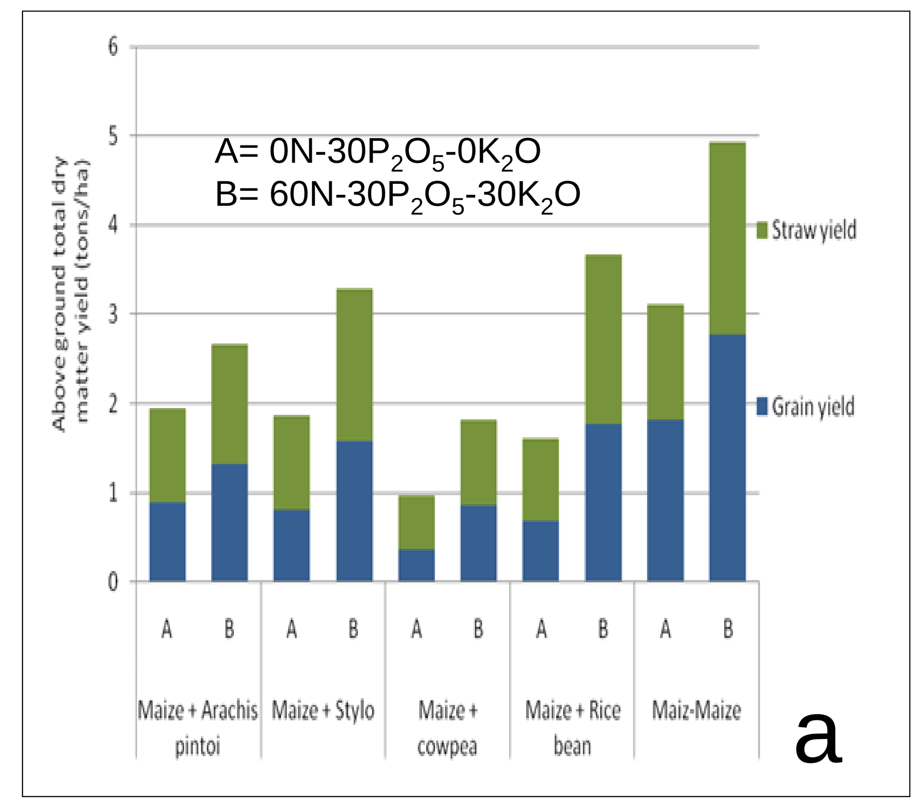
Table 1. Production schedule of CAPS treatments in acid sloping land. Claveria, Philippines

Treatments	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
T1	Arachis pintoi + Maize - A. pintoi + Maize								
	Maize 1st crop				Maize 2nd crop				
		A.Pintoi 1st pruning				A.pintoi			
T2	Maize + Stylosanthes – Stylosanthes fallow								
	Maize 1st crop				Stylosanthes fallow				
	Stylosanthes 1st pruning					Stylosanthes fallow			
T3	Maize + Cowpea – Upland Rice + Cowpea								
	Maize 1st crop				Cowpea 2nd crop		Maize 2nd crop		
	Cowpea 1st crop		Upland rice 1st crop				Cowpea 3rd crop		
T4	Maize + Ricebean + Maize + Rice bean								
	Maize 1st crop						Maize 2nd crop		
				Rice bean					
T5	Cassava + Stylosanthes								
	Cassava 1st crop								
	Stylosanthes 1st pruning					Stylosanthes 2nd pruning			
T6	Maize – Maize (Conventional plow based)								
	Maize 1st crop				Maize 2nd crop				

Results

Cambodia: It was found that labor activities were women predominate are sowing and weeding. Conservation agriculture can alleviate this burden since in CAPS, sowing will be mechanized and weeding will be done by herbicides and will eventually be controlled by thick mulch. Women are usually not responsible for operating machinery and chemical spraying in Cambodia.

Philippines: Conventional maize system yielded better compared to other CAPS in grain and total dry matter yield (Figure 1a). Maize with cowpea yielded the lowest due to very close spacing between rows at 30 cm. The moderate fertility level (60-30-30) had higher yield across all CAPS compared to low fertility level (0-30-0). Inter-planting maize and cowpea provided higher sales due to relatively higher price of cowpea beans even having lower total dry matter yield (Figure 1b).



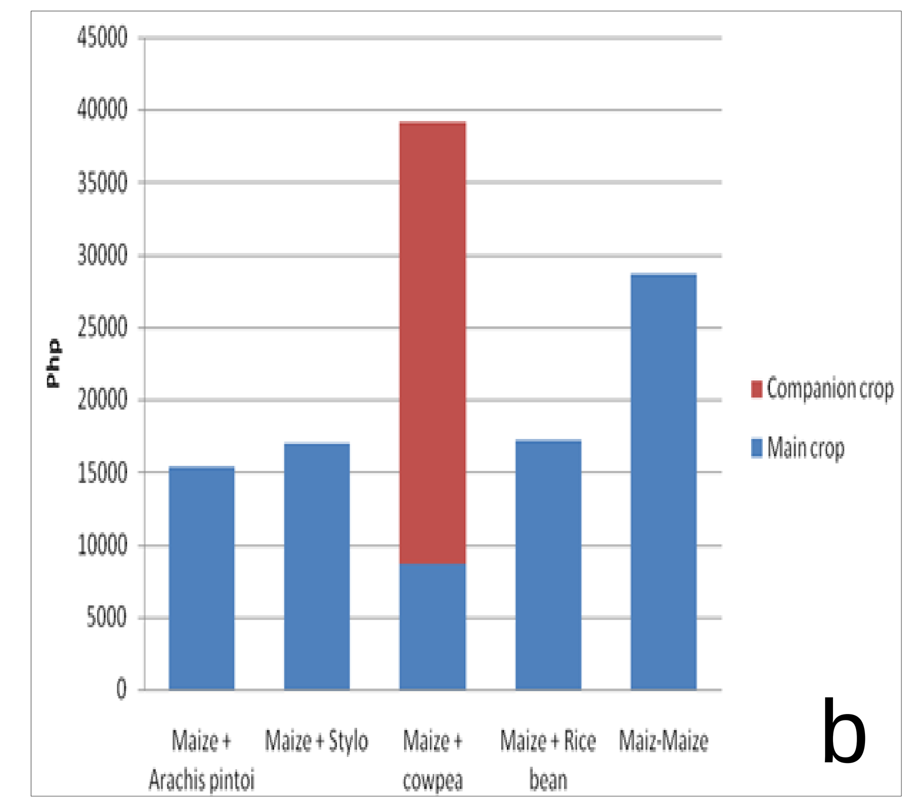
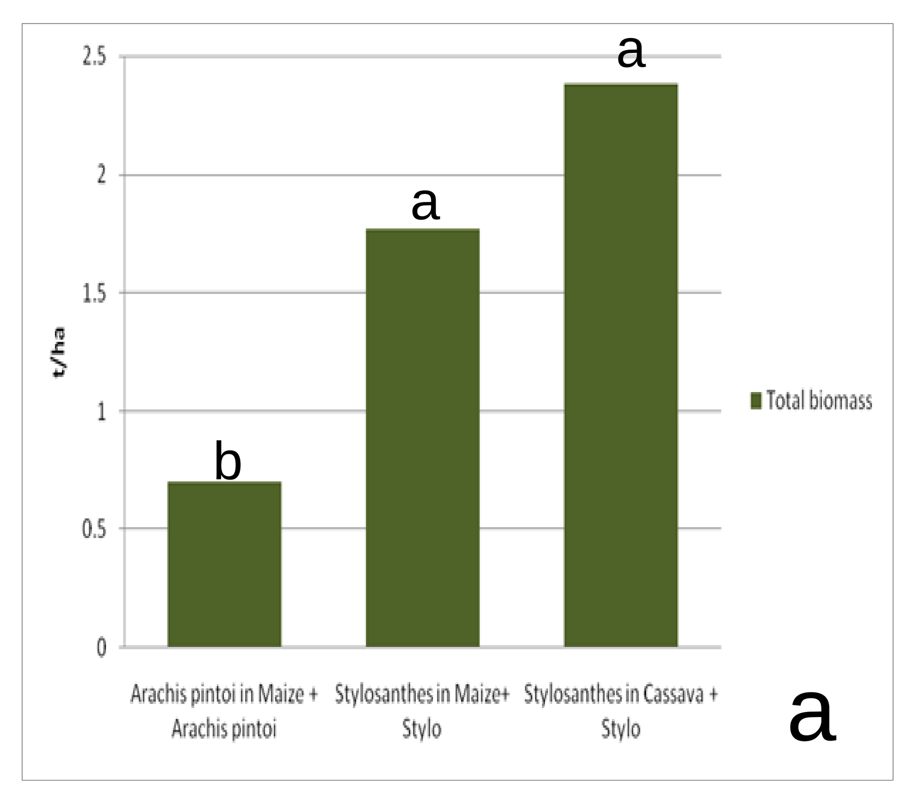


Figure 1. Total dry matter yield of maize (under CAPS and (a) Partial gross income of CAPS (Maize price at P13/kilo; Cowpea at P50/kilo) (b). Claveria, Misamis Oriental, Philippines.

Stylosanthes grown in cassava as well as in maize yielded significantly better than *Arachis pintoi* planted in maize (Figure 2a). *A. pintoi* is usually slow during establishment. *Stylosanthes* grown in cassava resulted in greater biomass yield partly because cassava plants did not shade the forage grass faster than in maize allowing the grass to grow better. Maize with *stylo* provided the greatest biomass compared to other treatments (Figure 2b).



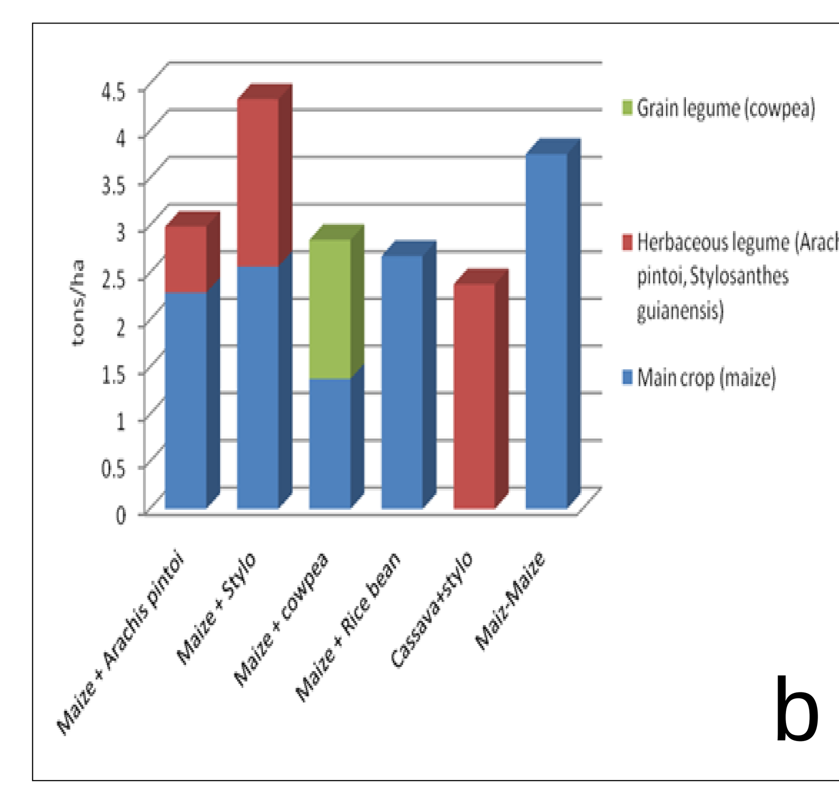


Figure 2. Total biomass of forage legumes *Arachis pintoi* and *Stylosanthes guianensis* grown with agronomic crops (a). Total biomass per crop component of CAPS (b). Claveria, Philippines.

CAPS treatments are diverse compared with conventional maize (Table 1). Maize with cowpea relayed with cowpea plus upland rice CAPS is more diverse, having 3 crop components, than other treatments (Figure 3a). The soil cover provided by CAPS act as effective soil binding function on surface soils preventing rill erosion as observed in conventional plow-based maize cropping system (Figure 3b).

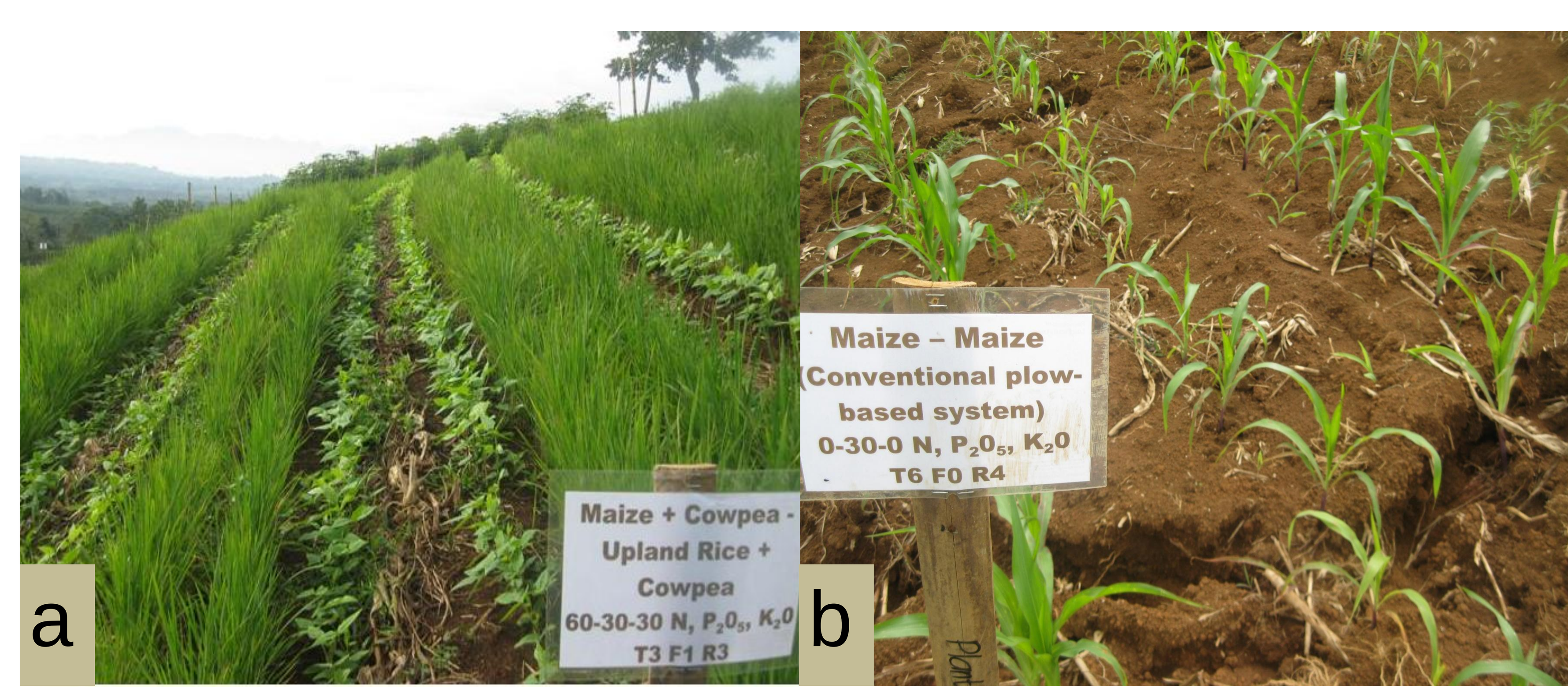


Figure 3. Upland rice planted after cowpea and cowpea planted after maize (a); and rill erosion observed under plow-based maize production (b). Claveria, Misamis Oriental. Philippines

Conclusion

Conservation agriculture is being practiced in many parts of the world yielding promising sustainable production systems. This project brings conservation agriculture in the humid tropical climate of Southeast Asia. Initial results showed that in Cambodia CAPS will reduce labor burden on women. In the Philippines conventionally grown maize provided the highest yield due to greater plant spacing but were the least diverse and most prone to erosion. Maize with cowpea provided the lowest grain yield of maize but provided the most income due to higher market price of cowpea seeds. CAPS with maize, cowpea and upland rice in sequence with low turn-around period is the most diverse among cropping patterns tested and offers continues ground cover. *Stylosanthes* is more productive than *A. pintoi* making it a suitable cover crop.

Principles of Conservation Agriculture *McD* Principles of Conservation Agriculture

Minimum soil disturbance
continuous mulch
Diverse species

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