Sustainable Agricultural and
Natural Resources Management
Collaborative Research Support Program

SANREM CRSP

Conservation Agriculture for Food Security in Cambodia and the Philippines

by GETS team

SANREM Phase IV Kick-off Meeting
Virginia Tech
May 6, 2010

North Carolina Agricultural
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Natural Resources Management
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Philippines site: a landscape rapidly multiplying every year

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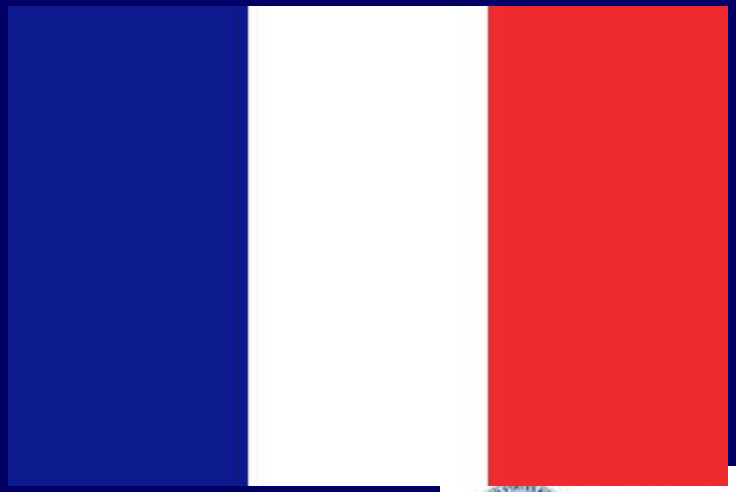
Strong Partnership of Countries with Flags of Red, White and Blue



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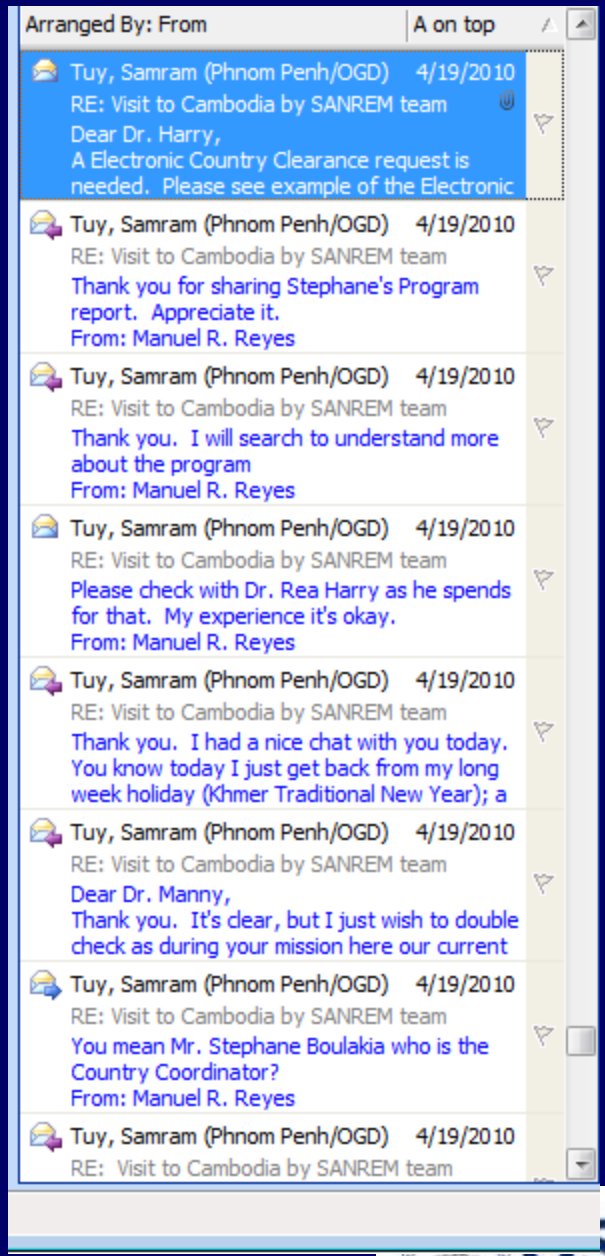
31 emails Cambodia Numerous emails from Philippines



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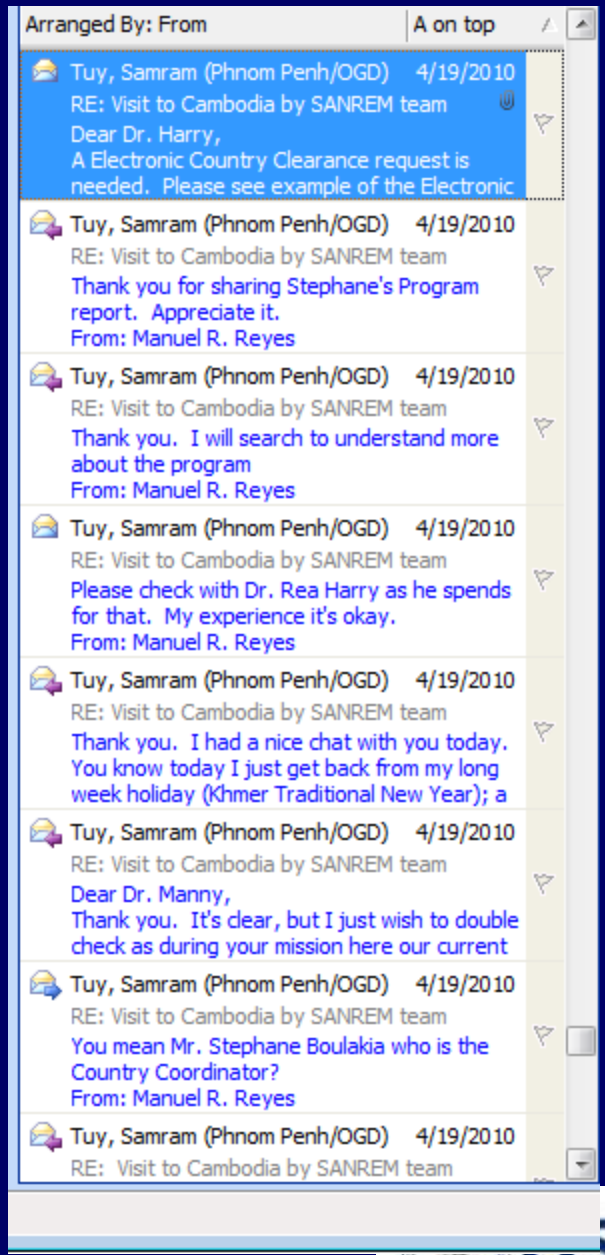
Send my best regard to Dr. Harry Rea. I have never met him and hope he will visit his programs in Cambodia someday.



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Strong Partnership

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USDA NRCS Natural Resources Conservation Service

LANDCARE FOUNDATION PHILIPPINES

agronomes & vétérinaires SANS FRONTIÈRES

General Directorate of Agriculture

Ministry of Agriculture, Forestry and Fishery

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

afd
Agence Française de Développement

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Partners

Dr. Susan Andrews, Soil Quality Team Leader and Ecologist, USDA-Natural Resources Conservation Service East National Tech Support Center, Greensboro, NC, USA,

Dr. Adrian Marc Bolliger, Advisor for Faculty Development, German Development Service (DED) in Cambodia - Embedded DED Advisor at the Faculty of Agronomy, Royal University of Agriculture (RUA), Cambodia

Mr. Stéphane *Boulakia,* Tropical Agronomist, Direct seed Mulch based Cropping System Specialist, PADAC/CIRAD-Cambodia, Research Unit n°1 DMC, CIRAD-PERSYST, TA B-01/07 Avenue Agropolis, 34 398 Montpellier Cedex

Mr. Stéphane Chabierski, Agronomist, PADAC/CIRAD-Cambodia, Research Unit n°1 DMC, CIRAD-PERSYST, TA B-01/07 Avenue Agropolis, 34 398 Montpellier Cedex,

Dr. Maria Helen F. Dayo, Director, Gender Center, UPLB, Farming Systems and Soil Resources Institute, Agricultural Systems Cluster, College of Agriculture

Partners

Dr. Victor B. Ella, Professor, Land and Water Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines at Los Banos (UPLB), College Laguna,

Dr. Charles E. Kome, Soil Scientist, USDA-Natural Resources Conservation Service East National Tech Support Center, Greensboro, NC, USA,

Mr. Hok Lyda, Soil Science and Lecturer, Royal University of Agriiculture, Cambodia,

Dr. Agustin Mercado, Research Officer, Landcare Foundation of the Philippines, Inc., Claveria, Mindanao, Philippines,

Mr. Kou Phally, Agronomist, "Projet d'Appui au Développement de l'Agriculture du Cambodge" (PADAC),

Mr. Chuong Sophal, Dean, Faculty of Agronomy, RUA, Cambodia,

Mr. San Sona, Agronomist, PADAC,

Dr. Osei Yeboah, Associate Professor, Department of Agribusiness, Applied Economics and Agriscience Education, North Carolina A&T State University, Greensboro, NC, USA,

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Dean and Interim Provost

Alton Thompson

Dr. Osei Yeboah

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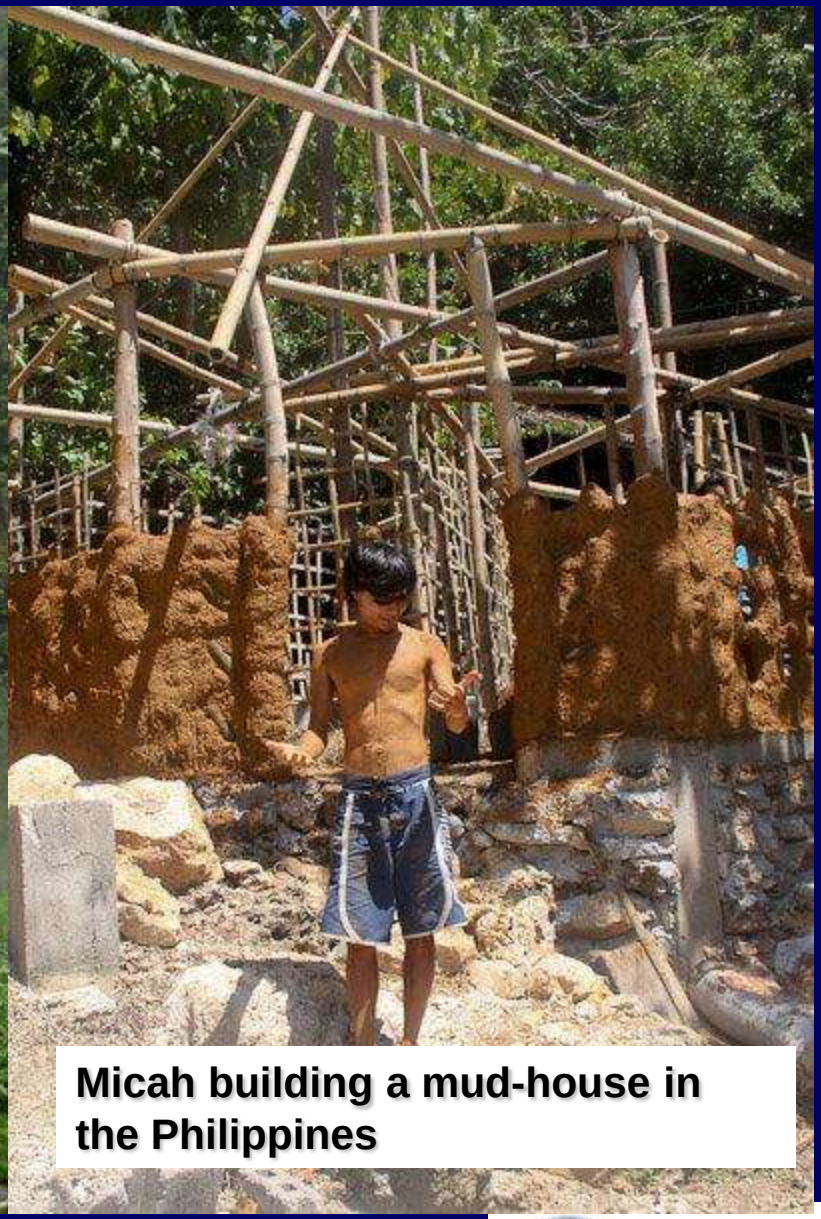
Zach and Lorna in Costa Rica



Micah building a mud-house in the Philippines

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Outline

1. Project Goal
2. ‘McD’ is Conservation Agriculture
3. ‘GETS’ Objectives
4. Methodology
   - Sites
   - Proposed Treatments
5. Current Progress
6. Questions and Discussions

Outline

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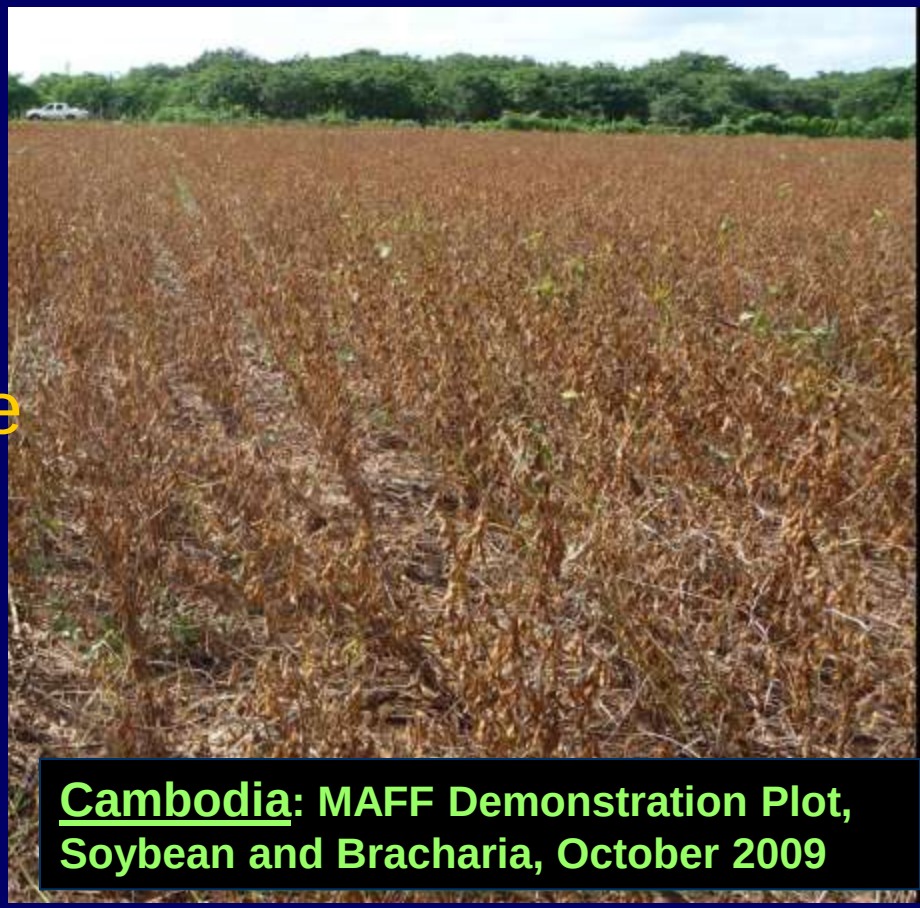
Problem: To see is to Believe

Cambodia site: from primary forest to non sustainable Cassava cultivation

Philippines site: a landscape rapidly multiplying every year

Project Goal

To promote **Conservation Agriculture** as a technologically-feasible, economically-viable, environmentally-sustainable and gender-responsive production system for food security of small farm communities in Cambodia and the Philippines



Cambodia: MAFF Demonstration Plot, Soybean and Bracharia, October 2009

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McD

Southeast Asia SANREM Team Definition of Conservation Agriculture

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McD

Minimal soil disturbance

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McD

Continuous mulch

McD

Diverse species rotation

McD

Minimal soil disturbance

Continuous mulch

Diverse species rotation

Outline

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GETS

I was ‘in a hairline’ not to be here

First try: not funded

‘I barked on the wrong tree’

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GETS

Second Try:

I need to hear the news

NCA&T GET'S funded

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GETS

Strategy: Stick to the Cross-cutting objectives of the RAF and 'bark' on the right tree

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is the Cross-cutting objectives of SANREM

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GETS

Gender

'glad this was first'

SANREM 2004 'huh!!!'

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

GETS

Economics

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

GETS

Technology Networks

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

GETS

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

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Gender

Economics

Technology Networks

Soil Quality

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Fig. 2 Two main stages of CREATE model implementation

Expected Outcomes

- Decreased labor burdens for women, men, and children;
- Improved soil quality rapidly;
- Reduced other production inputs (e.g. machinery wear and tear and fuel costs for tillage);
- Increased agricultural profitability;
- Enhanced resilience to climate change (since CAPS can reduce runoff); and
- Increased residual moisture, minimizing drought during extreme weather events.

Project Period

January 1, 2010 to September 30, 2014

SANREM Research Team

USA:

- Dr. Manuel Reyes –North Carolina Agricultural and Technical State University (NCA&T) (mannyreyes@nc.rr.com, tel: 336-3347787; fax: 336-3347270)
- Dr. Osei Yeboah –North Carolina Agricultural and Technical State University (NCA&T) (oyeboah@ncat.edu, 336-3347056)

Philippines:

- Dr. Victor Ella –University of the Philippines Los Baños (vbella@up.edu.ph, +63495362387)
- Dr. Maria Helen Dayo –University of the Philippines Los Baños (helenfd2002@yahoo.com, +639209108196)
- Dr. Agustin Mercado, Jr. – Landcare Foundation of the Philippines, Inc. (LFPI) (agustin9146@yahoo.com, +639062764780)

World Agroforestry Centre

LANDCARE FOUNDATION PHILIPPINES

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Conservation Agriculture for Food Security in the Philippines

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Sustainable Agriculture and Natural Resources Management - Collaborative Research Support Program
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Background

Degraded landscapes are expanding annually in Southeast Asia. In the Philippines, it is estimated that approximately 36 million people live on less than $2 a day. 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.

Principles of Conservation Agriculture

- **M**inimal soil disturbance
- **c**ontinuous mulching
- **D**iverse species rotations

Conservation agriculture (CA) has not established a foothold in Southeast Asia, although there are some promising sustainable agriculture in the region. SANREM in 1994 started developing solutions for arresting soil and water degradation concentrating research in Lantapan, a small farming community in the Philippines. In 1996, the World Agroforestry Centre (ICRAF) and the Agencia Española Cooperacion Internacionale (AECI) supported the evolution of the Landcare movement in Claveria, Misamis Oriental. This expanded to other municipalities and provinces in Mindanao and the Visayas, involving more than 10,000 Landcare farmers who are practicing conservation farming, like establishment of natural vegetative filter strips (NVS) along the contour and agroforestry technologies to control soil erosion. The Landcare Foundation of the Philippines, Inc. (LFPI) facilitates the formation and continuation of Landcare groups in many areas in southern Philippines.

Conservation Agriculture Production Systems (CAPS) are tailor-fitted approaches for successful adoption and implementation of CA to specific locations.

This research will show that CA principles and practice of minimal soil disturbance, continuous mulching and diverse species rotations, constitute the best "tool box" to create sustainable permanent cropping systems for annual crop production under wet tropical conditions. These reverse soil degradation, increase crop yield and profits and reduce the labor burden on women.

Project Goal

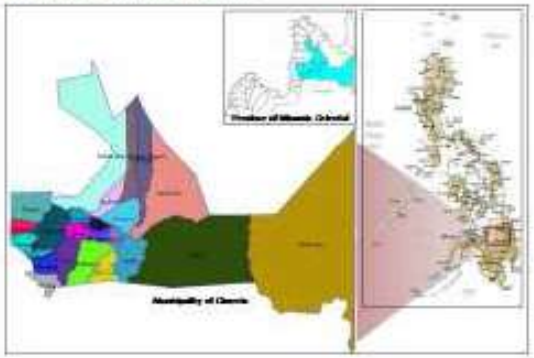
To promote **Conservation Agriculture** as a technologically-feasible, economically-viable, environmentally-sustainable and gender-responsive production system that will contribute to food security of small farm communities in the Philippines.

GETS Objectives

1. **Gender:** Identify gendered limitations and advantages that can promote adoption of CAPS, and determine if CAPS will increase labor burden on women;
2. **Economics:** Identify field-and-farm-level CAPS that will minimize smallholder costs and risks while maximizing benefits and adoption;
3. **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
4. **Soil:** 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.

Research Site

Claveria, Misamis Oriental



Methodology

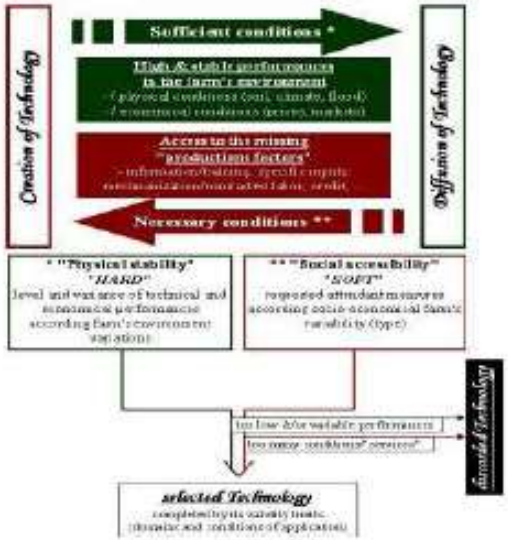


Fig. 1 -CREATE Model: "Creation-Research-Extension-Action-Teaching-Education" or the Creation Diffusion Training Method

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Cambodia

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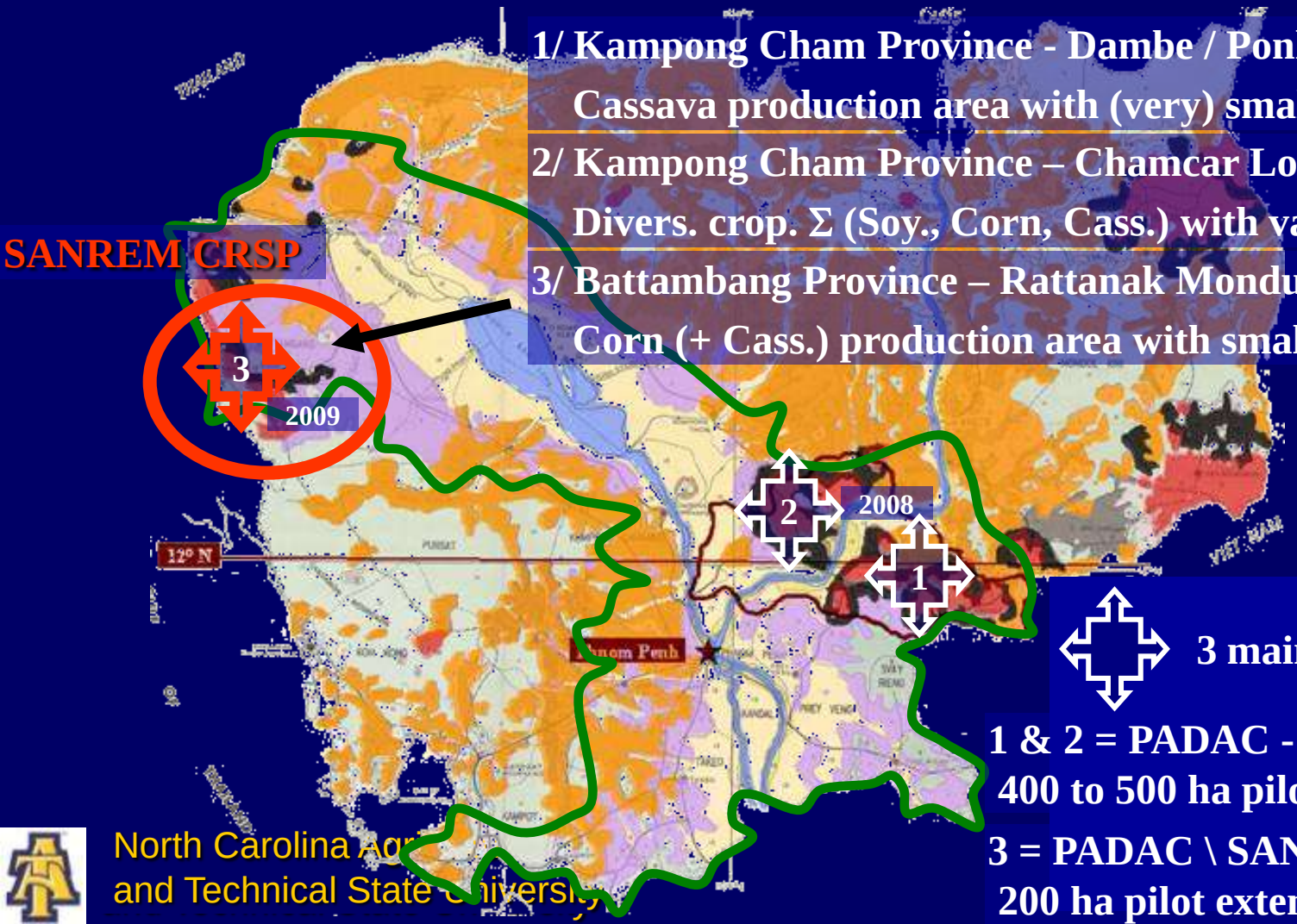
Cambodia SANREM site



1/ Kampong Cham Province - Dambe / Ponhea Krek Districts
Cassava production area with (very) smallholders

2/ Kampong Cham Province – Chamcar Loeu District
Divers. crop. Σ (Soy., Corn, Cass.) with various farms types

3/ Battambang Province – Rattanak Mondul District
Corn (+ Cass.) production area with small /medium farms

3 main Pilot Zones

1 & 2 = PADAC - 2008-2012:
400 to 500 ha pilot extension

3 = PADAC \ SANREM - 2009-2014:
200 ha pilot extension

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Philippines SANREM site

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CREATE Concept Model

Slight modification of the create-diffusion model of Séguy and Bouzinac, 2001

Creation-
Research-
Extension-
Action-
Teaching-
Education

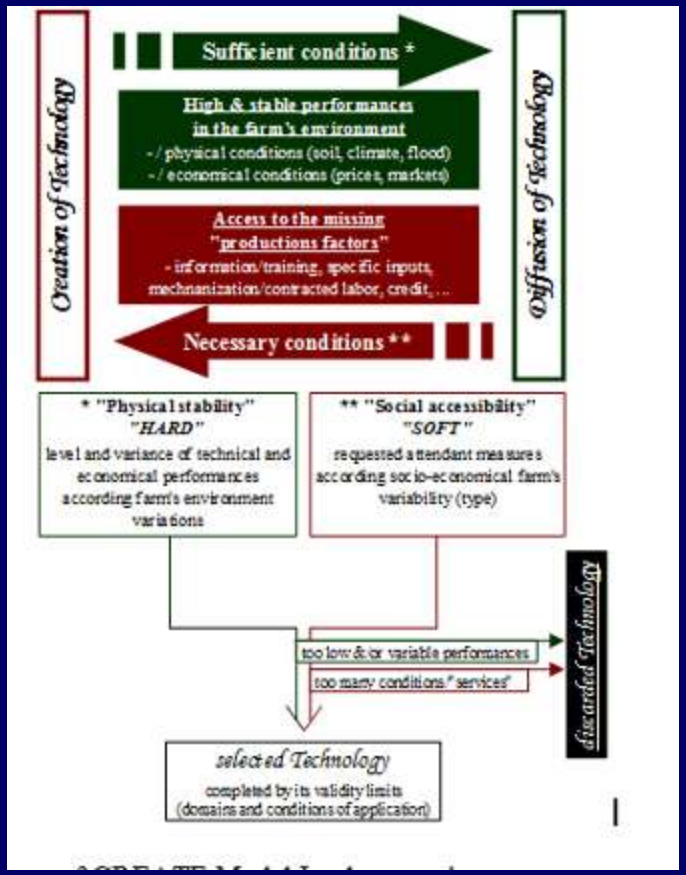

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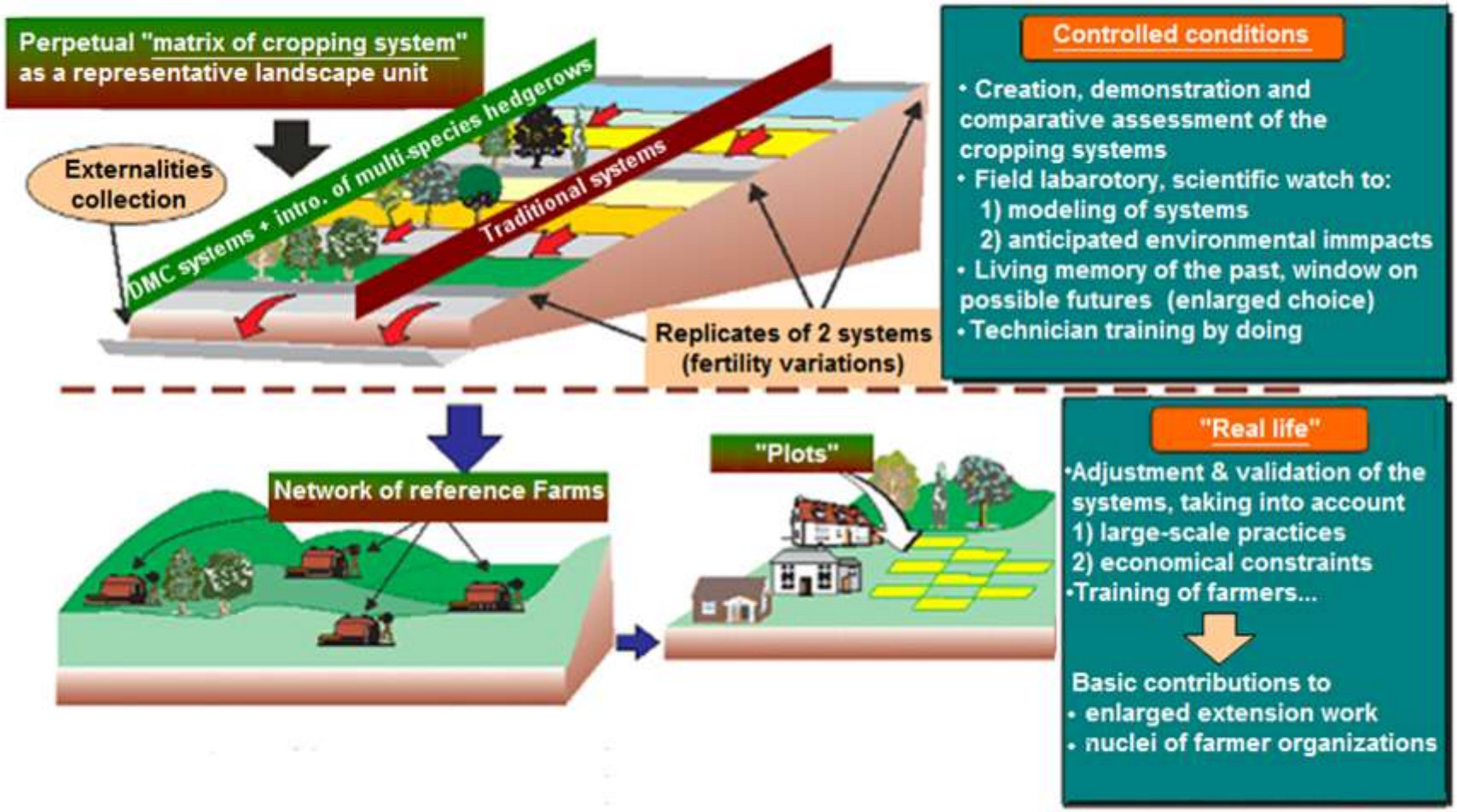
Figure 2. Two main stages of CREATE Model Implementation



Cambodia

CA started in 2004

Start:

- Researcher managed ‘controlled conditions’

2. Farmer managed ‘real life conditions’

Philippines

Start:
Researcher managed
‘controlled conditions’

Treatments

- Conservation Agriculture
- Traditional Practice

Treatments

- t-test statistic
- between groups experimental design

Philippines

Start:
Researcher managed
‘controlled conditions’

Cambodia

CA started in 2004

Start:

- Researcher managed ‘controlled conditions’

2. Farmer managed ‘real life conditions’

Proposed Treatments Cambodia

Successfully tested CAPS in PADAC sites:

- Corn + *Stylosanthes* (monocropping corn on *stylo* cover) (currently happening)
- Corn + *Stylo* // Cassava + Stylo
- Corn + *Brachiaria ruziziensis* // Soybean + *Stylosanthes*“

Traditional practice

Proposed Treatments Cambodia

Successfully tested CAPS in PADAC sites:

- Corn + *Stylosanthes* (monocropping corn on *stylo* cover) (currently happening)
- Corn + *Stylo* // Cassava + Stylo
- Corn + *Brachiaria ruziziensis* // Soybean + *Stylosanthes*“

Traditional practice

Proposed Treatments Cambodia

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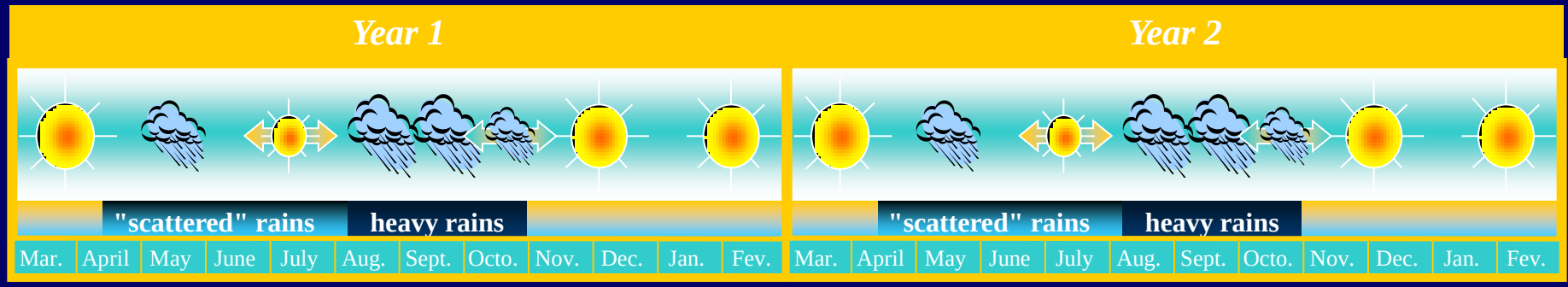
Traditional practice

Cambodia



Cassava + ***Stylo.*** | ***Stylo.*** | **Maize** + ***Stylo.*** | ***Stylo.***

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Proposed Treatments Cambodia

Successfully tested CAPS in PADAC sites:

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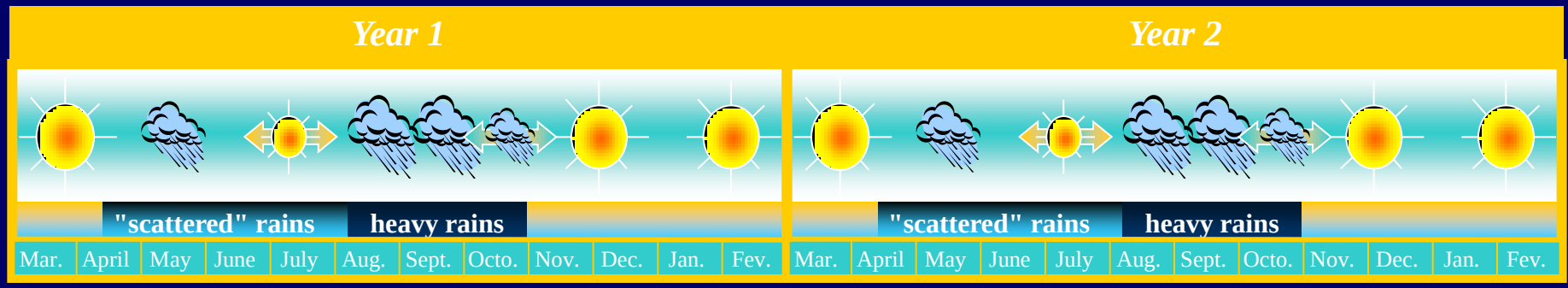
Traditional practice

Cambodia



Stylo.

Maize + *Brach.*

Brach.

Soybean + *Stylo.*

Stylo.

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GETS

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

Biophysical Sampling in Cambodia

Researcher Controlled plots: 16 sampling spots of 50 m²

- **CAPS:** Biophysical sampling will be conducted in two demonstration farms of 4 ha. Within each of these 2 demonstration farms, 4 sampling spots of 50 m² per demonstration farm will be chosen
- **Traditional:** Another 8 sampling spots of 50 m² will be chosen from the surrounding plow-based farms.

Real Life: 30 sampling spots of 50 m²

- **CAPS:** 200 one-ha CAPS practicing farms. A subsample of 15 farms from 15 farm households will be randomly chosen.
- **Traditional:** Subsample of 15 one-ha farms from the surrounding plow-based practicing farms from 15 households will be randomly chosen as well for a total of 30 farms.

Philippines

Start:
Researcher managed
‘controlled conditions’

Proposed Treatments Philippines

No Arachis pintoi CAPS: Y1: Maize-maize-maize with crop residues from the preceding crop left as mulch; Y2: Vegetable-maize-maize with crop residues from the preceding crop left as mulch; Y3: Upland rice-maize with crop residues from the preceding crop left as mulch; Y4: Maize-maize-maize with crop residues from the preceding crop left as mulch; & Y5: Vegetable-maize-maize with crop residues from the preceding crop left as mulch.

With Arachis pintoi CAPS: Y1: Maize-maize-maize and crop residues from the preceding crop left as mulch. Maize will be seeded on the *A. pintoi* plot by creating a 10-cm opening using herbicide; Y2: Vegetable-maize-maize and crop residues from the preceding crop left as mulch, managed as maize-maize-maize; Y3: Upland rice-maize and crop residues from the preceding crop left as mulch, managed as maize-maize-maize; Y4: Maize-maize-maize left as mulch; Y5: Vegetable-maize-maize with crop residues from the preceding crop left as mulch. managed as maize-maize-maize.

Traditional practice: Y1: Maize-maize; Y2: Vegetable-maize-maize; Y3: Upland rice-maize; Y4: Maize-maize; and Y5: Vegetable-maize-maize

Cover crop (perennial peanut Indonesia)

Cover crop (perennial peanut, Philippines)

Arachis Pintoi (Vietnam)

monitored.

Bitter gourd planted with and without Arachis Pintoi as a cover crop

Arachis pintoi study

SANREM studies in the Philippines and Vietnam (Mercado, 2009, and Ha, 2009) found that some vegetables grew well in between strips of *Arachis pintoi*, especially the ***tall*** kind.

Biophysical Sampling in the Philippines

Researcher Controlled plots: 30 sampling spots of 50 m²

- **CAPS 1 without *Arachis pintoi*:** Biophysical sampling will be conducted in five demonstration farms of 1000 m². Within each of these farms, a sampling spot of 50 m² per demonstration farm will be chosen
- **CAPS 2 with *Arachis pintoi*:** Biophysical sampling will be conducted in five demonstration farms of 1000 m². Within each of these farms, a sampling spot of 50 m² per demonstration farm will be chosen
- **Traditional:** Biophysical sampling will be conducted in five demonstration farms of 1000 m². Within each of these farms, a sampling spot of 50 m² per demonstration farm will be chosen

What will be measured in the 50 m^2 spots? Y0, Y2, & Y4

- Infiltration rates
- Soil bulk density
- Soil carbon
- Soil nutrient levels
- Water stable aggregates
- Soil water content

What will else will be measured?

- Yield
- Biomass
- Others

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   - **Approach on Gender**
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GET

Gender

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

Gender

- The baseline survey stage, the team will conduct a participatory rapid rural appraisal
- Structured Household Survey and key informant interviews, focused group discussion and documentation and analysis will be used in combination.
- Random Instant Sample measurement will be used to determine time use or time allocation of women and men in CAPS. A gender responsive CAPS development plan will be formulated.
- The sample population is households from the 2 x 15 farms in Cambodia and 3 x 10 farms in the Philippines.

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GETS

Economics

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

1. Key Farm Household Demographics

Household members

Gender

Age

Education

Number Students

Number of Active in Agriculture

2. Livelihood System

A. KEY FARMING SYSTEM CHARACTERISTICS

Agriculture Production Unit - Land

Forestry Production/Use on unit controlled land

Livestock production/Use

Access to physical assets/technology (1-yes; 0= no)

Natural Assets

Family Unit Social/Financial Assets (1= yes; 0=no)

Access to common property resources? (1=yes; 0=no)

Importance of non-staple agriculture contributions to livelihoods?

Overall wealth classification of family unit

3. STAPLE CROP PRODUCTION

STAPLE CROP PRODUCTION SYSTEM

Family unit staple utilization

_____ % consumed; ____% sold; _____% carryover/seed; _____% losses

Climatic and edaphic conditions

Pests and Diseases

Production risks

3. STAPLE CROP PRODUCTION SYSTEM

	Land Preparation	Planting/ replanting	Fertilization	1st Weeding
Gender Responsibility				
Method				
Labor				
Other Input cost				
Credit				

4. KNOWLEDGE AND USE OF CAPS PRACTICES

Does anyone in the family unit practice minimum tillage for any crop?

Does anyone in the family unit use ground cover for any crop cycle?

Does anyone in the family unit practice regular crop rotations on any parcel?

Off-Farm Services

Extension agent

Other service providers

Input/Output market actors

Financial institution

Methodology

- Provide descriptive statistics of variables for period 0 and period 4 and determine the level of changes
- Apply statistical tools to determine the significance of the changes
- Optimization of net returns using any optimization software like linear programming or General Algebraic Model Software (GAMS)

Methodology

Estimating the small-holders' adoption rates

Adoption behavioral model where farmers respond individually and differently to innovation

$$Yi = \beta i Xi + Ui$$

Where:

Yi = 1 if a choice is made and zero otherwise

Yi = 1 if Xi is greater than or equal to a critical value X* (Y= 1 if Xi ≥X*)

Yi = 0 if Xi is greater than or equal to a critical value X* (Y= 1 if Xi < X*)

Methodology

Extent of use of technology

Acceptability index (AI)

$$AI = (F_1/F_2)x(AL_1/AL_2)x100$$

Where:

F_1 = number of sample farmers adopted CAPS

F_2 = total number of sample farmers

AL_1 = total land committed to CAPS

AL_2 = total land operated by the whole sample

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GETS

Technology Networks

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

Cambodia

- Farmer group (FG) still to be formed
- FG will be provided:
  - »Access to credit – local bank – subsidy through PADAC
  - »Access to machinery
  - »Access to training and extension
  - »Access to other services
  - »Contract no-tillage machinery

Philippines

- Farmer group (FG) already formed – Landcare Foundation of the Philippines, Inc
- Some FG members will be provided:
  - »Subsidy for CA practicing farmers

Outline

1. Project Goal
2. ‘McD’ is Conservation Agriculture
3. ‘GETS’ Objectives
4. Methodology
   - Sites
   - Proposed Treatments
5. **Current Progress**
6. Questions and Discussions

Cambodia

- Kick-off meeting done
- Researched controlled demonstration plots established
- Real life plots experimental design has been completed and 27 households with total area of 45 ha agreed to partner with researchers
- Baseline soil samples and measurement in ’50 m^2 spots’ were completed
- Proposal of monitoring soil quality in SANREM/PADAC plots (Battambang) and PADAC plots (Kampong Cham) got funded

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Philippines Kick-off Meeting

	Male	Female		
Agusan del Sur State College of Agriculture and Technology (ASSCAT)	4	4	8	Students
Claveria Landcare Assoc (CLCA)	14	26	40	FARMERS
Lantapan Landcare Assoc (LLCA)	1	0	1	
Malitbog Landcare Assoc (MLCA)	3	1	4	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	3	[illegible]	[illegible]	
Private	4		4	
NOMIARC	2	2	4	DA Region X
Reg'l Field Unit(RFU)	3	1	4	
ICRAF	3	3	6	
LFPI	3		3	
Syngenta Phils	2		2	
Provincial Agricultural Office-Mis Or	2	1	3	
Agricultural Technicians	4	1	5	Municipal Agricultral Office-Claveria
Students	5	0	5	MOSCAT
Faculty	2	2	4	
Faculty-students(PhD)	1	0	1	
TOTAL	58	42	100	

100 attended

Fig. 2 Two main stages of CREATE model implementation

Expected Outcomes

- Decreased labor burdens for women, men, and children;
- Improved soil quality rapidly;
- Reduced other production inputs (e.g. machinery wear and tear and fuel costs for tillage);
- Increased agricultural profitability;
- Enhanced resilience to climate change (since CAPS can reduce runoff); and
- Increased residual moisture, minimizing drought during extreme weather events.

Project Period

January 1, 2010 to September 30, 2014

SANREM Research Team

USA:

- Dr. Manuel Reyes –North Carolina Agricultural and Technical State University (NCA&T) (mannyreyes@nc.rr.com, tel: 336-3347787; fax: 336-3347270)
- Dr. Osei Yeboah –North Carolina Agricultural and Technical State University (NCA&T) (oyeboah@ncat.edu, 336-3347056)

Philippines:

- Dr. Victor Ella –University of the Philippines Los Baños (vbella@up.edu.ph, +63495362387)
- Dr. Maria Helen Dayo –University of the Philippines Los Baños (helenfd2002@yahoo.com, +639209108196)
- Dr. Agustin Mercado, Jr. – Landcare Foundation of the Philippines, Inc. (LFPI) (agustin9146@yahoo.com, +639062764780)

World Agroforestry Centre

LANDCARE FOUNDATION PHILIPPINES

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Conservation Agriculture for Food Security in the Philippines

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Sustainable Agriculture and Natural Resources Management - Collaborative Research Support Program
SANREM CRSP

Background

Degraded landscapes are expanding annually in Southeast Asia. In the Philippines, it is estimated that approximately 36 million people live on less than $2 a day. 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.

Principles of Conservation Agriculture

- **M**inimal soil disturbance
- **c**ontinuous mulching
- **D**iverse species rotations

Conservation agriculture (CA) has not established a foothold in Southeast Asia, although there are some promising sustainable agriculture in the region. SANREM in 1994 started developing solutions for arresting soil and water degradation concentrating research in Lantapan, a small farming community in the Philippines. In 1996, the World Agroforestry Centre (ICRAF) and the Agencia Española Cooperacion Internacionale (AECI) supported the evolution of the Landcare movement in Claveria, Misamis Oriental. This expanded to other municipalities and provinces in Mindanao and the Visayas, involving more than 10,000 Landcare farmers who are practicing conservation farming, like establishment of natural vegetative filter strips (NVS) along the contour and agroforestry technologies to control soil erosion. The Landcare Foundation of the Philippines, Inc. (LFPI) facilitates the formation and continuation of Landcare groups in many areas in southern Philippines.

Conservation Agriculture Production Systems (CAPS) are tailor-fitted approaches for successful adoption and implementation of CA to specific locations.

This research will show that CA principles and practice of minimal soil disturbance, continuous mulching and diverse species rotations, constitute the best "tool box" to create sustainable permanent cropping systems for annual crop production under wet tropical conditions. These reverse soil degradation, increase crop yield and profits and reduce the labor burden on women.

Project Goal

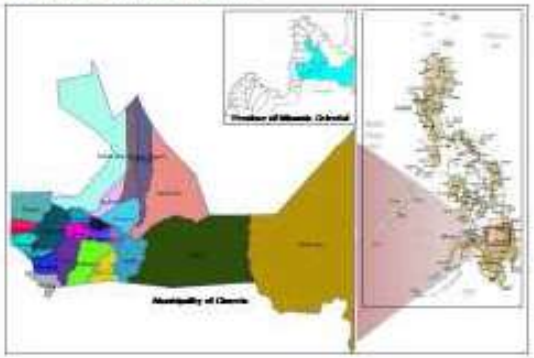
To promote **Conservation Agriculture** as a technologically-feasible, economically-viable, environmentally-sustainable and gender-responsive production system that will contribute to food security of small farm communities in the Philippines.

GETS Objectives

1. **Gender:** Identify gendered limitations and advantages that can promote adoption of CAPS, and determine if CAPS will increase labor burden on women;
2. **Economics:** Identify field-and-farm-level CAPS that will minimize smallholder costs and risks while maximizing benefits and adoption;
3. **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
4. **Soil:** 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.

Research Site

Claveria, Misamis Oriental



Methodology

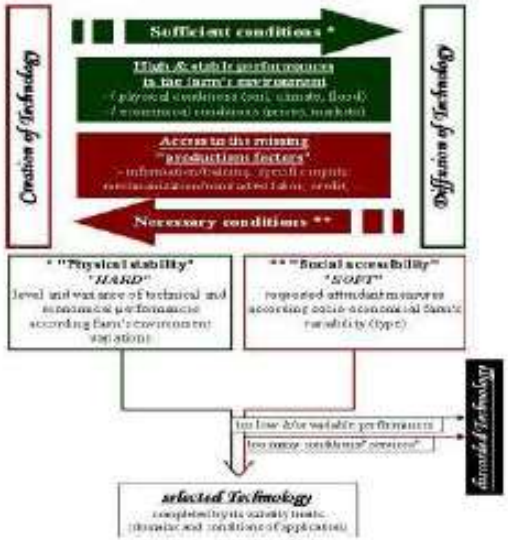


Fig. 1 -CREATE Model: "Creation-Research-Extension-Action-Teaching-Education" or the Creation Diffusion Training Method

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Potential Research Sites

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