ADOPTION OF CONSERVATION AGRICULTURE IN LAOS
A case study in the Mekong Corridor

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OUTLINE

• Context
• Objectives
• Methodology
• Results & discussion
• Conclusion
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Agricultural production strongly linked to the Thai market demand

Maize monoculture using conventional tillage is the most common cropping system used by the farmers
Agricultural production strongly linked to the Thai market demand

Maize monoculture using conventional tillage is the most common cropping system used by the farmers
Intensive systems based on heavy mechanized tillage on steep slope
Herbicides are now widely used for land preparation after burning or ploughing, and for chemical weeding.
on highly fertile soils, farmers have generated important profits with maize production. Livelihoods have been improved but...

- Soil erosion and exhaustion
- Environmental pollution and threats on human health due to pesticides misuse
- Siltation of paddy fields
- Destruction of road infrastructures

INCREASE LIVELIHOOD’S VULNERABILITY
> PASS-PCADR with the support of PRONAE has started dissemination of DMC systems since 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Villages</th>
<th>Smallholder</th>
<th>S (ha)</th>
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<td>2006</td>
<td>21</td>
<td>385</td>
<td>400</td>
</tr>
<tr>
<td>2007</td>
<td>38</td>
<td>689</td>
<td>830</td>
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<td>2008</td>
<td>45</td>
<td>1254</td>
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STEPS FOLLOWED FOR DISSEMINATION OF DMC SYSTEMS

STEP 1: LAND PREPARATION
> CONVENTIONAL CROPPING SEQUENCES WITH LOCAL SPECIES
> MAIZE MONO CULTURE WITH CROP RESIDUES MANAGEMENT
STEP 2: CROP MANAGEMENT

= NECESSITY TO IMPROVE NO-TILL CROPPING SYSTEM WITH ROTATION,
INTERCROPPING WITH LOCAL SPECIES
> 2-YEAR ROTATION SEQUENCE MAIS - VIGNA UMBELLATA
> INTERCROPPING MAIZE+VIGNA UMBELLATA
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OBJECTIVES

• To gain information on the technical and socioeconomic environment in southern Xayaburi province

• To estimate the level of dissemination of the DMC systems at the community level

• To determine the factors conditioning smallholders’ adoption or rejection of the DMC systems
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METHODOLOGY

- **PASS-PCADR survey**
  - 21 villages, 2160 smallholders (total of 3872 smallholders), random sampling

- **PRONAE survey**
  - 4 villages in 3 districts
  - Sampling: 462 smallholders (total of 942 smallholders)
    - households associated with PRONAE (Validation Group)
    - random sampling among others households
  - Gender-disaggregated survey
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Dissemination of DMC systems

Evolution of cultivated area under DMC
according to the 4 southern districts of Xayaburi province

Data from survey carried out in 21 villages of the 4 districts
Maize expansion & intensification

Evolution of maize cultivated area
(in the 21 villages surveyed by PASS-PCADR)

Data from survey carried out in 21 villages of the 4 districts
Dissemination of DMC systems

Evolution of cultivated area under DMC according to the 4 southern districts of Xayaburi province

Data from survey carried out in 21 villages of the 4 districts
Dissemination of DMC systems

Smallholders using DMC systems
according to 4 southern districts of Xayaburi province

Data from survey carried out in 21 villages of the 4 districts
Why do farmers practice no-tillage?

- **Nongphakbong**
  - Weed control
  - Low production costs
  - Increase cultivated area
  - Good yield
  - Labour force
  - Drudgery of labour decreasing

- **HOUAYLOD**
  - Prevent erosion & improve soil fertility
  - Low production costs
  - Drudgery of labour decreasing
  - Labour force

- **BOUAMLAO**
  - Drudgery of labour decreasing
  - Good yield
  - Labour force
  - Prevent soil erosion & improve soil fertility
  - Weed Control
  - Low Production Costs

- **PAKTOM**
  - Drudgery of labour
  - Prevent soil erosion & improve soil fertility
  - Good yield
  - Labour force
  - Low Production Costs
How is no-tillage perceived by « other farmers »?

- **BOUAMLAO**
  - Difficulty for sowing
  - Low yield
  - Field access
  - Pesticides
  - Lack of labor force
  - Drudgery for land preparation
  - Lack of informations

- **HOUAYLOD**
  - Pesticides
  - Drudgery for land preparation
  - Production costs
  - Access to water
  - Drudgery for land preparation
  - Lack of labor force
  - Difficulty for sowing

- **Nongphakbong**
  - Low yield
  - Lack of informations
  - Drudgery for land preparation
  - Lack of informations
  - Pesticides
  - Drudgery for land preparation
  - Pb with peanut cultivation
  - Lack of labor force

- **PAKTOM**
  - Weeds pressure
  - Predators
  - Drudgery for land preparation
  - Lack of credit system for inputs
  - Pesticides
  - Difficulty for sowing
  - Lack of labor force
What are the main constraints for improving current DMC systems?

**T.MIXAY**
- Pesticides
- Difficulty for sowing
- Land preparation
- Crop residues & cover crop conservation

**KENTHAO**
- Market
- Land preparation
- Difficulty for sowing
- Rodents
- Crop residues & cover crop conservation

**BOTENE**
- Land preparation
- Difficulty for sowing
- Rodents
- Crop residues & cover crop conservation

**PAKLAY**
- Lack of equipment
- Difficulty for sowing
- Lack of labour force
- Land preparation
- Crop residues & cover crop conservation
In the areas with productive soils
> Basaltic soils
> New opened areas on schist

Soils with conventional tillage (ploughing+herbicides)
- OM=4.1%
- CEC=28.6 cmol/kg
- OC=2.38%

Natural forest:
- OM=7.9%
- CEC=39.1 cmol/kg
- OC=4.6%

- Range of maize yields: 4.0 to 4.5 t/ha
  (>5 years of ploughing and maize monocropping)

- Range of net profits with maize cultivation: 370 to 540 USD/ha
Case study: Bouamlao, Paklay district

On basaltic soil, very low dissemination...

What are the research hypothesis?

- Mean cultivated area with maize = 1.2 ha/labour > drudgery of labour
  = Lack of specific equipment

- Due to high demand of Thai market
  > Maize price increase
  > High profits generated
  > Farmers’ strategy is to generate maximum profits on short-term with maize monoculture under conventional tillage
  = Economic environment

- Difficulties for preserving crop residues during the dry season (i.e. rice bean)
  > Constraints on crop diversification
  = Lack of land management at village community level

On basaltic soil, very low dissemination...
In new opened areas, rapid adoption by smallholders but…

Research hypothesis

“Pioneer front” recently opened
>important increase of cultivated area allowed by heavy mechanization on steep slope
Mean cultivated area with maize = 1,2 ha/labour

= Limited labour availability

The socioeconomic environment pushes farmers to use tillage-based systems and intensify maize mono cropping

= Economic environment, credit & collection system
• New opened areas on schist (less than 5 years of intensive cultivation)
In the most fragile areas
> Sandy soils
> Long exploited areas on schist

**Soils with conventional tillage**
(ploughing)
- OM=2.5%
- CEC=19.80 cmol/kg
- OC=1.45%

**On basaltic soils:**
- OM=4.1%
- CEC=28.6 cmol/kg
- OC=2.38%

- Range of maize yields: 2.4 to 3.5 t/ha
  (after 5 years of ploughing and maize monocropping) - (4.0 to 4.5 t/ha) -

- Range of net profits with maize cultivation: 100 to 300 USD/ha
  - (370 to 540 USD/ha) -

(Source: Raunet, 1996)
Case study: Nongphakbong, Botene district

Land preparation (% of total cultivated area)

No-Tillage practice (% of households)

Wide and rapid dissemination…

What are the research hypothesis?

• **Very low profit generated** by maize mono cropping and important soil exhaustion > maize yields decline (loss of 2t/ha within 4 years)
  > Farmers are willing to develop alternatives

• **High environmental and economic risks** due to degraded and fragile soils,
  > significant levels of crop diversification
  > involvement in off-farm or non-farm activities
Crop diversification

The graph shows the number of crops per household for the years 1995 to 2006. The data is presented for four villages: Bouamlao, Houaylod, Nongphakbong, and Paktom. The graph indicates an increasing trend in crop diversity over the years, with the number of crops per household rising significantly in all villages from 1995 to 2006.
Income sources

NONGPHAKBONG

Mean total of 2 060 USD (in 2006)

- Cash crops: 38.2%
- Cattle & buffalo husbandry: 13.9%
- Pig farming: 0.8%
- Off farm & Non-Farm activities: 21.4%

BOUAMLAO

Mean total of 2 470 USD (in 2006)

- Cash crops: 76.0%
- Cattle & buffalo husbandry: 2.1%
- Pig farming: 0.5%
- Off farm & Non-Farm activities: 21.4%
• Adoption of DMC systems for an agriculture completely manual on steep slopes

• Mean cultivated area with maize/labour = 0.5 ha

• Main cropping system adopted by smallholders is the 2-year rotation sequence maize-Vigna umbellata
Sowing of *Vigna umbellata* with hand-jab seeder on *Imperata cylindrica* in Botene district
Conclusion

• In the most fragile areas, dissemination of innovations is wide and rapid and livelihoods appear more diversified:
  > these trends can be considered as ‘risk avoidance’ strategies
  > by diversifying their livelihoods, smallholders attempt to limit their vulnerability to the potential failure of a single economic activity

• Diversification has to be integrated to development policy because it gives households more capabilities to improve their livelihood security
  > possible through land management, livestock-agriculture integration
Conclusion

• Discussion related to land management at the village community level has to be engaged rapidly in order to protect the watershed, to promote crop diversification and agro-biodiversity and for a better integration of livestock and agriculture

• In complete contrast with commonplace ideas regarding the association of DMC with large-scale, mechanized agriculture, in southern Xayabouri province, DMC systems appear to be adopted preferentially by small-scale farmers, engaged in manual agriculture, on steeply sloping land.
THANK YOU FOR YOUR ATTENTION!