Regional workshop on Conservation Agriculture

Investing in Sustainable Agriculture:
The Case of Conservation Agriculture and Direct Seeding Mulch-Based Cropping Systems

DMC, a tool for the raise of new forms of family based agriculture in Cambodia

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Ministry of Agriculture, Forestry and Fishery
Dep' of Agronomy & Agricultural Land Improvement

Agence Française de Développement

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Five years of “adaptative” research for upland DMC based cropping systems creation in Cambodia

Plan

1st PART
Agriculture and territory occupation

2nd PART
Current agricultural dynamics in the “full” and “empty” Cambodia

3rd PART
Potential input of DMC technologies for a reviewed agricultural Development
1st PART

Agriculture and territory occupation
1/ Agriculture and territory occupation

1.1/ 4 major Agro-ecosystems … cropped or “crop-able”

Rainfed lowland rice on Sandy plains (strictly rain dependant)
Rice, associated to Cattle/Buff. livestock
Ann. / Perennial based upland cult. possible

Floating Rice or Water management on deeply flooded areas
Water management for counter-season cultivation (different types : prek, dam …)
1.1/ 4 major Agro-ecosystems

Upland cultivation on Red and Black soils
1.1/ 4 major Agro-ecosystems

Rainfed lowland rice on Sandy plains
1.1/ **4 major Agro-ecosystems**

Rainfed lowland rice on hydromorphic plains
1.1/ 4 major Agro-ecosystems

Counter-season rice with water management in deep flood area
1/ Agriculture and territory occupation

1.1/ 4 major Agro-ecosystems

Some constraints of the physical conditions: soils and flood

<table>
<thead>
<tr>
<th>Soil</th>
<th>Flood</th>
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<tbody>
<tr>
<td>Plateau &amp; hill</td>
<td>Flood of tributaries / distributaries</td>
</tr>
<tr>
<td>Sandy Plain</td>
<td>Flood of Mekong / Tonle Sap</td>
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</table>

<table>
<thead>
<tr>
<th>Plateau &amp; hill</th>
<th>Sandy Plain</th>
<th>Hydromorphic Plain</th>
<th>Flooded areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great soil potential (basaltic substratum)</td>
<td>Poor sandy Soil &gt; 60 % of ricefield</td>
<td>Clay-silt Soil (greater soil x water potential)</td>
<td>“Alluvial soils”</td>
</tr>
<tr>
<td>Upland agriculture</td>
<td>Main part of the national land reserve?</td>
<td>Rice crop - hazardous, surplus in the West reg.</td>
<td>Water management &amp; counter season rice</td>
</tr>
</tbody>
</table>
1/ Agriculture and territory occupation

1.2/ An unequal population distribution on the national territory

The populated part of Cambodia: < 1/3 territory > 90 % population

1870: < 1 million inhabitants 2008: > 12 millions inhabitants

1/ Agriculture and territory occupation

1.2/ An unequal population distribution on the national territory

“Rice & central Cambodia” vs “Forest & peripheral Cambodia”

<table>
<thead>
<tr>
<th>A central and populated Cambodia</th>
<th>A peripheral and “empty” Cambodia</th>
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<tbody>
<tr>
<td>&gt; 12 millions inhabitants</td>
<td>&lt; 2 millions inhabitants</td>
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<tr>
<td>&gt; 250 inhab./km²</td>
<td>&lt; 15 hab./km²</td>
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<tr>
<td>agriculture &gt; 55 % of the territory</td>
<td>agriculture &lt; 5 % of the territory</td>
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Consequences on agriculture

- Cropped area < 20 % of the country surface
- Fragmentation of land holdings in the populated area:
  - # 90 % of the plots < 0,5 ha
  - # 75 % of the farms < 1,0 ha
- Rainfed lowland rice as subsistence farming in the populated area
- Commercial farming and natural resources exploitation in the “empty” area

- An increasing land concentration:
  - 15 to 20% landless farmers
  - 10 % of the owners hold 40 % of the land
2nd PART

Current agricultural dynamics in the “full” and “empty” Cambodia
2/ Current agricultural dynamics in the “full” … Cambodia

2.1/ Central plain

Simple typology of the rice production systems

- **Early**
  - Run-off water
  - Sandy Plain
  - Upland rice

- **Medium**
  - Run-off + Flooding water
  - Hydromorphic Plain
  - Rainfed Lowland rice

- **Late**
  - Flooding water
  - Flooded areas
  - Deepwater
  - Floating rice or Counter season rice

- **Better soil potential and more secured water supply**
- **Increasing possibilities to develop irrigation systems**
- **DMC** (no water control necessary)
- **SRI** (min. water control requested)

Irrigation represents less than 25% of the total rice area
2/ Current agricultural dynamics in the “full” … Cambodia

2.1/ Central plain

Main technical features of the rainfed lowland rice cropping system

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<tbody>
<tr>
<td>1st hazard</td>
<td>Rains arrival</td>
<td>2nd hazard</td>
<td>“Small dry season”</td>
<td>3rd hazard</td>
<td>Last useful rain</td>
<td></td>
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</tbody>
</table>

- Scattered rains
- Heavy-regular rains
- 500 to 700 mm “spoiled” rains
- Big climatic risk
- Nursery sowing
- Transplant
- Flowering
- Harvest

Photosensitive varieties: “inundation”
2/ Current agricultural dynamics in the “full” … Cambodia

2.1/ Central plain

Land intensification … a response to an extreme land fragmentation?

General problem of farm size: often < 1,0 ha … split in many small plots

High climatic risk in the traditional Rainfed Lowland Rice cropping system

Poor prospective for any Labour and/or Input-capital based forms of intensification within current crops calendar

Search for off farm activities

Seasonal migrations (cities or abroad)

Permanent migrations (peripheral regions)

Land price increase background

high temptation to sell
Upper terraces ... > # 1,5 million ha

Hydromorphic plain ... # 0,7 million ha
2/ Current agricultural dynamics in … the “empty” Cambodia

2.2/ Peripheral Cambodia
A huge “land reserve” … for which purpose?

**Table: Total area of Cambodia**

<table>
<thead>
<tr>
<th>Total area of Cambodia</th>
<th>Agricultural area</th>
<th>Great Lake</th>
<th>Protected area</th>
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<tbody>
<tr>
<td>18,0</td>
<td>3,0</td>
<td>1,5</td>
<td>3,5</td>
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</table>

**Total** = 10,0 millions hectares

Complementary characterization requested

**Agricultural potential?** (soil type, forest, land legal status …)

Key political choices for Cambodia, e.g.

- Estate x perennial monocropping via Economical Land Concession
- Smallholders x mix UPLAND farming via Social Land Concession

10 millions hectares

... a national asset of primary importance
2/ Current agricultural dynamics in … the “empty” Cambodia

2.2/ Peripheral Cambodia

What kind of Agricultural development in the low populated areas?

2 contrasted scenarios are possible

<table>
<thead>
<tr>
<th>1/ “Status quo”</th>
<th>2/ “Planned development”</th>
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<tbody>
<tr>
<td>Land access mainly by large private interests</td>
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<tr>
<td>• Economic Land Concessions</td>
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<tr>
<td>• Cambodian investors (PP)</td>
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<tr>
<td>• + increasingly marginalized poor people (survival, pressure on NR, land insecurity)</td>
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<tr>
<td>Agriculture dominated by plantations of perennial crops (mono-cropping)</td>
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<tr>
<td>• reduced diversification (limited choice)</td>
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<tr>
<td>• under-valorization of the production potential (knowledge, rigidity)</td>
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<tr>
<td>Increasing conflicts</td>
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<tr>
<td>Land access planned and secured to meet multiple objectives</td>
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<tr>
<td>• Environment Conservation</td>
<td></td>
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<tr>
<td>• Family agriculture (Social conc. …)</td>
<td></td>
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<tr>
<td>• Community based management of NR</td>
<td></td>
</tr>
<tr>
<td>• Estate based agriculture (Economic conc. / Cambodian private investors)</td>
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<tr>
<td>Diversified agriculture</td>
<td></td>
</tr>
<tr>
<td>• industrial products for international markets (estate / family)</td>
<td></td>
</tr>
<tr>
<td>• food products for national / regional markets (grain/livestock, quality)</td>
<td></td>
</tr>
<tr>
<td>Conflict managᵗ. “a priori” (consultation)</td>
<td></td>
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</table>
3/ Input of DMC for a reviewed agricultural development

3.1/ A double necessity of annual crops development for the uplands

**Perennial crops**
- a limited choice of species (rain, soil)
- rigidity of the production systems
- poor people excluded if no support (cost, immature period, land access/security...)

**Rubber, Cashew (low-med. tech.)**
**Fruits ("high tech.")**
**Bio-energy (Jatropha ? ...)**
**Wood (FGT, quality timber)**

AND **sustainable annual cropping systems for tropical uplands ...**

**Development of an land based agro-industrial sector**

**Annual crops and livestock**
- high diversification of possible species
- flexibility of production systems (/ market)
- more accessible for poor people (reduced cost, no immature period,...)
- close association with livestock possible

- **Principal**: Maize, Rice, Cassava, Soy.
- **Secondary**: Sesame, pulse sp., field veggies, Sorghum ...
- **Tertiary**: Cotton, Sunflower ...
- **Cattle rearing** (via fodder-cover crop), **Pig** and **Poultry** (via grain)

- **Development of an off-plantation agro-industrial sector**
Sc. n°1: Pressure on Natural resources

Cassava on Primary forest

Plain of Kaev Saemar (Kratie / Mondol Kiri, April 2008)
Sc. n°2: Secured land access to smallholders

Maize and Soybean crops in connection with Thai market (Pailin/ West Battambang, June 2005)
3rd PART

Potential input of DMC technologies for a reviewed agricultural development
3/ Input of DMC for a reviewed agricultural development

3.2/ Preliminary highlights on DMC application for rainfed lowland rice

- Scattered rains
- Heavy-regular rains

500 to 700 mm “valorized” rains by cover/fodder crop

- Spraying
- Direct sowing
- Flowering

Non photosensitive & mixed aptitudes varieties

- Mars
- Avril
- Mai
- Juin
- Juillet
- Août
- Sept.
- Octob.
- Nov.
- Dec.

1st hazard
Rains arrival

2nd hazard
“Small dry season”

3rd hazard
Last useful rain

: cover crop/mulch + inundation (in low landscape unit)
3/ Input of DMC for a reviewed agricultural development

3.3/ Necessary combination between DMC proposal and “land deal”