Climate Adaptation Seminar
23-24 October 2012
Siem Reap, Kingdom of Cambodia

Climate Adaptation in Southeast Asia:
Overview and best practices

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Cambodia

- **Rainfall:** 1250 – 2500 mm
  - January: lowest
  - October: highest
- **Humidity:** 69 - 80%
  - March: lowest
  - September: highest
- **Day length:** 11h - 13h
  - December: shortest
  - June: longest
- **Temperature:** 23 – 33°C
  - December: lowest
  - April: highest
- **Evaporation:** 2230mm/year
  - September: lowest
  - March: highest

- **Location:**
  - 102° to 108°E
  - 10° to 15° N
- **Monsoon climate:**
  - Dry season: November – April
  - Wet season: May – October
Natural Resources of Cambodia

Total area: 181,035 km²
Coastal: 435 km
Island: 64
The Mekong river
The Tonle Sap lake
The Central plains
Forest mountain areas
Land use categories

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area (ha)</th>
<th>Area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>18,133,656</td>
<td>100</td>
</tr>
<tr>
<td>Agriculture</td>
<td>4,370,027</td>
<td>24</td>
</tr>
<tr>
<td>Forest cover*</td>
<td>10,215,094</td>
<td>56</td>
</tr>
<tr>
<td>Grassland</td>
<td>1,078,243</td>
<td>6</td>
</tr>
<tr>
<td>Shrub land</td>
<td>1,883,882</td>
<td>10</td>
</tr>
<tr>
<td>Soil-Rock</td>
<td>36,254</td>
<td>0.2</td>
</tr>
<tr>
<td>Urban</td>
<td>18,022</td>
<td>0.1</td>
</tr>
<tr>
<td>Water</td>
<td>532,133</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: MPWT/JICA (2002)
*Reported Forest Cover as being 10,864,186 ha (60%) (FA, 2006)
Water resources

- Three main zones:
  - Mekong river systems,
  - Tonle Sap biosphere reserves, and
  - Coastal zone.
- Wetlands designated Ramsar site in 1999 with total area of 54,600 ha:
  - Mekong river north of Stung Treng province with an area of 14,600 ha;
  - Boeng Chmar and its associated river system and floodplain with an area of 28,000 ha;
  - Coastal wetlands of Koh Kapik and its associated islets with an area of 12,000 ha (SCW, 2006).
Protected areas (Royal Decree: November 1, 1993)

23 Areas divided into 4 categories:

<table>
<thead>
<tr>
<th>Types</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National parks</td>
<td>742,250</td>
</tr>
<tr>
<td>Wildlife sanctuaries</td>
<td>1,891,271</td>
</tr>
<tr>
<td>Protected landscape</td>
<td>97,000</td>
</tr>
<tr>
<td>Multiple use areas</td>
<td>403,950</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,134,471</strong></td>
</tr>
</tbody>
</table>
Commune-Level Poverty Rates

Note: This map reflects the poverty situation in 1998

Produced by the WFP VAM Unit, Apr. 2004
Natural resources and environmental management

The natural resources of Cambodia are officially under the protection of the state, as expressed in

**Article 59 of the constitution:**

“The state shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecology, ecologic system, mines, energy, petrol and gas, rocks and sand, germs, forests and forest products, wildlife, fish and aquatic resources”.

**MAFF:** main government institution for management of natural resources

**MoE:** protect natural resources and prevent environmental degradation, advising relevant ministries on the conservation, development and management of natural resources.

**MLMUPC:** managing issues of land management, urban planning, construction, cadastre and geography.

**MIME:** direct and manage the industry, mines and energy sectors.

**MAFF** = Ministry of Agriculture, Forestry and Fisheries, **MoE** = Ministry of Environment, **MLMUPC** = Ministry of Land Management, Urban Planning and Construction, **MIME** = Ministry of Industry, Mines and Energy
Main Agricultural Crop Production area,
(MAFF, 2009)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (ha)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>2,615,741</td>
<td>82.2</td>
</tr>
<tr>
<td>Maize</td>
<td>163,106</td>
<td>5.1</td>
</tr>
<tr>
<td>Cassava</td>
<td>179,945</td>
<td>5.7</td>
</tr>
<tr>
<td>Soybean</td>
<td>74,413</td>
<td>2.3</td>
</tr>
<tr>
<td>Mungbean</td>
<td>45,605</td>
<td>1.4</td>
</tr>
<tr>
<td>Sesame</td>
<td>35,874</td>
<td>1.1</td>
</tr>
<tr>
<td>Vegetable</td>
<td>47,781</td>
<td>1.5</td>
</tr>
<tr>
<td>Peanut</td>
<td>18,183</td>
<td>0.6</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>13,297</td>
<td>0.4</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>8,246</td>
<td>0.3</td>
</tr>
<tr>
<td>Tobacco</td>
<td>9,447</td>
<td>0.3</td>
</tr>
<tr>
<td>Jute</td>
<td>397</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>3,212,035</td>
<td></td>
</tr>
</tbody>
</table>
### Rainfed Lowland Environments

<table>
<thead>
<tr>
<th>Country</th>
<th>Favourable</th>
<th>Drought prone</th>
<th>Drought and submergence prone</th>
<th>Submergence prone</th>
<th>Deep water 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>10</td>
<td>29</td>
<td>57</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>16</td>
<td>16</td>
<td>19</td>
<td>30</td>
<td>19</td>
</tr>
<tr>
<td>India</td>
<td>12</td>
<td>51</td>
<td>15</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Indonesia</td>
<td>58</td>
<td>10</td>
<td>0</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Laos</td>
<td>33</td>
<td>33</td>
<td>33</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Myanmar</td>
<td>41</td>
<td>10</td>
<td>0</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Philippines</td>
<td>51</td>
<td>16</td>
<td>4</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Thailand</td>
<td>9</td>
<td>52</td>
<td>24</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Vietnam</td>
<td>38</td>
<td>19</td>
<td>0</td>
<td>32</td>
<td>11</td>
</tr>
</tbody>
</table>
Constraints in Agriculture

- Water
- Soil fertility
- Variety
- GQ Seed
- Pests and Diseases
- Investment in research
- Marketing
Generating skilful work force for agricultural research, extension and production.
To develop varieties of major agricultural crops for high yielding, good quality, resistance to major biotic and abiotic stresses and broad adaptation to diverse conditions.
Biotic & Abiotic stresses

- **Resistance to stripe stem borer:**
  - Resistance: Kru and IR72
  - Moderate: Sen Pidao and IR66

- **Tolerance to moderate drought:**
  - CAR3 and CAR4

- **Tolerance to flash flood:**
  - Popoul
Research for adaptation
Resistance to BPH

Moderate resistant:
IRKesar, Kru, Chul’sa and CAR12

Moderate susceptible:
IR66, Baray, Rohat, Santepheap 1, Santepheap 2, Popoul, Sarika, Phka Rumcheck, Phka Rumduol, CAR4, CAR5
Accession: 2557

in 3 catalogs

Rainfed Lowland: 88.0%
Irrigated: 0.2%
Deepwater/Floating: 1.2%
Upland: 10.6%
Mild Aromatic: 10.0%
Strong Aromatic: 0.2%
Glutinous: 8.4%
Insensitive: 7.0%
Mild sensitive: 4.5%
Moderate sensitive: 30.7%
Strong sensitive: 60.1%
Banana Conservation:

Green house

In-vitro

Germplasm for adaptation:
Two OPV maize varieties released

Sar Chey

Loeung Mongkul
Two watermelon varieties released

Chan Amreth

Reachnny
Two tomato varieties released

Neang Pich

nag tM
Two mango varieties released

Keo Tep

Ekve

TB

Keo Reach

Ekv
- Succeeded recession rice farming.
- Succeeded double rice crops in rainfed lowlands.
- Succeeded rice-fish farming system.
National IPM Programme in Cambodia
2,464 rice FFSs and with 76,759 farmers participated,
125 Integrated Rice-Fish-Vegetable Production FFSs and 3,582 farmers participated,
199 Student Field Schools involving 5,365 students
International Workshop on
“CLIMATE AND AGRICULTURAL RISK MANAGEMENT”
16-21 November 2009
CARDI, Phnom Penh, Cambodia
Increased knowledge on how access to improved medium-term weather and seasonal climate forecasting can enhance the capacity of both farmers and rural communities to adapt to climate variability, including climate change. For Climate Change, our concentration is on adaptation rather than mitigation.
- Concept notes for collaborative research projects for major agricultural areas in South Asia and South-East Asia on managing climate risk and adapting to climate change.
- Recommendations for policies and strategies will increase the uptake of research findings and decision-making tools by stakeholders in rural communities.
- A viable and active Network with effective working relationships encourage collaboration and information exchange between scientists, policy makers and farmer organisations.
Knowledge of how access to seasonal climate forecasting can enhance farmers’ capacity to adapt to climate change.
Lao P.D.R:
Tropical with wet and dry seasons.

Two monsoons:

1) the Northeast monsoon, which occurs from November to mid of March and

2) the Southwest monsoon, occurs from mid of May to mid of October; latter being characterized by frequent and heavy rainfall and high humidity.

A short drought: 02 weeks between the end of June and the beginning of July.

The annual rainfall: 1,400mm - 3,500mm.

The temperature:

- highest in April (35°C-38°C) and

- lowest from December-January (13°C –17°C) with an annual average of 26°C.
- Monthly recording of meteorological data and rainfall are collected from a network of main and secondary synoptic stations (power man resources is limited for daily recording).

- Department of meteorology and hydrology (DMH) is responsible on data processing, analyzing and archiving system.
Data storage and data processing center

The main activity:

- Process all climatic data in accordance to Clicom and spreadsheet Excel (Climate computing),
  for the hydrological data use HYMOS modeling for processing and analysis the stream flow data,

- Weather situation use Synergies software for analyzing the surface, Upper air chart and the tropical cyclone Track forecast from TC web site Project under WMO (As JMA, KMA and other...),

- Rainfall forecast 1-7 days from NOAA, and every 3 hours from USA (Fnoc Navy) and

IRI probabilities Enso for the seasonal weather forecast;
History of Agriculture losses by disasters in Vietnam (1951-1998) (*):

- 13 *El Niño* years,
- 11 *Laníña* years and
- 24 non ENSO years.


- The average losses due to those phenomenons are US$ 134 million per year

(*) Source: Nguyen Van Viet, researcher from Agro-meteorological Research Center of Vietnam
To cope with climate change and disasters for food security and sustainable development the Government of Vietnam is taken two principal measures approaches:

1) adaptation strategies for agriculture and

2) application of ENSO forecast for changing crop calendar in winter - spring, summer rice such as in Laniña years.
The first approach of adaptation strategies for agriculture is grouping into two:

**short term and long term adaptation.**

1) The short term adaptation:
   - insurance in agriculture to cope with weather variation,
   - diversification on crop and livestock for changing crop types requires sufficient,
   - farmers’ knowledge related to the climate change impact,
   - production intensification,
   - improving nutrient and pest control management, changes in tillage practices and farm systems and temporary migration.
2) The long term adaptation strategies for agriculture:
   - The development of new technologies and modernization, changing crop mix,
   - Improving water management and permanent migration of labor.

However, there are several strategies that can be short and/or long term; such as:
   - the investment and accumulation of capital,
   - reform of pricing schemes development of open markets and other reforms,
   - adaptation of new technologies,
   - promotion of trade, this is likely to enhance economic adaptations under climate,
   - extension services,
   - diversification if income earning and employment opportunities, dissemination of climate data, institutional planning and implementation.
The second approach of adaptation measures:

Application of ENSO forecast for changing crop calendar in winter - spring, summer rice such as in Laniña years.

In Laniña years, rice crops should be change in winter-spring and such rice production system should consider with some necessary measures.

There are some measures that need to be considered according to the region:

for example, in the North Vietnam should pay attention to having measure for preventing chilling for seeding, using late maturity and chilling tolerant varieties and having priority to early and leading crops in designing rice cropping pattern in delta region.
For Vietnam, we would pay attention in the following aspects:

1) - The effect of climate change, variability, and disasters on agriculture is not similar in different agro-ecological regions in Vietnam.

2) - For serving on food security and sustainable development on agriculture to cope with climate change and disasters, it is obligatory to change the cropping calendar, cropping pattern, cropping rotation for every agro-ecological regions.

3) - At present and near future it is important to use climate index and ENSO index in early agro-meteorological monitoring and forecasting food crop yield especially for rice, for conserving with food security in Vietnam.

4) - For region with unsustainable soil moistures it is necessary to keep water in the soil as first response, and then choose new varieties of crop, which can adapt to drought.

5) - Building a good irrigating system such as in the Red River Delta and Mekong River Delta.

6) - Building more reservoirs of all kinds in the midland and highland regions.
Methods of the predict food crop yields before harvest time:

Nguyen Van Viet, researcher from Agro-meteorological Research Center of Vietnam

\[ Y_{t+1} = Y_t + \Delta Y \]

Where are:
- \( Y_{t+1} \): prediction of crop yield in present year
- \( Y_t \): crop year in the year before
- \( \Delta Y \): difference food crop yield can be found in the following equations:

1) For winter-spring rice:

a1) in midland Bacbo: \( \Delta Y = 0.451 - 1.156\Delta T_3 + 0.095\Delta R_2 + 0.095\Delta S_4 \)
a2) in red river delta: \( \Delta Y = 0.714 - 2.2422\Delta T_3 + 0.024\Delta R_2 + 0.02\Delta S_{11} \)
a3) the Mekong river delta: \( \Delta Y = 0.708 + 1.095\Delta T_2 + 0.0296\Delta R_2 + 0.042\Delta S_{12} \)

Where are: \( \Delta T_2, \Delta T_3, \Delta R_2, \Delta S_4, \Delta S_{11} \) and \( \Delta S_{12} \) are the differences of temperature, rainfall and sunshine duration in February, May, April, November and December.
2) For summer rice:

b1) in midland Bacbo: \( \Delta Y = 0.397 - 2.034\Delta T_8 + 0.01\Delta R_{10} + 0.008\Delta S_7 \)

b2) in red river delta: \( \Delta Y = 0.159 - 3.406\Delta T_7 + 0.002\Delta R_7 + 0.02\Delta S_5 \)

b3) the Mekong river delta: \( \Delta Y = 0.851 + 0.613\Delta T_7 + 0.011\Delta R_7 + 0.106\Delta S_6 \)

Where: \( \Delta T_7, \Delta T_8, \Delta R_{10}, \Delta S_5, \Delta S_6 \) and \( \Delta S_7 \) are the differences of temperature, rainfall and sunshine duration in May, June, July, August and October.
Global concern to deal with climate change:

There are three key issues for taking action:

1) a long-term global goal for emissions reductions;

2) credible commitments and actions by all major economies to reduce their emissions; and

3) support to help the most vulnerable and least able adapt to the inevitable impacts of climate change.
Thank You Very Much