Agricultural Development and Reduced Glasshouse Gas Emmission

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Major Challenges for Food and agricultural Productivity

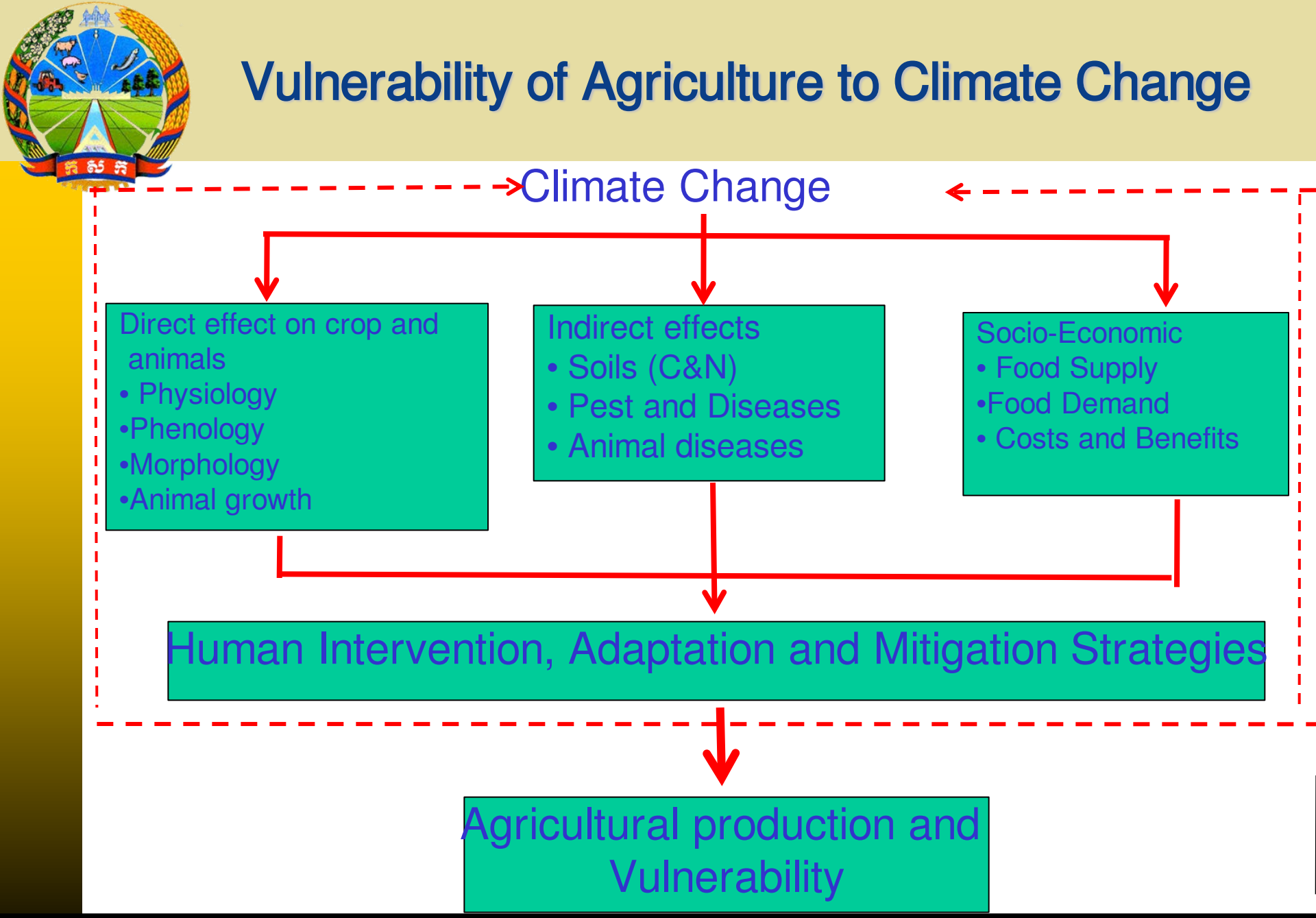
Demand

- Foods: demand cereals for both foods and animal, meat, oil, dairy,fish and aquaculture product, vegetable oils...ect.
- Water
- Energy

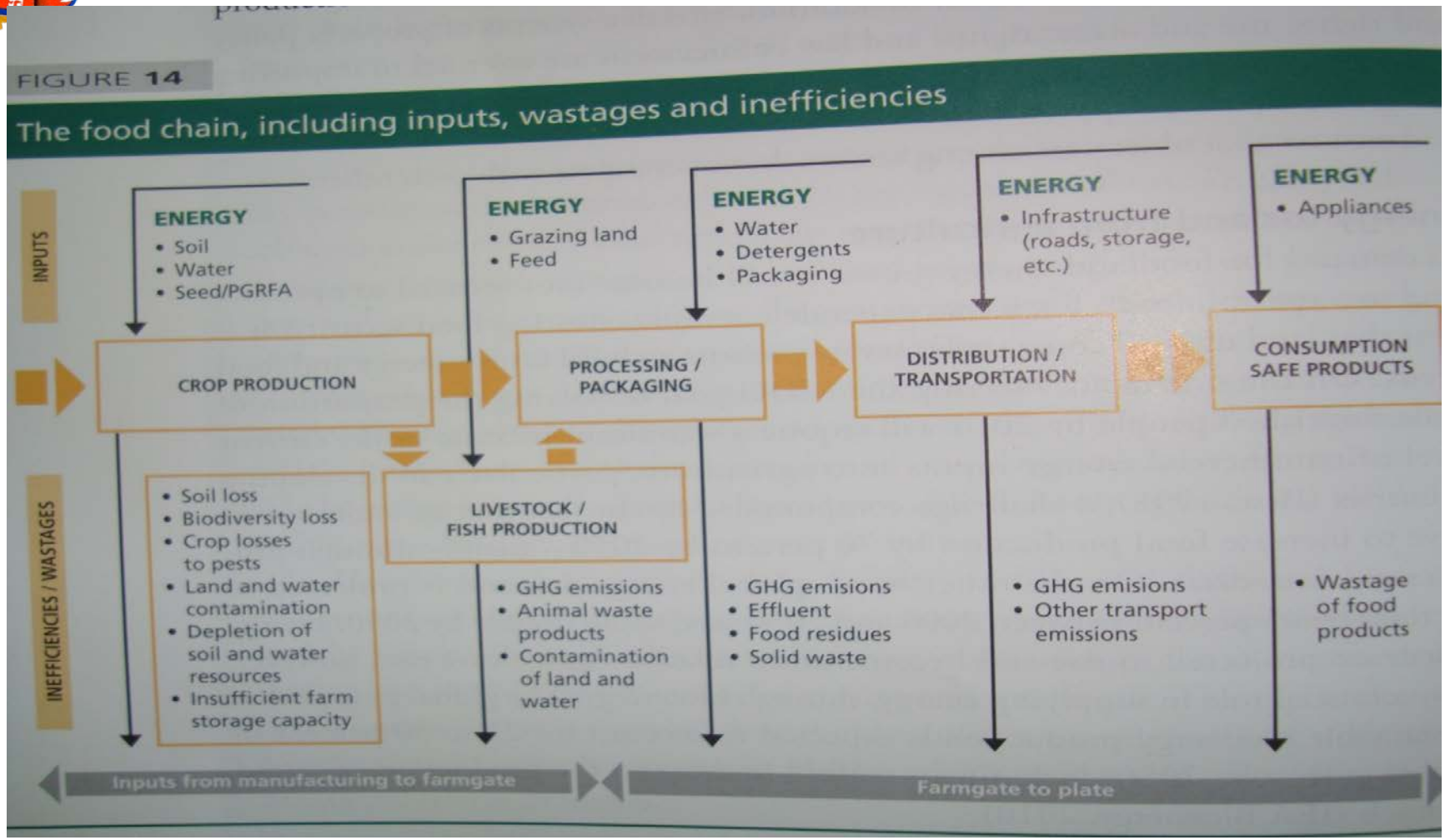
Constraint/risks

- Climate Change
- Economic crisis (food and oil prices, global and regional market compitition).

Vulnerability of Agriculture to Climate Change

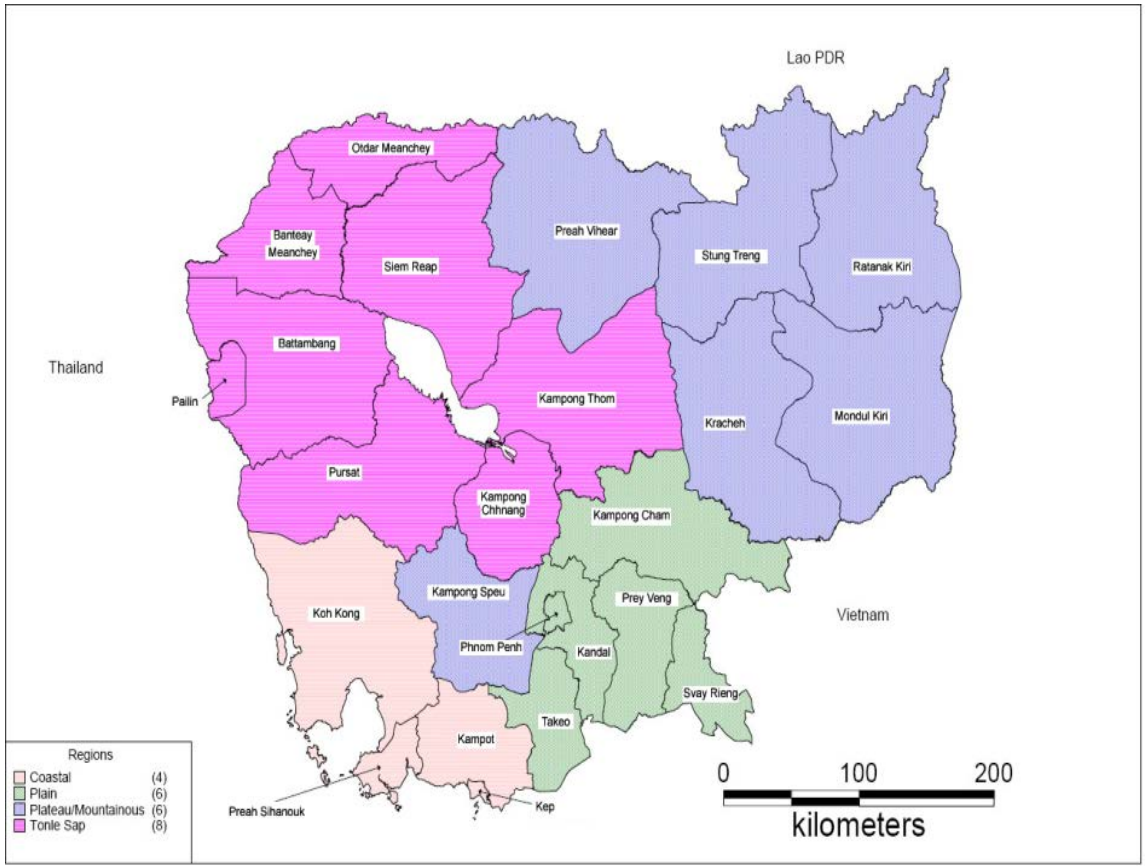


Food Chain and Climate change



Source: Adapted from FAO, 2010

Agro-ecological zone in Cambodia



- 80% of population heavy on agriculture, especially in Tonle Sap and Plain zones;
- About 2.5 Million Ha is Rainfed lowland Rice ecosystems
- Long coastline of 435 Km with low area.

Climate change&Agricultural productivity

Factors directly connect climate change and agricultural productivity:

- Average temperature increases
- Change in rainfall amount and patterns
- Rising atmospheric (GHG .e.g. CO_2, CH_4 NO_2)
- Sea level rise; soil saline water intrusion, soil erosion and degradation.
- Change in climatic variability and extreme events
- Pollution levels such as trophospheric ozone

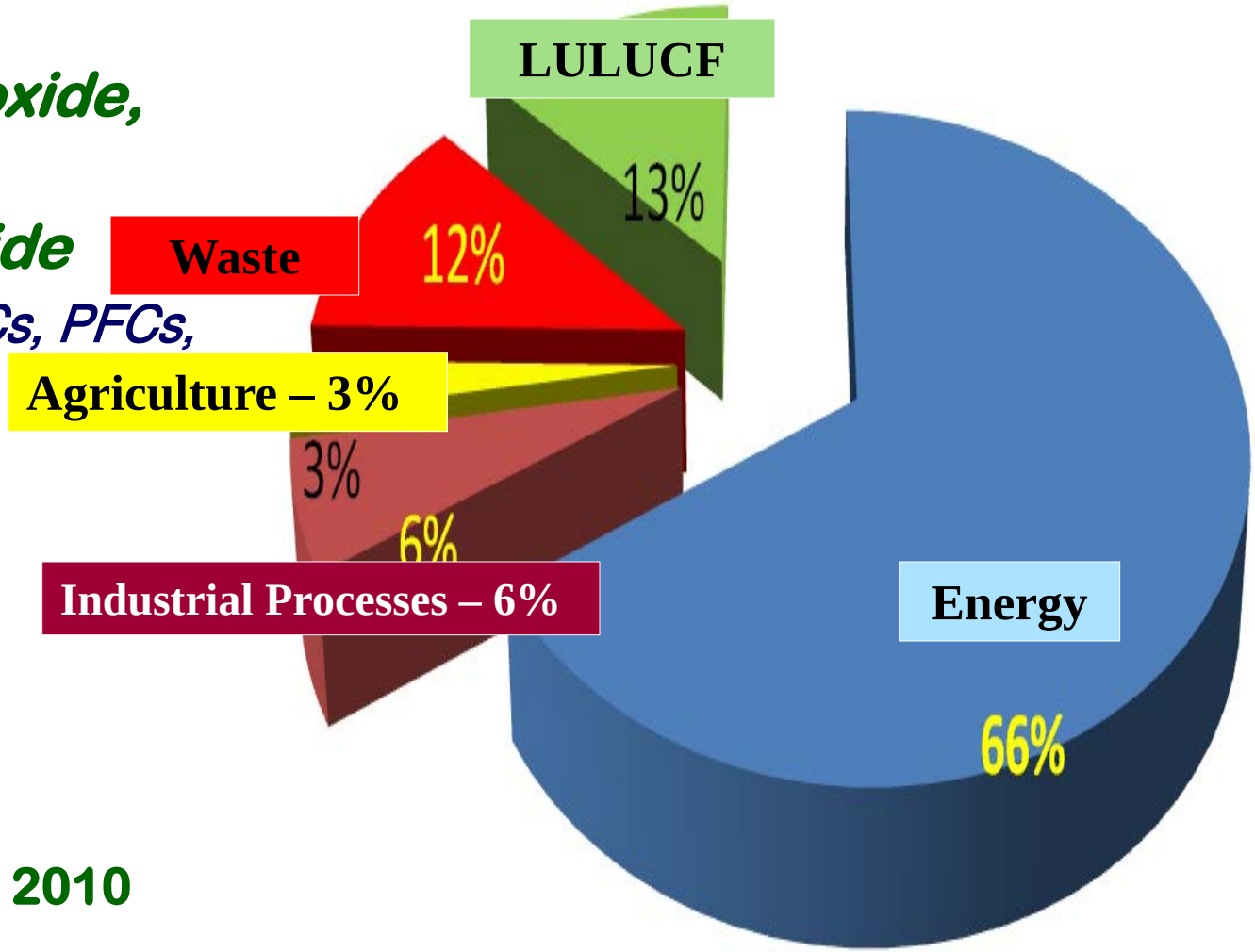
Climate change impacts on agricultural production

Item subject To impact:	Temp	Rainfall	CO_2	Extreme Events	Sea Level
Yield, Plant Size/Fruits	X	X	X	X	
Crop water requirement	X		X		
Soil fertility	X	X			X
Quantity - Irrigation & water supply	X	X		X	X
Animal - Rate of gain	X			X	
Animal - Milk production	X			X	
Weed competition	X	X	X		
Insects, fungus & diseases	X	X			

GHG Emissions by sectors

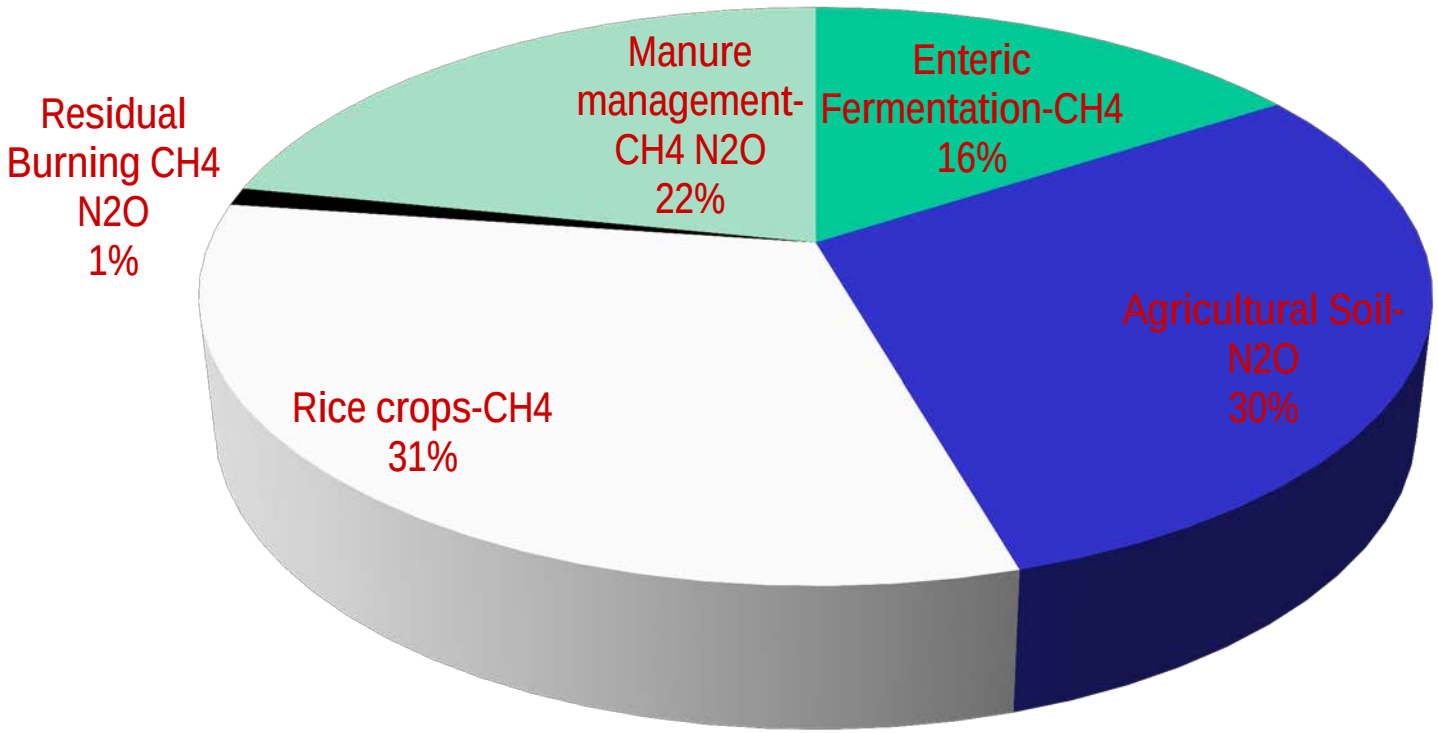
GHG Emission:

- ***Carbon dioxide,***
- ***Methane,***
- ***Nitrous oxide***
- ***others:*** *HFCs, PFCs, SF_6*



Source: MARDI, 2010

GHG Emission from Agricultural activities



Climate Change adaptation measures and Agricultural Technologies

- ***What is Adaptation?***
  - The adaptation involves developing ways to protect people and places by reducing their vulnerability to climate pattern.
  - Agricultural adaptation options could be grouped as:
    - *(a) technological developments;*
    - *(b) government programs;*
    - *(c) farm production practice; and*
    - *(d) farm financial management.*

Climate Change Mitigation

- Mitigation involves attempts or mechanisms to slow the process of global climate change by lowering the level of greenhouse gases in the atmosphere and such mechanisms that absorb carbon dioxide from the air and store it in the soil or in their trunks and roots.

Highlight Agricultural practices in Reducing GHG Emission

- *Crop production:*
  - Rice System Intensification (SRI)
  - Soil and Nutrient Management (Use Site Specific Nutrient Management)
  - Water saving techniques (AWD)
- *Conservation agriculture/Sustainable land Mgt. approaches*
  - Zero or Semi tillage
  - Permanent soil covers (cover crops, mulching, plastic cover...)
  - Crop rotation
- *Integrated farming systems (integrated rice, vegetables, fruit tree, livestock, fish ponds, water harvesting and promote agro-forestry).*

Highlight Agricultural practices in Reducing GHG Emission (con't)

- Urban and peri-urban Agriculture or Horticulture (Vegetable Green housing)
- Livestock production efficiency and resilience and encouraging development and use of renewable energy: 14,927 biogas units and use of biomass...etc.
- Integrated food-energy systems (e.g. Cassava, Jatrofa, oil palm...cte;
- Plant Agro-Industry plantation (e.g. Rubber and oil palm plantation...etc.);
- Fishery and aquaculture
- Agro-forestry and reforestation,
- Promote Carbon credits programs...etc.

1. System Rice Intensifications´pracices

Management of plants:
- transplant young seedling 8-12 old, carefully and quickly, one seedling per hill, widespread in square grid pattern (25cmx25cm or wider in good soil quality.

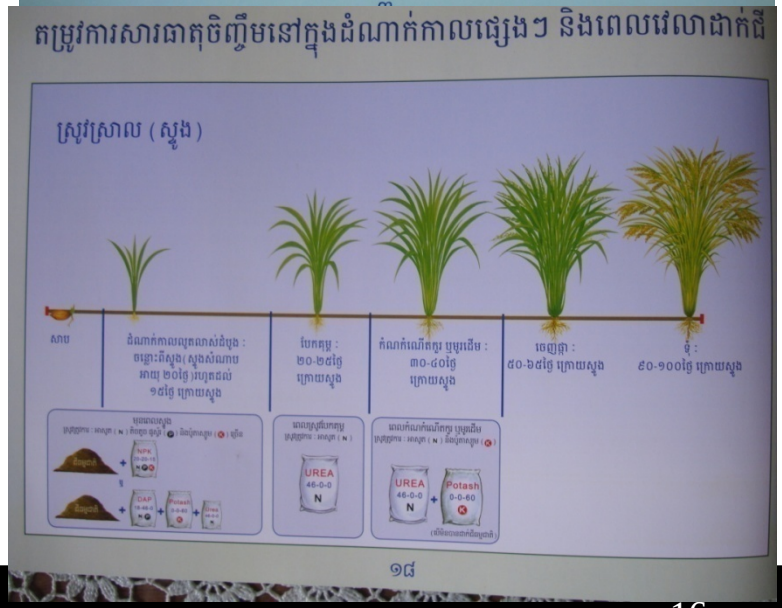
´Nutrient Mgt: Soil nutrient supplies should be augmented, preferably with compost, made from available biomass. Weeding every 10-12 days after transplanting until before canopy closes.

Soil mgt: Kept moist but well drained and aerobic, with good structure and enough organic matters. Quality and healthy soil is key to best production

Water mgt: Only a minimum water is applies during vegetative growth period, and Kept a thin layer of water is maintained on the field during flowering and grain filling.

2. Soil&Nutrient Management

- **Use Site Specific Nutrient management to precise efficient fertilizer application based on crops and site specific nutrient , balance, split application, timing...)**
- **Proper management of organic soil can reduce NO2 and CH4 emissions.**



3. Alternative Wetting and Drying (AWD)

- Apply Alternative Wetting and Dying(AWD) techniques
- Use drip Irrigation by crop water requirement

Field water tube from PVC
Note the holes on all sides

A Field tube under
Flooded conditions

Water at 15 cm depth:Time to
irrigate and floodthe field again

4. Conservation Agriculture

- No Mechnical soil disturbance or Zero tillages
- Permanant soil cover, especially by crop residue and cover crops
- Crop rotation and
- composting and straw mulchi

5. Integrated Farming Systems Practices

•At least area of 40 a or 0.4 ha for design farming systems: fish pond, rice field, cash crops field , fruit trees, multi-purposed trees, livestock pen/housing, compost pit and bio-digesters.

Urban and peri-urban Agriculture or Horticulture (Vegetable Green housing)

Livestock production efficiency and resilience

- Animal waste and manure management;
- Renewable energy: 14,927 biogas units and use of biomass...etc.

Integrated Food and Energy crops and plantation

Plant Agro-Industry plantation

Fishery and Aquaculture: Aquasilviculture:

- *Aquasilviculture: an environmentally-friendly and GHG mitigating marinculture systems by integrating of aquaculture and mangrove forest.*

Agro-Forestry systems

- *Farm-based agro-forestry:*
  - Promote Home garden:
  - Vegetable and cash crops
  - Fruit tree
  - Other plantation tree
- *Multipurpose tree and shrub on farmland:*
  - Live fences and woodlots on farmland;
  - Shelterbelt, windbreaks and soil conservation;
  - Protein banks and fodder production.
- *Fruit tree based agro-forestry:*
  - Fruit tree Orchard plantation

Agro-forestry systems

- *Forest based agro-forestry:*
  - - Improved fallow (Small-scale-block planting on abandoned land in upland areas
  - - Alley cropping in upland areas
  - - shifting cultivation areas.
  - -Forest garden for timbers and fuelwood production.

Conclusion

- Agriculture contributed to and affected by climate change
- Crop yield are likely to reduce due to rises in temperature, droughts and floods and incident of pest and diseases
- New agriculture technology and approaches can be implemented to mitigate and adapt climate change
- Science&Technology must spearhead agricultural production

Conclusion (con't)

Adaptation & mitigation measures include:

- Use of wider genetic base
- Breeding and selection for adaptation
- Biotechnological enhancement of genetic materials
- Incorporating local knowledge and indigenous species
- Using inputs with low carbon footprints
- Use of alternative nutrient sources

Thank you for your attentions