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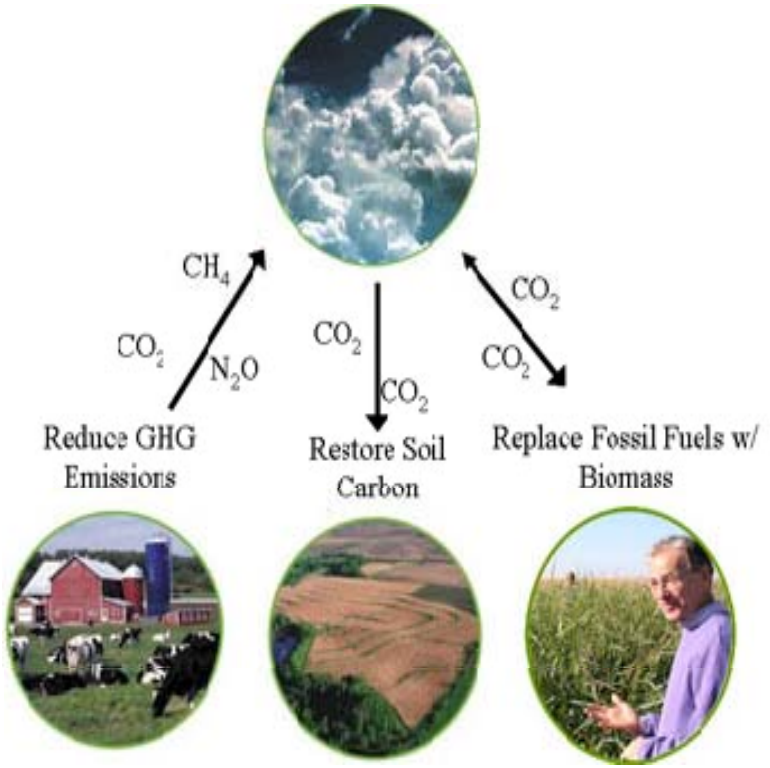
OVERVIEW OF RESEARCH ON AGRICULTURAL GREENHOUSE GAS EMISSION IN VIETNAM



Speaker: Nguyen Hong Son

1. Agriculture - the largest greenhouse gas emission source

a. Agriculture

- Agriculture representing 20.3% of total GDP in 2007
- More than 70 percent of the Vietnamese population lives in rural areas
- Vietnam is the second largest exporter of rice in the world in 2007.

=> *Agriculture is the largest GHG emission source in Vietnam.*

- Reference to the 2000 research report of The National GHG Inventory

Table 1. National GHG emission inventory for 2000

Sectors	Total CO_2 equivalent (Tg)	%
Agriculture	65.1	45.4
Fuel use	50.4	35.2
Land use change and forestry	15.1	10.5
Industrial processes	10.0	7.0
Waste matters	2.6	1.8
Total	143.0	100

(Source: Technical report for GHG inventory of the Second National Communication. HANOI, 2009).

While the world agriculture in 2000 contributes only 14% to global annual GHG emissions, 42 Gt CO2 equivalent (IPCC, 2007).

Rice cultivation is the largest source of agricultural GHGs emission in Vietnam (reference to Table 2)

Table 2. Agricultural GHG emission inventory for 2000

Sub-sectors	Total CO_2 equivalent (Tg)	%
Rice cultivation	37.4	57.5
Livestock (Enteric fermentation & Manure management)	11.2	17.2
Agricultural soil	14.2	21.8
Burning savanna	0.6	0.9
Field burning of agriculture residues	1.7	2.6
Total	65.1	100

(Source: Technical report for GHG inventory of the Second National Communication. HANOI, 2009).

Vietnam's rice land is about 4.1 millions ha, accounting for 44% of the agriculture land.

- Vietnam's annual rice-cultivated area is about 7.3 millions, yielding 36 millions tons of raw rice among which about 9 millions tons has been exported.

- GHG emission from rice cultivation was about 37.4 Tg CO2 equivalent, accounting for 57.5% of agricultural GHGs or 26.1% of national GHGs.

- To ensure food security and other socio-economic issues, Vietnam still needs an increase in rice production.

- Maintaining intensive rice production along with mitigating its adverse impacts on environment is a great challenge for Vietnam agriculture in coming decades

1. Agriculture - the largest greenhouse gas emission source

b. *Animal husbandry*

- A livestock population of 26.9 million pigs, 6.5 million cattle, 2.92 million buffaloes, 1.53 million sheep and goats, and 214.6 million poultry (in 2006).
- Releases more than 20 million (dry) animal waste every year.
- GHG emitting from animal husbandry activities was about 11.1 Tg CO2 equivalent, accounting for 17.2% of agricultural GHGs in Vietnam or 7.7% of total national GHGs (According to result of the national GHG inventory for 2000)

1. Agriculture - the largest greenhouse gas emission source

c. Agricultural soil, field burning of agriculture residue and burning savanna

- 14.2 million tons CO2 equivalent from agricultural soil
- 1.7 million tons CO2 equivalent from field burning of agriculture residue
- 0.6 million tons CO2 equivalent from burning savanna, accounting for 21.8%, 2.6%
- 0.9% of agricultural GHGs

(According to The National GHG Inventory)

2. Activities for mitigation of agricultural GHGs emission

- Vietnam ratified the UNFCCC in 1994 and the Kyoto Protocol in 2002.
- Vietnam carried out national research and participated in several regional studies aimed at providing a systematic overview of the climate change issue, its potential impacts on the country and the country's response.
- Vietnam submitted its first National Communication in October 2002 and its "National Strategy Study on CDM".

  => Almost all studies have been oriented towards the country's potential to reduce GHG emissions.

- National GHG inventories for 1994 and 2000 have been completed with the IPCC guidance and under the projects as:

  + “Climate Change in Asia: Vietnam” (1994, supported by ADB)

  + “First National Communication to UNFCCC, 1994” (2002, supported GEF/UNEP/MONRE)

  + “Second National Communication to UNFCCC, 2000” (2009, supported GEF/UNEP/MONRE).

- The inventories shown that total national GHG emissions were 103.8 and 143.0 million tons of CO2 equivalent in 1994 and 2000.
- Agricultural GHG were 52.3.8 and 65.1 million tons of CO2 equivalent in 1994 and 2000.
- There are some uncertainties associated with activity data in agriculture sector.
- Most of emission factors in 2000 GHG Inventory are from the revised 1996 IPCC Guidelines for National GHG Inventories.
- There are some uncertainties that should be verified, analyzed and made clear in the coming time due to using these default emission factors.
- Need experimental data for evaluation of precision level of the inventory software used for Vietnam as well as for management of QA/QC for each sector.

- **3. Specific study on GHG emission**:

- No systematic study carried out up to date.

- Several initial research focuss on: (1). Climate change adaptation and mitigation in the context of sustainable development; (2). Effects of fertilizer application to CH4 emission from rice paddy

- ***3.1. Study on strategies of climate change adaptation and mitigation in the context of sustainable development in the case of Vietnam concudted by*** Hanh H. Dang et al., 2003.

- Initial finding shown:

  + Major direct impacts of climate change

  + Adaptation and potential mitigation options for Vietnam agriculture selected by a multi-criteria analysis (MCA) technique (summarized in Table 3 and Table 4).

- Table 3

Major direct impacts and adaptation options for selected water and agriculture resources in Vietnam

Resource	Potential impact	Adaptation option
Water	- Changed water availability and quality - Changed annual run-off - Increased frequency and extreme of floods and inundation	- Construct and improve irrigation and drainage system - Improve sea dyke systems - Promote hydropower development
Agriculture	- Reduced arable area - Changed crop yields - Potential threat to national food security - Facilitated pests development	- Enhance irrigation system for agriculture - Further investigate the country agroclimatology - Develop flexible crop patterns

(Source: Hanh H. Dang et al.. Climate Policy, 3, Supplement 1, 2003)

Table 4:

Potential mitigation options in agriculture in Vietnam selected by a multi-criteria analysis technique.

Mitigation option	Emission eduction potential (mill. t CO_2 equivalent)	Commercial attractivenes s	Sustainable development	Adaptation benefits
A1: Water management for reducing methane emissions from rice fields	105.0	Low	High	Positive
A2: Food processing for animal husbandry	8.0	Low	High	Neutral
A3: Utilization of biogas	27.3	Low	Low	Neutral

(Source: Hanh H. Dang et al.. Climate Policy, 3, Supplement 1, 2003)

- The direct impacts lead to more serious consequences for the development of the country since they cause significant losses both economically and in terms of human casualties.
- These results indicate that sectoral adaptation strategies can influence abatement positively or negatively.
- The quantified changes in GHG emissions arising from the implementation of adaptation strategies depend on many factors, i.e. climatic stimuli, traditional cultivation techniques, economic factors etc.

=> There is a need for more specific research to answer these questions.

An appropriate activity to improve the operation and quality of the irrigation system would provide both mitigation and adaptation benefits.

- The analyses mostly rely on results of studies involved reducing CH4 emission from rice paddy by water management

- Several analyis conducted in Vietnam also shown that intermittent drying of the rice fields (referred to alternate wet/dry irrigation) instead of keeping them continuously decreased CH4 emitting from rice paddy by 10-13% while could increase rice yield up 9% and save water resource.

- Absolute value of CH4 emission measured in the studies fluctuated largely, from 184 to 515 kg CH4 m-2 cropping season-1.

- This large fluctuation could be because of differences in soil properties, climate conditions, used varieties, cropping season, CH4-measuring method, and crop managements as water irrigation, fertilizer application, tillage, etc.

- In Vietnam, most rice plants were grown in two ecological regions such as the southern delta having climate of warm-humid all year round with ample sunshine and the northern delta having of the tropical monsoon area with cold winters.
- The rest are grown in the other ecological regions with variable topography as the highlands in the north having cool summers and bitterly cold winters, the highlands in the central region having cool all year round with a long dry season, the central coast of the country with a mixture of northern and southern climates.

- Such wide distribution of rice-growing regions in Vietnam has created diversity in rice culture systems separated by irrigated and intensive, rain-fed and flood-prone and upland based on irrigation and intensive degree and by three rice crops, two rice crops (fallow or a dry crop in winter) and a rice crop (i.e., fallow or a dry crop in winter) based on crop rotation type.
- It has also created diversity in rice soil types (i.e., fluvisols, ferralsols and acrisols) and in crop managements as measures of planting (i.e., direct seeding and transplanting), tillage (i.e., no tillage and tillage), fertilizer application (i.e., high and low rate of fertilizer, with and without muck), crop residue management (i.e., burning, burying at paddy and removal from paddy).

Thus

More practical studies are a need to estimate more accurately CH4 emission and find out combinable cultivation techniques to reducing GHGs emission from different rice systems in Vietnam.

3.2. Research on effects of fertilizer application to CH4 emission:

Co-research of Institute for Agricultural Environment, Vietnam in co-operation with Chiba University, Japan conducting from rice paddy on fluvisols and acrisols

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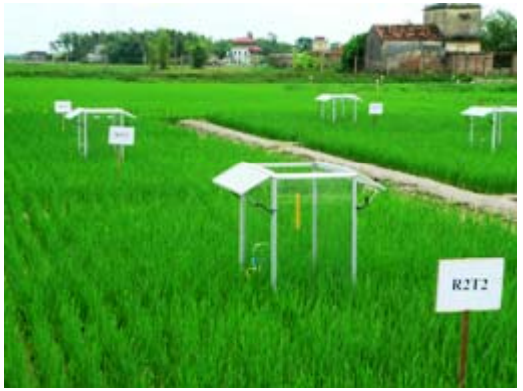
- *Pot experiment on efficacy of Fe-containing fertilizers to reducing methane emission from Fluvisol and Acrisol rice soils in North Vietnam conducted by IAE/VAAS, Spring rice, 2009.*



- *Field experiments on efficacy of Fe-containing fertilizers to reducing methane emission from Fluvisol and Acrisol rice soils in North Vietnam conducted by IAE/VAAS, Summer rice 2009.*

IN SUMMARY

- Agriculture in Vietnam plays a vital role in the national socio-economic development and is the largest GHG emission source. Rice cultivation is a major agricultural GHG emission source.
- Restricting GHG emission from agriculture, especially from rice cultivation could be significant in reducing in total national GHG.
- However, ensuring food security along with reducing GHG emission is a challenge for agriculture in the future.

- Whereas, there has been many action plan and commision of Government to reduce GHG emsission, there has been very few systematic studies on the above issue due to shortage of human and equipment capacity.

- Thus, the cooperation is esential important to strengthen research actitivites

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THANK YOU FOR YOUR ATTENTION!