

# **“Towards an Integrated Mitigation and Adaptation in agriculture”**

Side Event COP14, Poznan



University of Zurich



## **Interactions of mitigation and adaptation strategies in the agricultural sector**

**Yuri Okubo & Axel Michaelowa**

**Institute for Political Science  
University of Zurich**

**4<sup>th</sup> December, 2008**



# Outline

- Setting the Scene: why an integrated approach?
- GHG emissions from the agricultural sector and climate impact on the agricultural sector
- Mitigation and adaptation measures
- Potential synergies and trade-offs
- Benefits and barriers of an integrated approach

# Setting the Scene: Rationale for integration



University of Zurich



- There are **adaptation projects** that have an **impact on GHG emissions** and **mitigation projects** that have an **impact on vulnerability**
  - Both are so far considered **separately** with an emphasis on mitigation
  - Mitigation measures of agricultural sector and adaptation in general have been neglected
- ➔ Integrated approach could provide incentives to:
- implement effective climate measures
  - enhance mitigation and adaptation in the agricultural sector

# GHG emissions from the agriculture sector

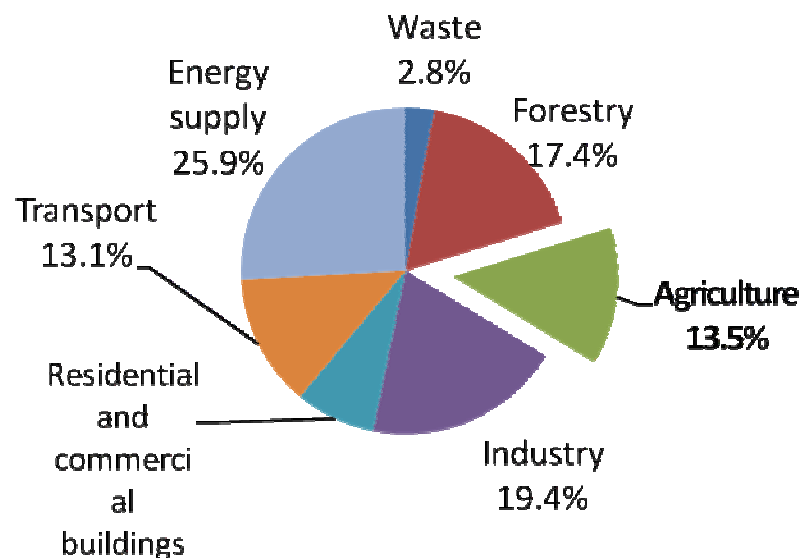


University of Zurich

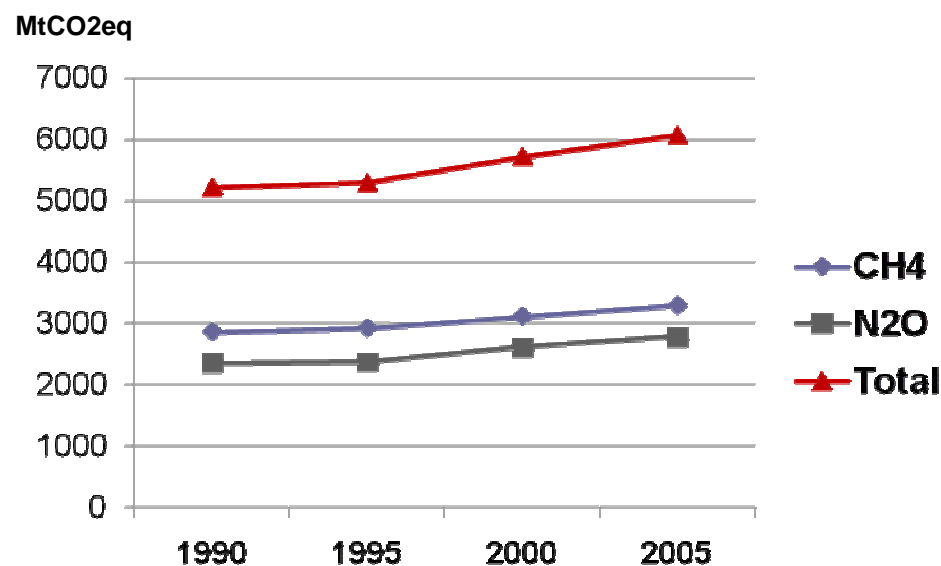


- Accounts for **13%** of total **global GHG emissions**
- Agricultural  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emissions have **increased** nearly **17%** between 1990 and 2005

## World GHG emissions by sector in 2004    World historical emissions from agriculture



Source: Adapted from Barker et al ( 2007)



Source: Adapted from US-EPA( 2006)

# Climate change impact on agricultural sector



University of Zurich



- Climate change is **already affecting** agricultural sector
  - Asia: c.a. 2.5-10% decrease in crop yield in 2020s, and 5-30% decrease in 2050s compared with 1990 levels
  - Europe: agricultural yields may increase in the north, but decrease in the south due to water stress
- ➔ Unsuccessful adaptation would have global repercussions due to decreased food production



# Mitigation measures

Characteristics:

- Reduced GHGs are **nitrous oxide, methane** and CO<sub>2</sub>
- **Variety of options** compared to other sectors

Measures	Examples
Crop land management	Nitrogen fixers in rotation cycles
	Soil water management improvements to irrigation and drainage
Livestock and manure management	Improved feeding practices
	Improved storage and handling of manure management
Grazing land management and pasture	Alleviating nutrient deficiencies by fertilizer or organic amendments
Bioenergy	Dedicated energy crops to replace fossil fuel use

# Adaptation measures



University of Zurich



## Characteristic

■ Vary with  
**agricultural  
production systems,  
location and climate  
scenarios**

Climate Change Impact	Examples
Changes in temperature	Adjustment of planting dates
Changes in temperature / precipitation	Cultivar and crop changes
Changes in temperature, Increased frequency and strength of storms	Crop relocation
Decreased precipitation, drought	Improved irrigation system
	Efficient water use technologies
Any climatic risk	Diversifying income
	Accessible, efficient markets for products and inputs for financial services including insurance



# Potential Synergies

<b>Mitigation measures</b>	<b>Positive effect on adaptation</b>
Reforestation	Lower likelihood of flash floods
Return residue to fields to sequester carbon (No tillage agriculture)	Improved water holding capacity increases resilience to drought
<b>Adaptation measures</b>	<b>Positive effect on mitigation</b>
Drought resistant cultivars	Stable availability of biomass residues for bio power production
Planting of mangroves for coast protection	-Carbon sequestration -Reduction of risk of power plant outage due to flooding





# Potential Trade-offs

<b>Mitigation measures</b>	<b>Negative effect on adaptation</b>
Increase in energy crops	Leads to deforestation and land slides
Hydropower development	Limited water resource for irrigation
<b>Adaptation measures</b>	<b>Negative effect on mitigation</b>
Rainfed to irrigated agriculture	Increase energy based GHG emissions for pumping
Change grassland to cropland	Increased emissions from soil

# Benefits and barriers of an integrated approach



University of Zurich



## Benefits

- Climate policy makers can maximize benefit of their policy
- Reduce climate vulnerability of mitigation measures
- Reduce energy intensive adaptation measures

## Barriers

- Synergies and trade-offs are location specific
- Lack of performance indicator(s) of adaptation measures
- Different temporal and spatial scale, involves different stakeholders and a different distribution of costs and benefits



# Discussion Points

- **How can we measure mitigation and adaptation effects simultaneously?**
  - How can we agree on common indicator for adaptation effectiveness?
- **How can we define policy instruments that consider both mitigation and adaptation?**
- **How can Europe and Asia learn from each other in this field?**



# **Thank you for your attention!**

**CONTACT: [okubo@pw.uzh.ch](mailto:okubo@pw.uzh.ch)**