Main Findings of IPCC AR4 on Agriculture

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Outline

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- Main findings in adaptation
- Baseline emission trends and drivers
- Mitigation potentials by regions and carbon price
- Contribution to mitigation in energy sector
- Limitations of AR4
- Key messages on agriculture from IPCC AR4
- Final comments on C sequestration in soils

Impacts, Adaptation

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- Warming will decrease yields in seasonally dry and tropical regions. Positive effects in temperate regions
- The number of people at risk of hunger tends to decrease with development. Climate change will attenuate this decrease, and cause localized increases (e.g., sub-Saharan region)
- Adaptation measures exist (change in practices, relocation). Beyond 3^{o}C warming, adaptation not possible in low latitudes
- Small landholders/subsistence farmers will suffer localized impacts (climate variability, snow-pack decrease, disease,…)
- Food trade expected to increase, with most developing countries becoming more dependent on food imports
- CO_2 enrichment increases crop yields (particularly C_3 crops) under unstressed conditions.

Baseline emissions: Agriculture

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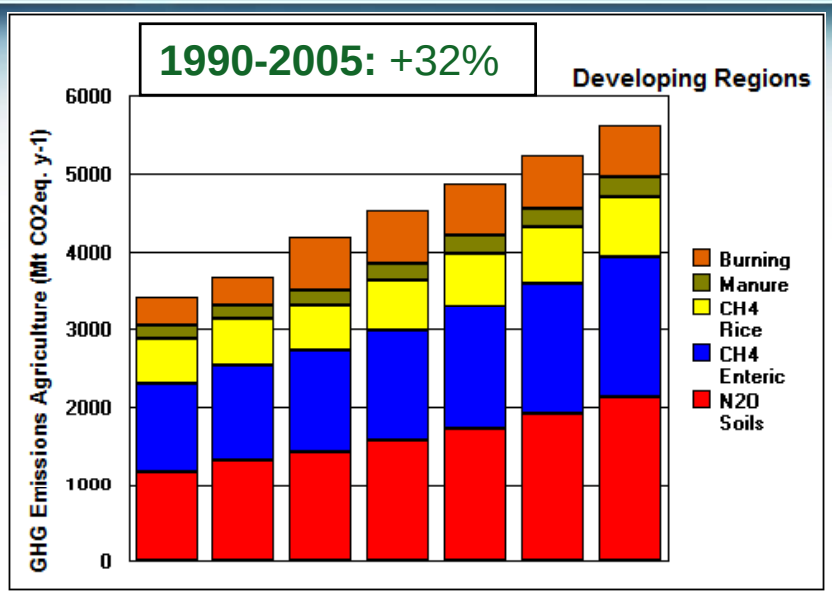

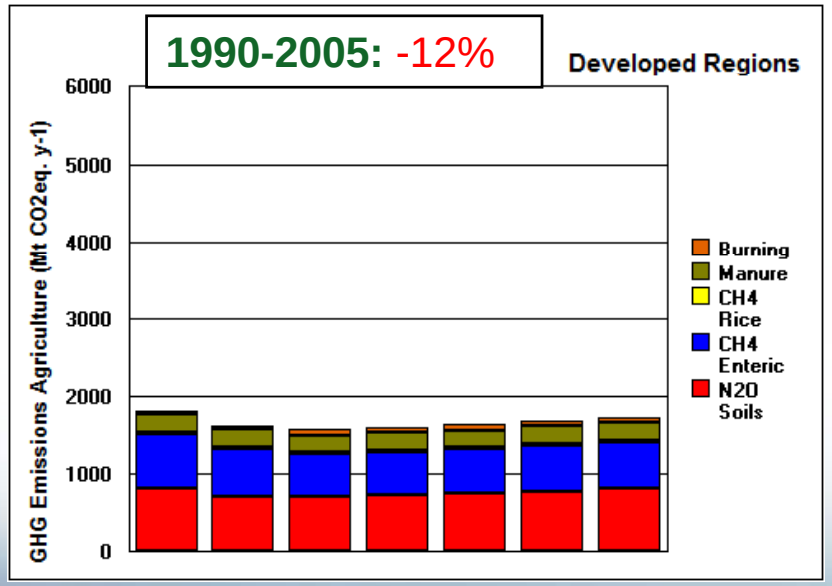

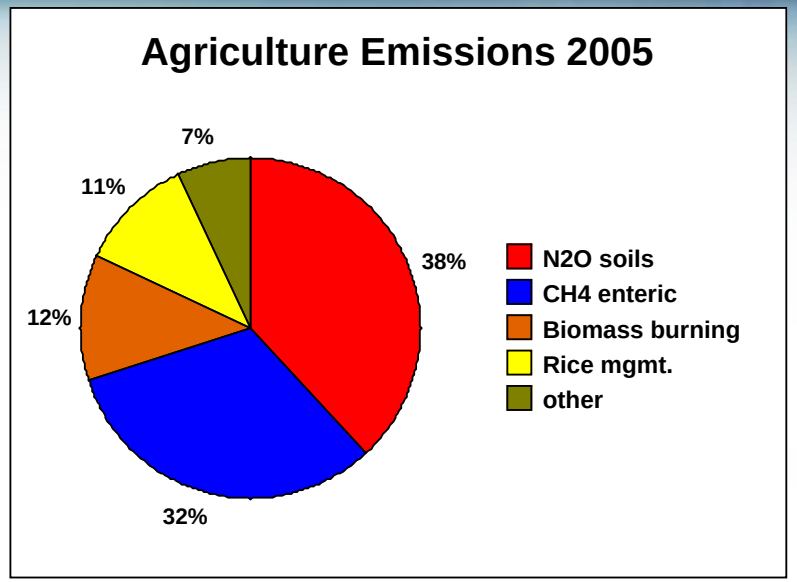

Main drivers for trends

- Increase in GHGs: population pressure, income increase, diet changes, technological changes
- Decrease in GHGs: increased land productivity, conservation tillage, non-climate policies

Economic Mitigation Potential in 2030

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Carbon price (US$/tCO$_2$-eq)	Mitigation Potential (Gt CO$_2$-eq/yr)
20	**1.6** (0.3-2.4)
50	**2.7** (1.5-3.9)
100	**4.4** (2.3-6.4)
Emissions 2030	**8.2**

Mitigation practices in Agriculture

Cropland management; Restoration of organic soils; Rice management; Grazing land management – 90% of potential is carbon sequestration

Mitigation Potentials by Sector

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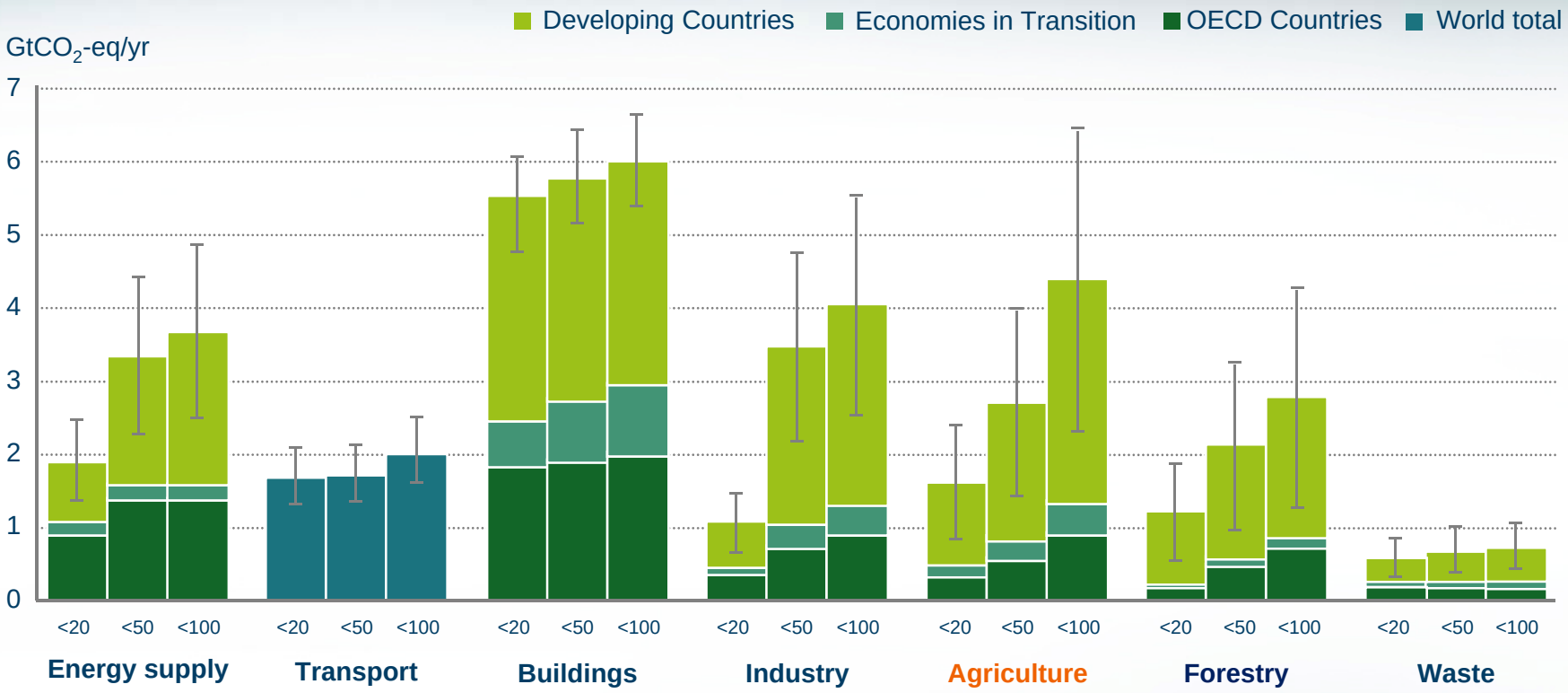

Relative contribution of Agriculture to total mitigation potential

US$ 20/tCO2 – 12%

US$ 50/tCO2 – 14%

US$ 100/tCO2 – 19%

Agriculture: Regional Distribution of Technical Potential

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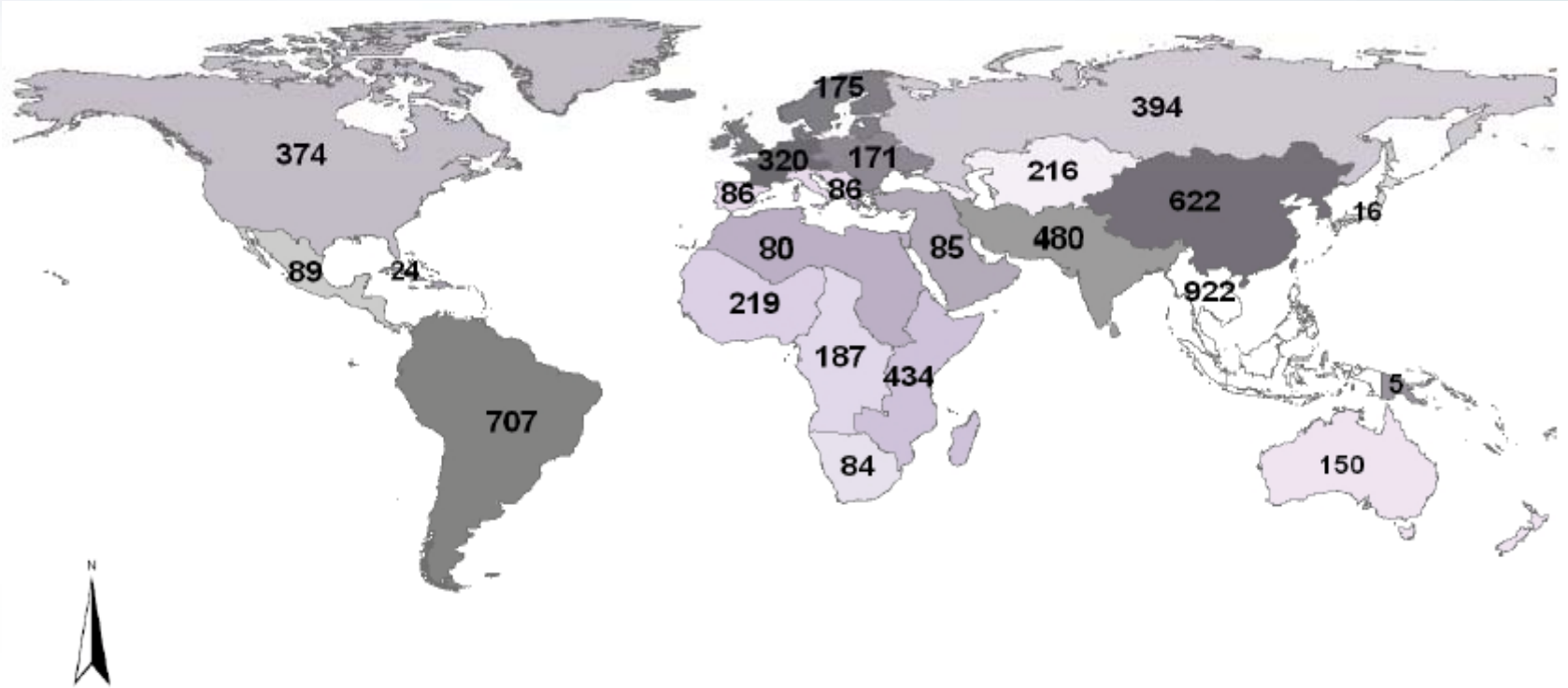

70% of technical potential is in developing regions

2/3 of potential not covered by Kyoto mechanisms

Contribution to Energy Sector

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- Biomass as energy feedstock produced in agricultural land may cause indirect emissions reductions of 70-1,260 Mt CO_2-eq./yr (at US$ 20/tCO2) by 2030.
- In addition, emissions reductions of 770 Mt CO2-eq./yr can be achieved through energy efficiency
- Associated impacts:
  - Competition with other land uses, positive or negative environmental impacts, implications for food security

Limitations of the Assessment

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- Mitigation potential in livestock systems may have been underestimated. Emphasis was on per-head emissions, but relevance of per-unit-product emissions (i.e., getting certain amount of products with lesser animals) was overlooked.
- Some possible synergies between mitigation options were not quantified (e.g., grazing land/cropland productivity and reduced deforestation)
- Estimates of some options with possibly good potential (lifestyle changes) are not provided
- Sink enhancement or reversal due to climate change are identified, but uncertainties remain high

Key Messages

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- Carbon sequestration in agricultural soils has a mitigation potential of 1 to 4 billion t CO_2/yr at carbon prices of 20 to 100 US$/t$CO_2$
  - This represents between 11 and 17% of total mitigation potential
  - C stock in soils is highly correlated with productivity/resilience and soil conservation
  - Links with REDD
- 70% of mitigation potential is in developing regions
  - This potential was neglected by Kyoto, thus wasting an opportunity for adaptation and sustainable development benefits.
- Potential of mitigation of livestock emissions may have been underestimated (especially for grazing systems in warm regions).

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The report of IPCC Working Group III is available at www.mnp.nl/ipcc

A Mitigation Potential Largely Missed by Kyoto

	Emission Reductions ($GtCO_2$-eq/yr)	
Mitigation Practice	**Economic Potential**	**Kyoto Mechanisms**
C sequestration in agricultural lands	**4.0** (2.8/1.2)	~**0** (three AI Parties)
Afforestation / Reforestation / Agroforestry	**0.8** (0.6/0.2)	**n/e** (nil in NAI Parties)
Reduced emissions from deforestation	**0.8** (0.7/0.1)	**n/e** (nil in NAI Parties)
Forest management	**1.3** (0.7/0.6)	**0.2** (20 AI Parties)
Total	**6.9** (4.8/2.1)	**<0.5**

Annex I countries: net sink of 1.2 Gt CO_2 in 2004

Policy Relevant Issues

- Permanence
  - Temporary credits for AR CDM, a big failure
  - Buffer reserve approach (e.g., VCS) is a more effective mechanism
- Measurement of emissions and removals
  - IPCC Good Practice Guidance 2003 and IPCC Guidelines 2006 provide a sound basis to achieve reasonable accuracy
  - Uncertainties remain high for non-CO_2 gases
- Baselines
  - Agricultural emissions: adoption of carbon intensity baselines (i.e., per-unit-product emissions) should be more effective than baselines based on absolute emissions. Potential conflict with trade issues (e.g., subsidies, embedded carbon)
- Any restrictions to the trade of C credits will reduce the mitigation potentials and/or increase the market price of carbon