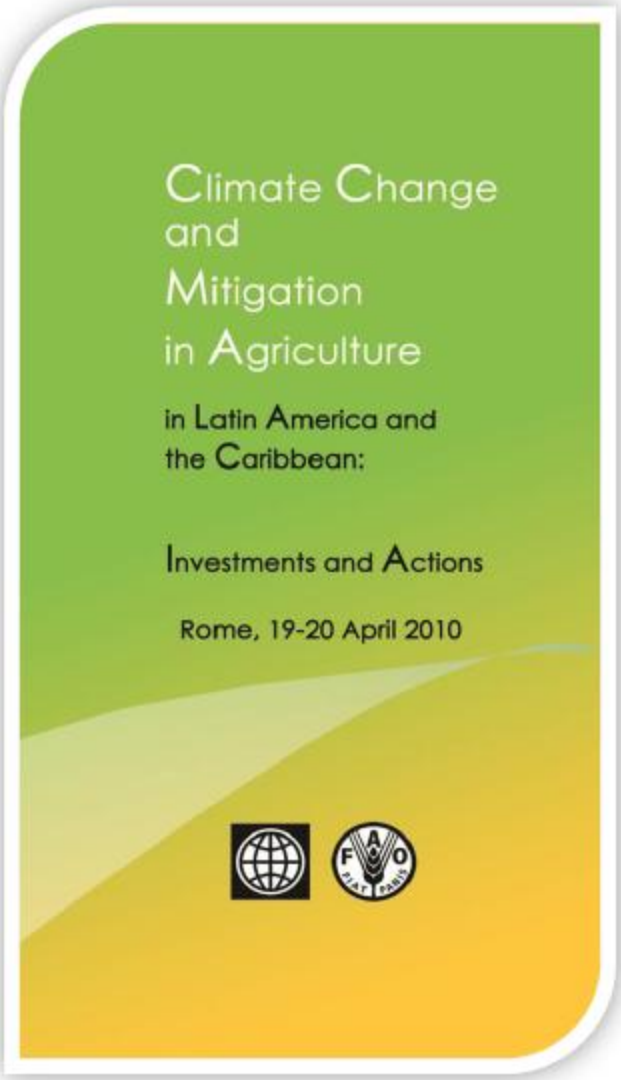


CARBOSUR

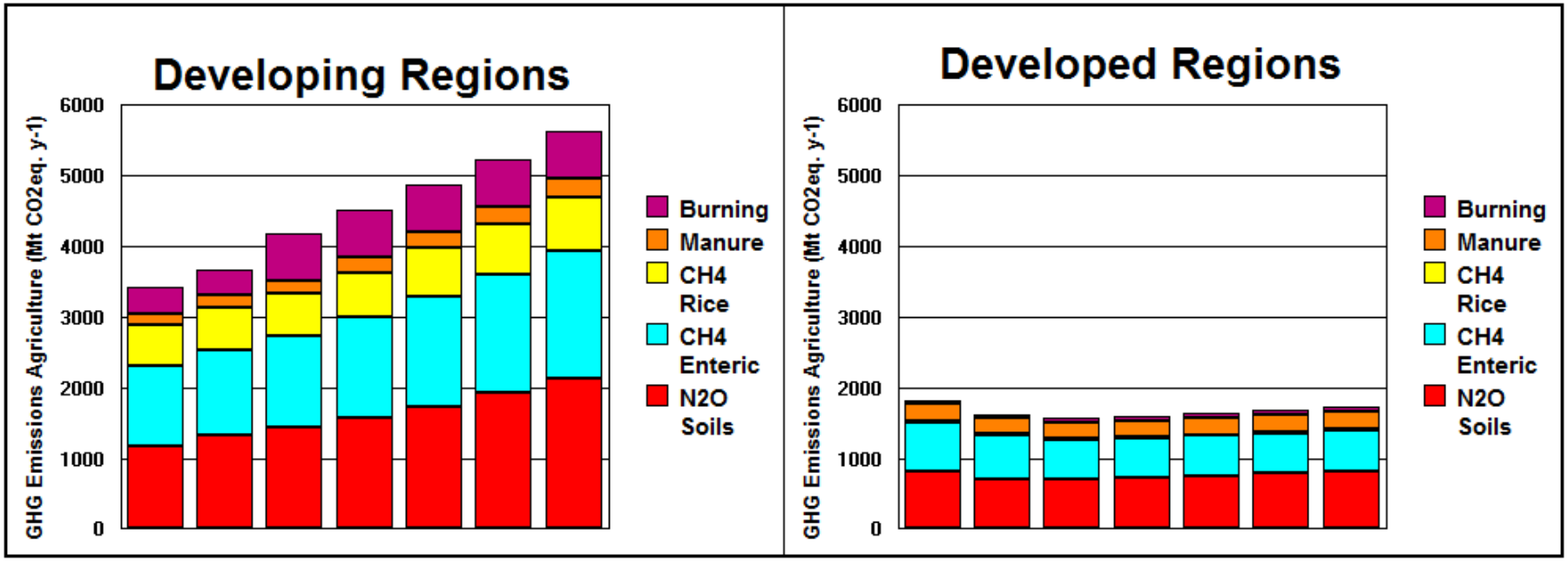
Climate Change Mitigation in Agriculture in Latin America and the Caribbean

Daniel L. Martino

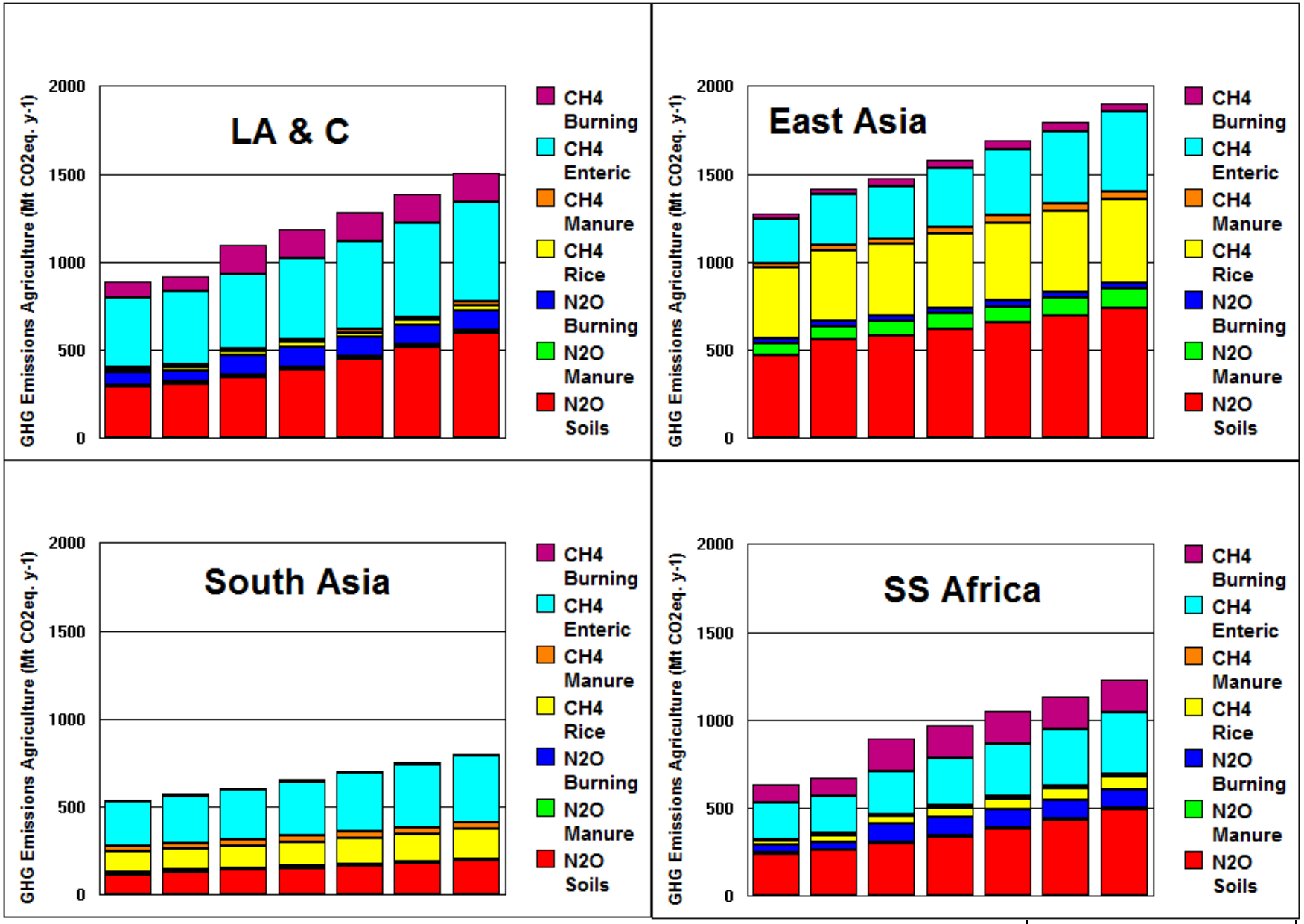
daniel.martino@carbosur.com.uy

Rome - 19 April 2010

GHG Emissions in Agriculture

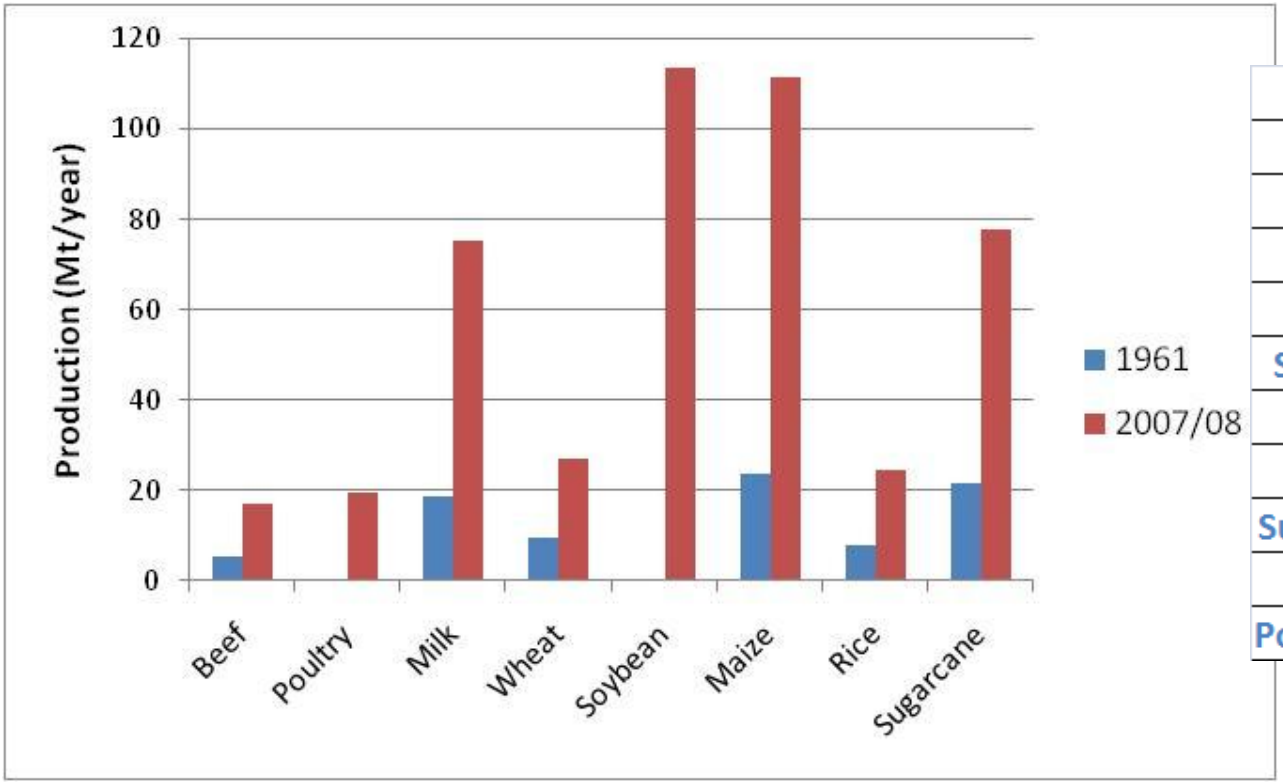


Source: US-EPA, 2007



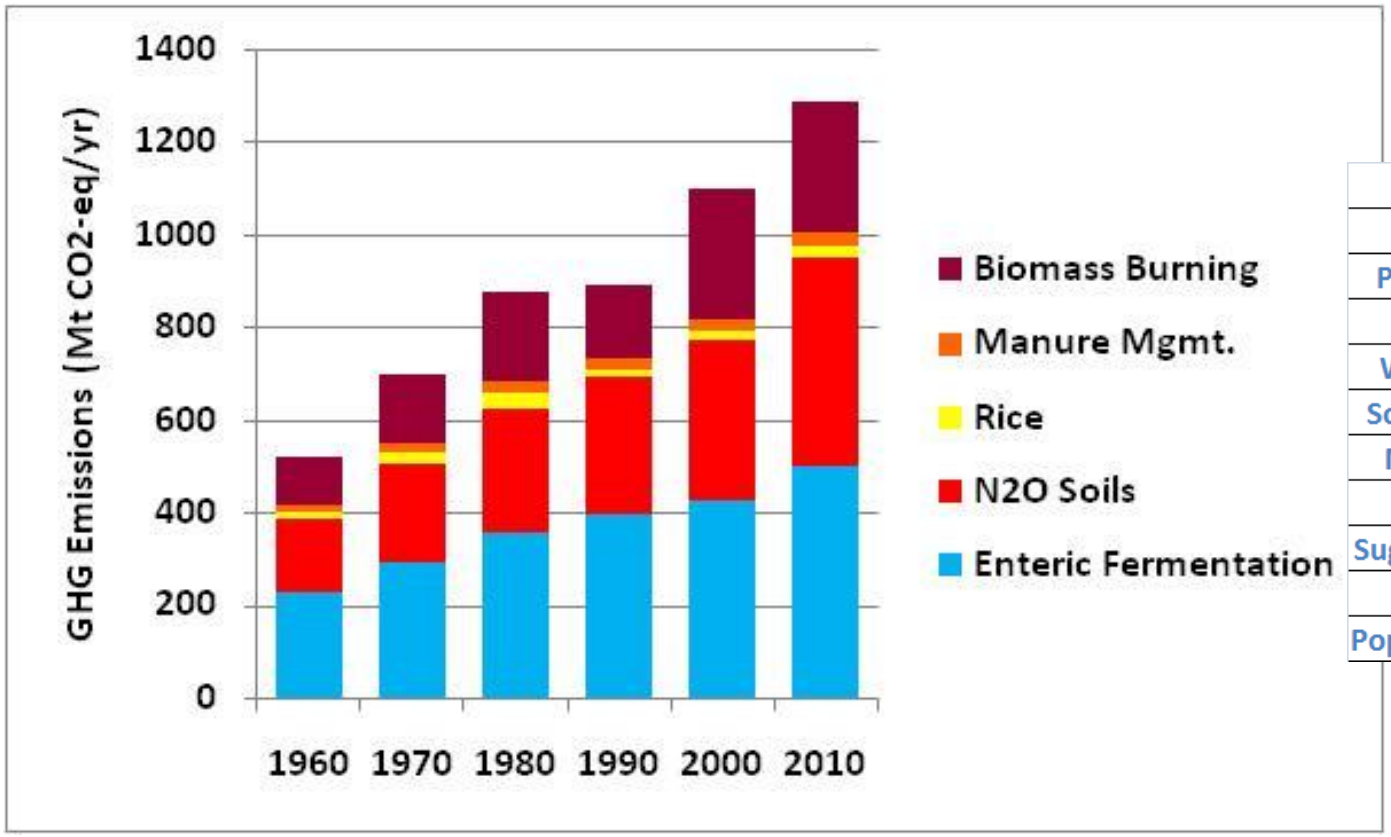
Source: US-EPA, 2007

Production of Agricultural Commodities in LAC



	Increase 1960-2008
Beef	220%
Poultry	3600%
Milk	306%
Wheat	186%
Soybean	---
Maize	369%
Rice	201%
Sugarcane	258%
Population	176%

Emissions of GHG in Agriculture in LAC



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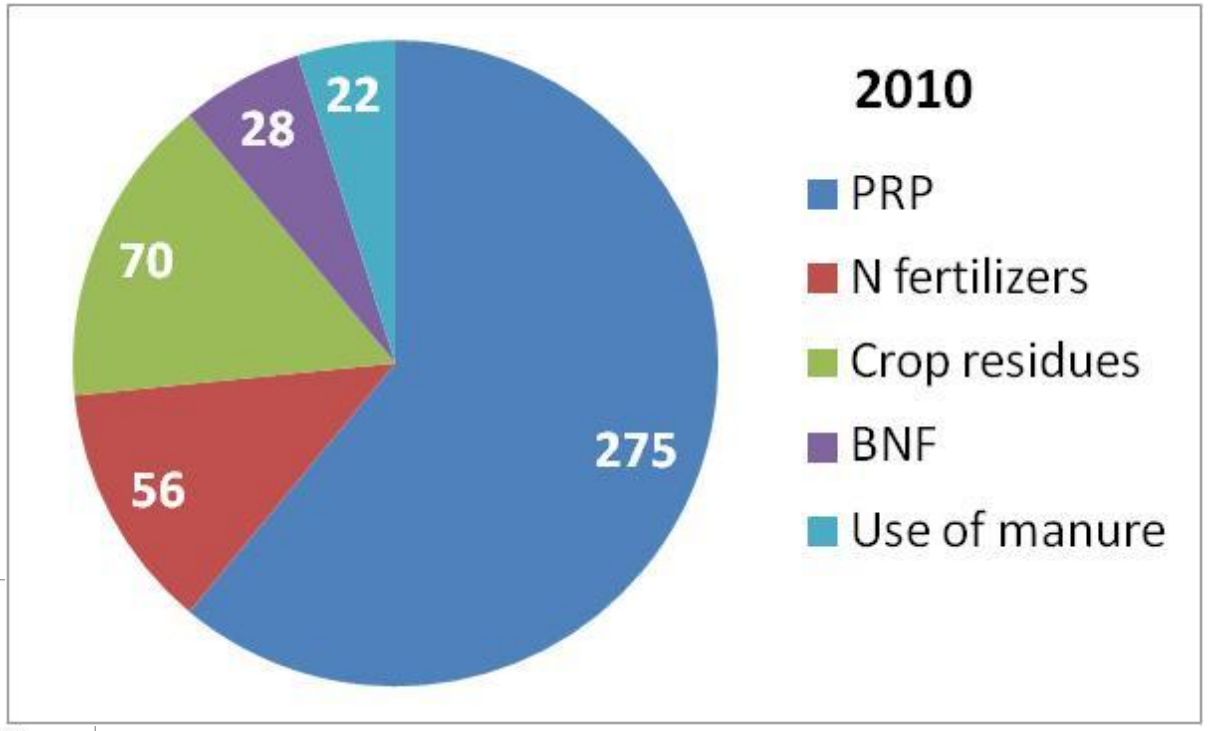
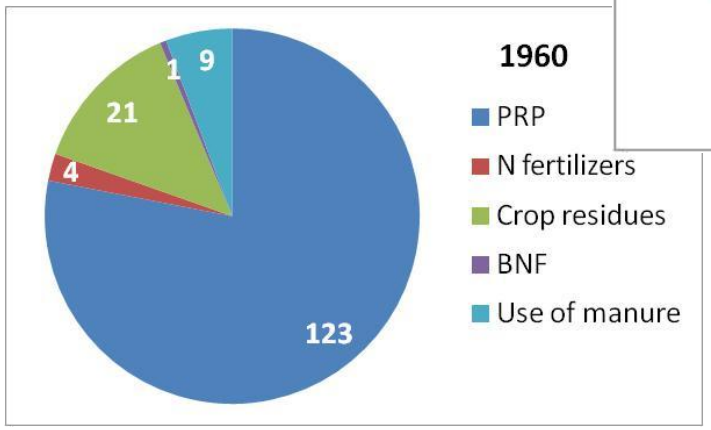
N_2O from Soils in LAC





Grazing animals (PRP): 61% of N_2O emissions
Emissions from livestock: 77% of total Ag. GHG

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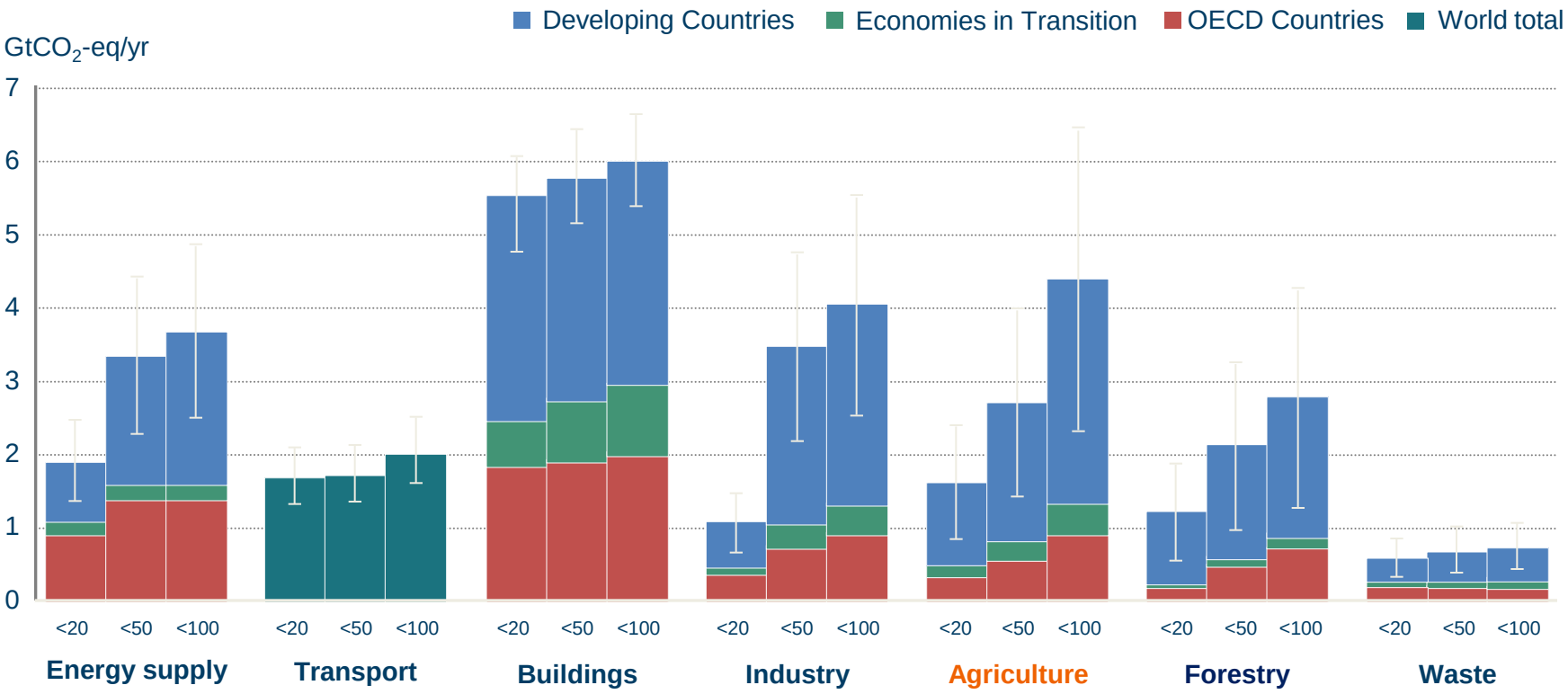
Summary of GHG Emissions in Agriculture in LAC

- Current emissions: 1.3 Pg CO_2/yr (20% of global agricultural emissions; 3% of global GHG)
- Increases in production are a major driver of emissions
  - Production increased by more than 200% since 1960 (soybean from nil to main commodity; poultry rose by 3600%)
  - Population and agricultural GHGs both increased by 150%
- Livestock emissions account for almost 80% of total
  - Enteric fermentation, N_2O from grazing animals main sources
  - Biomass burning: >80% of emissions are on grasslands
  - Expansion of grazing land is the main cause of deforestation (70%) in LAC emissions. If these are considered, livestock in LAC accounts for ~4% of global total emissions.
- Expansion of cropland: 3 Mha per year. This may cause decreases in soil carbon, probably compensated by increases in existing cropland (no tillage, improved productivity)

IPCC AR4: Mitigation Potentials by Sector



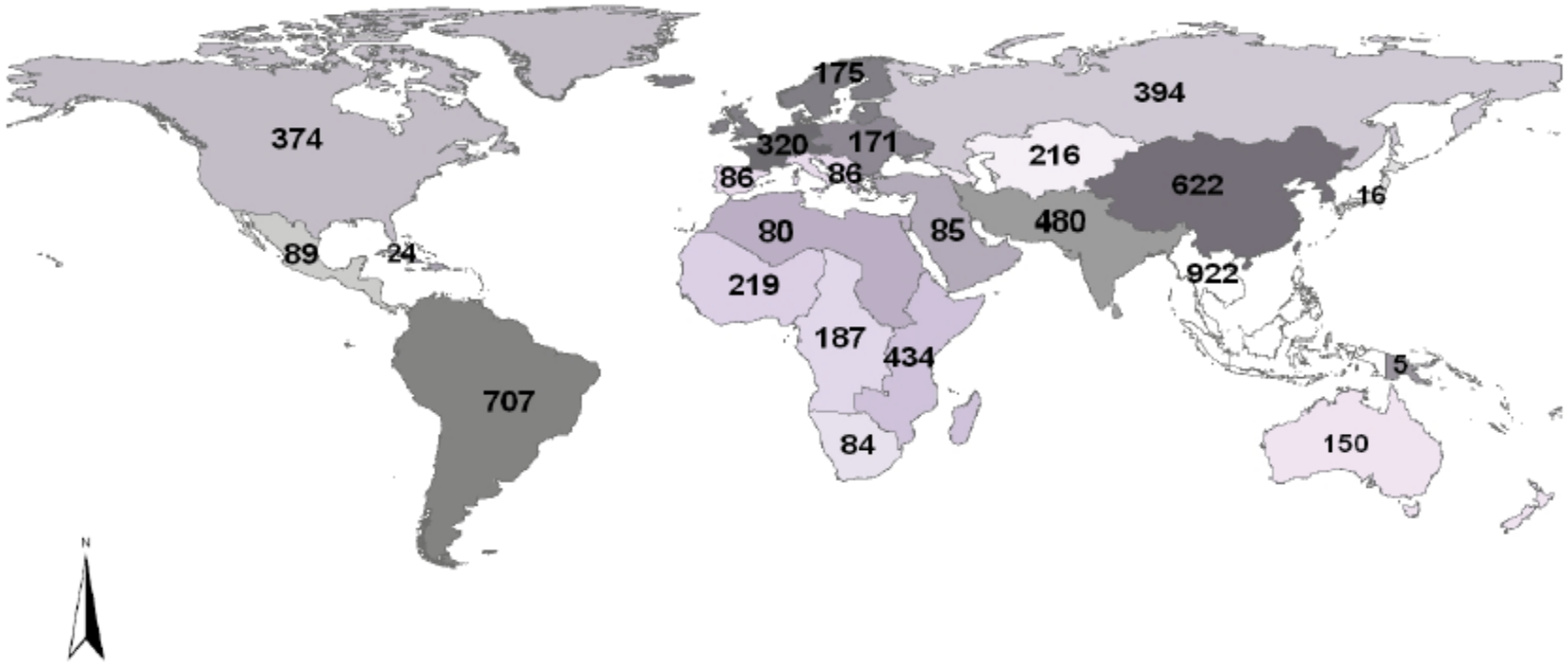
Relative contribution of Agriculture to total mitigation potential

US$ 20/tCO2 – 12%

US$ 50/tCO2 – 14%

US$ 100/tCO2 – 19%

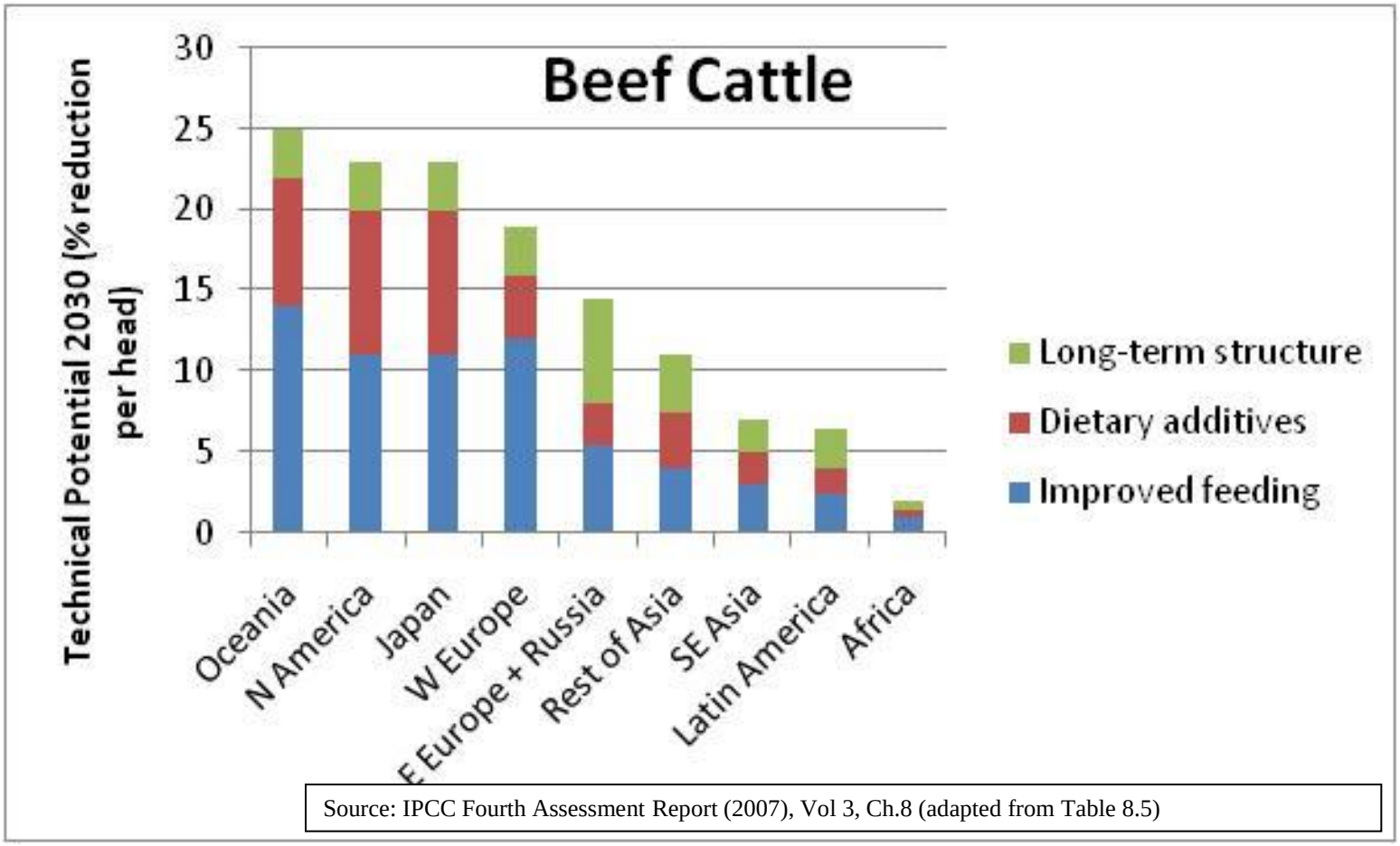
Agriculture: Regional Distribution of Technical Potential



70% of technical potential is in developing regions

LAC: 0.8 Pg CO_2-eq/yr

Ruminant CH_4 Mitigation - technical potential



Source: IPCC Fourth Assessment Report (2007), Vol 3, Ch.8 (adapted from Table 8.5)

Per cent reductions are per head

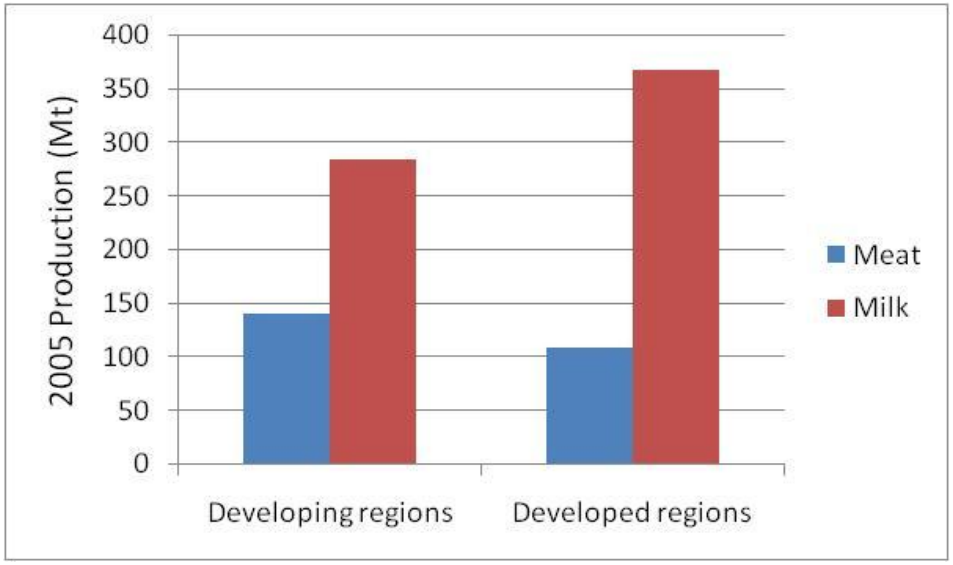
IPCC AR4: Economic Mitigation Potential in 2030

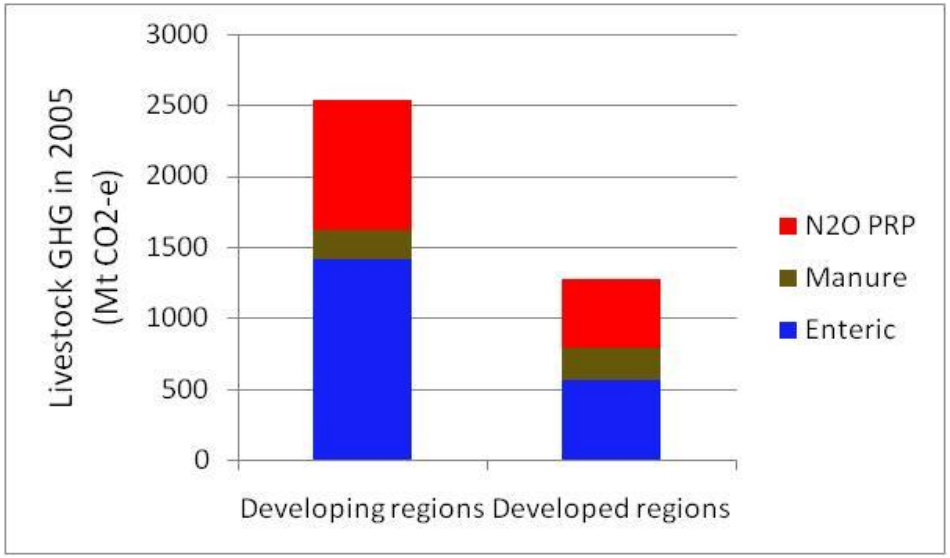
Carbon price (US/tCO_2-eq)	Economic Potential 2030 in Agriculture in LAC ($GtCO_2$-eq/yr)
20	~0.2
50	~0.4
100	~0.6
Baseline Emissions in 2030	**~2.0**

Mitigation practices

- Cropland management; Grazing land management; Rice management; Restoration of organic soils – >90% of potential is carbon sequestration
- Reduction of absolute livestock emissions has a very limited contribution to that potential (<**0.05 $PgCO_2$-eq/yr** at US$ 100/tCO_2).
- If emissions per unit product are considered, potential would increase substantially (potentials may double)
- Lifestyle changes not considered in the analysis.

Livestock Production and GHG Emissions





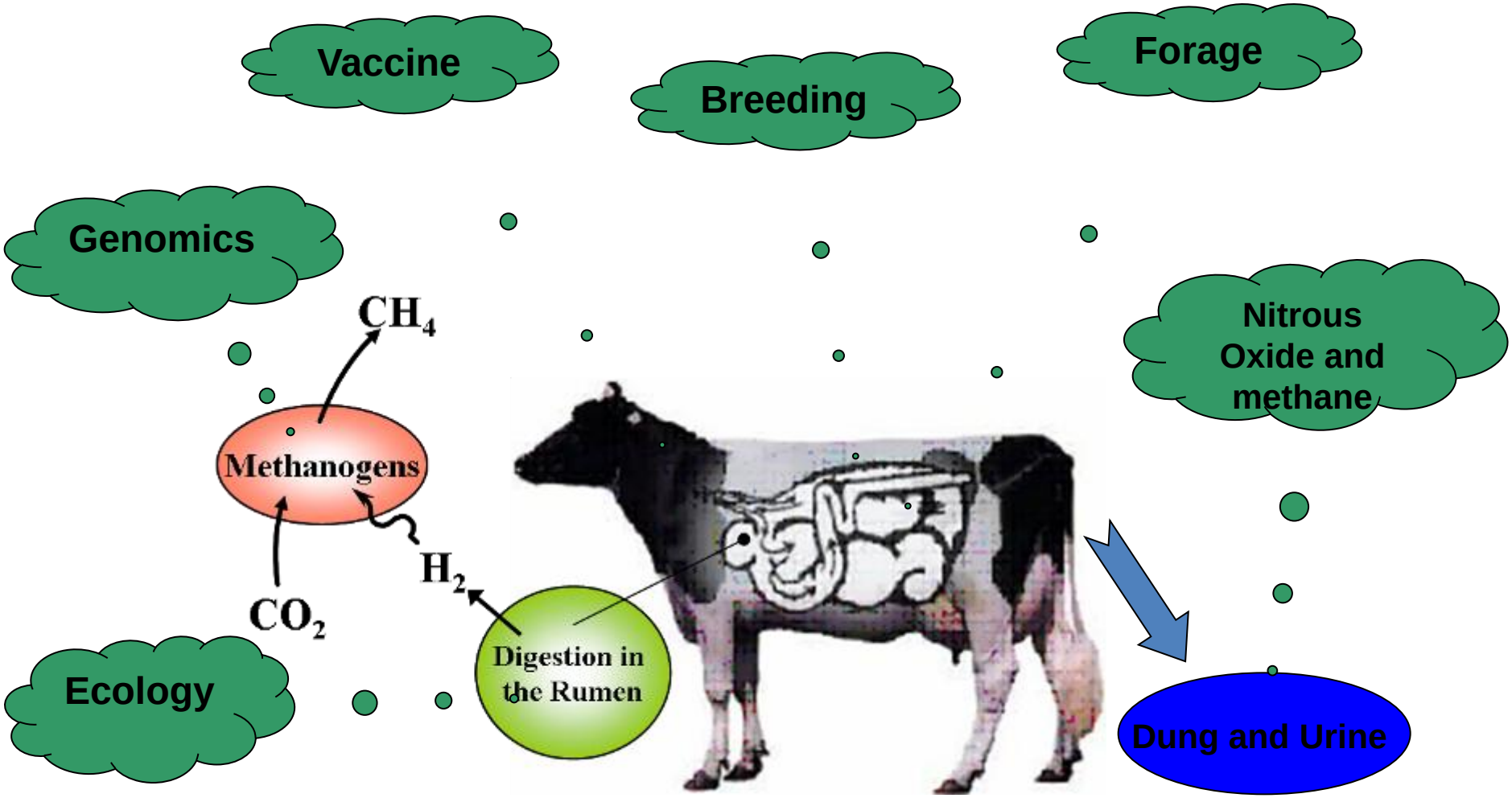
In spite of relatively similar levels of production of meat and milk, GHG emissions from livestock are much higher in developing than in developed regions

- Enteric: 150% higher
- N_2O PRP: 90% higher
- Manure: 10% lower
- LULUCF emissions and biomass burning were not considered. These are most significant in developing regions

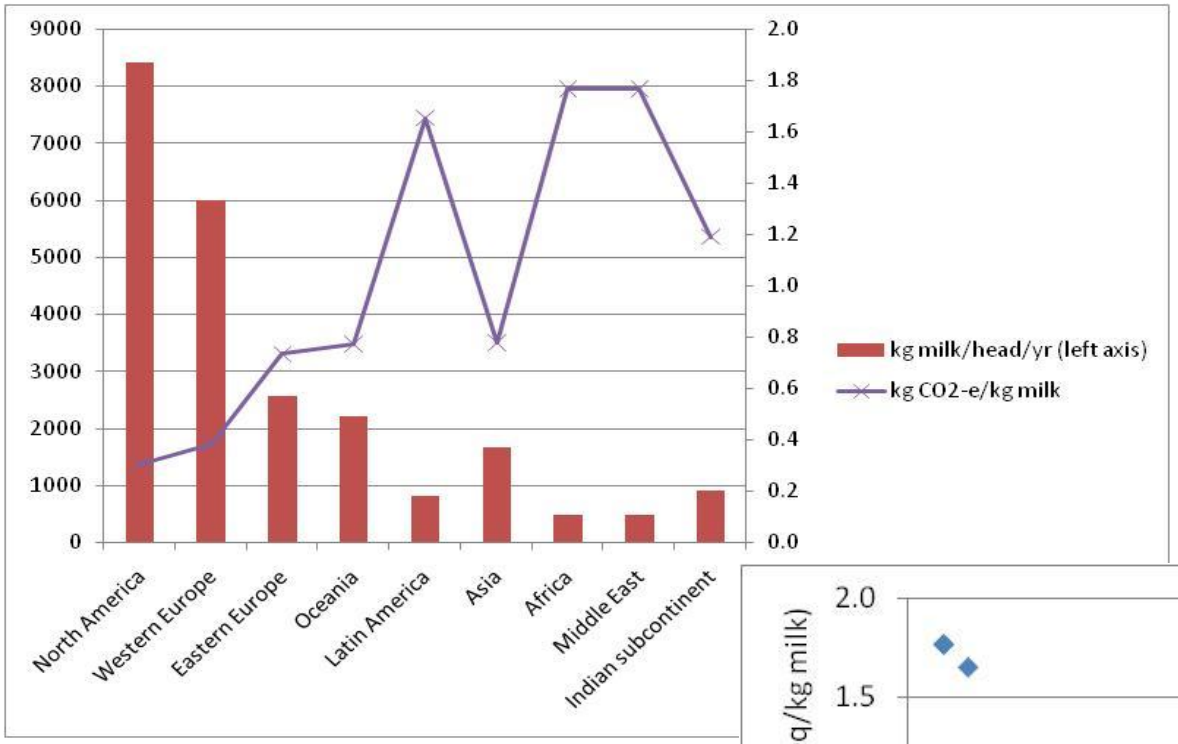
Two different, complementary strategies

- **Already efficient systems** (mostly in developed regions)
  - Limited options for mitigation based on reducing animal population
  - Focus on research (e.g., New Zealand's PGgRc) aiming at reducing emissions per animal (and per unit product).
  - Need to consider land use emissions associated with production of feed.
- **Less efficient systems** (mostly in developing regions)
  - Intensification of pastoral systems provides the best opportunities (large area of grassland). Adoption of mixed crop/livestock systems in cropland would also be effective.
  - Rapid implementation is possible, synergies with adaptation, food security and SD.
  - Focus on integral approach (AFOLU) including consideration of avoidance of deforestation, C sequestration in soils and N_2O to reduce emissions per unit product

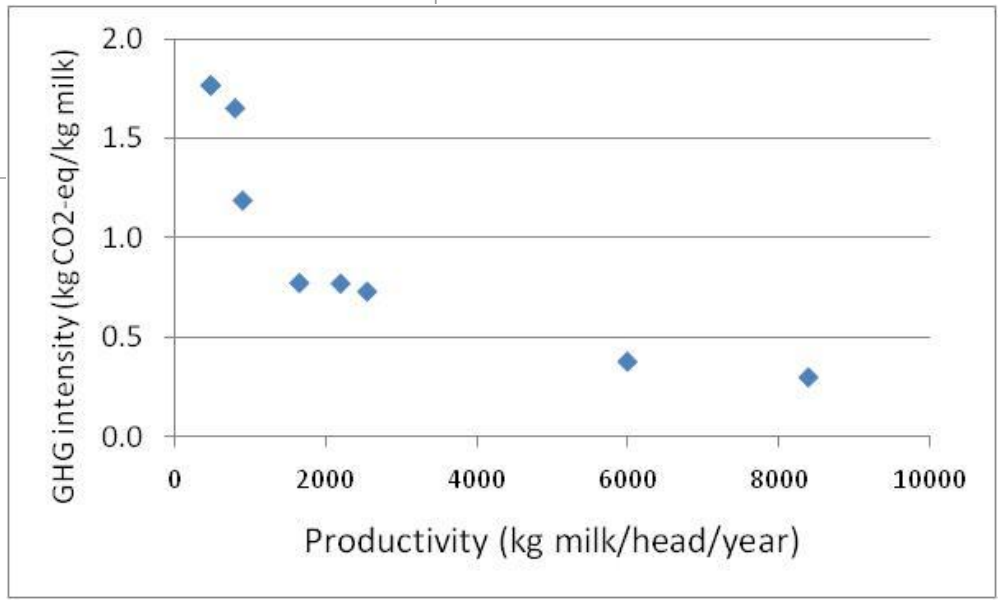
PGgRc Research Programme (NZ)



Productivity and CH_4 Emissions from Enteric Fermentation

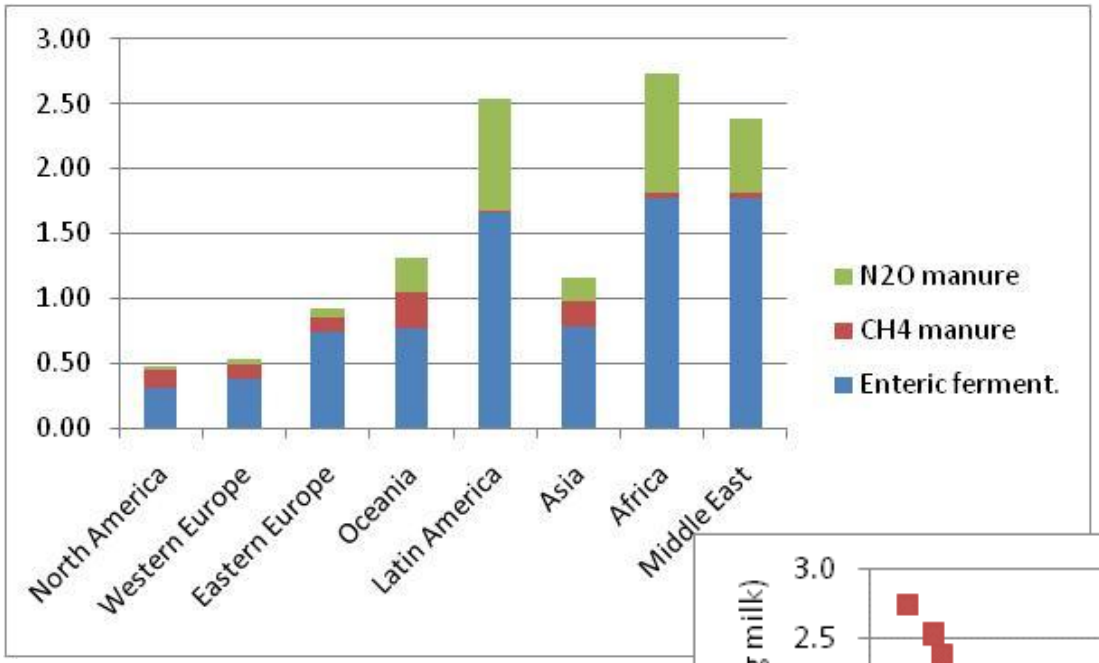


Small increases in productivity may yield substantial reduction in emissions per unit product

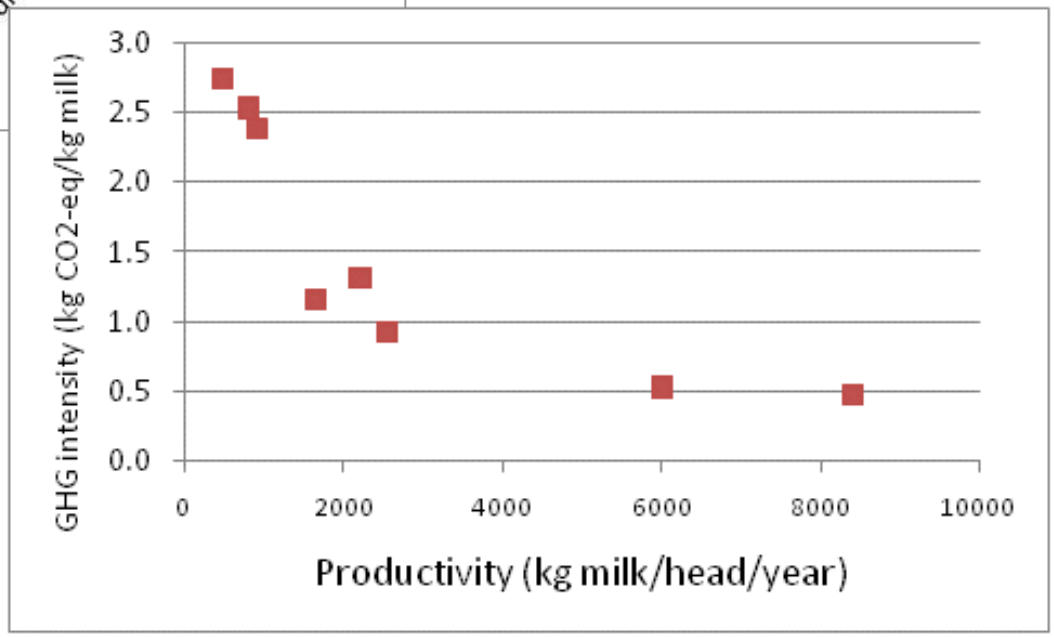


Graphs are based on IPCC tier 1 default emission factors for enteric fermentation for different regions and their underlying assumptions.

Productivity and GHG Emissions per unit product (milk)



Consideration of N_2O emissions from manure magnify the differences between regions



Graphs are based on the following sources:

- IPCC tier 1 default emission factors for enteric fermentation for different regions and their underlying assumptions
- US-EPA 2005
- FAO Fertilizers Statistics

Beef cattle: Emissions per unit product

System	GHG emissions (kg CO_2-eq/kg CW)
High-quality pasture (NZ)	12-18
Grain-fed, Medium-quality pasture	20-40
Poor quality pasture (tropical)	40-100
Tropical pasture + recent deforestation	>>100
Global average	>40?

Substitution of high carbon intensity systems (extensive grazing of grassland, particularly on recently deforested land) by more productive systems would enable large emission reductions.

Adoption of mixed livestock-crop systems (e.g., crop and pasture rotations) may also be very effective in reducing emissions

Opportunities for reducing emissions through pasture improvement and/or adoption of mixed systems

- Meat (and, to a lesser extent, dairy) production is based on low-quality pastures in large areas.
- Adoption of pasture improvement on those areas would bring about:
  - Reduced CH_4 emissions (somewhat offset by small increases in N_2O if legumes followed by soil tillage or N fertilisers are used).
  - Increased CO_2 removals (sequestration in soils)
  - Reduced emissions from deforestation (where it is driven by expansion of grazing areas).
- Associated benefits
  - Improved land productivity and resilience, soil conservation
  - Optimization of land use, risk management through diversification
  - Reduced emissions from deforestation (where it is driven by expansion of grazing areas or by procurement of timber) and reduced pressure on land.

Final Remarks

- Main opportunities for climate change mitigation in agriculture in LAC relate to:
  - C sequestration in agricultural soils (grassland, cropland)
  - Reduced emissions per unit product (livestock and also crops)
  - Reduced biomass burning
- These opportunities require increases in productivity per unit area of land
- Project-based activities seem to offer the most cost-effective opportunities for sequestering C in soils and for reducing livestock GHG emissions per unit product.
- Significant barriers (e.g., lack of approved methodologies, need for large-scale projects, non-eligibility of soil C sequestration in the CDM, consideration of non-permanence risk) exist for implementation of these projects.