Pasture Management for Carbon and Livestock Methane and Nitrous Oxide

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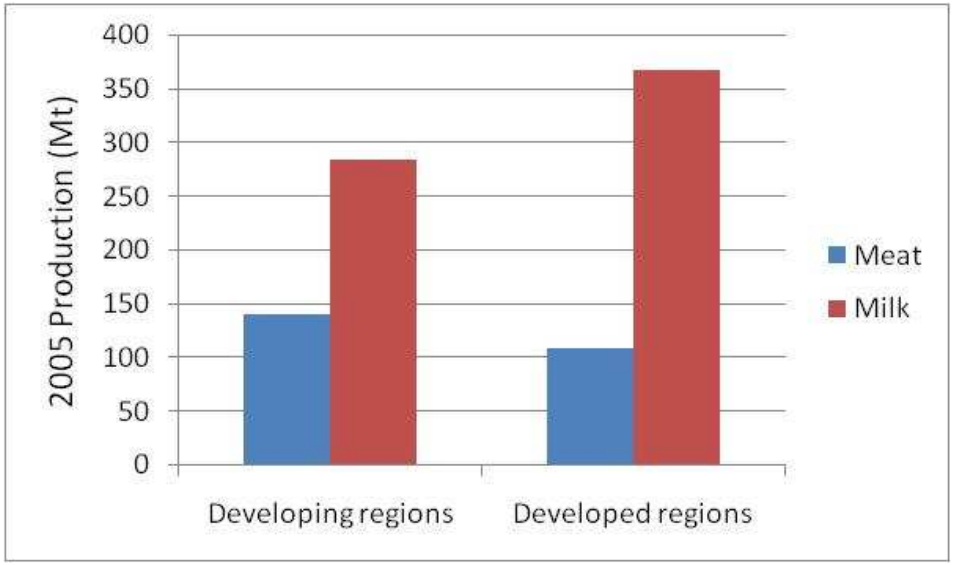
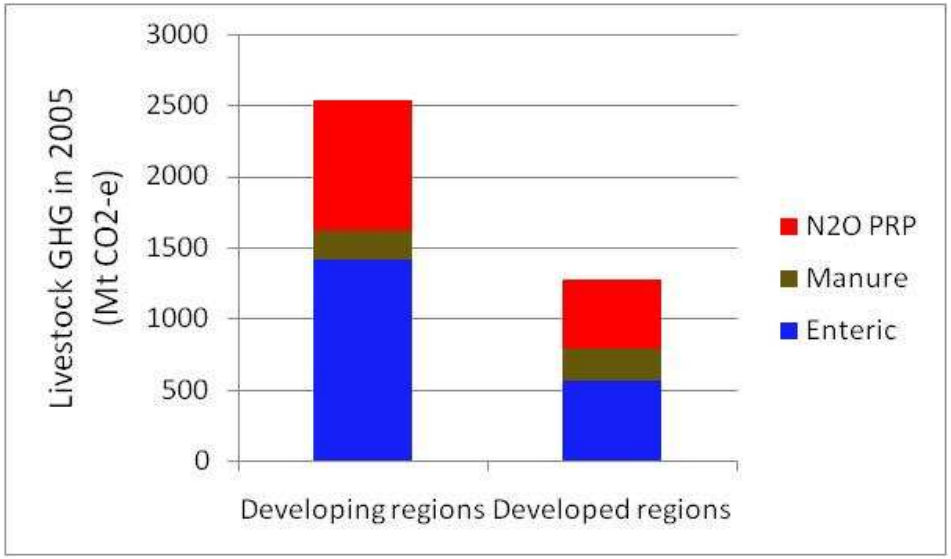
Livestock Production and GHG Emissions





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

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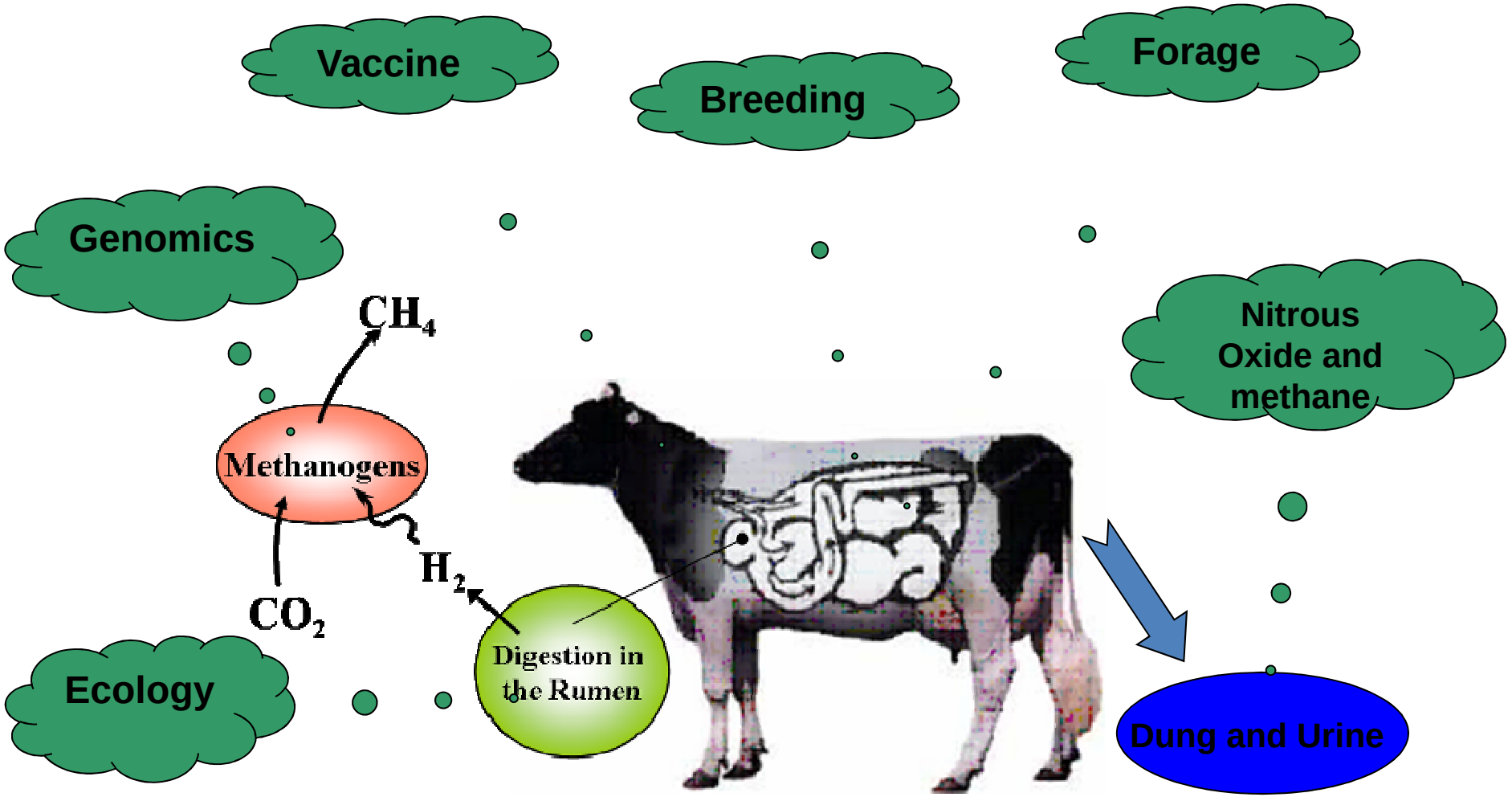
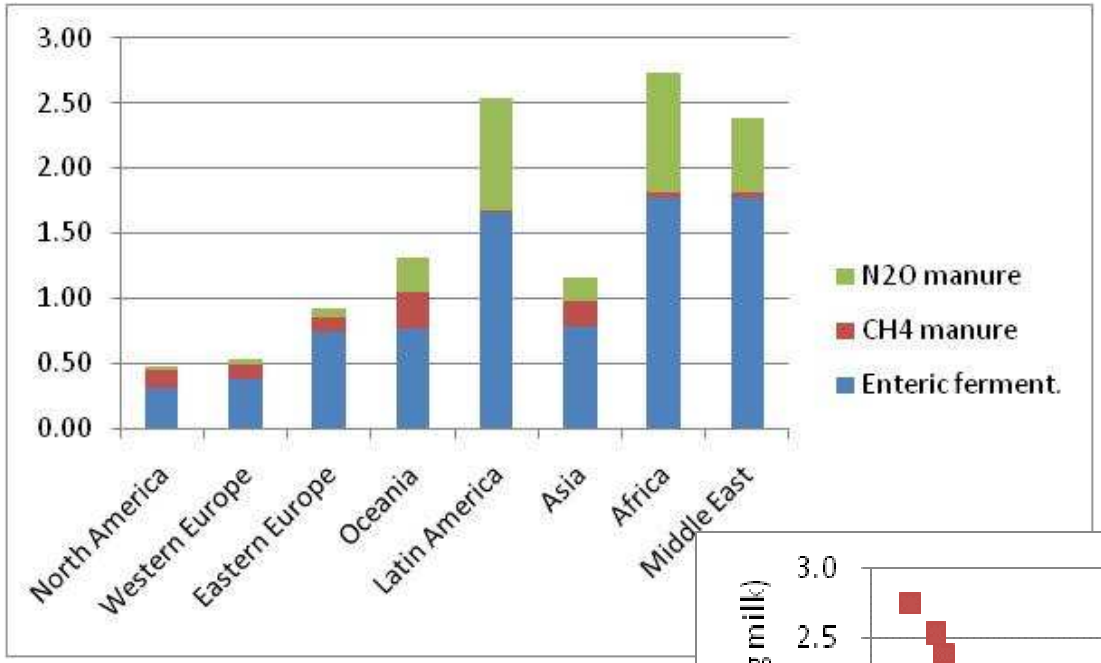
Two different, complementary strategies

- **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

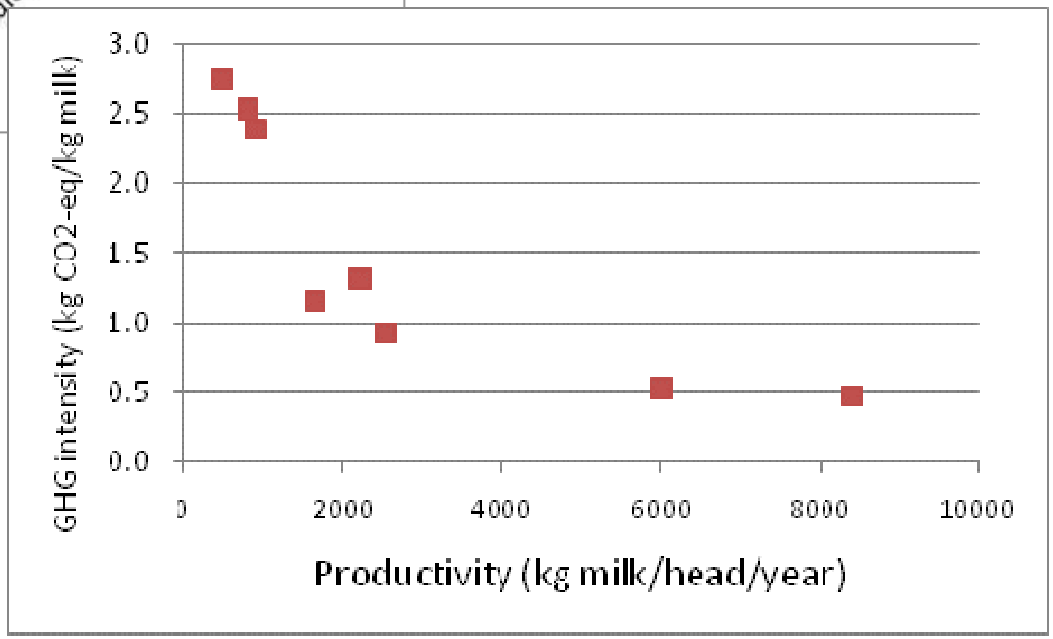
PGgRc Research Programme (NZ)



Productivity and 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

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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

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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 methane CH_4 and PRP soil N_2O emissions per unit product (somewhat offset by small increases in N_2O from soils if legumes followed by soil tillage or N fertilizers 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.

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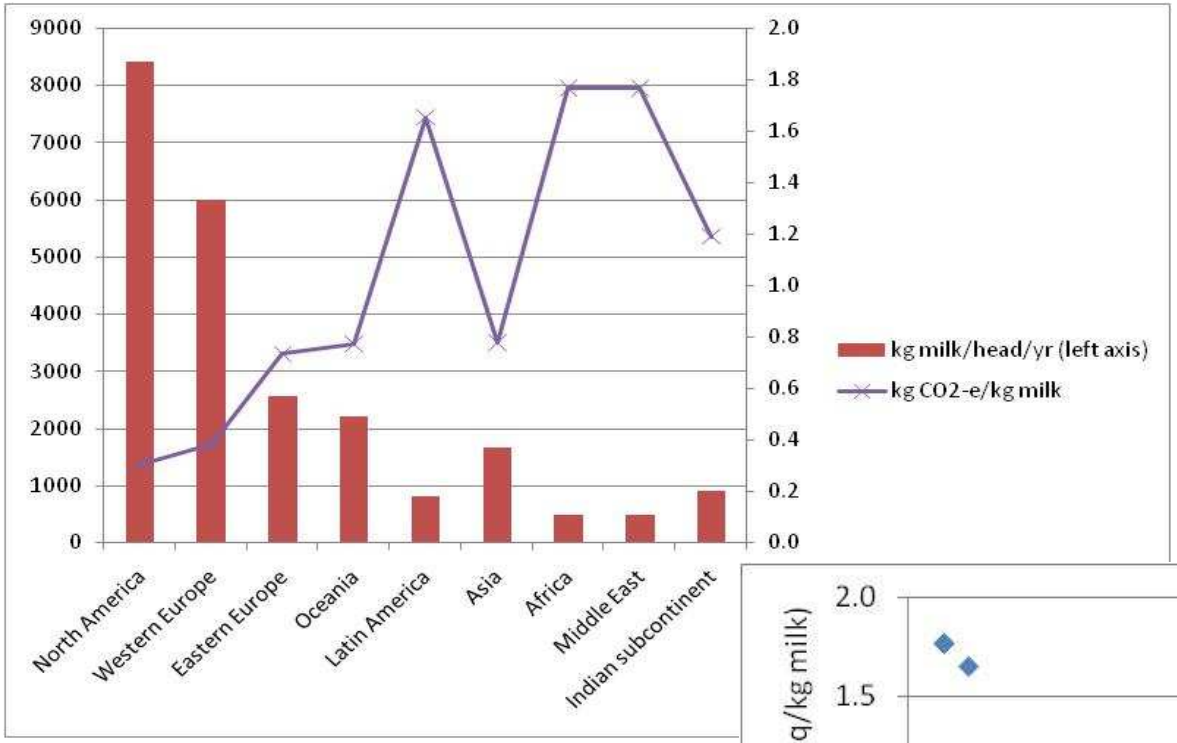
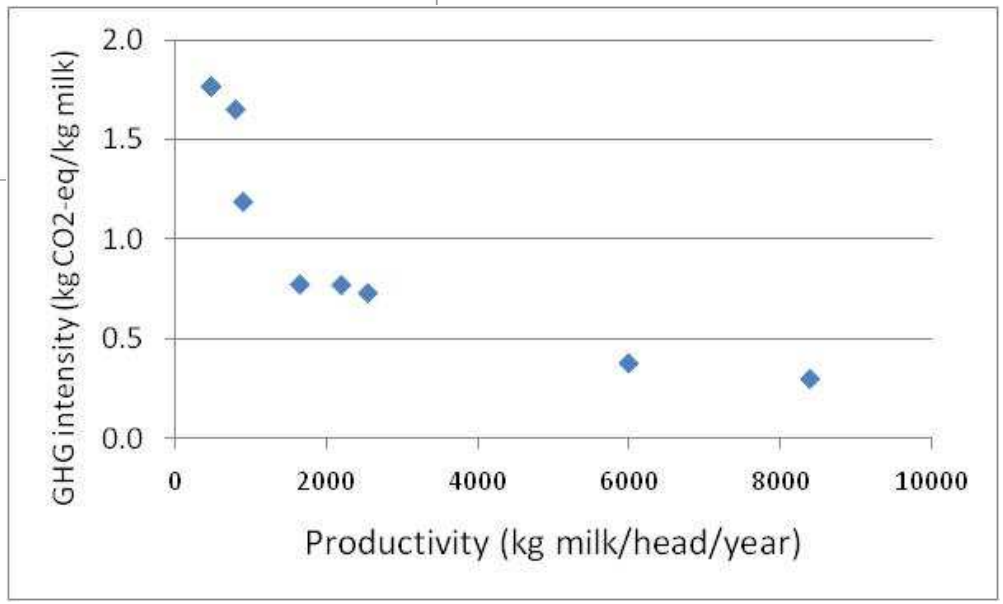
Productivity and CH_4 Emissions from Enteric Fermentation



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



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