Agriculture and Climate Change Emissions:

Potential mitigation and adaptation measures in the agricultural sector

Anthony Nyong

Expert Meeting on
Climate Change – the Role of Food and Agricultural Trade

UNFCCC COP 14, Poznan, Poland
9 December 2008
Outline of Presentation

- Agricultural Greenhouse Gas Emissions and Mitigation Potentials
- Adaptation Strategies to Climate Change
- Limits and Constraints to Adaptation
- Knowledge Gaps Recommendations
Climate Change

- Problems largely caused by anthropogenic factors
  - Large increase in Carbon Dioxide (CO2), Methane (CH4) and Nitrous Oxide (N2O) in the atmosphere
  - Most CO2 from fossil fuel burning, but CH4 and N2O mainly from agriculture and forestry
  - About 30% of global greenhouse emissions from Agriculture (including forestry and landuse change)
Climate Change Mitigation in Agriculture (1)

- Most of the agricultural contribution to GHG is from the developing countries

- About 70% of economic potential for mitigation is in the developing countries

Mitigation Options

- cropland management,
- grazing land management and pasture improvement,
- management of organic/peaty soils,
- restoration of degraded lands,
- livestock management,
- manure management, and
- bioenergy.
Climate Change Mitigation in Agriculture (2)

- Many of the options have win-win outcomes in higher productivity, better management of natural resources, or the production of valuable by-products such as bio-energy

- Incentives required to encourage mitigation in developing countries
  - Carbon trading
  - Expansion of CDM to include aforestation & reforestation
  - Investment in science and technology for low carbon emission technology

- Mitigation Trade-Offs
Regional Contributions of Agricultural Greenhouse Gases (Smith et al., 2007)

Regional Distribution of Economic Potential (at US$ 100/tCO2-eq) by 2030
(Smith et al., 2007)
Climate Change and Agriculture – Biophysical Impacts

- Decrease in yield in seasonally dry and tropical regions,
- Reduction in agricultural productivity from increased frequency of climate extremes such as droughts and floods
- Increased incidences of agricultural pests and diseases,
- Changes in land availability for agriculture (expansion in some areas and a reduction in others),
- Possible local extinctions of particular fish species, increased global food insecurity.
Projected Changes in Agricultural Productivity by 2080 as a Result of Climate Change
Climate Change and Agriculture – Socio-Economic Impacts

- Global Cereal Production and Agric GDP
  - Increase in northern latitudes and decline in lower latitudes
  - Up to 20% increase in agricultural prices in short and medium term
  - Increase in agric GDP up to 2.6% in high latitudes and decline of up to 1.5% in others.

- Food Security
  - By 2080, about 768 million people malnourished
  - By 2030, additional 10 million Africans at risk of hunger
Adaptation to short-term Variability

- Farm level decisions and adjustments
  - implementation of agronomic practices
  - Nutrient management
  - Tillage / residue management
  - Water management
  - Rice management
  - Agro-forestry
  - Land cover (use) change

- Insurance and other financial mechanisms

- Temporary migration
Adaptation to Long Term Climate Change

- Still in infancy, often implemented as planned adaptation

- Development of new technologies to build resilience
  - soft technologies - information systems, management practices, development of new crop cultivars, etc,
  - hard technologies - development of equipment for irrigation, conservation tillage, and integrated drainage systems.

- Insurance
  - Caribbean Catastrophic Risk Insurance, Index Insurance
From Adaptation to Adaptive Capacity

- Climate change is a ‘moving target’, hence the emphasis on adaptive capacity
  - The presence of adaptive capacity is a necessary condition for the design and implementation of effective adaptation strategies

- Determinants of adaptive capacity
  - Education, income, health, institutions, knowledge, technology and levels of national development
  - Differential adaptive capacity in developing Countries

- Enhancing Adaptive Capacity
  - Current Programmes and Initiatives – NAPA, MACC, etc
Limits and Barriers to Adaptation

- Financial barriers
- Physical and ecological Limits
- Informational limits
- Technological limits
- Social and cultural barriers
Integrating Mitigation & Adaptation

- Agriculture & forestry contribute 50% of the global emissions of NO2 and CH4, and about 30% of total GHGs emissions.

- Agriculture contributes to reduce carbon sequestration through deforestation and land use change.

- Agriculture offers excellent opportunities for reducing GHGs. Most of the agricultural contribution to GHG is from developing countries; about 70% of the economic potential for mitigation is in the developing countries, predominantly in ACP.

- Many mitigation strategies in agriculture have win-win outcomes in higher productivity, better management of natural resources, or the production of valuable by-products, such as bio-energy.
Examples of Mitigation and Adaptation Strategies

- Nutrient management by improving efficiency of Nitrogen with appropriate fertilizer application rates.
  - Reducing nitrogen fertilizer use can improve water quality and reduce nitrous emissions.
- Agro-forestry: Establishment of shelter belts and riparian buffer strips with woody species.
  - Providing riparian buffers can enhance wildlife habitat, improve water quality, and increase carbon storage.
- Reducing Emissions through Avoided Deforestation and Degradation (REDD).
Matters Arising from Mitigation and Adaptation

- **Food Miles**
  - Lop-sided argument
  - Should consider entire market chain
  - Recognise impacts on African economies

- **Virtual Water and Ghost Acres**
  - Climate change and political implications

- **Carbon Leakage and Embodied Carbon**
  - Transferring consequences to developing countries?
  - Need to quantify carbon associated with international agricultural trade

- **Biofuels**
  - Ethical issues: Food versus Fuel?
Thank you