Greenhouse Gas Emissions from Agriculture

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Presentation Outline

- Background and Context – Emission Reporting
- Agriculture Sector – Contribution and Trends
- Agriculture Sector – Structure
- Methodology
- Emission Estimates
- Input Data

- Emission Projections
- Input Data
- Policies and Measures
- Emission Estimates

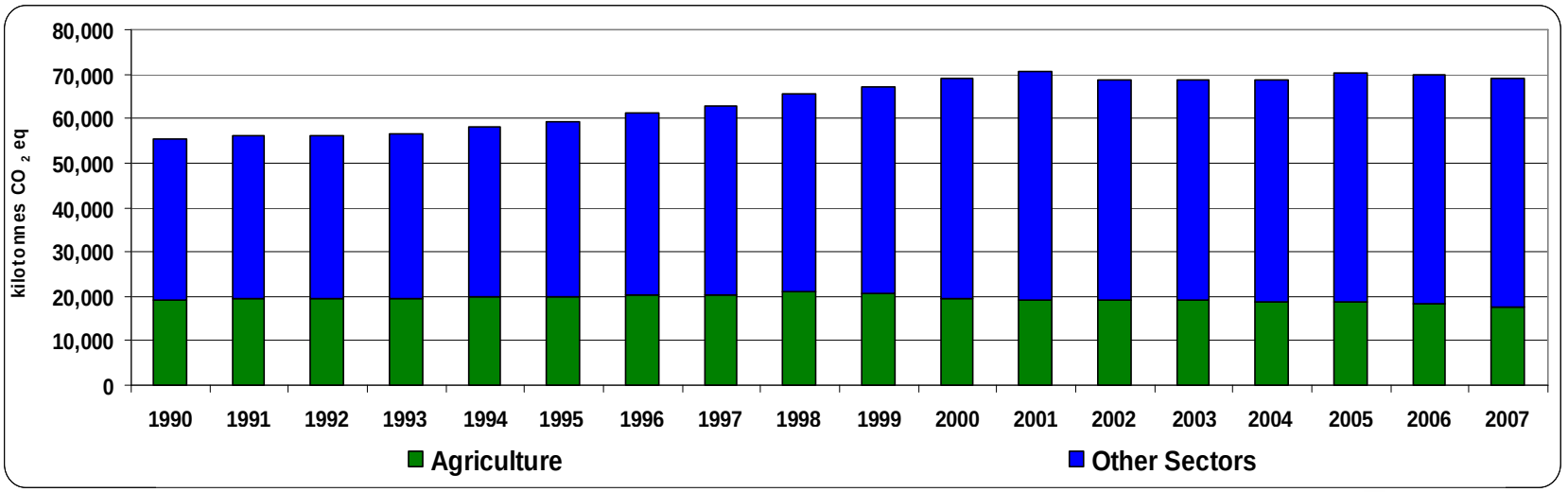
Background and Context – Emission Reporting

- Artciles 4 and 12 of the UNFCCC, Annex I Parties must develop, publish and make available to the Conference of Parties (COP), their national inventories of emissions of all GHG's not covered by the Montreal Protocol

- Decision 280/2004/EC - mechanism for monitoring European Community greenhouse gas emissions and for implementing the Kyoto Protocol

Overall Sector Contribution and Trends

- Agriculture accounted for 26.0% of total GHG emissions in 2007 (34.6% in 1990)
- Single largest source is CH_4 emissions from enteric fermentation (12.4% of total GHG) – non-dairy cattle largest contributor



Agriculture Sector - Structure

- The Agriculture sector includes five sources of GHG emissions – IPCC GPG & UNFCCC Reporting Guidelines
  - Domestic Livestock: Enteric fermentation & Manure management
  - Rice Cultivation: Flooded Rice Fields
  - Prescribed Burning of Savannas
  - Field Burning of Agricultural Residues
  - Agricultural Soils

Good Practice Guidance/Methods

General and sector-specific guidance covering such issues as

Data gathering
Selection of Activity Data and Emission Factors
Methodological choice
Key category identification
QA/QC and verification
Time-series consistency
Uncertainty estimation
Reporting and Archiving

Designed to achieve annual inventories meeting the principles of transparency, consistency, comparability, completeness and accuracy

Emission estimates

- It is important that the GHG emissions reported are
  - Based on Sound Science
  - Accurate
  - Verifiable (open to scrutiny)
  - Complete

  - The Intergovernmental Panel on Climate Change (IPCC) provides templates for making the estimates for all sectors and activities but this is only good as a first order approximation

Methodological Tiers

Tier 1

A simple first order approach that uses spatially coarse default data based on globally available data characterized by large uncertainties and sometimes with methods involving several simplifying assumptions; e.g. Direct N_2O emissions

Tier 2

A more accurate approach substituting country or region specific values for the general defaults and appropriately disaggregated activity data characterized by relatively smaller uncertainties; e.g. CH_4 emissions from enteric fermentation

Tier 3

Higher order methods involving detailed modeling and/or measurement systems driven by data at a greater resolution that provide estimates with lower uncertainties than Tier 1 or Tier 2 methods; e.g. CARBWARE, Forest inventory

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Agriculture Sector - Structure

- CH_4 and N_2O emissions from domestic livestock
  - CH_4 is produced in herbivores as a by-product of enteric fermentation, a digestive process by which carbohydrates are broken down by micro-organisms into simple molecules for absorption into the bloodstream
  - CH_4 is produced from the decomposition of manure under anaerobic conditions. These conditions occur when animals are managed in confined areas (i.e. housing) where manure is typically stored in heaps or in liquid/slurry stores
  - During the storage of manure, some manure nitrogen is converted to N_2O

Agriculture Sector- Structure

- Emissions from agricultural soils
  - Emissions of N_2O from agricultural soils are primarily due to the microbial processes of nitrification and denitrification in the soil.
  - Three types of emission are distinguished
  - 1) Direct Soil Emissions – Fertilizer, landspreading, biological N fixation, crop residue N, sewage sludge applications
  - 2) Direct Soil Emissions – grazing animals
  - 3) Indirect Soil Emissions – due to N lost as NO_x, NH_3, leaching and runoff
- Agricultural soils may also emit or remove CO_2 and/or CH_4 - Land Use Land Use Change and Forestry

Inventory Input Data

Cattle
Dairy cows
Suckler cows
Male cattle < 1 year
Male cattle 1-2 years
Male cattle > 2 years
Female cattle < 1 year
Female cattle 1-2 years
Female cattle > 2 years
Bulls for breeding
Dairy in-calf heifers
Beef in-calf heifers

Sheep
Lowland ewes
Upland ewes
Rams
Lambs

Pigs
Sows in pig
Sows for breeding
Gilts in pig
Gilts notyet served
Fattening pigs < 20kg
Fattening pigs > 20kg

Poultry
Layers
Broilers
Turkeys

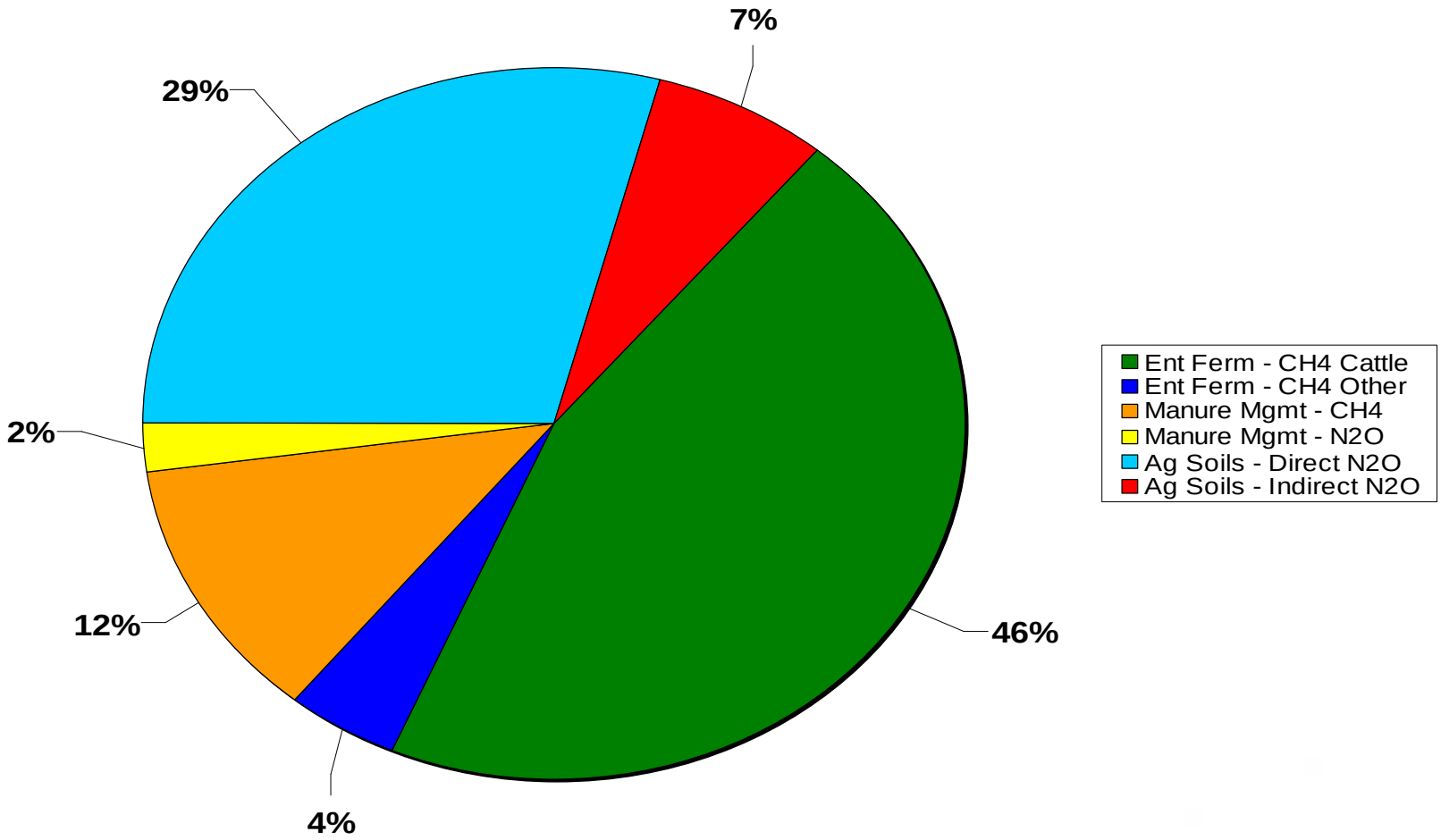
Other livestock
Horses
Mules and Asses
Goats

Other Data
Manure Management statistics
Fertilzer use statistics
NH_3 emission estimates
Sludge application to land

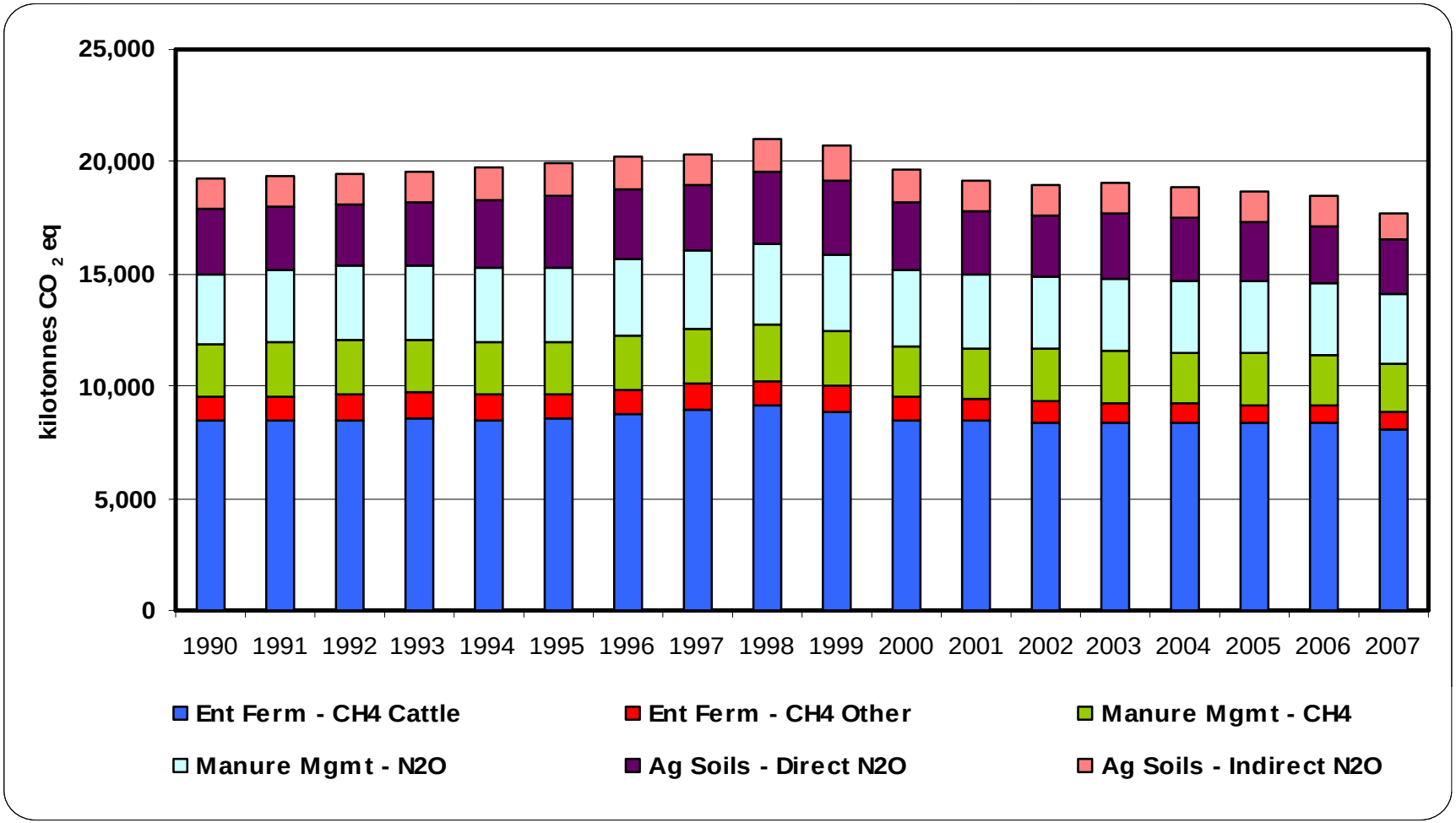
Inventory Input Data Sources

- Emission factors
  - CH_4 – national research – Tier II estimation
  - N_2O – default Tier I IPCC Guidelines
- Animal population statistics – C.S.O., C.M.M.S.
- N excretion – NO_3 Directive, DAFF/ Teagasc
- Manure Management Practices – DAFF/Teagasc
- Crop production statistics – C.S.O.
- Fertilizer Use Statistics – DAFF/Teagasc
- Sewage Sludge - EPA

Breakdown of Agricultural Emissions - 2007



Timeseries of Agricultural emissions



Emission Projections

- EPA compiles projections on an annual basis
- Decision 2004/280/EC
  - Projections of GHG must be reported on a sectoral basis giving priority to those sectors that have the most impact on GHG emissions levels
- National Initiatives
  - National Climate Change Strategy - develop national emission projections for GHG for all key sectors of the economy
  - Carbon Budget

Projections Input Data

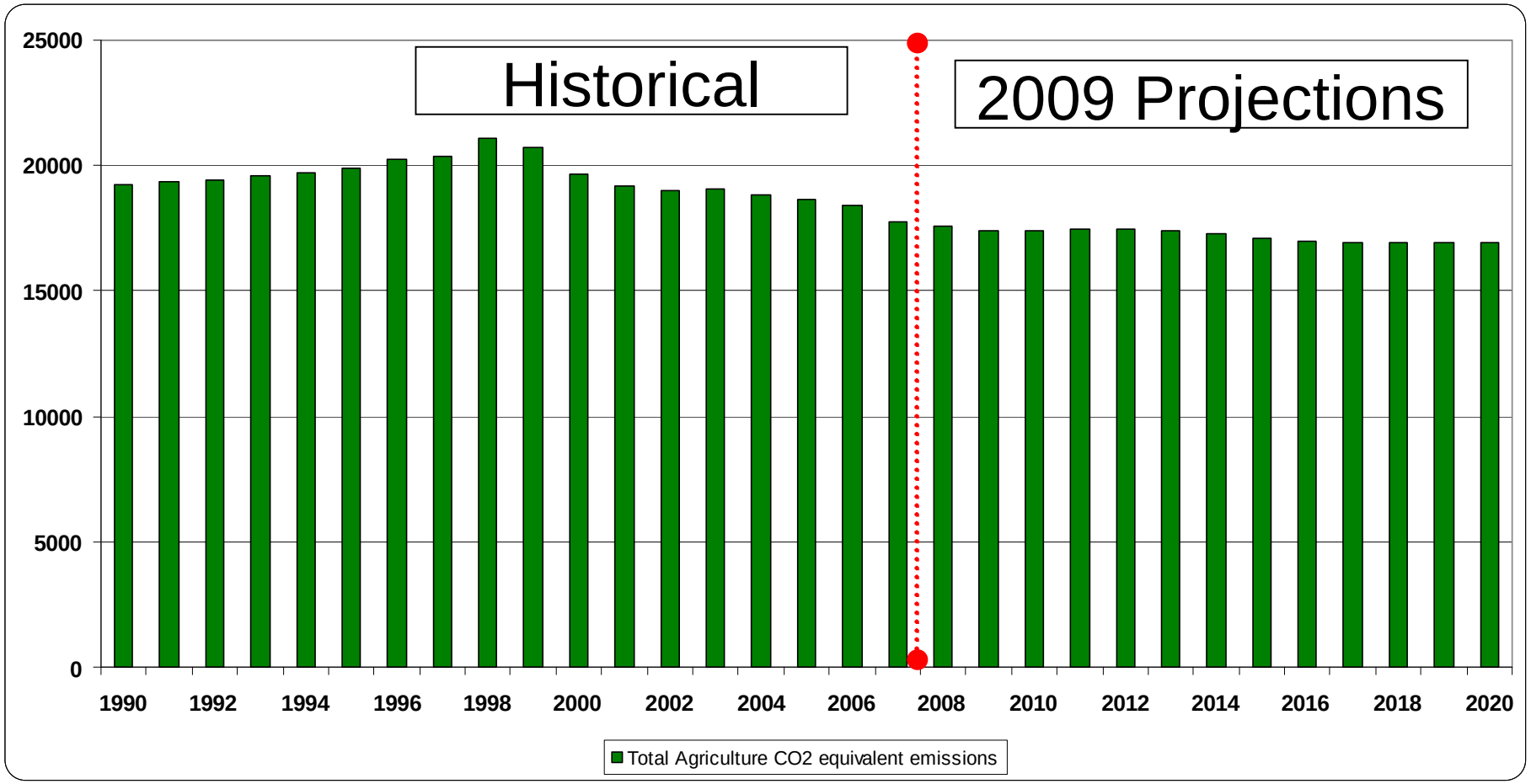
- Projected animal numbers, crop areas and fertilizer use statistics
  - FAPRI – Ireland Partnership
  - Food and Agriculture Policy Research Institute

- Produce objective analysis of agricultural policy options based on economic models of commodity markets

Policies and Measures

- CAP Reform
  - Baseline estimates vs scenarios
- Activity data driven by agriculture policy options
- Various policy options can be considered
  - Dairy Quota expansion & removal
  - Special beef cow premium
  - Other policies
- Activity data updated and published yearly - policy dependent

Emission Projections - Timeseries



Conclusions

- Outline of why and how emissions are reported
- Structure of Agriculture Sector/Methods
- Input Data Sources
- Current Inventory Estimates and Projections

Thank You

Any Questions ?????

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