

SMEthane Workshop



Contribution of ruminants to greenhouse gas production

Diego Morgavi

INRA – Centre Clermont-Fd Theix



The Greenhouse effect

A T M O S P H E R E



- 1 Solar radiation passes through the clear atmosphere.
Incoming solar radiation:
343 Watt per m^2

- 3 Some solar radiation is reflected by the atmosphere and earth's surface
Outgoing solar radiation:
103 Watt per m^2

- 6 Some of the infrared radiation passes through the atmosphere and is lost in space

Net outgoing infrared radiation:
240 Watt per m^2

- 2 Net incoming solar radiation:
240 Watt per m^2

- 5 Some of the infrared radiation is absorbed and re-emitted by the greenhouse gas molecules. The direct effect is the warming of the earth's surface and the troposphere.

Surface gains more heat and infrared radiation is emitted again

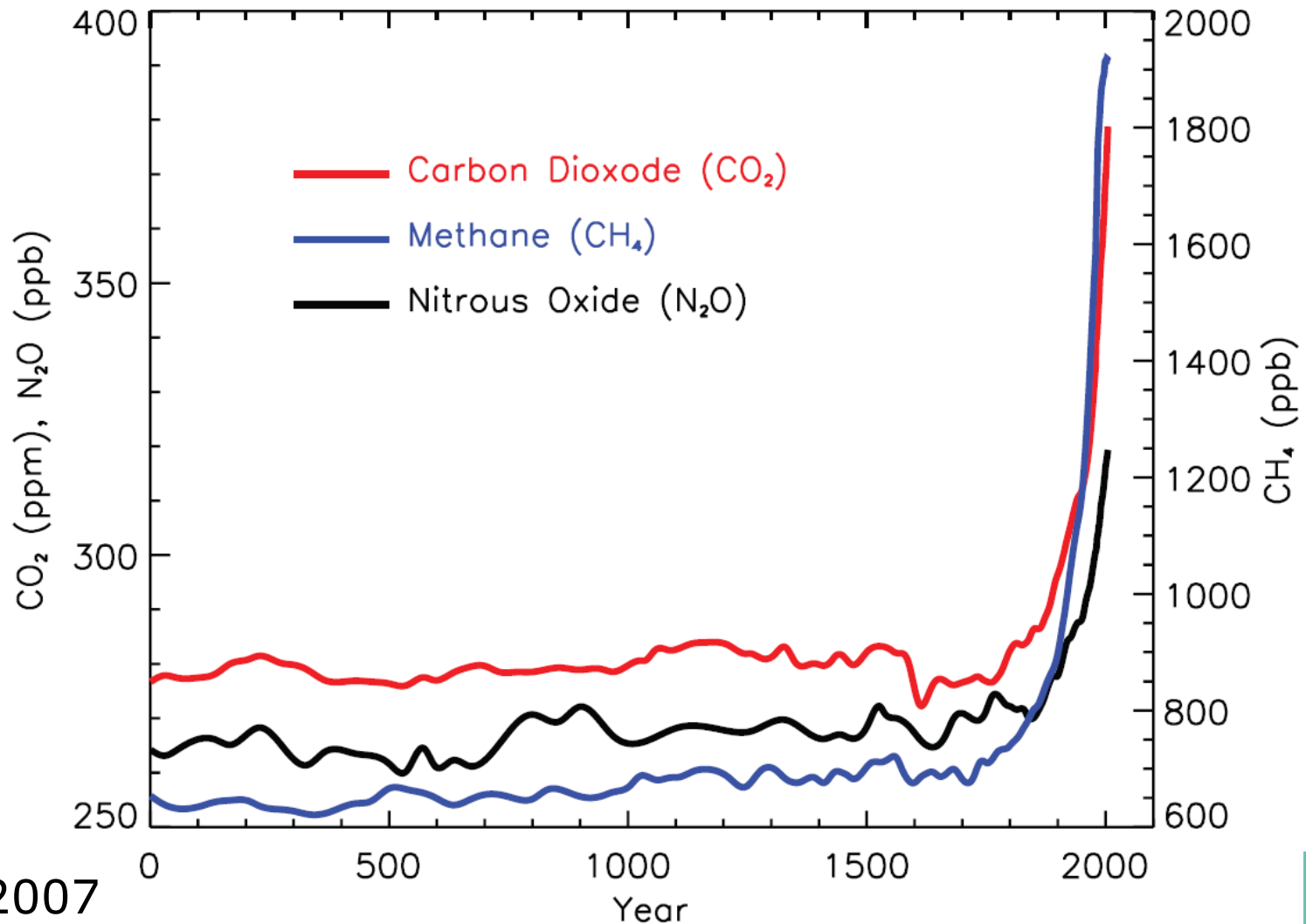
- 4 Solar energy is absorbed by the earth's surface and warms it...
168 Watt per m^2

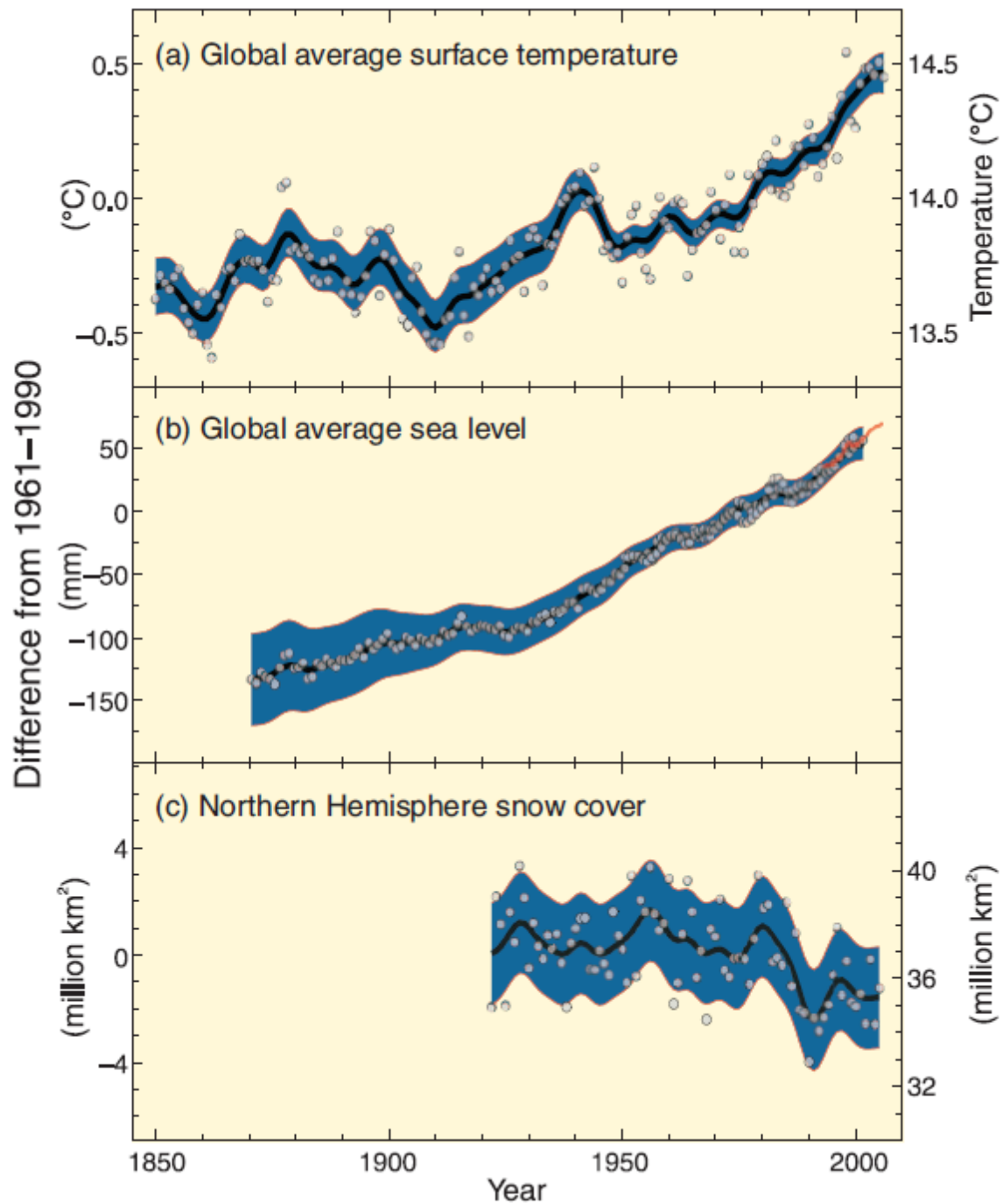
... and is converted into heat causing the emission of longwave (infrared) radiation back to the atmosphere

G R E E N H O U S E G A S E S

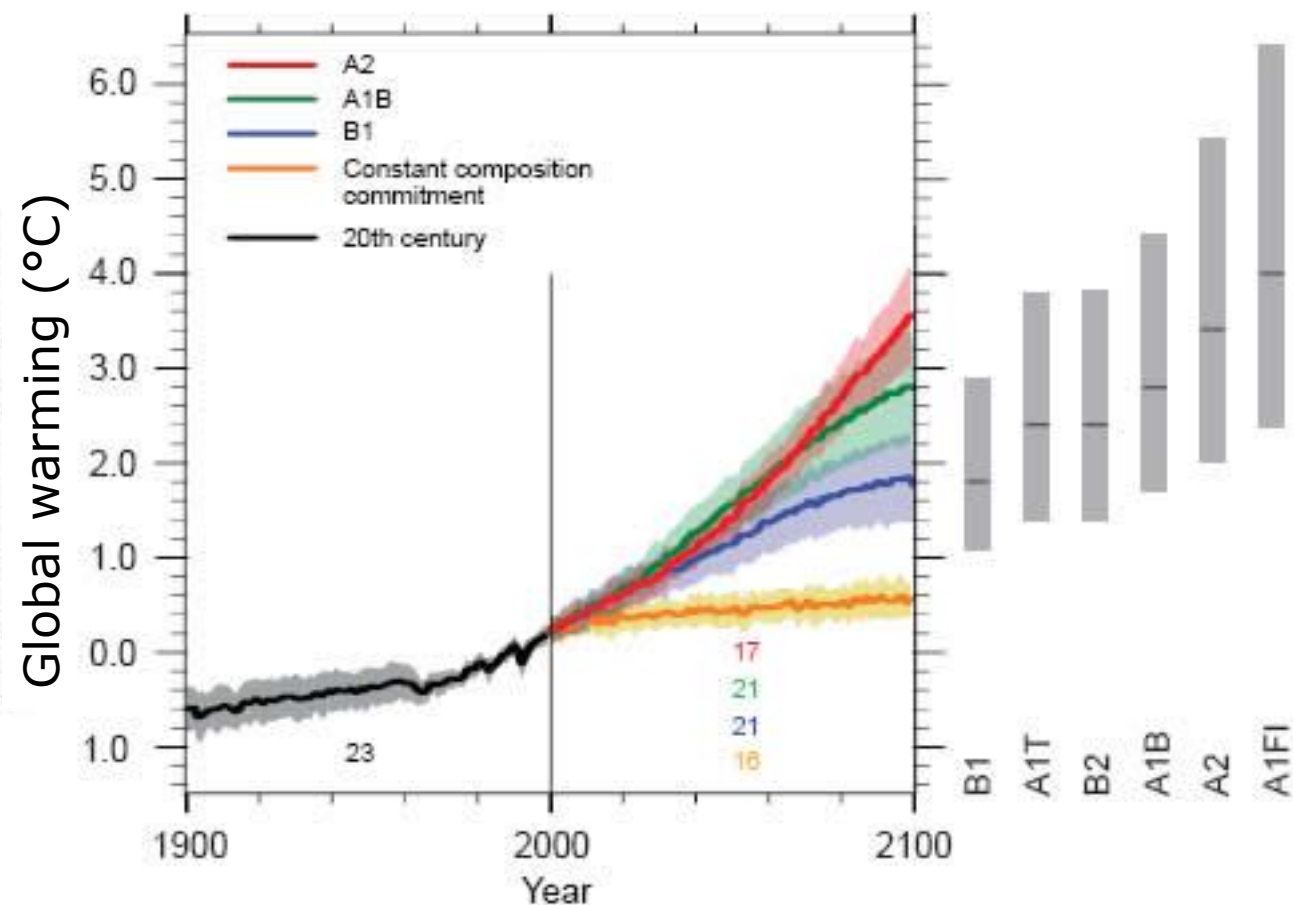
E A R T H

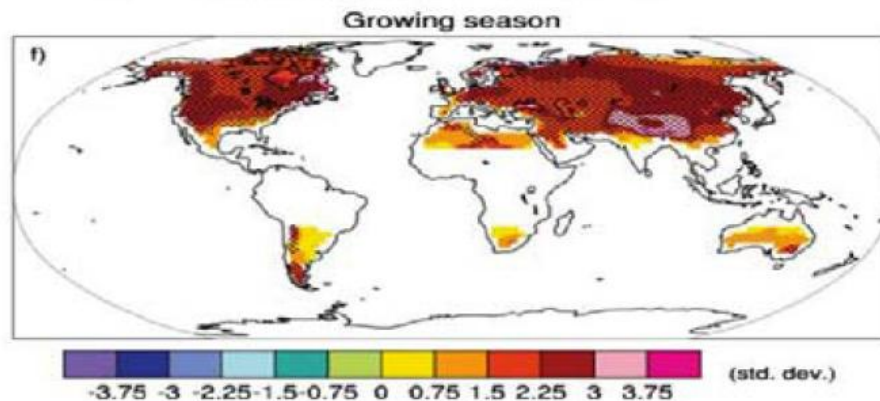
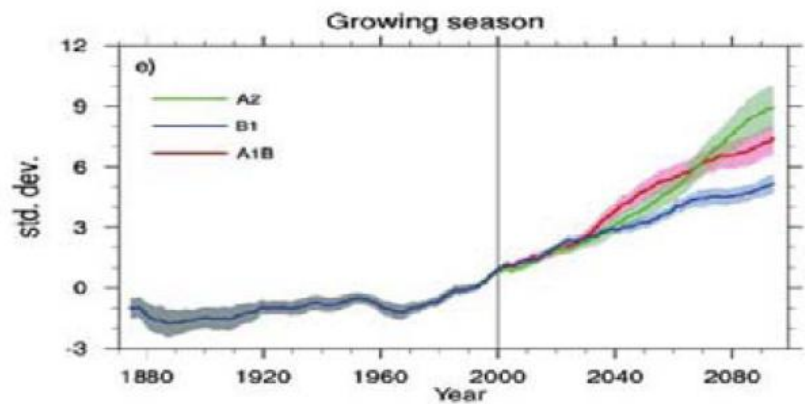
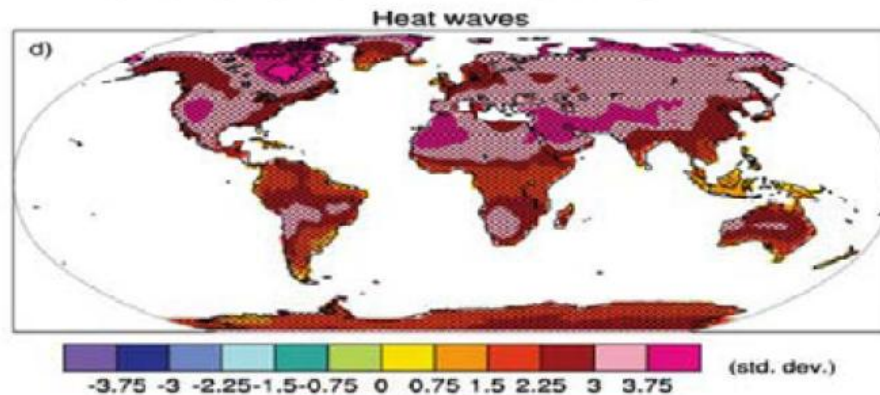
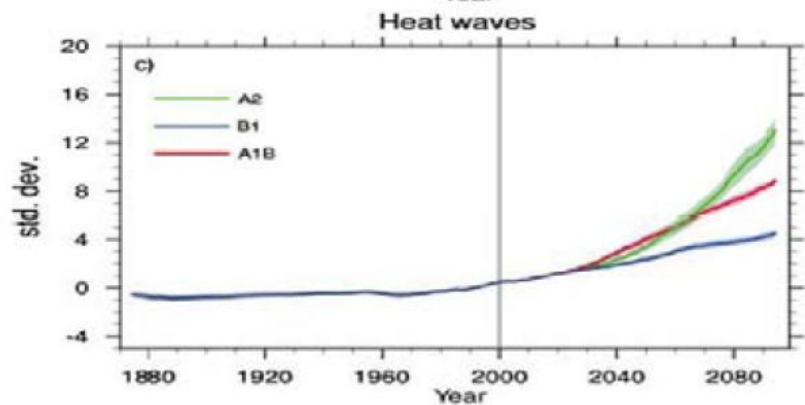
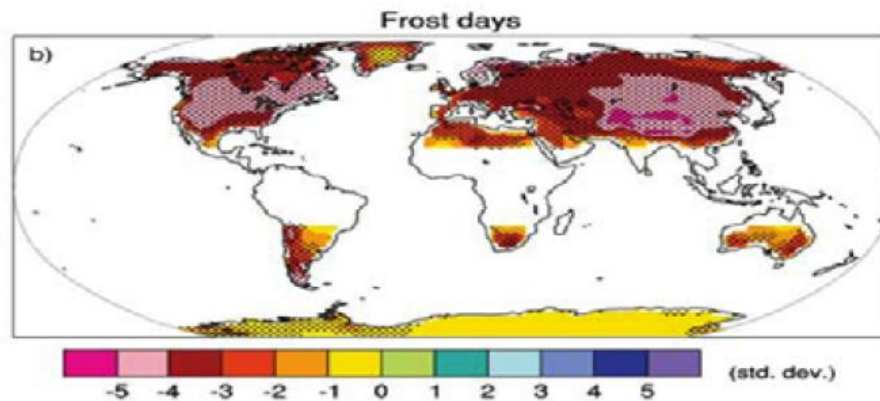
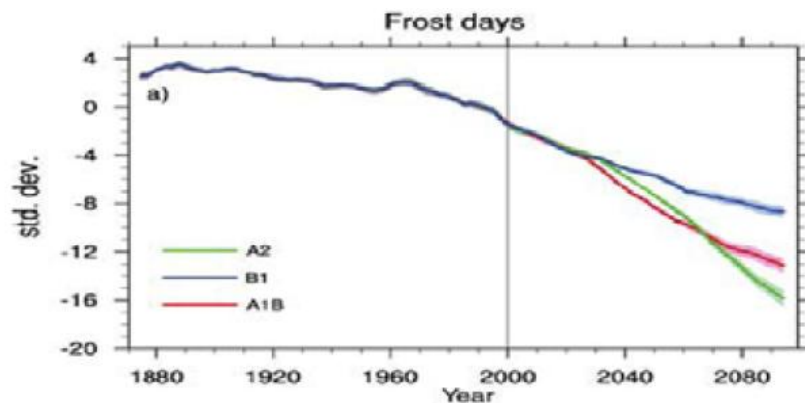
Concentrations of GHG – 0 to 2500



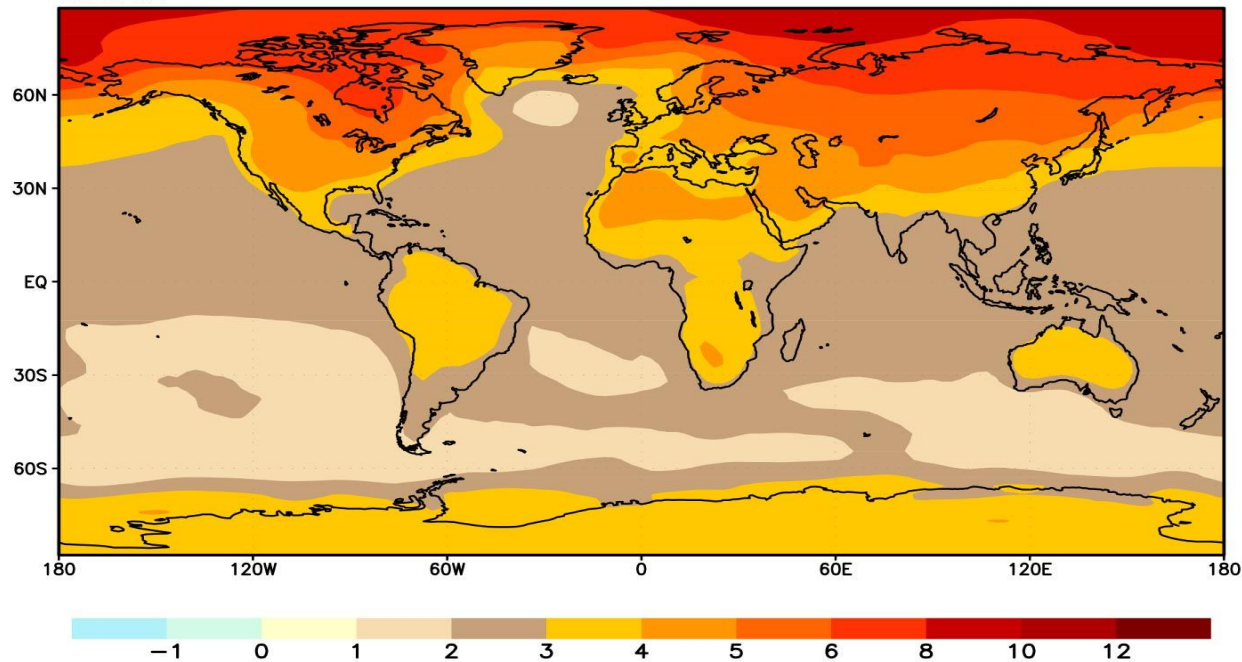


Main scenarios (IPCC 2007)





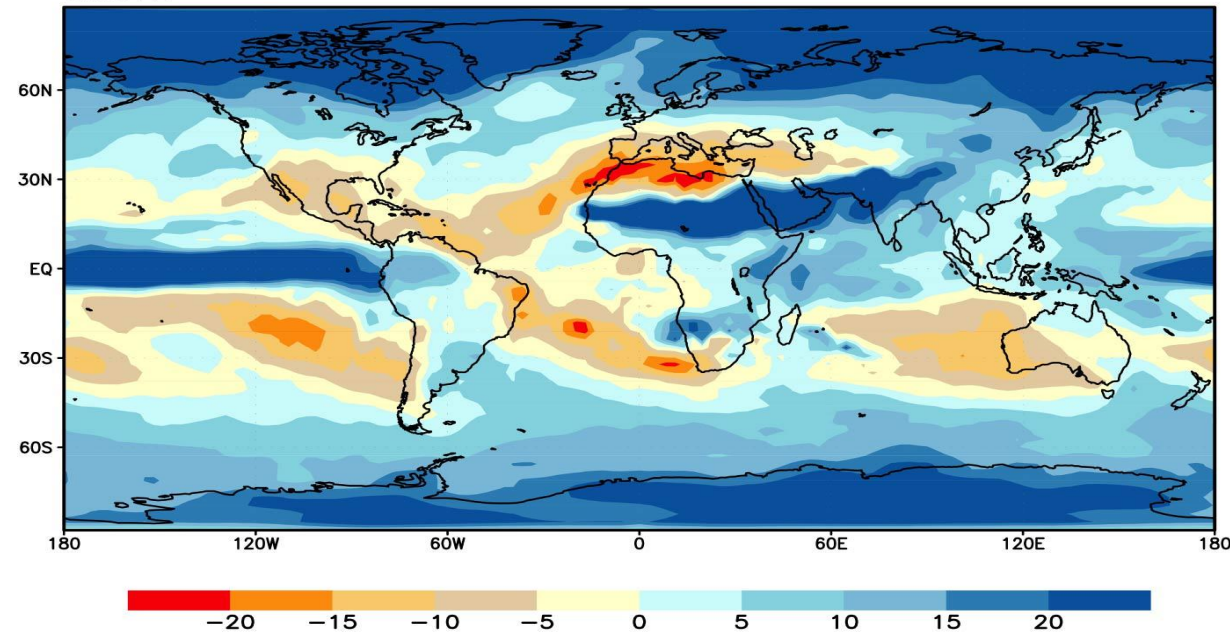
SRES A2



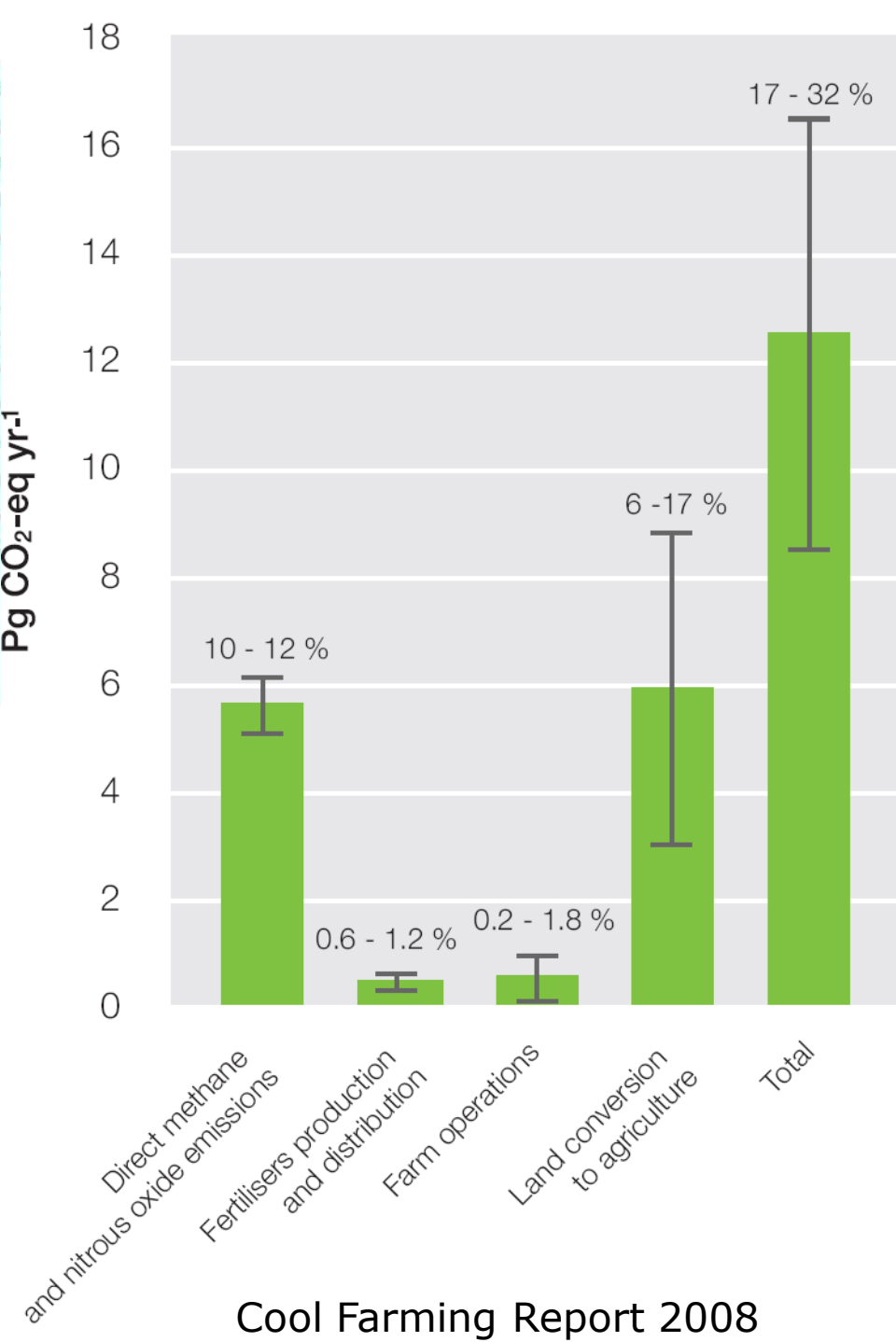
Change in annual
mean temperature
2070-2100 / 1990,
(in °C)

(source : IPCC)

SRES A2



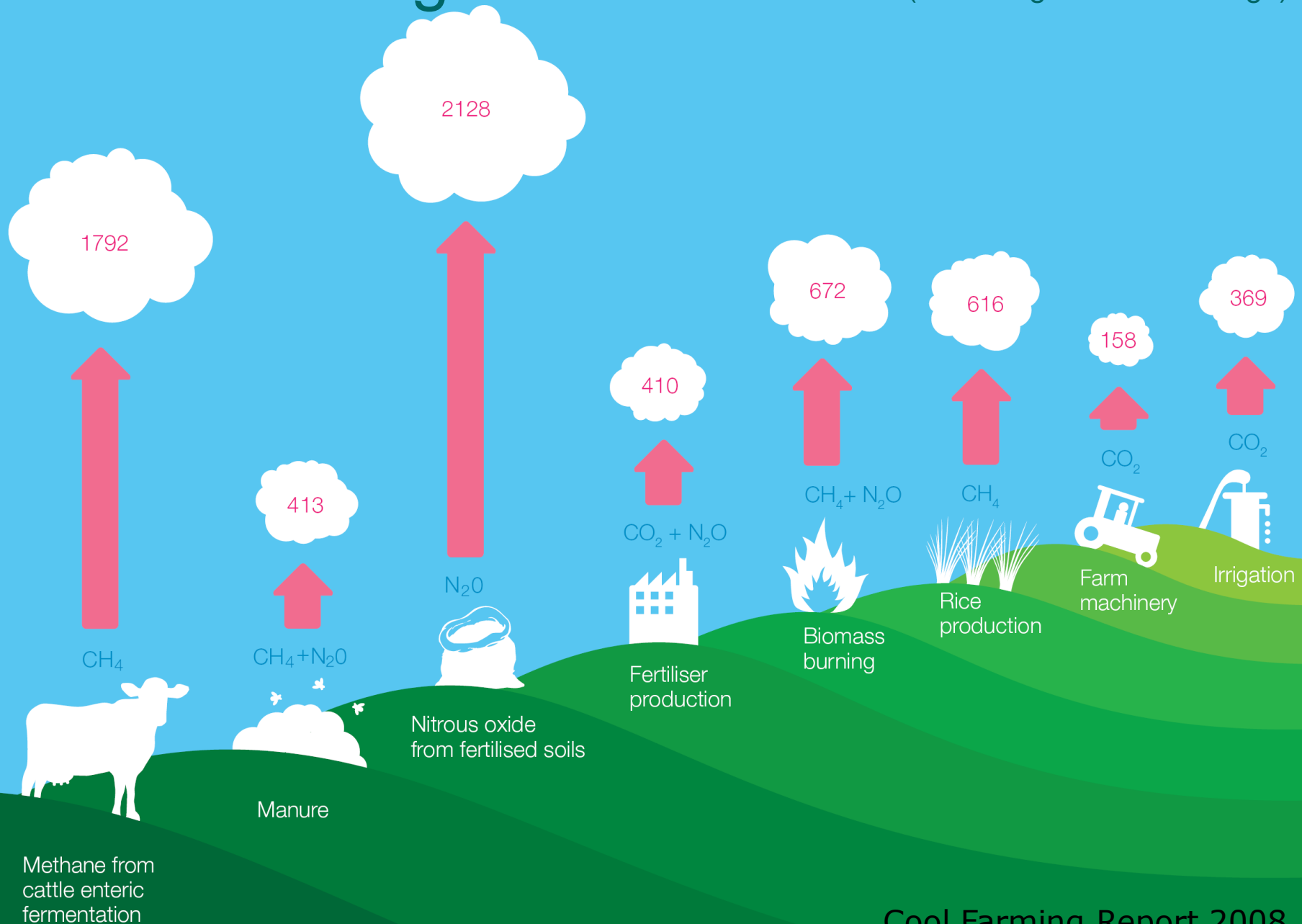
Change in annual
mean rainfall
2070-2100 / 1990,
(in °C)



Global contribution of agriculture to greenhouse gas emissions

Percentages are relative to global greenhouse gas emissions

Sources of agricultural GHG (excluding land use change)



Livestock and the Environment

- Grazing - 26% earth's surface
 - 70% dry areas degraded by overgrazing
- Feed crops - 33% arable land
- Consumes 8% water
 - Contributes to contamination
- 18% GHG emissions
 - 37% methane





Why this figure is that high?

- Global figure

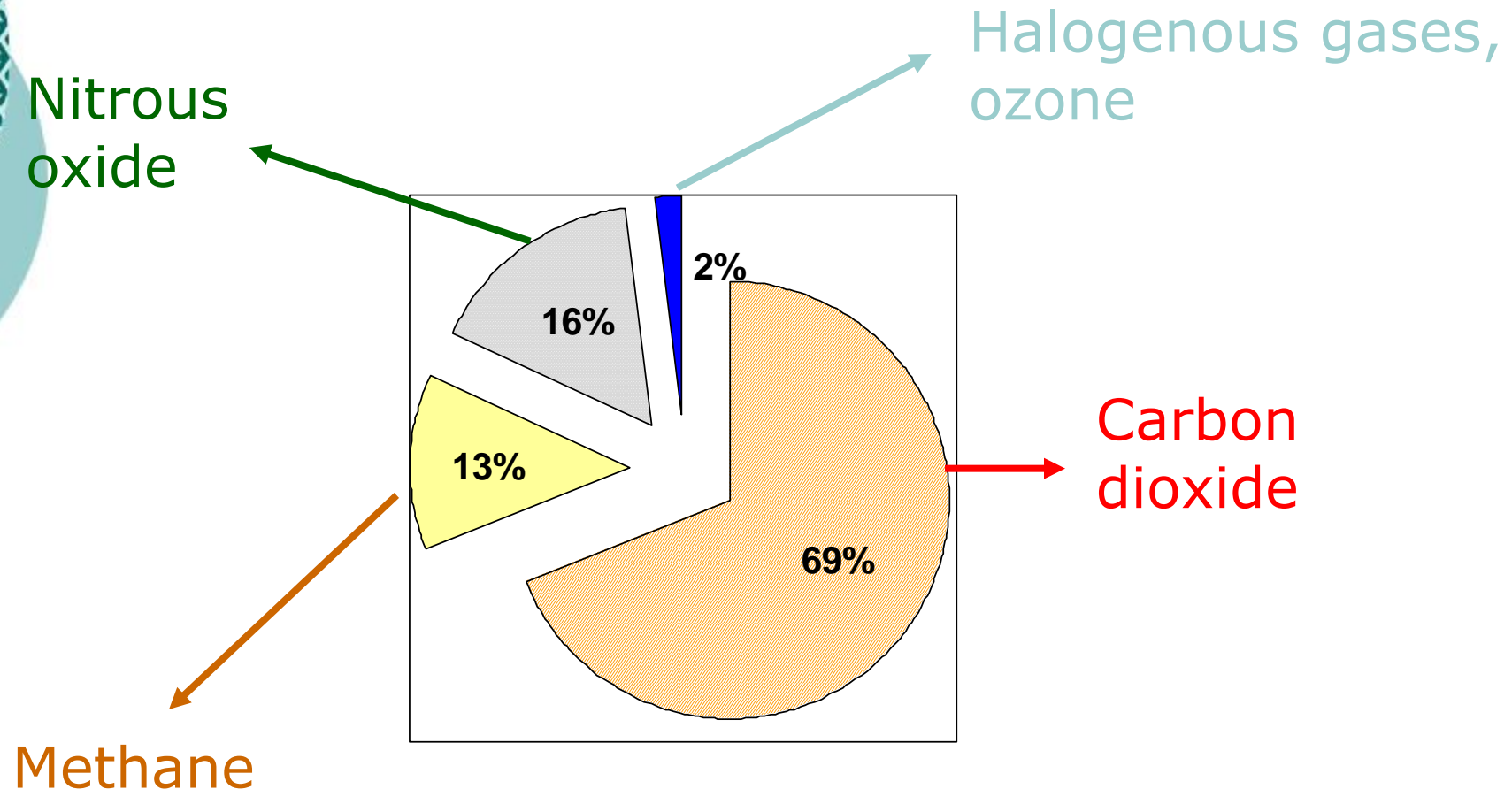
The proportion of livestock in total emissions is higher in southern countries

- The totality of emissions related to livestock production are accounted

e.g., crops for animal feeding, energy use in the farm, etc; it includes a part of emissions previously attributed to transport or industry sectors

- Takes into account the change in land use and thus deforestation, including the difference in carbon sink between forest and pastures or crops

Contribution of the different GHG to global warming in France (*Citepa, 2009*)



These are gas emissions, but a part of GHG is stored in soil, ocean and plants (« sinks »)

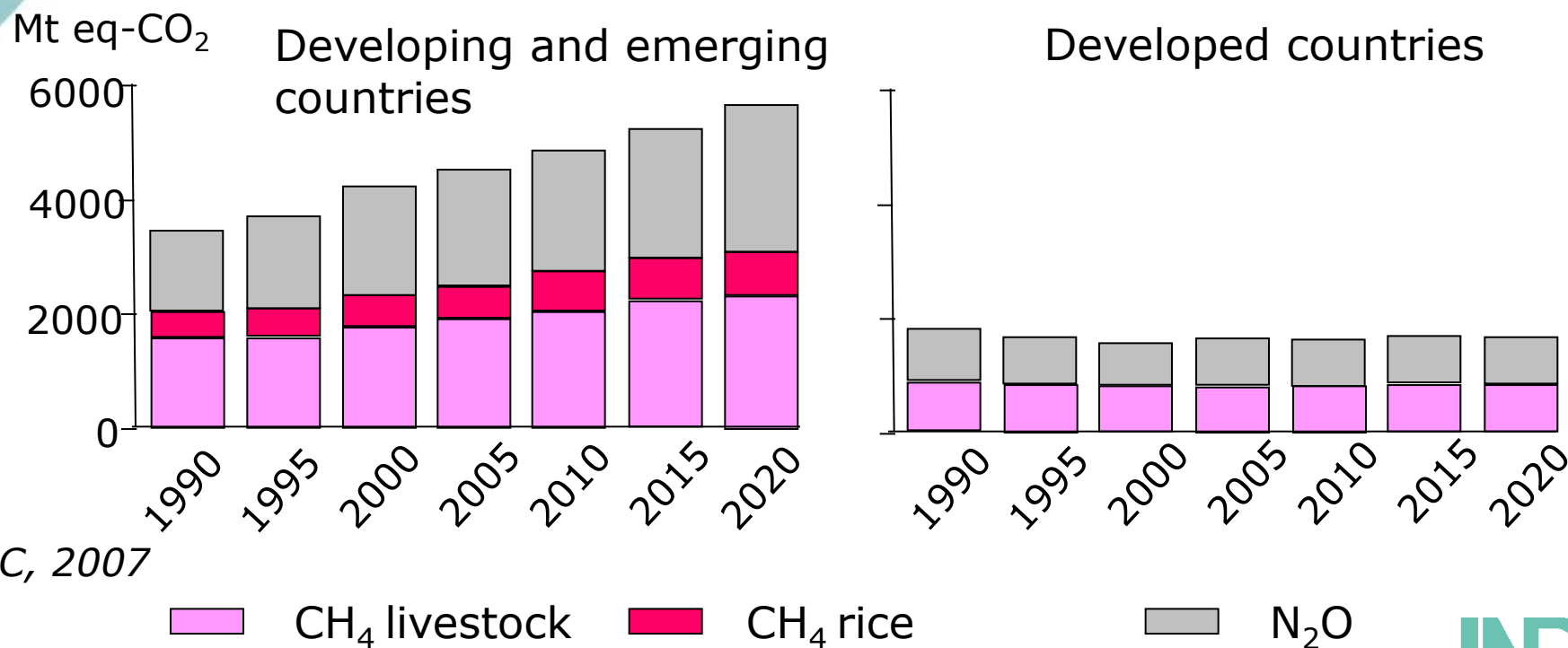
Contribution of livestock to global warming in France

(CITEPA, 2008)

	Million T CO2-equivalent	
Transports	149	
Energy	72	
Industry	111	
Waste treatment	14	
Domestic use, services	102	
Agriculture	108	
Crops	50	
Livestock	48	i.e. 9%
Energy for agriculture	10	

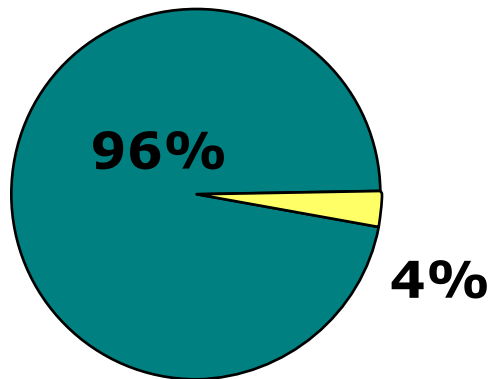
Don't forget : pastures store CO2

Historical N₂O and CH₄ emissions (Mt CO₂ eq.) of the agriculture sector



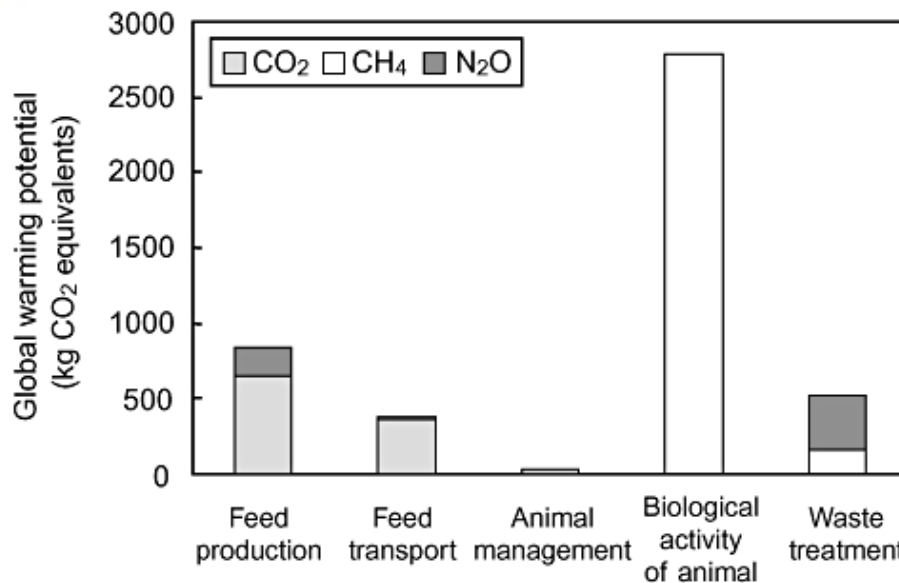
GHG emitted in ruminant production

- Carbon dioxide
- Nitrous oxide
- Methane



- Short half-life in the atmosphere
- Methane emissions by ruminants represent 3 to 5% of total GHG

Enteric methane is the most important contributor to GHG emissions in ruminant production



Methane (45 – 60%)

- Enteric
- Excreta (mainly manure)

Nitrous oxide (25 – 35%)

- Excreta (mainly on pasture)
- N fertilisers
- Indirect emissions due to input

Carbon dioxide (10 – 25%)

- Fuel
- Indirect emissions due to input

Methane and Ruminants

- Loss of energy
 - ~ 6-8% intake
- Environmental concern
 - Sheep 8 kg/yr
 - Beef cattle 60~70 kg/yr
 - Dairy cattle 110~145 kg/yr





Loss of dietary energy as methane in different species

	CH ₄ (kg/yr)	CH ₄ energy (% intake)
Cow	150	4 – 10
Horse	18	2 – 3
Pig	1	0,5 – 2
Poultry	≈ 0	≈ 0

Global warming potential of the main meat categories and milk compared to selected plant products

Product	Global warming potential
	kg CO ₂ -eq per kg of product
Sheep	17.4
Beef	12.98
Pig	6.35
Poultry	4.57
Milk	1.32
Bread wheat	0.80
Potato	0.21

(kg CO₂ equivalents on a 100 year time scale per kg product). Calculations were based on UK data (Foster et al., 2006).

Foresight. The Future of Food and Farming (2011)

How to reduce GHG emissions from the livestock sector

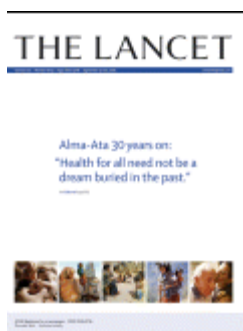
- The Observer: Main section
Sunday September 7 2008

● Main section
News p1-21
Comment p11-34
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World news p35-40
7 days p41-44



UN: eat less meat to curb global warming

R. Pachauri
Chairman IPCC



McMichael et al. Lancet 2007

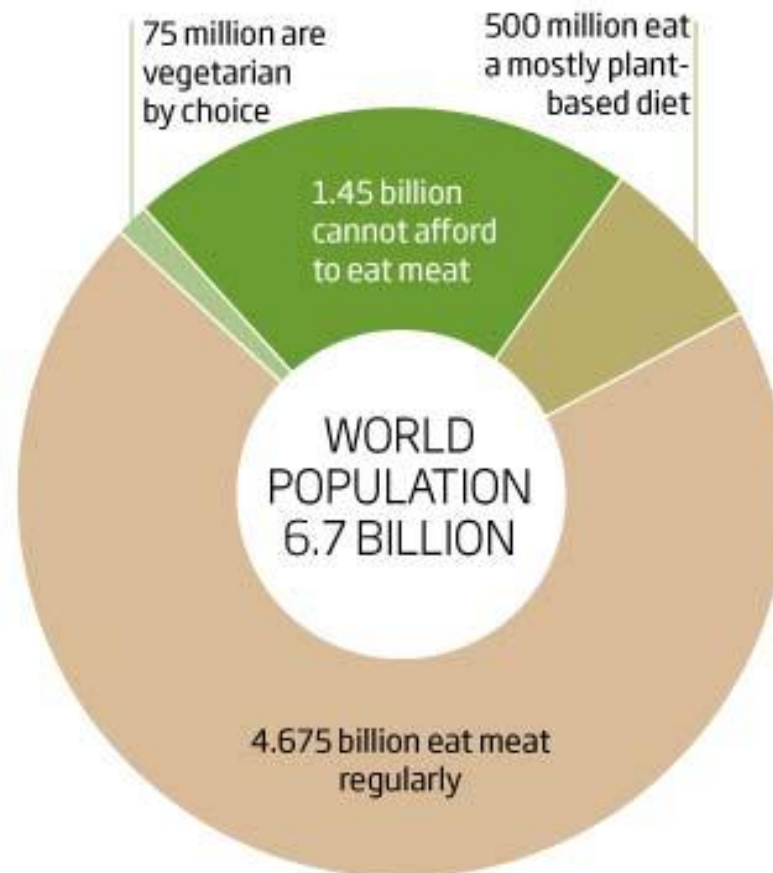
Food, livestock production, energy, climate change, and health .

“To prevent increased greenhouse-gas emissions from this production sector, both the average worldwide **consumption** level of animal products and the **intensity** of emissions from livestock production must be reduced.”

Veggie world

©NewScientist

About 20% of the world's population is vegetarian



SOURCE: ECONOMIC AND SOCIAL RESEARCH INSTITUTE

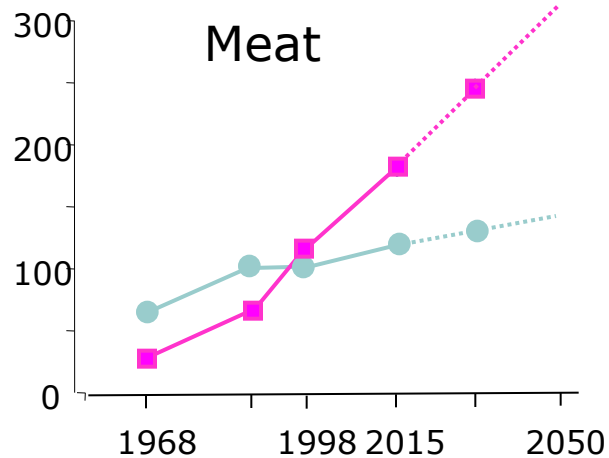
World population increases

9 billions expected in 2050

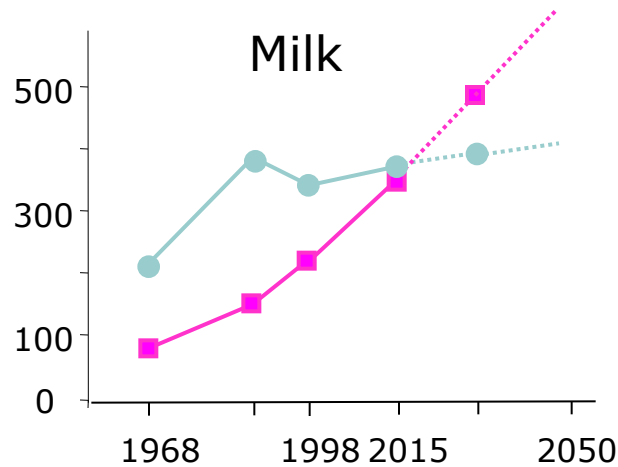


World production

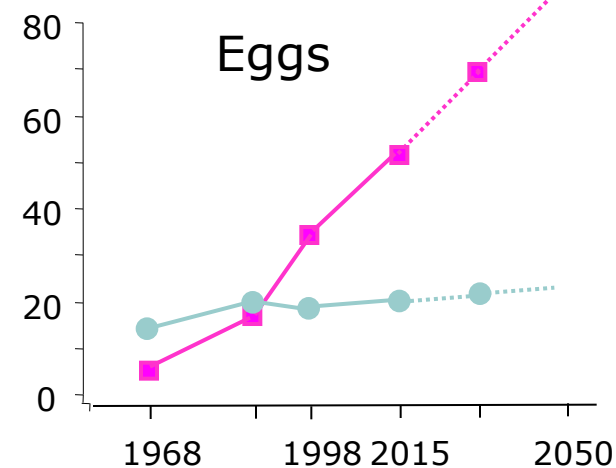
Millions T
Meat



Millions T
Milk



Millions T
Eggs



● Industrialized and transition countries

■ Emerging and developing countries

The global context of livestock production



A major social and economic force on the planetary scale



Major changes over the past years
Increase in demand, technical progress, organisation of sectors and markets



An activity that raises many questions on its conflicting challenges



Research is expected to provide answers

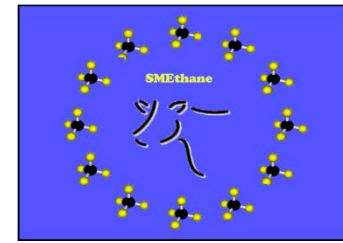




Future prospects ... and business opportunities

- Farmers and agrifood sector
 - Cap and trade schemes
- Consumers
 - Supermarket chains, food retailers
- Citizens

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Thank you for your attention