Climate Change – The Heat is On?

Edinburgh June 2008

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Greenhouse gas emissions on dairy farms

Dr. Theun Vellinga

Animal Sciences Group

Wageningen University and Research Centre

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GHG are expressed as CO_2 - equivalents

1 kg CO_2	→	1 kg eq. CO_2
1 kg CH_4	→	21 kg eq. CO_2
1 kg N_2O	→	310 kg eq. CO_2

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Contribution of agriculture to GHG emissions worldwide

CO_2	: 5 %
N_2O	: over 50 %
CH_4	: over 50 %

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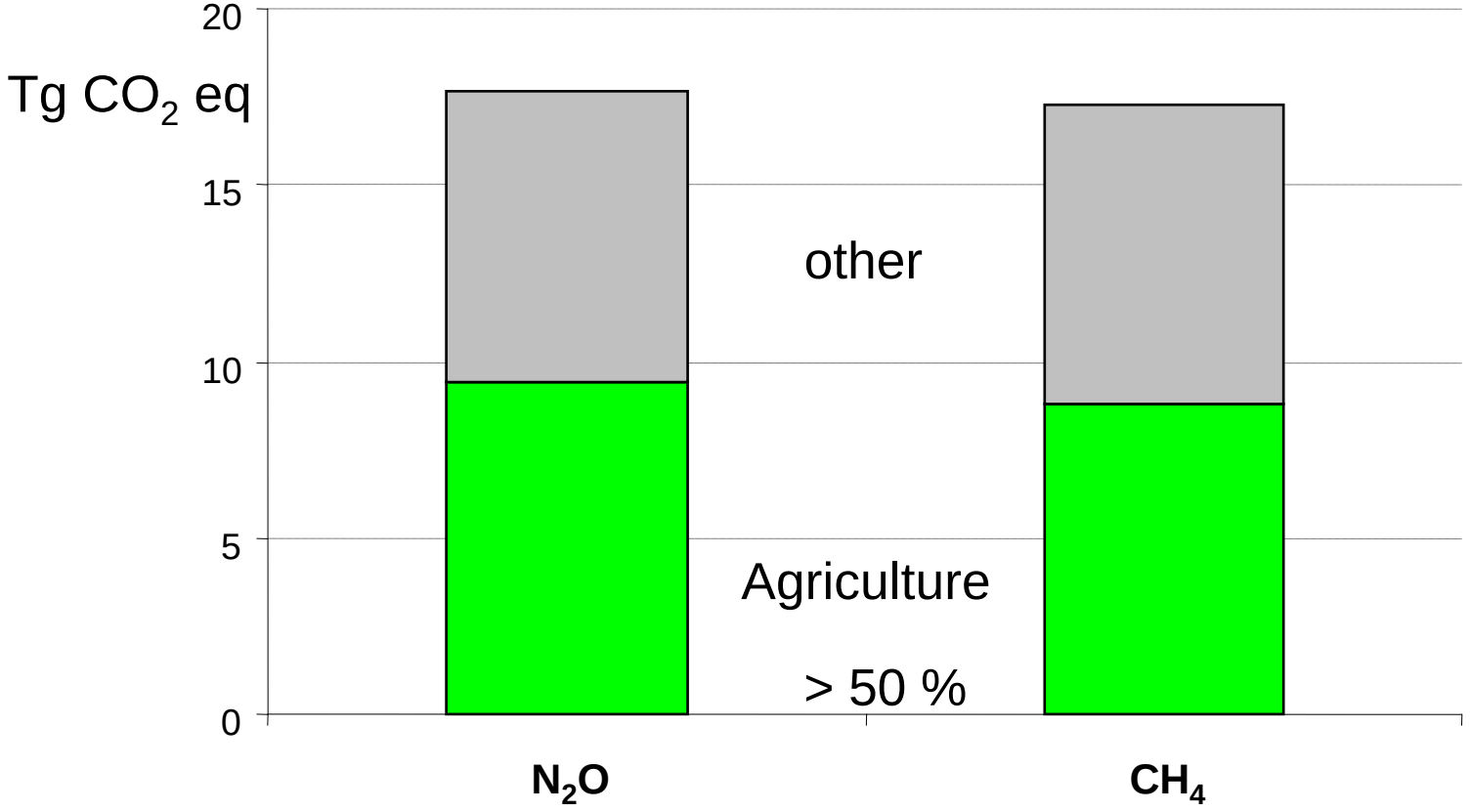
Contribution of agriculture to GHG emissions in the Netherlands in 2004



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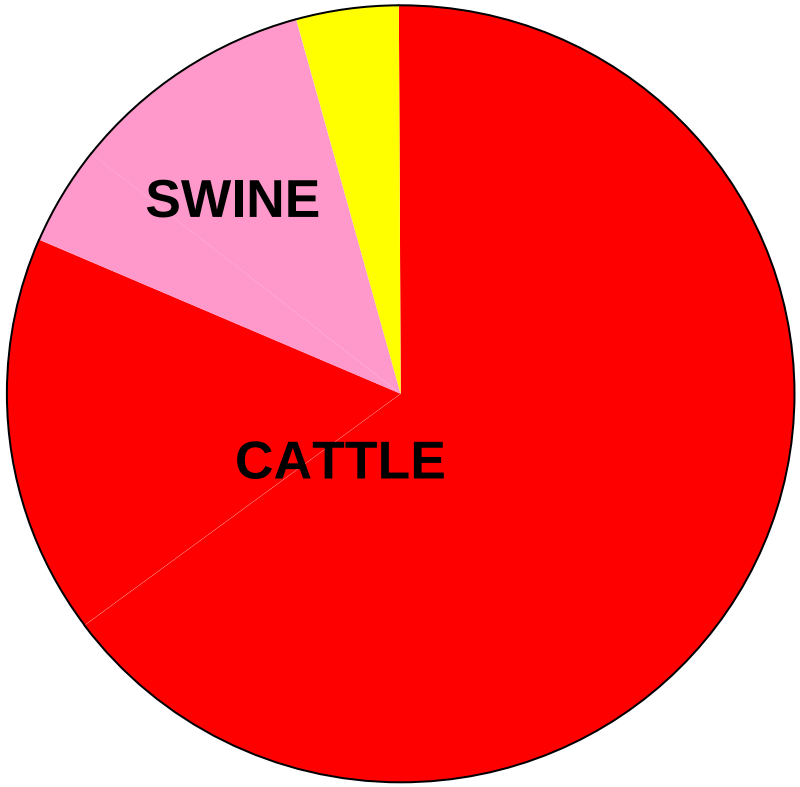
The Netherlands:
Methane emissions from agriculture :
80 % cattle



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Mitigation policy

Kyoto-protocol 2008-2012 minus 6%

Bali (2007):

EU: reduction of 20 % in 2020

The Netherlands: reduction of 30 % in 2020

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Reduction of GHG emissions

Methane reduction by:
reduced number of cattle
and higher milk production/cow
not by nutritional management

N_20 reduction by MINeral Accounting System (MINAS)

1990 1995 2000 2005

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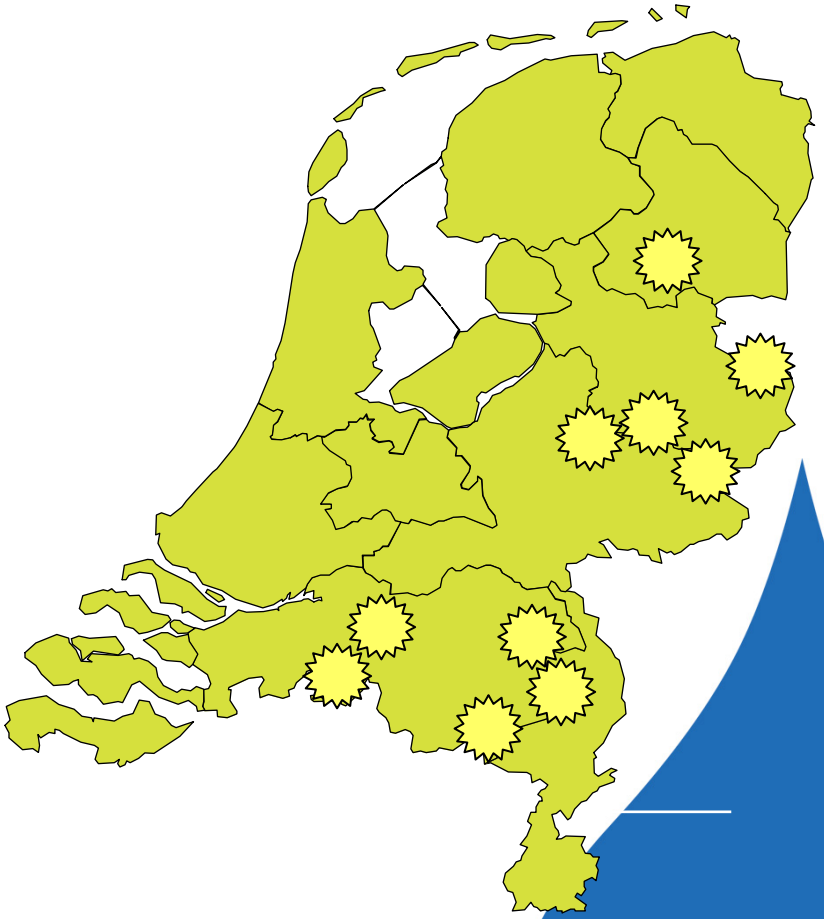
Pilot dairy farms on sandy soils (2002)

Acreage (ha)	47
Grassland (%)	70
Dairy cows (n)	80
Milk (kg/koe)	8200
Milk (kg/ha)	13900
Concentrates (kg/cow)	1865
Fertilizer N (kg/ha)	78
Slurry N (kg/ha)	231



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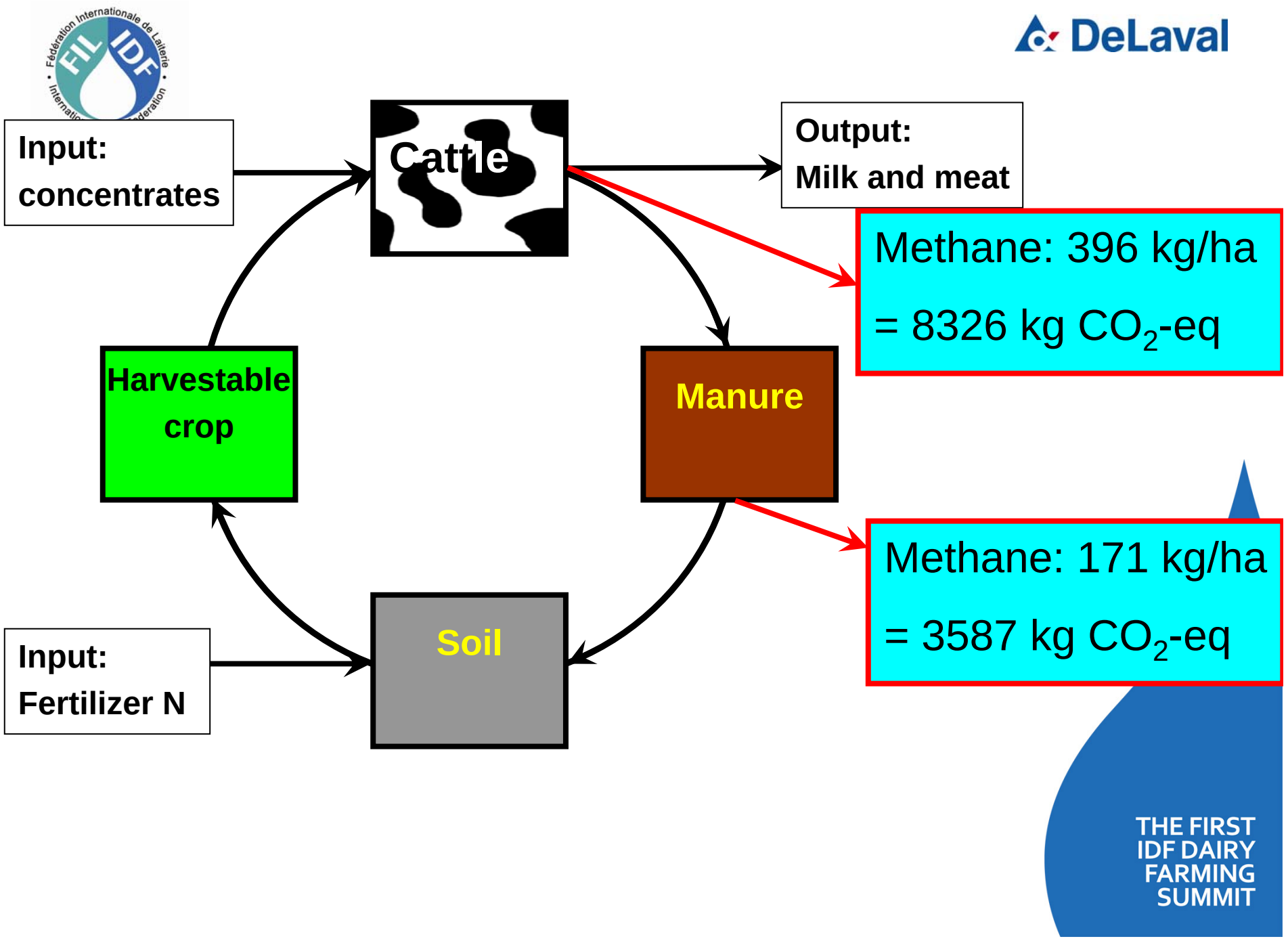
Input:
concentrates
Cattle
Output:
Milk and meat
Methane: 396 kg/ha
= 8326 kg CO_2-eq
Harvestable
crop
Manure
Methane: 171 kg/ha
= 3587 kg CO_2-eq
Input:
Fertilizer N
Soil
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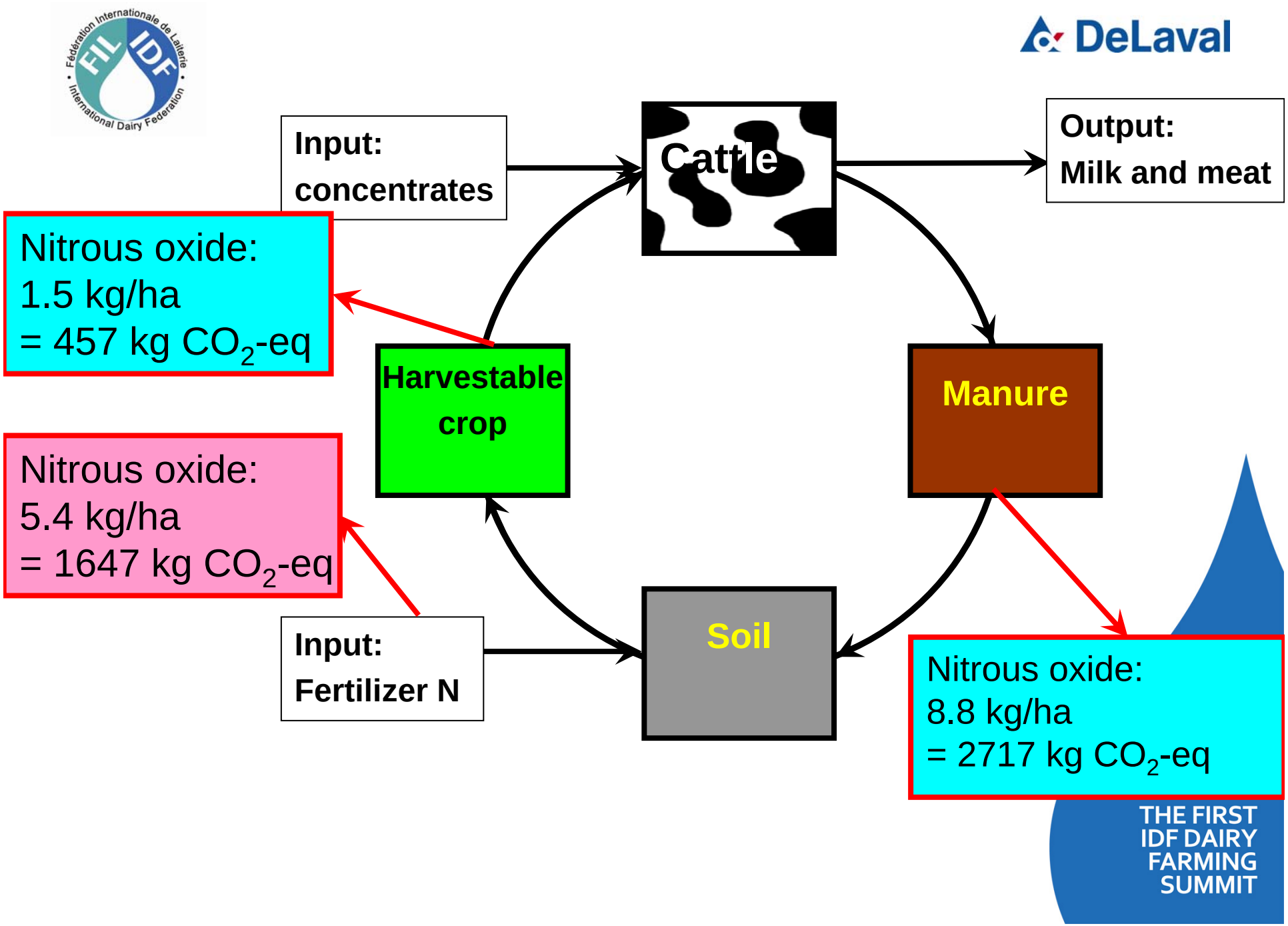
Input:
concentrates
Cattle
Output:
Milk and meat
Nitrous oxide:
1.5 kg/ha
= 457 kg CO_2-eq
Harvestable
crop
Manure
Nitrous oxide:
5.4 kg/ha
= 1647 kg CO_2-eq
Input:
Fertilizer N
Soil
Nitrous oxide:
8.8 kg/ha
= 2717 kg CO_2-eq
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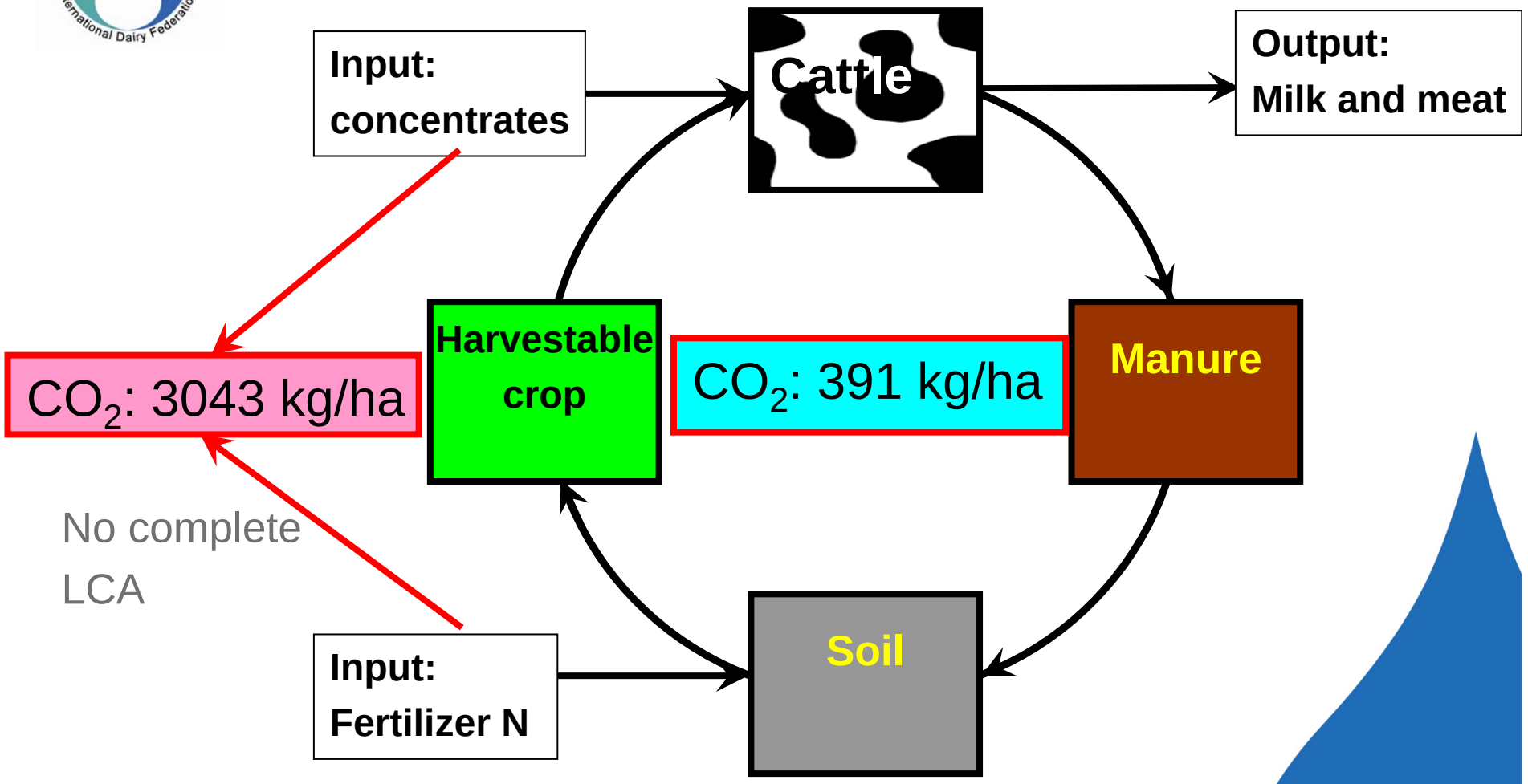

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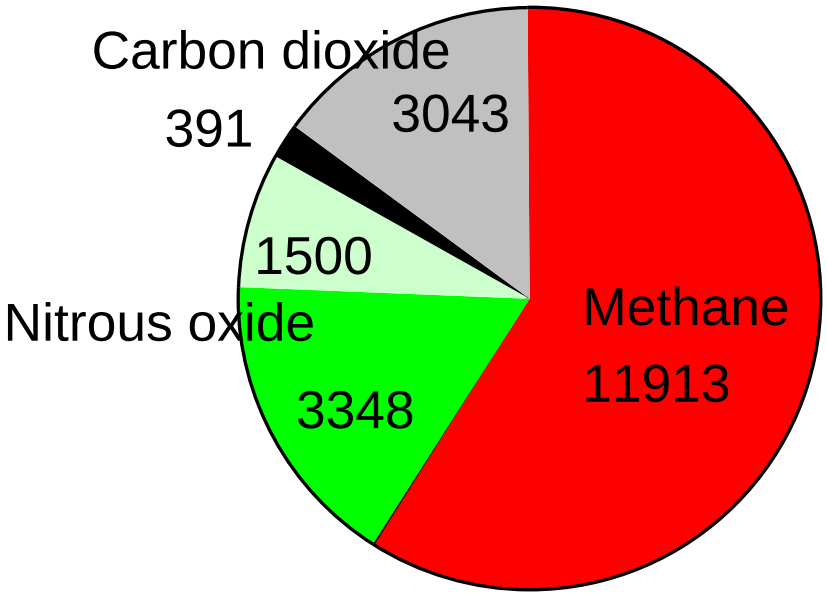
Total emissions on pilot dairy farms



(kg CO2-eq/ha)

Total emission: 20 195 kg CO_2 – equivalents/ha

= 1.46 kg CO_2 – equivalents/kg milk

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Agriculture as a carbon sink?

CO_2 in crops, milk and meat etc. returns to the short carbon cycle

Only carbon sequestration in soil organic matter counts.

Grassland:
mineral soils fixation of 900 kg C/ha/year
drained peat soils **release** of 5000 kg C/ha/year

And…

Carbon sequestration has an end,
high at young swards, low at old(er) swards

Ploughing up grassland: fast release of soil organic C and N

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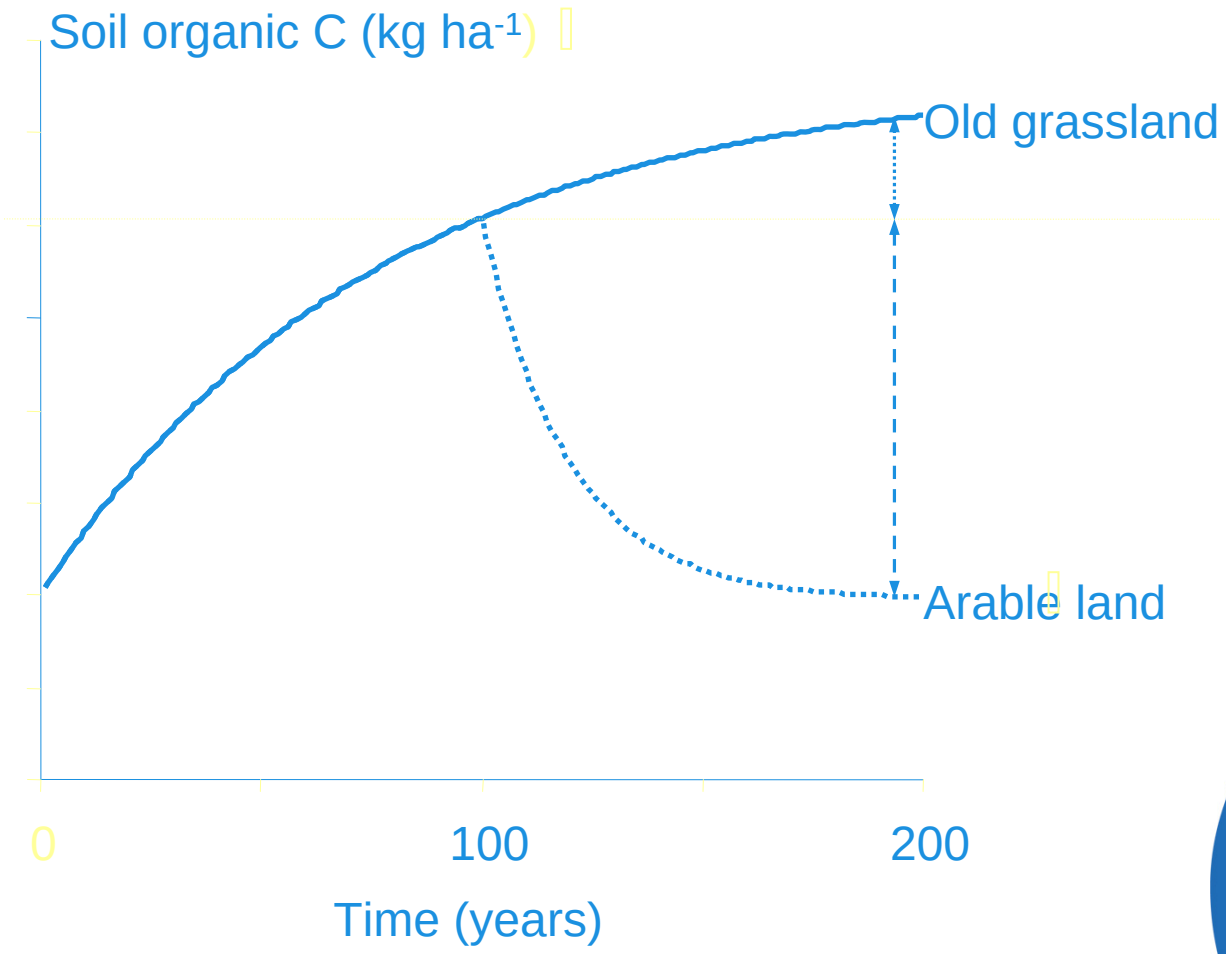
Grassland and organic matter



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Methane

Methane emission on pilot farms 0.85 kg CO_2 equivalents (60 % of the total emissions)

Intensive dairy farms:

fresh herbage 25 %	:	D > .80
silage grass/maize 75 %	:	D = .75
concentrates 1865 kg	:	D > .80

High digestibility, many concentrates

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Options to reduce methane

Manure fermentation

Increasing milk production per cow

Reducing number of young stock

Nutrition: bypassing the rumen:

Feed the cow as a pig,
not as a ruminant!

Interaction with Nitrogen, Carbon and socio-economic conditions

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Side effects of methane reduction

Competition with food

Ploughing up grassland

Increasing imports

Increasing N inputs and -losses

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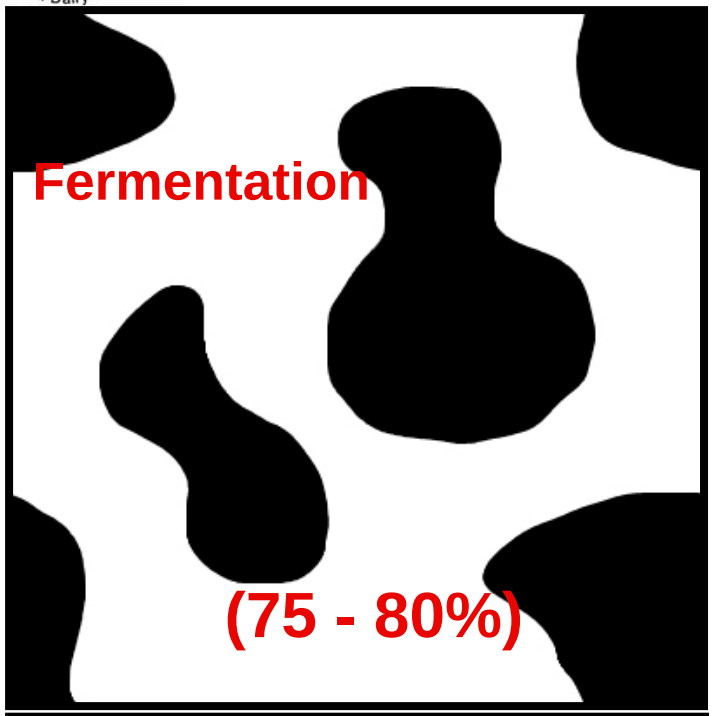
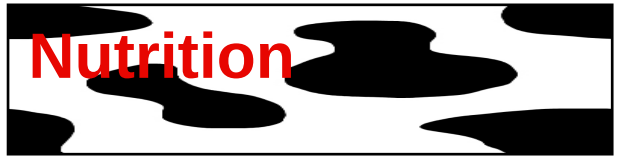
Reduction methane emission





Manure emission

(20 - 25 %)

Manure fermentation

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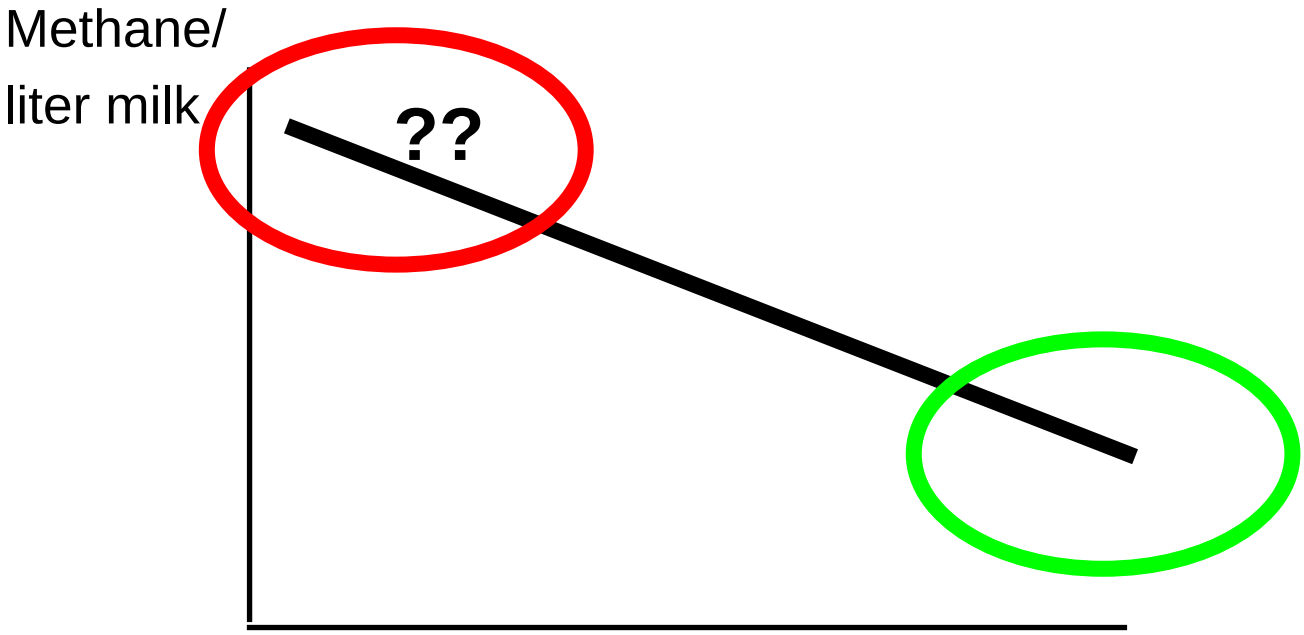

Low inputs/high fibre

Upgrading organic matter

High inputs (N, concentrates)
High stocking rates
High milk/cow
Low fibre

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The ruminant for upgrading organic matter and waste?

Abandoned rural areas in Europe

Loss of ancient land use systems

Increasing scales are parallel to industrialization of the dairy enterprise

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Conclusions

From all GHG from a dairy enterprise, methane is the most important contributor;

Options to reduce methane emissions are limited; changes in animal nutrition can cause many side effects

Options for extensive dairy systems are to be developed

Increased productivity per animal provides the possibility of reducing the number of animals, while maintaining production

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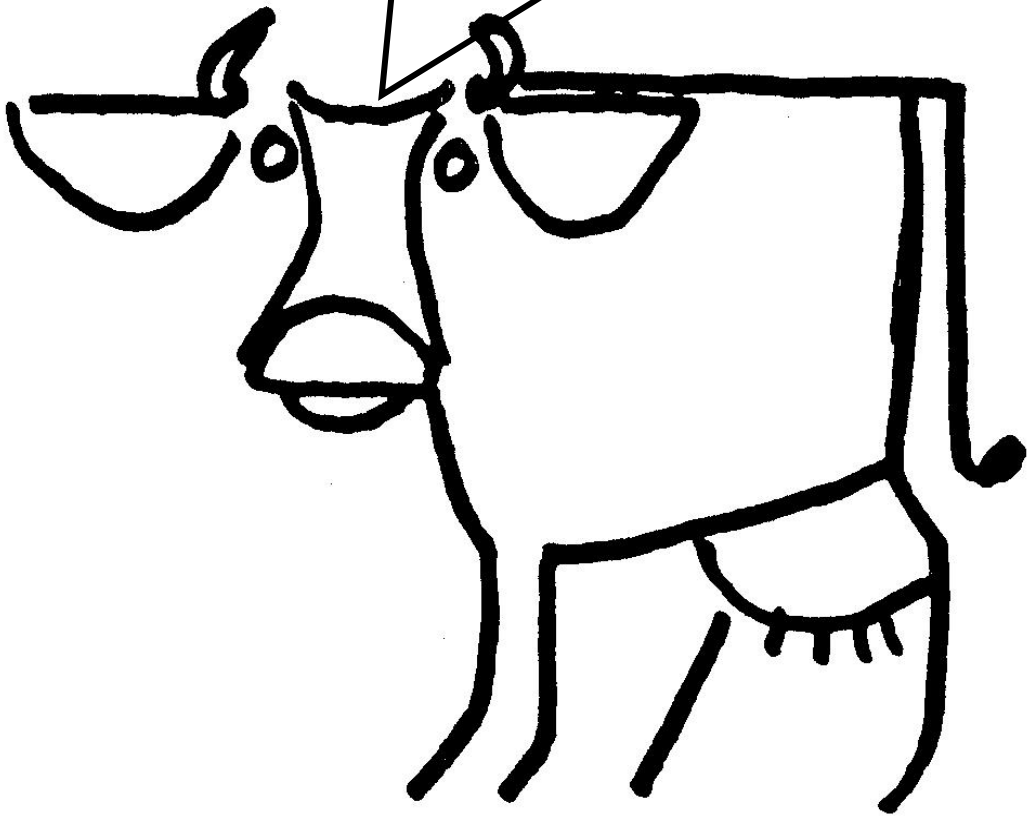
Heavy stuff at the end of the day

Thank for your attention



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Lachgasemissie verminderen

Grasland en maisland niet uitwisselen

Graslandvernieuwing beperken

Verminderen N-bemesting

Speciale meststof in voorjaar weinig effectief

Splitsing voorjaarsgift enig effect

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IDF RGB colors

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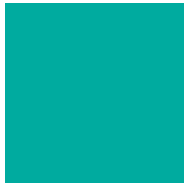

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Fertilizer level Maturity	LOW	HIGH
YOUNG	CP medium WSC high ME high DMY low	CP high WSC low ME high DMY low
OLD	CP low WSC high ME low DMY medium	CP medium WSC low ME low DMY high

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