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THE SHEEP SECTOR IN GREENHOUSE GAS INVENTORY IN HUNGARY

György BORKA – Tímea NÉMETH – Edina KRAUSZ – Sándor KUKOVICS

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Bratislava, Slovakia, 27-31 August, 2012

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JUHINNOV PLATFORM, GHG-PROJECT

AIM OF THE PROJECT: HAVE MORE EXACT DATA OF GHG EMISSIONS OF SHEEP PRODUCTION

ANALYSIS:

Hungarian national and agricultural GHG emission inventory by gas and source

DATA COLLECTION:

Survey on parameters relevant to GHG emissions of Hungarian sheep sector

METHOD DEVELOPMENT:

Using the results of survey, development of country-specific emission factors to estimate the GHG emissions of sheep sector (Basis: IPCC Tier 2 method)

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JUHINNOV PLATFORM, GHG-PROJECT

CALCULATION OF EMISSIONS:

Trends of nitrous oxide (N_2O) and methane (CH_4) between 1985 and 2009, comparison the GHG emissions of cattle and sheep sectors

CONCLUSIONS, PROPOSALS:

Reduction of GHG emissions in ruminant sectors: necessity and reduction possibilities

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DATA COLLECTION:

SURVEY ON PARAMETERS RELEVANT TO GHG EMISSIONS FROM SHEEP SECTOR

- Purpose of animal keeping
- Number of animals
  (ewes, lambs until weaning, lambs until 1 year of age, rams, other sheep)
- Body mass and body mass gain
- Milk yield
- Nutrition
- Housing
- Grazing (grazing days per year, grazing hours per day)
- Manure management

Field-survey in 10 farms, survey-method (questionnaire) in 75 farms,
(total animal places approx. 95 000)

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IMPORTANT CHARACTERISTIC PARAMETERS OF SHEEP FARMS IN HUNGARY


Fotó: Kukovics Sándor

- Main product: lamb for slaughtering
  (until 60-90 days of age, body mass at selling: 22 kg)
- Average body mass of ewes: 49-75 kg
- Nutrition (per animal per day):
  - grass 4-8 kg,
  - other feed components (ewes): hay 0.4-2.5 kg, silage 0.3-0.5 kg, concentrate 0.1-0.5 kg, straw 0.1-0.2 kg
- Grazing: average 200 days/ year, and 10 hours/day
- Manure management:
  - exclusively solid manure systems
  - cleaning out 2 times per year
  - storage time 120-160 days
  - manure application in September - October, incorporation usually immediately or in 1 week

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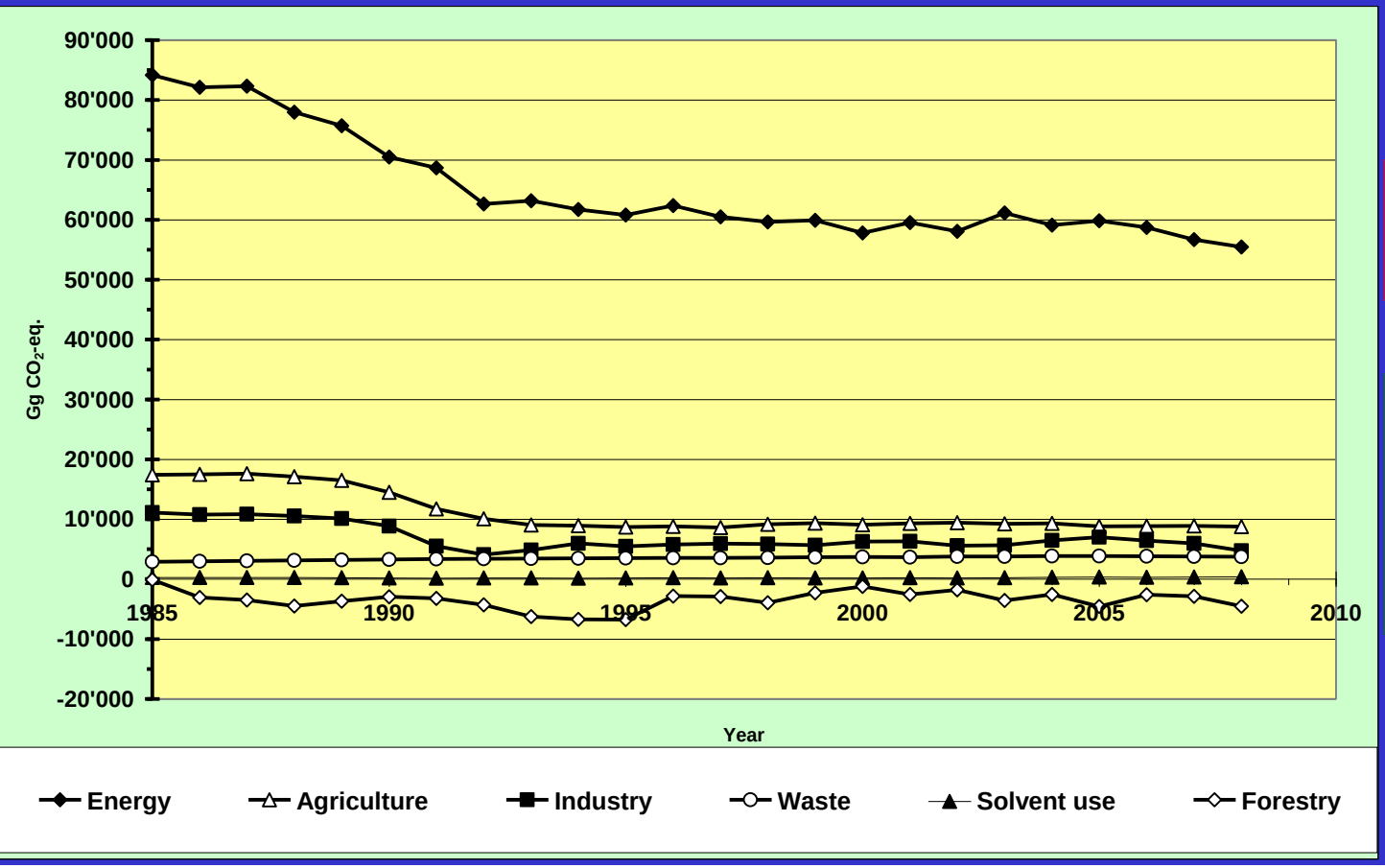
NATIONAL GHG EMISSIONS (in CO_2-Eq.) IN HUNGARY BETWEEN 1985 AND 2008 BY SECTORS (Gg year^{-1})



Energy

⇨ 78% (73-84%)

Agriculture

⇨ 13% (11-16%)

With energy use:

16% (13-20%)

(100% = total GHG emissions from Hungarian national economy)

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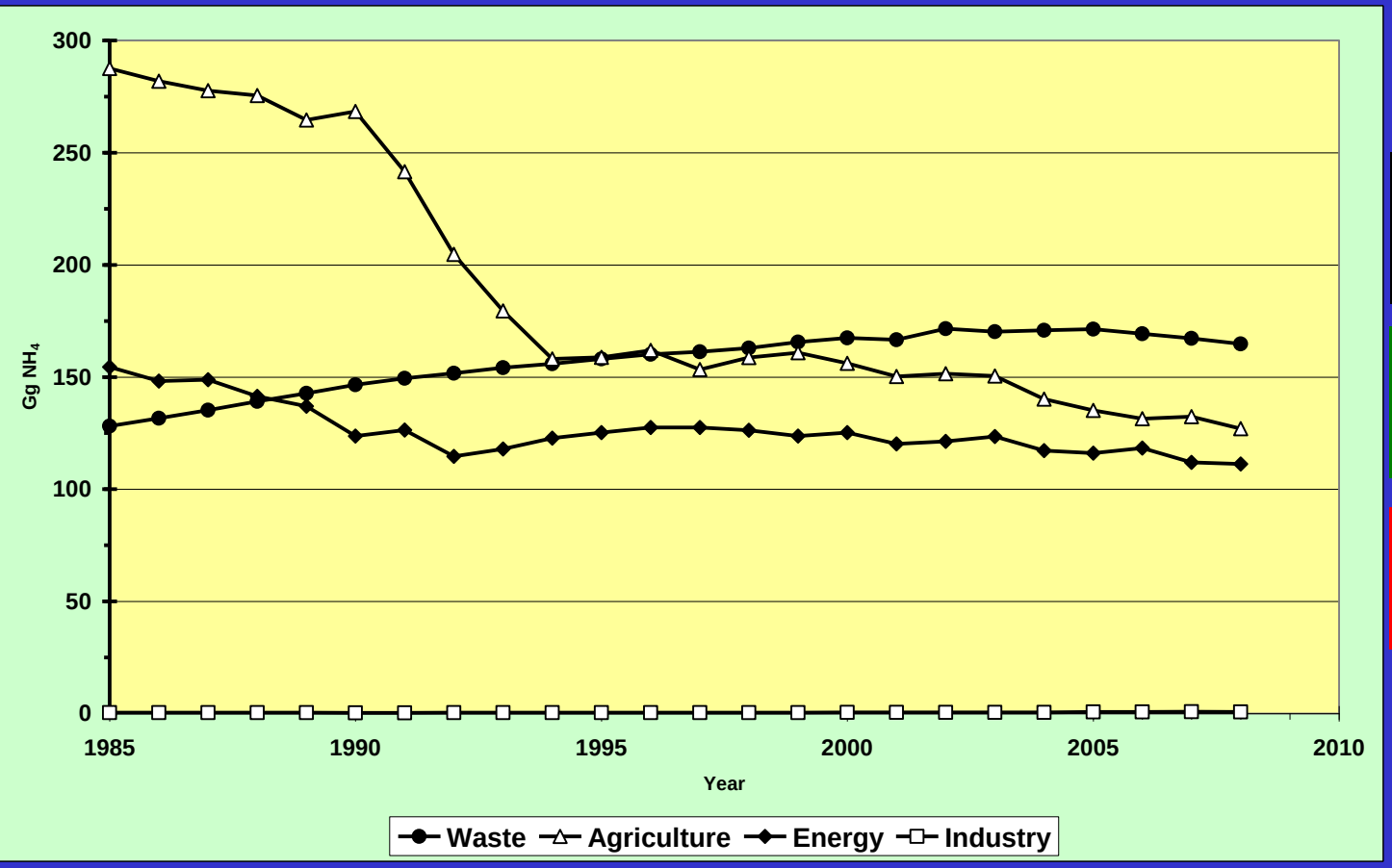
METHANE (CH_4) EMISSIONS IN HUNGARY BETWEEN 1985 AND 2008 BY SECTORS ($Gg\ year^{-1}$)



Waste

⇨ 34% (22-41%)

Agriculture

⇨ 39% (30-50%)

Energy

⇨ 27% (23-29%)

(100% = total CH_4 emissions from Hungarian national economy)

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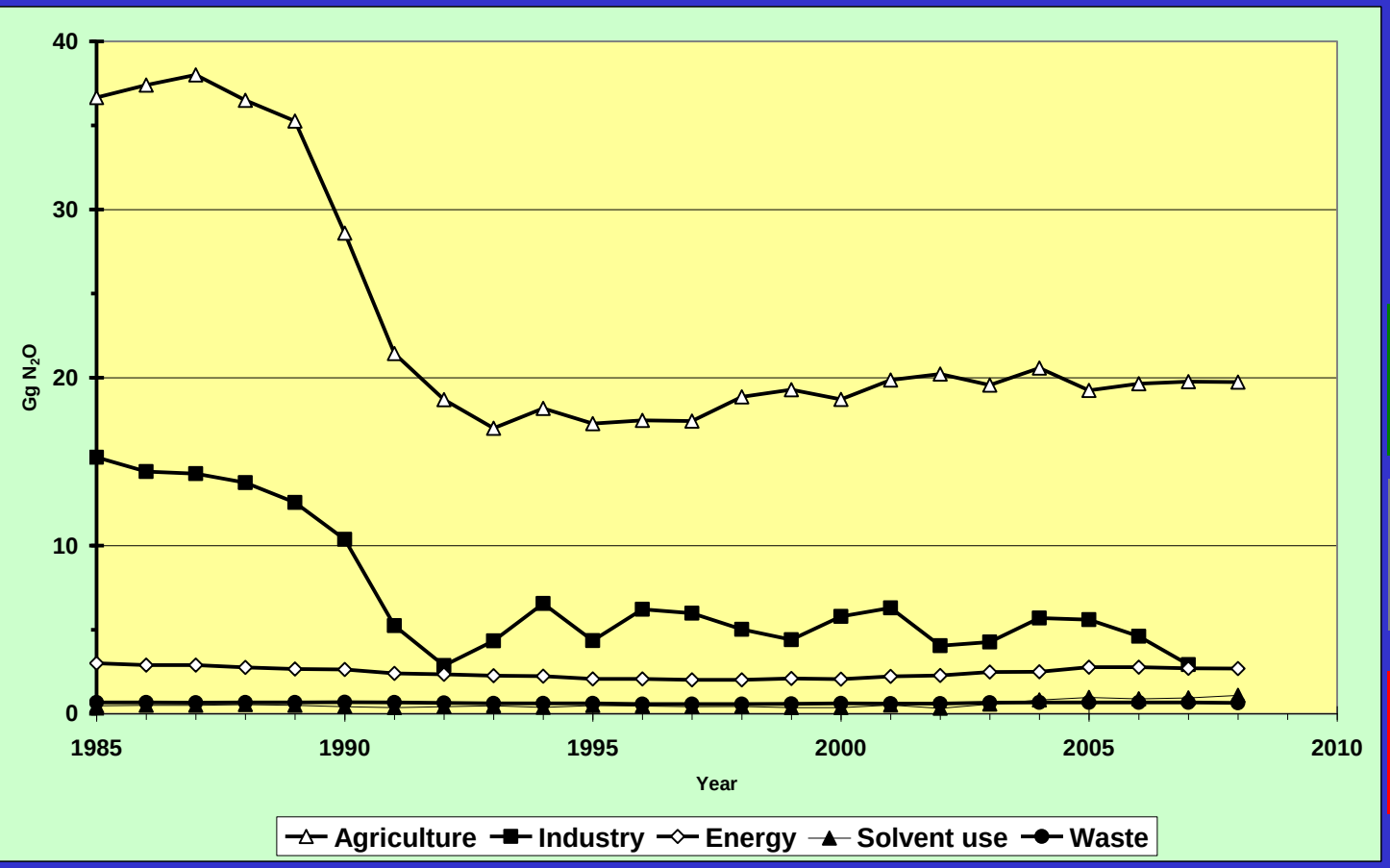
NITROUS OXIDE (N_2O) EMISSIONS IN HUNGARY BETWEEN 1985 AND 2008 BY SECTORS (Gg year^{-1})



Agriculture

⇨ 69% (65-81%)

Industry

⇨ 19% (11-27%)

Energy

⇨ 8% (5-11%)

(100% = total N_2O emissions from Hungarian national economy)

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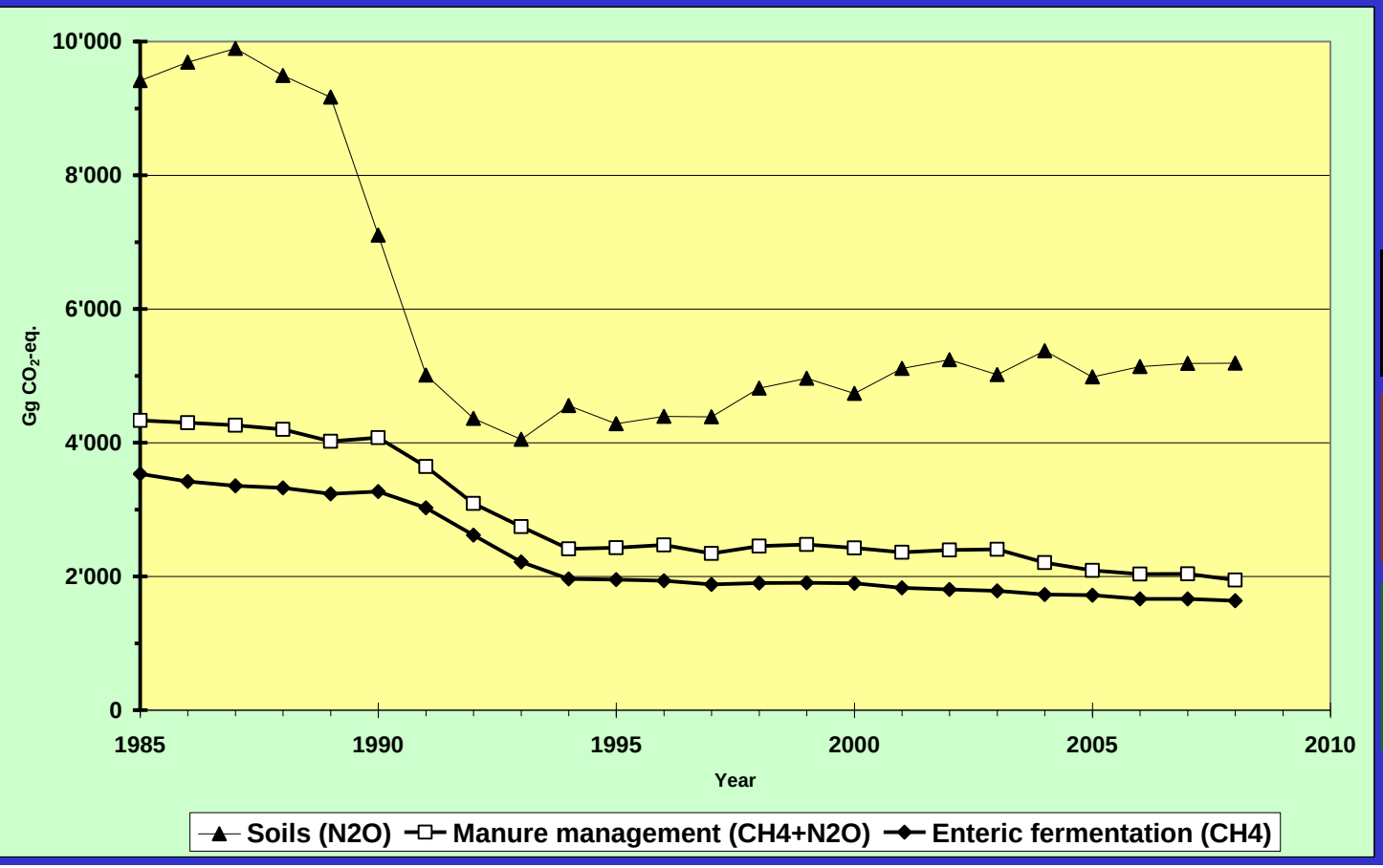
GHG EMISSIONS (N_2O AND CH_4, in CO_2-Eq.) FROM AGRICULTURE IN HUNGARY BETWEEN 1985 AND 2008 BY SOURCE (Gg year^{-1})



Soils (N_2O)

⇨ 53% (43-59%)

Manure management (N_2O+CH_4)

⇨ 26% (22-31%)

Enteric fermentation (CH_4)

⇨ 21% (19-26%)

(100% = total GHG emissions from agriculture)

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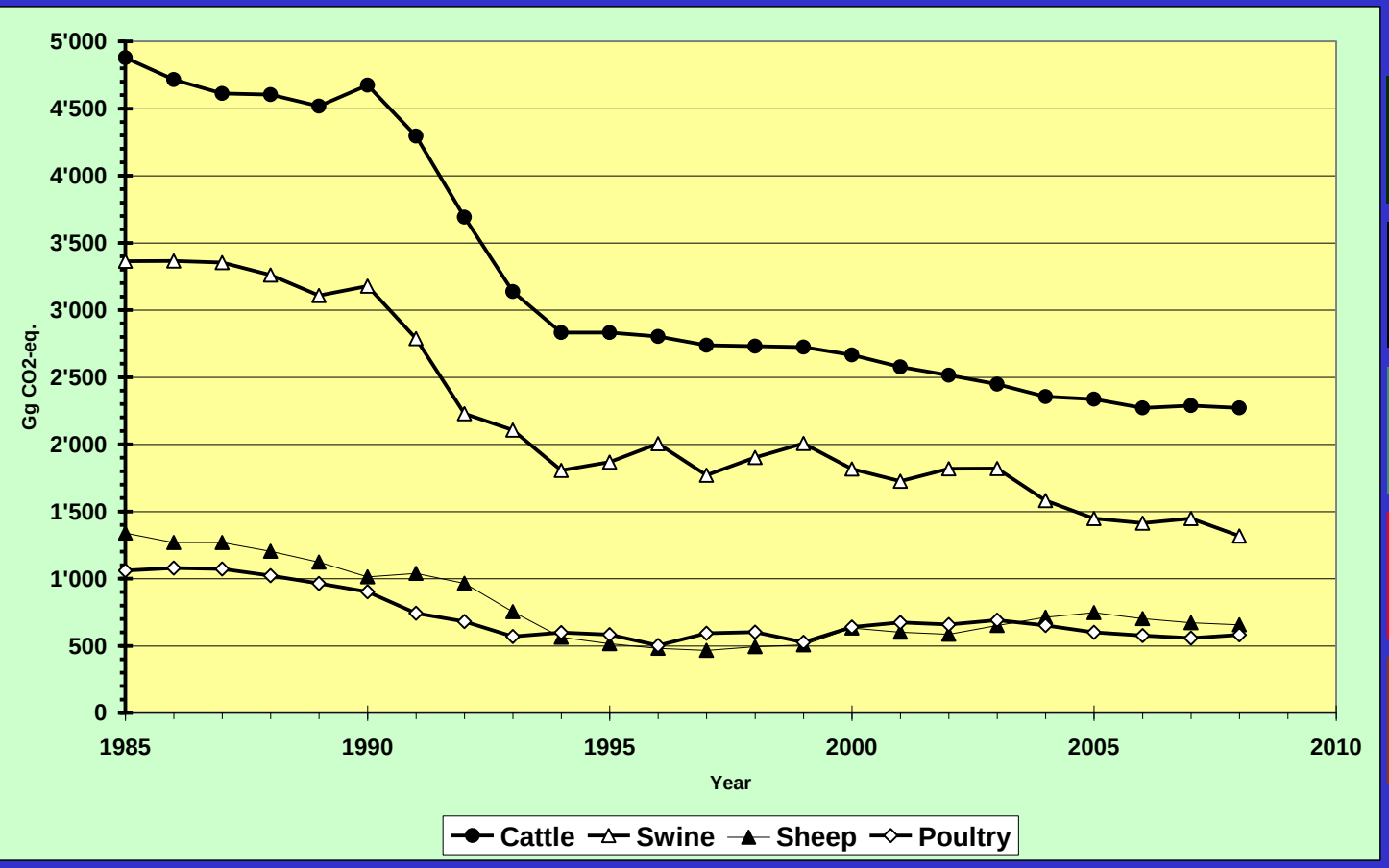
GHG EMISSIONS (N_2O AND CH_4, in CO_2-Eq.) FROM ANIMAL PRODUCTION IN HUNGARY BETWEEN 1985 AND 2008 BY ANIMAL SPECIES (Gg year^{-1})



Cattle
⇨ 45% (42-47%)

Swine
⇨ 30% (22-34%)

Sheep
⇨ 11% (8-14%)

Poultry
⇨ 10% (8-12%)

Other
⇨ 4% (3-5%)

(100% = total GHG emissions from animal production)

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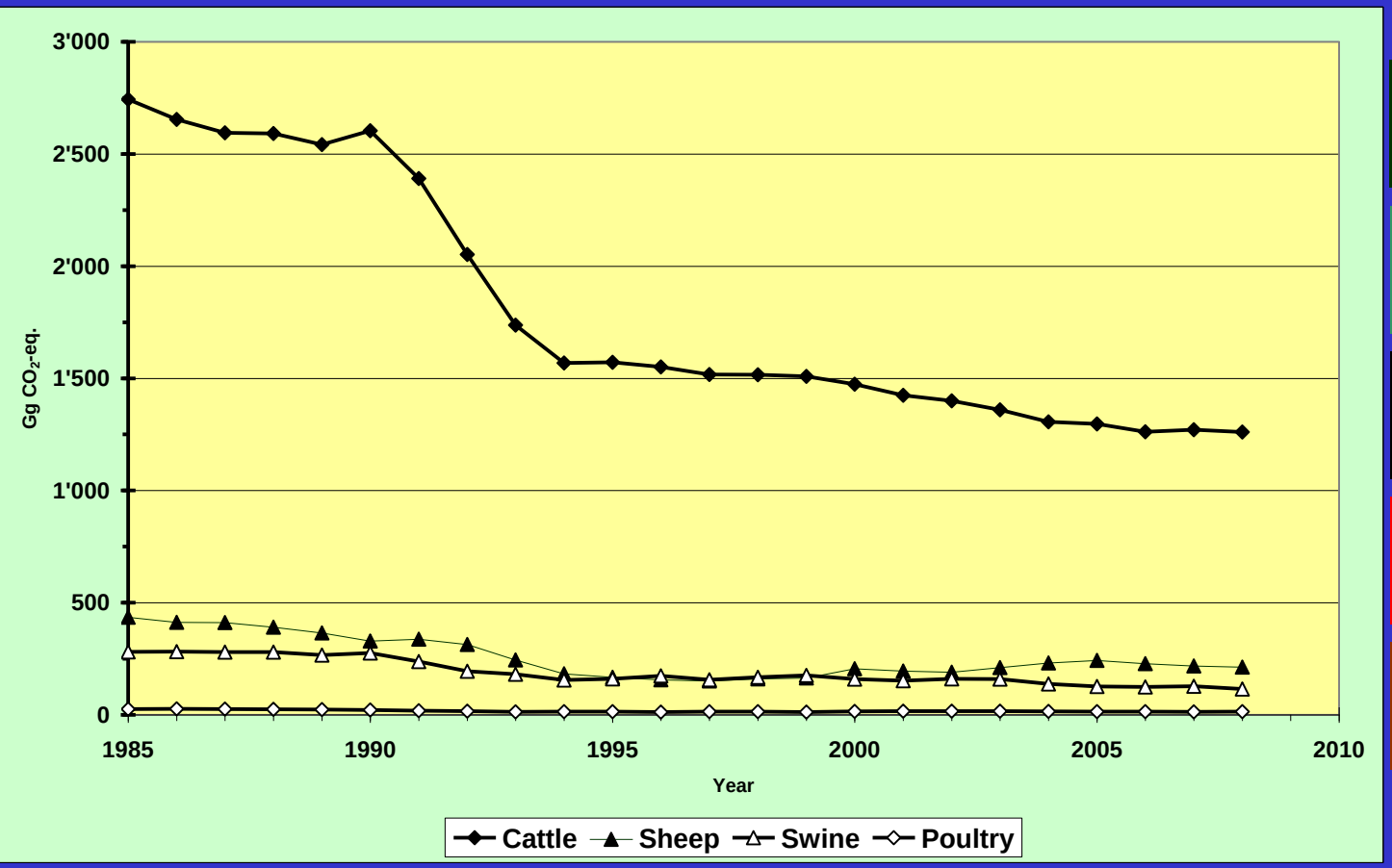
METHANE EMISSIONS (in CO_2-Eq.) FROM ENTERIC FERMENTATION BETWEEN 1985 AND 2008 BY ANIMAL SPECIES (Gg $year^{-1}$)



Cattle:
⇨ 78% (75-81%)

Sheep:
⇨ 11% (8-14%)

Pig:
⇨ 8% (7-9%)

Poultry:
⇨ 0.8% (0.6-1%)

Other:
⇨ 2% (1-2%)

(100% = total NH_4 emissions from enteric fermentation)

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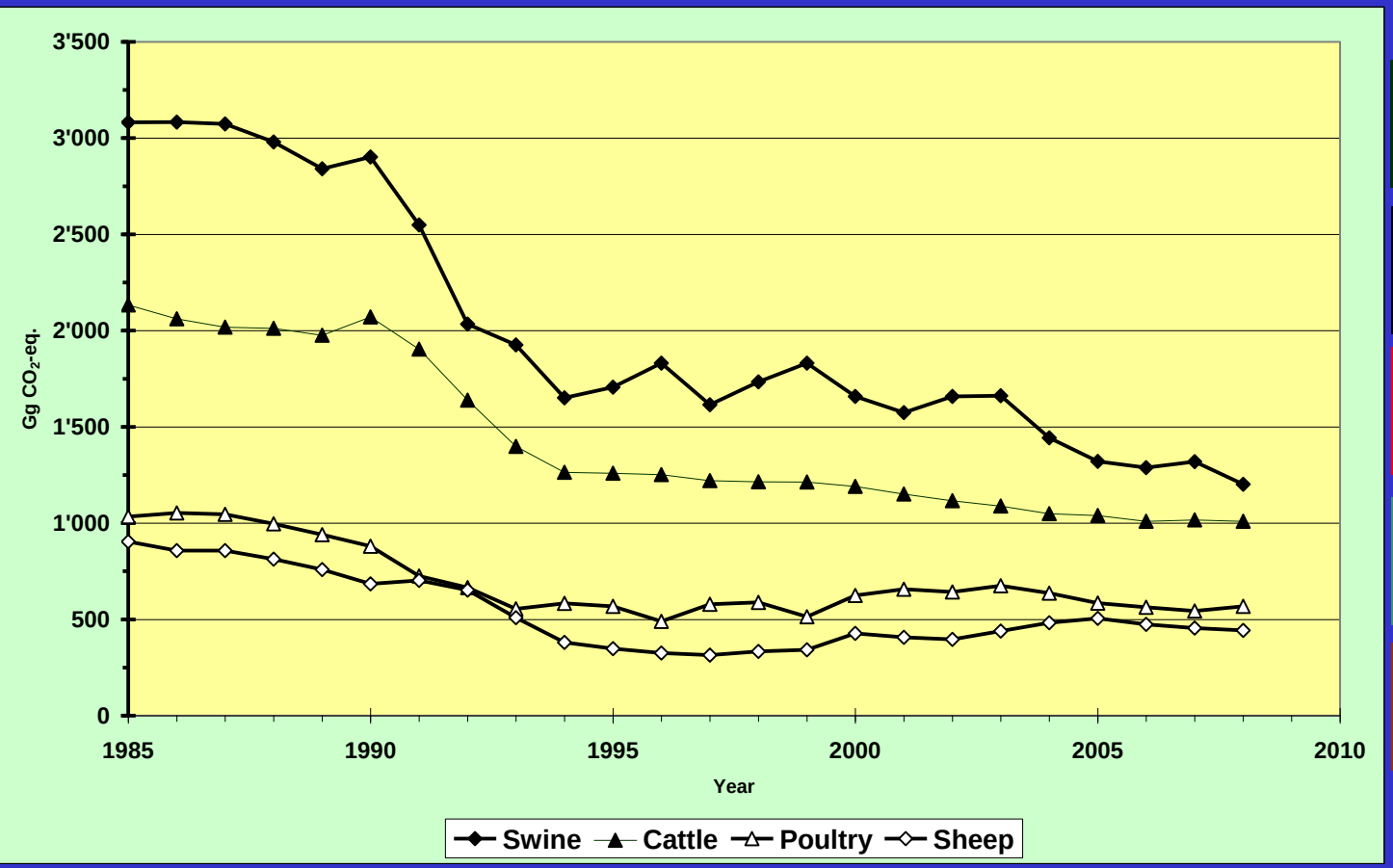
GHG EMISSIONS (N_2O AND CH_4, in CO_2-Eq.) FROM MANURE MANAGEMENT AND APPLICATION BETWEEN 1985 AND 2008 BY ANIMAL SPECIES ($Gg\ year^{-1}$)



Cattle
⇨ 30% (26-31%)

Pig
⇨ 41% (36-45%)

Poultry
⇨ 15% (12-17%)

Sheep
⇨ 11% (8-14%)

Other
⇨ 2% (1-2%)

(100% = total GHG emissions from manure management and application)

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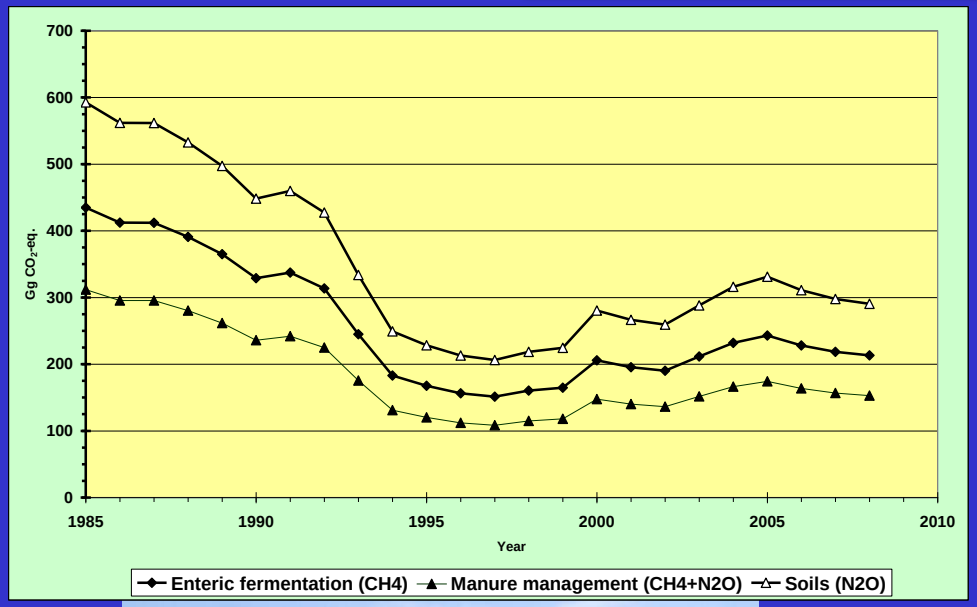
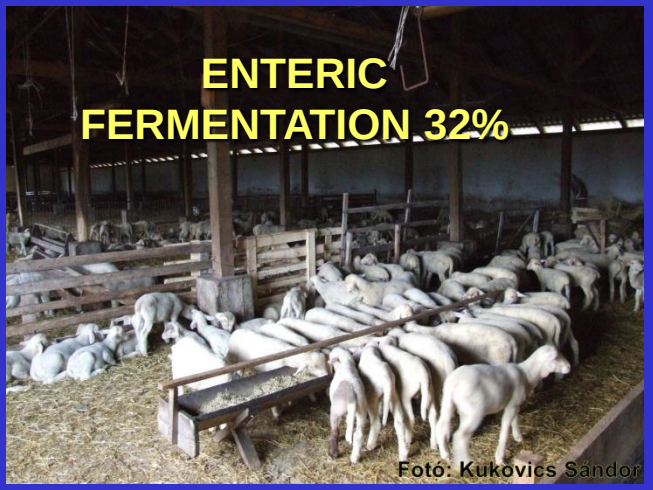
GHG EMISSIONS (N_2O AND CH_4, in CO_2-Eq.) FROM SHEEP SECTOR BETWEEN 1985 AND 2008 BY SOURCES (Gg year^{-1})





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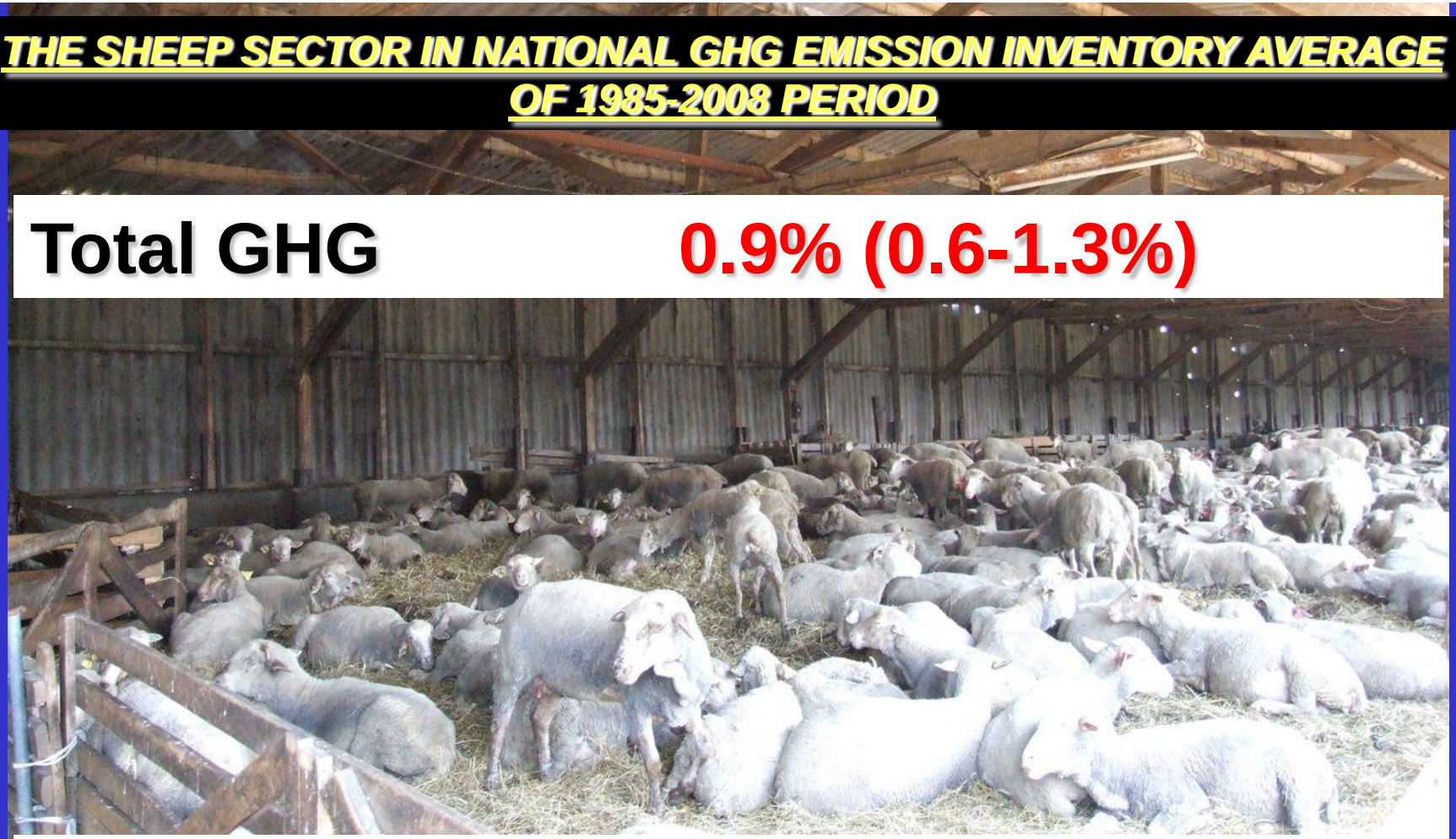
THE SHEEP SECTOR IN NATIONAL GHG EMISSION INVENTORY AVERAGE OF 1985-2008 PERIOD



Total GHG	**0.9% (0.6-1.3%)**
METHANE (CH_4)	**2.6% (1.7-3.6%)**
NITROUS OXIDE (N_2O)	**5.1% (3.8-8.3%)**

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COMPARISON OF GHG-EMISSIONS FROM SHEEP AND CATTLE PRODUCTION IN HUNGARY IN AVERAGE OF 2004 – 2008 PERIOD by ANIMAL

Sources / categories		Average sheep	Average cattle
All sources (enteric fermentation, manure management, soils)			
CH_4	kg head^{-1} yr^{-1}	8.2458	89.5866
N_2O	kg head^{-1} yr^{-1}	1.1107	4.3538
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg head^{-1} yr^{-1}	**517.4624**	**3'231.0093**
Enteric fermentation			
CH_4	kg head^{-1} yr^{-1}	8.0000	85.4187
N_2O	kg head^{-1} yr^{-1}	-	-
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg head^{-1} yr^{-1}	168.0000	1'793.7917
Manure management (stables and storage)			
CH_4	kg head^{-1} yr^{-1}	0.2458	4.1680
N_2O	kg head^{-1} yr^{-1}	0.3721	1.9866
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg head^{-1} yr^{-1}	120.5052	703.3779
Soils (incl. pastures)			
CH_4	kg head^{-1} yr^{-1}	-	-
N_2O	kg head^{-1} yr^{-1}	0.7386	2.3672
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg head^{-1} yr^{-1}	228.9571	733.8397

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COMPARISON OF GHG-EMISSIONS FROM SHEEP AND CATTLE PRODUCTION IN HUNGARY IN AVERAGE OF 2004 – 2008 PERIOD by BODY MASS

Sources / categories		Average sheep	Average cattle
All sources (enteric fermentation, manure management, soils)			
CH_4	kg kg^{-1} yr^{-1}	0.1666	0.1747
N_2O	kg kg^{-1} yr^{-1}	0.0224	0.0085
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg kg^{-1} yr^{-1}	**10.4537**	**6.3012**
Enteric fermentation			
CH_4	kg kg^{-1} yr^{-1}	0.1616	0.1666
N_2O	kg kg^{-1} yr^{-1}	-	-
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg kg^{-1} yr^{-1}	3.3939	3.4983
Manure management (stables and storage)			
CH_4	kg kg^{-1} yr^{-1}	0.0050	0.0081
N_2O	kg kg^{-1} yr^{-1}	0.0075	0.0039
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg kg^{-1} yr^{-1}	**2.4344**	**1.3718**
Soils (incl. pastures)			
CH_4	kg kg^{-1} yr^{-1}	-	-
N_2O	kg kg^{-1} yr^{-1}	0.0149	0.0046
Total GHG (CH_4+N_2O) in CO_2-equivalent	kg kg^{-1} yr^{-1}	**4.6253**	**1.4312**

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NECESSARY CONDITON OF SUSTAINABLE AGRICULTURAL PRODUCTION IS DEVELOPMENT AND IMPLEMENTATION OF LOW-EMISSION PRODUCTION SYSTEMS

⇩

REDUCTION OF GHG EMISSIONS FROM ANIMAL PRODUCTION IS NECESSARY

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REALISTIC MEASURES FOR REDUCTION OF METHANE (CH_4) EMISSIONS IN RUMINANT SECTOR

NUTRITION

INCREASING OF CONCENTRATE AND FAT IN RATION

but: possibilities are limited (digestion physiology, increasing of concentrate feeding in ruminant sector is not practical)

MANURE MANAGEMENT

SUITABLE (LOW-EMISSION) STORAGE METHODS

but: conflicts between methane, nitrous oxide and ammonia reduction

(⇩CH_4 ⇨ N_2O⇧, ⇩CH_4 ⇨ NH_3 ⇧)

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REALISTIC MEASURES FOR REDUCTION OF NITROUS OXIDE (N_2O) IN RUMINANT SECTOR

NUTRITION

OPTIMIZATION OF PROTEIN FEEDING

but: possibilities are more limited in ruminants, especially in sheep, than in pig or poultry

MANURE MANAGEMENT

SUITABLE STORAGE AND APPLICATION METHODS (MORE LIQUID MANURE SYSTEMS)

but: conflicts between nitrous oxide, methane and nitrate reduction

(⇩N_2O ⇨ CH_4⇧, ⇩N_2O ⇨ nitrate⇧)

GRAZING

REDUCTION OF GRAZING TIME

but: ecological, environmental protection and animal welfare conflicts

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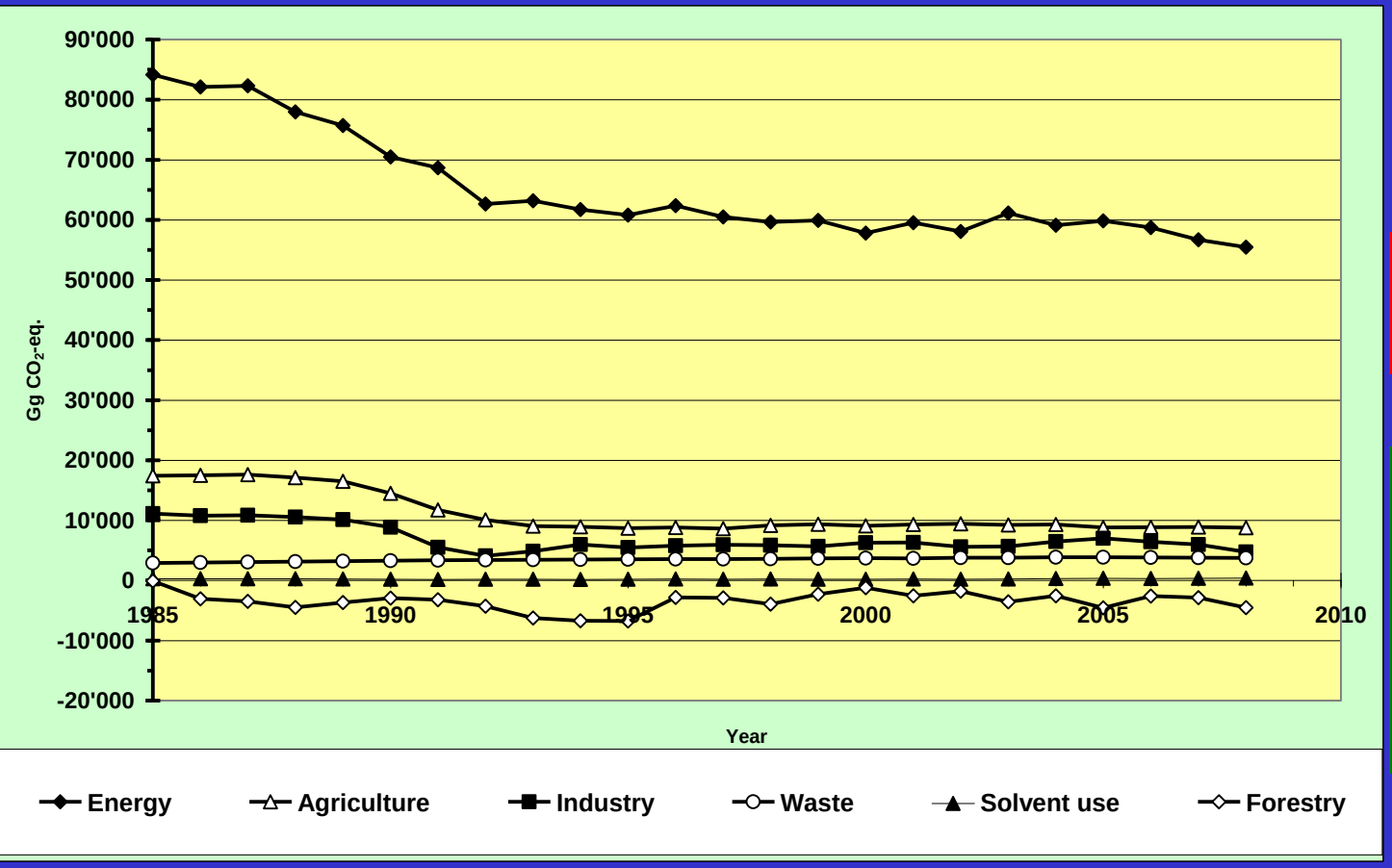

Energy

⇨ 78% (73-84%)

Agriculture

⇨ 13% (11-16%)

With energy use:

16% (13-20%)

Sheep sector < 1%

(100% = total GHG emissions from Hungarian national economy)

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THE LAST QUESTION TO BE ANSWERED:

HAVING ALL OF THESE DATA KNOWN,

- **HOW ADEQUATE TO CONCENTRATE ON TO**
- **DECREASE THE GHG EMISSION OF SHEEP (AND PROBABLY CATTLE AND GOAT) SECTOR?**

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THANK YOU FOR YOUR ATTENTION!

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