Impact assessment of a possible modification of the IPPC Directive

G.J. Monteny, H.P. Witzke & D.A. Oudendag

Alterra, Wageningen, 31 May 2007

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Service contract "Integrated measures in agriculture to reduce ammonia emissions"
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Task 4

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Content

EXECUTIVE SUMMARY

This (draft) report describes the (preliminary) results of a study conducted on the Impact assessment of a possible modification of the IPPC directive (Task 4), as a part of the Service Contract on Integrated Measures in Agriculture to reduce Ammonia Emissions. Task 4 consists of the following sub-tasks:

4.1: Data gathering of the current situation (EU-25)
4.2. Broad assessment of various options for lowered IPPC thresholds for pigs and poultry and for possible thresholds for cattle rearing
4.3. In-depth, integrated assessment of lowering the current thresholds

As to date most of the work on sub-task 4.1 has been finished, whereas the work on the other sub-tasks is ongoing.

The data collected under this task are exchanged with the other members of the Consortium (Alterra, EUROCARE, IIASA) to eventually assess the impact of the IPPC Directive and possible modifications of the thresholds in terms of environment (ammonia, greenhouse gases, nitrate), economical issues and social aspects.

Data have been gathered on the following topics (per Member State and for EU-25):

- Farm size distribution (pigs, poultry, cattle) – 2003 data from EUROSTAT
- Trends in livestock and farm sizes – to be included
- IPPC permitting situation – data from summer 2006; newest ENTEC data (autumn 2006) to be included
- Environmental legislation concerning livestock production – from various sources
- Best Available Techniques (BAT) and penetration – based on IIASA-RAINS

Based on the 2003 ***farm size distribution data***, the following numbers of farms and animals (total and for IPPC farms) can be summarized:

	Farms (unit)		**Animals (in million head)**	
	Total	IPPC	Total	IPPC
Fattening pigs	1.927.260	6.040	150.0	23.8 (15.9%)
Sows	769.070	2.360	16.1	3.6 (22.3%)
Laying hens	3.017.570	2.450	460.8	270 (58.5%)
Broilers	1.147.190	5.180	839.3	539 (64.3%)

These data show that the total number of IPPC farms (>2,000 fattening pigs; >750 sows; >40,000 poultry) in the EU-25 is around 16,000. This is less than 0.1% of the total number of farms in the EU-25. On these farms, 16% of the total number of fattening pigs, 22% of the total number of sows, and around 60% of the total number of poultry is kept.

The graphs below summarize the farm size distribution for EU-25, for fattening pigs, sows, laying hens, and broilers. The numbers represent the total number of animals and the total number of farms for various farm size classes.

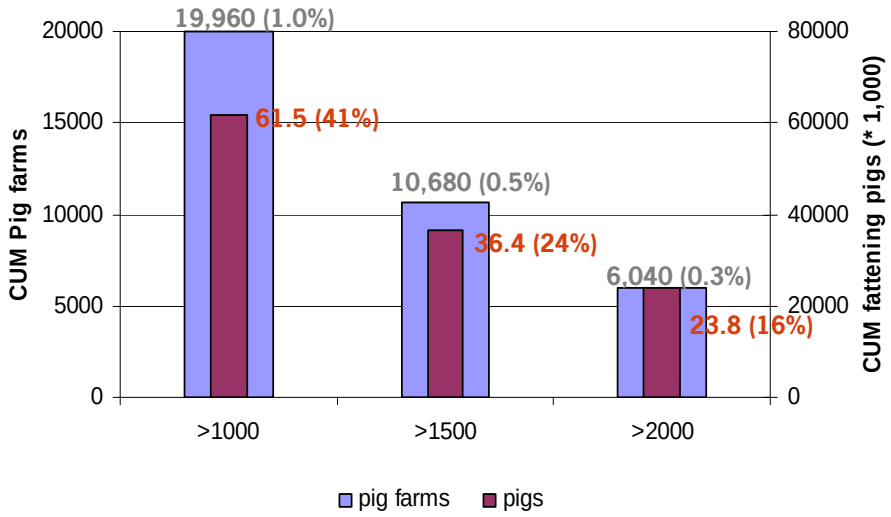

Figure A. Number (and % of total) of pig farms and number of fattening pigs for various farm size classifications.

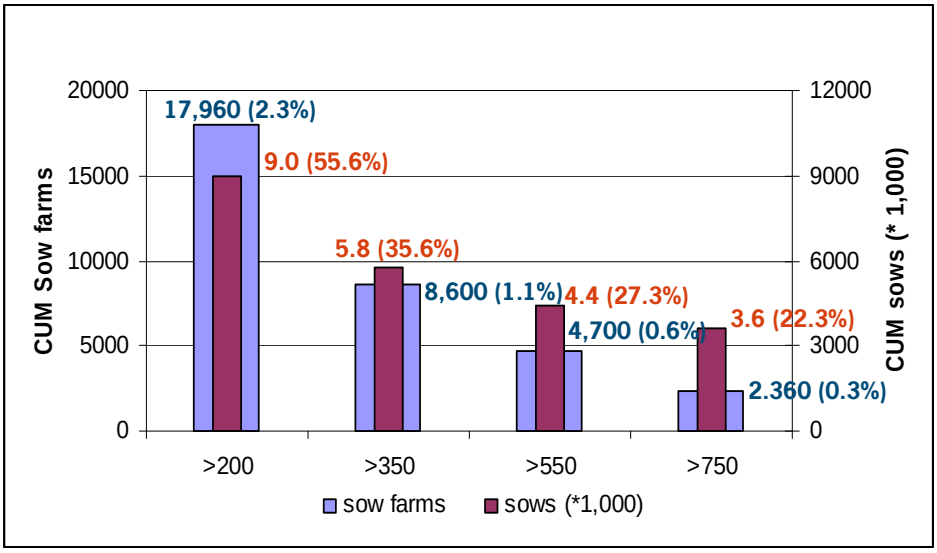

Figure B. Number (and % of total) of sow farms and number of sows for various farm size classifications.

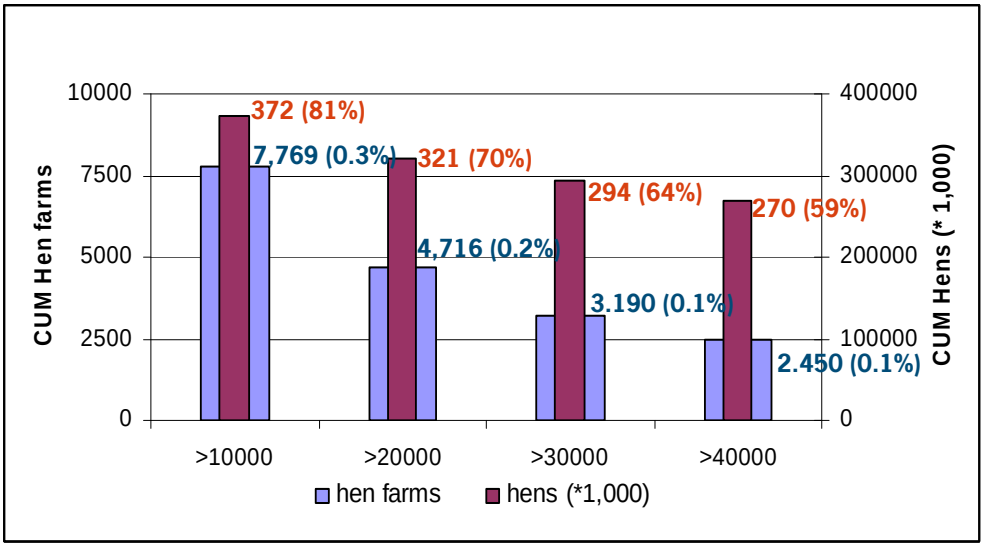

Figure C. Number (and % of total) of laying hen farms and number of laying hens for various farm size classifications.

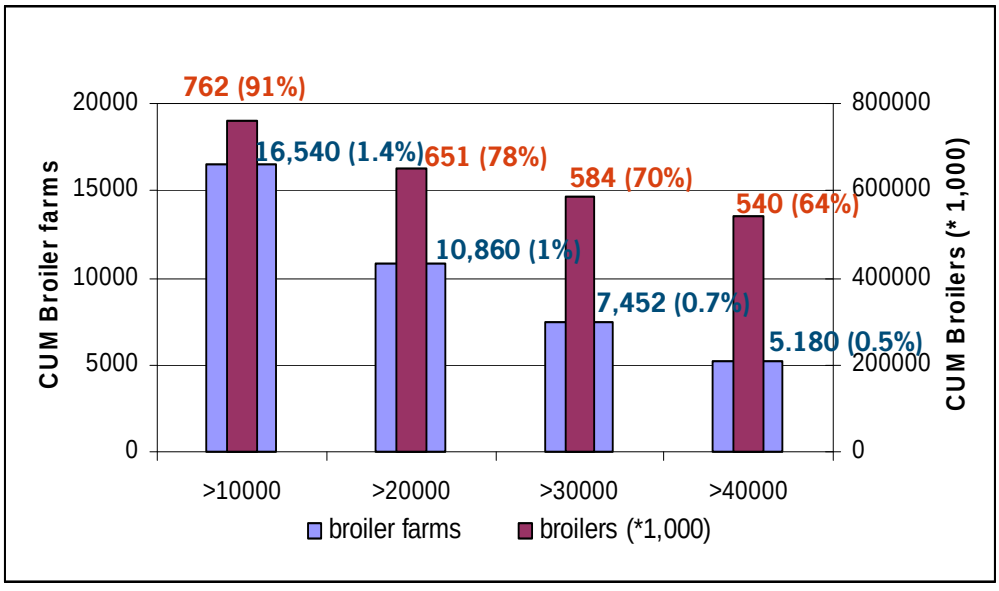

Figure D. Number (and % of total) of broiler farms and number of broilers for various farm size classifications.

The ***permitting situation*** in EU-25 described in the current draft report is based upon the situation around summer 2006. The information has recently been updated (ENTEC report October 2006), but not yet included in the MS fiches in this report.
The following MS have not provided information about the permitting situation:

- IT, SK

The other MS have provided full or partial information, whereas IPPC is not relevant for LU and MT as regards intensive rearing.

The permitting situation in EU-25 is summarized below:

	IPPC farms (Eurostat 2003)	**Existing IPPC installations (ENTEC)** Autumn 2006	**Permitting situations (autumn 2006; ENTEC data)**		
			New permits	Pre-IPPC permits	Outstanding
Fattening pigs	6.040	4.099	845	809	737
Sows	2.360	1.311	318	177	179
Laying hens	2.450	7.201	1.884	1.317	3.315
Broilers	5.180				

The difference between the IPPC farms according to Eurostat and the existing IPPC installations (especially for the pig sector) is probably mainly due to absence of information from the previously mentioned MS (IT and SK). Some 25% new permits has been issued. A large percentage of the permits are either pre-IPPC, or outstanding.

Environmental legislation in each MS has been addressed for most of the MS. The level of detail is still low, and further verification is required. A number of MS have IPPC based legislation (permitting), whereas other MS have wider legal framework taking into account for instance the national environmental situation, and international obligations, e.g. deriving from the Gothenburg Protocol (UNECE/CLTRAP).

Per MS, an inventory is presented of the way that ***Best Available Techniques*** (BAT) are used in practice for the whole sector (beyond IPPC installations). This work is conducted in close collaboration with IIASA. BAT and their penetration (use) in practice is presented using IIASA-RAINS categories:

- Low Emission Feeding
- Low Nitrogen Application
- Stable Adaptation
- Covering of Storage
- Combination of measures

Information is presented for pigs (fattening pigs, sows) kept on systems where liquid manure (slurry) is produced, and for laying hens and broilers in general. The percentage of penetration represents the % of total number of animals (not just in IPPC installations) that are kept in husbandry systems where one or more of the Best Available Techniques is used.
The evolution of penetration is assumed to represent the situation between now and 2020, where in particular full implementation of BAT for all animals kept on IPPC farms is achieved (assuming no changes in farm size distribution or modified IPPC thresholds).

For the analysis of the impact of lowering IPPC thresholds for intensive rearing of pigs and poultry, and inclusion of new thresholds for cattle, N excretion was used as a basis to make scenarios with comparable thresholds. The following scenarios were analysed:

	Scenario 2020 Current IPPC	**IPPC1**	**IPPC2**	**IPPC3**
Fattening pigs	> 2,000	> 2,000	> 1,750	> 1,500
Sows	> 750	> 750	> 675	> 600
Hens	> 40,000	> 27,500	> 25,000	> 20.000
Broilers	> 40,000	> 37,000	> 32,000	> 27,000
Dairy cows	-	> 450	> 400	> 350
Other cattle	-	> 1,000	> 850	> 700

The % of animals and number of farms included in these scenarios are:

	Scenario 2020 Current IPPC		**IPPC1**		**IPPC2**		**IPPC3**	
	% animals	# farms	% animals	# farms	% animals	# farms	% animals	# farms
Fattening pigs	15.9	6040	15.9	6040	20.1	8360	24.3	10680
Sows	22.3	2380	22.3	2380	24.2	3238	26.1	4115
Hens	58.5	2450	65.4	3572	66.8	3953	69.6	4716
Broilers	64.3	5180	65.9	5862	68.5	6998	72.0	8474
Dairy cows	0	0	9.7	7283	11.1	9357	12.5	11430
Other cattle	0	0	0.9	383	2.8	1149	5.7	2298

The most stringent IPPC thresholds in this study results in a coverage of around 25% for the pig sector, 70% for the poultry sector, 12,5% for dairy cows, and nearly 6% for other cattle. The total number of farms included in the scenarios increases from 16,000 for the current IPPC to nearly 42,000 for the IPPC3 scenario. The latter number is fairly equally distributed over pigs, poultry, and cattle.

A summary of NH_3 emission in 2020 for various scenarios, compared to current IPPC thresholds (in 1,000,000 kg or kton NH_3), shows the following results. In the analysis, each scenario was calculated with and without the inclusion of Low Nitrogen Application in the IPPC permits:

	Current IPPC	IPPC1	IPPC2	IPPC3	IPPC1+ LNA	IPPC2+ LNA	IPPC3+ LNA
Total NH3 emissions agriculture	2,800	2,771	2,763	2,751	2,726	2,712	2,691
Difference with current IPPC (kton)	-	30	37	49	74	88	110
in % compared to current IPPC	-	98,9	98,7	98,2	97,4	96,9	96,1

These data show that the maximum emission reduction achieved is 110 kton, for scenario IPPC3. Low Nitrogen Application contributes 61 kton to this.
Most important trade offs when reducing NH_3 emissions are in the nitrogen cycle. Lowering the IPPC thresholds appeared to have very little adverse effects on the loss of nitrogen through nitrate leaching. Nevertheless, the loss of nitrous oxide was found to increase by 1.5-3.3%, depending on the scenario. Methane emissions were not affected.

The key results from the CAPRI simulations are collected in the following table, taking into account that emissions reported differ (slightly) from the emissions and losses calculated with MITERRA-EUROPE.

	agric income [m €]	consumer welfare [m €]	total econ welfare [m €]	total NH3 loss [kton]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
IPPC1	-240	-236	-532	-47	5	7	-3
IPPC2	-392	-471	-980	-63	5	8	-5
IPPC2 + more LNA	-482	-640	-1239	-107	5	12	-3
IPPC3	-558	-686	-1425	-85	4	9	-7
IPPC3 + more LNA	-655	-877	-1712	-138	4	304	-5

	abatement relative to welfare cost estimate NH3 [g / €]	CH4 [g / €]	N2O [g / €]	leaching [g / €]
IPPC1	88	-10	-13	5
IPPC2	65	-6	-8	5
IPPC2 + more LNA	86	-4	-10	3
IPPC3	60	-3	-6	5
IPPC3 + more LNA	81	-2	-177	3

A substantial reduction of the NH_3 emission in 2020 due to a more stringent IPPC Directive can only be realized when many more farms will fall under the Directive. The maximum reduction from this study is 110 kton (from MITERRA-EUROPE). Quite some efforts and costs are needed in terms of numbers of permits, administrative costs for this extra permitting, and implementation of emission reducing technologies to achieve the reduction. When the outcome of the calculations for 2000 and 2020 are compared, more effect is seen from a more strict application of the current IPPC Directive (including low nitrogen application and low nitrogen feeding) than from lowering thresholds. Especially when considering the difference between European and MS related interpretation of the IPPC Directive, more effort is needed to improve compliance on MS level with the IPPC Directive as it is.

1 1 INTRODUCTION

At the end of 2005, DG Environment issued a Service Contract on Integrated Measures to reduce Ammonia Emissions, hereafter indicated as the Service Contract (or SC). The SC originates from the recently adopted Thematic Strategy on Air Pollution (TS). The objective of this Strategy is to meet the objectives of the 6th Environmental Action Plan (EAP), which have the aim of "achieving levels of air quality that do not give rise to significant negative impacts on and risks to human health and the environment". The "Clean Air for Europe" (CAFE) program has produced the scientific basis for the Strategy'. Various health and environmental ambition levels for 2020 have been evaluated and a global ambition level has been proposed in the Strategy.

Ammonia emissions contribute to the eutrophication and acidification, and to the formation of secondary particulate matter in the atmosphere. The main source of ammonia emission is agriculture (cattle farming for about 40%, pig and poultry - 40%, and the use of N-fertilisers, -about 20%). This ammonia emission and its impacts have been quantified using the RAINS model developed by IIASA. The model allows to identify the most cost effective packages of measures to meet various environmental and health objectives, such as the objectives of the Strategy. Different abatement technologies and associated costs are included in the model. The data on abatement technologies used in the RAINS model are based amongst others on bilateral consultations with the Member States and on the guidelines for ammonia abatement developed and updated by Working Group on Ammonia Abatement of the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP).

In the evaluation of the measures aimed at reducing ammonia emissions, the necessity and the interest of an integrated approach to the nitrogen cycle (N cycle) as a whole was highlighted, in order to address ammonia, but also nitrous oxide (N_2O) and nitrate emission. Moreover, it shall also cover methane emissions.

Finally, in the framework of the revision of NEC directive, a new baseline scenario has been developed by IIASA and was submitted to consultations with stakeholders. This new baseline includes new energy and agriculture projections integrating the measures taken by the Member States in order to meet the objectives of the Kyoto protocol. The impact of the CAP reform has also been integrated. The new baseline was presented at a meeting with stakeholders in September 2006[1]

1.1 Objectives

The objective of the SC is to define and assess the most appropriate integrated and consistent actions to reduce various environmental impacts (notably water, air, climate change) from agriculture. Specifically, simple methodology is developed and used, allowing to assess and to quantify the costs and the effects of various policies and measures aiming at reducing the impact of agriculture on water air pollution and climate. Both ancillary benefits and trade offs of measures need to be identified. The impacts and feasibility of the most promising measures needs to be analysed in depth.

[1] See web page: http://ec.europa.eu/environment/air/conf_air.htm

1.2 Overview of the Service Contract and a detailed description of the task related to IPPC

In the SC, the following five tasks are allocated:
1. Develop an integrated approach.
2. Analysis of International and European instruments
3. In depth assessment of the most promising measures
4. Impact assessment of a possible modification of the IPPC directive
5. Stakeholder consultation, presentations, workshops.

The terms of reference of the service contract can be found on http://ec.europa.eu/environment/air/cafe/activities/ammonia_en.htm.

Task 4: Impact Assessment of a possible modification of the IPPC directive

One of the proposed measures of the TS is the assessment of the extension of the IPPC directive to intensive cattle rearing installations and a possible revision of the thresholds for intensive rearing installations of pigs and poultry', taking into account the impact of the CAP reform as well as the possible evolution of the farming structure in the new Member States. The division into sub-tasks is as follows:

Sub-task 1. Data gathering on the current situation: For each Member State, the following information is gathered:

a) Pig and poultry installations:

(1) the number of installations linked with the number of animals with a clear distinction between those already covered by IPPC and the others

(2) a quantitative estimation of the environmental impacts for each size-category of installation

(3) level of variation of environmental performance across the EU (4) estimation of the impacts of implementing the IPPC Directive (reduction of the environmental impacts/estimation of the economic and social impacts);

b) Cattle installations:

(1) the number of installations linked with the number of animals with a clear distinction between those already covered by national permitting legislation (which can be based on the concept of BAT or can fix minimum standards for the operation of such installations)

(2) a quantitative estimation of the environmental impacts for each size-category of installation

(3) a description of the current regulation of this sector across the EU (4) level of variation of environmental performance across the EU.

Sub-task 2. Definition and broad assessment of various options

On the basis of existing legislation in the Member States and on the basis of its own expertise, various realistic options will be proposed (at least 3 different options) for lowering the current thresholds (and introducing a new threshold for cattle installations).

The implications of various possible thresholds for each of these activities will be assessed for each country and for the EU as a whole. This includes at least an assessment of:

(1) the number of installations which could be concerned (additionally to those already covered by IPPC and/or national legislation)

(2) on the basis of possible BAT ("Best available techniques"), emission reductions at least of ammonia, methane and N emissions as well as, on the basis of the results of task 1, the implications on nitrate emissions

(3) costs and benefits. Costs evaluation will include in particular the up take of BAT and the administrative burden (e.g. permits application, costs for authorities for issuing permits and controlling the installations).

All the scenarios should be compared to a "do nothing scenario", including in particular the application of the current Community framework (in particular the nitrate directive, the water framework directive and CAP). On this basis, the potential added value of a possible extension of the IPPC directive will be discussed.

In order to calculate the potential impact of these options, the possible BAT for cattle farming needs to be assessed. This should be done on the basis of the existing BREF on intensive livestock, definition of BAT, current standards in Member States and comparison with the technologies integrated in RAINS. For cattle installations, for which the BAT are not yet defined at EU level, main elements of a possible BAT will be defined, and their associated costs, notably on the basis of existing national legislation and permitting rules which will be summarised in the report. Particular focus should be set on feeding strategies, housing techniques, storage of manure and spreading of manure.

Sub-task 3. Assessment of the impacts of lowering the current thresholds:

On the basis of the results of the sub-task 2one level of threshold will be chosen for each activity and in depth assessed in respect of the guidelines on impact assessment as established by the Commission. In addition to the impacts already analysed in sub-task 2, local disturbance (odour, noise) and diffuse spreading of heavy metals and as well as social impact will notably be assessed. The social impact will need to take account of the economic state of the sector and the extent to which applying IPPC would affect the ability of farmers to keep operating, employment, etc. In order to reduce the possible social impact, it is expected from the contractor to identify possible European accompanying measures.

The final output of this task will be a technical report covering the task and sub-tasks as defined above accompanied with a complete proposal of impact assessment for the selected scenario for each sector strictly respecting the guidelines on the impact assessment as established by the Commission.

1.3 Introduction to the report

In this draft report, the main results of the work conducted under Sub-Task 4.1 of the SC are described. The main purpose of this draft report is to offer a basis for stakeholder consultation on the data collected per MS and to inform about assumptions made for model calculations (RAINS, MITERRA-EU, CAPRI) for various scenario's.

It contains the information on MS level, relevant to the scope of the task and sub-tasks. For each MS, the following information is gathered and presented:

- Farm size distribution (pigs, poultry, cattle)
- Trends in livestock and farm sizes
- IPPC permits
- Environmental legislation concerning livestock production
- Best Available Techniques (BAT) and penetration

Farm size distribution

Graphs are presented on:

- number of fattening pigs and sows per farm size category (2 graphs)
- number of laying hens and broilers per farm size category (2 graphs)
- number of cattle and dairy cows per farm size category (2 graphs)

Data were derived from EUROSTAT and are presented for 2003, including numbers and percentages of farms and animals covered by IPPC.

IPPC permits

A table is presented per MS about the most recent permitting situation. MS provided data from mid 2006 mostly. They relate to:

a. existing installations
b. new permits granted
c . pre-IPPC permits not updated
d. pre-IPPC permits updated
e. outstanding permits

The number of existing installations (a) should be equal to the SUM of b, c, d, and e. This is not always the case, and if so, this needs to be verified.

The numbers of existing IPPC installations for intensive rearing of pigs and poultry are compared with the IPPC farms, based upon EUROSTAT data (2003). Also, the % of each animal category covered by IPPC (according to EUROSTAT data) is presented.

Environmental legislation concerning livestock production

Information is obtained from literature, the consultant network and other sources. Aim is to present a comprehensive overview of environmental legislation where IPPC and/or BAT is or could be embedded in. It may also offer a basis for the legislation related aspects of the assessment of the possible IPPC thresholds for cattle.

Best Available Techniques and penetration

This section is produced in close collaboration with IIASA, who has used a MS based inquiry (questionnaire) and their MS network as a basis. That information was integrated with the information derived in the framework of this study (SC), to create inputs to a 'baseline scenario' for the development of NH_3 emission between 2000 and 2020. A table is presented with the Best Available Techniques (BAT) applied in pig and poultry husbandry in each MS in 2000, 2005, 2010 and 2020. The figures in this table indicate the percentage (%) of all animals that are kept in systems where the respective low emission systems (BAT) is or are used. This way of expressing is related to the RAINS methodology. For the latter years, full implementation of BAT on all IPPC farms (and for

all animals covered by IPPC based upon the 2003 data) is in particular assumed. Developments in farm size distribution are not taken into account. However, in the RAINS scenario's, evolutions in animal numbers per MS, including CAP reform, are accounted for. In the next reporting period of the SC, assumptions will be included about the changes in farm size distribution.
The categories are according to the RAINS model, and a reference is made to the legislation if applicable. The following categories are possible:

- Low Emission Feeding (LNF)
- Low Nitrogen Application (LNA)
- Stable Adaptation (SA)
- Covering of Storage (CS)
- Combination of measures (e.g.: SA_LNA)

LNF basically means feeding animals with a lowered (e.g. 17% for pig diets) amount of Crude Protein (CP). LNA is possible with techniques that have low (e.g. incorporation of manure within 24h after application) or high efficiency (e.g. shallow injection on grassland, direct incorporation of manure after application). When SA is used, CS is included according to the RAINS terminology. This means that an emission reducing (adapted) stable also includes high efficient covering of manure storage. CS can also be of low (e.g. natural crust) or high efficiency (tent, floating foil).

Results

Results are presented on ammonia emissions, trade offs in terms of losses of nitrate and emissions of nitrous oxide and methane. Finally socio-economic impacts of lowered thresholds are presented in detail.

2 DESCRIPTION AND ANALYSIS OF THE ACTUAL SITUATION PER MEMBER STATE

Most of the information presented in this Chapter is taken from data provided by EUROSTAT. During the project, consultation with the MS representatives in the IPPC Advisory Board revealed that some MS had access to improved or more detailed information. Approximately 10 MS replied with a variety (in quality and quantity) of information, especially concerning animal numbers, farm size distribution, and environmental legislation. This information was analyzed, discussed and shared with IIASA. The information was included in the paragraphs below, as well as in the input files for the models. In case of doubt or uncertainty of the basis of the information (e.g. when literature references or sources were lacking or insufficiently clear), the MS information is included in the text below in *'italic'* and not used in the models.

2.1 Belgium

2.1.1 Farm size distribution

Pigs

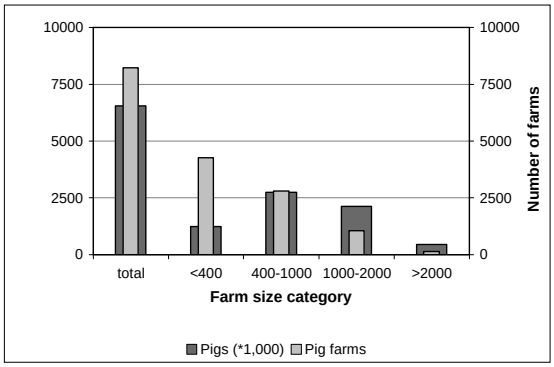

Figure BE1a. Number of pig farms and pigs per size category.

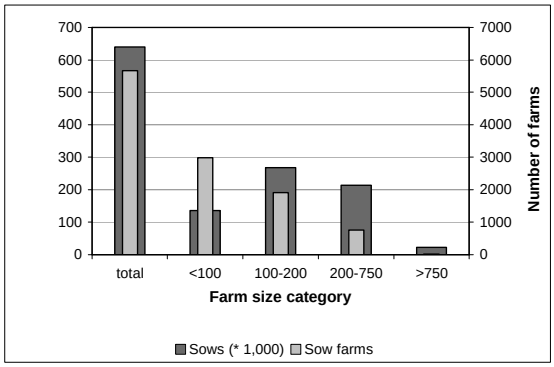

Figure BE1b. Numbers of sow farms and sows per farm size category.

Most of the Belgium fattening pig farms (>30 kg) have less than 400 animals, whereas most of the fattening pigs are kept on farms with 400-1,000 and 1,000 – 2,000 animals. There are 140 IPPC pig farms (> 2,000 head), which is 2% of the total number of pig farms. On these farms, 7% (451,000 head) of the fattening pig herd is kept. Sows are mainly kept on farms with 100 – 750 animals, but most sow farmers keep 100 animals or less. On the 20 (0%) IPPC sow farms, 22,000 sows (3% of the total herd of sows) are kept.

Poultry

In Belgium, most laying hen and broiler farms have less than 10,000 animals. Around 2% of the laying hen farms (100) have more than 40,000 animals; on these farms, 50% of the total number of hens is kept. On some 10% (120) of the broiler farms, more animals are kept than the IPPC threshold; on these farms, there are around 8 million (46% of the total number of broilers) animals.

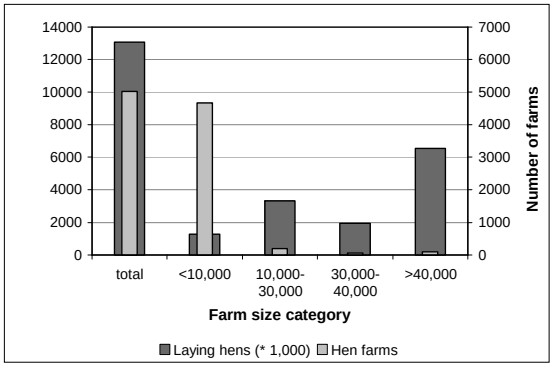

Figure BE2a. Number of laying hen farms and hens per farms size category.

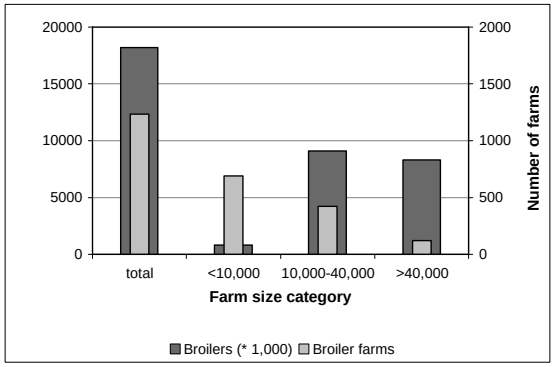

Figure BE2b. Numbers of broiler farms and broilers per farm size category.

Cattle

In 2003, Belgium (Flanders, Wallonia, Brussels) had 33,610 cattle farms, of which 16,570 are dairy farms (50%). The total number of cattle was 2,778,080 head, of which 585,400 (20%) were dairy cows.

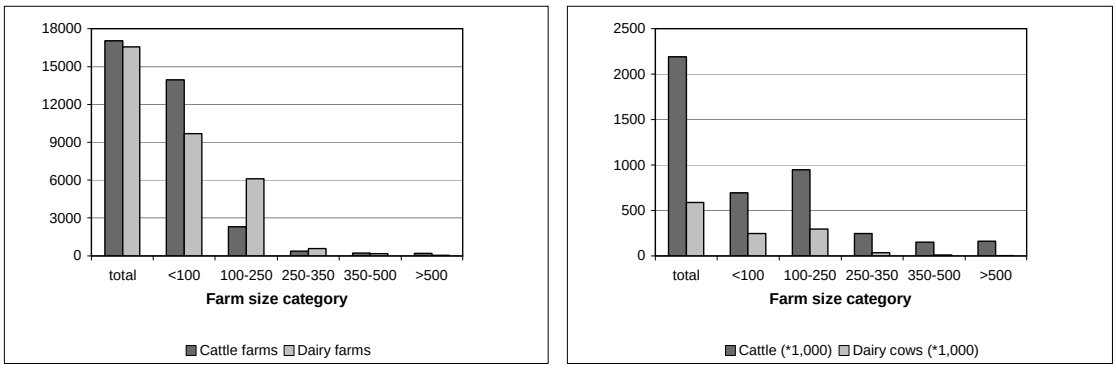

Figure BE3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

Figure 2a shows that 7,000 farms have 20-50 cattle, whereas this figure is around 3,000 for dairy cows. An approximate equal number of farms (around 8,500) have 50-100 and 100-500 head of cattle, whereas this is approximately 6,000 for dairy cows. The vast majority of cattle and dairy cows (>80%) is kept on farms with a size of 50 head of animals or more.

2.1.2 IPPC permits

Table BE1. Overview of animals covered by IPPC and IPPC permits in Belgium (latest MS information of January 2007 is presented between parentheses).

	Fattening pigs	**Sows**	**Laying hens**	**Broilers**
% of animals covered by IPPC (2003 data)	7%	3%	50%	46%
IPPC farms according to EUROSTAT	**140**	**20**	**100**	**120**
Existing installations	**13 (237)**	**0 (21)**	**562 (334)**	
New permits granted	0	0	0	
Pre-IPPPC permits reconsidered but not updated	0	0	0	
Pre-IPPC permits reconsidered and updated	224	21	314	
Outstanding permits	13	0	20	

Based on the most recent MS information (January 2007), the number of existing installations for fattening pigs and poultry are higher than the IPPC farms according to EUROSTAT, whereas good accordance is shown for sows.
The vast majority of the IPPC farms have updated pre-IPPC permits; only few permits are outstanding.

2.1.3 Environmental legislation concerning livestock production

General

Source: P. De Clercq, J. Salomez an G. Hofman. In : Nutrient Management Legislation in European Countries, P. De Clerq et al., 2001.

The federal authorities of Belgium ratified the NEC Directive in 2001. The total emission ceiling of 74 kton of NH_3 in 2010 was divided over Flanders and Wallonia in the ratio 45/29 kton. Belgium has also adopted the IPPC Directive, taking into account the formal dates set for application of BAT on newly built farms (buildings) and existing installations.

Flanders

Following the Environment and Nature Plan (MINA), issued in 1989, a manure decree was launched in 1991. This decree is the transposition of the Nitrate Directive. In the last amendments, originating from 2000, limits are set to the amount of N and P from organic manure, including those deposited during grazing, and inorganic fertilisers. Since January 2007, a new manure decree is implemented. Similar to the Netherlands, the Manure Bank takes care of transport and processing of animal manure from regions with a surplus to regions with a shortage, within the legislative boundaries. Concerning low-emission manure application, strict rules for the use of low-emission techniques apply as of 2003.
General and sectoral regulations concerning environmental hygiene are laid down in the so called “VLAREM” legislation. Within this legislation, high efficiency covering of outside slurry storage facilities is obligatory since 1995. Recently (2003), an amendment was adopted on the direct implementation of low emission housing systems on newly built farms and for newly built farm houses for pig and poultry. All permits issued in this framework are based on BAT and are in accordance with IPPC. Furthermore, a covenant was signed between the Flemish government and the Flemish association of animal feed

producers on the application of low nitrogen (crude protein; e.g. maximum 16% CP for fattening pigs and laying hens) animal feeds in pig and poultry husbandry. This covenant has entered into force on 1 July 2006, and is valid until 31 December 2006 and will be renewed or revised on a yearly basis.

Wallonia
Walloon environmental legislation concerning animal production is mainly directly related to the Nitrate Directive. Both a Code of Good Agricultural Practice (whole territory) and an Action Plan (relevant for the Nitrate Vulnerable Zones) are in action, mostly setting limits to the time of manure application, and the amounts of nutrients (<350 kg/ha) used for crop production. A detail is the need for farmers to make a soil assessment at farm scale to determine their potential ground water pollution. No specific ammonia related regulations are in force (*to the knowledge of the advisors*).

Specific elements for pig and poultry husbandry
In the scope of VLAREM II, newly built animal housing systems (farms) have to implement BAT techniques to reduce ammonia emissions as of 2003 onward. In the framework of the IPPC Directive, all farms will have to comply by October 2007, meaning that all farms will have to apply BAT techniques.

Specific element for cattle husbandry
Besides the VLAREM II measures on low emission slurry application and storage covering (only outside the farm buildings), no specific animal housing system or diet related regulations are in force.

2.1.4 Best Available Techniques and penetration

Below, the penetration % of BAT for Belgium are summarized.

TableBE2. Overview of Best Available Techniques and their penetration in the Belgium (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3_LNA
DAICOW_l	CS_high	42	48	64	64	64	64		64	64	64
DAICOW_l	CS_low	28	30	17	17	17	17		17	17	17
DAICOW_l	LNA_high	12	13	64	64	64	64		64	64	64
DAICOW_l	LNA_low	41	48	0	0	0	0		0	0	0
DAICOW_s	LNA_high	0	33	35	35	35	35		35	35	35
DAICOW_s	LNA_low	66	36	34	34	34	34		34	34	34
LAYHENS	LNA_high	89	89	89	89	89	89		89	89	89
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
LAYHENS	SA	80	84	84	84	84	84		84	84	84
LAYHENS	CS_high	80	84	84	84	84	84		84	84	84
LAYHENS	LNF	0	0	0	0	0	0		0	0	0
OCOW_l	CS_high	41	47	60	60	60	60		60	60	60
OCOW_l	CS_low	29	30	20	20	20	20		20	20	20
OCOW_l	LNA_high	9	10	60	60	60	60		60	60	60
OCOW_l	LNA_low	41	47	0	0	0	0		0	0	0
OPOUL	LNA_high	63	74	78	78	78	78		78	78	78
OPOUL	LNA_low	6	6	4	4	4	4		4	4	4
OPOUL	SA	10	10	10	49	54	60		49	54	60
OPOUL	CS_high	10	10	10	49	54	60		49	54	60
OPOUL	LNF	0	0	0	0	0	0		0	0	0
OCOW_S	LNA_high	0	27	28	28	28	28		28	28	28
OCOW_S	LNA_low	63	38	37	37	37	37		37	37	37
PIGS_l	LNA_low	85	78	69	69	69	69		69	69	69
PIGS_l	LNA_high	8	11	25	25	25	25		25	25	25
PIGS_l	SA	14	20	25	25	25	25		25	25	25
PIGS_l	CS_high	14	20	25	25	25	25		25	25	25
PIGS_l	LNF	0	0	0	0	0	0		0	0	0
PIGS_S	LNA_high	0	63	67	67	67	67		67	67	67
PIGS_S	LNA_low	71	12	8	8	8	8		8	8	8
SHEGOA	LNA_high	0	40	42	42	42	42		42	42	42
SHEGOA	LNA_low	44	7	5	5	5	5		5	5	5

The Belgium national legislation is predominant. This means that all animals are subject to Best Available Techniques and that application of the IPPC hardly has any effect on the % of animals that are kept on any Best Available Technique. Only for ‘other poultry’ (broilers), lowering the IPPC threshold results in more animals kept on BAT-systems.

2.2 Czech Republic

2.2.1 Farm size distribution

Pigs

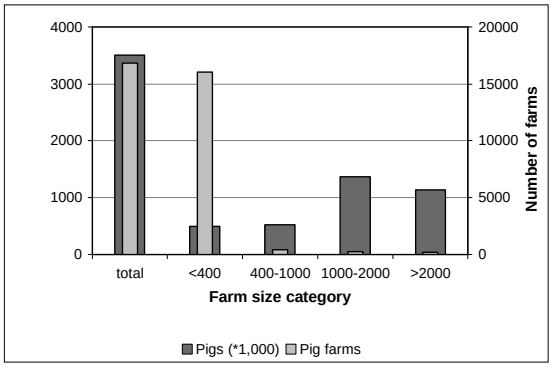

Figure CZ1a. Number of pig farms and pigs per size category.

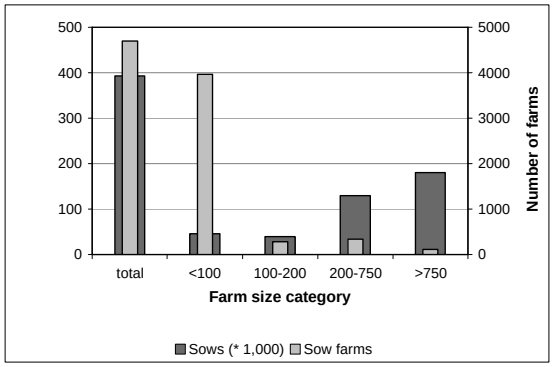

Figure CZ1b. Numbers of sow farms and sows per farm size category.

Nearly all Czech fattening pig farms have less than 400 animals. On the 180 (1%) IPPC pig farms (> 2,000 head), 1.14 million animals are kept (32%). Similarly, most of the sow farms host less than 100 animals, but the vast majority of the sows are kept on farms with over 200 animals. The 110 (2%) IPPC sow farms (> 750 animals) house 180 thousand animals (46%).

Poultry

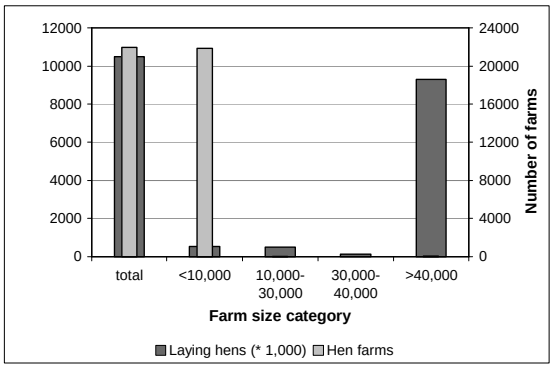

Figure CZ2a. Number of laying hen farms and hens per farms size category.

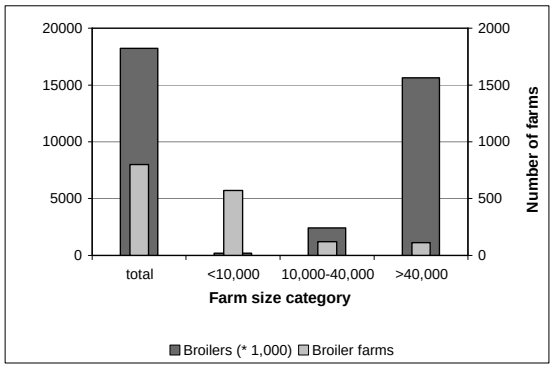

Figure CZ2b. Numbers of broiler farms and broilers per farm size category.

A large percentage of the Czech poultry farms have less than 10,000 animals. Only 60 laying hen farms (0%) and 110 broiler farms (14%) have more than 40,000 animals, respectively. A large part of the poultry flock (89% and 86%, respectively) is kept on these farms.

Cattle

The Czech cattle sector comprises 17,850 cattle farms, of which 8,450 (50%) are keeping dairy. The cattle herd is 1.50 million in total, with 468 thousand dairy cows.

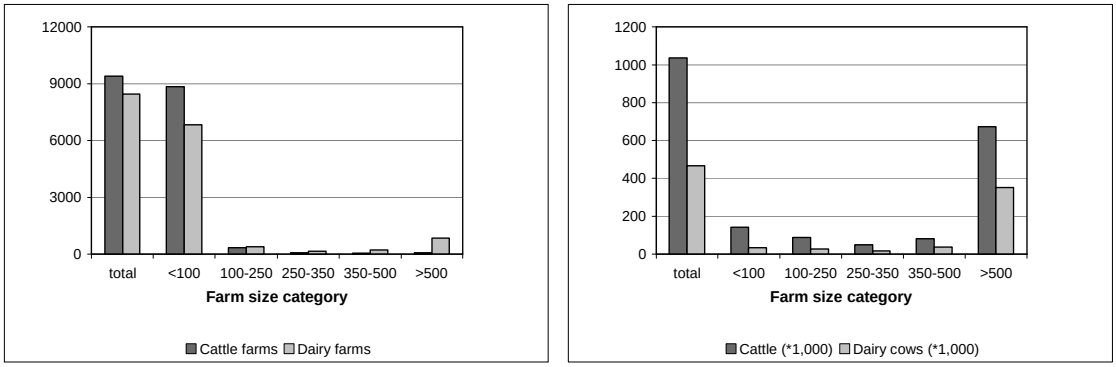

Figure CZ3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

Except for farms with 0-5 head of cattle and dairy, the farm size distribution is reasonably equally distributed over the other size categories. However, most of the cattle (1 million head) and dairy cows (300,000 head) are kept on large farms with over 500 head per farm.

2.2.2 IPPC permits

Table CZ1. Overview of animals covered by IPPC and IPPC permits in the Czech Republic.

	Fattening pigs	**Sows**	**Laying hens**	**Broilers**
% of animals covered by IPPC (2003 data)	32%	46%	89%	86%
IPPC farms according to EUROSTAT data	**180**	**110**	**60**	**110**
Existing installations	108	65	169	
New permits granted	56	30	10	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits	52	35	159	

The number of IPPC farms with fattening pigs and sows in the Czech Republic according to EUROSTAT are higher than the number of existing installations provided by the MS. Numbers match well for the poultry sector.

2.2.3 Environmental legislation concerning livestock production

In the Czech Republic there is a regulation dealing with the air protection (Clean Air Act no. 353/2002). Furthermore, the 2001 Environmental Impact Assessment Act (EIA Act no. 100/2001), and the IPPC Act (no. 076/2002) are relevant for animal production. The Clean Air Act is based on the application of the Gothenburg protocol principles. Farmers keeping more than 180 Animal Units (AU = 500 kg of live weight) have to compile a document (Impact Assessment under EIA Act), where they prove application of principles of good agriculture practice on their farms and especially utilization of ammonia emissions abatement techniques in the stable, in the manure or excrements storage and during the manure application on the field. If the document meets all demands given by above mentioned legislation, then it is confirmed by the local authority. The document has to contain a description of used manure cleaning system, housing system, ventilation system etc.
As far as water and soil protection is concerned, there are applied some general principles resulted from the Nitrates Directive. Especially for cow breeding, demands are on how to store the solid manure on the field, notably in Nitrate Vulnerable Zones (Dedina, personal communication).

The situation concerning permitting in the framework of IPPC is mainly focused on manure management inside the facility or directly connected with the facility (interpreted as: storage). Concerning land spreading of manure, it is only considered when the manure is applied on land belonging to the IPPC facility. In these situations, BAT is required, and in the permit time and technology of spreading is specified (Slavik, personal communication). Furthermore, land spreading of animal manures is regulated in a complex way:

- Act No. 156/1998 Coll. (fertilizers)
- Decree No. 274/1998 (storage and use of fertilizers)
- Governmental Ordinance No 103/2003 Coll. (establishing vulnerable areas, and use and storage of fertilizers and farm fertilizers, rotation of crops and measures against erosion)

No detailed information was provided about specific measures.

2.2.4 Best Available Techniques and penetration

The previous analysis leads to the following table with % of penetration of Best Available Techniques.

Table CZ2. Overview of Best Available Techniques and their penetration in the Czech Republic (% of animals covered) between 2000 and 2020.

		2000	2020	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	LNA_high	3	10	20	20	20	20		78	81	83
DAICOW_I	LNA_low	10	15	20	20	20	20		22	19	17
DAICOW_I	CS_high	0	0	0	78	81	83		78	81	83
DAICOW_s	LNA_high	5	10	20	20	20	20		20	20	20
DAICOW_s	LNA_low	20	40	60	60	60	60		60	60	60
LAYHENS	SA	0	89	89	91	91	92		91	91	92
LAYHENS	CS_high	0	89	89	91	91	92		91	91	92
LAYHENS	LNF	0	0	70	70	70	70		70	70	70
LAYHENS	LNA_high	0	0	0	0	0	0		46	46	47
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OCOW_I	LNA_high	3	10	20	20	20	20		20	20	20
OCOW_I	LNA_low	10	15	20	20	20	20		20	20	20
OPOUL	SA	0	75	75	87	88	90		87	88	90
OPOUL	CS_high	0	75	75	87	88	90		87	88	90
OPOUL	LNF	0	0	70	70	70	70		70	70	70
OPOUL	LNA_high	0	0	0	0	0	0		70	70	70
OPOUL	LNA_low	0	0	0	0	0	0		0	0	0
OCOW_S	LNA_high	5	10	20	20	20	20		20	20	20
OCOW_S	LNA_low	20	40	60	60	60	60		60	60	60
PIGS_I	LNA_high	0	0	40	40	40	40		40	43	47
PIGS_I	LNA_low	20	26	26	26	26	26		26	26	26
PIGS_I	SA	0	34	40	40	43	47		40	43	47
PIGS_I	CS_high	0	34	40	40	43	47		40	43	47
PIGS_I	LNF	0	0	40	40	40	40		40	40	40

2.3 Denmark

2.3.1 Farm size distribution

Pigs

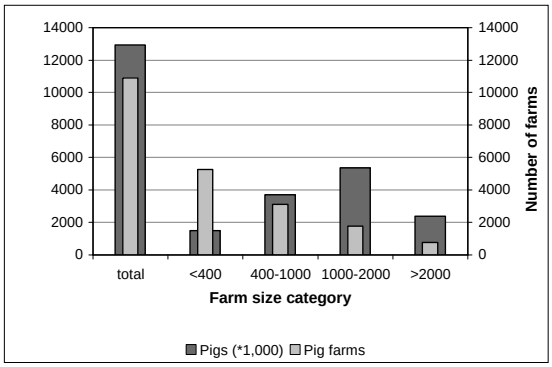

Figure DK1a. Number of pig farms and pigs per size category.

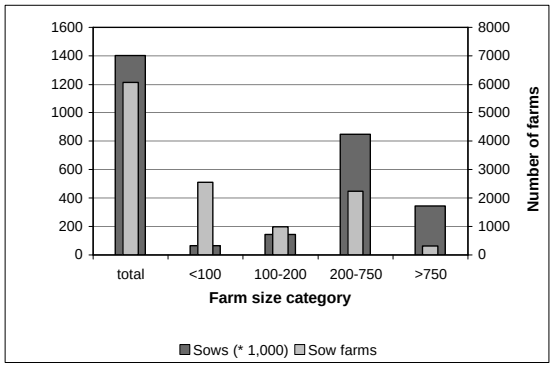

Figure DK1b. Numbers of sow farms and sows per farm size category.

In Danmark, there are 10,900 farms with fattening pigs, and 6,070 sow farms. IPPC farms number 760 (7%) and 310 (5%), respectively. Around 18% (2.4 million head) of the Danish fattening pig herd and 25% (344,000 animals) of the sows are kept on farms with animal numbers above the IPPC thresholds.

Poultry

The laying hen sector in Denmark mainly has smaller animal numbers, whereas broilers are kept on farms within each farm size category. Only 30 (1%) of the hen farms have more than 40,000 animals; this is 120 (35%) for IPPC broiler farms. The percentages of the total number of hens and broilers kept on these farms are 44% (2.1 million hens) and 89% (11 million broilers), respectively

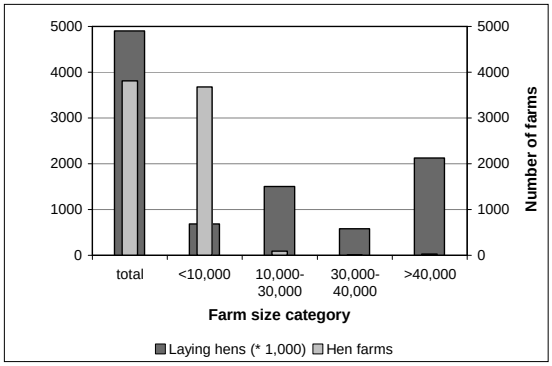

Figure DK2a. Number of laying hen farms and hens per farms size category.

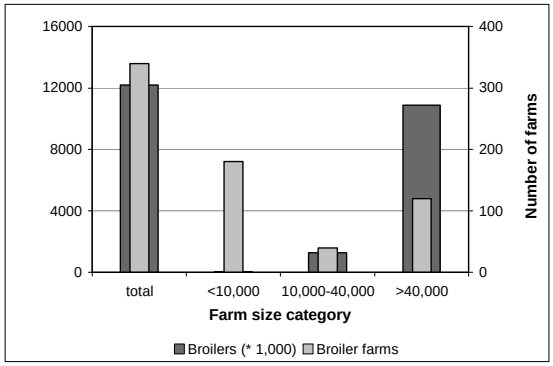

Figure DK2b. Numbers of broiler farms and broilers per farm size category.

Cattle

Danish cattle farms (19,330 farms in total) are distributed over all size categories, whereas the 7,950 dairy farms are mostly keeping 100 animals or more. The vast amount of the cattle herd (65%), including milking cows, are kept on these larger farms.

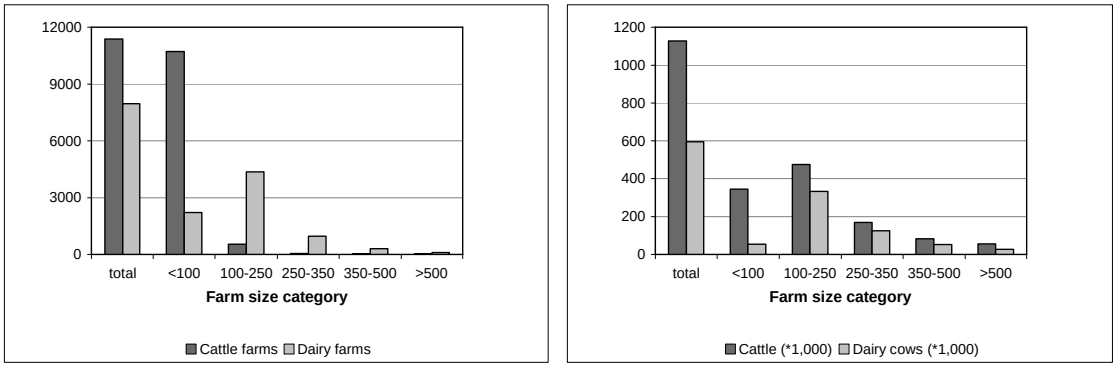

Figure DK3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.3.2 IPPC permits

Table DK1. Overview of animals covered by IPPC and IPPC permits in Denmark.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	18%	25%	44%	89%
IPPC farms according to EUROSTAT data	**760**	**310**	**30**	**120**
Existing installations	**nd**	**nd**	**540**	
New permits granted			352	
Pre-IPPPC permits reconsidered but not updated			17	
Pre-IPPC permits reconsidered and updated			75	
Outstanding permits			96	

Denmark provided no data (= nd) about the IPPC permit situation in the pig sector, although compliance with the IPPC Directive is an element of the Ammonia Action Plan III (see below). The number of IPPC farms, based on the EUROSTAT data, is much lower than the MS information. This needs to be checked. EUROSTAT data will be used in this study.

2.3.3 Environmental legislation concerning livestock production

Information obtained from: Jesper Bak, Danish National Environmental Research Institute. Presentation: Danish examples of effects and costs of measures in the agricultural sector (date ?)

Key environmental legislation concerning environmental pollution from agriculture is laid down in the: NPO Action Plan. Action Plan I on the Aquatic Environment was issued in 1987, and dealt mainly with (ground) water protection from leaching of N. In 2001, the Ammonia Action Plan was launched, whereas a 3rd phase of the Action Plan entered into force in 2004.

Key regulation elements are:

- limit on livestock density (1.4-2.3 LSU/ha)
- regulation on N utilization in manure
- ban on broadcast spreading of manure
- mandatory covering of manure stores
- IPPC approval, including application of BAT for animal houses (pigs, poultry)
- Stop on extra emissions (expanding farms) in 300 buffer zones (around vulnerable habitats)

Available techniques for cattle houses are the use of manure scrapers and slurry acidification, but there is no legal enforcement.

Source: P. Ambus, F.L. Soerensen, D. Lillelund and G.G. Nielsen. In: Nutrient Management Legislation in European Countries, P. De Clercq et al., 2001.

The whole of Denmark became Nitrate Vulnerable Zone in the framework of the Action Plan and compliance was achieved by its further development. An important aspect is that Danish farmers have to calculate a farm quota of N to be used on their farm, depending on the crops grown. When organic manure is used, the N efficiency (available mineral N for plant growth) in the first year and second year (residual effect) have to be taken into account. Other specific legislative topics are:

- compulsory registration with the Plant Directorate for farms with high animal density and farms that receive specific quantities of organic manure
- annual sequence of information to the Plant Directorate about use of N (mainly arable farmers)
- N quotation per farm to a level of 90% of the economic optimum

Specific rules (Environmental Protection Law Chapter Five) are implemented for the storage of manure, which is related to the period of the year when application is forbidden. A storage capacity of 6-9 months is envisaged. Stored slurry is prevented from emitting ammonia by a natural, stable crust or other types of cover.
Liquid manure and silage effluents spread on soils without a crop must be incorporated as quickly as possible, but within 12 h after application. Solid manures must be incorporated immediately.

2.3.4 Best Available Techniques and penetration

The analysis presented in the previous paragraphs results in the following overview of % of animals kept on the various Best Available Techniques.

Table DK2. Overview of Best Available Techniques and their penetration in Denmark (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	70	70	70	70	70	70		70	70	70
DAICOW_l	SA	5	15	55	55	55	55		55	55	55
DAICOW_l	LNF	0	0	15	15	15	15		15	15	15
DAICOW_l	LNA_high	32	47	90	90	90	90		90	90	90
DAICOW_l	LNA_low	3	3	10	10	10	10		10	10	10
DAICOW_s	LNA_high	72	80	85	85	85	85		85	85	85
DAICOW_s	LNA_low	18	18	15	15	15	15		15	15	15
LAYHENS	LNA_high	64	43	43	43	43	43		58	60	66
LAYHENS	LNA_low	18	57	57	57	57	57		42	40	34
LAYHENS	SA	0	43	43	58	60	66		58	60	66
LAYHENS	CS_high	0	43	43	58	60	66		58	60	66
OCOW_l	CS_high	70	70	70	70	70	70		70	70	70
OCOW_l	LNA_high	20	47	90	90	90	90		90	90	90
OCOW_l	LNA_low	1	3	10	10	10	10		10	10	10
OCOW_l	SA	0	15	20	20	20	20		20	20	20
OPOUL	LNA_high	67	85	45	45	45	45		90	91	92
OPOUL	LNA_low	15	15	56	56	56	56		10	9	8
OPOUL	SA	0	45	45	90	91	92		90	91	92
OPOUL	CS_high	0	45	45	90	91	92		90	91	92
OCOW_S	LNA_high	67	80	80	80	80	80		80	80	80
OCOW_S	LNA_low	15	20	20	20	20	20		20	20	20
PIGS_l	CS_high	60	60	60	60	60	60		60	60	60
PIGS_l	LNF	0	15	90	90	90	90		90	90	90
PIGS_l	SA	28	55	60	60	60	60		60	60	60
PIGS_l	LNA_high	28	55	100	100	100	100		100	100	100
PIGS_S	LNA_high	72	80	85	85	85	85		85	85	85
PIGS_S	LNA_low	18	18	15	15	15	15		15	15	15
SHEGOA	LNA_high	64	80	80	80	80	80		80	80	80
SHEGOA	LNA_low	18	18	18	18	18	18		18	18	18

2.4 Germany

2.4.1 Farm sizes distribution

Pigs

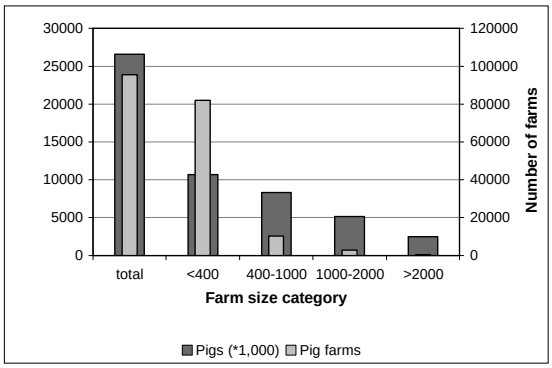

Figure DE1a. Number of pig farms and pigs per size category.

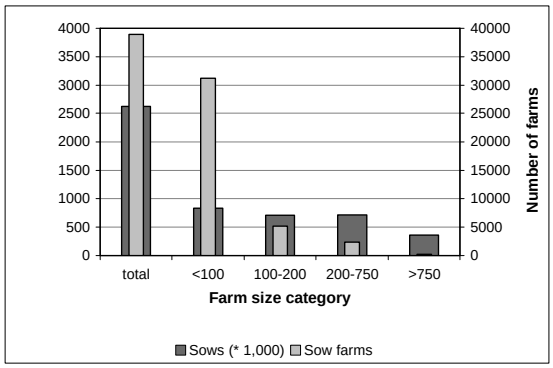

Figure DE1b. Numbers of sow farms and sows per farm size category.

In Germany, most of the farms have less than 400 fattening pigs or 100 sows. Around 1% (600 farms) of the total number of around 100 thousand fattening pig farms fall into the IPPC category. For sows, this number is also 1% (220 farms on a total of 39,000). On IPPC farms for fattening pigs and sows, respectively 9% and 14% of the animals are kept.

Poultry

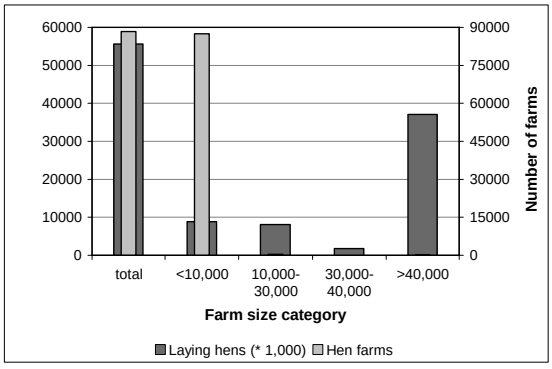

Figure DE2a. Number of laying hen farms and hens per farms size category.

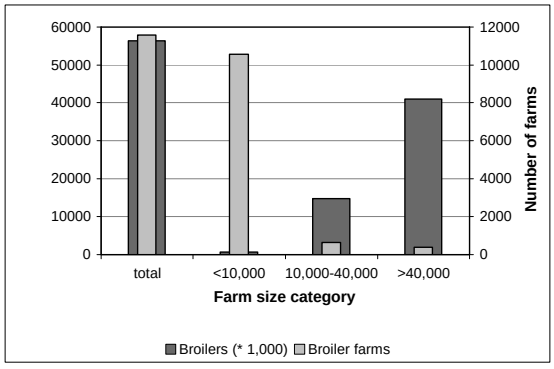

Figure DE2b. Numbers of broiler farms and broilers per farm size category.

IPPC laying hens farms number 280 (0%), whereas this is 380 for broilers (>40,000 animals). On these farms, 37 million hens (67% of total number of German laying hens) and 41 million broilers (73%) are kept.

Cattle

The German cattle sector (total: 196,550 farms) comprises 121,820 dairy farms. Most farms fall in the categories with >20 LSU. The German cattle herd is 13.6 million

animals, of which 4.4 million are dairy cows. Cattle is mainly kept on farms with 100-500 LSU, and to a lesser extent on farms with 20-100, and >500 LSU. Most dairy cows are kept on farms with 50-100, and 100-500 LSU.

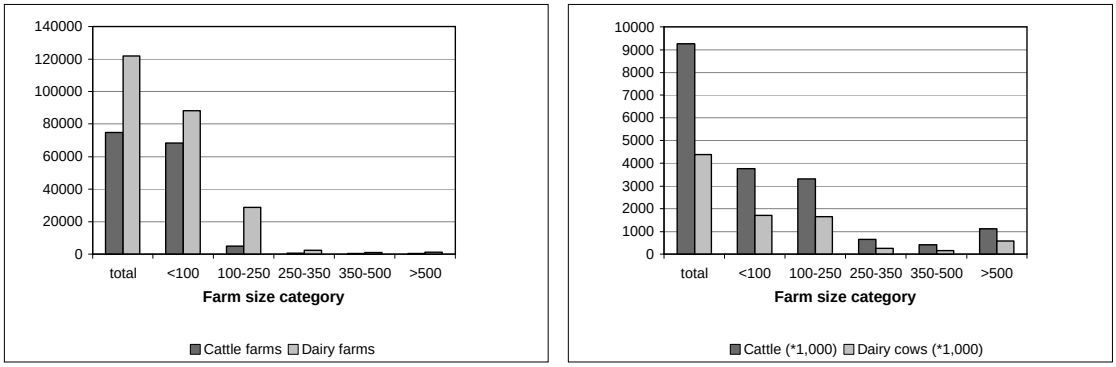

Figure DE3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.4.2 IPPC permits

Table DE1. Overview of animals covered by IPPC and IPPC permits in Germany.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	9%	14%	67%	73%
IPPC farms according to EUROSTAT data	**600**	**220**	**280**	**380**
Existing installations	**405**	**197**	**822**	
New permits granted	57	33	49	
Pre-IPPPC permits reconsidered but not updated	225	109	606	
Pre-IPPC permits reconsidered and updated	26	5	43	
Outstanding permits	116	53	139	

The number of IPPC farms from EUROSTAT data and the information provided by the Member State ('Existing installations') are quite well comparable. EUROSTAT data indicate that some more pig farms should be permitted (600), whereas this should be less for poultry (660 in total). The permitting situation shows that the majority of the IPPC permits are in the procedure of reconsideration or outstanding, but not updated (yet).

2.4.3 Environmental legislation concerning livestock production

In Germany, the Fourth Ordinance for the implementation of the Federal Immission Control Act has become active in 1985, and has been updated and revised recently (2004). This Ordinance (BImSchV) deals with installations that require a permit ("Genähmigungsbedürftige Anlagen"). Larger installations have to get a permit ("Umwelverträglichkeitprüfung") which approved after a publication ("Veröffentlichung"; type of permits required under IPPC), wheras the smaller installations only need to get the permit without the public procedure. In this BImSchV,

only the animal house is regarded. Farms that fall under one of the below mentioned categories have to adopt systems and techniques that are Best Available Techniques ("Best Verfügbare Technike").

Animal Category	Public permit	Regular permit
Laying hens	20,000	15,000 – 20,000
Chicken laying hens	40,000	30,000 – 40,000
Broilers	40,000	30,000 – 40,000
Fattening turkeys	20,000	15,000 – 20,000
Cattle	**350**	**250 – 350**
Calves	**1,000**	**300 – 1,000**
Fattening pigs	2,000	1,500 – 2,000
Sows	750	560 - 750
Piglets	6,000	4,500 – 6,000
Fur animals	1,000	750 – 1,000
Miscellaneous		**> 50 LSU + > 2 LSU/ha**

It has to be noted that the above mentioned thresholds have not fully been consolidated by the German Government.

Concerning the land application of animal manures, cattle manure falls – like other animals – under the so called "Düngerverordnung". This ordinance prescribes methods to apply animal manures with minimal environmental burdens:

- techniques that apply manure as closely as possible to the soil surface ("Bodennah") on grassland and arable land
- direct (on the same day) incorporation of animal manure after application on arable land

The methods to be used are similar to those described in the Guidance Document adopted under the UNECE-CLTRAP Gothenborg Protocol.

2.4.4 Best Available Techniques and penetration

Below, the results of the analysis for German is presented.

Table DE2. Overview of Best Available Techniques and their penetration in Germany (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	20	28	39	39	39	39		39	39	39
DAICOW_l	CS_low	2	9	5	5	5	5		5	5	5
DAICOW_l	LNA_low	22	58	56	56	56	56		56	56	56
DAICOW_l	LNA_high	2	23	34	34	34	34		34	34	34
DAICOW_s	LNA_high	4	11	11	11	11	11		11	11	11
DAICOW_s	LNA_low	20	89	89	89	89	89		89	89	89
LAYHENS	LNA_high	99	99	99	99	99	99		99	99	99
LAYHENS	LNA_low	1	1	1	1	1	1		1	1	1
LAYHENS	SA	0	67	67	71	72	75		71	72	75
LAYHENS	CS_high	0	67	67	71	72	75		71	72	75
OCOW_l	CS_high	21	65	68	68	68	68		68	68	68
OCOW_l	CS_low	1	5	5	5	5	5		5	5	5
OCOW_l	LNA_low	21	41	27	27	27	27		27	27	27
OCOW_l	LNA_high	3	26	38	38	38	38		38	38	38
OPOUL	LNA_high	30	56	65	74	77	80		65	65	65
OPOUL	LNF	0	0	50	50	50	50		50	50	50
OPOUL	LNA_low	70	43	9	9	9	9		9	9	9
OPOUL	SA	0	65	65	74	77	80		74	77	80
OPOUL	CS_high	0	65	65	74	77	80		74	77	80
OCOW_S	LNA_high	4	13	13	13	13	13		13	13	13
OCOW_S	LNA_low	20	87	87	87	87	87		87	87	87
PIGS_l	LNA_low	51	85	84	84	84	84		84	84	84
PIGS_l	LNA_high	14	15	16	16	16	16		16	16	16
PIGS_l	SA	15	16	16	16	16	16		16	16	16
PIGS_l	CS_high	15	16	16	16	16	16		16	16	16
PIGS_l	LNF	0	0	11	11	11	11		11	11	11
PIGS_S	LNA_high	16	16	16	16	16	16		16	16	16
PIGS_S	LNA_low	54	84	84	84	84	84		84	84	84

2.5 Estonia

2.5.1 Farm size distribution

Pigs

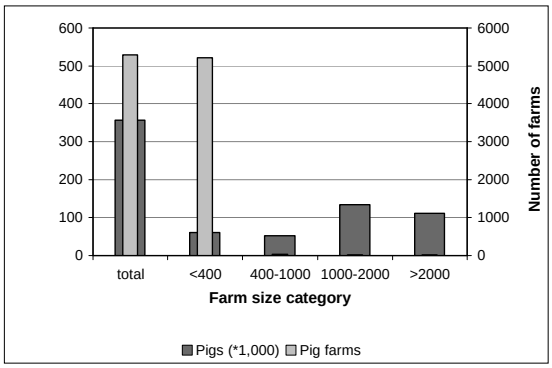

Figure EE1a. Number of pig farms and pigs per size category.

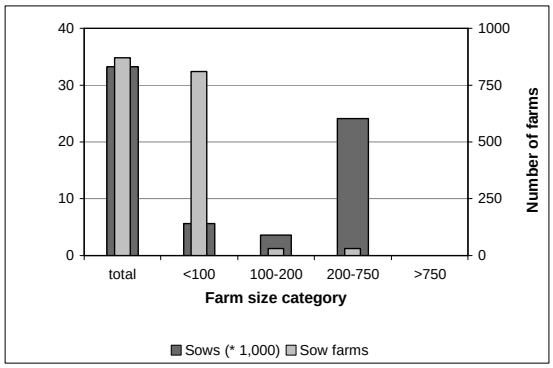

Figure EE1b. Numbers of sow farms and sows per farm size category.

Estonian fattening pig husbandry is occurring on small farms (< 400 fattening pigs; < 100 sows). Only 20 fattening pig farms (0% of 5,300 farms)) and no sow farms (0% of 870 sow farms) fall into the IPPC category. Still, 31% (111 thousand) of the herd of fattening pigs is kept on farms with more than 2,000 animals.

Poultry

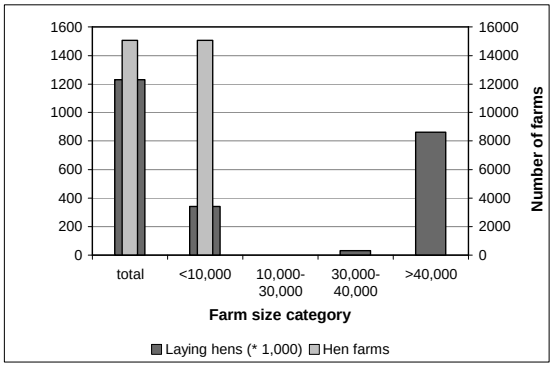

Figure EE2a. Number of laying hen farms and hens per farms size category.

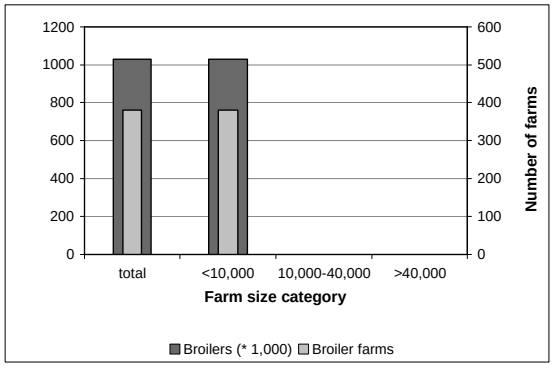

Figure EE2b. Numbers of broiler farms and broilers per farm size category.

Ten (10) laying hens on farms have more than 40,000 animals (0%); the total number of laying hens kept on these farms amount 0.9 million (70%). None of the Estonian broiler farms have more than 40,000 animals.

Cattle

The Estonian cattle sector comprises 14,550 cattle farms of which the vast majority (12,400) have dairy cows. Most of these farms have a small number of animals (0-5 and 5-10 LSU). Roughly 40% (120 thousand head) of the cattle herd (274.210 head) are dairy cows. The largest part of the cattle and dairy herd is kept on enterprises with 100-500 and >500 LSU per farm.

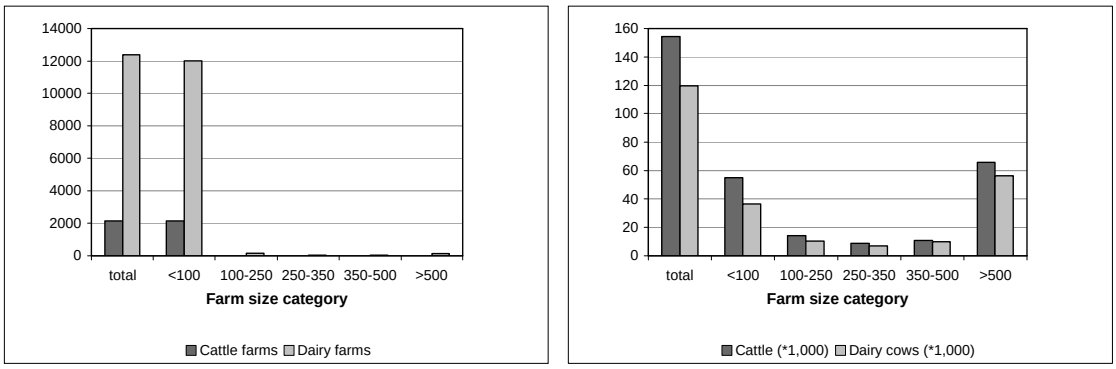

Figure EE3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.5.2 IPPC Permits

Table EE1. Overview of animals covered by IPPC and IPPC permits in Estonia.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	31%	0%	70%	0%
IPPC farms according to EUROSTAT data	**20**	**0**	**10**	**0**
Existing installations	**35**	**0**	**2**	
New permits granted	3			
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits	32		2	

The numbers of IPPC farms derived from the EUROSTAT data indicate that less fattening pig farms and more laying hen farms should have to be permitted, compared to the information on 'existing installations' provided by the MS. Most of the permits are outstanding.

2.5.3 Environmental legislation concerning livestock production

The Estonian government has issued legislation on IPPC not only for intensive rearing of pigs and poultry, but also for the cattle sector. It is part of the IPPC Act 2002. IPPC permits are required for farms with intensive rearing of cattle with more than 300 places for milk cow or more than 400 places for beef oxen or more than 600 places for up to 24 months old oxen 01.09.2006 (www.envir.ee/ippc/). On this web-site, information is provided about BAT to be applied, and examples are presented about permits issues. Moreover, the site contains a guide for pig farmer compliance with IPPC.

2.5.4 Best Available techniques and penetration

The results of the analysis presented in the previous paragraphs in term of penetration of Best Available Techniques is presented below.

Table EE2. Overview of Best Available Techniques and their penetration in Estonia (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1_LNA	2020 IPPC2_LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	0	0	0	50	53	55		50	53	55
DAICOW_I	LNA_high	0	0	0	0	0	0		50	53	55
OCOW_I	CS_high	0	0	0	4	13	27		4	13	27
OCOW_I	LNA_high	0	0	0	0	0	0		4	13	27
LAYHENS	SA	0	72	72	72	72	72		72	72	72
LAYHENS	CS_high	0	72	72	72	72	72		72	72	72
LAYHENS	LNF	0	0	50	50	50	50		50	50	50
LAYHENS	LNA_high	0	65	0	0	0	0		70	70	70
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	SA	0	36	36	36	36	44		36	36	44
PIGS_I	CS_high	0	36	36	36	36	44		36	36	44
PIGS_I	LNF	0	0	36	36	36	36		36	36	36
PIGS_I	LNA_high	0	0	0	0	0	0		36	36	36
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0

2.6 Greece

2.6.1 Farm size distribution

Pigs

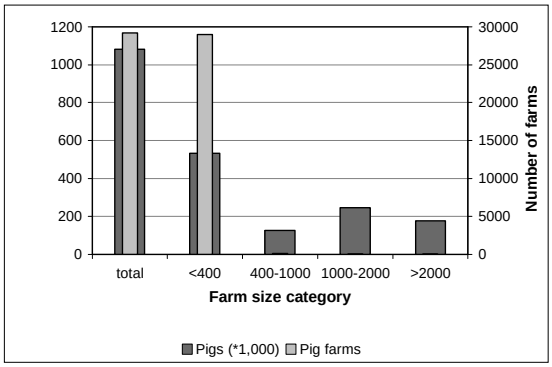

Figure EL1a. Number of pig farms and pigs per size category.

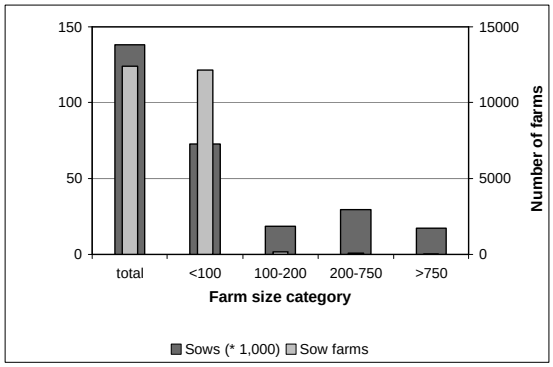

Figure EL1b. Numbers of sow farms and sows per farm size category.

In Greece, the vast majority of fattening pig farms have less than 400 animals, whereas this is similar for sows. Approximately 50 farms (0%) with fattening pigs and 20 sow farms (0%) have more than 2,000 pigs and 750 sows, respectively. On these farms, 16% (177,000 on a total of 1.1 million) of the fattening pig herd and 12% (17,000 on 138,000) of the sow herd is kept.

Poultry

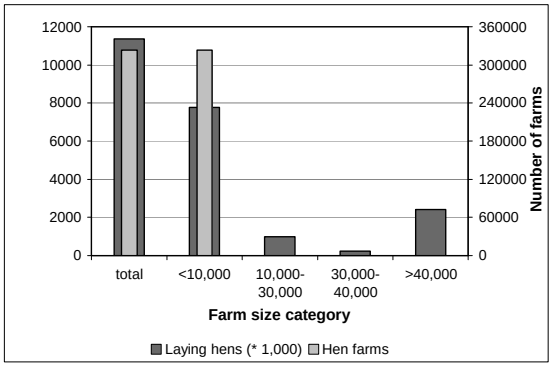

Figure EL2a. Number of laying hen farms and hens per farms size category.

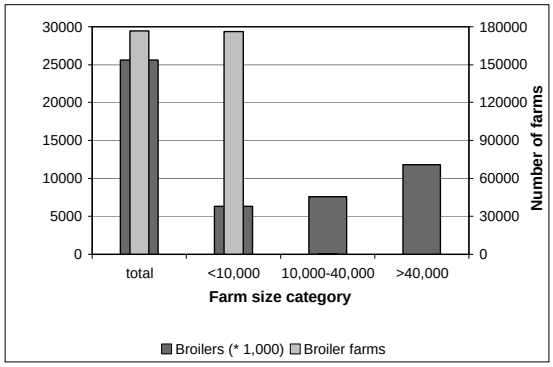

Figure EL2b. Numbers of broiler farms and broilers per farm size category.

In Greece, 30 farms have more than 40,000 laying hen (0%), on which 2.4 million animals are kept (21%). For broiler farms with more than 40,000 animals, these figures amount 120 (0%) and 12 million (46%), respectively.

Cattle

Greece cattle farms (total of 24,510) and dairy farms (11,550; 47%) are quite equally distributed over all size categories. However, most cattle and dairy cows is kept on larger farms, notably those with 20 cows or more. The majority of cattle (total of 0.73 million head) is non-dairy; the dairy herd comprises 170 thousand animals.

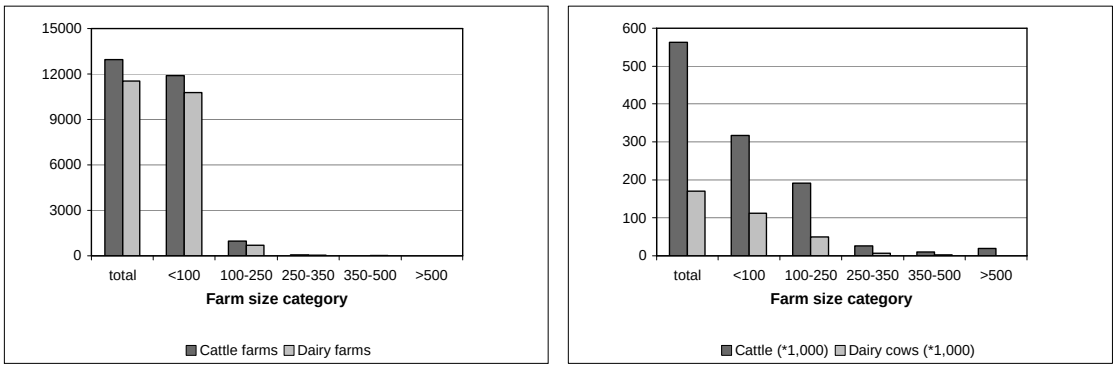

Figure EL3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.6.2 IPPC Permits

Table EL1. Overview of animals covered by IPPC and IPPC permits in Greece.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	16%	12%	21%	46%
IPPC farms according to EUROSTAT data	**50**	**20**	**30**	**120**
Existing installations	**12**	**0**	**35**	
New permits granted	0		0	
Pre-IPPPC permits reconsidered but not updated	0		0	
Pre-IPPC permits reconsidered and updated	0		0	
Outstanding permits	12		35	

The number of existing IPPC installations according to the Member State information is much smaller than the IPPC farms according to EUROSTAT data. Only 12 of the 50 IPPC farms for fattening pigs, none of the 20 sow farms, and 35 of the total of 150 IPPC poultry farms are considered as 'existing IPPC installations'. All permits are outstanding, and no new permits have been granted yet.

2.6.3 Environmental legislation concerning livestock production

Greece is in the process of full implementation of the Nitrates Directive. A Code of Good Agricultural Practice was issued in 2000, mainly focusing on the reduction of water pollution with nitrates. More recently, a section with a prerequisite for farmers was added in order for them to receive financial support and a permit to run a farm. This Code, however, is restricted to nitrates and has no provisions for other pollutants, like ammonia.

2.6.4 Best Available techniques and penetration

The analysis for Greece results in the following overview of penetration of Best Available Techniques.

Table EL2. Overview of Best Available Techniques and their penetration in Greece (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	0	0	0	1	1	2		1	1	2
DAICOW_I	LNA_high	0	0	0	0	0	0		1	1	2
OCOW_I	CS_high	0	0	0	0	1	2		0	1	2
OCOW_I	LNA_high	0	0	0	0	0	0		0	1	2
LAYHENS	SA	5	21	21	24	25	26		24	25	26
LAYHENS	CS_high	5	21	21	24	25	26		24	25	26
LAYHENS	LNF	0	0	21	21	21	21		21	21	21
OPOUL	SA	10	35	35	48	51	55		48	51	55
OPOUL	CS_high	10	35	35	48	51	55		48	51	55
OPOUL	LNF	0	0	46	46	46	46		46	46	46
PIGS_I	SA	5	13	13	17	20	24		17	20	24
PIGS_I	CS_high	5	13	30	35	38	42		17	20	24
PIGS_I	LNF	0	0	18	18	18	18		18	18	18
LAYHENS	LNA_high	5	5	5	5	5	5		24	25	26
OPOUL	LNA_high	10	10	10	10	10	10		48	51	55
PIGS_I	LNA_high	5	5	5	5	5	5		16	19	23
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OPOUL	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0

2.7 Spain

2.7.1 Farm size distribution

Pigs

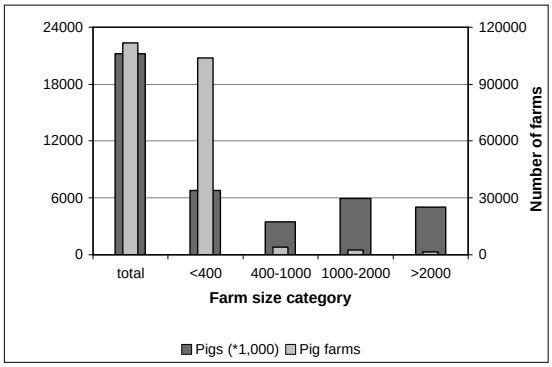

Figure ES1a. Number of pig farms and pigs per size category.

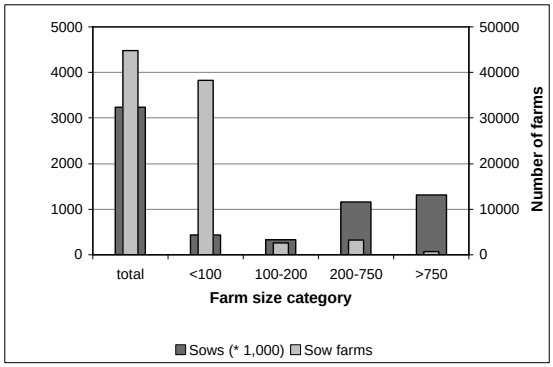

Figure ES1b. Numbers of sow farms and sows per farm size category.

Spanish pig farms mostly have less than 400 fatteners or 100 sows. A total of 1420 (1%) of the fattening pigs farms (total of 112,000), and 710 (2%) sow farms have more animals than the relative IPPC thresholds. On these farms, around 5 million fattening pigs (24% of the 21.2 million pigs) and 1.3 million sows (41% of 3.2 million sows) are kept.

Poultry

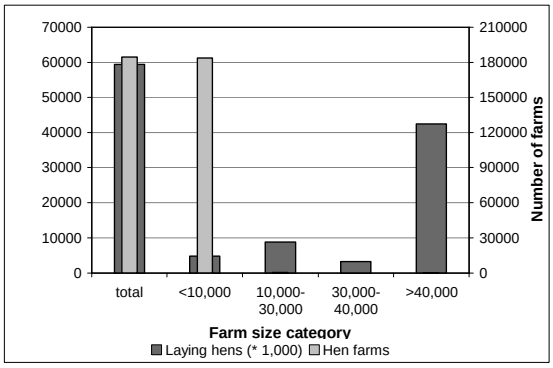

Figure ES2a. Number of laying hen farms and hens per farms size category.

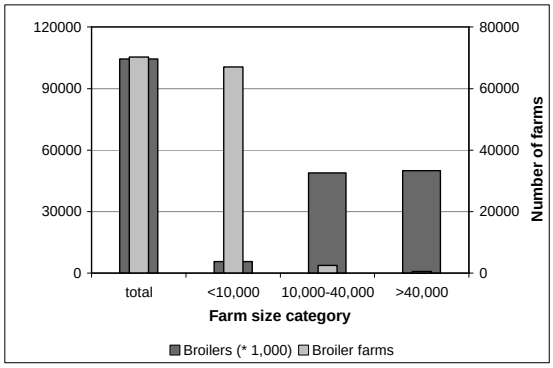

Figure ES2b. Numbers of broiler farms and broilers per farm size category.

In Spain there are 310 (0%) farms with more than 40,000 laying hens, and 610 (0%) farms with more than 40,000 broilers. On these farms, 42 million hens (71%) and 50 million broilers (48%) are kept.

Cattle

The 150,800 Spanish cattle farms, including 51,030 dairy farms (35%), are quite evenly distributed over the various size categories, with a relatively high number of farms occurring in the 0-5 and 20-50 categories. Most of the cattle and dairy cows, however, are kept on relatively larger farms (20 head or more).

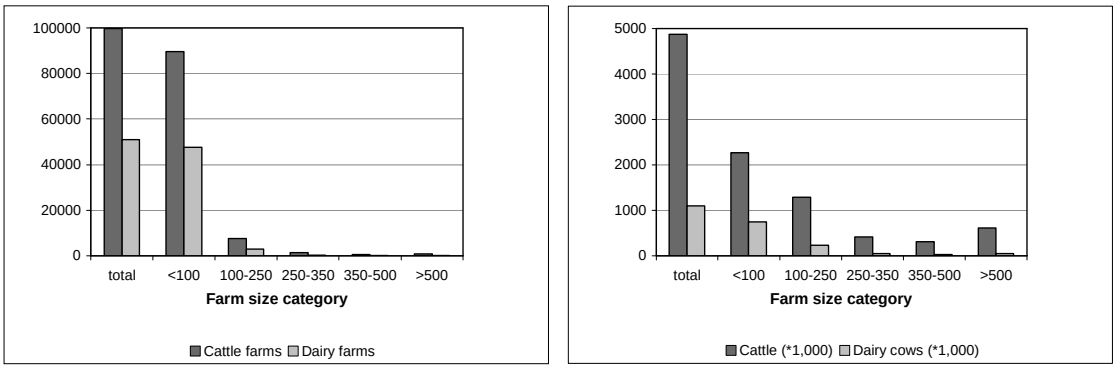

Figure ES3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.7.2 IPPC Permits

Table ES1. Overview of animals covered by IPPC and IPPC permits in Spain.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	24%	41%	71%	48%
IPPC farms according to EUROSTAT data	**1420**	**710**	**310**	**610**
Existing installations	**1330**	**229**	**573**	
New permits granted	112	51	96	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits			3	

IPPC farms in Spain number around 3,000, according to EUROSTAT data, whereas the Member State reported around 2,000 IPPC installations for pigs and poultry. The numbers match well for fattening pigs (1420 IPPC farms according to EUROSTAT, against 1330 existing installations according to the MS), whereas the number of existing IPPC installations for sows and poultry are much less when compared to EUROSTAT data. Around 10-25% of these installations have been granted new permits. Few permits are outstanding, meaning that the remainder still needs to be addressed.

2.7.3 Environmental legislation concerning livestock production

The Nitrates Directive was included in the Spanish legal systems by a Royal Decree of 1996, with a certain authority of the regional governments. Codes of Good Agricultural Practices and Action Programs (AP) were developed, disseminated and implemented for most regions (AP for Nitrate Vulnerable Zones).

The IPPC was transposed in the Spanish Law 16 in 2002, which includes a new system for environmental authorization (e.g. Environmental Impact Assessment) for installations concerned. IPPC applies to all sectors, including intensive rearing of pigs and poultry. For other poultry than laying hens, equivalent numbers of animals are used to judge IPPC compliance.

2.7.4 Best Available techniques and penetrations

In table ES2, an overview is presented on the penetration of Best Available Techniques, based upon the analysis in the previous paragraphs.

Table ES2. Overview of Best Available Techniques and their penetration in Spain (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	0	0	0	5	6	7		5	6	7
DAICOW_I	LNA_high	0	0	0	0	0	0		5	6	7
OCOW_I	CS_high	0	0	0	1	4	8		1	4	8
OCOW_I	LNA_high	0	0	0	0	0	0		1	4	8
LAYHENS	SA	20	20	50	78	79	82		78	79	82
LAYHENS	CS_high	20	20	50	78	79	82		78	79	82
LAYHENS	LNF	0	0	51	51	51	51		51	51	51
OPOUL	SA	5	20	40	51	55	61		51	55	61
OPOUL	LNF	0	0	25	25	25	25		25	25	25
OPOUL	CS_high	0	0	45	45	45	45		45	45	45
PIGS_I	SA	10	40	40	40	40	40		40	40	40
PIGS_I	CS_high	10	40	60	60	60	60		60	60	60
PIGS_I	LNF	0	0	60	60	60	60		60	60	60
LAYHENS	LNA_high	20	20	20	20	20	20		78	79	82
OPOUL	LNA_high	5	5	5	5	5	5		51	55	61
PIGS_I	LNA_high	9	10	10	10	10	10		25	35	40
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0

2.8 France

2.8.1 Farm size distribution

Pigs

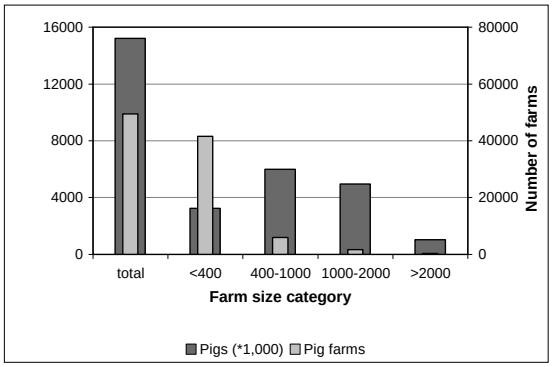

Figure FR1a. Number of pig farms and pigs per size category.

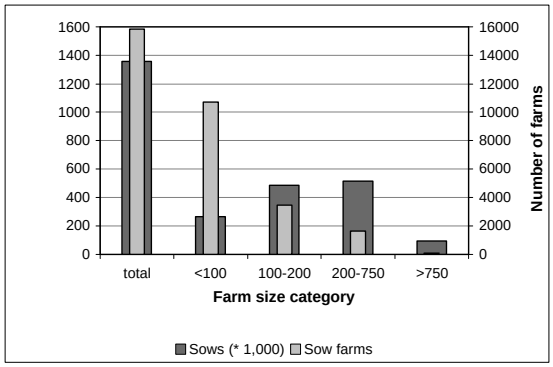

Figure FR1b. Numbers of sow farms and sows per farm size category.

Approximately 80% of the French pig farms have less than 400 fatteners or less than 100 sows. Most fattening pigs are kept on farms with more than 400 head. Sows are mainly kept on farms with 100-200 and 200-750 animals. The number of farms with more animals than the IPPC thresholds are 350 (1%) for fattening pigs and 90 (1%) for sows. These farms house 7% of each type of pigs, amounting 1 million fatteners and 94,000 sows.

Poultry

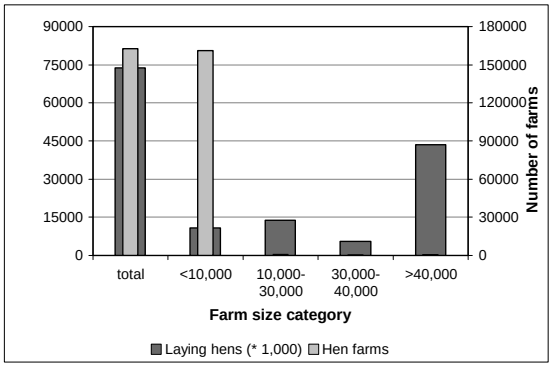

Figure FR2a. Number of laying hen farms and hens per farms size category.

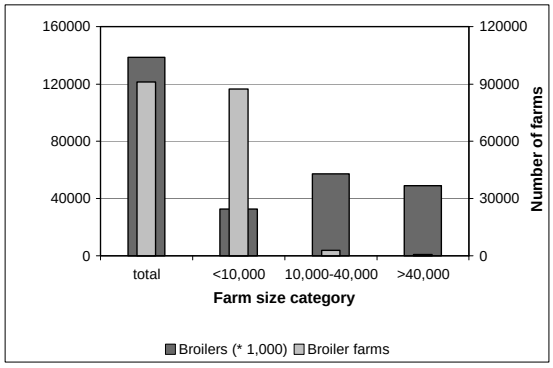

Figure FR2b. Numbers of broiler farms and broilers per farm size category.

On the 480 (0%) French laying hen farms with more than 40,000 animals and 720 IPPC (1%) broiler farms, 44 million hens (59%) and 49 million broilers (35%) are kept.

Cattle

The French cattle sector counts 258,210 farms, of which 113,930 (40%) keep dairy cows. Most dairy farms have more than 20 animals, but a significant amount of farms have lesser amounts of cattle. The 19.5 million head of cattle, of which 4 million dairy cows, are mostly kept on larger farms (>50 head)

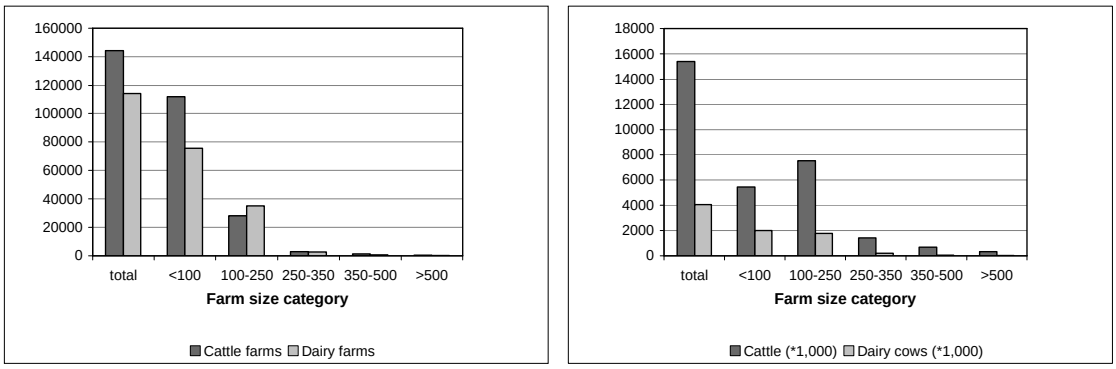

Figure FR3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.8.2 IPPC Permits

Table FR1. Overview of animals covered by IPPC and IPPC permits in France.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	7%	7%	59%	35%
IPPC farms according to EUROSTAT data	**350**	**90**	**480**	**720**
Existing installations	**242**	**16**	**2150**	
New permits granted	89		608	
Pre-IPPPC permits reconsidered but not updated	3		34	
Pre-IPPC permits reconsidered and updated	10		21	
Outstanding permits	229	16	2095	

The number of existing IPPC installations for the poultry sector is much larger than the number based on EUROSTAT data. Around 75% of the permits are outstanding; the remainder of the permits is outstanding. For the pig sector, the number of existing installations is lower than the IPPC farms according to EUROSTAT data. Also here, around 25% of the IPPC farms were granted new permits, and the remainder is outstanding.

Note: need to check data in this table to complete the permitting situation (figures don't add up).

2.8.3 Environmental legislation concerning livestock production

Most of the French environmental legislation concerning livestock production is geared towards implementation of the Nitrates Directive. Recently, also the IPPC Directive was integrated in the French law (Source: Frédéric Bourgoin, 2006. Soil Protection in French

Environmental Law. JEEPL 3, 2006, p204-212), but no details could be found (yet) about measures prescribed.

2.8.4 Best Available techniques and penetration

The results of the analysis on penetration of Best Available Techniques for France is presented below.

Table FR2. Overview of Best Available Techniques and their penetration in France (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	2	4	4	4	4	18		4	4	18
DAICOW_I	CS_low	10	20	20	20	20	20		20	20	20
DAICOW_I	LNA_high	0	0	0	0	0	0		1	1	18
LAYHENS	SA	0	59	59	68	70	73		68	70	73
LAYHENS	CS_high	0	59	59	68	70	73		68	70	73
LAYHENS	LNF	0	0	59	59	59	59		59	59	59
LAYHENS	LNA_high	0	0	0	0	0	0		68	70	73
OCOW_I	CS_high	2	5	5	5	5	11		5	5	11
OCOW_I	LNA_high	0	0	0	0	1	11		0	1	11
OCOW_I	CS_low	4	10	10	10	10	10		10	10	10
OPOUL	SA	0	30	30	38	42	47		38	42	47
OPOUL	CS_high	0	30	30	38	42	47		38	42	47
OPOUL	LNF	0	0	30	30	30	30		30	30	30
OPOUL	LNA_high	0	0	0	0	0	0		38	42	47
OPOUL	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	CS_high	5	5	5	5	11	15		5	11	15
PIGS_I	CS_low	7	7	7	7	7	7		7	7	7
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	LNA_high	5	5	5	5	5	5		7	11	15
PIGS_I	SA	0	5	5	7	11	15		7	11	15
PIGS_I	LNF	0	0	9	9	9	9		9	9	9

2.9 Ireland

2.9.1 Farm size distribution

Pigs

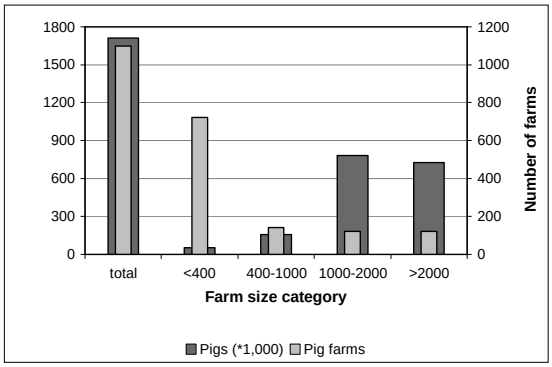

Figure IE1a. Number of pig farms and pigs per size category.

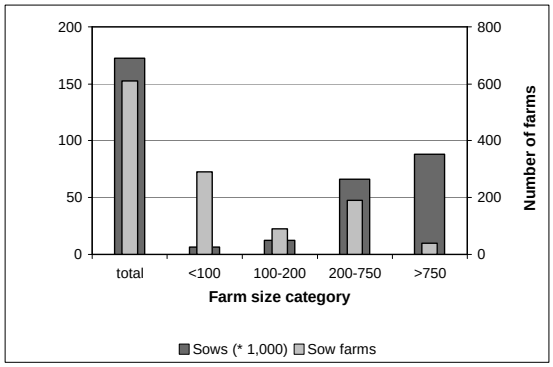

Figure IE1b. Numbers of sow farms and sows per farm size category.

Most Irish fattening pig farms have less than 400 animals or more. Sow farms are more equally distributed over the various farm sizes. Around 120 fattening pig farms (11%() and 40 (7%) sow farms have more animals than the IPPC thresholds. Nearly 90% of the fattening pigs are kept on farms with 1000 head or more, and 42% of the fatteners are kept on farms with more than 2,000 head (IPPC threshold). For sows, this is 51% (88,000 head on a total of 173,000).

Poultry

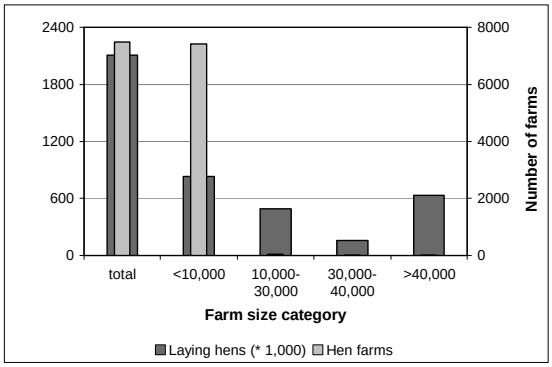

Figure IE2a. Number of laying hen farms and hens per farms size category.

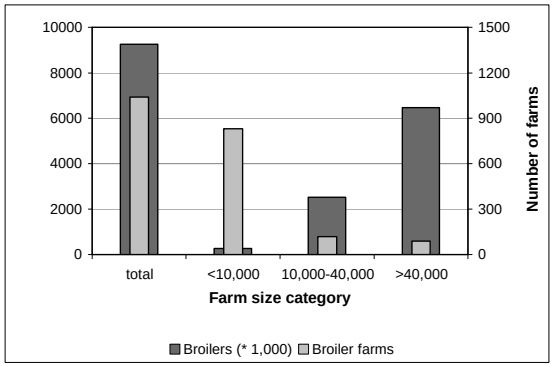

Figure IE2b. Numbers of broiler farms and broilers per farm size category.

In Ireland, there are 10 farms (0%) with more than 40,000 laying hens, and 90 farms (0%) with more than 40,000 broilers. The numbers of animals kept are 0.6 million (30%) and 6 million (70%), respectively.

Cattle

The 116,580 Irish cattle farms include 27,000 dairy farms. They house 7 million head of cattle, of which 1,155,550 head are dairy cows. Cattle is kept in significant number on farms of all sizes, but most cattle and dairy farms have more than 20 animals. Roughly 90% of the cattle herd is kept on farms with 20 animals, whereas this percentage is valid for dairy farms with more than 50 head.

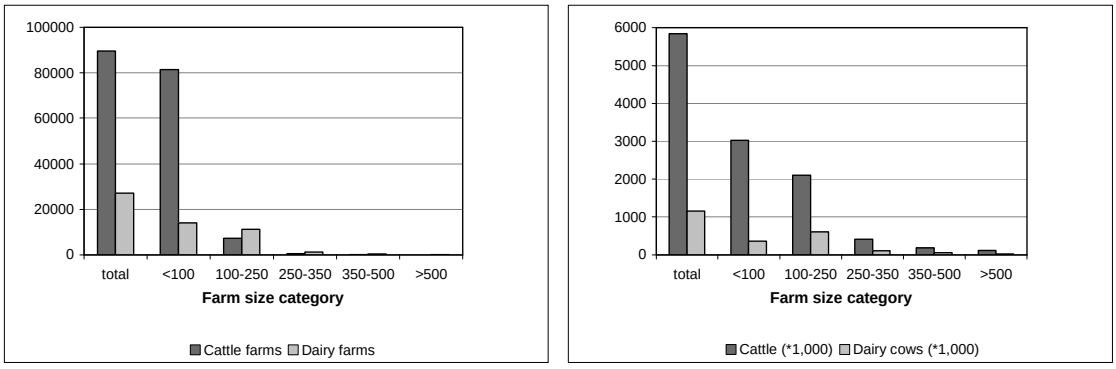

Figure IE3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.9.2 IPPC Permits

Table IE1. Overview of animals covered by IPPC and IPPC permits in Ireland.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	42%	51%	30%	70%
IPPC farms according to EUROSTAT data	**120**	**40**	**10**	**90**
Existing installations	**89**	**0**	**173**	
New permits granted				
Pre-IPPPC permits reconsidered but not updated	89		3	
Pre-IPPC permits reconsidered and updated				
Outstanding permits			170	

Ireland provided data on existing IPPC installations for fattening pigs and the poultry sector. Different from the MS information on existing installations for pigs (89 in total), data from Teagasc Pig Sensus 2003 show that some 150 pig farms may be liable for an IPPC licence, which is more in accordance with EUROSTAT data. Most of the permits for fattening pig farms have not been updated, while most of the poultry farm permits are outstanding.

2.9.3 Environmental legislation concerning livestock production

Mostly in the framework of the Nitrates Directive, Statutory Instruments (SI) No. 788 of 2005 was issued. For the ammonia related BAT, only restrictions are taken up for the spreading of manures. In general, animal manures must be applied 'close to the soil', meaning that the original broadcast spreading with a splash plate or irrigation is forbidden.

2.9.4 Best Available techniques and penetration

The Irish situation concerning penetration of Best Available Techniques and its evolution is presented below.

Table IE2. Overview of Best Available Techniques and their penetration in Ireland (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_low	75	77	90	90	90	90		90	90	90
DAICOW_I	LNA_low	0	1	4	4	4	4		4	4	4
DAICOW_I	LNA_high	0	0	0	4	6	7		4	6	7
LAYHENS	SA	0	15	15	39	41	45		39	41	45
LAYHENS	CS_high	0	15	15	39	41	45		39	41	45
LAYHENS	LNF	0	15	15	15	15	15		15	15	15
LAYHENS	LNA_high	0	0	2	2	2	2		39	41	45
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OCOW_I	CS_low	75	78	80	80	80	80		80	80	80
OCOW_I	LNA_low	0	1	4	4	4	4		4	4	4
OCOW_I	LNA_high	0	0	0	0	0	0		0	1	1
OPOUL	INCER	0	4	50	28	26	22		28	26	22
OPOUL	SA	0	38	50	72	74	78		72	74	78
OPOUL	CS_high	0	38	50	72	74	78		72	74	78
OPOUL	LNA_high	0	8	10	10	10	10		72	74	74
PIGS_I	CS_low	87	47	26	26	26	26		26	26	26
PIGS_I	LNA_low	1	19	19	19	19	19		19	19	19
PIGS_I	CS_high	0	0	23	23	23	23		23	23	23
PIGS_I	LNF	0	15	23	23	23	23		23	23	23
PIGS_I	SA	0	20	20	46	51	56		46	51	56
PIGS_I	LNA_high	0	3	3	3	3	3		27	32	37

2.10 Italy

2.10.1 Farm size categories

Pigs

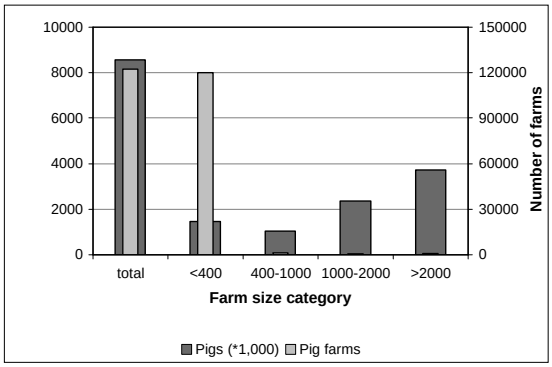

Figure IT1a. Number of pig farms and pigs per size category.

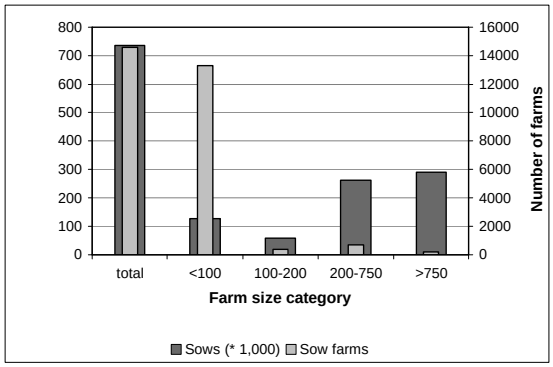

Figure IT1b. Numbers of sow farms and sows per farm size category.

Most Italian pig farms have less than 400 fatteners or 100 sows. Still, the majority of fatteners and sows is kept on larger farms (>1,000; >200, respectively). The percentage of pig farms that fall into the IPPC category is 3.7 million (43%) and 290,000 (39%), respectively.

Poultry

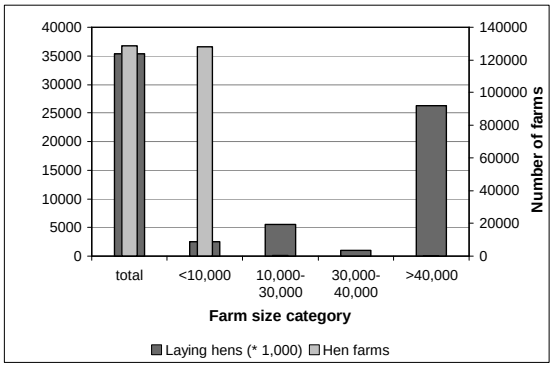

Figure IT2a. Number of laying hen farms and hens per farms size category.

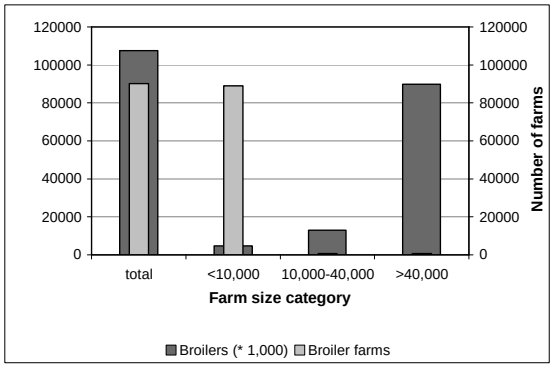

Figure IT2b. Numbers of broiler farms and broilers per farm size category.

The number of IPPC laying hen and broiler farms in Italy amount 240 (0%) and 750 (0%), respectively. Around 26 million (74%) laying hens and 90 million (84%) broilers are kept on those farms.

Cattle
In Italy there are 147,850 cattle farms of which a bit less than 50% (67,500) are dairy farms. These farms are relatively equally distributed over the various farm sizes. The Italian cattle herd counts 6,261,130 head, with 1,857,000 head of dairy cows. Most of the cattle and dairy cows are kept on larger farms (100-500 head per farm).

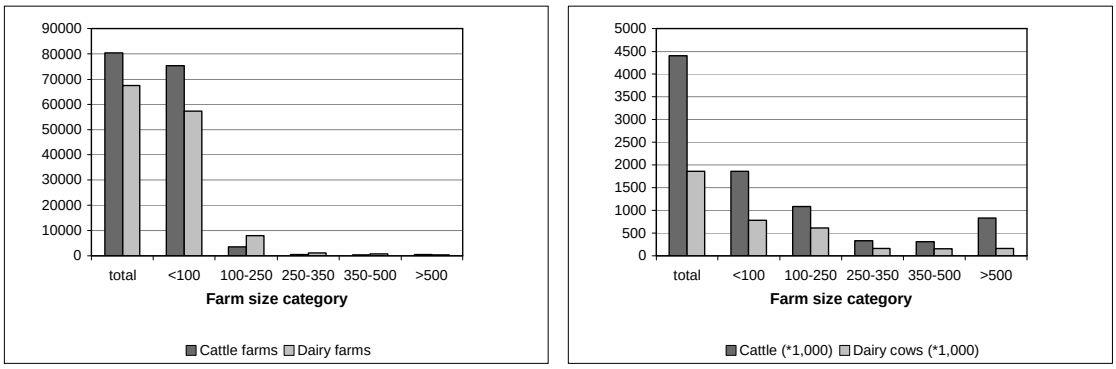

Figure IT3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.10.2 IPPC Permits

Table IT1. Overview of animals covered by IPPC and IPPC Permits in Italy.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	43%	39%	74%	84%
IPPC farms according to EUROSTAT data	**840**	**190**	**240**	**750**
Existing installations	**nd**	**nd**	**Nd**	
New permits granted				
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

Italy provided no information (= nd) about existing installations and the permitting situation.

2.10.3 Environmental legislation concerning livestock production

On 07.04.06 a new Decree of Italian Ministry of Agriculture was issued concerning manure utilization in Vulnerable and Non Vulnerable Zones, cattle manure included. The Decree is the first national Act fully binding for all the Italian Regions. Concerning emissions to the air, farms with sufficient land around are exempted for applying for a permit. Only few cattle farms are not exempted: e.g. veal cattle farms (Bonazzi, personal communication).
Concerning IPPC, there is no legally embedded reference to BAT measures at the moment.

2.10.4 Best Available techniques and penetration

The Italian situation concerning penetration of Best Available Techniques between 2000 and 2020, based on the analysis in the previous paragraphs, is presented below.

Table IT2. Overview of Best Available Techniques and their penetration in Italy (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	33	33	33	33	33	33		33	33	33
DAICOW_I	CS_low	1	1	0	0	0	0		0	0	0
DAICOW_I	LNA_high	20	20	20	20	20	20		20	20	20
DAICOW_I	LNA_low	10	10	10	10	10	10		10	10	10
DAICOW_s	LNA_high	10	10	10	10	10	10		10	10	10
DAICOW_s	LNA_low	30	30	30	30	30	30		30	30	30
LAYHENS	LNA_high	34	32	60	60	60	60		60	60	60
LAYHENS	LNA_low	46	18	18	18	18	18		46	48	50
LAYHENS	SA	10	50	50	78	80	82		78	80	82
LAYHENS	CS_high	10	50	50	78	80	82		78	80	82
LAYHENS	LNF	0	0	50	50	50	50		50	50	50
OCOW_I	CS_high	20	20	20	20	20	20		20	20	20
OCOW_I	LNA_low	1	1	10	10	10	10		10	10	10
OCOW_I	LNA_high	19	19	20	20	20	20		20	20	20
OPOUL	LNA_high	12	32	32	32	32	32		84	86	87
OPOUL	LNA_low	20	0	0	0	0	0		0	0	0
OPOUL	SA	0	50	57	84	86	87		84	86	87
OPOUL	CS_high	0	0	57	84	86	87		84	86	87
OPOUL	LNF	0	0	50	50	50	50		50	50	50
OCOW_S	LNA_high	5	5	5	5	5	5		5	5	5
OCOW_S	LNA_low	15	15	15	15	15	15		15	15	15
PIGS_I	CS_high	18	43	43	43	43	43		43	43	43
PIGS_L	CS_low	0	0	0	32	36	48		32	36	48
PIGS_I	LNA_high	10	20	20	20	20	20		21	25	37
PIGS_I	LNA_low	10	0	0	0	0	0		0	0	0
PIGS_I	LNF	0	21	43	43	43	43		43	43	43
PIGS_I	SA	0	20	20	41	45	57		41	45	57

2.11 Cyprus

2.11.1 Farm size distribution

Pigs

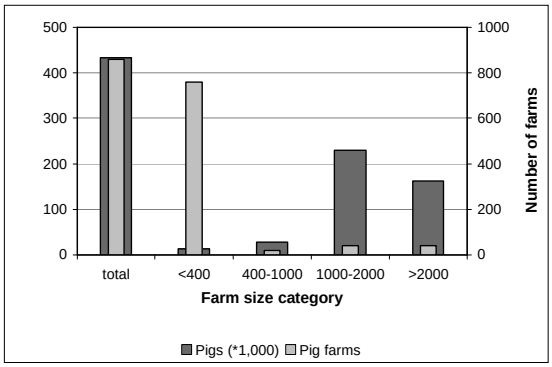

Figure CY1a. Number of pig farms and pigs per size category.

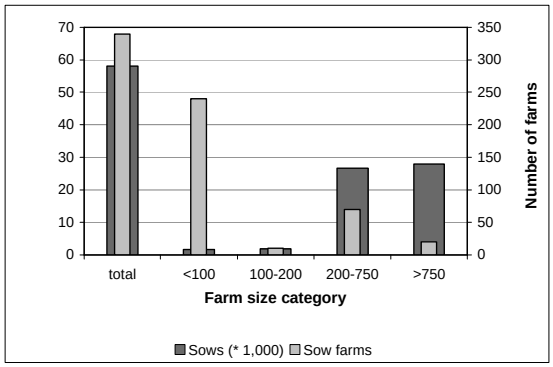

Figure CY1b. Numbers of sow farms and sows per farm size category.

Based on EUROSTAT data, the Cypriote pig sector comprises 860 farms with fattening pigs, and 340 farms with sows. However, according to MS information (Demetriou, personal communication), this number should be 107. Although most farms are small, 40 (5%) and 20 (6%) of these farms have more than 2,000 fatteners and 750 sows, respectively (43 IPPC pig farms in total, according to MS information). Of the total pig herd, 162,000 fatteners (37%) and 28,000 sows (48%) are kept on farms that fall under the IPPC thresholds, indicating that most animals are kept on larger farms.

Poultry

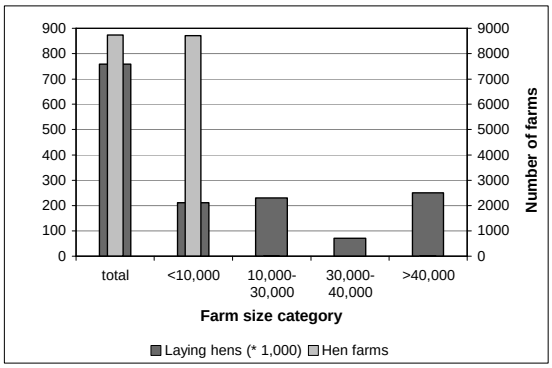

Figure CY2a. Number of laying hen farms and hens per farms size category.

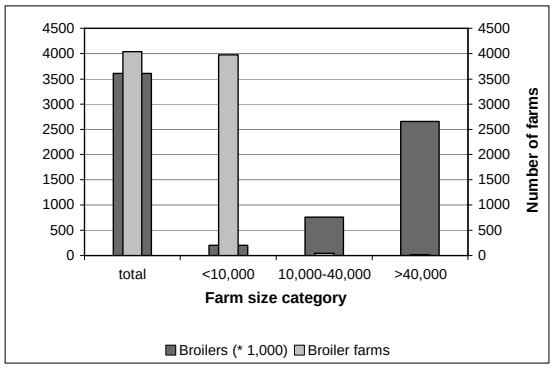

Figure CY2b. Numbers of broiler farms and broilers per farm size category.

In Cyprus, 10 IPPC laying hen farms (0% of a total of 8,740) and 20 IPPC broiler farms (0% of a total of 4,040) are present, according to EUROSTAT data. The respective numbers of animals kept are 0.3 million hens (33%), and 3 million broilers (73%). Based

on the MS information (Demetriou, personal communication), there are 182 poultry farms in Cyprus, of which 39 have more animals than the IPPC threshold.

Cattle
Dairy cows are kept on 250 of the total of 320 cattle farms (MS information: 253 cattle farms, of which 241 only keep dairy; Demetriou, personal communication). Like for pigs and poultry, also cattle farms and dairy farms are relatively large. The cattle herd of 61,050 head in total, and the 26,000 dairy cows are mostly kept on larger farms.

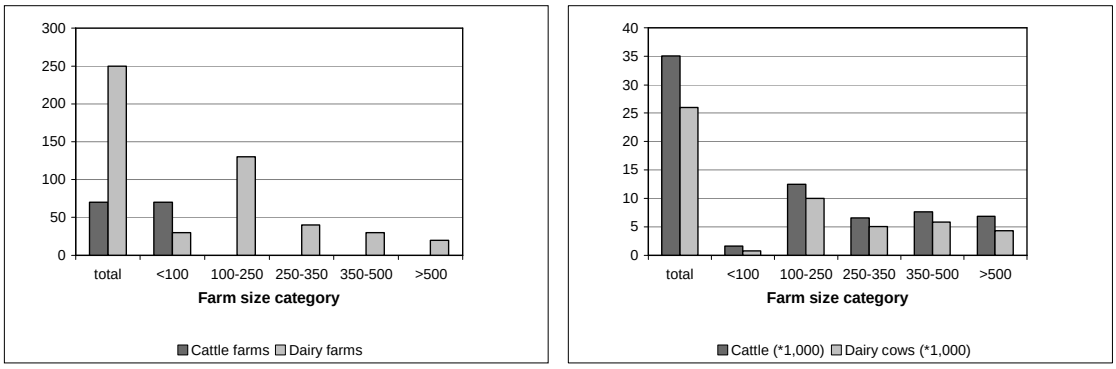

Figure CYt3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.11.2 IPPC Permits

Table CY1. Overview of animals covered by IPPC and IPPC permits in Cyprus.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	37%	48%	33%	73%
IPPC farms according to EUROSTAT data	**40**	**20**	**10**	**20**
Existing installations	**42**	**1**	**39**	
New permits granted	nd	nd	nd	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

Cyprus hasn't provided information (= nd) about the permitting situation.

2.11.3 Environmental legislation concerning livestock production
Information on environmental legislation concerning livestock production is Cyprus could not be found.

2.11.4 Best Available techniques and penetration

In table CY2, an overview is presented of the assumed penetration of Best Available Techniques in Cyprus between 2000 and 2020.

Table CY2. Overview of Best Available Techniques and their penetration in Cyprus (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	0	0	0	24	32	39		24	32	39
DAICOW_I	LNA_high	0	0	0	0	0	0		24	32	39
OCOW_I	CS_high	0	0	0	2	6	12		2	6	12
OCOW_I	LNA_high	0	0	0	0	0	0		2	6	12
LAYHENS	SA	0	32	32	45	47	52		45	47	52
LAYHENS	CS_high	0	32	32	45	47	52		45	47	52
LAYHENS	LNF	0	0	32	32	32	32		32	32	32
OPOUL	SA	0	65	65	75	77	80		75	77	80
OPOUL	CS_high	0	65	65	75	77	80		75	77	80
OPOUL	LNF	0	0	65	65	65	65		65	65	65
PIGS_I	SA	0	40	40	40	46	55		40	46	55
PIGS_I	CS_high	0	40	40	40	46	55		40	46	55
PIGS_I	LNF	0	0	40	40	46	55		40	46	55
LAYHENS	LNA_high	0	0	0	0	0	0		45	47	52
OPOUL	LNA_high	0	0	0	0	0	0		75	77	80
PIGS_I	LNA_high	0	0	0	0	0	0		40	48	54
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OPOUL	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0

2.12 Latvia

2.12.1 Farm size distribution

Pigs

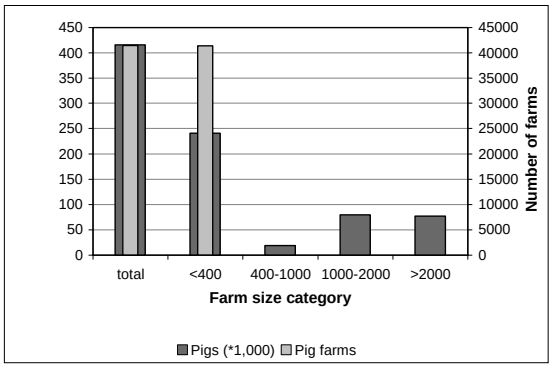

Figure LV1a. Number of pig farms and pigs per size category.

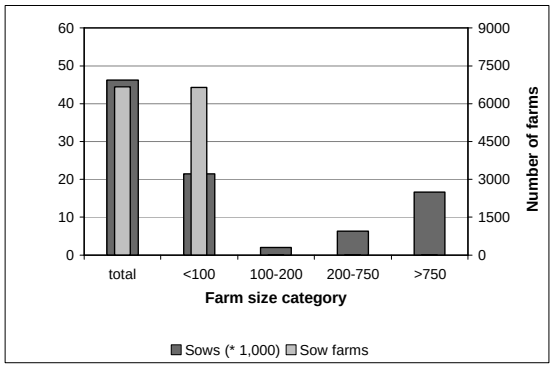

Figure LV1b. Numbers of sow farms and sows per farm size category.

Nearly all Latvian pigs farms are small. Only 10 (0%) of each total number of fattening pig and sow farms have more than 2,000 and 750 animals, respectively. The number of animals kept on those farms account for a respective19% (77,000 head) and 36% (17,000 head) of the total herd of fattening pigs and sows.

Poultry

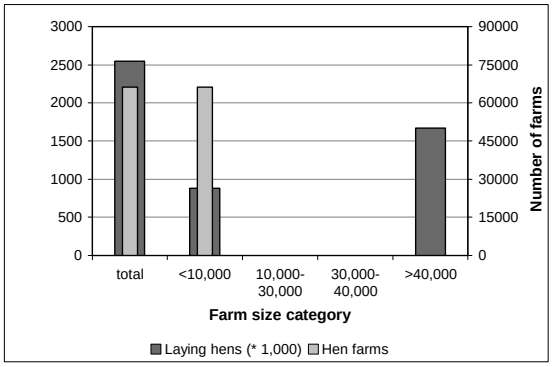

Figure LV2a. Number of laying hen farms and hens per farms size category.

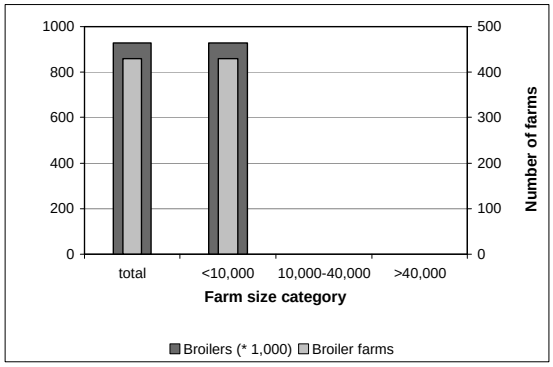

Figure LV2b. Numbers of broiler farms and broilers per farm size category.

In Latvia, no broiler farms and 10 laying hens farms (>30,000 animals; 0%) fall under the IPPC. On the laying hen farms, 1.7 million (66%) animals are kept.

Cattle

Most of the Latvian 67,000 cattle farms (including the 63,650 farms with dairy cows), have less than 10 animals. Although most of the cattle (380,000 head; 182,000 of which are dairy cows) is kept on farms with a small number of animals, significant numbers are kept on farms in all size categories.

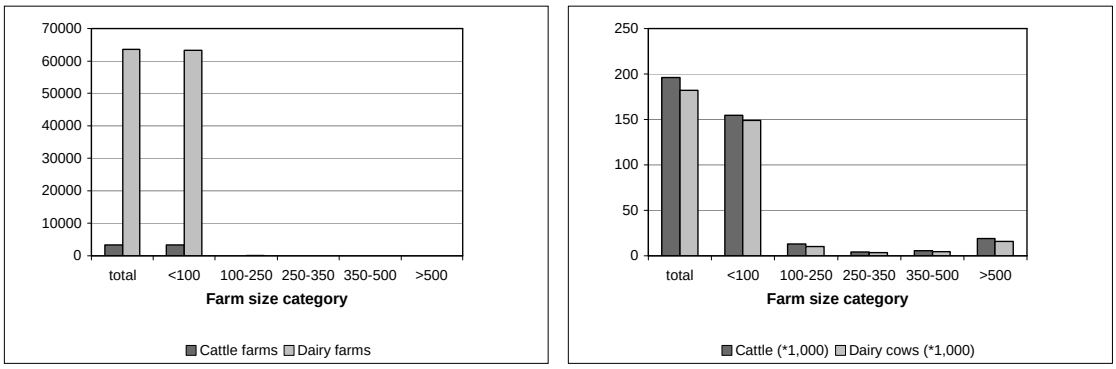

Figure LV3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.12.2 IPPC Permits

Table LV1. Overview of animals covered by IPPC and IPPC permits in Latvia.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	19%	36%	66%	0%
IPPC farms according to EUROSTAT data	**10**	**10**	**10**	**0**
Existing installations	**20**	**3**	**8**	
New permits granted	15	1	7	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated	1	0	1	
Outstanding permits	4	2	0	

The Latvian authorities have granted new permits for most of the IPPC farms.

2.12.3 Environmental legislation concerning livestock production

The Latvian Ministry of Environment has issued (in 2004) on their web-site a full documentation of the level of compliance with the IPPC Directive. This includes the permitting procedure and BAT (BREF) to be applied. It comprises farms with intensive animal keeping.

2.12.4 Best Available techniques and penetration

The evolution of penetration of Best Available Techniques in Latvia between 2000 and 2020, based upon the analysis presented in the previous paragraphs, is shown below.

Table LV2. Overview of Best Available Techniques and their penetration in Latvia (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
LAYHENS	LNF	0	0	50	50	50	50		50	50	50
LAYHENS	SA	0	65	65	65	65	65		65	65	65
LAYHENS	LNA_high	0	0	0	0	0	0		65	65	65
PIGS_I	LNA_high	0	0	0	0	0	0		24	28	30
PIGS_I	LNF	0	0	43	43	43	43		43	43	43
PIGS_I	SA	0	43	43	43	43	43		43	43	43
DAICOW_I	CS_high	0	0	0	9	10	11		9	10	11
DAICOW_I	LNA_high	0	0	0	0	0	0		9	10	11
OCOW_I	CS_high	0	0	0	1	3	6		1	3	6
OCOW_I	LNA_high	0	0	0	0	0	0		1	3	6

2.13 Lithuania

2.13.1 Farm size distribution

Pigs

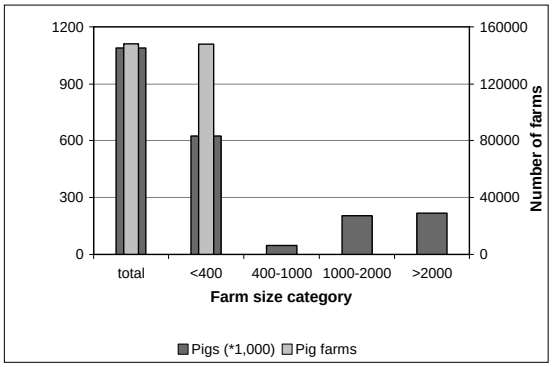

Figure LT1a. Number of pig farms and pigs per size category.

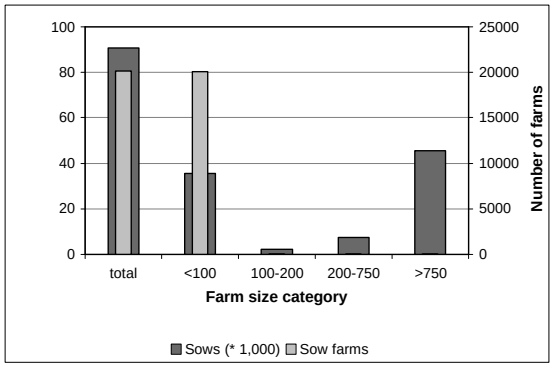

Figure LT1b. Numbers of sow farms and sows per farm size category.

On Lithuanian pig farms, mainly fattening pigs are kept (150,000 against 20,000 sow farms). The vast majority of pig farms are in the lowest size category. Both sectors have 30 (0%) farms that have more animals than the IPPC threshold. Some 20% (217,000 head) of the fatteners and 50% (46,000 animals) of the sows are kept on these farms.

Poultry

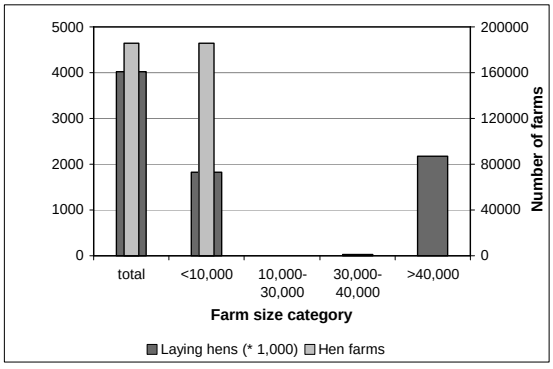

Figure LT2a. Number of laying hen farms and hens per farms size category.

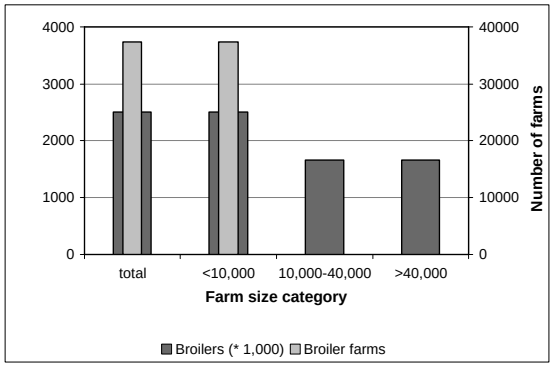

Figure LT2b. Numbers of broiler farms and broilers per farm size category.

In Lithuania, 10 (0%) laying hen farms (>40,000) and 10 (0%) broiler farms (>40,000) are present, with 2.2 million (54%) hens and 2 million (66%) broilers, respectively.

Cattle

Lithuania has 210,050 cattle farms, most of them keep dairy (193,390). They fall in the lower size categories. Most of the cattle and dairy herd is kept on these farms; only a small percentage of the animals occur on farms in each of the other size categories.

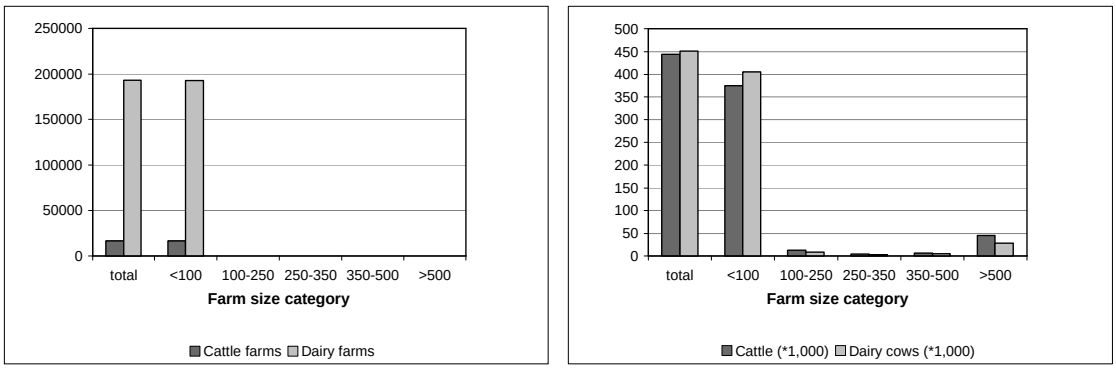

Figure LT3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.13.2 IPPC Permits

Table LT1. Overview of animals covered by IPPC and IPPC permits in Lithuania.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	20%	50%	54%	66%
IPPC farms according to EUROSTAT data	**30**	**30**	**10**	**10**
Existing installations	**30**	**0**	**21**	
New permits granted				
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated	21		15	
Outstanding permits	9		6	

Most of the permits issued in Lithuania for IPPC farms originate from the pre-IPPC period and were updated. Both numbers from EUROSTAT and from MS information match well. No permits were issued for IPPC sow farms.

2.13.3 Environmental legislation concerning livestock production

No information could be found about the environmental legislation concerning livestock production in Lithuania.

2.13.4 Best Available techniques and penetration

Table LT2 presents and overview of the penetration of Best Available Techniques in Lithuania between 2000 and 2020.

Table LT2. Overview of Best Available Techniques and their penetration in Lithuania (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
LAYHENS	SA	0	54	54	54	54	54		54	54	54
LAYHENS	CS_high	0	54	54	54	54	54		54	54	54
LAYHENS	LNA_high	0	0	0	0	0	0		55	55	55
OPOUL	LNF	0	0	50	50	50	50		50	50	50
OPOUL	SA	0	60	60	70	77	86		70	77	86
OPOUL	CS_high	0	60	60	70	77	86		70	77	86
OPOUL	LNA_high	0	0	0	0	0	0		57	57	57
PIGS_I	LNF	0	0	34	34	34	34		34	34	34
PIGS_I	SA	0	34	34	35	37	39		35	37	39
PIGS_I	CS_high	0	34	34	35	37	39		35	37	39
PIGS_I	LNA_high	0	0	0	0	0	0		13	15	17
DAICOW_I	CS_high	0	0	0	7	7	8		7	7	8
DAICOW_I	LNA_high	0	0	0	0	0	0		7	7	8
OCOW_I	CS_high	0	0	0	1	3	6		1	3	6
OCOW_I	LNA_high	0	0	0	0	0	0		1	3	6

2.14 Luxembourg

2.14.1 Farm size categories

Pigs

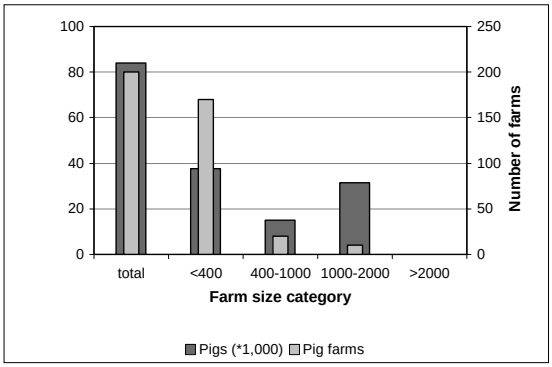

Figure LU1a. Number of pig farms and pigs per size category.

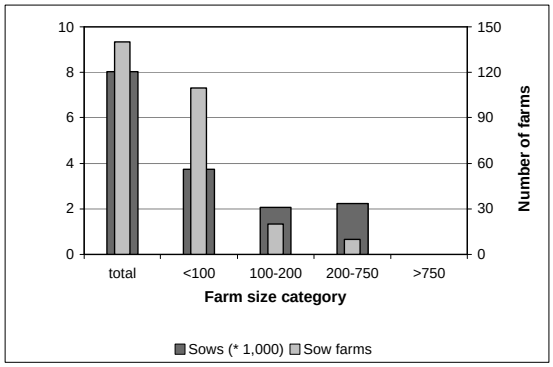

Figure LU1b. Numbers of sow farms and sows per farm size category.

None of the Luxembourg 200 fattening pig farms and 140 farms with sows are within the IPPC farm size categories.

Poultry

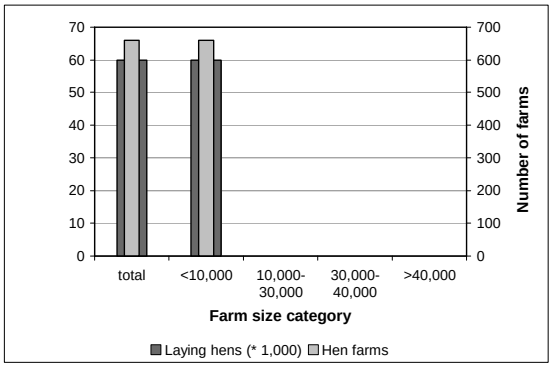

Figure LU2a. Number of laying hen farms and hens per farms size category.

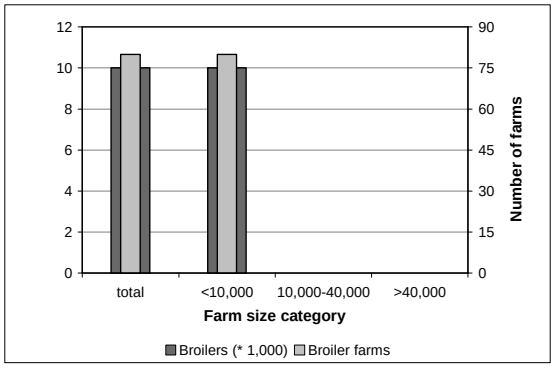

Figure LU2b. Numbers of broiler farms and broilers per farm size category.

None of the poultry farms in Luxembourg fall under IPPC.

Cattle

In Luxembourg, 190,000 head of cattle are kept on 1,620 cattle farms. This is including the 40,600 head of dairy cows on 1,040 dairy farms. Most of the cattle and dairy is kept on larger farms.

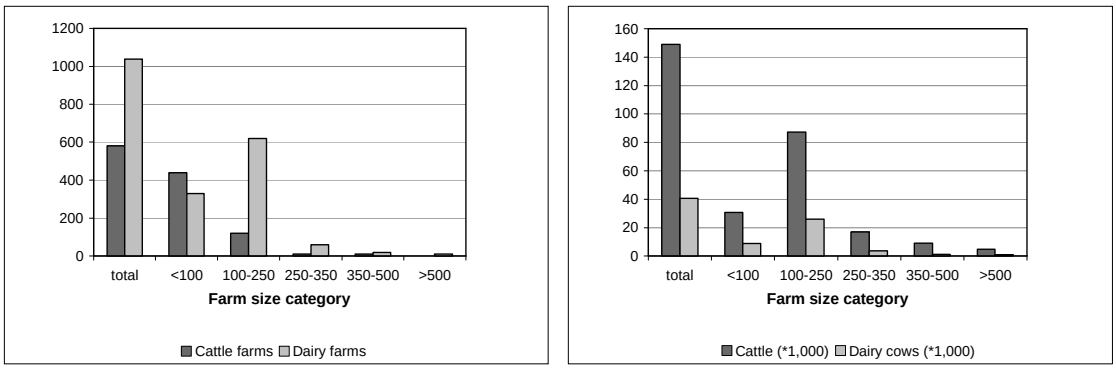

Figure LU3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.14.2 IPPC Permits

Table LU1. Overview of animals covered by IPPC and IPPC permits in Luxembourg.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	0%	0%	0%	0%
IPPC farms according to EUROSTAT data	**0**	**0**	**0**	**0**
Existing installations				
New permits granted				
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

None of the Luxembourg farms have more animals that the IPPC threshold.

2.14.3 Environmental legislation concerning livestock production

There is no relevant environmental legislation concerning livestock production in Luxembourg.

2.14.4 Best Available techniques and penetration

Penetration of BAT is not relevant for Luxembourg.

2.15 Hungary

2.15.1 Farm size distribution

Pigs

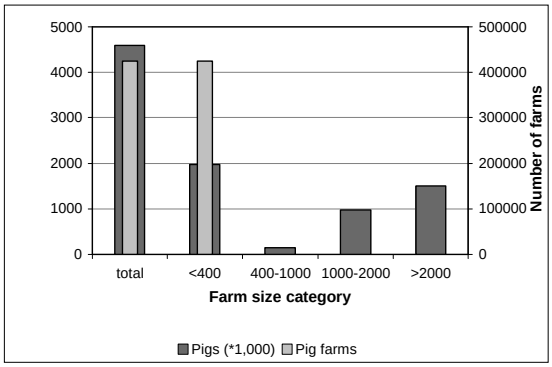

Figure HU1a. Number of pig farms and pigs per size category.

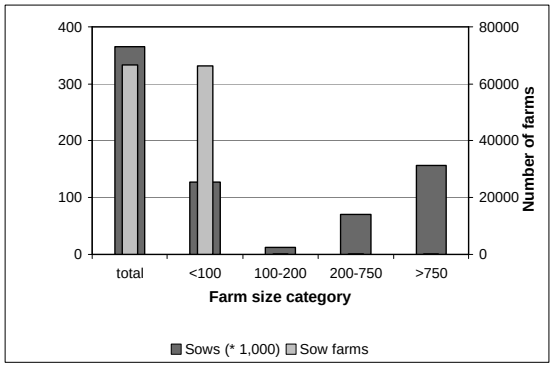

Figure HU1b. Numbers of sow farms and sows per farm size category.

Almost all pig farms have less than 400 fatteners or less than 100 sows. The number of farms with more than 2,000 fattening pigs is 220 (0%), whereas this is 100 (0%) for sows. On these farms, 1,5 million fatteners (33%) and 156,000 sows (43%) are kept.

Poultry

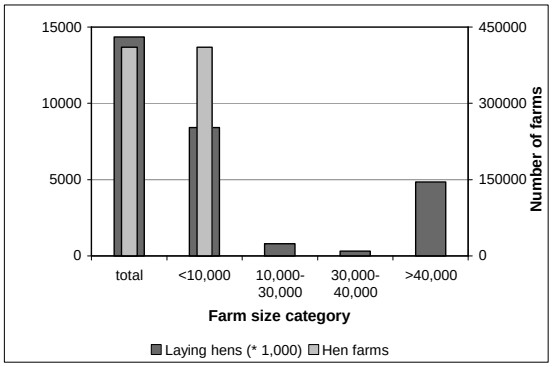

Figure HU2a. Number of laying hen farms and hens per farms size category.

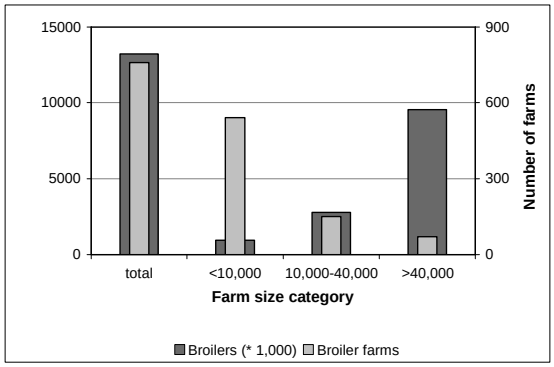

Figure HU2b. Numbers of broiler farms and broilers per farm size category.

Some 40 laying hen farms (0%) and 70 broiler farms (0%) in Hungary have more animals than the IPPC threshold. On these farms, 4.8 million hens (34%) and 10 million (72%) broilers are kept, respectively.

Cattle

Some 706,000 head of cattle is kept on 32,250 farms in Hungary. These numbers comprise 22,000 dairy farms with 295,000 milking cows. Most of the farms have small

numbers of animals. Still, more than 75% of the cattle and dairy cows are kept on larger farms, with 100 animals or more, and especially on farms with more than 500 head.

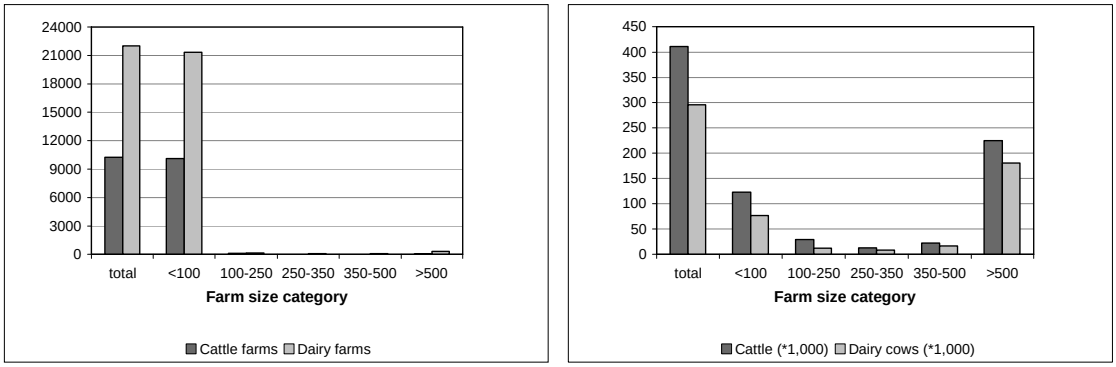

Figure HU3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.15.2 IPPC Permits

Table HU1. Overview of animals covered by IPPC and IPPC permits in Hungary [*1)]

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	33%	43%	34%	72%
IPPC farms according to EUROSTAT data	**220**	**100**	**40**	**70**
Existing installations	**240**	**47**	**229**	
New permits granted	3	2	8	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated	167	35	146	
Outstanding permits	70	10	75	

[*1)] *data on installations and permits taken from MS response to the draft report (Dec. '06)*

Around 20% of the Hungarian fattening pigs and poultry farms were granted new permits, based on the Member State information about existing IPPC farms. For the poultry sector, the number of existing IPPC farms (229) is higher than the IPPC farms according to EUROSTAT (110).
Hungary has indicated that most of the permits granted are related to existing installations (included under 'Pre-IPPC permits reconsidered and updated'), whereas a limited number of new installations were granted permits (see: 'New permits granted'). Limited permits are outstanding.

2.15.3 Environmental legislation concerning livestock production

IPPC permits in Hungary do not contain provisions for land spreading of manures, whereas is does for manure storage. Land spreading, however, is subject to permits issued by the Polish agricultural authorities (not further specified).

2.15.4 Best Available techniques and penetration

The analysis presented in the previous paragraphs results in the following overview of penetration of Best Available Techniques in Hungary.

Table HU2. Overview of Best Available Techniques and their penetration in Hungary (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	LNA_low	100	100	100	100	100	100		100	100	100
OCOW_I	CS_high	0	0	0	6	16	33		6	16	33
OCOW_I	LNA_high	0	0	0	6	16	33		6	16	33
LAYHENS	SA	0	34	34	36	37	38		36	37	38
LAYHENS	CS_high	0	34	34	36	37	38		36	37	38
LAYHENS	LNF	0	34	34	34	34	34		34	34	34
LAYHENS	LNA_high	0	0	0	0	0	0		36	37	38
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OPOUL	SA	0	45	45	73	75	78		73	75	78
OPOUL	LNA_high	0	0	0	0	0	0		66	68	71
OPOUL	CS_high	0	0	65	65	65	65		65	65	65
PIGS_I	LNA_low	100	74	29	29	29	29		29	29	29
PIGS_I	LNA_high	0	26	45	45	45	45		45	45	45
PIGS_I	SA	0	30	30	35	40	42		35	40	42
PIGS_I	LNF	0	0	45	45	45	45		45	45	45
PIGS_I	CS_high	0	0	45	45	45	45		45	45	45

2.16 Malta

2.16.1 Farm size distribution

Pigs

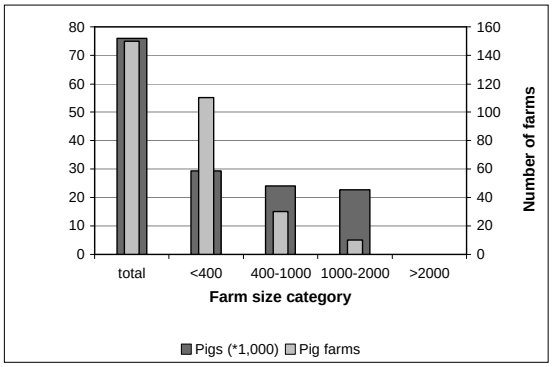

Figure MT1a. Number of pig farms and pigs per size category.

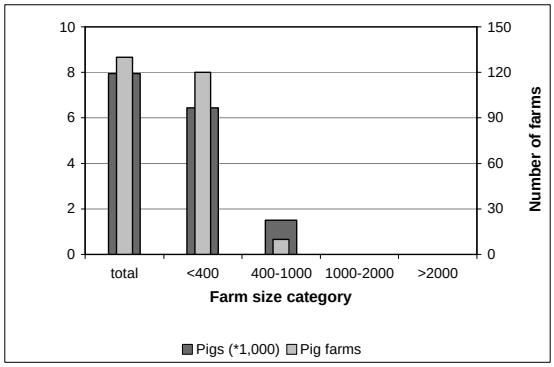

Figure MT1b. Numbers of sow farms and sows per farm size category.

The Maltese pig sector comprises 150 fattening pig farms and 130 sow farms. None of these farms have more animals than the IPPC thresholds (the farm mentioned in table MT1 reduced its size recently). It has to be noted that the MS representatives provided data on animal numbers and farm numbers that greatly differed with the EUROSTAT data.

Poultry

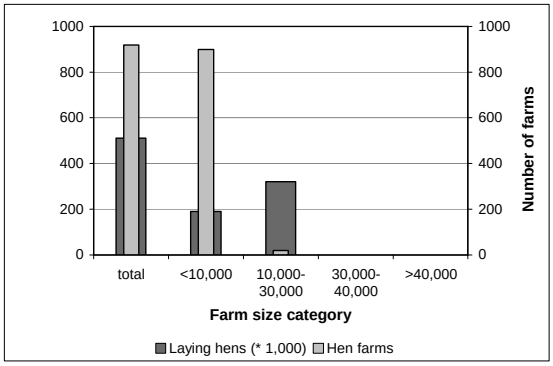

Figure MT2a. Number of laying hen farms and hens per farms size category.

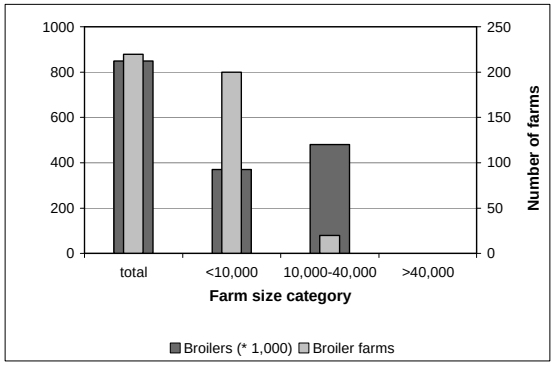

Figure MT2b. Numbers of broiler farms and broilers per farm size category.

None of the Maltese poultry farms fall under IPPC, based on EUROSTAT data, although the MS representative reported 3 IPPC farms for poultry (2 keeping broilers, and 1 keeping layers).

Cattle
The 350 Maltese cattle farms, of which 170 have dairy cows, keep 18,580 head of cattle, with 7,630 dairy cows. Cattle farms are quite evenly distributed over the farm size categories, whereas dairy cows are mostly kept on the larger farms.

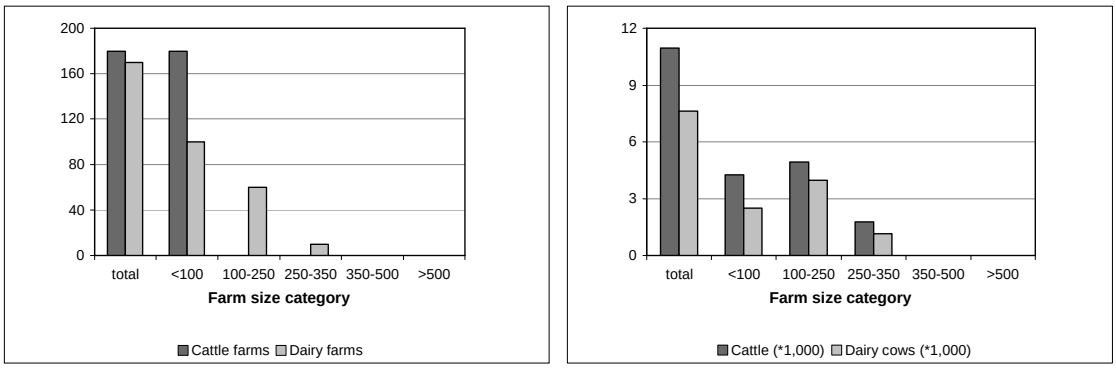

Figure MT3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.16.2 IPPC Permits

Table MT1. Overview of animals covered by IPPC and IPPC permits in Malta (most recent MS information is included between parentheses).

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	0%	0%	0% (18.1%)	0% (9.7%)
IPPC farms according to EUROSTAT data	**0**	**0**	**0**	**0**
Existing installations	**1 (0)**		**3**	
New permits granted				
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

None of the Maltese farms have more animals than the IPPC thresholds, and therefore, no permitting information is to be expected. However, the MS has indicated that 3 poultry farms and 1 fattening pig farm are existing IPPC installations. This information is not included in this study.

2.16.3 Environmental legislation concerning livestock production
Malta has no relevant environmental legislation concerning livestock production.

2.16.4 Best Available techniques and penetration

Since none of the Maltese intensive animal production farms fall under IPPC, no implementation of BAT is assumed.

2.17 Netherlands

2.17.1 Farm size distribution

Pigs

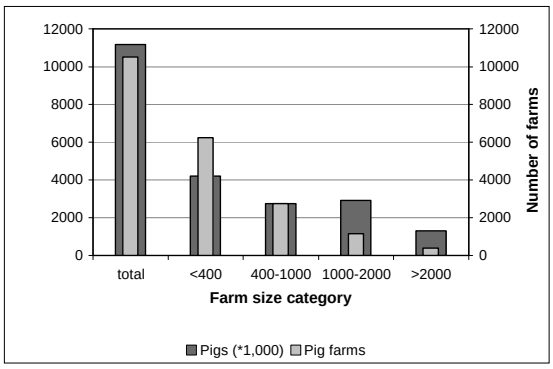

Figure NL1a. Number of pig farms and pigs per size category.

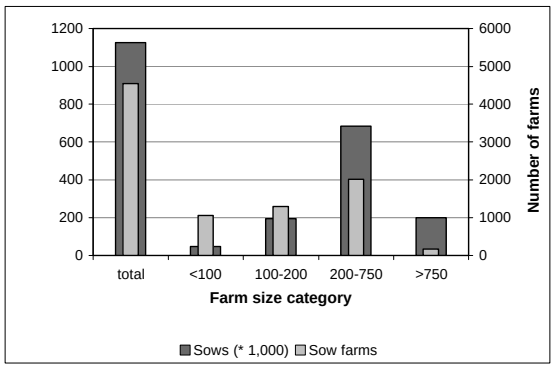

Figure NL1b. Numbers of sow farms and sows per farm size category.

The Dutch pig sector has 10,500 fattening pig farms and 4,550 sow farms, relatively equally distributed over the various farm sizes. The number of farms with more animals than the IPPC thresholds are 400 (4%) and 170 (4%), respectively. Some 1,3 million fatteners (12%) and 200,000 sows (18%) are kept on the largest farms.

Poultry

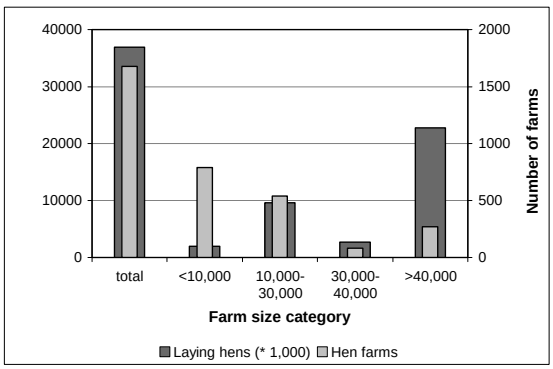

Figure NL2a. Number of laying hen farms and hens per farms size category.

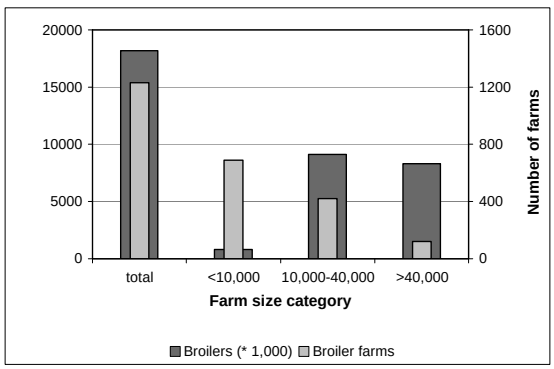

Figure NL2b. Numbers of broiler farms and broilers per farm size category.

Dutch laying hen farms with more than 40,000 animals amount 270 farms (16%), whereas this is 410 (53%) for broiler farms. On these farms, 23 million hens (62%) and 34 million broilers (80%) are kept, respectively.

Cattle

Dutch cattle was kept on 39,190 farms in 2003, of which 25,000 (60%) were specific dairy farms. The cattle herd consisted of approximately 3.75 million head, with a bit less than 1,5 million dairy cows.

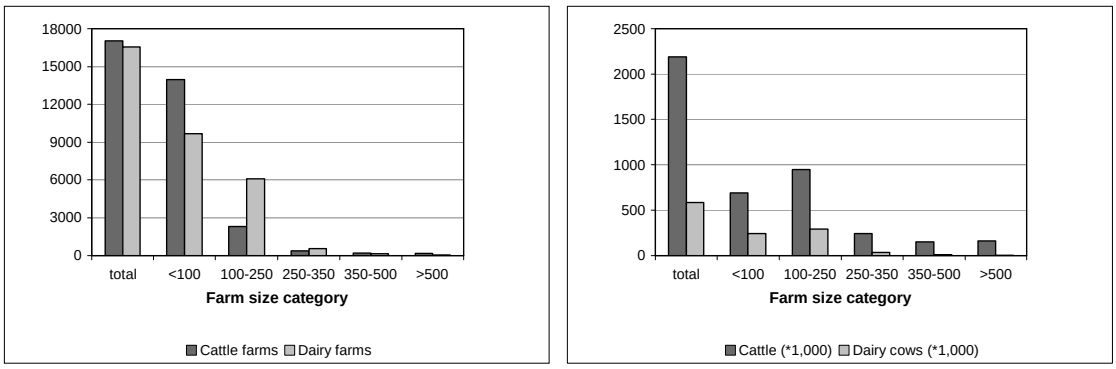

Figure NL3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.17.2 IPPC Permits

Table NL1. Overview of animals covered by IPPC and IPPC permits in The Netherlands.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	12%	18%	62%	80%
IPPC farms according to EUROSTAT data	**400**	**170**	**270**	**410**
Existing installations	**516**	**198**	**727**	
New permits granted	397	150	400	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits	119	48	327	

Dutch data on the existing IPPC installations are in good accordance with the information provided by EUROSTAT. Most of the IPPC farms were granted new permits, especially in the pig sector.

2.17.3 Environmental legislation concerning livestock production

The IPPC Directive is implemented mainly in the Environmental Management Act ('Wet Milieubeheer, 2005). Farms falling under the IPPC Directive need a permit and have to apply Best Available Techniques (BAT). Based on this Act, several general binding rules are in force regarding livestock farming:

- to reduce emissions of ammonia and odour, farmers are obliged to cover their outdoor slurry storage facilities, built before 1987 ("Besluit Mestbassins Milieubeheer, 1991)
- to reduce emissions of ammonia from animal houses, emission limit values for housing systems are layed down ("Besluit Ammoniakemissie Huisvesting Veehouderij, 2005)

The Decree on Animal Housing is only relevant for cattle (dairy) farmers when the cattle is being held inside the stable the whole year: in newly built stables and major enlargements (reconstructions), techniques to reduce ammonia emissions have to be applied. In addition, the Ministry of Environment agreed in 2002 with the farmers' organization LTO to reduce the ammonia emission by means of reaching a 20 mg/100 g level on milk urea in 2010, to be evaluated in 2008.
Besides the general Environmental Management Act, the special Ammonia and Livestock Farming Act is also of importance. This Act protects vulnerable nature against ammonia deposition. In a zone of 250 m around these areas, new stock farms are not allowed and existing farms may only expand if housing systems are applied with a very high reduction of ammonia emission (more stringent than BAT).
Furthermore, based on the Soil Protection Act ("Wet Bodembescherming"), there are general binding rules in force that oblige farmers to apply slurry to grassland and arable land with low emission techniques ("Besluit Gebruik Meststoffen, 1992/1993).

2.17.4 Best Available techniques and penetration

Table NL2 contains an overview the evolution of penetration of Best Available Techniques in the Netherlands between 2000 and 2020.

Table NL2. Overview of Best Available Techniques and their penetration in the Netherlands (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	CS_high	100	100	100	100	100	100		100	100	100
DAICOW_I	CS_low	0	0	0	0	0	0		0	0	0
DAICOW_I	LNA_high	100	100	100	100	100	100		100	100	100
DAICOW_I	LNA_low	0	0	0	0	0	0		0	0	0
DAICOW_I	SA	80	80	80	80	80	80		80	80	80
DAICOW_s	LNA_low	80	85	85	85	85	85		85	85	85
LAYHENS	CS_high	18	10	10	10	10	10		10	10	10
LAYHENS	SA	82	90	90	90	90	90		90	90	90
LAYHENS	LNA_high	82	90	90	90	90	90		90	90	90
OCOW_I	CS_high	95	95	95	95	95	95		95	95	95
OCOW_I	LNA_high	80	80	80	80	80	80		80	80	80
OCOW_I	LNA_low	0	0	0	0	0	0		0	0	0
OCOW_I	CS_low	5	5	5	5	5	5		5	5	5
OPOUL	CS_high	23	13	13	13	13	13		13	13	13
OPOUL	INCER	4	5	5	5	5	5		5	5	5
OPOUL	SA	73	82	82	82	82	82		82	82	82
OPOUL	LNA_high	73	82	82	82	82	82		82	82	82
OCOW_S	LNA_low	80	85	85	85	85	85		85	85	85
PIGS_I	CS_high	10	0	0	0	0	0		0	0	0
PIGS_I	LNA_high	90	99	100	100	100	100		100	100	100
PIGS_I	LNF	0	20	20	20	20	20		20	20	20
PIGS_I	SA	65	85	85	85	85	85		85	85	85
PIGS_S	LNA_low	100	75	75	75	75	75		75	75	75
PIGS_S	LNF	0	100	100	100	100	100		100	100	100

2.18 Austria

2.18.1 Farm size distribution

Pigs

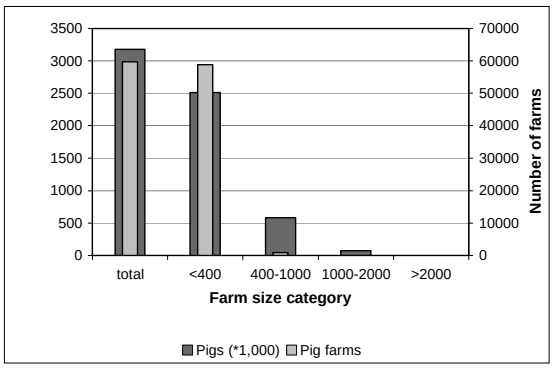

Figure AT1a. Number of pig farms and pigs per size category.

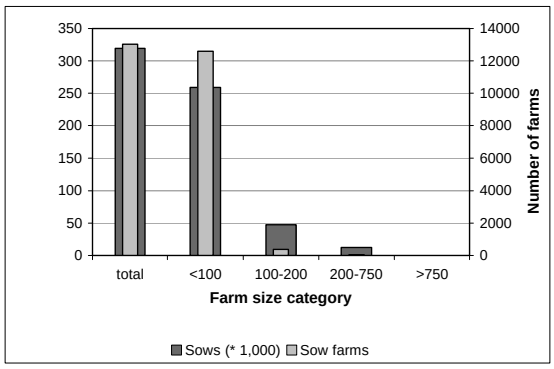

Figure AT1b. Numbers of sow farms and sows per farm size category.

In Austria, most of the pig farms have less than 400 fattening pigs or 100 sows. None of the farms have more animals than the IPPC thresholds.

Poultry

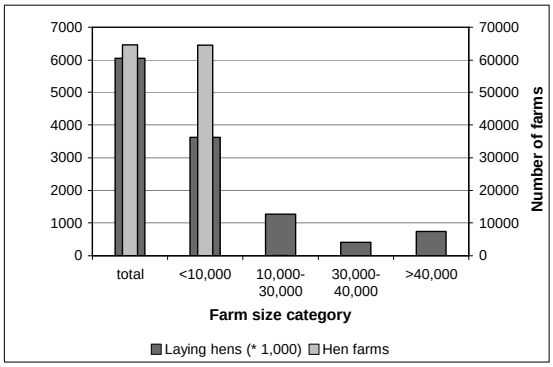

Figure AT2a. Number of laying hen farms and hens per farms size category.

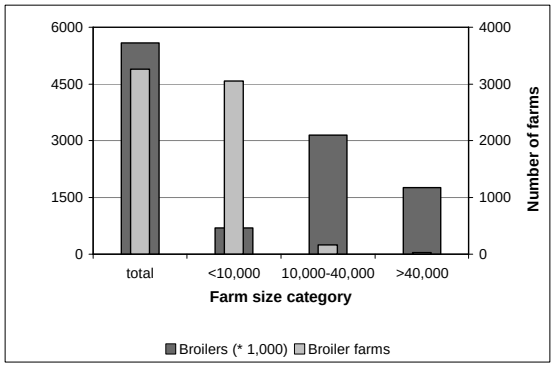

Figure AT2b. Numbers of broiler farms and broilers per farm size category.

Around 10 Austrian laying hen farms (0%), with a total of 0.7 million hens (12%) fall under IPPC, whereas this is 30 farms (1%) and 2 million animals (31%) for broilers (>40,000 animals).

Cattle

The Austrian cattle sector of 87,420 cattle farms, including 65,130 dairy farms, 65130 dairy farms is relatively equally distributed over the farm size categories from 0-5 to 20-50 animals. Approximately 50% of the cattle herd (total number of 2 million head) and the dairy cow herd (in total 580,000 animals) is kept on farms with 20-50 animals.

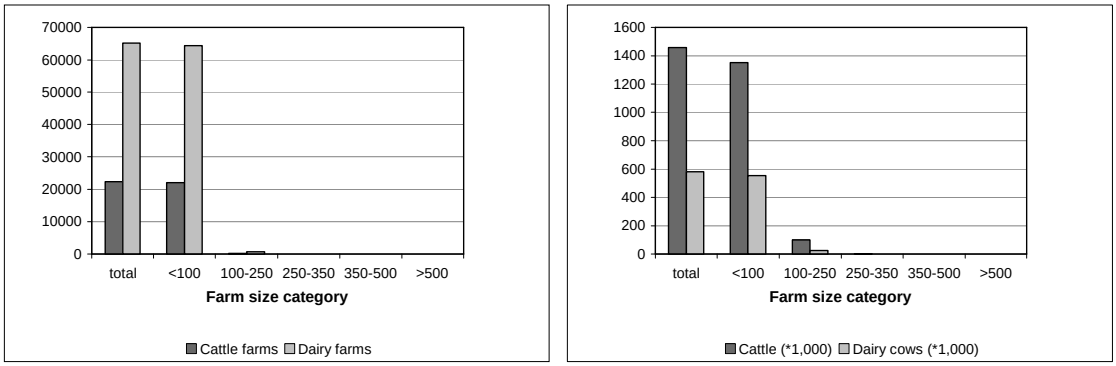

Figure AT3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.18.2 IPPC Permits

Table AT1. Overview of animals covered by IPPC and IPPC permits in Austria.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	0%	0%	12%	31%
IPPC farms according to EUROSTAT data	**0**	**0**	**10**	**30**
Existing installations	**3**	**1**	**7**	
New permits granted	nd	nd	nd	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

Austria didn't provide information about the permitting situation yet. The MS representative has indicated that in general, Austrian pre-IPPC permits are reconsidered, because most of the Austrian IPPC installations do have a pre-IPPC permit. The number of existing IPPC installations for poultry are lower than based upon EUROSTAT data.

2.18.3 Environmental legislation concerning livestock production

In Austria, the competence for the transposition of the IPPC Directive in relation to the rearing of animals lies with the (nine) provinces. Eight of them have adopted framework laws for IPPC installations, including *inter alia* installations for the rearing of pigs and poultry (Tyrol has prohibited intensive rearing of animals above IPPC Thresholds). Existing installations have to comply with the IPPC regime by 31. October 2007, and the

operators have to inform the competent authorities in time of the measures they have taken. If the measures are not sufficient, the authorities have to lay down additional measures (permitting conditions).

Apart from the regional IPPC laws and construction laws, i.a. the Water Act 1959 (Fed. Law Gazette 215), as amended by the Federal Law Gazette 1 No. 123/2006, applies. Based on the Water Act, an ordinance on the limitation of sewage from installations for the intensive rearing of animals was adopted in 1997 (Federal Law Gazette II No. 349/1997).

The Federal Act on Environmental Impact Assessment (Federal Law Gazette 697/1993) as amended by Federal Law Gazette 1 No. 149/1006, provides an EIA for pigs and poultry with the following thresholds:

- pigs: 2,500 places for fatteners and 700 places for sows (in sensible areas: 1,400 and 450 places, respectively)
- poultry: 48,000 places for laying hens, and 65,000 places for broilers (in sensible areas: 40,000 and 42,500 places, respectively)

The EIA is in these cases carried out in a simplified procedure, meaning that there are procedural simplifications, but there is no difference to an ‘ordinary’ EIA concerning the material requirements.

2.18.4 Best Available techniques and penetration

Based on the analysis in the previous paragraphs, the following overview of penetration of Best Available Techniques for Austria can be composed.

Table AT2. Overview of Best Available Techniques and their penetration in Austria (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	20	20	20	20	20	20		20	20	20
DAICOW_l	CS_low	26	26	26	26	26	26		26	26	26
DAICOW_l	LNA_low	10	10	10	10	10	10		10	10	10
DAICOW_s	LNA_high	5	5	5	5	5	5		5	5	5
DAICOW_s	LNA_low	5	5	5	5	5	5		5	5	5
LAYHENS	CS_high	10	0	0	0	0	0		0	0	0
LAYHENS	LNF	0	0	12	12	12	12		12	12	12
LAYHENS	LNA_high	1	6	6	6	6	6		21	23	26
LAYHENS	LNA_low	10	2	0	0	0	0		0	0	0
LAYHENS	SA	0	12	12	21	23	26		21	23	26
LAYHENS	CS_high	0	12	12	21	23	26		21	23	26
OCOW_l	CS_high	10	10	10	10	10	10		10	10	10
OCOW_l	CS_low	34	34	34	34	34	34		34	34	34
OCOW_l	LNA_low	10	10	10	10	10	10		10	10	10
OPOUL	LNF	0	0	28	28	28	28		28	28	28
OPOUL	LNA_high	10	15	15	15	15	15		35	41	48
OPOUL	LNA_low	10	0	0	0	0	0		0	0	0
OPOUL	SA	0	28	28	35	41	48		35	41	48
OPOUL	CS_high	0	28	28	35	41	48		35	41	48
OCOW_S	LNA_high	5	5	5	5	5	5		5	5	5
OCOW_S	LNA_low	5	5	5	5	5	5		5	5	5
PIGS_l	CS_high	10	10	10	10	10	10		10	10	10
PIGS_l	CS_low	33	33	33	33	33	33		33	33	33
PIGS_l	LNA_low	10	10	10	10	10	10		10	10	10
PIGS_l	LNA_high	0	0	0	0	0	0		0	0	1
PIGS_l	SA	0	0	0	0	0	1		0	0	1
PIGS_S	LNA_high	10	10	10	10	10	10		10	10	10
PIGS_S	LNA_low	10	10	10	10	10	10		10	10	10
SHEGOA	LNA_low	100	100	100	100	100	100		100	100	100

2.19 Poland

2.19.1 Farm size distribution

Pigs

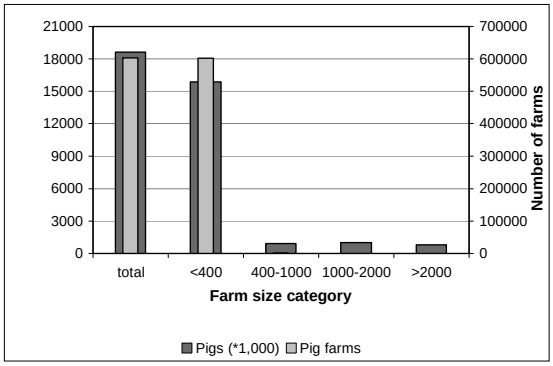

Figure PL1a. Number of pig farms and pigs per size category.

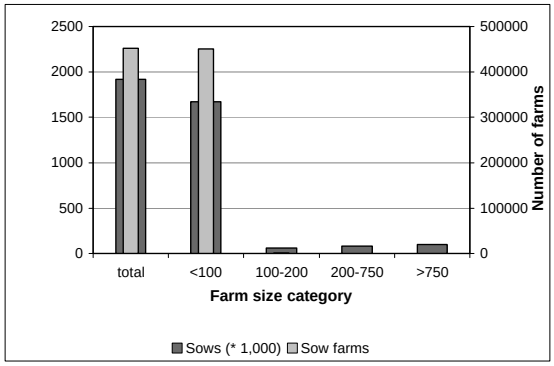

Figure PL1b. Numbers of sow farms and sows per farm size category.

The Polish pig sector has a large number of fattening pig farms (around 600,000) and sow farms (over 450,000). The vast amount of them have less than 400 fatteners or less than 100 sows. Some 150 (0%) fattening pig farms and 50 (0%) sow farms have more than 2,000 and 750 animals, respectively. On these IPPC farms, 811,000 fattening pigs (4%) and 102,000 sows (5%) are kept.

Poultry

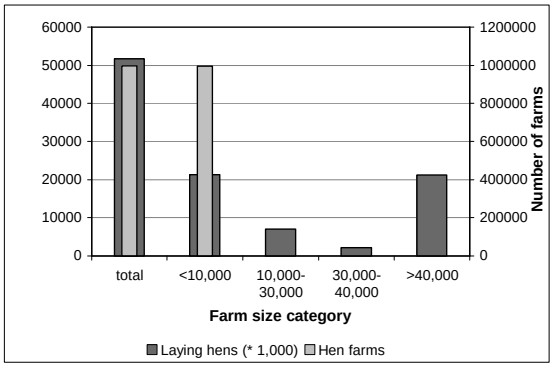

Figure PL2a. Number of laying hen farms and hens per farms size category.

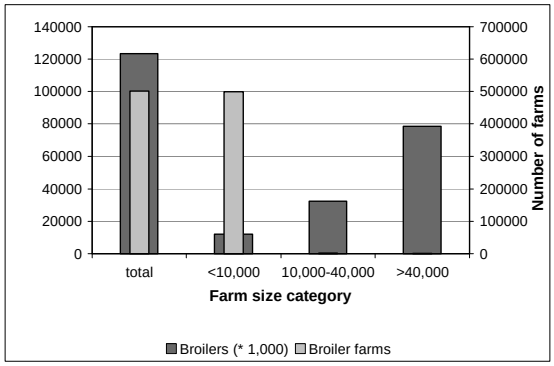

Figure PL2b. Numbers of broiler farms and broilers per farm size category.

In Poland, there are 220 farms (0%) with more than 40,000 laying hens and 660 IPPC broiler farms (0%). Some 21 million hens (41%) and 79 million broilers (64%) are kept on these farms, respectively.

Cattle

The Polish cattle sector comprises 935,190 cattle farms and (or: of which) 873,800 dairy farms (93%). Most of the farms are in the size category of 0-5 LSU and 5-10 LSU. Approximately 50% of the cattle heard of slightly over 5.5 million head is dairy cows (2,851,360 head). Both cattle and dairy cows are quite evenly distributed over farms in size categories between 0-5 and 20-50 LSU.

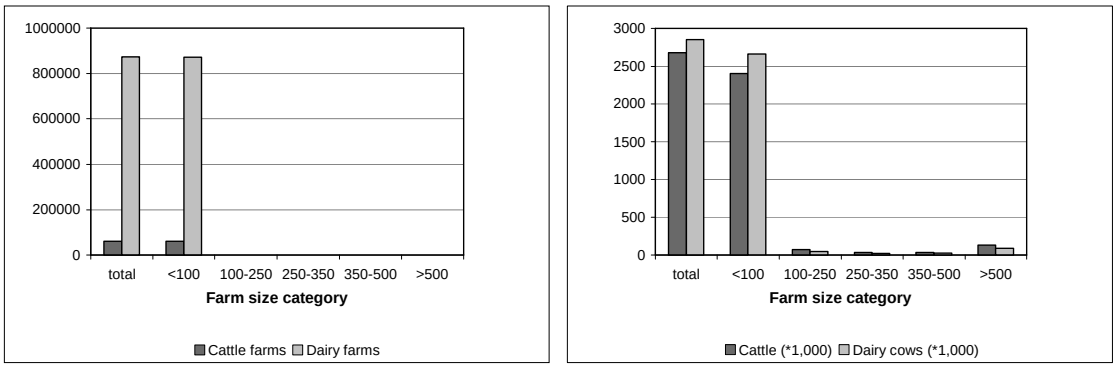

Figure PL3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.19.2 IPPC Permits

Table PL1. Overview of animals covered by IPPC and IPPC permits in Poland (most recent MS information of 22 January 2007 between parentheses).

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	4%	5%	41%	64%
IPPC farms according to EUROSTAT data	**150**	**50**	**220**	**660**
Existing installations	**97 (126 existing and 8 new)**	**6 (47 existing and 2 new)**	**262 (427 existing and 18 new)**	
New permits granted	16 (72)	3 (36)	10 (226)	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

Differences exist in the numbers of existing IPPC installations provided by the Member State and those derived from EUROSTAT data, especially for sow farms (6 versus 50) and poultry farms (262 based upon MS information; 880 according to EUROSTAT data). However, the most recent information submitted in January 2007 shows much better accordance. A small percentage of the existing installations were granted new permits, but recently many more new permits were issues.

2.19.3 Environmental legislation concerning livestock production

The Polish government has issued regulations with detailed requirements to be met by farmers in order to comply with notably the Nitrates Directive. This 2005 Regulation

concerns farms with 5-30 LSU, and implies regulation on minimum manure storage capacity, covering of slurry stores, and manure and fertilizer application (Kuczynski, personal communication). No specific requirements for ammonia abatement are included, except for the covering of slurry stores. The Polish government has negotiated an extension in implementing the IPPC directive until 2010. IPPC permits don't include provisions on land spreading of manures. This issue is separately regulated by (Malgorzata, personal communication):

- Act on fertilizers and fertilization (OJ 2000 No. 89, of 26 July 2000), which regulates treatment of manure, prevention of harmful effects on people, animals and the environment that can occur as an effect of transport, storing and usage of fertilizers. An important element of this Act is that farmers should have an approved fertilization plan, which is also included in the IPPC permit
- Regulation of the Minister of Environment (OJ No. 4/2003 of 23 December 2003), with detailed requirements to reduce N emissions from agriculture. It contains specifications concerning periods for fertilizer application, capacity of storage tanks and barns with manure storage, methods of fertilization, and fertilization plans
- Regulation of the Minister of Agriculture (OJ No. 60 of 1 June 2001), concerning usage of fertilizers and training of farmers

2.19.4 Best Available techniques and penetration

The analysis presented in the previous paragraphs results in the following overview of penetration of Best Available Techniques between 2000 and 2020 in Poland.

Table PL2. Overview of Best Available Techniques and their penetration in Poland (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	25	35	35	35	35	35		35	35	35
DAICOW_l	LNA_high	0	0	0	0	0	0		4	4	4
DAICOW_s	LNA_high	5	5	5	5	5	5		5	5	5
DAICOW_s	LNA_low	95	95	95	95	95	95		95	95	95
LAYHENS	LNA_high	4	40	41	41	41	41		46	47	49
LAYHENS	LNA_low	76	40	6	6	6	6		6	6	6
LAYHENS	SA	0	41	41	46	47	49		46	47	49
LAYHENS	CS_high	0	41	41	46	47	49		46	47	49
LAYHENS	LNF	0	0	41	41	41	41		41	41	41
OCOW_l	CS_high	20	35	35	35	35	35		35	35	35
OCOW_l	LNA_high	0	0	0	0	0	0		1	2	3
OPOUL	LNA_high	5	46	50	50	50	50		65	68	71
OPOUL	LNA_low	95	54	3	3	3	3		3	3	3
OPOUL	SA	0	55	55	65	68	71		65	68	71
OPOUL	LNF	0	0	60	60	60	60		60	60	60
OPOUL	CS_high	0	0	60	60	60	60		60	60	60
OCOW_S	LNA_high	5	5	5	5	5	5		5	5	5
OCOW_S	LNA_low	95	95	95	95	95	95		95	95	95
PIGS_l	CS_high	25	23	26	26	26	26		26	26	26
PIGS_l	SA	0	11	11	11	11	11		11	11	11
PIGS_l	LNF	0	0	11	11	11	11		11	11	11
PIGS_l	LNA_high	0	11	11	11	11	11		11	11	11
PIGS_l	LNA_low	0	3	74	74	74	74		74	74	74
PIGS_S	LNA_high	6	6	6	6	6	6		6	6	6
PIGS_S	LNA_low	94	94	94	94	94	94		94	94	94
SHEGOA	LNA_low	100	100	100	100	100	100		100	100	100

2.20 Portugal

2.20.1 Farm size distribution

Pigs

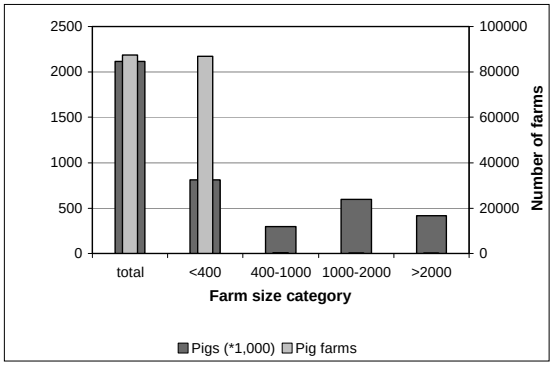

Figure PT1a. Number of pig farms and pigs per size category.

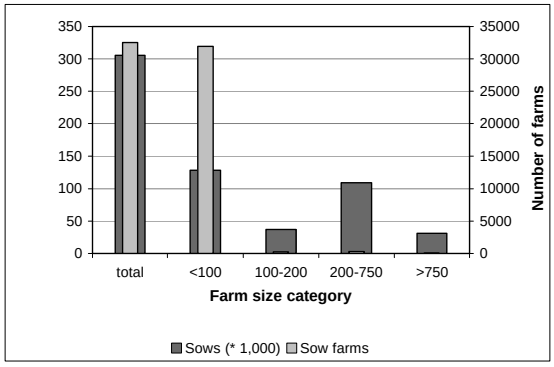

Figure PT1b. Numbers of sow farms and sows per farm size category.

The pig sector in Portugal has over 80,000 pig farms and over 30,000 sow farms, most of them having less than 400 and 100 animals, respectively. Of these farms, 110 (0%) farms with fattening pigs and 30 (0%) sow farms have more animals than the IPPC thresholds. Around 20% (415,000 head) of the fattening pig herd and 10 % (31,000 animals) of the sow herd is kept on these IPPC farms.

Poultry

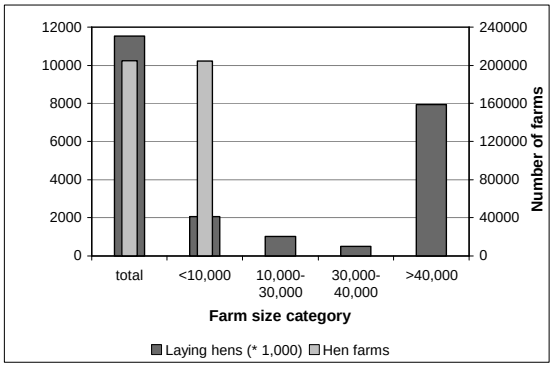

Figure PT2a. Number of laying hen farms and hens per farms size category.

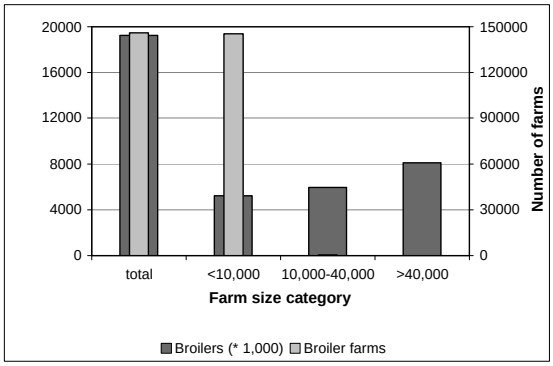

Figure PT2b. Numbers of broiler farms and broilers per farm size category.

The vast majority (7.9 million; 69%) of the laying hens in Portugal are kept on 60 (0%) farms with more than 40,000 animals. Around 8 million (42%) broilers are kept on the 70 (0%) IPPC broiler farms.

Cattle

The Portuguese cattle sector comprises 85,000 farms, of which 27.000 are keeping dairy cows. Most of these farms have 0-5 head of livestock, but the rest of the farms are quite equally distributed over the remainder size categories. The cattle herd is 1,4 million head, of which 335,000 are dairy cows. Most of the cattle and dairy cow herd is kept on farms with 20-50 to 100-500 animals.

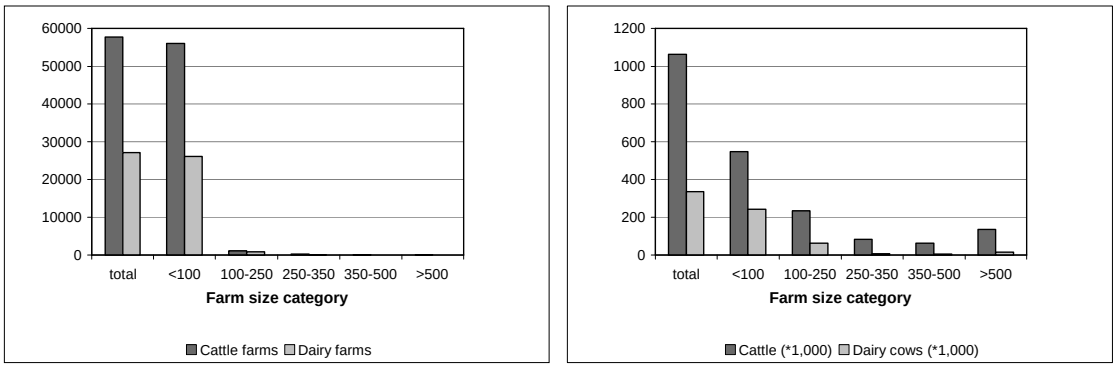

Figure PT3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.20.2 IPPC Permits

Table PT1. Overview of animals covered by IPPC and IPPC permits in Portugal (most recent MS information, of January 2007, is presented between parentheses).

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	20%	10%	69%	42%
IPPC farms according to EUROSTAT data	**110**	**30**	**60**	**70**
Existing installations	**54 (59)**	**11 (13)**	**70 (72)**	
New permits granted	1 (4)	2 (3)	3 (8)	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits	53 (55)	9 (10)	67 (64)	

The number of IPPC farms based on EUROSTAT data is larger than the numbers of existing installations indicated by the Member State. For fattening pigs and poultry, the number of IPPC farms according to EUROSTAT data is 2 times greater than based upon MS information. For sow farms, this factor is 3. Verification is needed to explain for these differences. Most of the permits are outstanding.

2.20.3 Environmental legislation concerning livestock production

All the IPPC farms have to comply with the current legislation.

a) Manure application and storage

Agricultural recovery of residual substances must comply with the Regulation of sub-products (Regulation CE No. 1774/2002), and/or with the Law of the Residues (Decree-law No. 239/97), and complementary legislation.

Discharge in the soil of effluents is only allowed in those cases identified in the Good Agricultural Practices Code (Directive No. 91/676), with specific conditions defined in the environmental permit. This stimulates the use of good agricultural practices, which contributes to the improvement of the level of protection of waters against the diffuse pollutions of agricultural origin. It also must respect Decree Law No. 236/98 and No. 58/2005, and complementary legislation regarding the prevention of water pollution. Additionally, use of treated effluents for irrigation can only be operated if emission limit values (ELV's) are complied with.

The effluent discharge in water courses is presently regulated by Portaria No. 810/90.

b) Housing systems

Decree Laws exist on the basic principles for lodging and feeding of animal, keeping in mind behavioral and physiological needs of the animals, as well as on similar issues for pigs, taking into account animal welfare.

2.20.4 Best Available techniques and penetration

In Table PT2, an overview is presented of the evolution of penetration of Best Available Techniques in Portugal between 2000 and 2020.

Table PT2. Overview of Best Available Techniques and their penetration in Portugal (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	LNA_high	0	0	0	0	0	0		5	6	7
DAICOW_I	CS_high	0	0	0	5	6	7		5	6	7
OCOW_I	LNA_high	0	0	0	0	0	0		1	4	8
OCOW_I	CS_high	0	0	0	1	4	8		1	4	8
LAYHENS	SA	0	59	59	74	75	76		74	75	76
LAYHENS	CS_high	0	59	59	74	75	76		74	75	76
LAYHENS	LNF	0	0	60	60	60	60		60	60	60
OPOUL	SA	0	30	30	44	47	51		44	47	51
OPOUL	CS_high	0	30	30	44	47	51		44	47	51
OPOUL	LNF	0	0	60	60	60	60		60	60	60
PIGS_I	SA	0	21	40	40	40	40		40	40	40
PIGS_I	CS_high	0	21	40	40	40	40		40	40	40
PIGS_I	LNF	0	0	40	40	40	40		40	40	40
LAYHENS	LNA_high	0	0	0	0	0	0		74	75	76
OPOUL	LNA_high	0	0	0	0	0	0		44	47	51
PIGS_I	LNA_high	0	0	0	0	0	0		20	24	29

2.21 Slovenia

2.21.1 Farm size distribution

Pigs

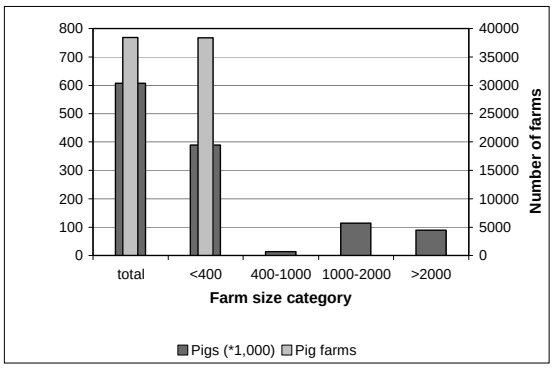

Figure SIa. Number of pig farms and pigs per size category.

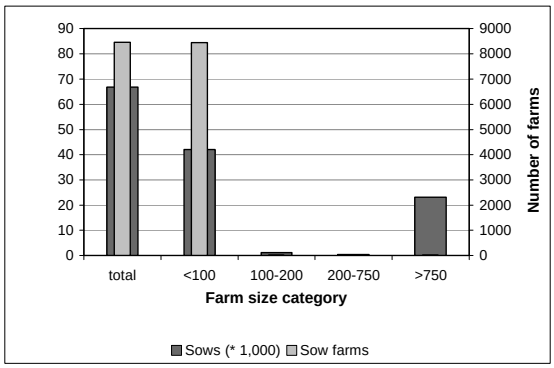

Figure SI1b. Numbers of sow farms and sows per farm size category.

Nearly all (fatteners and sow) pig farms in Slovenia have less than 400 (fatteners) or 100 (sows) animals. For both type of pigs, 10 farms (0%) have more animals than the IPPC thresholds. Some 89,000 fattening pigs (15%) and 23,000 sows (35%) are kept on these farms.

Poultry

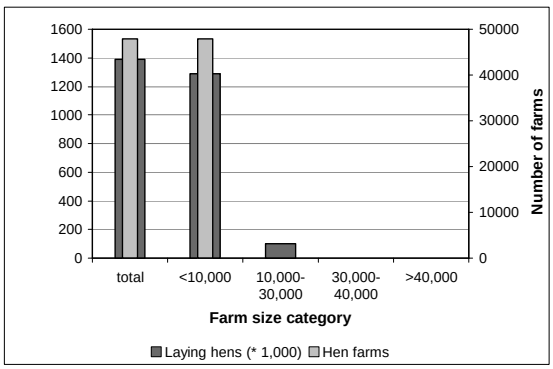

Figure SI2a. Number of laying hen farms and hens per farms size category.

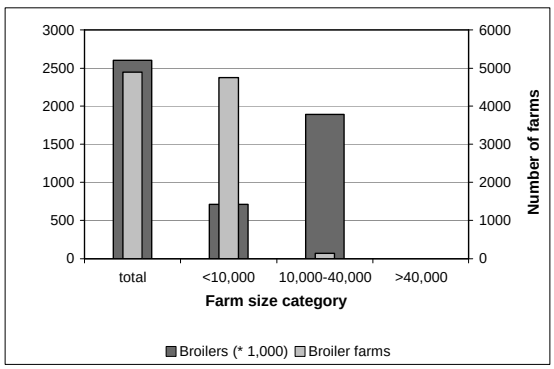

Figure SI2b. Numbers of broiler farms and broilers per farm size category.

None of the Slovenian laying hen and broiler farms fall under the IPPC Directive.

Cattle

In Slovenia, nearly 500,000 head of cattle is kept on 46,740 farms. These numbers include 131,100 head of dairy cows and 17,190 dairy farms. Cattle is mostly kept on small farms (0-5 and 5-10 animals), but dairy cow farms are quite equally represented in

farm size categories of 0-5 to 20-50 head. Cattle and dairy cows is kept in relatively equal numbers on farms between 0-5 and 20-50 animals, with 20-50 being the largest single category.

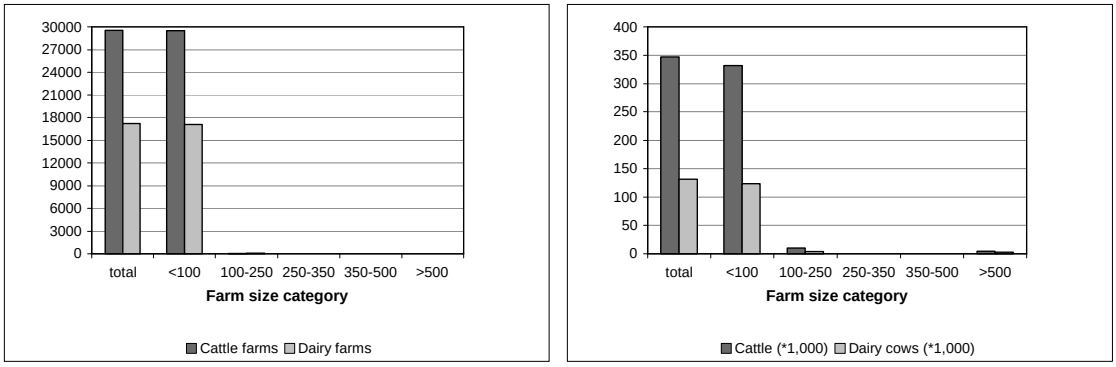

Figure SI3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.21.2 IPPC Permits

Table SI1. Overview of animals covered by IPPC and IPPC permits in Slovenia.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	15%	35%	0%	0%
IPPC farms according to EUROSTAT data	**10**	**10**	**0**	**0**
Existing installations	**8**	**2**	**16**	
New permits granted				
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits	8	2	16	

Although none of the Slovenian poultry farms have more animals than the IPPC thresholds, the Member State reported 16 existing installations. This needs to be checked. For the pig sector, the number of IPPC farms with sows according to EUROSTAT is 10, whereas the MS reported 2 IPPC sow farms. All permits for the pig and poultry sector are outstanding.

2.21.3 Environmental legislation concerning livestock production

No information could be found about relevant environmental legislation concerning livestock production in Slovenia.

2.21.4 Best Available techniques and penetration

As a result of the analysis presented in the previous paragraphs, the development of penetration of Best Available Techniques in Slovenia between 2000 and 2020 is as follows.

Table SI2. Overview of Best Available Techniques and their penetration in Slovenia (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	50	50	50	50	50	50		50	50	50
DAICOW_l	LNA_low	20	20	20	20	20	20		20	20	20
DAICOW_l	LNA_high	0	0	0	0	0	0		3	3	3
DAICOW_s	LNA_low	20	20	20	20	20	20		20	20	20
LAYHENS	LNA_low	8	8	8	8	8	8		8	8	8
LAYHENS	SA	0	0	0	1	1	2		1	1	2
LAYHENS	CS_high	0	0	0	1	1	2		1	1	2
OCOW_l	CS_high	50	50	50	50	50	50		50	50	50
OCOW_l	LNA_low	20	20	20	20	20	20		20	20	20
OCOW_l	LNA_high	0	0	0	0	0	0		0	0	1
OPOUL	LNA_low	8	8	8	8	8	8		8	8	8
OPOUL	SA	0	0	0	4	12	21		4	12	21
OPOUL	CS_high	0	0	0	4	12	21		4	12	21
OCOW_S	LNA_low	20	20	20	20	20	20		20	20	20
PIGS_l	CS_high	55	55	55	55	55	55		55	55	55
PIGS_l	LNA_high	6	6	6	6	6	6		24	26	27
PIGS_l	SA	0	6	6	24	26	27		24	26	27
PIGS_l	LNF	0	0	21	21	21	21		21	21	21
PIGS_l	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_S	LNA_high	8	8	8	8	8	8		8	8	8

2.22 Slovakia

2.22.1 Farm size distribution

Pigs

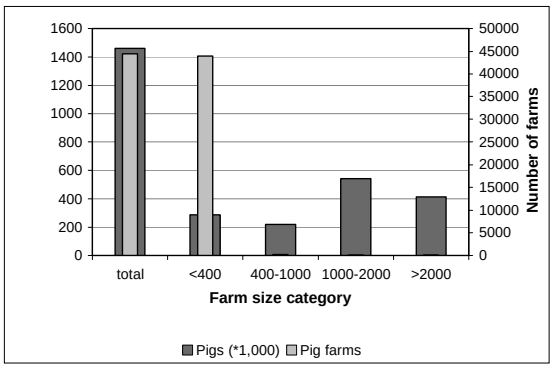

Figure SK1a. Number of pig farms and pigs per size category.

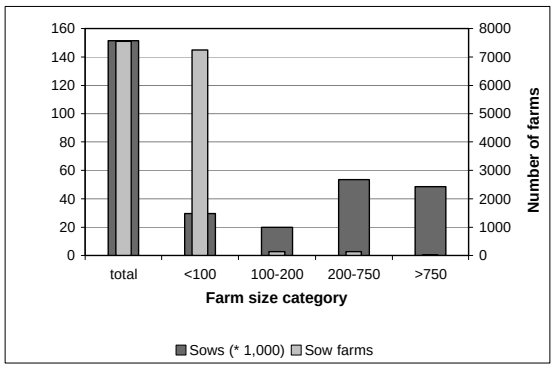

Figure SK1b. Numbers of sow farms and sows per farm size category.

Nearly all of the 45,000 fattening pig farms and 7,500 sow farms in Slovakia have relatively small animal numbers. Farms with more animals than the IPPC threshold amount 90 (0%) and 30 (0%) for fattening pigs and sows, respectively. Still, 28% (413,000 fatteners) and 32% (48,000 sows) of the animals are kept on these farms.

Poultry

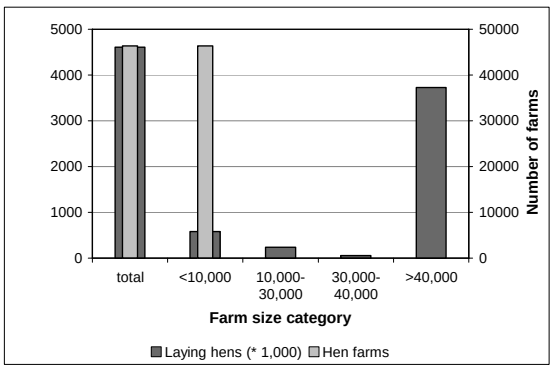

Figure SK2a. Number of laying hen farms and hens per farms size category.

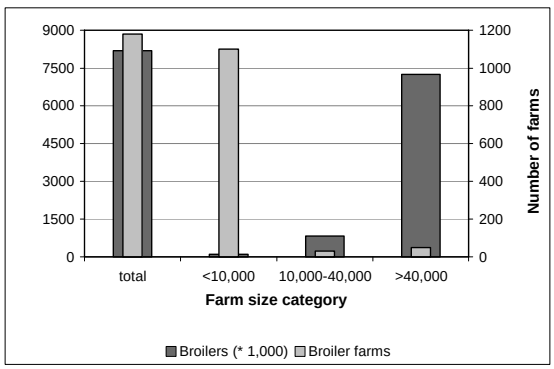

Figure SK2b. Numbers of broiler farms and broilers per farm size category.

Slovak IPPC farms for laying hens and broilers (>40,000 birds) are limited in numbers. The 30 (0%) IPPC laying hen farms house 3.7 million animals (81%), whereas these figures are 50 (4%) and 7 million (89%), respectively, for broilers.

Cattle
Nearly 600,000 head of cattle is kept on 19,370 farms. These numbers include 208.000 dairy cows and 14,230 dairy farms. Cattle and dairy farms have low animal numbers, but a vast percentage of the herds is kept on large farms (>500 animals).

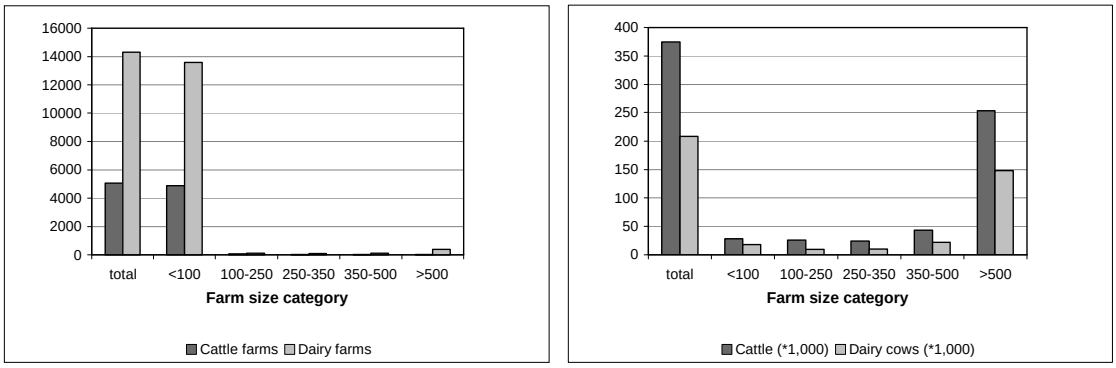

Figure SK3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.22.2 IPPC Permits

Table SK1. Overview of animals covered by IPPC and IPPC permits in Slovakia.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	28%	32%	81%	89%
IPPC farms according to EUROSTAT data	**90**	**30**	**30**	**50**
Existing installations	**nd**	**nd**	**nd**	
New permits granted	nd	nd	nd	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

The Member State provided no information (= nd) about the number of existing IPPC installations and about the permitting situation.

2.22.3 Environmental legislation concerning livestock production
No information about relevant environmental legislation concerning livestock production for Slovakia could be found.

2.22.4 Best Available techniques and penetration

The results of the analysis in the previous paragraphs in terms of penetration of Best Available Techniques in Slovakia is presented in table SK2.

Table SK2. Overview of Best Available Techniques and their penetration in Slovakia (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_I	LNA_high	0	0	0	0	0	0		75	78	82
DAICOW_I	CS_high	0	0	0	75	78	82		75	78	82
OCOW_I	LNA_high	0	0	0	0	0	0		7	20	41
OCOW_I	CS_high	0	0	0	7	20	41		7	20	41
LAYHENS	SA	0	81	81	83	83	84		83	83	84
LAYHENS	LNF	0	0	50	50	50	50		50	50	50
OPOUL	SA	0	81	81	89	90	92		89	90	92
OPOUL	CS_high	0	81	81	89	90	92		89	90	92
OPOUL	LNF	0	0	60	60	60	60		60	60	60
PIGS_I	SA	0	21	21	28	35	40		28	35	40
PIGS_I	CS_high	0	21	21	28	35	40		28	35	40
PIGS_I	LNF	0	0	21	21	21	21		21	21	21
LAYHENS	LNA_high	0	0	0	0	0	0		83	83	84
LAYHENS	LNA_low	0	0	0	0	0	0		0	0	0
OPOUL	LNA_high	0	0	0	0	0	0		89	90	92
OPOUL	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_I	LNA_high	0	0	0	0	0	0		28	35	40
PIGS_I	LNA_low	0	0	0	0	0	0		0	0	0

2.23 Finland

2.23.1 Farm size distribution

Pigs

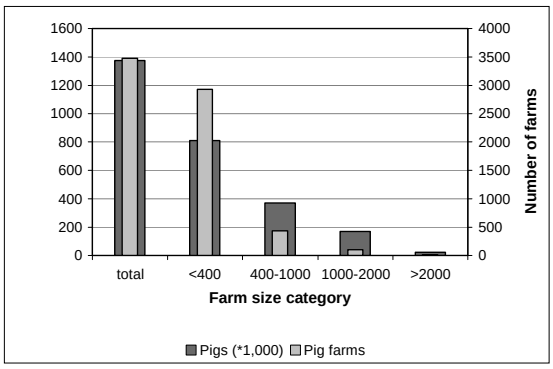

Figure FI1a. Number of pig farms and pigs per size category.

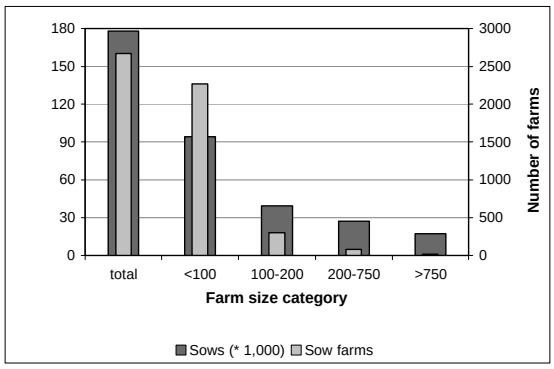

Figure FI1b. Numbers of sow farms and sows per farm size category.

On the Finnish 3,500 fattening pig farms and 2,670 sow farms, a total number of 1.375 million and 178,000 animals are kept, respectively. Most of the farms have small numbers of animals. Around 10 farms (0%) have more than 2,000 fatteners, whereas this number is 20 (1%) for farms with more than 750 sows. The respective percentage of animals kept on these farms is 2 (23,000 head) and 10 (17,000 animals).

Poultry

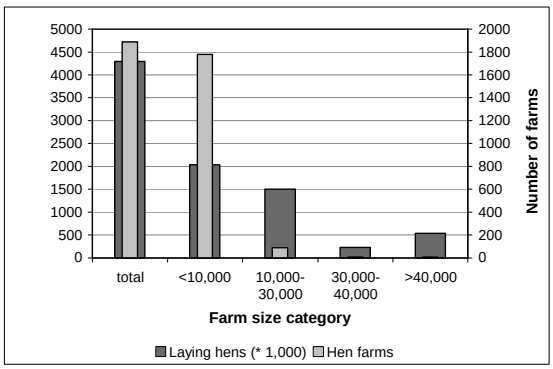

Figure FI2a. Number of laying hen farms and hens per farms size category.

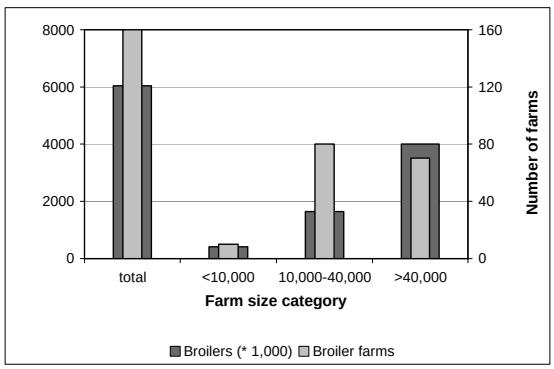

Figure FI2b. Numbers of broiler farms and broilers per farm size category.

IPPC farms for laying hens and broilers (>40,000 animals) in Finland number 10 (1%) and 70 (44%), respectively. Around 0.54 million (13%) hens, and 4 million (66%) broilers are kept on these farms.

Cattle
Around 1 million head of cattle are kept on 24,350 cattle farms. These numbers include 334,000 head of dairy cows and 19,400 dairy farms. Most farms have 20-50 animals. Cattle and dairy cows are mainly kept on farms with 20-50 and 50-100 head.

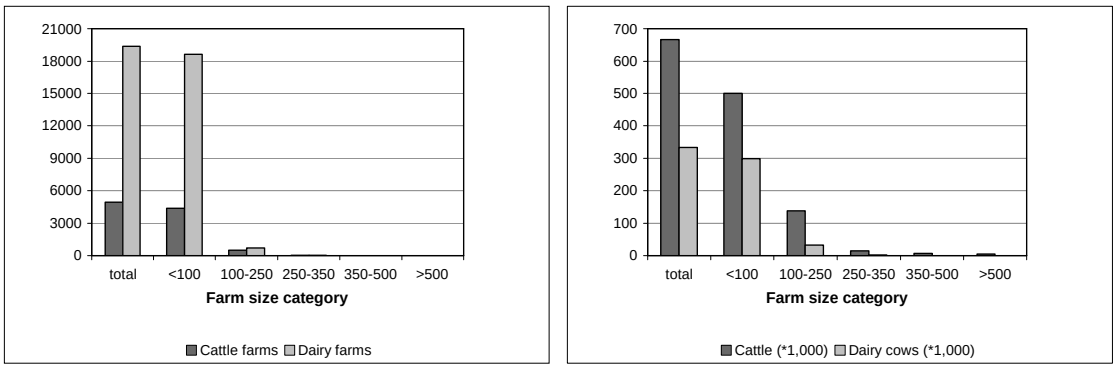

Figure FI3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.23.2 IPPC Permits

Table FI1. Overview of animals covered by IPPC and IPPC permits in Finland.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	2%	10%	13%	66%
IPPC farms according to EUROSTAT data	**10**	**20**	**10**	**70**
Existing installations	**34**	**23**	**114**	
New permits granted	2	0	27	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated	9	0	22	
Outstanding permits	23	23	65	

For Finland, the information about IPPC farms match well with the information provided by the Member State, except for fattening pigs where the Member State reported significantly more existing IPPC farms (34 versus 10 based upon EUROSTAT data). No full account was given about the permitting situation, but roughly 40% of the existing installations have been granted a new permit or pre-IPPC permits have been updated.

2.23.3 Environmental legislation concerning livestock production

The IPPC Directive has been implemented in Finland as part of the national Environmental Protection Act which entered into force in 2000. In environmental protection law, BAT means the most effective and advanced techniques that can be practically adopted to prevent harmful emissions and other environmental impacts, or reduce them to acceptable limits.

2.23.4 Best Available techniques and penetration.

The Finnish situation concerning evolution of penetration of Best Available Techniques between 2000 and 2020 is presented below.

Table FI2. Overview of Best Available Techniques and their penetration in Finland (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_high	0	0	0	0	0	0		0	0	0
DAICOW_l	CS_low	50	40	35	35	35	35		35	35	35
DAICOW_l	LNA_high	2	16	25	25	25	25		25	25	25
DAICOW_l	LNA_low	47	44	40	40	40	40		40	40	40
DAICOW_s	LNA_high	0	20	20	20	20	20		20	20	20
DAICOW_s	LNA_low	47	55	55	55	55	55		55	55	55
LAYHENS	LNA_low	34	34	34	34	34	34		34	34	34
LAYHENS	LNA_high	0	13	13	13	13	13		13	13	13
LAYHENS	LNF	0	0	6	6	6	6		6	6	6
LAYHENS	SA	0	13	13	13	13	13		13	13	13
LAYHENS	CS_high	0	13	13	13	13	13		13	13	13
OCOW_l	CS_high	0	15	20	20	20	20		20	20	20
OCOW_l	LNA_high	2	22	30	30	30	30		30	30	30
OCOW_l	LNA_low	47	73	70	70	70	70		70	70	70
OPOUL	LNA_low	47	30	0	0	0	0		0	0	0
OPOUL	SA	0	60	62	68	71	74		68	71	74
OPOUL	LNA_high	0	30	31	31	31	31		34	36	37
OPOUL	LNF	0	0	31	31	31	31		31	31	31
OPOUL	CS_high	0	60	62	68	71	74		68	71	74
OCOW_S	LNA_high	0	10	15	15	15	15		15	15	15
OCOW_S	LNA_low	47	60	65	65	65	65		65	65	65
PIGS_l	LNA_high	2	4	4	4	4	4		6	7	8
PIGS_l	LNA_low	67	67	67	67	67	67		67	67	67
PIGS_l	SA	0	4	4	6	7	8		6	7	8
PIGS_l	CS_high	0	4	4	6	7	8		6	7	8
PIGS_l	LNF	0	0	4	4	4	4		4	4	4
PIGS_S	LNA_low	68	68	68	68	68	68		68	68	68

2.24 Sweden

2.24.1 Farm size distribution

Pigs

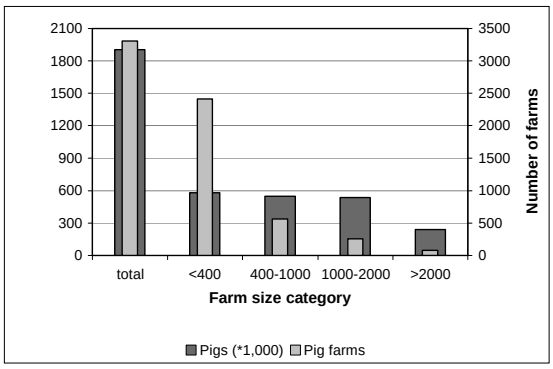

Figure SE1a. Number of pig farms and pigs per size category.

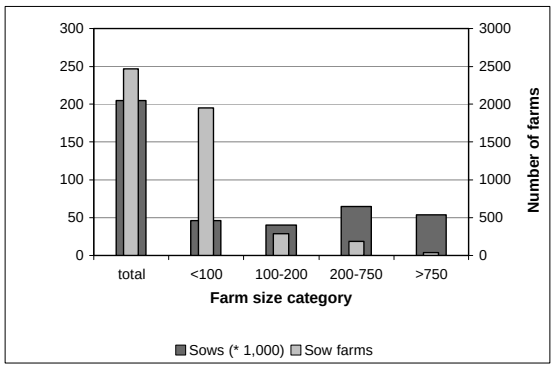

Figure SE1b. Numbers of sow farms and sows per farm size category.

In Sweden, around 75-80% of the pig farms have less than 400 fatteners and less than 100 sows. There are 10 (0%) fattening pig farms and 20 (1%) sow farms with more animals than the IPPC thresholds. Fattening pigs and sows are quite evenly distributed over the various farm sizes, with 238,000 (13%) and 53,000 (26%) animals kept on the largest fattening pig and sow farms, respectively.

Poultry

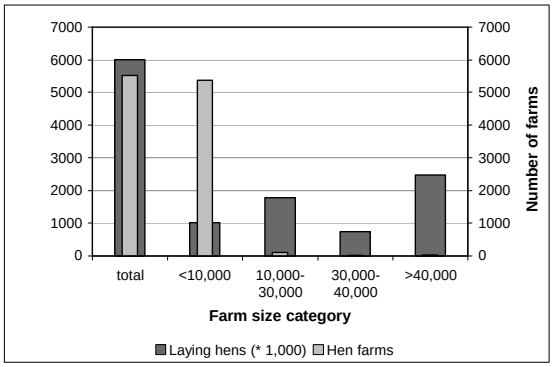

Figure SE2a. Number of laying hen farms and hens per farms size category.

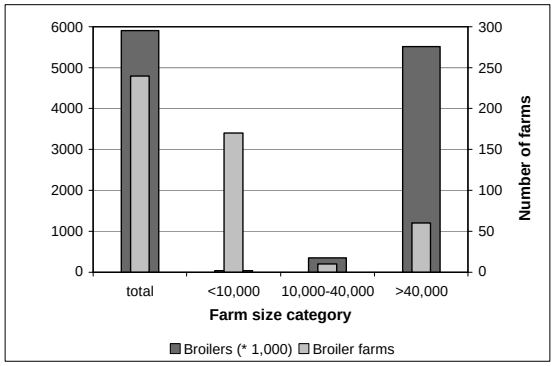

Figure SE2b. Numbers of broiler farms and broilers per farm size category.

Swedish farms with more than 40,000 laying hens number 30 (1%). On these farms, 2.5 million (41%) hens are kept. Furthermore, there are 60 (25%) broiler farms with more than 40,000 animals, on which 6 million (93%) broilers are kept.

Cattle

Sweden has 27,910 cattle farms, of which 9,720 (35%) keep dairy cows. The cattle herd comprises 1,6 million head. Approximately 25% is dairy cows. Cattle is kept on farms in nearly all size categories, but the majority of cattle farms have 20-50 and 50-100 animals. Most dairy farms have between 20-50 and 50-100 animals per farm. Two third of the cattle herd is kept on farms with 50-100 and 100-500 animals per farm, whereas this is 80% for dairy cows.

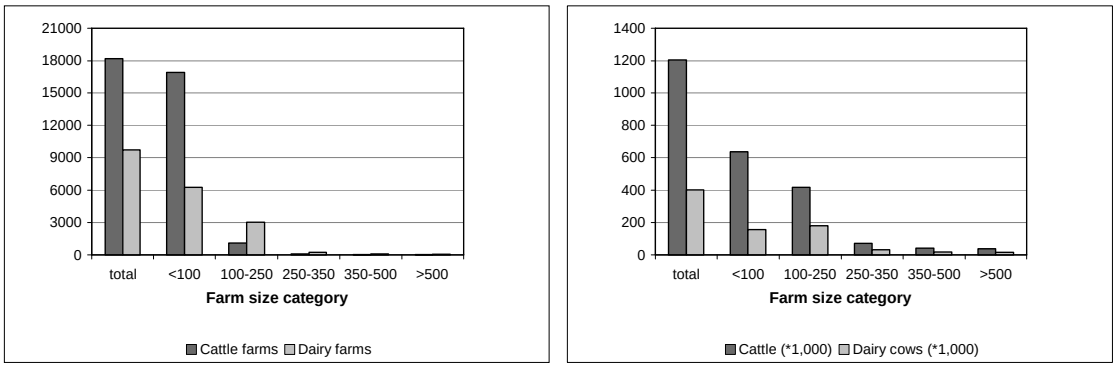

Figure SE3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

2.24.2 IPPC Permits

Table SE1. Overview of animals covered by IPPC and IPPC permits in Sweden.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	13%	26%	41%	93%
IPPC farms according to EUROSTAT data	**10**	**40**	**30**	**60**
Existing installations	**105**	**17**	**136**	
New permits granted	27	5	73	
Pre-IPPPC permits reconsidered but not updated	1	0	0	
Pre-IPPC permits reconsidered and updated	32	7	20	
Outstanding permits	45	5	43	

The number of existing installations, provided by the MS, are for fattening pigs and poultry (much) higher than the number of IPPC farms based upon EUROSTAT data. This is opposite for sow farms. A fair part of the existing installations are being granted new permits or have updated pre-IPPC permits.

2.24.3 Environmental legislation concerning livestock production

General

In 1988, Sweden launched a Plan of Action against Plant Nutrient Losses from Agriculture. The action plan has subsequently been revised. In this action plan, the EU Nitrates Directive, the IPPC Directive and the UNECE-CLTRAP are recognized. Legislative frameworks that are a part of the action plan are (new; 1999): Environment Code, and specific rules for agriculture, regulated by an Ordinance concerning

environmental considerations (concerns) in agriculture, and supplemented by Regulations and Guidelines. In addition, the Ordinance on environmental hazardous activities and health protection lays down that farms with more than 100 LSU require notification or permission.

Basically, the Environment Code and its general rules of consideration concern all farms. The Ordinance concerning environmental consideration in agriculture concerns all farms, although the requirements are stricter in vulnerable areas. The Ordinance on environmental hazardous activities and health protection requires IPPC installations and other farms with more than 200 LSU to get a license from the county board. The Ordinance is currently being revised and changes might be introduced regarding livestock operations. Farms with 100-200 LSU need to notify the local authorities before the operation commences. The local authorities may, if it is necessary for health protection, according to this ordinance also adopt regulations regarding the rearing of livestock or spreading of manure in or next to detailed planning areas.

1 LSU in Sweden equals:
- 1 dairy cow (also dry dairy cow)
- 6 calves of 1 month or older
- 3 other cattle of 6 months or older
- 3 sows, including piglets up to 12 weeks of age
- 10 pigs or boars of 12 weeks or older
- 1 horse, including foal up to 6 months of age
- 10 breeding mink females
- 100 rabbits
- 100 laying hens of 16 weeks or older
- 200 pullets up to 16 weeks of age
- 200 broilers
- 100 turkeys, geese or ducks
- 15 ratite of the species Ostrich, Emu or Rhea
- 10 sheep of goat of 6 months or older
- 40 lambs or goat kids up to 6 months of age

For other animals, on LSU is equivalent to the number of animals having a yearly excretion of 100 kg of N or 13 kg of P in fresh faeces and urine.

The Ordinance on environmental considerations (concerns) contains specific regulations for the storage of liquid manures. For all agricultural enterprises with more than 10 LSU, there are requirements regarding slurry and manure storage capacity. For farms in vulnerable zones (under ND), this is when there are more than 2 LSU. To reduce ammonia emissions from the storage, it must be covered with a stable surface crust layer or other types (see: measures tabulated in the Guidance Document under the UNECE-CLTRAP) of covering that effectively reduces emissions. Moreover, filling of the slurry storages must take place from beneath the covering.

Concerning slurry application, the Regulation on environmental consideration stipulates particular measures. The stipulated options differ depending on the area in Sweden. For

example, in the counties of Skane, Halland and Blekinge, the regulation lay down the following options for slurry application:

- direct placement beneath the crop (band spreading techniques)
- placement directly into the ground/soil (shallow injection/injection)
- dilute with water (1 part manure; ½ part water)
- spreading followed by irrigation of >10 mm of water
- incorporation on bare soil within the 4 hours of application

Another major element in the Regulation on environmental consideration is the rules on livestock density, that have been replaced by a limit on the supply of P from manure and other organic fertilizers. This limit is 22 kg total-P per ha and year, calculated as a 5 year average for the available spreading area.

2.24.4 Best Available techniques and penetration

The analysis of the Swedish situation presented in the previous paragraphs results in the following table with the evolution of penetration of Best Available Techniques between 2000 and 2020.

Table SE2. Overview of Best Available Techniques and their penetration in Sweden (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_low	29	10	8	8	8	8		8	8	8
DAICOW_l	CS_high	14	28	30	30	30	30		30	30	30
DAICOW_l	LNA_high	8	16	30	30	30	30		30	30	30
DAICOW_l	LNA_low	7	7	0	0	0	0		0	0	0
DAICOW_s	LNA_high	20	35	35	35	35	35		35	35	35
DAICOW_s	LNA_low	15	10	10	10	10	10		10	10	10
LAYHENS	CS_high	20	21	21	21	21	21		21	21	21
LAYHENS	LNA_low	40	5	0	0	0	0		0	0	0
LAYHENS	LNA_high	0	20	20	20	20	20		56	58	63
LAYHENS	SA	0	20	54	56	58	63		56	58	63
LAYHENS	LNF	0	0	41	41	41	41		41	41	41
OCOW_l	CS_high	14	27	30	30	30	30		30	30	30
OCOW_l	CS_low	30	11	8	8	8	8		8	8	8
OCOW_l	LNA_high	8	16	30	30	30	30		30	30	30
OCOW_l	LNA_low	7	0	0	0	0	0		0	0	0
OPOUL	CS_high	20	60	90	90	90	90		90	90	90
OPOUL	LNA_low	40	5	0	0	0	0		0	0	0
OPOUL	LNA_high	0	20	20	20	20	20		94	94	95
OPOUL	SA	0	20	85	94	94	95		94	94	95
OPOUL	LNF	0	0	60	60	60	60		60	60	60
OCOW_S	LNA_high	20	35	35	35	35	35		35	35	35
OCOW_S	LNA_low	15	10	10	10	10	10		10	10	10
PIGS_l	LNA_low	25	35	35	35	35	35		35	35	35
PIGS_l	SA	10	17	17	19	23	25		19	23	25
PIGS_l	LNF	0	0	17	17	17	17		17	17	17
PIGS_l	LNA_high	5	9	17	17	17	17		19	23	25
PIGS_S	LNA_high	30	45	45	45	45	45		45	45	45
PIGS_S	LNA_low	10	10	10	10	10	10		10	10	10

2.25 United Kingdom

2.25.1 Farm size distribution

Pigs

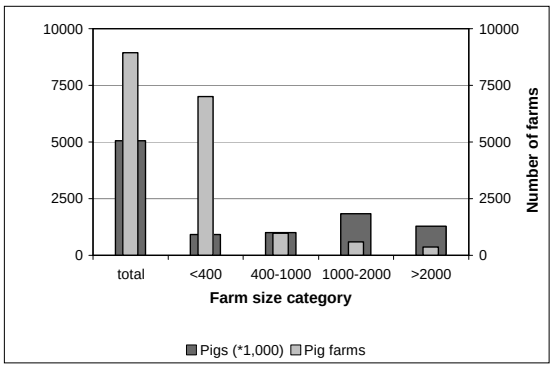

Figure UK1a. Number of pig farms and pigs per size category.

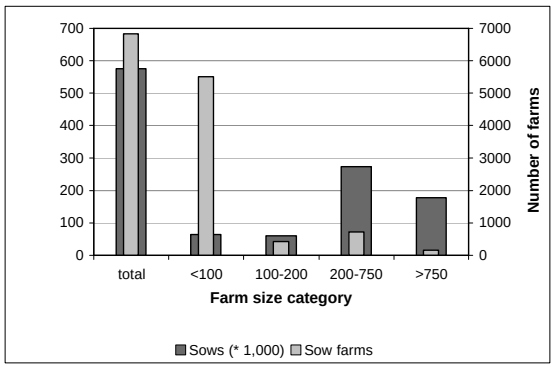

Figure UK1b. Numbers of sow farms and sows per farm size category.

Although most of the UK pig farms have less than 400 fatteners and less than 100 sows, significant numbers of animals are kept on larger farms. Around 1.3 million (26%) fattening pigs are kept on 370 (4%) farms with more than 2,000 animals, whereas this is 177,000 (31%) for sows on 160 (2%) farms with >750 head.

Poultry

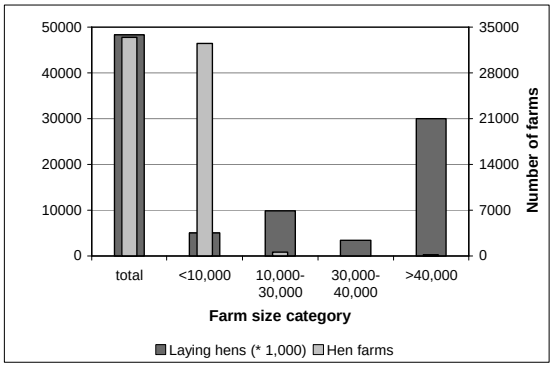

Figure UK2a. Number of laying hen farms and hens per farms size category.

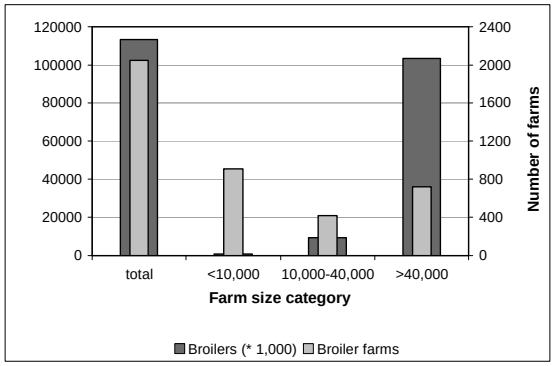

Figure UK2b. Numbers of broiler farms and broilers per farm size category.

Around 30 million (62%) laying hens are kept on 200 (1%) farms with more than 40,000 animals. For broilers (>40,000 birds), these figures amount 103 million (91%) and 720 (35%), respectively.

Cattle

The UK has 111,300 cattle farms, of which 28,210 (25%) have only dairy cow livestock. Cattle are kept on farms in all farm size groups, but the majority of the farms have 20 head or more. Most dairy cow farms have over 100 animals. Furthermore, most of the 10,5 million head cattle and 2.2 million dairy cows are kept on farms with 100+ animals.

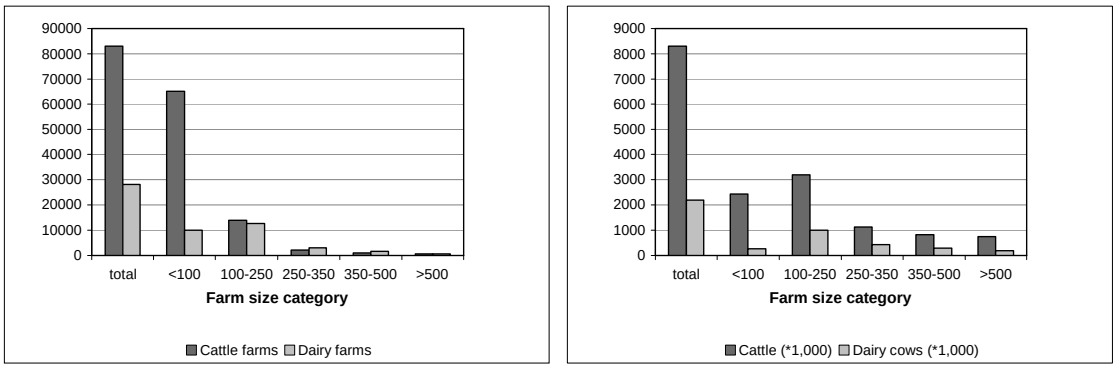

Figure UK3. Farm size distribution: number of farms per size category (left), and number of animal kept per size category (right).

<u>UK remarks to the farm size distribution:</u>

A recent 'COST' report prepared by Rural Development Service in early 2006 based on Census 2003 data for England estimated that 21% of sows and 31% of growing pigs would be caught by IPPC measures. The UK data given above estimates 31% sows and 26% of growing pigs. The UK representative suspect that the animal number data include outdoor pig production (that is not within IPPC).

The Rural Development Service estimates for England that 52% of the national laying hen flock (excluding outdoor production) and 95% of broilers (table chicken) are affected by IPPC.

Not included in the report is duck production, of which it is estimated that 48% would be affected by IPPC. Furthermore, this would also be valid for 72% of growing pullets, 38% of laying breeders, and 54% of broiler breeders. The total national flock of these animals amount 9 million head.

Census 2004 data for England concerning the dairy herd report 1,374,455 dairy cows, of which 60% are on 4,875 holdings with more than 100 animals.

2.25.2 IPPC Permits

Table UK1. Overview of animals covered by IPPC and IPPC permits in UK.

	Fattening pigs	Sows	Laying hens	Broilers
% of animals covered by IPPC (2003)	26%	31%	62%	91%
IPPC farms according to EUROSTAT data	**370**	**160**	**200**	**720**
Existing installations	**449**	**429**	**586**	
New permits granted	8	7	20	
Pre-IPPPC permits reconsidered but not updated				
Pre-IPPC permits reconsidered and updated				
Outstanding permits				

The numbers of fattening pig IPPC farms according to EUROSTAT data are well comparable to the information provided by the MS, but the number of existing sow farms is greater than the IPPC farms according to EUROSTAT. This is the other way around for the poultry sector, where the EUROSTAT information indicate a much higher number of IPPC farms compared to the MS data. Only a small percentage of the existing IPPC installations were granted new permits. No information was provided concerning the total permitting situation.

2.25.3 Environmental legislation concerning livestock production

General

All farms in the Nitrate Vulnerable Zones have to comply with an Action Programme that implements the Nitrates Directive. Action Programmes are being revised. And all farms in England and Wales have to comply with the recently introduced "The Waste Management (England and Wales) Regulations 2006" that fully implements the Waste Framework Directive for agriculture. This includes protecting the environment when dealing with agricultural waste. Livestock manures and slurries are not ‘waste’ if they are applied to agricultural land for agricultural or ecological benefit, whether on the farm where produced or sent to another farm. Similar legislation applies in Northern Ireland and Scotland.

Specific regulatory programs that specifically effect animal farming are:

- Discharge Consents (under Water Resources Act 1991), apply to small number of the dairy farmers in England and Wales
- The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil - SSAFO) Regulations 1991 as amended. These regulations set standards for the construction of storage facilities for silage, slurry, and agricultural fuel oil, built or modified after 1991.
- The Ground Water Regulations 1998 deal with land spreading of certain substances. Typically, farmers who wish to apply spent sheep dip or pesticide washings to land will need to obtain a written authorization that contains conditions under which the activity can be carried out.

- Water Abstraction Licenses; mainly applies to arable farmers that irrigate high value crops, although it does apply to other farms that extract water from wells or directly from surface waters.

Specific elements for pig and poultry husbandry
IPPC Directive applies to installations above the threshold values.

2.25.4 Best Available techniques and penetration

Table UK2 shows an overview of the development of the penetration of Best Available Techniques between 2000 and 2020.

Table UK2. Overview of Best Available Techniques and their penetration in the UK (% of animals covered) between 2000 and 2020.

		2000	2010	2020	2020 IPPC1	2020 IPPC2	2020 IPPC3		2020 IPPC1+LNA	2020 IPPC2+LNA	2020 IPPC3+LNA
DAICOW_l	CS_low	80	80	80	80	80	80		80	80	80
DAICOW_l	CS_high	0	0	0	13	18	23		13	18	23
DAICOW_l	LNA_high	1	1	1	1	1	1		13	18	23
DAICOW_l	LNA_low	2	3	3	3	3	3		3	3	3
DAICOW_s	LNA_high	3	3	3	3	3	3		3	3	3
DAICOW_s	LNA_low	18	18	18	18	18	18		18	18	18
LAYHENS	LNA_high	18	70	70	70	73	76		70	73	76
LAYHENS	CS_high	0	0	70	70	73	76		70	73	76
LAYHENS	LNA_low	36	15	0	0	0	0		0	0	0
LAYHENS	SA	25	35	70	71	73	76		71	73	76
LAYHENS	LNF	0	0	62	62	62	62		62	62	62
OCOW_l	CS_low	80	80	80	80	80	80		80	80	80
OCOW_l	LNA_high	0	1	1	1	1	1		1	3	5
OCOW_l	CS_high	0	0	1	1	3	5		1	3	5
OPOUL	LNA_high	11	36	36	36	36	36		36	36	36
OPOUL	LNA_low	23	0	0	0	0	0		0	0	0
OPOUL	INCER	36	36	36	36	36	36		36	36	36
OPOUL	SA	0	36	50	56	57	58		56	57	58
OPOUL	LNF	0	0	50	50	50	50		50	50	50
OPOUL	CS_high	0	0	50	56	57	58		56	57	58
OCOW_S	LNA_high	3	3	3	3	3	3		3	3	3
OCOW_S	LNA_low	18	18	18	18	18	18		18	18	18
PIGS_l	LNA_high	14	31	31	31	31	31		31	31	31
PIGS_l	LNA_low	0	0	0	0	0	0		0	0	0
PIGS_l	SA	0	40	41	41	41	41		41	41	41
PIGS_l	CS_high	0	0	86	86	86	86		86	86	86
PIGS_l	LNF	0	0	61	61	61	61		61	61	61
PIGS_S	LNA_high	20	75	75	75	75	75		75	75	75
PIGS_S	LNA_low	0	20	20	20	20	20		20	20	20

3 POTENTIAL IMPACT OF IPPC THRESHOLD REVISION

This part of the study comprises two phases:

1. Broad assessment of 3 potential lowered thresholds for pigs and poultry rearing, and 3 possible thresholds for cattle rearing
2. In depth assessment of 1 selected lowered threshold for pigs and poultry, and 1 possible new threshold for cattle rearing

In the assessment, notably of the phase 2, the following issues are addressed:

- impact on ammonia and greenhouse gas emissions (using RAINS)
- impact on nitrate and nitrous oxide emissions (using MITERRA-EUROPE)
- impact on other pollutants and nuisance (e.g. odour; using own assessment tools)
- impact on social and economic issues (using CAPRI)

The results of both assessments are presented below.

3.1 Method

Basis for the analysis preformed under this task is information from EUROSTAT on farm size distribution (2003 data). Since basic EUROSTAT farm size categories do not specifically include the farm sizes that correspond with the IPPC thresholds, additional work was carried out by EUROSTAT to provide these data. The results are summarized below. Details, e.g. the farm size distribution for pig, poultry and cattle production, are presented in a Background Report.

The second step was to make a broad inventory of the situation per Member State (EU-25) concerning the relevant environmental legislation, and the penetration (implementation) of Best Available Techniques (BAT), either as a consequence of national environmental legislation, IPPC or both. Also, there results are extensively described in the Background Report. In the description of BAT, the RAINS methodology is used:

- SA = Stable Adaptation (implicitly including CS)
- CS = Covered Storage (low and high efficiency)
- LNA = Low Nitrogen (manure) Application (low and high efficiency)
- LNF = Low Nitrogen (animal) Feed

This assessment has resulted in tables per Member State, presenting the % of animals that is kept on farms with one or more of the above mentioned NH3 emission abatement (BAT) measures. The Background Report was presented during the meeting of the national representatives in the IPPC Advisory Group (AG), and left for commenting. Comments were received, processed, and included in the input files for the 3 models used (RAINS, MITERRA-EU, CAPRI).

When BAT were the result of national legislation, the % of animals kept on farms with the techniques were estimated from the information gathered from and provided by Member States. When BAT was a result of implementation of the IPPC Directive, the following was assumed (and partly checked with the MS representatives):

- SA and CS for pig and poultry farms
- CS for cattle farms

To assess the potential of the various BAT, scenarios were built taking into account LNF (experts and representatives interpretation, mainly based upon national legislation and/or based upon guidelines issues under the CLTRAP and/or based upon the BREF-document), and LNA. During the study it became clear that LNA, although being part of the CLTRAP Ammonia Abatement guidelines, and BREF, it is not considered being an integrated part of permitting under the IPPC Directive in all Member States. Therefore, all IPPC related scenarios were run with and without LNA as part of IPPC permits. The results provide information about the level of importance of including LNA in the framework of IPPC, and about the need to enforce application of this measure either under the IPPC or in the framework of another Directive (e.g. Nitrates Directive).

During the process of providing a basis for lowering the IPPC thresholds for intensive animal rearing (pigs and poultry) and suggested new thresholds for cattle husbandry, attempts were made to find a solid basis for comparison of IPPC thresholds. The following options are presented:
- Livestock Units
- N excretion

All data gathered are reported in the Background Report and processed in such a way that they can be used as direct input to the models. The following scenarios are analyzed:

- situation in 2020, with the full implementation of BAT on all IPPC farms (2020_IPPC). This scenario takes into account the implementation of BAT as a result of national legislation. Developments in animal numbers are obtained from CAPRI. Development of the farm size distribution is not taken into account, since no data could be found to support any assumption on this
- situation in 2020, assuming 3 levels of IPPC thresholds, using the options for inter-comparison of thresholds for various animal types, and taking into account the basic BAT penetration option (SA/CS); 2020_IPPC1, IPPC2 and IPPC3
- similar as above, but than taking into account full implementation of LNA as a part of the IPPC permitting; 2020_IPPC1+LNA, IPPC2+LNA, IPPC3+LNA
- all IPPC scenarios for 2020 assume full implementation of the Nitrates Directive, and in particular Balanced Fertilization

The results of the analysis include development of the NH_3 emission per Member State, the development of the number of IPPC farms (and permits), and the permitting costs and permitting efficiency associated. Furthermore, the impact on the losses of other nitrogen compounds, nitrate and nitrous oxide, and methane is presented to assess the level of trade off of pollutants. MITERRA-EUROPE was used for this purpose. Finally, the social and economical impact of lowering of IPPC thresholds is analysed, and presented under the work conduced with CAPRI model (Task 3).

3.2 Results

3.2.1 Farm size distribution and IPPC farms

The graphs below summarize the farm size distribution for EU-25, for fattening pigs, sows, laying hens, and broilers. The numbers represent the total number of animals and the total number of farms for various farm size classes.

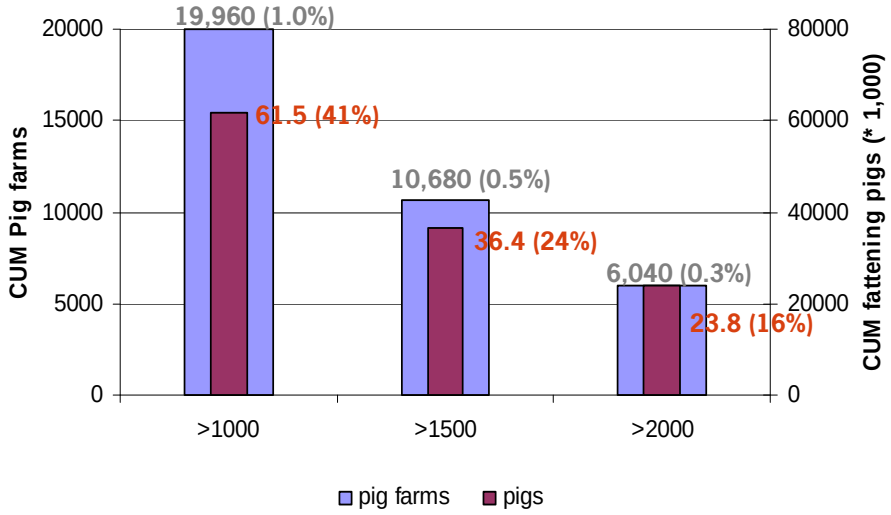

Figure 3.1. Number (and % of total) of pig farms and number of fattening pigs for various farm size classifications.

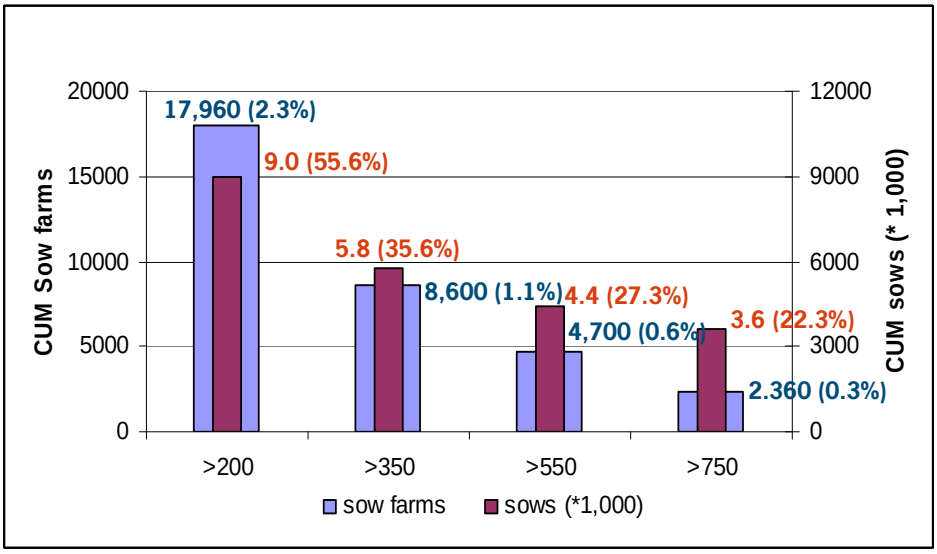

Figure 3.2. Number (and % of total) of sow farms and number of sows for various farm size classifications.

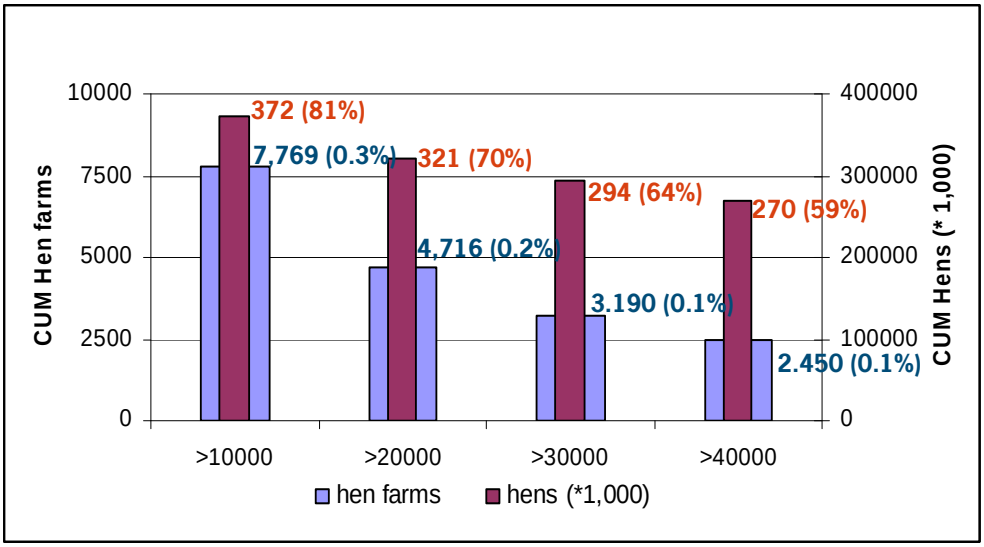

Figure 3.3. Number (and % of total) of laying hen farms and number of laying hens for various farm size classifications.

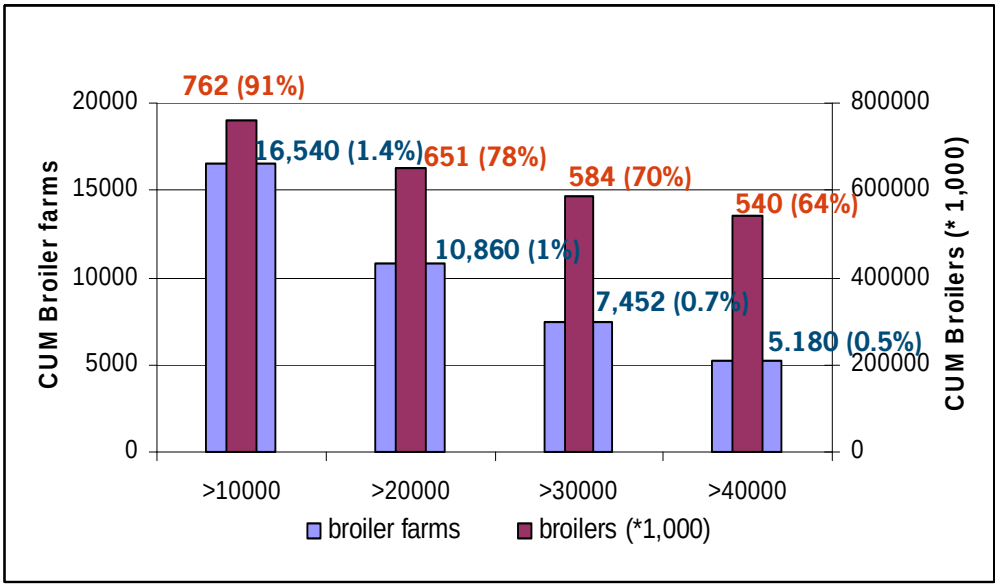

Figure 3.4. Number (and % of total) of broiler farms and number of broilers for various farm size classifications.

Based on the 2003 farm size distribution data, the following numbers of farms and animals (total and for IPPC farms) can be summarized:

Table 3.1. Farms and animals covered by the current IPPC thresholds (2003 data).

	Farms (unit)		**Animals (in million head)**	
	Total	IPPC	Total	IPPC
Fattening pigs	1.927.260	6.040	150.0	23.8 (15.9%)
Sows	769.070	2.360	16.1	3.6 (22.3%)
Laying hens	3.017.570	2.450	460.8	270 (58.5%)
Broilers	1.147.190	5.180	839.3	539 (64.3%)

These data show that the total number of IPPC farms (>2,000 fattening pigs; >750 sows; >40,000 poultry) in the EU-25 is around 16,000. This is less than 0.1% of the total number of farms in the EU-25. On these farms, 16% of the total number of fattening pigs, 22% of the total number of sows, and around 60% of the total number of poultry is kept.

3.2.2 Developments in farm size distribution

For this study, no changes in farm size distributions were included, mainly because a solid, scientific basis for future developments in the size of farms across the EU-25 was lacking. However, it is beyond doubt that in each sector, farm size will increase. Especially the number of larger farms will increase, while the number of (mainly smaller) farms will decrease.
Assuming a growth rate of 0,1% and 1,0% per year for the IPPC categories, the following would be the result in terms of number of farms falling under IPPC in 2020.

Table 3.1a. Number of IPPC farms and number of animal on those farms when assuming an annual growth rate of 0,1% and 1,0%.

	Farms (unit)		**Animals (in million head)**	
Growth rate	*0,1%*	*1,0%*	*0,1%*	*1,0%*
Fattening pigs	6.131	7.012	24.2	27.6
Sows	2.396	2.740	3.7	4.2
Laying hens	2.487	2.486	274	313
Broilers	5.258	5.258	547	626
TOTAL	16.272	17.496		

The above figures imply that the (autonomous) increase in farm size of the bigger farm would result in a +1.5% and a 16% increase in IPPC farms and animals on those farms by the year 2020 for the annual growth rate of 0,1 and 1,0%, respectively.

3.2.3 Revised IPPC thresholds

Livestock Units (LU)
According to EUROSTAT, the following basis for LSU applies:

Animal	LSU	Animals/LSU
dairy cow	1.0	1.0
heifer/other cows	0.8	1.25
piglets (< 20 kg)	0.027	37
breeding sows (>50 kg)	0.5	2
other pigs	0.3	3.3
broilers	0.007	142.9
laying hens	0.014	71.4
sheep/goat	0.25	4
duck	0,01	100
horses	1	1
rabbits	0.025	40
turkey (average)	0.013	75

Using fattening pig (= fp) as basis, the following animal numbers correspond (round figures).

Table 3.2. Overview of Livestock Units based comparison of IPPC thresholds.

LSU equivalent	**2000 fatteners (current IPPC)**	**1750 fatteners**	**1,500 fatteners**	**1250 fatteners**
Dairy cows	600	530	450	375
Other cows	750	660	570	475
Sows	1200	1000	900	750
Broilers	90,000	75,000	65,000	55,000
Laying hens	54,000	37,500	32,500	27,000
Sheep/goat	2400	2100	1800	1500
Duck	60,000	55,000	45,000	37,500
Horse	600	530	450	375
Rabbit	25,000	21,000	18,000	15,000
Turkey	45,000	40,000	34,000	28,000

Using LSU as a basis would mean that only for laying hens the threshold (54,000 hens) would comparable with the threshold for fatteners. Equivalent sow and broiler farms would have much higher thresholds (respectively 1,200 and 90,000).

Nitrogen excretion

The following table summarizes the N excretions for various farm animals, as taken from different sources (RAINS and CAPRI: this Service Contract), including the suggested N excretion (including during grazing for cattle) for IPPC threshold comparison.

Table 3.3. Overview of N excretion based thresholds.

Fatteners	***2000***	***1750***	***1500***	***1250***
N excretion	***22000***	***19250***	***16500***	***13750***
Dairy cow	220	193	165	138
Other cow	489	428	367	306
Piglet				
Sow	786	688	589	491
Pig	2000	1750	1500	1250
Broiler	36667	32083	27500	22917
Laying hen	27500	24063	20625	17188
sheep/goat	1571	1375	1179	982
Duck	22000	19250	16500	13750
Horse	344	301	258	215
Rabbit	31429	27500	23571	19643
Turkey	10476	9167	7857	6548

Based on the N-excretion, current IPPC thresholds for fattening pigs, sows and broilers could be explained; only for laying hens the current level of 40,000 is too high. If we would use N-excretion (including grazing) as a basis for an IPPC for cattle, these thresholds based upon the current thresholds for intensive rearing would be around 220 and 500 head per farm. When the N excreted during grazing (approximately 50% of the total N excretion) is not taken into account, the thresholds would become 450 and 1,000 head per farm.

Based on the considerations mentioned before, the following IPPC thresholds (animal numbers) were chosen to be assessed.

Table 4.4. Selected thresholds.

	Scenario 2020 Current IPPC	**IPPC1**	**IPPC2**	**IPPC3**
Fattening pigs	> 2,000	> 2,000	> 1,750	> 1,500
Sows	> 750	> 750	> 675	> 600
Hens	> 40,000	> 27,500	> 25,000	> 20.000
Broilers	> 40,000	> 37,000	> 32,000	> 27,000
Dairy cows	-	> 450	> 400	> 350
Other cattle	-	> 1,000	> 850	> 700

3.2.4 Animals covered by various IPPC thresholds

Tables 3.5, 3.6, 3.7 and 3.8 present the % of animals covered by each of the IPPC scenarios. The exact percentage is taken up for thresholds that correspond with EUROSTAT farm size categories. In all other cases, the percentages are obtained from creating sub-categories and interpolation. In general, when larger sub-categories are used, the distribution of animal over the categories is non-linear (less animals are kept on smaller farms); when smaller sub-categories were needed, the number of animals is equally distributed over the sub-categories. A full account of the distribution of animals over sub-categories is given in the Background Report.

Table 3.5. Percentage of animals covered per Member State by the current IPPC thresholds.

	Fatteners	**Sows**	**Hens**	**Broilers**	**Dairy**	**Other cattle**
	>2,000	**> 750**	**>40,000**	**>40,000**	**no threshold**	**no threshold**
	%	%	%	%	%	%
Belgium	6,9	3,4	50,0	45,6	0,0	0,0
Czech Rep.	32,4	45,6	88,8	85,8	0,0	0,0
Denmark	18,4	24,5	43,5	89,0	0,0	0,0
Germany	9,3	13,7	66,5	72,7	0,0	0,0
Estonia	31,0	0,0	69,9	0,0	0,0	0,0
Greece	16,3	12,5	21,3	45,9	0,0	0,0
Spain	23,7	40,5	71,4	47,9	0,0	0,0
France	6,9	6,9	59,0	35,2	0,0	0,0
Ireland	42,3	50,9	29,9	69,9	0,0	0,0
Italy	43,4	39,4	74,2	83,6	0,0	0,0
Cyprus	37,4	48,0	32,9	73,4	0,0	0,0
Latvia	18,5	35,8	65,5	0,0	0,0	0,0
Lithuania	20,0	50,1	54,0	66,4	0,0	0,0
Luxembourg	0,0	0,0	0,0	0,0	0,0	0,0
Hungary	32,7	42,7	33,7	72,0	0,0	0,0
Malta	0,0	0,0	0,0	0,0	0,0	0,0
Netherlands	11,7	17,8	61,6	80,3	0,0	0,0
Austria	0,0	0,0	12,2	31,5	0,0	0,0
Poland	4,4	5,3	41,1	63,8	0,0	0,0
Portugal	19,6	10,1	68,9	42,1	0,0	0,0
Slovenia	14,6	34,7	0,0	0,0	0,0	0,0
Slovakia	28,3	32,0	80,9	88,6	0,0	0,0
Finland	1,7	9,7	12,6	66,1	0,0	0,0
Sweden	12,5	26,1	41,3	93,4	0,0	0,0
United Kingdom	25,7	30,8	62,1	91,2	0,0	0,0
EU25	**15,9**	**22,3**	**58,5**	**64,3**	**0,0**	**0,0**

Some 16% and 22% of respectively fatteners and sows fall under current IPPC thresholds, whereas this is around 60% for the poultry sector. Since current IPPC is not applicable for cattle, 0% of the cattle herd in EU-25 fall under IPPC compliance.

Table 3.6. Percentage of animals covered per Member State for revised IPPC thresholds 'scenario 1' (= IPPC1).

	Fatteners	**Sows**	**Hens**	**Broilers**	**Dairy**	**Other cattle**
	>2,000	**> 750**	**>27,500**	**> 37,000**	**>450**	**> 1,000**
	%	**%**	**%**	**%**	**%**	**%**
Belgium	6,9	3,4	67,0	48,6	1,2	0,7
Czech Rep.	32,4	45,6	90,6	86,6	77,8	6,5
Denmark	18,4	24,5	57,9	89,7	7,6	0,5
Germany	9,3	13,7	70,9	74,3	14,5	1,2
Estonia	31,0	0,0	72,4	0,0	49,8	4,3
Greece	16,3	12,5	24,0	47,7	0,6	0,3
Spain	23,7	40,5	78,1	50,7	5,2	1,2
France	6,9	6,9	68,0	37,7	0,9	0,2
Ireland	42,3	50,9	39,4	71,5	4,2	0,2
Italy	43,4	39,4	78,4	84,3	11,3	1,9
Cyprus	37,4	48,0	44,6	74,7	24,2	2,0
Latvia	18,5	35,8	65,5	0,0	9,4	1,0
Lithuania	20,0	50,1	54,7	70,4	6,7	1,0
Luxembourg	0,0	0,0	0,0	0,0	3,1	0,3
Hungary	32,7	42,7	36,3	73,3	63,1	5,5
Malta	0,0	0,0	5,2	3,4	0,0	0,0
Netherlands	11,7	17,8	71,0	81,5	1,7	2,2
Austria	0,0	0,0	20,8	34,9	0,0	0,0
Poland	4,4	5,3	46,3	65,4	3,5	0,5
Portugal	19,6	10,1	74,0	44,0	5,2	1,3
Slovenia	14,6	34,7	0,6	4,4	2,5	0,1
Slovakia	28,3	32,0	82,6	89,2	74,7	6,8
Finland	1,7	9,7	20,8	67,8	0,1	0,1
Sweden	12,5	26,1	56,0	93,8	5,6	0,3
United Kingdom	25,7	30,8	70,9	91,7	13,3	0,9
EU-25	**15,9**	**22,3**	**65,4**	**65,9**	**9,7**	**0,9**

Since no change in the IPPC thresholds for fatteners and sows was taken as a basis for scenario 1, the % of animals covered remains unchanged compared to table 3.2. For the poultry sector, the revised thresholds results in an increase in the % of animals that fall under the IPPC to around 66%. Furthermore, the suggested thresholds for cattle result in a coverage of 9.7% for dairy cows and 0.9% for other cattle.

Table 3.7. Percentage of animals covered per Member State for revised IPPC thresholds 'scenario 2' (= IPPC2).

	Fatteners	**Sows**	**Hens**	**Broilers**	**Dairy**	**Other cattle**
	>1750	**>675**	**> 25000**	**>32000**	**>400**	**>850**
	%	**%**	**%**	**%**	**%**	**%**
Belgium	12,3	5,3	69,1	53,6	1,8	2,2
Czech Rep.	38,9	47,5	91,0	87,9	80,5	19,5
Denmark	25,3	27,9	60,4	90,7	10,5	1,5
Germany	12,5	15,2	72,1	76,9	15,8	3,6
Estonia	37,3	4,1	72,4	0,0	52,5	12,8
Greece	20,1	13,7	24,7	50,6	1,1	1,0
Spain	28,3	42,6	79,4	55,4	6,0	3,7
France	12,3	9,1	69,6	41,8	1,4	0,7
Ireland	49,9	53,1	41,3	74,2	5,6	0,6
Italy	48,0	41,4	79,7	85,5	14,0	5,6
Cyprus	46,2	50,6	47,1	76,8	31,7	5,9
Latvia	21,7	36,6	65,5	0,0	10,2	2,9
Lithuania	23,1	50,6	54,7	77,0	7,1	3,1
Luxembourg	6,2	1,6	0,0	0,0	4,0	0,9
Hungary	36,3	43,8	36,8	75,3	65,0	16,4
Malta	5,0	0,0	10,5	9,0	0,0	0,0
Netherlands	16,1	21,2	73,1	83,4	2,4	6,6
Austria	0,4	0,2	22,5	40,5	0,0	0,0
Poland	5,3	5,5	47,4	68,0	3,8	1,5
Portugal	24,3	12,1	74,8	47,1	5,8	3,8
Slovenia	17,8	34,7	1,2	11,6	2,5	0,4
Slovakia	34,5	34,0	83,1	90,2	78,2	20,3
Finland	3,8	10,6	23,7	70,5	0,1	0,2
Sweden	17,2	27,9	58,5	94,3	7,1	0,9
United Kingdom	31,7	33,4	72,6	92,5	17,9	2,7
UE-25	**20,1**	**24,2**	**66,8**	**68,5**	**11,1**	**2,8**

In scenario 2, all thresholds are lowered, resulting in an increased coverage of animals by IPPC. The increase is the largest for fattening pigs (+4%), and broilers (+3%).

Table 3.8. Percentage of animals covered per Member State for revised IPPC thresholds 'scenario 3' (= IPPC3)

	Fatteners	**Sows**	**Hens**	**Broilers**	**Dairy**	**Other cattle**
	>1500	**>600**	**>20000**	**>27000**	**>350**	**>700**
	%	**%**	**%**	**%**	**%**	**%**
Belgium	17,7	7,2	73,3	60,1	2,4	4,4
Czech Rep.	45,3	49,3	91,8	89,7	83,2	38,9
Denmark	32,2	31,3	65,5	92,1	13,4	3,0
Germany	15,7	16,8	74,5	80,3	17,1	7,3
Estonia	43,6	8,1	72,4	0,0	55,3	25,6
Greece	23,9	14,9	26,2	54,5	1,7	2,0
Spain	33,0	44,6	81,9	61,4	6,8	7,5
France	17,7	11,2	72,7	47,2	1,9	1,3
Ireland	57,5	55,2	45,2	77,8	7,1	1,2
Italy	52,6	43,4	82,3	87,1	16,6	11,3
Cyprus	55,1	53,2	52,2	79,5	39,1	11,7
Latvia	24,9	37,3	65,5	0,0	11,0	5,8
Lithuania	26,2	51,0	54,7	85,7	7,5	6,1
Luxembourg	12,4	3,1	0,0	0,0	4,9	1,9
Hungary	39,8	44,9	37,7	78,1	66,9	32,7
Malta	10,0	0,0	20,9	16,4	0,0	0,0
Netherlands	20,4	24,6	77,5	85,9	3,1	13,2
Austria	0,8	0,4	26,0	47,8	0,0	0,0
Poland	6,1	5,8	49,7	71,4	4,2	2,9
Portugal	29,0	14,1	76,2	51,0	6,5	7,7
Slovenia	20,9	34,7	2,4	21,1	2,5	0,9
Slovakia	40,7	36,0	83,9	91,5	81,7	40,5
Finland	5,8	11,5	29,5	74,0	0,2	0,5
Sweden	21,9	29,7	63,4	95,1	8,6	1,9
United Kingdom	37,8	36,1	76,0	93,6	22,5	5,3
EU-25	**24,3**	**26,1**	**69,6**	**72,0**	**12,5**	**5,7**

The most stringent IPPC thresholds in this study results in a coverage of around 25% for the pig sector, 70% for the poultry sector, 12,5% for dairy cows, and nearly 6% for other cattle.

Table 3.9. Number of farms covered by various IPPC scenarios.

	Fatteners	**Sows**	**Laying hens**	**Broilers**	**Dairy cows**	**Other cattle**	**Total**
Current IPPC	6,040	2,380	2,450	5,180	0	0	16,050
IPPC1	6,040	2,380	3,572	5,862	7,283	383	25,520
IPPC2	8,360	3,238	3,953	6,998	9,357	1,149	33,054
IPPC3	10,680	4,115	4,716	8,474	11,430	2,298	41,714

Some 16,000 farms in the EU-25 have to comply with IPPC under the current thresholds. Each scenario adds roughly 8,000 farms to that number. Assuming equal costs for permitting in all sectors, the total costs would increase by 50% when the scenario 1 thresholds would be implemented. Based on UK data, that indicate annual costs of permitting of around 3,000 € per farm (UK data: around 3,000 - 4,000 € or 2,500 – 3,000 UK Pound per permit issued; Pellini and Morris, 2002), the total amount of money involved in permitting would be around 50 million Euro, with a 50% increase for each scenario. In scenario 3, most of the permits would be issued for the fattening pig and dairy cow sector, meaning that these sectors would be facing the highest costs compared to other sectors

3.2.5 Ammonia emissions

Table 3.10. Summary of NH_3 emission in 2020 for various scenarios, compared to current IPPC thresholds (in 1,000,000 kg or kton NH_3).

	Current IPPC	IPPC1	IPPC2	IPPC3	IPPC1+ LNA	IPPC2+ LNA	IPPC3+ LNA
Total NH3 emissions agriculture	2,800	2,771	2,763	2,751	2,726	2,712	2,691
Difference with current IPPC (kton)	-	30	37	49	74	88	110
in % compared to current IPPC	-	98,9	98,7	98,2	97,4	96,9	96,1

Table 3.11. Efficiency and additional efficiency of permitting under the various sets of thresholds.

	Current IPPC	IPPC1	IPPC2	IPPC3	IPPC1 +LNA	IPPC2 +LNA	IPPC3 +LNA
Permits (IPPC farms)	16,050	25,520	33,054	41,714	25,520	33,054	41,714
Cumulative efficiency per permit (1,000 kg/permit)	-	3,1	2,2	1,9	7,8	5,2	4,3
Additional efficiency (d_Emission/d_permit)	-	3,1	1,0	1,4	7,8	1,9	2,2

The data in table 3.10 show that a maximum reduction of 49 kton NH_3 is realized for scenario 3, where IPPC permits are issued for nearly 42,000 farms (sum of farms with > 1,500 fattening pigs, >600 sows, >20,000 laying hens, >27,000 broilers, >350 dairy cows, and >700 head of other cattle). The efficiency (Table 3.11) of the increased number of permits under scenario 3 when compared to the current IPPC situation is 1,900 kg NH_3 saved per permit (49 kton saved with the issuing of 24,000 permits). The permitting efficiency (and additional efficiency) decrease with progressing scenarios. The additional effect of lowering the thresholds from the values valid for scenario 2 to values in scenario 3 is 1,400 kg NH_3 extra saved per permit (12 kton extra saved by issuing an extra number of 8,000 permits). As indicated before, permits for the intensive rearing of pigs and poultry are assumed to include Stable Adaptations and Covered Storage (high efficiency).

When Low Nitrogen Application (high efficiency) is also included in the IPPC permits, the reduction in NH_3 emission drastically increases when compared to current IPPC, up to 110 kton for scenario 3. This is also reflected in the increased efficiency per permit and the additional permitting efficiency. Despite this greater reduction, the NH_3 emissions from agriculture in 2020 due to lowering IPPC thresholds, inclusion of cattle, and

tightened LNA use, is reduced with nearly 4% compared to the 'current' IPPC situation in 2020.

The development of NH_3-emissions in each EU-Member State (EU-25) is shown below.

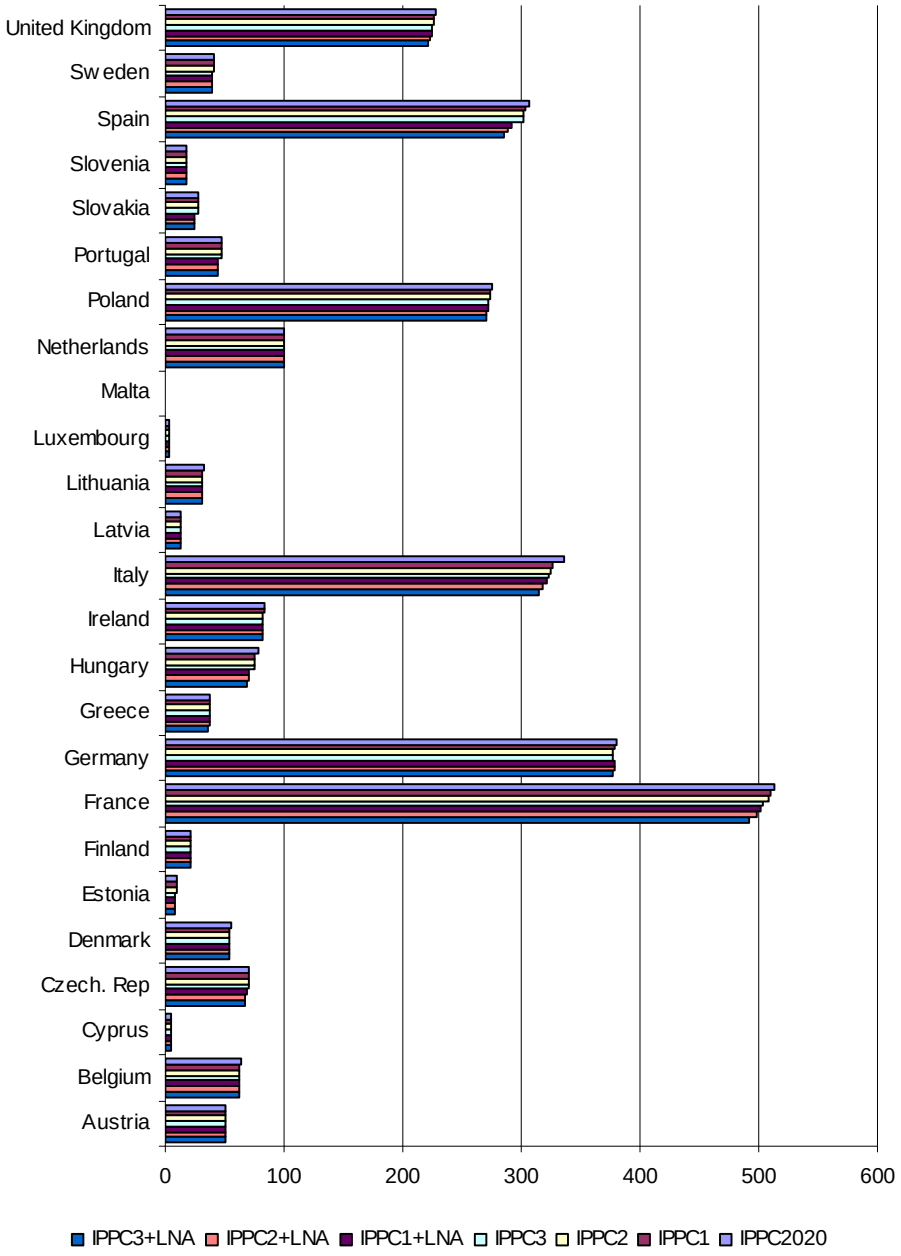

Figure 3.5. Ammonia emission in 2000 (scenario '2000+ND) and in 2020 (all other scenarios) from agriculture (in kton) per Member State for the various scenario's, compared to the ammonia emission in 2020 under 'current' IPPC (*note: the order of scenarios in the legend is opposite to the order in the graph; 2000+ND scenario has the highest emission).*

This figure shows that the NH_3 emission in all 2020 scenarios will be markedly lower for nearly all Member States when compared to the emission in 2000 (including the actual level of implementation of the Nitrates Directive in both years). This is caused by the lowered number of animals (from CAPRI calculations), the increased implementation of BAT following the IPPC Directive, and a reduced use of chemical fertilizers. Furthermore, the figure shows that lowering of the IPPC thresholds for intensive animal rearing, and the inclusion of IPPC thresholds for cattle husbandry has the greatest absolute impact on NH_3 emission in countries with the least national environmental legislation concerning BAT to reduce NH_3 emissions (See: Background report per Member State), like France, Italy, Czech Republic, Hungary, Portugal, UK and Spain. In a fair part of the other countries, national environmental legislation is assumed to be implemented to such a level that lowering thresholds has limited or no impact (e.g. for Germany, Belgium, Sweden, Denmark, Netherlands). The remainder Member States contribute little to the EU-27 NH_3 emission, and lowering of the thresholds has little to no impact on NH_3 emission.

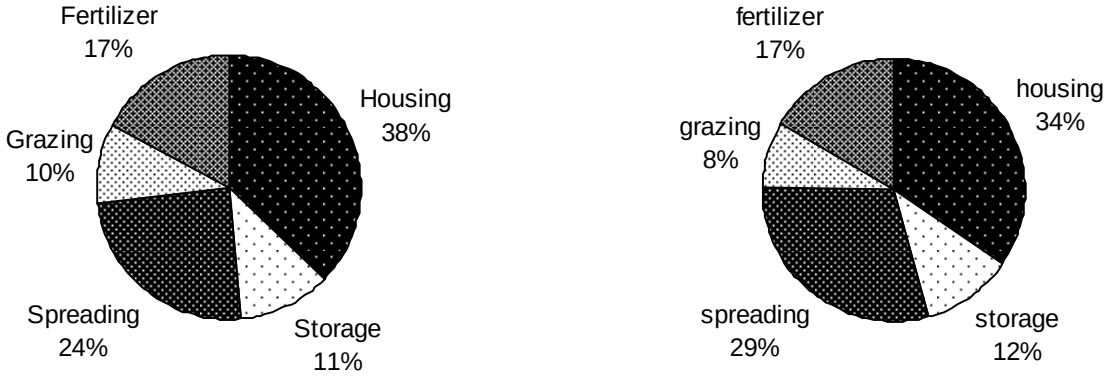

Figure 3.6. Distribution of NH_3 emission from agriculture in the EU-25 over the various sources in 2000 and 2020.

This figure shows that animal housing systems are by far the largest single source, accounting for 38% and 34% of the EU-25 NH_3 emission in 2000 and 2020, respectively, followed by animal manure spreading (24%), and the use of chemical fertilizers (17%). Grazing and storage are relatively small sources, each accounting for around 10% of the total emission.

3.2.6 Emission trade offs

Most important trade offs when reducing NH_3 emissions are in the nitrogen cycle. Without any compensatory measures taken, NH_3 emissions reduced from housing systems, during storage and following land spreading manures will result in increased production of nitrous oxide and in increased nitrate leaching. However, in the scenarios

we analysed, increased savings of NH_3 in animal manures following emission reducing measures is accompanied with full implementation of measures originating from the Nitrates Directive to account for this additionally available plant nutrient NH_3, including balanced fertilization.
Figure 3.7 shows the results of the calculations for the various scenarios. The results show hardly any effect of lowering the IPPC thresholds on the nitrate leaching per ha.

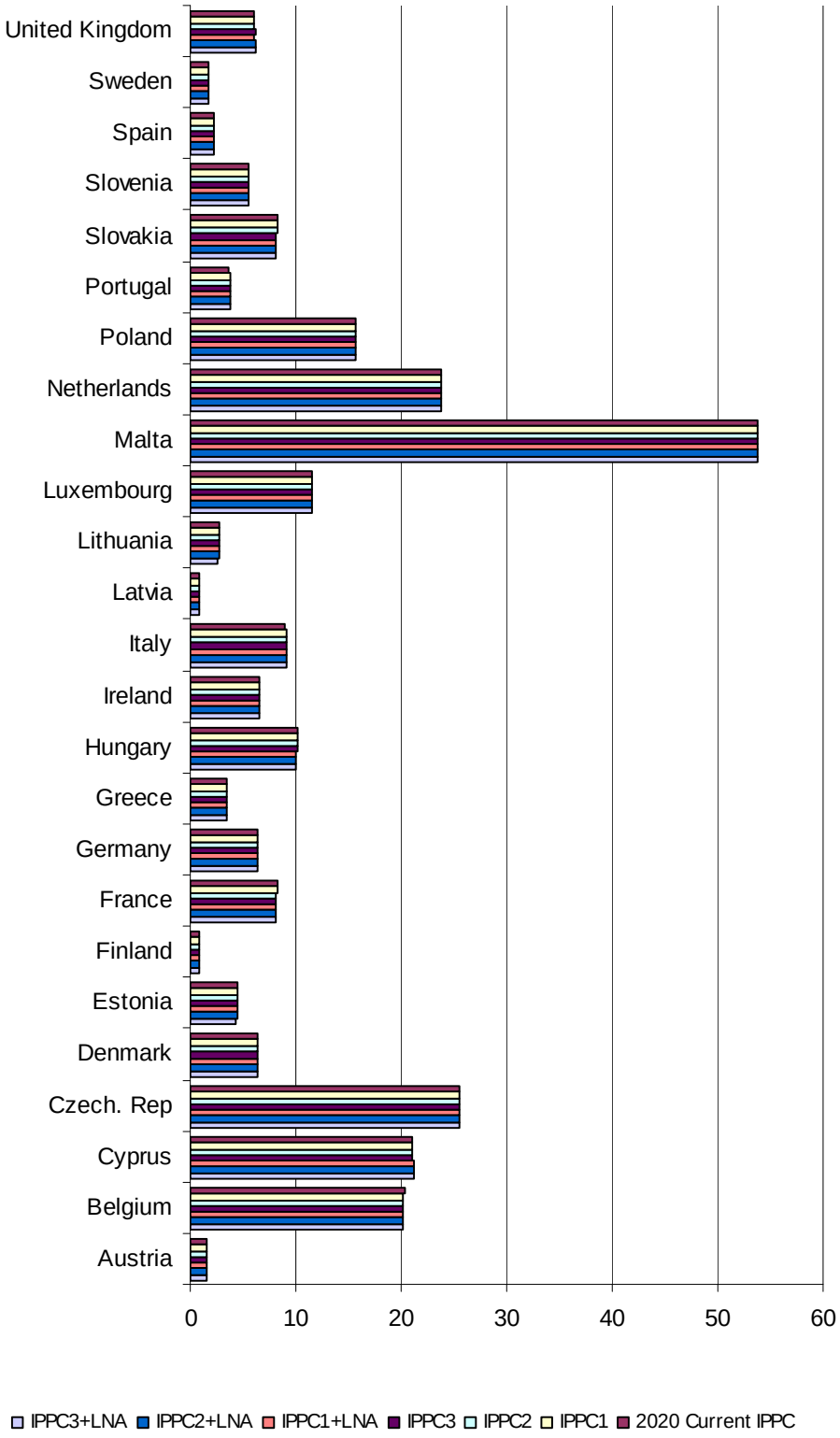

Figure 3.7. Nitrate leaching (in kg N/ha) per Member State in 2000, and in 2020 for the various scenarios studied.

Other relevant trade offs are emissions of methane and nitrous oxide.

Table 3.12. Overview of absolute and relative levels of nitrous oxide (as N) and methane for the various scenarios.

	current IPPC	IPPC1	IPPC2	IPPC3	IPPC1 +LNA	IPPC2 +LNA	IPPC3 +LNA
N_2O-N (kton)	329	334	335	337	337	338	340
CH_4 (kton)	8,443	8,446	8,447	8,450	8,446	8,447	8,450
%N_2O		101.5	101.8	102.2	102.3	102.7	103.3
%CH_4		100.0	100.0	100.1	100.0	100.0	100.1

The results show that lowering the IPPC threshold, resulting in extra NH_3 saved in animal manure, results only in an increase in N_2O emissions of 3.3% when the emissions are compared to current IPPC (in 2020). Especially, the implication of LNA as an element of IPPC permits has impact, since the NH_3 saved during spreading of manures directly enters the soil N cycle, and may therefore leach as nitrate or emit as N_2O when no compensatory measures (e.g. adjusting the N fertilization) are taken. The impact of lowering the thresholds on the emission of CH_4 is negligible when compared to the current IPPC scenario.
Both findings are well in line with the results of the study performed by IIASA, both concerning the trend and the absolute level (around 315 kton N_2O-N).

3.2.7 Economic and social aspects

Several scenarios presented in Table 3.10 have also been investigated with the CAPRI modeling system, more precisely: current IPPC (reference situation ND Full), IPPC1, IPPC2, IPPC3, IPPC2+LNA, IPPC3+LNA. For this purpose an increased IPPC coverage has been treated as being equivalent to an increased percentage of farms applying NH_3 emission abatement measures, similar as in the simulations with MITERRA-EUROPE. For the environmental impacts this is a gross simplification because large farms may have a far higher impact on local ecosystems than captured by their share in the regional aggregate. Furthermore the national IPPC shares have been applied to all NUTS2 regions in the Member States even though large farms may be concentrated in some areas only (as regional IPPC shares were unavailable).

In terms of economic impacts, the costs of NH_3 emission abatement measures have been applied according to the changed implementation of these measures. Investment cost and current cost of ammonia measures per unit were taken from the RAINS database. Additional administrative costs related to the permit procedure have been assumed to equal 2500 € per permit or 340 € per year[2]. The direct cost for ammonia measures per animal have been increased in line with this total amount per farm. The calculation is illustrated in the following table for the case of a very strong expansion of IPPC coverage (IPPC3) in the laying hens sector in Denmark. This is a convenient example because it

[2] The administrative cost per farm for permits has been converted into an annual amount with an interest rate of 6% and an assumed life time for permits of 10 years due to changes in the legal framework.

may be expected that in terms of the RAINS ammonia measures only the penetration of stable adaptation (SA) would increase.

Table 3.13: Illustrative calculation of direct cost impacts of a very strong extension of IPPC coverage (IPPC3 2020) in the case of Denmark

Unit cost SA, per hen, year 2000 prices	€/hen	0,277
Penetration rate reference 2020	%	43
Penetration rate with IPPC3 extension 2020	%	66
Average cost all ammonia measures, per hen, reference, year 2000 prices	€/hen	0,274
Average cost all ammonia measures, per hen, IPPC3, year 2000 prices	€/hen	0,338
Additional cost all ammonia measures, per hen, IPPC3, year 2000 prices	€/hen	0,064
# of hens, 2020	million hens	3,46
Additional cost all ammonia measures for hens, IPPC3, current prices	1000 €	311
Additional cost for all animals, IPPC3, current prices	1000 €	8910

The cost calculation starts from the unit cost estimates in the RAINS database, given in year 2000 prices. Stable adaptation is assumed to apply to 66% of all hens (up from 43%). This gives an increase in the average cost per laying hen for all ammonia measures of 0.064 €/hen. With about 3.46 million hens and after inflating the cost with 1.9% per year this amounts to additional direct costs for ammonia measures of 311 000 € in 2020, contributing to the total increase from all animals by 8.9 m € (included in the 'net' direct cost change in Table 3.18).

Before moving to the economic impacts of each IPPC extension and related measures it is useful to clarify the reference situation ('IPPC0') which differs slightly from that in the Annex 3 simulations ('ND full'). The Annex 3 reference situation is a baseline without explicit consideration of IPPC impacts. Instead the underlying control strategies adopted from the RAINS model are the outcome of consultations with national representatives (NEC national baseline) which may incorporate the implementation of current IPPC legislation but to an unknown degree. On the contrary the reference situation for the Annex 4 simulations are based on control strategies specified with explicit consideration of current IPPC legislation, developed in a collaboration of authors of this study with the RAINS team at IIASA. There are additional technical reasons for differences in the two sets of control strategies but the key conclusion is that simulated impacts reported in Annex 3 and Annex 4 are not directly comparable due to difference in the reference situation. These differences are illustrated in Table 3.14.

The 'IPPC0' scenario involves lower emissions, higher net direct cost and lower agricultural income compared to 'ND full' because the explicit consideration of IPPC requirements apparently implies an enforced implementation. An important contribution in the CAPRI simulations is that low nitrogen feeding (LNF) has been assumed to be a standard requirement on IPPC farms such that low nitrogen feeding is implemented by default according to the shares of animals on IPPC farms. However the effects of partial low nitrogen feeding are not separable in Table 3.14 from other contributions (other ammonia measures, technical reasons), such that we will illustrate the impact of LNF below in a supplementary simulation which may be compared to the Annex 3 scenario 'LNF 10% on IPPC2 farms'.

Table 3.14: Comparison of the Annex 4 reference situation 'IPPC0' with the Annex 3 reference situation ND Full 2020 in CAPRI simulations.

Absolute change IPPC0 (+ ND full) vs. ND full 2020

	agric 'net' dir income cost		poultry meat prd	poultry price	mineral fertiliser	excretion	total NH3 loss	total CH4 emisions	total N2O emisions	leaching
	[m €]	[m €]	[kton]	[€ / ton]	[kton N]	[kton N]	[kton N]	[kton N]	[kton N]	[kton N]
EU27	-181	910	-75	27	-55	-70	-78	10	-8	-5
Austria	15	6	1	24	0	0	0	0	0	0
Belgium	7	25	-3	25	-1	0	-2	0	0	0
Bulgaria	-21	26	0	15	0	-1	0	-1	0	0
Cyprus	-2	2	0	37	0	0	0	0	0	0
Czech. Rep	4	6	3	18	-1	0	0	0	0	0
Denmark	18	0	-2	20	-12	-4	-18	0	1	0
Estonia	0	0	0	34	0	0	0	0	0	0
Finland	1	9	-1	27	0	0	0	0	0	0
France	64	101	18	32	2	-1	7	2	-1	-1
Germany	23	112	-14	22	-18	-8	-25	1	0	0
Greece	3	11	-2	19	0	0	0	0	0	0
Hungary	-27	41	-4	31	2	-3	1	0	-1	0
Ireland	-34	41	-2	25	-4	1	0	3	0	0
Italy	-69	122	-14	36	-6	-13	-13	0	-1	-1
Latvia	0	1	0	177	0	0	0	0	0	0
Lithuania	0	2	0	53	0	0	0	0	0	0
Malta	0	0	0	33	0	0	0	0	0	0
Netherlands	5	30	-19	21	-7	-4	-13	0	0	1
Poland	11	34	4	22	-7	-4	-9	0	0	0
Portugal	-9	21	-3	26	0	-1	-1	0	0	0
Romania	-38	37	1	19	0	-1	0	-2	0	0
Slovakia	0	3	0	25	1	-1	1	0	0	0
Slovenia	4	1	2	23	0	0	0	0	0	0
Spain	-91	170	-5	26	2	-17	2	1	-4	-2
Sweden	6	9	-2	22	0	-1	-1	0	0	0
United Kingdom	-48	100	-34	27	-6	-12	-7	3	-1	-1

Percentage change IPPC0 (+ ND full) vs. ND full 2020

	agric 'net' dir income cost		poultry meat prd	poultry price	mineral fertiliser	excretion	total NH3 loss	total CH4 emisions	total N2O emisions	leaching
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
EU27	-0,1	4,4	-0,6	2,3	-0,5	-0,7	-2,6	0,1	-1,0	-0,4
Austria	0,5	1,1	0,6	2,3	-0,5	0,1	0,4	0,1	-0,3	-0,2
Belgium	0,2	10,8	-1,0	2,3	-1,2	-0,1	-3,2	0,0	0,9	0,4
Bulgaria	-0,8	11,5	0,5	1,0	0,0	-0,5	-0,3	-0,5	-0,3	-0,2
Cyprus	-0,4	14,3	-1,1	2,2	2,0	-2,1	-0,5	-0,4	-4,3	-1,4
Czech. Rep	0,2	1,1	1,1	2,2	-0,2	0,4	-0,1	0,3	-1,2	-0,1
Denmark	0,6	3,8	-0,7	2,3	-7,1	-1,1	-22,4	0,0	5,4	1,1
Estonia	-0,1	5,5	0,9	2,2	0,2	-0,6	0,2	-0,2	-1,3	-0,6
Finland	0,1	1,4	-0,7	2,3	0,0	-0,2	0,1	0,0	-0,4	-0,5
France	0,2	2,2	0,9	2,3	0,1	0,0	1,4	0,1	-1,0	-0,4
Germany	0,1	3,9	-0,7	2,3	-1,0	-0,6	-5,1	0,1	-0,1	0,1
Greece	0,0	6,9	-1,2	2,3	-0,1	-0,1	0,4	0,1	-1,0	-0,4
Hungary	-0,7	6,4	-0,7	2,2	0,3	-1,6	1,6	-0,1	-3,8	-1,3
Ireland	-1,3	4,4	-1,4	2,3	-1,3	0,2	-0,2	0,5	-0,4	-0,8
Italy	-0,2	5,2	-1,6	2,3	-0,9	-1,4	-3,7	0,0	-1,2	-1,2
Latvia	0,1	1,8	0,0	2,2	-0,1	-0,2	0,7	0,2	-0,5	-0,6
Lithuania	0,1	2,4	0,8	2,2	0,0	-0,4	0,1	0,0	-0,7	-0,7
Malta	0,6	8,9	2,5	2,2	-2,0	0,4	1,3	0,0	0,0	5,3
Netherlands	0,0	2,6	-3,3	2,3	-3,8	-0,9	-14,3	0,1	1,0	0,9
Poland	0,1	19,6	0,3	2,2	-0,7	-0,7	-3,4	0,0	-0,5	-0,3
Portugal	-0,2	2,8	-0,9	2,3	-0,3	-0,7	-1,1	0,2	-2,8	-0,9
Romania	-0,7	3,0	0,8	1,0	0,1	-0,5	-0,3	-0,5	-0,1	-0,1
Slovakia	0,0	2,1	0,0	2,2	0,7	-1,8	5,0	0,1	-3,3	-2,3
Slovenia	0,7	2,1	3,0	2,2	-0,2	0,3	0,7	0,1	-0,5	0,0
Spain	-0,2	20,4	-0,3	2,3	0,3	-1,2	0,5	0,1	-4,8	-1,6
Sweden	0,4	1,5	-1,3	2,3	-0,1	-0,6	-2,1	0,2	-1,1	0,0
United Kingdom	-0,5	4,5	-1,9	2,3	-0,7	-1,1	-3,4	0,3	-1,5	-1,2

With this background we may move to the economic impacts of an increased IPPC coverage. The additional costs of animal production in IPPC farms tend to decrease their profitability and will slightly decrease their contribution to aggregate production. Given that IPPC farms cover a great share of total production in the poultry sector these supply reducing effects are most clearly visible here and have been selected as illuminating examples already in Table 3.14 above. In the first enforcement scenario 'IPPC1', i.e. with a moderately increased IPPC coverage, EU27 production of poultry meat declines by 0.2% (Table 3.15). As a consequence there will be some increase in producer prices which is 0.5% at the EU level. These market effects also affect pork but are only about half as strong as on the poultry market. They help to limit the aggregate loss to agriculture to 240 m €. The aggregate loss hides reallocations within agriculture. Whereas the additional cost is born by IPPC farms only, the counteracting price increase benefits all farms.

The first level of IPPC extension would reduce aggregate NH_3 emissions by 47 ktons. This is a larger impact than according to Miterra-Europe simulations (30 ktons). The differences is related to the CAPRI assumption that LNF is a standard requirement for IPPC farms by 2020 which goes beyond the cautious penetration rates adopted in RAINS and Miterra-Europe. The LNF contribution will be investigated in more detail below therefore. However, Table 3.15 also reveals small antagonistic effects on N_2O emissions which tend to increase slightly.

Fertilizer use is somewhat declining in the CAPRI simulations because farmers are assumed to maintain the desired ratio of crop available N supply to N demand. They would thus adjust to lower NH_3 losses with a decline of fertilizer application. However this adjustment does not completely eliminate the antagonistic effect on leaching, as a part of the increased N from manure will be considered unavailable to crops.

The variation between countries in the IPPC scenarios is driven by the assumed changes of penetration rates for NH_3 emission abatement measures which in turn mainly derive from the country level farm structure information and the expected implementation. The above average impact in Italy, for example, derives from a significant application of stable adaptation measures which are both costly and effective. The additional cost in turn reinforces the savings in emissions through their supply curbing impact. Excretion is usually declining as a consequence of LNF but this effect may be compensated to a large extent by an expansion of animal production, if the price increases on EU markets stimulate production more than the curbing effect of higher cost on IPPC farms.

Table 3.15: Simulation results of a moderate extension of IPPC coverage (IPPC1 2020) vs. IPPC0 in 2020

Absolute change IPPC1 vs. IPPC0 2020

	agric 'net' dir income cost [m €]	[m €]	poultry meat prd [kton]	poultry price [€ / ton]	mineral fertiliser [kton N]	excretion [kton N]	total NH3 loss [kton N]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
EU27	-240	334	-19	6	-32	-23	-47	5	7	-3
Austria	2	2	0	5	0	0	0	0	0	0
Belgium	-9	13	-5	6	0	0	-1	0	0	0
Bulgaria	22	-21	0	1	0	1	0	1	0	0
Cyprus	-1	1	0	10	0	0	0	0	0	0
Czech. Rep	-16	18	-2	5	-2	-1	-1	1	0	0
Denmark	-3	9	-4	4	-1	-1	-2	0	1	0
Estonia	-2	2	0	9	0	0	0	0	0	0
Finland	0	2	0	6	0	0	0	0	0	0
France	-4	30	3	7	-3	0	-4	0	1	0
Germany	-34	68	-3	5	-4	-5	-6	1	1	-1
Greece	-3	3	-1	4	0	0	0	0	0	0
Hungary	-29	25	-3	9	0	-2	-1	0	0	0
Ireland	-24	17	-1	6	-2	0	-2	1	0	0
Italy	-144	95	-5	8	-7	-7	-15	-1	2	0
Latvia	0	1	0	49	0	0	0	0	0	0
Lithuania	-2	2	0	15	0	0	0	0	0	0
Malta	0	0	0	9	0	0	0	0	0	0
Netherlands	2	9	1	5	0	0	0	0	0	0
Poland	-8	15	-1	6	-1	-1	-2	0	0	0
Portugal	-3	6	-1	6	-1	0	-1	0	0	0
Romania	39	-28	1	2	-1	1	0	1	0	0
Slovakia	-4	4	0	7	0	-1	-1	0	0	0
Slovenia	-1	1	0	6	0	0	0	0	0	0
Spain	-14	33	-3	6	-4	-2	-6	0	1	0
Sweden	-2	5	0	5	0	0	0	0	0	0
United Kingdom	-1	21	2	6	-4	-3	-4	1	0	-1

Percentage change IPPC1 vs. IPPC0 2020

	agric 'net' dir income cost [%]	[%]	poultry meat prd [%]	poultry price [%]	mineral fertiliser [%]	excretion [%]	total NH3 loss [%]	total CH4 emisions [%]	total N2O emisions [%]	leaching [%]
EU27	-0.1	1.6	-0.2	0.5	-0.3	-0.2	-1.6	0.1	0.9	-0.2
Austria	0.1	0.3	0.0	0.5	-0.2	0.0	-0.2	0.0	0.3	0.0
Belgium	-0.3	4.2	-1.4	0.5	-0.2	-0.1	-1.1	0.0	2.2	0.1
Bulgaria	0.9	-6.4	0.3	0.1	-0.2	0.5	0.3	0.5	0.1	0.0
Cyprus	-0.2	4.4	0.0	0.6	-0.5	-0.5	-2.6	0.0	1.1	-0.5
Czech. Rep	-0.9	4.8	-0.6	0.6	-0.5	-0.8	-1.7	1.0	-0.1	-1.4
Denmark	-0.1	1.7	-1.7	0.5	-0.9	-0.2	-3.9	0.0	2.4	-0.1
Estonia	-0.9	8.3	0.6	0.6	-0.1	-2.2	-2.6	-0.1	-1.3	-1.9
Finland	0.0	0.3	0.1	0.5	-0.1	0.0	-0.7	0.0	0.5	0.0
France	0.0	0.7	0.2	0.5	-0.1	0.0	-0.8	0.0	0.6	0.0
Germany	-0.2	1.7	-0.2	0.5	-0.2	-0.3	-1.4	0.0	0.7	-0.5
Greece	0.0	1.9	-0.6	0.5	-0.2	0.0	-1.4	0.0	0.7	0.1
Hungary	-0.7	3.7	-0.7	0.6	0.0	-0.9	-1.8	-0.2	1.8	-0.5
Ireland	-0.9	3.1	-0.5	0.5	-0.7	-0.1	-1.6	0.1	0.6	-0.3
Italy	-0.4	4.8	-0.5	0.5	-0.9	-0.8	-4.4	-0.1	3.1	-0.1
Latvia	-0.1	2.7	0.0	0.6	-0.3	-0.6	-0.6	0.0	-0.3	-1.0
Lithuania	-0.3	1.8	0.3	0.6	-0.1	-0.4	-0.8	-0.1	0.0	-0.4
Malta	0.1	2.1	0.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	0.0	0.4	0.2	0.5	-0.1	0.0	0.0	0.0	0.0	-0.1
Poland	-0.1	6.9	-0.1	0.6	-0.1	-0.2	-0.8	-0.1	0.6	-0.1
Portugal	-0.1	0.8	-0.4	0.5	-0.6	-0.2	-1.9	0.1	1.5	-0.2
Romania	0.7	-1.8	0.7	0.1	-0.2	0.5	0.3	0.4	0.1	0.0
Slovakia	-0.6	3.2	0.2	0.6	-0.3	-2.5	-4.5	-0.1	-0.2	-1.7
Slovenia	-0.2	2.0	0.6	0.6	-0.5	-0.1	-0.9	0.0	0.5	0.0
Spain	0.0	3.0	-0.2	0.5	-0.5	-0.1	-1.9	0.0	2.0	-0.1
Sweden	-0.1	0.5	0.0	0.5	0.0	-0.2	-0.9	0.0	0.5	0.0
United Kingdom	0.0	1.0	0.1	0.5	-0.5	-0.3	-1.9	0.1	0.3	-0.6

Table 3.16 shows that the major contributions to aggregate income are hardly affected by scenario IPPC1.

Table 3.16: Contributions to agricultural income according to CAPRI simulations for a moderate extension of IPPC coverage (IPPC1 2020) vs. IPPC0 in 2020

	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]
European Union 27						
Production value	427108			0.0%		
Cereals	35589	105	339079	-0.1%	-0.1%	0.0%
Other non fodder	157328	252	624671	0.0%	0.0%	0.0%
Fodder	18922	9	2141668	0.0%	0.0%	-0.1%
Meat	74654	1629	45818	0.1%	0.2%	-0.1%
Other Animal products	59486	273	217671	0.1%	0.1%	0.0%
Other output	81129	164	493456	0.0%	0.0%	0.0%
Inputs	262230			0.1%		
Fertiliser	39252	819	47912	0.0%	0.0%	0.0%
Feedingstuff	71915	47	1543543	-0.3%	-0.3%	0.0%
Other input	151063	283	532917	0.4%	0.3%	0.1%
European Union 15						
Production value	371005			0.0%		
Cereals	26426	110	239820	-0.1%	-0.1%	0.0%
Other non fodder	140787	263	535176	0.0%	0.0%	0.0%
Fodder	15796	9	1764251	0.0%	0.0%	0.0%
Meat	64895	1695	38275	0.1%	0.2%	-0.1%
Other Animal products	51308	278	184390	0.1%	0.1%	0.0%
Other output	71794	174	413408	0.0%	0.0%	0.0%
Inputs	225505			0.1%		
Fertiliser	31791	850	37390	0.0%	0.0%	0.0%
Feedingstuff	62599	47	1324382	-0.3%	-0.2%	0.0%
Other input	131114	292	449002	0.4%	0.3%	0.1%
European Union 12						
Production value	56102			0.0%		
Cereals	9163	92	99259	-0.1%	-0.1%	0.0%
Other non fodder	16541	185	89496	0.0%	0.0%	0.0%
Fodder	3126	8	377418	-0.1%	0.0%	-0.1%
Meat	9759	1294	7543	0.2%	0.2%	0.0%
Other Animal products	8178	246	33281	0.1%	0.0%	0.0%
Other output	9335	117	80048	0.0%	-0.1%	0.1%
Inputs	36725			0.1%		
Fertiliser	7461	709	10523	0.0%	0.0%	0.0%
Feedingstuff	9316	43	219161	-0.4%	-0.5%	0.0%
Other input	19948	238	83915	0.3%	0.2%	0.1%

The change in agricultural income is one component of the total change in ‘economic welfare’ (Table 3.17)

Table 3.17: Contributions to the change in conventional economic welfare according to CAPRI simulations for a moderate extension of IPPC coverage (IPPC1 2020) vs. IPPC0 in 2020 [million €]

	EU27	EU15	EU12
Total	-532	-491	-41
Consumer money metric	-236	-206	-30
Agricultural income	-240	-239	-1
Premiums	0	0	0
Agricultural Output	89	68	21
Output crops	-37	-30	-7
Output animals	126	98	28
Output rest	0	0	0
Agricultural Input	329	307	22
Crop specific Input	-7	-6	-1
Animal specific Input	-227	-183	-44
Other Input	564	496	67
'Net' direct cost	334	313	21
Profit of dairies	1	1	0
Profit of other processing	-48	-42	-6
Tariff revenues	-4	-1	-3
FEOGA first pillar	4	3	0

The price increases reduce consumer welfare. A part of the additional 'net direct cost' for NH_3 emission abatement measures on IPPC farms (334 m €) is thus passed on to consumers (aggregate loss: 236 m €) such that agriculture is less affected (-240 m €). This 'net direct cost' is defined as in Annex 3: It is the cost of additional quality of management and feed plus costs of permits and net of any savings on fertilizer cost or feed quantities due to LNF. Note that the total welfare loss is somewhat larger than the net direct cost but not very far away from this straightforward measure of economic cost. Impacts on the processing industry and on the budget are negligible. Whereas the change in our conventional welfare measure is clearly negative it has to be mentioned that the benefits of this and other scenarios in terms of reduced emissions have not been monetised. The estimated (partial) welfare loss may be interpreted as an estimate of the cost to society to achieve the environmental improvements in terms of reduced emissions of NH_3.

Moving to the strong extension of IPPC coverage (Tables 3.18 to 3.20) reinforces all effects discussed so far without modification in basic relationships.

Table 3.18: Simulation results of a strong extension of IPPC coverage (IPPC2 2020) vs. IPPC0 in 2020

Absolute change IPPC2 vs. IPPC0 2020

	agric 'net' dir income cost [m €]	[m €]	poultry meat prd [kton]	poultry price [€ / ton]	mineral fertiliser [kton N]	excretion [kton N]	total NH3 loss [kton N]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
EU27	-392	622	-28	10	-43	-41	-63	5	8	-5
Austria	4	5	0	8	0	0	0	0	0	0
Belgium	-18	27	-6	9	0	-1	-1	0	0	0
Bulgaria	30	-26	0	2	-1	1	0	1	0	0
Cyprus	-2	2	0	15	0	0	0	0	0	0
Czech. Rep	-20	20	-2	7	-2	-1	-1	1	0	0
Denmark	-13	19	-4	7	-1	-2	-3	0	0	0
Estonia	-2	2	0	14	0	0	0	0	0	0
Finland	1	3	0	9	0	0	0	0	0	0
France	-34	78	2	11	-5	-2	-8	0	1	0
Germany	-66	120	-5	8	-5	-8	-9	0	1	-1
Greece	-4	5	-1	7	0	0	-1	0	0	0
Hungary	-39	36	-3	12	0	-2	-2	0	0	0
Ireland	-31	28	-1	9	-3	0	-2	1	0	0
Italy	-186	143	-4	12	-7	-11	-17	-2	2	0
Latvia	-1	1	0	72	0	0	0	0	0	0
Lithuania	-4	5	0	22	0	0	0	0	0	0
Malta	0	0	0	13	0	0	0	0	0	0
Netherlands	-1	22	-1	7	0	-1	0	0	0	0
Poland	-6	24	-1	9	-2	-1	-2	0	0	0
Portugal	-5	12	-2	9	-1	-1	-1	0	0	0
Romania	53	-35	1	3	-1	2	0	2	0	0
Slovakia	-5	6	0	10	0	-1	-1	0	0	0
Slovenia	-4	4	0	9	0	0	0	0	0	0
Spain	-35	75	-6	9	-5	-5	-8	0	2	0
Sweden	-5	10	0	8	0	-1	-1	0	0	0
United Kingdom	-1	39	4	9	-6	-5	-6	2	0	-1

Percentage change IPPC2 vs. IPPC0 2020

	agric 'net' dir income cost [%]	[%]	poultry meat prd [%]	poultry price [%]	mineral fertiliser [%]	excretion [%]	total NH3 loss [%]	total CH4 emisions [%]	total N2O emisions [%]	leaching [%]
EU27	-0.2	2.8	-0.2	0.8	-0.4	-0.4	-2.2	0.1	1.1	-0.4
Austria	0.1	0.7	-0.3	0.8	-0.4	0.1	-0.3	0.1	0.6	-0.2
Belgium	-0.5	8.6	-1.8	0.8	-0.2	-0.3	-1.4	-0.1	2.4	-0.1
Bulgaria	1.1	-8.7	0.4	0.1	-0.4	0.7	0.3	0.7	0.2	0.0
Cyprus	-0.5	7.8	0.0	0.9	-0.4	-1.0	-4.2	-0.3	1.1	-0.9
Czech. Rep	-1.1	6.0	-0.6	0.9	-0.6	-1.1	-2.4	1.0	-0.1	-1.6
Denmark	-0.4	3.5	-1.8	0.8	-0.7	-0.6	-4.4	-0.1	2.2	-0.5
Estonia	-0.8	9.5	0.8	0.9	-0.2	-2.4	-3.0	-0.1	-1.3	-1.9
Finland	0.1	0.4	0.2	0.8	-0.2	0.1	-0.9	0.1	0.7	0.0
France	-0.1	1.8	0.1	0.8	-0.2	-0.1	-1.6	0.0	0.8	0.0
Germany	-0.4	3.1	-0.3	0.8	-0.3	-0.6	-2.0	0.0	0.8	-0.7
Greece	0.0	3.3	-0.8	0.8	-0.2	0.0	-1.9	0.0	0.9	0.1
Hungary	-1.0	5.3	-0.7	0.9	-0.1	-1.3	-2.7	-0.4	2.0	-0.7
Ireland	-1.2	4.3	-0.5	0.8	-1.1	-0.1	-1.9	0.2	0.6	-0.5
Italy	-0.5	6.7	-0.4	0.8	-1.0	-1.2	-5.1	-0.2	3.3	-0.5
Latvia	-0.2	4.0	0.4	0.9	-0.4	-0.7	-0.7	0.0	-0.3	-1.2
Lithuania	-0.7	3.5	0.4	0.9	-0.2	-0.5	-1.0	-0.1	0.0	-0.6
Malta	0.0	4.6	0.3	0.9	0.0	-0.4	0.0	0.0	0.0	-5.0
Netherlands	0.0	1.0	-0.1	0.8	-0.1	-0.3	-0.2	0.0	-0.2	-0.3
Poland	-0.1	10.3	-0.1	0.9	-0.2	-0.2	-1.0	0.0	0.8	-0.1
Portugal	-0.1	1.5	-0.5	0.8	-0.7	-0.4	-2.4	0.0	1.6	-0.4
Romania	1.0	-2.5	1.0	0.1	-0.3	0.8	0.5	0.6	0.1	0.0
Slovakia	-0.8	4.1	0.3	0.9	-0.4	-2.9	-5.6	-0.2	0.0	-1.9
Slovenia	-0.6	6.2	0.5	0.9	-0.7	-0.4	-2.1	-0.3	1.0	0.0
Spain	-0.1	6.6	-0.4	0.8	-0.7	-0.4	-2.5	0.0	2.2	-0.5
Sweden	-0.3	1.1	0.1	0.8	0.0	-0.4	-1.5	0.1	0.5	-0.3
United Kingdom	0.0	1.6	0.2	0.8	-0.8	-0.5	-2.6	0.2	0.3	-0.9

Even for the strong expansion the aggregate income effects are rather moderate on the sectoral level, in particular in percentage terms. Evidently this does not hold for the farms affected.

Table 3.19: Contributions to agricultural income according to CAPRI simulations for a strong extension of IPPC coverage (IPPC2 2020) vs. IPPC0 in 2020

	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]
European Union 27						
Production value	427108			0.1%		
Cereals	35589	105	339079	-0.2%	-0.2%	0.0%
Other non fodder	157328	252	624671	0.0%	0.0%	0.0%
Fodder	18922	9	2141668	-0.1%	0.0%	-0.1%
Meat	74654	1629	45818	0.3%	0.4%	-0.2%
Other Animal products	59486	273	217671	0.2%	0.2%	0.0%
Other output	81129	164	493456	0.0%	0.1%	-0.1%
Inputs	262230			0.2%		
Fertiliser	39252	819	47912	0.0%	0.0%	0.0%
Feedingstuff	71915	47	1543543	-0.5%	-0.4%	0.0%
Other input	151063	283	532917	0.7%	0.6%	0.1%
European Union 15						
Production value	371005			0.1%		
Cereals	26426	110	239820	-0.2%	-0.2%	0.0%
Other non fodder	140787	263	535176	0.0%	0.0%	0.0%
Fodder	15796	9	1764251	0.0%	0.1%	-0.1%
Meat	64895	1695	38275	0.3%	0.4%	-0.2%
Other Animal products	51308	278	184390	0.2%	0.2%	0.0%
Other output	71794	174	413408	0.0%	0.1%	-0.1%
Inputs	225505			0.3%		
Fertiliser	31791	850	37390	0.0%	0.0%	0.0%
Feedingstuff	62599	47	1324382	-0.5%	-0.4%	-0.1%
Other input	131114	292	449002	0.7%	0.6%	0.0%
European Union 12						
Production value	56102			0.1%		
Cereals	9163	92	99259	-0.2%	-0.2%	0.0%
Other non fodder	16541	185	89496	0.0%	0.0%	0.0%
Fodder	3126	8	377418	-0.1%	0.0%	-0.1%
Meat	9759	1294	7543	0.4%	0.4%	0.0%
Other Animal products	8178	246	33281	0.2%	0.1%	0.1%
Other output	9335	117	80048	0.0%	-0.1%	0.1%
Inputs	36725			0.1%		
Fertiliser	7461	709	10523	0.0%	0.0%	0.0%
Feedingstuff	9316	43	219161	-0.6%	-0.6%	0.0%
Other input	19948	238	83915	0.5%	0.3%	0.2%

Finally we add the welfare effects of a strong extension of IPPC coverage (Table 3.20). The price increases reduce consumer welfare and pass on a significant part of the direct cost for NH3 emission abatement measures on IPPC farms to consumers such that agriculture is less affected. Impacts on the processing industry and on the budget are negligible. As under scenario IPPC1 the change in our conventional welfare measure is clearly negative (-980 m €), indicating that reduced emissions of NH3 are not available for free.

Table 3.20: Contributions to the change in conventional economic welfare according to CAPRI simulations for a strong extension of IPPC coverage (IPPC2 2020) vs. IPPC0 in 2020 [million €]

	EU27	EU15	EU12
Total	-980	-907	-73
Consumer money metric	-471	-410	-61
Agricultural income	-392	-393	1
Premiums	0	0	0
Agricultural Output	251	207	43
Output crops	-84	-67	-17
Output animals	335	274	61
Output rest	0	0	0
Agricultural Input	642	600	43
Crop specific Input	-14	-12	-2
Animal specific Input	-336	-281	-55
Other Input	992	892	100
'Net' direct cost	622	584	39
Profit of dairies	2	2	0
Profit of other processing	-114	-102	-12
Tariff revenues	1	1	0
FEOGA first pillar	7	7	0

At this point it will be illuminating to look at the separate contributions from LNF to the impacts of the 'strong' extension of IPPC coverage under scenario IPPC2. For this purpose it has been investigated what would be the result if, contrary to the CAPRI default assumption, LNF would *not* be mandatory for IPPC2 farms. Comparing this scenario with the standard version of IPPC2 reveals the partial contribution of LNF according to our simulations (Table 3.21).

This partial LNF impact compares well with the results from Annex 3 where it has been investigated what would be the LNF impacts without further ammonia measures on IPPC2 farms. The presence or absence of standard ammonia measures modifies the estimated contribution of LNF measures, but does not fundamentally change the picture: On the EU27 level the agricultural income loss is 564 m € (397 m € according to Annex 3) and ammonia losses decline by 32 ktons (as in Annex 3), for example. This consistency is reassuring. More importantly it confirms that the contribution of LNF in the CAPRI simulations of IPPC scenarios is significant and partly explains the stronger impacts obtained compared to MITERRA-EUROPE. Note that the agricultural income loss due to LNF on IPPC2 farms is larger than the additional loss when moving from the IPPC1 extension to IPPC2. Expressed differently the gain in income would have been higher if LNF were abolished on all IPPC2 farms rather than eliminating both ammonia measures and LNF on the additional farms coming under IPPC at this state of extension.

Table 3.21: Simulation results of scenario IPPC2 (strong extension of IPPC coverage) with LNF compared to IPPC2 without LNF in 2020

Absolute change IPPC2 without LNF vs. IPPC2 2020

	agric income [m €]	'net' dir cost [m €]	poultry meat prd [kton]	poultry price [€ / ton]	mineral fertiliser [kton N]	excretion [kton N]	total NH3 loss [kton N]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
EU27	-541	1175	-83	30	-23	-108	-32	14	-6	-15
Austria	13	9	1	27	-1	0	0	0	0	0
Belgium	-9	37	-4	29	0	-1	0	0	0	0
Bulgaria	9	-4	1	13	-1	0	0	0	0	0
Cyprus	-3	3	0	42	0	-1	0	0	0	0
Czech. Rep	-12	21	3	20	-2	0	0	1	0	-1
Denmark	-11	15	-1	22	1	-6	-1	0	0	-1
Estonia	-2	2	0	38	0	-1	0	0	0	0
Finland	-3	11	-1	31	0	0	0	0	0	0
France	23	129	17	36	-4	-2	-1	2	0	-1
Germany	-93	197	-16	25	-1	-17	-5	1	-1	-3
Greece	-3	14	-2	21	-1	0	0	0	0	0
Hungary	-39	53	-3	34	0	-4	-1	0	0	0
Ireland	-40	45	-2	28	-4	0	0	3	0	0
Italy	-133	175	-14	40	0	-19	-5	-1	-1	-2
Latvia	-1	1	0	199	0	0	0	0	0	0
Lithuania	-3	4	0	60	0	-1	0	0	0	0
Malta	0	0	0	37	0	0	0	0	0	0
Netherlands	-25	48	-24	23	0	-6	-1	0	0	-1
Poland	-12	48	3	24	-1	-6	-1	0	0	-1
Portugal	-17	29	-3	29	0	-2	-1	0	0	0
Romania	19	-6	3	16	-1	1	0	1	0	0
Slovakia	-2	5	0	28	0	-2	-1	0	0	0
Slovenia	3	2	2	26	0	0	0	0	0	0
Spain	-122	202	-6	29	-3	-22	-7	1	-1	-2
Sweden	-3	16	-2	25	1	-1	0	0	0	0
United Kingdom	-74	119	-34	30	-6	-17	-6	5	-1	-3

Percentage change IPPC2 without LNF vs. IPPC2 2020

	agric income [%]	'net' dir cost [%]	poultry meat prd [%]	poultry price [%]	mineral fertiliser [%]	excretion [%]	total NH3 loss [%]	total CH4 emisions [%]	total N2O emisions [%]	leaching [%]
EU27	-0,3	6,1	-0,6	2,5	-0,2	-1,1	-1,1	0,1	-0,8	-1,4
Austria	0,4	1,7	0,5	2,5	-0,8	0,2	0,1	0,2	-0,1	-0,4
Belgium	-0,3	15,3	-1,4	2,5	-0,2	-0,4	-0,4	-0,1	-0,4	-0,6
Bulgaria	0,3	0,8	0,9	0,8	-0,4	0,2	0,1	0,1	-0,1	-0,2
Cyprus	-0,8	20,3	-1,0	2,4	1,2	-3,0	-4,7	-0,5	-3,3	-2,3
Czech. Rep	-0,7	5,2	1,2	2,4	-0,7	-0,4	-0,5	1,4	-0,6	-1,7
Denmark	-0,4	5,6	-0,4	2,5	0,4	-1,8	-1,8	-0,2	-1,4	-2,5
Estonia	-1,1	13,7	1,1	2,4	0,0	-3,0	-2,6	-0,2	-1,3	-2,6
Finland	-0,2	1,6	-0,6	2,5	-0,2	-0,1	-0,1	0,1	-0,2	-0,5
France	0,1	3,4	0,8	2,5	-0,2	-0,1	-0,2	0,1	-0,2	-0,3
Germany	-0,5	6,4	-0,9	2,5	-0,1	-1,2	-1,0	0,1	-0,9	-2,0
Greece	0,0	8,7	-1,4	2,5	-0,3	-0,1	-0,3	0,1	-0,2	-0,2
Hungary	-1,0	8,2	-0,6	2,4	0,0	-2,3	-1,8	-0,1	-0,8	-1,6
Ireland	-1,5	4,7	-1,4	2,5	-1,5	0,0	-0,3	0,6	-0,4	-1,2
Italy	-0,4	7,5	-1,6	2,5	0,0	-2,2	-1,7	-0,1	-1,6	-2,6
Latvia	-0,3	5,8	0,4	2,4	-0,6	-1,0	-1,0	0,1	-0,5	-1,7
Lithuania	-0,5	5,0	0,9	2,4	-0,2	-1,0	-0,9	0,0	-0,2	-1,2
Malta	0,2	13,6	1,9	2,4	0,0	-0,4	0,0	-0,5	0,0	0,0
Netherlands	-0,2	3,6	-4,0	2,5	0,2	-1,3	-1,4	0,0	-1,6	-1,3
Poland	-0,1	26,8	0,2	2,4	-0,1	-1,0	-0,6	-0,1	-0,5	-1,0
Portugal	-0,4	3,9	-1,0	2,5	-0,3	-1,1	-1,4	0,2	-1,1	-1,4
Romania	0,3	0,1	1,8	0,8	-0,2	0,3	0,2	0,2	0,0	-0,1
Slovakia	-0,3	4,8	0,3	2,4	0,0	-4,4	-3,3	0,2	-1,6	-3,8
Slovenia	0,5	5,4	3,1	2,4	-0,3	0,0	0,2	-0,1	-0,5	-0,5
Spain	-0,3	25,4	-0,4	2,5	-0,4	-1,6	-2,2	0,1	-1,5	-2,0
Sweden	-0,2	2,2	-1,3	2,5	0,5	-1,0	-0,9	0,2	-0,6	-0,3
United Kingdom	-0,7	5,8	-1,9	2,5	-0,7	-1,6	-2,8	0,4	-1,5	-2,2

The contribution of LNF to the overall effects is particularly interesting for the income and welfare impacts (Table 3.22). It may be seen that the 'net direct cost' are an incomplete indicator of total welfare cost.

Table 3.22: Contributions to the change in conventional economic welfare according to CAPRI simulations for scenario IPPC2 (strong extension of IPPC coverage) with LNF compared to IPPC2 without LNF in 2020 [million €]

	EU27	EU15	EU12
Total	-2284	-2025	-259
Consumer money metric	-1324	-1158	-166
Agricultural income	-564	-512	-53
Premiums	1	0	1
Agricultural Output	575	485	90
Output crops	-234	-171	-62
Output animals	808	656	152
Output rest	0	0	0
Agricultural Input	1140	997	143
Crop specific Input	-41	-35	-6
Animal specific Input	-973	-856	-116
Other Input	2153	1888	265
'Net' direct cost	1190	1054	136
Profit of dairies	9	7	1
Profit of other processing	-381	-340	-42
Tariff revenues	17	16	1
FEOGA first pillar	41	40	1

For the strong expansion of IPPC coverage we have also investigated the additional effect of mandatory additional low nitrogen application of manure (Table 3.23)

Table 3.23: Simulation results of scenario IPPC2 (strong extension of IPPC coverage) with additional LNA compared to IPPC2 without additional LNA in 2020

Absolute change IPPC2 + more LNA vs. IPPC2 2020

	agric 'net' dir income cost [m €]	[m €]	poultry meat prd [kton]	poultry price [€ / ton]	mineral fertiliser [kton N]	excretion [kton N]	total NH3 loss [kton N]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
EU27	-90	177	-15	4	-34	-1	-43	0	4	1
Austria	2	1	0	3	0	0	0	0	0	0
Belgium	4	2	1	4	0	0	0	0	0	0
Bulgaria	1	0	0	2	0	0	0	0	0	0
Cyprus	-2	1	0	8	0	0	0	0	0	0
Czech. Rep	-12	9	-4	4	-1	0	-1	0	0	0
Denmark	2	2	-1	3	-1	0	-1	0	0	0
Estonia	-1	1	0	7	0	0	0	0	0	0
Finland	1	1	0	4	0	0	0	0	0	0
France	-14	23	-5	5	-7	0	-10	0	1	0
Germany	28	3	6	3	1	1	2	0	0	0
Greece	-2	2	-1	3	0	0	-1	0	0	0
Hungary	-14	13	-4	7	-2	0	-3	0	0	0
Ireland	-4	4	-1	4	-1	0	-1	0	0	0
Italy	-6	14	-3	5	-3	0	-5	0	1	0
Latvia	-1	1	0	38	0	0	0	0	0	0
Lithuania	-2	2	0	11	0	0	0	0	0	0
Malta	0	0	0	7	0	0	0	0	0	0
Netherlands	6	4	2	3	0	0	0	0	0	0
Poland	6	7	1	5	-2	0	-2	0	0	0
Portugal	-9	7	-1	4	-2	0	-2	0	0	0
Romania	2	0	0	2	0	0	0	0	0	0
Slovakia	-7	5	-1	5	-1	0	-2	0	0	0
Slovenia	0	0	0	5	0	0	0	0	0	0
Spain	-65	52	-8	4	-10	-1	-14	0	1	0
Sweden	-2	2	-1	3	0	0	-1	0	0	0
United Kingdom	0	20	5	4	-2	0	-2	0	0	0

Percentage change IPPC2 + more LNA vs. IPPC2 2020

	agric 'net' dir income cost [%]	[%]	poultry meat prd [%]	poultry price [%]	mineral fertiliser [%]	excretion [%]	total NH3 loss [%]	total CH4 emisions [%]	total N2O emisions [%]	leaching [%]
EU27	0.0	0.6	-0.1	0.3	-0.3	0.0	-1.5	0.0	0.6	0.1
Austria	0.1	0.1	0.0	0.3	-0.4	0.0	-0.5	0.0	0.3	0.0
Belgium	0.1	0.0	0.2	0.3	0.0	0.1	0.1	0.0	0.1	0.0
Bulgaria	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	-0.4	3.4	-0.6	0.4	-2.4	-0.4	-8.8	-0.2	3.4	0.5
Czech. Rep	-0.7	2.2	-1.7	0.4	-0.3	-0.2	-3.3	0.0	0.9	0.2
Denmark	0.1	0.3	-0.6	0.3	-0.3	0.0	-1.1	0.0	0.2	0.1
Estonia	-0.7	4.1	0.3	0.4	-0.7	-0.3	-4.2	-0.2	1.4	0.0
Finland	0.0	0.1	0.2	0.3	-0.1	0.0	-0.3	0.0	0.2	0.0
France	0.0	0.5	-0.2	0.3	-0.3	0.0	-2.0	0.0	0.7	0.2
Germany	0.2	-0.1	0.3	0.3	0.1	0.1	0.5	0.0	-0.1	-0.1
Greece	0.0	1.3	-0.6	0.3	-0.2	-0.1	-2.3	0.0	0.5	0.2
Hungary	-0.4	1.6	-0.7	0.4	-0.5	-0.1	-4.1	0.0	1.2	0.3
Ireland	-0.2	0.9	-0.5	0.3	-0.2	0.0	-0.7	0.0	0.5	0.0
Italy	0.0	0.6	-0.3	0.3	-0.5	0.0	-1.5	0.0	0.9	0.2
Latvia	-0.2	0.7	-0.4	0.4	-0.2	0.0	-1.2	0.0	0.3	0.0
Lithuania	-0.3	1.4	0.1	0.4	-0.3	-0.2	-2.0	-0.1	0.5	0.1
Malta	0.2	0.0	0.7	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Netherlands	0.1	0.0	0.3	0.3	-0.1	0.1	0.1	0.0	0.1	0.0
Poland	0.1	1.6	0.1	0.4	-0.2	0.1	-0.8	0.0	0.4	0.1
Portugal	-0.2	0.9	-0.5	0.3	-1.5	-0.1	-4.4	0.0	1.8	0.3
Romania	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Slovakia	-1.0	2.4	-0.7	0.4	-1.1	-0.6	-10.6	-0.4	3.0	0.8
Slovenia	0.1	0.6	0.6	0.4	-0.5	0.0	-0.7	0.0	0.5	0.5
Spain	-0.2	3.8	-0.4	0.3	-1.3	-0.1	-4.6	0.0	1.8	0.3
Sweden	-0.1	0.4	-0.9	0.3	-0.3	-0.1	-1.6	0.0	0.9	0.0
United Kingdom	0.0	0.4	0.3	0.3	-0.3	0.0	-1.1	0.0	0.3	0.1

Associated welfare and income effects are given in Table 3.24

Table 3.24: Contributions to the change in conventional economic welfare according to CAPRI simulations for scenario IPPC2 (strong extension of IPPC coverage) with additional LNA compared to IPPC2 without additional LNA in 2020 [million €]

	EU27	EU15	EU12
Total	-259	-205	-54
Consumer money metric	-169	-144	-25
Agricultural income	-90	-61	-30
Premiums	0	0	0
Agricultural Output	124	113	11
Output crops	4	3	0
Output animals	121	110	11
Output rest	0	0	0
Agricultural Input	215	173	41
Crop specific Input	-1	0	0
Animal specific Input	-5	4	-9
Other Input	221	170	51
'Net' direct cost	177	138	40
Profit of dairies	0	0	0
Profit of other processing	-2	-2	-1
Tariff revenues	1	0	1
FEOGA first pillar	-1	-1	0

Finally we will look at the ‘very strong’ extension of IPPC coverage in scenario IPPC3 (Table 3.25).

Table 3.25: Simulation results of a very strong extension of IPPC coverage (IPPC3 2020) vs. IPPC0 in 2020

Absolute change IPPC3 vs. IPPC0 2020

	agric 'net' dir income cost [m €]	[m €]	poultry meat prd [kton]	poultry price [€ / ton]	mineral fertiliser [kton N]	excretion [kton N]	total NH3 loss [kton N]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
EU27	-558	892	-37	13	-56	-63	-85	4	9	-7
Austria	7	7	-1	11	-1	0	0	0	0	0
Belgium	-19	37	-7	12	0	-1	-1	0	0	0
Bulgaria	27	-23	0	4	-1	1	0	1	0	0
Cyprus	-3	2	0	20	0	0	0	0	0	0
Czech. Rep	-25	22	-2	10	-2	-2	-1	1	0	-1
Denmark	-11	21	-4	9	-1	-3	-3	0	0	0
Estonia	-3	3	0	18	0	-1	0	0	0	0
Finland	1	4	0	13	0	0	0	0	0	0
France	-86	138	-1	15	-8	-6	-14	-3	1	0
Germany	-70	150	-7	10	-7	-10	-12	0	1	-1
Greece	-6	8	-2	9	-1	0	-1	0	0	0
Hungary	-45	44	-4	16	-1	-3	-2	0	0	0
Ireland	-38	38	-1	11	-4	0	-2	2	0	0
Italy	-253	198	-2	16	-9	-16	-22	-2	2	-1
Latvia	-1	1	0	94	0	0	0	0	0	0
Lithuania	-5	5	0	28	0	0	0	0	0	0
Malta	0	0	0	17	0	0	0	0	0	0
Netherlands	1	32	-1	10	0	-2	0	0	0	0
Poland	-5	32	-2	11	-2	-1	-3	0	1	0
Portugal	-7	18	-2	12	-1	-2	-2	0	0	0
Romania	43	-28	2	5	-1	2	0	2	0	0
Slovakia	-6	7	0	13	-1	-2	-1	0	0	0
Slovenia	-3	4	0	12	0	0	-1	0	0	0
Spain	-46	106	-11	12	-7	-9	-10	1	2	-1
Sweden	-5	13	0	10	0	-1	-1	0	0	0
United Kingdom	2	53	6	12	-9	-6	-7	4	0	-2

Percentage change IPPC3 vs. IPPC0 2020

	agric 'net' dir income cost [%]	[%]	poultry meat prd [%]	poultry price [%]	mineral fertiliser [%]	excretion [%]	total NH3 loss [%]	total CH4 emisions [%]	total N2O emisions [%]	leaching [%]
EU27	-0.3	4.0	-0.3	1.1	-0.5	-0.6	-2.9	0.0	1.3	-0.6
Austria	0.2	1.0	-0.6	1.0	-0.7	0.1	-0.5	0.1	0.9	-0.2
Belgium	-0.5	11.6	-2.2	1.0	-0.3	-0.4	-1.6	0.0	2.6	-0.3
Bulgaria	1.0	-6.6	0.4	0.3	-0.4	0.6	0.3	0.6	0.1	-0.1
Cyprus	-0.8	11.4	0.0	1.1	-0.4	-1.7	-6.3	-0.5	1.1	-0.9
Czech. Rep	-1.4	7.3	-0.6	1.1	-0.7	-1.4	-3.4	1.1	0.0	-1.7
Denmark	-0.4	4.2	-1.7	1.0	-0.6	-1.0	-4.9	-0.2	2.1	-1.0
Estonia	-1.3	13.3	1.1	1.1	-0.2	-3.0	-4.1	-0.4	-1.3	-2.3
Finland	0.1	0.7	0.1	1.0	-0.3	0.1	-1.3	0.1	0.9	0.0
France	-0.3	3.4	0.0	1.0	-0.4	-0.4	-2.9	-0.1	1.2	0.0
Germany	-0.4	4.1	-0.4	1.0	-0.4	-0.7	-2.5	0.0	1.1	-0.9
Greece	-0.1	4.9	-1.2	1.0	-0.3	-0.1	-2.5	0.1	1.1	0.1
Hungary	-1.2	6.6	-0.7	1.1	-0.1	-1.6	-3.4	-0.5	2.2	-0.9
Ireland	-1.5	5.3	-0.6	1.0	-1.5	-0.1	-2.2	0.4	0.7	-0.7
Italy	-0.7	9.3	-0.3	1.0	-1.2	-1.8	-6.5	-0.3	3.6	-0.9
Latvia	-0.3	4.7	0.4	1.1	-0.5	-0.7	-0.7	0.2	-0.3	-1.3
Lithuania	-0.7	4.1	0.4	1.1	-0.2	-0.7	-1.5	-0.2	0.1	-0.8
Malta	-0.2	6.8	0.3	1.1	0.0	-0.9	-1.3	0.0	0.0	-5.0
Netherlands	0.0	1.5	-0.1	1.0	-0.1	-0.4	-0.4	0.0	-0.4	-0.6
Poland	-0.1	13.6	-0.1	1.1	-0.2	-0.2	-1.2	0.0	1.0	-0.2
Portugal	-0.2	2.2	-0.8	1.0	-0.9	-0.7	-3.1	0.0	1.6	-0.7
Romania	0.8	-1.7	1.0	0.3	-0.3	0.7	0.4	0.5	0.1	0.0
Slovakia	-0.9	4.9	0.4	1.1	-0.5	-3.5	-6.9	-0.3	0.0	-2.3
Slovenia	-0.5	6.5	0.5	1.1	-1.4	-0.4	-3.1	-0.1	1.9	0.0
Spain	-0.1	9.7	-0.6	1.0	-0.9	-0.7	-3.3	0.0	2.6	-0.9
Sweden	-0.4	1.4	0.2	1.0	0.0	-0.5	-2.0	0.1	0.6	-0.3
United Kingdom	0.0	2.2	0.3	1.0	-1.1	-0.6	-3.5	0.3	0.3	-1.3

In the case of the IPPC3 2020 scenario we might also find non-negligible differences between regions. In general we see that even with a very strong extension of IPPC coverage the aggregate income effects are usually very small and sometimes even positive. This does not hold where the positive impact from small increases in meat prices is insufficient to compensate for the increase in costs and loss in meat output and where the animal sector contributes significantly to overall agricultural output. Gains are possible if the increase in farms covered under IPPC is small (FI, UK, evidently in BG + RO, where IPPC coverage is unknown).

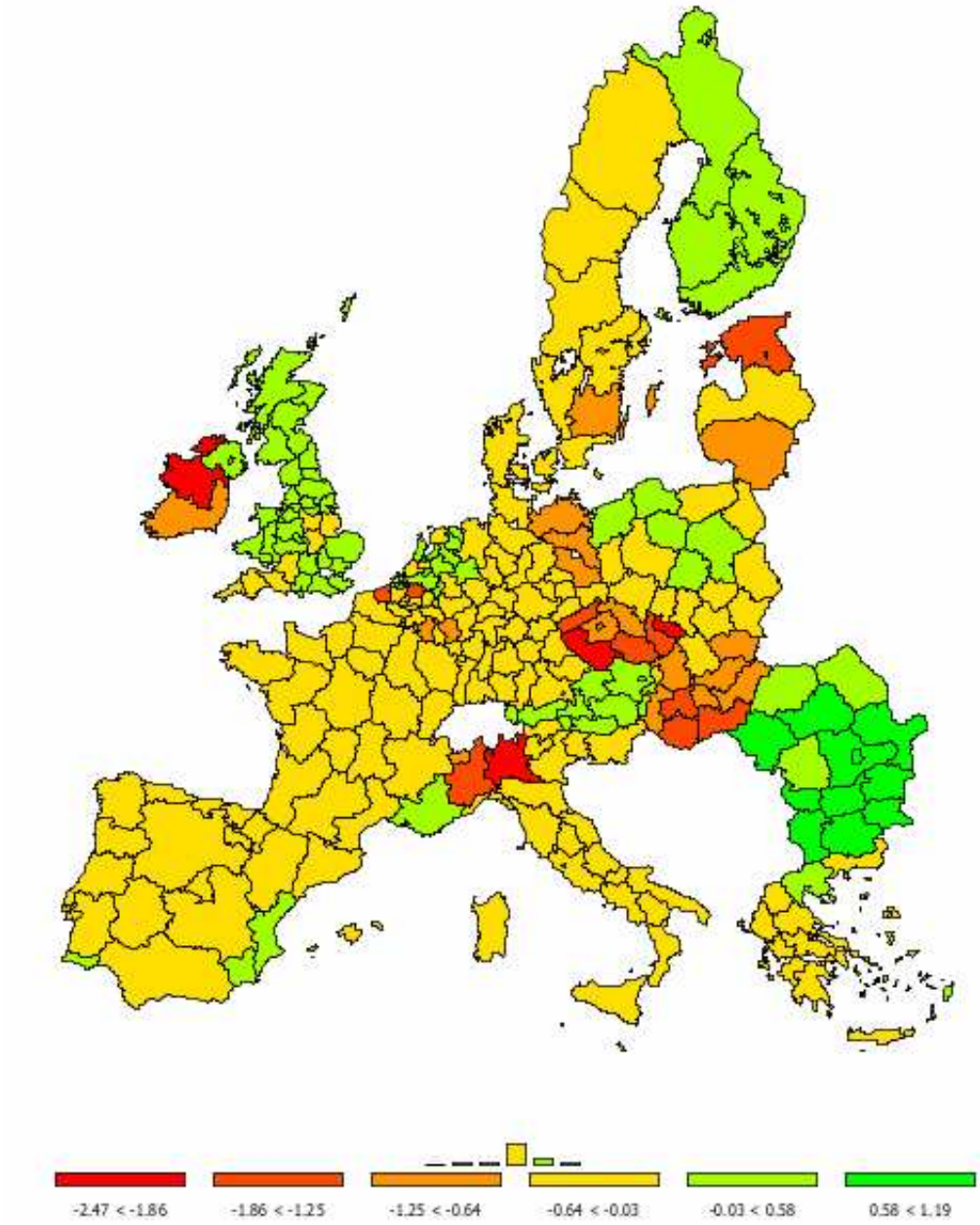

Figure 3.8. Regional variation of percentage income effects for scenario IPPC3 2020 relative to IPPC0 in 2020.

Table 3.26: Contributions to agricultural income according to CAPRI simulations for a very strong extension of IPPC coverage (IPPC3 2020) vs. IPPC0 in 2020

	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]	EAA value [million €]	Unit value EAA [€ / t]	Quantity [1000 t]
European Union 27						
Production value	427108			0.1%		
Cereals	35589	105	339079	-0.4%	-0.4%	0.0%
Other non fodder	157328	252	624671	0.0%	0.0%	0.0%
Fodder	18922	9	2141668	-0.1%	0.0%	-0.1%
Meat	74654	1629	45818	0.4%	0.7%	-0.2%
Other Animal products	59486	273	217671	0.2%	0.2%	0.0%
Other output	81129	164	493456	0.1%	0.2%	-0.1%
Inputs	262230			0.4%		
Fertiliser	39252	819	47912	-0.1%	0.0%	-0.1%
Feedingstuff	71915	47	1543543	-0.7%	-0.6%	-0.1%
Other input	151063	283	532917	1.0%	0.9%	0.1%
European Union 15						
Production value	371005			0.1%		
Cereals	26426	110	239820	-0.4%	-0.3%	0.0%
Other non fodder	140787	263	535176	0.0%	0.0%	0.0%
Fodder	15796	9	1764251	-0.1%	0.1%	-0.1%
Meat	64895	1695	38275	0.4%	0.7%	-0.3%
Other Animal products	51308	278	184390	0.2%	0.2%	0.0%
Other output	71794	174	413408	0.1%	0.2%	-0.2%
Inputs	225505			0.4%		
Fertiliser	31791	850	37390	-0.1%	0.0%	-0.1%
Feedingstuff	62599	47	1324382	-0.7%	-0.6%	-0.1%
Other input	131114	292	449002	1.0%	0.9%	0.1%
European Union 12						
Production value	56102			0.1%		
Cereals	9163	92	99259	-0.4%	-0.4%	0.0%
Other non fodder	16541	185	89496	0.0%	0.0%	0.0%
Fodder	3126	8	377418	-0.1%	0.0%	-0.2%
Meat	9759	1294	7543	0.6%	0.7%	-0.1%
Other Animal products	8178	246	33281	0.2%	0.2%	0.1%
Other output	9335	117	80048	0.1%	0.0%	0.0%
Inputs	36725			0.2%		
Fertiliser	7461	709	10523	0.0%	0.0%	-0.1%
Feedingstuff	9316	43	219161	-0.9%	-0.9%	0.0%
Other input	19948	238	83915	0.8%	0.6%	0.2%

Finally we add the welfare effects of the very strong extension of IPPC coverage (Tables 3.27. The price increases reduce consumer welfare and pass on a significant part of the net direct cost for NH_3 emission abatement measures on IPPC farms to consumers such that agriculture is less affected. Impacts on the processing industry and on the budget are negligible. The change in our conventional welfare measure is negative (- 1425 m €), indicating that reduced emissions of NH_3 are costly.

Table 3.27: Contributions to the change in conventional economic welfare according to CAPRI simulations for a very strong extension of IPPC coverage (IPPC3 2020) vs. ND Full 2020 [million €]

	EU27	EU15	EU12
Total	-1425	-1293	-132
Consumer money metric	-686	-599	-87
Agricultural income	-558	-532	-27
Premiums	-2	-2	1
Agricultural Output	374	327	47
Output crops	-136	-102	-34
Output animals	509	429	80
Output rest	0	0	0
Agricultural Input	930	856	74
Crop specific Input	-21	-18	-3
Animal specific Input	-485	-406	-80
Other Input	1437	1280	157
'Net' direct cost	892	822	70
Profit of dairies	4	3	0
Profit of other processing	-178	-161	-17
Tariff revenues	4	4	0
FEOGA first pillar	9	9	1

The key results from the CAPRI simulations are collected again in Table 3.28 including also a sensitivity analysis on additional LNA measured starting from scenario IPPC3

Table 3.28: Simulation results of increase coverage of farms by IPPC measures, all relative to the current IPPC0 scenario

	agric income [m €]	consumer welfare [m €]	total econ welfare [m €]	total NH3 loss [kton]	total CH4 emisions [kton N]	total N2O emisions [kton N]	leaching [kton N]
IPPC1	-240	-236	-532	-47	5	7	-3
IPPC2	-392	-471	-980	-63	5	8	-5
IPPC2 + more LNA	-482	-640	-1239	-107	5	12	-3
IPPC3	-558	-686	-1425	-85	4	9	-7
IPPC3 + more LNA	-655	-877	-1712	-138	4	304	-5
				abatement relative to welfare cost estimate			
				NH3 [g / €]	CH4 [g / €]	N2O [g / €]	leaching [g / €]
IPPC1				88	-10	-13	5
IPPC2				65	-6	-8	5
IPPC2 + more LNA				86	-4	-10	3
IPPC3				60	-3	-6	5
IPPC3 + more LNA				81	-2	-177	3

It is evident that additional IPPC coverage will achieve significant improvements on ammonia emissions at moderate cost whereas progress on leaching would be minimal.

It is noteworthy that LNA coverage would clearly increase the effectiveness of ammonia abatement in terms of total emission avoided and also in terms of efficiency (higher yiled in abatement per € of welfare loss). Again it has to be noted that a great part of the economic loss is born by consumers. Price increases of 1% for meats under IPPC3 may

appear negligible but they sum up to significant economic cost. It has to be acknowledged that these price increases are part of the uncertainties. Among other influences they hinge on the unknown degree of consumer preferences for EU produced meat which determine the amount of pass through of additional cost in the livestock sector. With greater substitutability the economic losses would fall more on agriculture than on consumers.

Deciding on the optimal level involves some comparisons of inputs and outputs. A welfare theoretic perspective suggests to compare the ratio of avoided NH_3 emissions to the cost of NH_3 emission abatement measures in terms of conventional welfare loss. Under this criterion it is clearly recommendable to promote the application of LNA measures. The stronger extensions of IPPC coverage without LNA measures appears to be less favourable, but the differences are quite small. Considering that there are many uncertainties in a model based analysis like this one is it fair to state that all levels of IPPC extension have similar yields in terms of ammonia abatement. The decision needs to be made on other grounds therefore, for example on the required total abatement while minimising interference with the private sector.

3.3 Discussion

Task 4 consisted of a wide variety of activities, with a focus on the collection of data needed for the assessment of lowering the IPPC threshold for intensive animal rearing, and the inclusion of thresholds for cattle husbandry.

Statistical data

Statistical data were obtained from EUROSTAT and used throughout the study to assure a uniform basis for the calculations. However, during the study the MS were invited to submit MS specific information. This showed that there are differences between EUROSTAT and MS data on farm size distribution, the number of IPPC farms and the number of permits issued. For future work, a more solid and consolidated basis for statistical information must be found to make the outcome of these type of studies recognizable for MS representatives. Statistical agencies within the MS should, therefore, have to work more closely together with more general agencies like EUROSTAT. Especially on the number of IPPC farms and permits, MS information is supposed to be more reliable than data from other, more general sources.

Information on environmental legislation

Information on the environmental legislation per MS was gathered to the extent possible. Especially in the perspective of penetration of Best Available Techniques there appeared to be a gap between the advisors' perception and the perception of the MS representatives. Their information was used to improve the table with inputs on % of penetration of BAT. Nevertheless, a more detailed inventory of the BAT penetration in the coming years, based upon current and developing legislation, is advised to improve the validity of projections.

Best Available Techniques

Key elements of the Best Available Techniques are:

- Low Nitrogen Feeding (LNF)
- Covering of Storages (CS)

- Stable Adaptation (SA)
- Low Nitrogen Application (LNA)

The allocation of each technique or combination of techniques per MS, animal species, and scenario was done in close collaboration with IIASA. Information provided by the MS representatives was incorporated to the extent possible.
Implementation of Low Nitrogen Feed was intensively debated during the project. Since it is an important element of the BAT-Reference Document (BREF) and therefore a measure in the IPPC-permits, LNF was integrated in most of the MS list of BAT. No or a reduced % of penetration of LNF was assumed for those MS (e.g. BE, NL) where reduced crude protein contents are already used as part of good agricultural practice. In all other MS, the % of penetration in future scenarios is assumed to be equal to the % of penetration of other BAT (except LNA).

Although LNA is also an element of BREF, implementation of low emission application techniques in practice is only found in a small number of MS (e.g. NL, DE, BE, DK), especially those MS with 'older' environmental legislation. Although it being a relatively cost-effective measure, practical farmers are often reluctant to use LNA techniques for a variety of reasons. Therefore, we have constructed IPPC scenarios with and without LNA, where the % of penetration of LNA in scenarios with LNA is assumed to be equal to the % of penetration of other BAT (unless other data were provided by the MS).

Where CS and SA are BAT that are relatively easy to control in IPPC permits, since they are clearly related to the farm as 'installation', LNA is usually operated on locations (e.g. fields) away from the farm. So, in theory, authorities may find it difficult to perform controlling activities in the framework of the IPPC permits when it comes to the use of LNA technologies. However, in a number of MS, LNA is already legally embedded (e.g. in NL, DE, DK, BE) and controlled in the respective legal frameworks. This could be taken as an example in other MS too, and LNA could become an element of IPPC permits in all EU MS. Alternatively, LNA is closely related to measures in the framework of the Nitrates Directive (ND), since in the ND the timing and amounts of animal manure applied to the field is regulated. When including LNA (also) in the ND, also the way manure is applied to the land should be defined and legally embedded (and controlled)

Ammonia emissions and swapping issues
Revised IPPC thresholds for intensive animal rearing and new thresholds for cattle were chosen on the basis of criteria concerning maximum permitting efficiency and restricted increase in number of permits. The scenarios chosen appeared to have little impact on the reduction of NH_3 emission, whereas also the adverse effects (trade off of pollution) on other emissions were limited. This was mostly because the scenarios also included measures to reduce all N losses to the environment, such as balanced fertilization, full implementation of the Nitrates Directive and low nitrogen feeding. Key issue appeared the inclusion of LNA. This measure is now not legally regarded as an element of the IPPC permit in many MS, although it is a part of the BAT-Reference Document under the IPPC Directive. A maximum reduction of the NH_3 emission with 110 kton in 2020 can be achieved when lowering the thresholds for intensive animal rearing and thresholds for cattle husbandry include provision on the LNA of animal manure. It is, therefore, advised to consider strengthening of the EU legislation concerning low nitrogen application, either in the framework of the IPPC Directive, or under any other Directive (e.g. Nitrates

Directive). Except from low nitrogen animal feeding, low nitrogen manure application is the most cost-effective way to abate NH_3 emissions.

Permits and permitting

The number of IPPC farms based upon EUROSTAT data compared to latest the MS information provided in the framework of ENTEC data (autumn 2006) differs. For the pig sector, EUROSTAT data show a significant higher number of IPPC farms, whereas for the poultry sector a good accordance is shown. A part of the difference may be explained by the background of the statistical data, where MS information sources may differ from EUROSTAT sources. Also, the definition of 'an IPPC installation' may be differently interpreted. For example, farms may comprise installations on more than one location, being counted as an IPPC farm when the sum of animals is greater than the IPPC thresholds, or being not counted as IPPC farm when on each location less animals are being kept than the IPPC threshold. This may require re-definition of the term 'IPPC farm' or 'IPPC installation', and improvement of the criteria issued to the MS and statistical bodies.

During the project, MS provided information about the number of IPPC permits issues, and the state of the art in permitting (new permits, pre-IPPC permits, outstanding permits). This clearly illustrates that the permitting process is still ongoing in most MS, and – consequently – better information will become available in the next years. The improved information may support the assumptions in this study that by 2020 BAT will be implemented to a large extent in many MS, and that the emissions calculated will be close to reality.

It is obvious that the current level of permitting is the most effective, both in absolute and in relative terms: big farms contribute more to pollution that smaller farms. Consequently, absolute and relative effectiveness of permits when lowering the IPPC thresholds will decrease. A more stringent control to the current situation of permitting, and adding LNA to the IPPC permits will, therefore, be more effective than lowering thresholds.

Economic aspects

There are many uncertainties surrounding our modelling analysis, for example:

Simplifications:

- Profit maximising farmers seem to contradict observed inefficiency
- Ignorance of heterogeneity of farmers, consumers, locations (within NUTS2)
- Limited choice space for farmers: no endogenous technology choice,
- Lack of detail in policy representation: IPPC treated as a certain percentage of NUTS2 without local relevance

Data and parameter uncertainty:

- Initial CAPRI nitrogen surplus in crop sector and in feeding depends on statistical data with gaps and errors
- Different conceivable data sources (e.g. animal stocks vs. animal production)
- Uncertain parameters: elasticities, emission factors, expert coefficients (grass yields and losses, average nutrient availability from manure, leaching fractions, crop residues)

Uncertainty on future developments
- Future of milk quotas (maintained in simulations), future WTO agreement
- Boom in energy crops
- Farm structure and penetration rates ammonia measures
- Catching up in New MS, accession of more countries (Western Balkan, Turkey?)
- Future macro development (GDP, inflation, exchange rates)

Implementation uncertainty
- Will the measures be sufficiently monitored if they are not in the farmers interest?
- Will farmers counteract in unforeseen ways?
- Will Member State implement the measures as planned on EU level?

3.4 Conclusions

Within the framework of a service contract on integrated measures, an analysis was performed of the impact of lowered thresholds for intensive rearing of pigs and poultry, and of thresholds for cattle production. The analysis focussed on the impact on ammonia emissions, number of farms covered, effectiveness of permitting, and trade offs in terms of nitrate leaching, nitrous oxide emissions and methane emissions. Also, the social and economic impact of the newly defined thresholds were assessed. Results were calculated for 2020 and compared with the scenario with full implementation of the current IPPC Directive.

Nitrogen excretion per animal was used as a basis to define the new thresholds.

The number of farms (and permits) covered by the various scenarios range from 16,000 under the current IPPC to nearly 42,000 under the lowest thresholds selected. The latter figure comprises approximately 15,000 pig farms, 13,000 poultry farms, and 13,500 cattle farms.

The impact of lowered IPPC thresholds in 2020 ranges from 30-49 kton, compared to the current IPPC in 2020 when Covered Storage, Low Nitrogen Feed and Stable Adaptation are fully implemented. The additional impact of including Low Nitrogen Application is 44-60 kton.

The effectiveness of permits is strongly reduced when IPPC thresholds are lowered. Cumulative efficiency, expressed in kg NH_3 saved per permit, is reduced from 3,100 to 1,900 for IPPC1 and IPPC3, respectively. This is markedly higher for the LNA scenarios (7,800 and 4,300 kg, respectively). The additional efficiency (extra NH_3 saved per extra permit issued) is around 1,400 kg and 2,200 kg for without and with LNA, respectively.

The trade off of losses from lowered IPPC thresholds for nitrate leaching and methane emissions are low to negligible. The scenarios where LNA is considered results, however, in a not insignificant increase (3.3% maximum) in the emission of the greenhouse gas nitrous oxide. Obviously, the ND related compensatory measures, like balanced fertilization, are insufficient to abate the extra NH_3 applied to land and crops by LNA.

In the first enforcement scenario ‘IPPC1’, i.e. with a moderately increased IPPC coverage, EU27 production of poultry meat declines by 0.2% (Table 3.15). As a

consequence there will be some increase in producer prices which is 0.5% at the EU level. These market effects also affect pork but are only about half as strong as on the poultry market. They help to limit the aggregate loss to agriculture to 240 m €. The aggregate loss hides reallocations within agriculture. Whereas the additional cost is born by IPPC farms only, the counteracting price increase benefits all farms. The price increases reduce consumer welfare. A part of the additional 'net direct cost' for NH_3 emission abatement measures on IPPC farms (334 m €) is thus passed on to consumers (aggregate loss: 236 m €) such that agriculture is less affected (-240 m €).

Scenario IPPC2 results on the EU27 level in an agricultural income loss of 564 m €. More importantly it confirms that the contribution of LNF in the CAPRI simulations of IPPC scenarios is significant and partly explains the stronger impacts obtained compared to MITERRA-EUROPE. Note that the agricultural income loss due to LNF on IPPC2 farms is larger than the additional loss when moving from the IPPC1 extension to IPPC2. Expressed differently the gain in income would have been higher if LNF were abolished on all IPPC2 farms rather than eliminating both ammonia measures and LNF on the additional farms coming under IPPC at this state of extension

For scenario IPPC3, the price increases reduce consumer welfare and pass on a significant part of the net direct cost for NH_3 emission abatement measures on IPPC farms to consumers such that agriculture is less affected. Impacts on the processing industry and on the budget are negligible. The change in our conventional welfare measure is negative (- 1425 m €), indicating that reducing emissions of NH_3 are costly

A substantial reduction of the NH_3 emission in 2020 due to a more stringent IPPC Directive can only be realized when many more farms will fall under the Directive. The maximum reduction from this study is 110 kton. Quite some efforts and costs are needed in terms of numbers of permits, administrative costs for this extra permitting, and implementation of emission reducing technologies to achieve the reduction. When the outcome of the calculations for 2000 and 2020 are compared, more effect is seen from a more strict application of the current IPPC Directive (including low nitrogen application and low nitrogen feeding) than from lowering thresholds. Especially when considering the difference between European and MS related interpretation of the IPPC Directive, more effort is needed to improve compliance on MS level with the IPPC Directive as it is.

Table I.1. Summary of fattening pig holdings per size class (2003 data from EUROSTAT), existing IPPC installations, and permitting situation per MS (nd = no data provided) and for EU-25.

MS	Total number of pig farms	Farm size class				MS information on Existing IPPC Installations (>2,000 pigs)	Permitting situation (MS info)		
		<400	400-1000	1000-2000	>2000		New Permits	Pre-IPPC permits	Outstanding permits
BE	8230	4250	2790	1050	140	237	0	224	13
CZ	16860	16030	420	230	180	108	56	0	52
DK	10900	5270	3110	1760	760	nd	nd	nd	nd
DE	95650	81920	10240	2890	600	405	57	251	116
EE	5300	5220	40	20	20	35	3	0	32
GR	29230	29000	120	60	50	12	0	1	1
ES	111670	103720	3990	2540	1420	1330	112	0	0
FR	49440	41470	5880	1740	350	242	89	13	229
IE	1100	720	140	120	120	89	0	89	0
IT	122630	119950	1100	740	840	nd	nd	Nd	nd
CY	860	760	20	40	40	42	nd	Nd	nd
LV	41490	41450	20	10	10	20	15	1	0
LT	148130	148040	40	20	30	30	0	21	9
LU	200	170	20	10	0	0	0	0	0
HU	425280	424810	160	90	220	240	3	167	70
MT	150	110	30	10	0	1	0	0	0
NL	10520	6220	2750	1150	400	516	397	0	119
AT	59830	58890	900	40	0	3	nd	nd	nd
PL	603790	602400	1030	210	150	134	72	0	0
PT	87470	86930	270	160	110	59	4	0	55
SI	38430	38400	20	0	10	8	0	0	8
SK	44410	44010	200	110	90	nd	nd	nd	Nd
FI	3480	2930	440	100	10	34	2	9	0
SE	3310	2410	560	260	80	105	27	33	45
UK	8940	7000	970	600	370	449	8	0	0
EU25	**1927260**	**2E+06**	**35260**	**13920**	**6040**	**4099**	**845**	**809**	**737**

Around 70% of the IPPC farms for fattening pigs have been identified as ‘existing installations’ based upon the MS information. However, some MS still have to provide data. Around 850 new permits have been issued, whereas same numbers are pre-IPPC and outstanding.

Table I.2. Summary of sow holdings per size class (2003 data from EUROSTAT), existing IPPC installations, and permitting situation per MS (nd = no data provided) and for EU-25.

MS	Total number of sow farms	Farm size class				Existing Installations (>750 sows)	Permitting situations (MS Info)		
		<100	100-200	200-750	>750		New Permits	Pre-IPPC permits	Outstanding permits
BE	5670	2980	1910	760	20	21	0	21	0
CZ	4700	3970	280	340	110	65	30	0	35
DK	6070	2550	980	2230	310	Nd	nd	nd	nd
DE	38970	31220	5180	2350	220	197	33	114	53
EE	870	810	30	30	0	0	0	0	0
GR	12420	12170	150	80	20	0	0	0	0
ES	44800	38310	2550	3230	710	229	51	0	0
FR	15860	10680	3450	1640	90	16	0	0	16
IE	610	290	90	190	40	0	0	0	0
IT	14580	13300	390	700	190	Nd	nd	nd	nd
CY	340	240	10	70	20	1	nd	nd	nd
LV	6670	6640	10	10	10	3	1	0	0
LT	20140	20070	20	20	30	0	0	0	0
LU	140	110	20	10	0	0	0	0	0
HU	66710	66350	90	170	100	47	2	35	10
MT	130	120	10	0	0	0	0	0	0
NL	4550	1060	1300	2020	170	198	150	0	48
AT	13030	12620	370	40	0	1	Nd	nd	nd
PL	452260	451500	470	240	50	49	36	0	0
PT	32550	31940	270	310	30	13	3	0	10
SI	8460	8440	10	0	10	2	0	0	2
SK	7560	7240	140	150	30	Nd	nd	nd	nd
FI	2670	2270	300	80	20	23	0	0	0
SE	2470	1950	290	190	40	17	5	7	5
UK	6830	5520	430	720	160	429	7	0	0
EU25	**769070**	**732360**	**18750**	**15600**	**2360**	**1311**	**318**	**177**	**179**

Around 55% of the IPPC sow farms have been identified as ‘existing installations’, based upon MS information. However, some MS still have to provide information. Pre-IPPC permits and outstanding permits have been identified in more or less equal numbers.

Table I.3. Summary of total number and number of IPPC farms with laying hens and broilers (2003 data from EUROSTAT), existing IPPC installations, and permitting situation per MS (nd = no data provided) and for EU-25.

MS	Farms with laying hens total	Broiler farms total	IPPC farms (<40,000 birds)			Existing Installations	Permitting situation (MS Info)		
			With laying hens	With broilers	Total poultry		New Permits	Pre-IPPC permits	Outstanding permits
BE	5020	1230	100	120	220	334	0	314	20
CZ	21950	800	60	110	170	169	10	0	159
DK	3810	340	30	120	150	540	352	92	96
DE	88340	11580	280	380	660	822	49	649	139
EE	15070	380	10	0	10	2	0	0	2
GR	323620	2E+05	30	120	150	35	0	0	35
ES	184710	70190	310	610	920	573	96	0	3
FR	162690	91100	480	720	1200	2150	608	55	2095
IE	7480	1040	10	90	100	173	0	3	170
IT	128680	90310	240	750	990	nd	nd	nd	Nd
CY	8740	4040	10	20	30	39	nd	nd	Nd
LV	66200	430	10	0	10	8	7	1	0
LT	185850	37330	10	10	20	21	0	15	6
LU	660	80	0	0	0	0	0	0	0
HU	410200	760	40	70	110	229	8	146	75
MT	920	220	0	0	0	3	0	0	0
NL	1680	780	270	410	680	727	400	0	327
AT	64630	3260	10	30	40	7	nd	nd	nd
PL	997390	5E+05	220	660	880	445	226	0	0
PT	204760	1E+05	60	70	130	72	8	0	64
SI	47890	4890	0	0	0	16	0	0	16
SK	46440	1180	30	50	80	nd	nd	nd	Nd
FI	1890	160	10	70	80	114	27	22	65
SE	5530	240	30	60	90	136	73	20	43
UK	33420	2050	200	720	920	586	20	0	0
EU25	**3017570**	**1E+06**	**2450**	**5180**	**7640**	**7201**	**1884**	**1317**	**3315**

The total number of existing IPPC installations match well with the IPPC poultry farms based upon EUROSTAT data (2003). Most of the permits are outstanding. Around 25% of the existing installations have received new permits. The remainder is either pre-IPPC permits or outstanding permits.

Table I.4. Summary of total number of fattening pigs, sows, laying hens and broilers kept on IPPC farms per MS and for EU-25 (2003 data from EUROSTAT).

MS	Fattening pigs on IPPC farms with pigs		Sows on IPPC sow farms		Laying hens on IPPC hen farms		Broilers on IPPC broiler farms	
	* 1,000 pigs	In % of total number of fattening pigs	* 1,000 sows	In % of total number of sows	* 1,000 hens	In % of total number of hens	* 1,000 broilers	In % of total number of broilers
BE	451	6.9	22	3.4	6530	50.0	8290	45.6
CZ	1137	32.4	179	45.6	9320	88.8	15640	85.8
DK	2382	18.4	344	24.5	2130	43.5	10870	89.0
DE	2479	9.3	359	13.7	37050	66.5	41020	72.7
EE	111	31.0	0	0.0	860	69.9	0	0.0
GR	177	16.3	17	12.5	2420	21.3	11780	45.9
ES	5017	23.7	1311	40.5	42480	71.4	50010	47.9
FR	1045	6.9	94	6.9	43560	59.0	48770	35.2
IE	725	42.3	88	50.9	630	29.9	6470	69.9
IT	3724	43.4	290	39.4	26270	74.2	89930	83.6
CY	162	37.4	28	48.0	250	32.9	2650	73.4
LV	77	18.5	17	35.8	1670	65.5	0	0.0
LT	217	20.0	46	50.1	2170	54.0	1660	66.4
LU	0	0.0	0	0.0	0	0.0	0	0.0
HU	1504	32.7	156	42.7	4840	33.7	9540	72.0
MT	0	0.0	0	0.0	0	0.0	0	0.0
NL	1310	11.7	200	17.8	22750	61.6	33980	80.3
AT	0	0.0	0	0.0	740	12.2	1760	31.5
PL	811	4.4	102	5.3	21250	41.1	78670	63.8
PT	415	19.6	31	10.1	7940	68.9	8110	42.1
SI	89	14.6	23	34.7	0	0.0	0	0.0
SK	413	28.3	48	32.0	3730	80.9	7260	88.6
FI	23	1.7	17	9.7	540	12.6	4000	66.1
SE	238	12.5	53	26.1	2480	41.3	5520	93.4
UK	1295	25.7	177	30.8	30000	62.1	103420	91.2
EU25	**23803**	**15.9**	**3602**	**22.3**	**269610**	**58.5**	**539350**	**64.3**

These data show that around 60% of the total number of poultry in the EU-25 is covered by the current IPPC thresholds, whereas this is 22% for sows and 16% for fattening pigs. There are large variations between the MS.