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Study on the stunning/killing practices in slaughterhouses and their economic, social and environmental consequences

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Final Report
Part I: Red Meat

Submitted by:

Food Chain Evaluation Consortium (FCEC)

Civic Consulting - Agra CEAS Consulting -

Bureau van Dijk - Arcadia International

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Acronyms

AWO: Animal Welfare Officer

BSE: Bovine Spongiform Encephalopathy

CAP: Common Agricultural Policy

CSF: Classical Swine Fever

Defra: Department for Environment, Food, and Rural Affairs (UK)

DFD: Dark, Firm and Dry

DG: Directorate General

EFSA: European Food Safety Authority

FAO: Food & Agriculture Organisation

FCEC: Food Chain Evaluation Consortium

FMD: Food and Mouth Disease

HSA: Humane Slaughter Association

HACCP: Hazard Analysis and Critical Control Point

MFN: Most Favoured Nation

MS: Member State/s

OABA: Œuvre d'Assistance aux Bêtes d'Abattoirs

OIE: Organisation Mondiale de la Santé Animale – World Animal Health Organisation

PSE: Pale, Soft and Exudative

RSPCA: Royal Society for the Prevention of Cruelty to Animals

SFP: Single Farm Payment

TRQ: Tariff Rate Quotas

UECBV: European Livestock And Meat Trading Union

URAA: GATT Uruguay Round Agreement on Agriculture

WTO: World Trade Organisation

Executive Summary

The European Commission is in the process of revising Directive 93/119/EC, which covers slaughter practices. DG SANCO commissioned this study to present a socio-economic overview of the situation of the meat sector in the EU with regards to the protection of animals at the time of slaughter. The overall study was conducted by Civic Consulting (lead) and Agra CEAS Consulting of the Food Chain Evaluation Consortium, with support from Bureau van Dijk. Part I of the report (red meat) was prepared by Civic Consulting. Results of the study include:

- The EU cattle and sheep sectors are relatively uncompetitive and are likely to be sensitive to increases in production cost. The pig sector is considered to be much more competitive. The main cost areas of concern to the industry are feed costs, costs of compliance with legislation and the cost of labour. The cost of stunning and killing is not seen as being significant in this context.

- The main stunning method used in the EU to slaughter *cattle* is the penetrating captive bolt. *Sheep* are predominantly slaughtered with an electrical current on the head and to a smaller extent with captive bolt. Stunning and killing in the *pig* sector has seen the largest changes in recent years; though gas stunning is increasingly introduced, electrical stunning of pigs continues to be quite common. Slaughter without prior stunning is quite prevalent for sheep and to a lesser extent cattle; this practice is reportedly on the rise in several EU MS.

- Better animal welfare reduces physical injuries to animals and prevents the internal release of stress hormones in the animal which have a damaging impact on meat quality. Physical injuries and meat quality problems related to stress may have two effects on slaughterhouse revenue: (1) poor meat quality can reduce the classification level of the meat and consequently the wholesale value of the meat; and (2) physical injuries must often be trimmed away, possibly resulting in lower meat yields. Better animal welfare will also cause the animals to behave more calmly, thereby improving the occupational safety of employees. No direct impact was identified on the environment related to differing stunning and bleeding techniques.

- Drivers for considering animal welfare in designing slaughter equipment include national requirements, which strongly differ between MS, animal welfare standards of some retailers and a recognised relationship between animal welfare and meat quality. In consideration of the investment constraints of slaughterhouses, it is best when animal welfare decisions are taken into account before new slaughterhouses are constructed or modernised but it is according to stakeholders often the case that animal welfare considerations are not involved until after a slaughterhouse has been built or modernised.

- There are a variety of practices and requirements existing in Member States that aim at ensuring that slaughterhouse employees dealing with live animals are trained regarding animal welfare. Although nearly all responding slaughterhouse operators answered that their employees were systematically trained with respect to animal welfare, some factors were identified that may contribute to an inadequate training of employees, such as employee turnover and language problems. There is evidence that improving animal handling could result in significant economic gains at the slaughterhouse level, due to increased revenue from higher-quality meat. Economic gains could be enough to compensate costs associated with training of employees handling animals. This is largely the view of slaughterhouse operators, with a minority indicating that there was even a positive impact of training on production costs.

- There is a strong consensus by slaughterhouses, competent authorities and animal welfare organisations that the implementation of a quality assurance scheme with an emphasis on animal

welfare and the presence of an animal welfare officer employed by the slaughterhouse are the two most beneficial operational procedures in terms of animal welfare. The costs of the measures seem to be more than compensated by potential benefits, as a large majority of slaughterhouses that have implemented the measures see an increase of competitiveness of their operations.

- Any voluntary change in the stunning method is unlikely to have any appreciable impact on the final consumer price for red meat. This would not necessarily be the case if change were mandated as some plants may not be suitable for conversion to e.g. gas stunning in the case of pig slaughter, or may not be of a sufficient scale to make the investment viable.

1. Introduction

Aim of the study

The European Commission has been developing animal welfare legislation for over 30 years. The first Council Directive with respect to slaughtering practices for meat production was Directive 74/577/EC on the stunning of animals before slaughter, which was replaced in 1993 with Council Directive 93/119/EEC with a broader scope, both in terms of species concerned and slaughter circumstances.[1] This legislation stipulates that the killing of domestic animals for human consumption will be performed so as to avoid any unnecessary suffering of the animals during slaughtering practices through the use of proper approved methods to stun and kill animals, based on scientific knowledge and practical experience. Since 1993, the industry has changed along with methods for stunning and killing; likewise, new scientific evidence has emerged regarding such methods. In this context, the European Food Safety Authority issued in 2004 an opinion and report on the welfare aspects of the main systems of stunning and killing the main commercial species of animals and in 2005, the World Organisation for Animal Health (OIE) adopted guidelines for the slaughter of animals for human consumption. In the light of the scientific data and technical developments the European Commission is in the process of revising Directive 93/119/EC.

For this purpose DG SANCO has commissioned this study to present an overview of the situation of the meat sector in the EU with regards to the protection of animals at the time of slaughter, taking into account the main socio-economic consequences of the current practices. The overall study was conducted by Civic Consulting (lead) and Agra CEAS Consulting of the Food Chain Evaluation Consortium, with support from Bureau van Dijk. Part I of the report (red meat) was prepared by Civic Consulting.

Acknowledgements

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[1] DG SANCO (2007). *Animal welfare at the time of slaughter and killing*. Available at: http://ec.europa.eu/food/animal/welfare/slaughter/index_en.htm

2. The EU red meat sector

2.1. Presentation of the red meat sector within the EU

2.1.1. Red meat production

The EU has a large and significant red meat industry, making it one of the world's largest exporters of livestock agricultural products. Livestock production makes up approximately one quarter of the total value of agricultural production within the EU.[2] The industry is characterised by a complex network of farmers, farmer cooperatives, slaughterhouses, processing and rendering plants, and retailers involved in distribution and marketing. The relationships and degree of integration of the red meat chain vary significantly between MS as well as the degree of specialisation and dependency on such products.

The red meat industry has faced many significant challenges in recent years. The EU and specifically several highly productive MS (e.g., UK, NL) suffered several animal disease outbreaks (e.g., CSF in 1997 - 1998 and FMD in 2001), which depressed both production and consumption of pig meat, beef and sheep. Further liberalisation of trade and economic development worldwide has increased competitive pressure for EU red meat products (see section 2.2). Consequently, this sector has not been very dynamic; from 1996 to 2005 growth in EU red meat gross internal production[3] has only averaged 1.8% every year though there has been regional variations in growth (see Table 11 in Annex 1).

The cattle and sheep sectors are both net importers and not self-sufficient and neither industry is expected to improve their situation in the near future. In contrast, the EU's pig meat sector continues to be a self-sufficient and strong sector (see Table 1).

Table 1: Degree of self-sufficiency of EU red meat production (2005)

	Cattle	Pigs	Sheep and goats
Gross indigenous production (1000 t carcass weight)	7,910	21,101	1,058
Total exports of live animals (1000 t carcass weight)	131.3	30.7	2.5
Total imports of live animals (1000 t carcass weight)	43.2	0.05	9.7
Net production (1000 t carcass weight)	7,844	21,099	1,051
Total exports (1000 t carcass weight)	352.9	1,468	6.9
Total imports (1000 t carcass weight)	564.6	14	283.5
Total domestic uses (1000 t carcass weight)	8,143	19,647	1,328
Degree of self-sufficiency	96.3%	107.6%	79.1%

Note: self-sufficiency is defined as a ratio of gross indigenous production to total domestic uses. "Total domestic uses" is defined as parts of the animal used for the following purposes: seeds (or eggs for hatching), losses, animal feed, industrial uses, processing, human consumption.
Source: DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006.*

[2] DG Agriculture. *The 2006 Agriculture Year: Economic Data*. Table 3.1.1.

[3] Red meat is defined here as beef/veal, pig meat, sheep meat, and goat meat as it falls in the scope of our study.

In contrast to the relatively stable meat production, prices in the meat market are rather volatile (see Figure 2 in Annex 1).

Pig meat production dominates the EU meat sector representing 50% of total meat produced in terms of weight (see Figure 3 in Annex 1). The EU-25 produces approximately 21% of the total global production of pig meat; this ranks second in the world behind China producing nearly 49% of global production and ranks ahead of third ranked USA with 9% of global production.[4] This sector, similar to the total meat sector, has not grown in net pig meat production[5] in the period between 1999 and 2005 within the EU-15. The 10 new MS with the enlargement of the EU added an additional 3.3 million tonnes to the EU pig meat industry in 2004 (15% of the total production capacity within the EU-25).[6] The main MS producing pig meat are Germany (19.4% of total EU production), Spain (14.7%), France (10.3%), Poland (8.9%) and Denmark (8.3%).[7] Production has been fairly steady for all MS in recent years with a few notable exceptions. The UK and NL have both seen steadily decreasing productivity since 1999 with an approximate 33% and 24% decline in production between 1999 and 2005, respectively. This decline has been partially compensated for by increased productive capacity in Spain, Germany, and Denmark.

EU beef meat production accounts for about 19% of total gross EU production of meat (see Figure 3 in Annex 1). The EU25 produces 13.3% of the total global production of beef/veal meat, ranking second in global output. First ranked USA produces about 19% of the global output and third ranked Brazil produces 12.9% of global output.[8] Cattle production within the EU-15 has decreased 5.4% since 1999 until 2005. With the addition of the new MS in 2004, 554 thousand tonnes of carcass weight was added to EU cattle production (nearly 7% of total EU cattle production in that year).[9] The main producers within the EU (and their share of EU total production) are France (29.7%), Germany (10.2%), and Italy (11.6%).[10] This industry has been relatively volatile due to epidemic disease outbreaks, markedly the FMD outbreak in 2001 in the UK, Ireland, Netherlands, and France. Not surprisingly, these four countries suffered the most significant decreases in production in 2001. Germany, however, recorded an increase in production in the same year.

Sheep meat production comprises just 3% of the total gross internal production of meat in the EU-25 (see Figure 3 in Annex 1). The sheep and goat meat industry is a net importer, importing 277.5 thousand tonnes of sheep and goat meat in 2005 and exporting only 6.9 thousand tonnes.[11] Gross internal sheep production has decreased 8.7% since 1999 until 2004 within the EU-15. However, this is due primarily to an 11.5% sudden drop in production in 2001 when the FMD crisis affected production of sheep meat. This decline was felt most prominently in the UK, when production of sheep and goat meat in 2001 dropped to just 68% of levels from the year before; production in the UK has not yet recovered to levels before the crisis. Since the FMD crisis has been controlled, sheep production has stagnated in the EU15 between 2002 and 2004. The major sheep and goat meat producing MS in the EU are Spain (with 29.7% of the total production in 2005), the UK (20%),

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[4] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.16.2.1.

[5] Net meat production is defined as total slaughterings of animals, including those of foreign origin.

[6] DG Agriculture (2006). *Agriculture in the European Union – Statistic and economic information 2005*. Table 4.16.1.2

[7] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 3.1.2.

[8] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.15.2.1

[9] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.15.1.2.

[10] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 3.1.2.

[11] Including live animals (measured in carcass weight). DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.17.3.1.

Greece (16.1%), and France (14.7%).[12] The new MS in 2004 contributed 13 thousand tonnes of production to the total gross internal production for the EU-25 (1.2% of the total).[13]

2.1.2. Slaughter industry

The slaughterhouse[14] industry varies significantly between MS. In some countries, for example Germany, by law slaughtering animals and processing by-products must be separated whereas in other countries it has become increasingly common for slaughterhouses to additionally undertake the de-boning of the carcasses to produce retail cuts.[15]

Slaughterhouses have become increasingly large and automated within the EU. Many are specialised and only slaughter one species, though it is still common for several red meat species to be slaughtered in the same plant. Most MS have seen a reduction in slaughterhouse numbers as the remaining slaughterhouses increase in size; for which there are several reasons. Firstly, this is a competitive strategy to achieve economies of scale in order to make their products competitive with other countries, which have competitive advantages in terms of cheaper labour and other resources. Consolidation within the industry has also been reinforced by the consolidation at the retailing end as large retailers wish to deal with larger suppliers who tend to deliver larger orders of meat of consistent quality and at a lower cost; consolidation at the retail end in the EU has increased from 1990 when the five largest retailers held 14% of the total EU market to 2000 when these retailers had nearly doubled their market share to 26%.[16] Finally, as slaughterhouses often run on tight margins, they have diversified their production to more value-added products such as diced meat and mince; such specialisation can often only be achieved by larger plants who can afford the necessary capital investments.[17] In some countries, such as the UK, another factor has been increased food safety, veterinary and hygiene standards introduced by legislation during the last two decades involving significant compliance costs which smaller slaughterhouses were often unable to meet.[18]

Data on the nature and structure of the red meat slaughtering industry in the EU are not available from a common source, partly because there is no legislative requirement to provide detailed data to the Commission. Contact was made with individual sector associations and Member State governments and this resulted in some limited data on the structure of the slaughtering sector, but this is by no means comprehensive, nor is it comparable[19]. Due to its disparate nature, the information gathered is presented in Table 12 in Annex 1 of this report.

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[12] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 3.1.2.

[13] DG Agriculture (2006). *Agriculture in the European Union – Statistic and economic information 2005*. Table 4.17.1.2.

[14] The terms slaughterhouse and abattoir are synonymous; in this report we will use the former. This term refers to plants which slaughter livestock and dress carcasses; they may also undertake the boning of carcasses to produce retail cuts.

[15] UNEP and Danish Environmental Protection Agency. *Cleaner Production Assessment in Meat Processing*. Agrifood-forum.net. 2000. < http://www.agrifood-forum.net/publications/guide>, pg. 8.

[16] Cunningham, E.P. *After BSE-A future for the European livestock sector*. European Association for Animal Production. Wageningen Academic Publishers, 2003. p.23.

[17] European Commission (DG JRC). *Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques in the Slaughterhouses and Animal By-Products Industries*. Nov 2003. p 5, 9.

[18] Ministry of Agriculture, Fisheries and Food (MAFF) (2000). *The BSE Inquiry. Volume 13: Industry Processes and Controls*. Referenced from: http://www.bseinquiry.gov.uk/report/

[19] It is also at times inconsistent with total production data.

2.2. Competitive position of the EU red meat sector

The EU is one of the world's largest agricultural producing, consuming and trading entities. In 2005, the EU-25 total exported agricultural products amounted to 67.6 billion EUR (or 9.9% of global exported value) making it the largest agricultural exporter in the world (surpassing the US this year with 66.5 billion EUR of agricultural goods). For the EU, this was a 7.2% increase on the year before. In the same year, the EU-25 imported a value of 91.04 billion EUR in agricultural goods (or 12.5% of global imported value) making the EU the largest importing region in the world. This was an increase of 5.2% in imported value on the year before.[20]

2.2.1. Overview of the import tariff instrument

Historically, EU producers have benefited from a relatively high level of import protection. The EU meat sector is relatively protected by sanitary barriers, export subsidies and protective tariffs, as well as by limited use of aid for private storage (primarily in the pig meat sector). The most significant protection afforded to EU producers has been a system of tariffs and quotas. However, this tariff protection decreased following implementation of the Uruguay Round Agreements Act (URAA), which resulted in the following changes to specific meat tariffs in the EU:

- For beef meat imports, the duty is a sum of *ad valorem* and specific tariffs. The *ad valorem* tariff ceiling on meat was reduced from 20% to 12.8% between 1995 and 2000. Additional specific tariffs lowered from ranges of 2210-4752 Euro/tonne to 1414-3041 ecu/tonne during the same time period (see Table 13 in Annex 1);

- For pork meat imports, the duty is a sum of *ad valorem* and specific tariffs. The *ad valorem* tariff ceiling on meat was reduced from 3% to zero between 1995-2000. Additional specific tariffs lowered from 729-1358 Euro/tonne to 467-869 Euro/tonne between the same time period (see Table 13 in Annex 1);

- For sheep meat imports, duty is a sum of *ad valorem* and specific tariffs. The *ad valorem* tariff ceiling on meat lowered from 20% to 12.8% between 1995 and 2000. Additional specific tariffs lowered from ranges of 1409-4872 Euro/tonne to 902-3118 Euro/tonne during the same time period (see Table 13 in Annex 1).

Meat products entering the EU are subject not only to import tariffs but also import quotas. As part of the URAA, minimum access quotas were established for the import of meat into the EU:

- Fresh or chilled boneless meat of bovine animals: either 4,000 or 11,000 tonnes from 1995 onwards for different types of "high-quality" beef at a 20% tariff rate;

- Frozen boneless meat of bovine animals: 5,000 tonnes from 1995 onwards at a 20% tariff rate;

- Fresh, chilled, or frozen pig carcasses and half-carcasses of domestic swine: 0 tonnes in 1995 to 15,000 tonnes in July 2001 at 268 Ecu/tonne;

[20] WTO, International Trade Statistics, 2006. "Leading exporters and importers of agricultural products, 2005." Table IV.8. Converted at 1 USD = 0.804 EUR (2005).

- Fresh, chilled, or frozen cuts of domestic swine with or without the bone (excluding tenderloin presented alone): from 0 tonnes in 1995 to 5,500 tonnes in 2001 with various tariffs (depending on the tariff item number);
- Frozen domestic swine: 7,000 tonnes from 1995 onwards with 0% tariff;
- Fresh or chilled boneless loins and hams: from 5,667 tonnes in 1995 to 34,000 tonnes in July 2001;
- Fresh or chilled tenderloins of pig: from 833 tonnes in 1995 to 5,000 tonnes in 2001 with a 300 Ecu/tonne tariff;
- Preserved meat of domestic swine: from 0 tonnes in 1995 to 6,100 tonnes in 2001 with various tariff rates (depending on the tariff item number).

2.2.2. Evolution of EU-15 imports and comparison with quotas

The impact of the URAA was felt most strongly in the beef sector. What was historically a net exporting industry, became a net importer in 2002 (see Figure 6 in Annex 1). Several factors may have contributed to this trend: It may have been a consequence of the FMD outbreak in several MS in 2001; however, it could also be a consequence of the BSE crisis in the second half of the 1990s since which time production had decreased but consumer confidence and demand had been partly restored, thereby leading to the deficit in EU cattle production. Additionally, it is clear that imports increased once the URAA was fully implemented (primarily during 2000-2002). In 2005, the EU imported a value of 9.8 billion EUR of beef, an increase of 10.1% on the year before. A majority of these imports, including live animals, came from Brazil and Argentina.[21]

The EU pig market, conversely, has continued to remain one of EU's strongest in the meat sector as it has been a secure net exporter between 1995-2002 (see Figure 7 in Annex 1). The EU-25 exported a value of 15.1 billion EUR of pork meat in 2005, an increase of 7.5% on the year before.[22] It is also possible to see that, following the URAA, imports increased in the pig meat sector from 2000-2002; however, pig meat imports remain relatively small, this is also related to import restrictions based on sanitary requirements.

To be considered is that a majority of the recorded imports of pig products to the EU-15 in Figure 7 (Annex 1, presenting data until 2002) were exported from candidate countries that in the meantime have joined the EU; therefore, EU pig imports from export countries outside Europe may be considerably less. A majority of pig meat imports from third countries, including live animals, came from Chile and the US.[23]

The sheep and goat sector has historically been a net importer (see Figure 8 in Annex 1). In 2005, the EU-25 imported a value of 2.1 billion EUR in sheep and goat meat, a 10.7% increase on the year before.[24] The EU imports the majority of its sheep and goat meat, including live animals, from New Zealand and Australia.[25]

[21] DG Agriculture, Trade statistics. *EU 25: Trade with world (including intra-trade).*

[22] DG Agriculture, Trade statistics. *EU 25: Trade with world (including intra-trade).*

[23] DG Agriculture, Trade statistics. *Pork (incl. Live): EU 25 Main Markets.*

[24] DG Agriculture, Trade statistics. *EU 25: Trade with world (including intra-trade).*

[25] DG Agriculture, Trade statistics. *Sheep and goat meat (incl. Live): EU 25 Main Markets.*

2.2.3. Possible impacts of trade liberalisation

Speculation varies as to what extent trade liberalisation and CAP reform will have on the sector. A recent study analysing the potential impact Doha round implementations and CAP reform would have on the sector revealed to which degree the red meat sectors are vulnerable to such changes.[26] It was based on a quantitative analysis of the price pressure on agricultural products should the further market liberalisations occur (such as those which were proposed under the Doha Round negotiations). Assumptions taken are that no further CAP reforms are foreseen and the Doha round outcome characterised by tiered reductions of import tariffs, increased market access under Tariff Rate Quotas (TRQ), and a reduction/elimination of export subsidies.

Factors measured are the strength of the Euro, tariff cuts, and the extent of export subsidy reduction/elimination. Imports into the EU will strongly be affected by the strength of the Euro and the affect on market prices from the 2003 CAP reform measures. The exchange rate will determine import quantities at Most Favoured Nation (MFN) and preferential tariff rates. With a strong Euro, export opportunities will decrease and imports will increase.

According to the study the beef sector is particularly vulnerable to market liberalisations and reforms as prices drop significantly under every scenario considered. However, calve and feed costs will most likely fall as well and dampen the effect on supply reactions. Sheep and goat meat will also suffer price reductions but these would most likely be the effect from over quota imports occurring at the reduced MFN rates. A moderate decrease in pig meat prices would be expected as import penetration would generally be low even though the study forecasts, in the case that there are no export subsidies, an increase in imports by about 87% (40,000 tonnes).[27]

In theory, many countries would suffer similar price decreases should elements of the Doha round be implemented and the global market becomes further liberalised. However, a cause for concern with respect to European competitiveness is that current EU tariffs tend to be relatively high even after the reductions of the URAA, therefore the meat sector is still highly protected compared to other competitive countries, especially for the beef market (see Table 2):

Table 2: Average quota rates between large beef competitors

	1995		2000		Average reduction	
	In-quota rate	Out-of-quota rate	In-quota rate	Out-of-quota rate	In-quota rate (%)	Out-of-quota rate (%)
EU beef	40.0	433.3	29.2	142.8	-27.0	-67.0
Canada beef	0.0	30.3	0.0	26.4	0.0	-12.9
US beef	4.8	30.3	4.7	26.4	-1.2	-12.9

Source: OECD, Agriculture and Trade Liberalisation, 2002.

[26] Britz, W., Heckerlei, T., Junker, F., Perez, I., Wieck, C. *How sustainable is the latest CAP reform under possible trade liberalisation outcomes of the Doha Round.* Institute for Agricultural Policy, Market Research and Economic Sociology (University of Bonn) and IMPACT Center (Washington State University), 2005.

[27] Britz, W., Heckerlei, T., Junker, F., Perez, I., Wieck, C. *How sustainable is the latest CAP reform under possible trade liberalisation outcomes of the Doha Round.* Institute for Agricultural Policy, Market Research and Economic Sociology (University of Bonn) and IMPACT Center (Washington State University), 2005.

Though the EU's out-of-quota rate is relatively high, the largest exporters (Brazil, Argentina, and Uruguay) fill almost all of their allocations of the quota and often even export substantial quantities of beef at the high out-of-quota tariffs; this illustrates the significant cost competitiveness of these exporting countries in supplying beef to the EU market.[28] Though it is clear that the EU has made severe cuts in protection measures, it continues to be vulnerable due to the relatively high level of protection.

2.2.4. Conclusions concerning 'vulnerability' of sector

The EU's high level of protection and its current competitive status, suggest that EU produces at prices higher than the world price. Many of the countries the EU competes with in red meat trade have significant cost advantages in terms of low-cost resources such as labour, feed, and land prices. Other factors that put the sector at disadvantage according to industry stakeholders include costs related to meat inspection; BSE testing in cattle; stricter regulations, including on disposal of waste (offals) and other environmental regulations.

Obviously, this high level of protection leaves the EU in a vulnerable place should further market liberalisation occur. This is especially true for the beef markets, as it is highly protected and struggling to remain competitive. Stakeholders in the slaughter industry recognise that the beef sector is strongly supported by import duties as the cost of production in other countries, particularly Brazil and Argentina for example, is much lower. However, it is expected expect that feed prices will increase due to a worldwide growth in demand exceeding supply; for European cattle which are mostly feed from grasslands as opposed to cattle fed from feedlots (as they are in Brazil or the US) this will be a competitive advantage which may help to support the European beef producing industry in the medium-term. The red meat sector has also been benefiting from some structural changes that are positively impacting the development of the sector. For example, labelling and traceability systems are improving food safety as well as consumer confidence in meat products. EU enlargement has been beneficial for the EU and production in these MS continue to grow. Finally, industry concentration and farm restructuring will build upon the economies of scale from which the EU may derive a competitive advantage.

Other hand, competitiveness is less of a concern for the pig sector as it is already relatively unprotected. This was confirmed by industry stakeholders, who did not express concern regarding the competitiveness of the EU pig export sector.

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[28] Drum, Frank, Andrew Dickson and John Hogan. *Meat outlook to 2010-11*. Australian commodities. Vol. 13, no.1. March 2006, pg. 74.

3. The slaughter chain for red meat production

3.1. Stunning/killing methods used in the EU

3.1.1. Cattle

3.1.1.1. Stunning techniques

The main stunning equipment used for adult cattle and calves (up to 8 months) are: penetrating captive bolt; non-penetrating captive bolt; and electrical stunning as is reflected in the results received from the questionnaire to slaughterhouse operators (see Table 3):

Table 3: Stunning and bleeding techniques used for cattle

Stunning technique	Number of calves slaughterhouses	Number of adult cattle slaughterhouses
Penetrating captive bolt	23	34
Non-penetrating captive bolt	1	3
Electronarcosis	0	2
Electrocution	0	3
Bleeding technique		
1 carotid artery	5	7
2 carotid arteries	8	15
Chest sticking	15	22

Source: Survey of slaughterhouse operators (n=44).

The use of a penetrating captive bolt typically begins with cattle being led into a restraining area / box where the animal is isolated; in some cases, restraints are also provided for the animal's head to allow a more accurate positioning of the penetrating captive bolt. Captive bolt guns have a sharp-rimmed steel bolt and are powered by either compressed air or a blank cartridge causing sufficient penetration force to initiate trauma to the cortex. The bolt is fired at a right angle in the forehead, centred above imaginary lines crossing from the base of the horns and the contra-lateral eyes. The animal is then rendered unconscious; if this is performed correctly, the stun-to-stick time is not critical as unconsciousness can be longer than 10 minutes. However, according to EFSA mis-stuns occur relatively frequently with this technique. Research indicates that 4% to 6.6% of captive bolt stunning in cattle requires a second stun.[29] Often this is attributed to insufficient head restraints, wrong positioning of the operator, and the maintenance of the captive bolt gun. Penetrating captive bolt is the most preferred tool for stunning operations of cattle in the questionnaires returned by the slaughter industry; 34 use the penetrating captive bolt on cattle (representing 79% of cattle slaughterhouses respondents to the questionnaire) and 23 slaughterhouses (96%) use this method for calves. The tool

[29] European Food Safety Authority (EFSA) (2004). *Welfare aspects of animal stunning and killing methods* - Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods (Question N° EFSA-Q-2003-093). P. 61.

used for back up (in the event of an emergency or failure of the main method) was also reported from most slaughterhouses as penetrating captive bolt (from 84% of respondents).

Non-penetrating captive bolt stunning typically requires the same restraint method as the penetrating captive bolt. The non-penetrating captive bolt gun has a mushroom-headed steel bolt and is powered either by air or a cartridge causing sufficient force to initiate trauma to the cortex without penetrating the skull. Normally it is fired into the forehead but other sites are possible. It may be either trigger-operated or contact fired. A recent field study on non-penetrating captive bolt stunning[30] discovered that about 20 to 30% of cattle needed a re-stun which implies serious animal welfare concerns as the effectiveness of a second stun is often considerably less due to immediate swelling in the location where the stun should occur. Also, there is a much shorter stun-to-stick interval (potentially as low as 20 seconds), in comparison to penetrating captive bolt. According to EFSA, there are no welfare advantages to this method as opposed to penetrating captive bolt.[31] Three slaughterhouses responding to the questionnaire reported that they operate non-penetrating captive bolt stunning for adult cattle and 1 slaughterhouse uses it for calves; 4 slaughterhouses use this for the back-up cattle stunning tool and 2 for calves.

Electronarcosis involves trans-cranial application of an electric current by using a pair of tongs (or electrodes) placed on either side of the head; various types of electrodes can be used. This may be achieved manually, by the application of electrified tongs on either side of the head, or automatically, by purpose-built devices. This method has a short duration of unconsciousness and problems with clonic convulsions, which makes sticking difficult immediately following the stun. EFSA recommends sticking is to occur within 12 (for calves) and 23 seconds (for cattle) after the stun.[32] Of the 44 cattle /calves slaughterhouses responding to the questionnaire, two use electronarcosis for adult cattle.

Electrocution follows the same head stunning technique as described for electronarcosis (above) but it also includes the induction of cardiac ventricular fibrillation, by passing an electric current across the heart either simultaneously or after inducing unconsciousness with electrical head stunning equipment. Ventricular fibrillation can be induced using withers-to-back, head-to-back or head-to-leg application of electrical current. With cardiac ventricular fibrillation, unconsciousness is deeper and lasts longer. This stunning technique is recommended by EFSA as preferable to electronarcosis. Cardiac ventricular fibrillation often leads to cardiac arrest, ensuring that the animal will not recover consciousness. However, there is also a high failure rate of ventricular fibrillation (between 11 to 31 %).[33] It may be the case that there needs to be a delay of 30-60 seconds before hoisting the cattle carcass, so as to prevent a resuscitation of the heart activity. However, if there has been successful cardiac fibrillation, the stun-to-stick interval is not critical. Only three adult cattle slaughterhouses reported that they use electrocution for stunning adult cattle.

3.1.1.2. Slaughter without prior stunning

Slaughter without prior stunning is also a slaughter method used in the EU. Although, as a general principle of EU legislation, prior stunning is compulsory, derogation is possible for animals slaughtered for ritual purposes. In a question to slaughterhouse operators about whether they conducted ritual slaughter, 12 slaughterhouses respondents indicated that they do slaughter in this manner. However, 6 slaughterhouses reported that they apply ritual slaughter with a prior stun.

[30] Conducted by Moje (2003) and reported by EFSA (2004). *Welfare aspects of animal stunning and killing methods.*

[31] EFSA (2004). *Welfare aspects of animal stunning and killing methods*. P. 64.

[32] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 71.

[33] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 68.

Conversely, two slaughterhouses in Italy slaughter 1% of their animals without prior stun, two slaughterhouses in Spain slaughter 30% without prior stun, one Spanish house slaughters 25% without prior stun and one slaughterhouse in Ireland slaughters 20% of cattle without prior stun. In the questionnaire to competent authorities, several countries indicated percentages of cattle slaughtered either with a post-stun (application of a stun which occurs immediately after the cut) or no stun application at all (see following table).

Table 4: Slaughter without prior stun of cattle

Country	Percent of calves with post-cut stun	Percent of cattle with post-cut stun	Percent of calves without stun at all	Percent of cattle without stun at all
France*	0%	0%	**20%**	**20%**
Belgium**	0%	0%	**21%**	**10%**
Spain	0%	0%	**5%**	**10%**
Netherlands	0%	0%	**+/- 5%**	**+/- 5%**
Hungary	0%	0%	0%	**5%**
UK***	**0.4%**	**0.8%**	**0.4%**	**0.8%**
Austria	0%	0%	0%	**< 1%**
Germany[34]	--	--	marginal	marginal
Cyprus, Czech Republic, Denmark[35], Estonia, Finland, Luxembourg, Slovenia, Sweden	0%	0%	0%	0%

* This data provided from OABA in response to survey of animal welfare organisations.
** This data for Belgium is only an estimation of the percentage of animals slaughtered ritually as opposed to conventionally; it is not sure whether the animals are stunned beforehand.
*** The UK competent authority has expressed that this data is from 2003 and the numbers may have increased significantly since then for calves.
Source: Survey of competent authorities (France: OABA).

Equipment producers report that there has been an interest by some slaughterhouses to invest in gas stunning systems for cattle. Live tests have been conducted on the species by manufacturers. In the interview with an equipment producer, it was reported that a prototype for such technology has been developed, though gas stunning of cattle is not yet performed in the EU. As the above quoted evidence indicates that captive bolt stunning in cattle is ineffective in some cases[36], this producer anticipates that there could be some animal welfare advantages for gas stunning of cattle.[37] However, the investment costs for such systems are anticipated to be a considerable limitation to the development of the market for this stunning equipment. It is expected that this market would only be developed should concerns about BSE and its transferability with captive bolts become a legislative issue in the future.

[34] No numbers were provided. Though the competent authority reported that "100% intended" of animals are slaughtered with a prior stun, there is evidence from discussions with other stakeholders that it is done, though "not very frequently" and that it is "not easy" to receive a license permitting such practices in Germany.

[35] Though Danish legislation allows an exemption to mandatory stunning of animals at the time of slaughter for ritual purposes, no animals are currently slaughtered by ritual slaughter in Denmark. See: Food and Veterinary Office of the European Commission (2006). *Final Report of a Mission carried out in Denmark from 06/02/2006 to 10/02/2006 in Order to Assess Animal Welfare at Slaughter*. DG (SANCO)/8039/2006 – MR Final.

[36] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 61.

[37] Butina. Interview, 22 January 2007.

3.1.1.3. Bleeding techniques

Bleeding techniques varied for cattle between cutting one carotid artery, two carotid arteries and chest sticking. After the stun, in some cases slaughterhouses will sever one carotid artery in the neck to induce the period of unconsciousness and then death. It is possible, as was stated by veterinary experts from the meat industry, that the slaughterhouses only severing one artery do so out of compliance with EU Regulation 853/2004 which explicitly states that the trachea and oesophagus must remain intact, thereby making it difficult to cut both carotid arteries without severing the trachea and oesophagus.[38] In practice, it is not possible to sever both carotid arteries without cutting the trachea and/or the oesophagus. According to respondents of the slaughterhouse survey, this bleeding technique is used in five calve slaughterhouses and seven adult cattle slaughterhouses (see Table 3). Five of these slaughterhouses come from Spain, one from Ireland and one from Germany.

More commonly, two carotid arteries are severed in the neck following a stun. This allows for a faster time of blood loss than severing only one carotid artery. This technique was reported by 15 cattle slaughterhouses (34% of cattle slaughterhouse respondents) and 8 calves slaughterhouses (29%) as the bleeding method in use in their slaughter operations (see Table 3).

The chest sticking bleeding method takes longer to perform than a neck cut as it must be preceded by a skin cut but is considered by EFSA to be the most efficient way to prevent a return of consciousness during the bleeding out procedure and these results are more reliably obtained in all animals than with the neck cutting techniques. In the returned questionnaires, half of the cattle slaughterhouses reported that they operate the chest sticking method (22 cattle slaughterhouses) and a majority of calves slaughterhouses use this method (15 calves slaughterhouses); 4 slaughterhouses use this method in conjunction with neck sticking of both carotid arteries (see Table 3).

3.1.2. Pigs

3.1.2.1. Stunning techniques

The main stunning techniques in the EU for adult pigs are: electrical stunning; and gas stunning as is reflected in the results received from the questionnaire to slaughterhouse operators:

Table 5: Stunning and bleeding techniques used for pigs

Stunning technique	Number of adult pig slaughterhouses (up to 150 kg LW)	Number of adult pig slaughterhouses (more than 150 kg LW)
Electronarcosis	2	3
Electrocution	6	2
Dip-lift gas system	5	3
Paternoster gas system	9	5
Bleeding technique		
Chest sticking	19	14
Neck cutting	3	0

Source: Survey of slaughterhouse operators (n=25).

[38] UECBV. Interview, 06 March 2007.

Electronarcosis, similar as with cattle, involves passing an electric current across the head to span the brain for stunning. Pigs are led to the stunning area single file with various kinds of restrainers or passageways. Many restrainers allow for either manual or automatic positioning of the stunning tongs for electronarcosis. However, automatic placement of electrodes could potentially be ineffective for stunning as animals differ in size (pre-selection of animals based on size may overcome this problem). The voltage and current flowing into the brain from the electrodes determine the depth and onset of unconsciousness. After electric stunning, tonic-clonic seizures will ensue. Stun-to-stick intervals differ depending on if the operation is manual or automatic and the intensity of the electricity applied to the head. EFSA reports that under commercial conditions manual stunning with this method may not be consistently sufficient under high throughput conditions and if the stun is inadequately applied, it could be painful. Also, the duration of unconsciousness can be short with electronarcosis.[39] In the survey to slaughterhouse operators, 2 slaughterhouses processing smaller pigs and three slaughterhouses with bigger pigs indicated in the returned questionnaires that they operate electronarcosis stunning systems for pigs.

Electrocution involves the same current across the head as with electronarcosis, but it is complemented by an electrical current passed over the heart to induce cardiac arrest or fibrillation (either simultaneously applied or immediately after the head stun). In this system, animals show little or no clonic seizures, which often makes it easier for operators to stick animals after the stun. This method can lead to immediate unconsciousness or death. EFSA, as well as equipment manufacturers, identify an animal welfare concern with this method (as well as with electronarcosis) when animals have to line up single file, which is stressful to pigs. Six small pig slaughterhouses and two large pig slaughterhouses responding to the survey operate electrocution stunning for pigs in the EU.

For details of the electrical parameters associated with both electrical stunning methods in use in slaughterhouses, please see responses to Question 26 of the survey of slaughterhouse operators in Annex 6.

Gas stunning with dip-lift systems works discontinuously while lowering pigs in a box directly into the maximum gas concentrations at the bottom of the pit. After spending a defined period of time at the bottom of the pit, the box resurfaces and the unconscious pigs are tipped out for shackling, hoisting, and bleeding. These systems are more complex than paternoster. In the returned questionnaires, 5 operate dip-lift gas stunning systems (23%) for smaller pigs and 3 slaughterhouses (also 23%) operate this system for larger pigs (more than 150 kg LW) (see Table 5).

Gas stunning with paternoster works continuously with gondolas (i.e., cradle) and pigs are lowered consecutively into the maximum gas concentration at the bottom of the pit after making several stops throughout the procedures at increasingly higher gradients of gas concentration. EFSA suggests that a disadvantage of the paternoster systems is the pulsatile nature of the machine, which is not conducive to handling pigs.[40] EFSA states that this system is more common than dip-lift systems, which complies with results from the returned slaughterhouse questionnaires; nine slaughterhouses (41%) indicated that they operate paternoster gas stunning systems for smaller pigs and 5 slaughterhouses (38%) operate this system for larger pigs.

For both systems, all slaughterhouses use carbon dioxide except one slaughterhouse in Norway indicated that they use some concentrations of non-adverse gases (employed in the second round of gas exposure with 7.8% concentration of Nitrogen, and 2.09% concentration of argon with 90% CO_2). Currently, Directive 93/119/EC specifies that gas stunning with carbon dioxide must have

[39] EFSA (2004). *Welfare aspects of animal stunning and killing methods*. p. 95.
[40] EFSA (2004). *Welfare aspects of animal stunning and killing methods*. p. 112.

concentrations greater than 70%.[41] EFSA recommends that carbon dioxide concentrations should be at least 85% for meat quality purposes as well as animal welfare considerations; two slaughterhouses responding to the questionnaire reported concentrations less than this for small pigs (one at 82.5% and one at 84%).

The vast majority of slaughterhouses use either penetrating captive bolt stunners or head-only (electronarcosis) for back-up, emergency use.

3.1.2.2. Bleeding techniques

Overwhelmingly, chest sticking is the dominant bleeding method used; it was reported in all 14 slaughterhouses processing large pigs and 19 of 22 slaughterhouses with small pigs (see Table 5). Within 30 seconds of chest sticking, pigs have lost about 70% to 80 % of their blood. Studies have indicated that the stunning method, and the effect upon heart activity, has no impact on effective blood loss at the time of sticking.[42] Neck cutting was reported in three slaughterhouses. It was expressed that in Poland, it is quite common that pigs are killed by cutting one carotid artery in the neck, rather than chest sticking; the competent authority said this was done for practical reasons.[43]

3.1.3. Sheep

3.1.3.1. Stunning techniques

According to EFSA, the main stunning techniques in the EU for sheep are: penetrating captive bolt; and electrical stunning. Electrical stunning was the most prevalent method in use according to the results received from the questionnaire to slaughterhouse operators:

Table 6: Stunning and bleeding techniques used for sheep

Stunning technique	Number of lamb slaughterhouses	Number of adult sheep slaughterhouses
Penetrating captive bolt	0	0
Non-penetrating captive bolt	1	0
Electronarcosis	14	12
Electrocution	0	0
Bleeding technique		
1 carotid artery severed	5	5
2 carotid arteries severed	8	6
Chest sticking	0	0

Source: Survey of slaughterhouse operators (n=16).

[41] Directive 93/119/EC, Official Journal L 340 , 31/12/1993 P. 0021 – 0034.

[42] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 82.

[43] No further details were provided. Główny Inspektorat Weterynarii (Polish General Veterinary Inspectorate). Interview, 08 June 2007.

Penetrating captive bolt is applied to sheep at the highest point in the skull of the animal which results in an immediate and irreversible loss of brain activity. When this is performed properly, this method may result in less fear and anxiety and may be quicker.[44] The main disadvantage is that animals may have to be restrained for an effective stun. Though EFSA reports this as one of the most common stunning mechanisms for sheep in the EU, no slaughterhouses responding to our questionnaire report using this method. However, this is the most common back-up, emergency method in use for both lamb and sheep according to the responses from the survey of slaughterhouse operators.

The impact of the blunt non-penetrating captive bolt with the skull when implemented at the frontal position of the head is enough to induce a concussion of the brain and unconsciousness. The bolt does not penetrate the brain. This method is applied either in stunning pens or when the animals are individually restrained. After the impact of the bolt, animals will collapse immediately and tonic seizures will ensue. One study has found the severity of the impact on lambs will produce enough structural brain damage to adequately stun/kill lambs.[45] However, EFSA considers that because the prevalence of mis-stunning in commercial conditions is unknown despite the fact that it is a major concern, it does not have any animal welfare advantages over other stunning methods of sheep.[46] Only one slaughterhouse responding to the questionnaire operated this stunning method for lamb.

Electronarcosis can be operated on individual animals within a group in a pen or individually in a restrainer, although it is preferable that animals are individually restrained to avoid electric shocks due to the wrong placement of the electrodes with this method. The tongs should be applied between the eyes and the base of the ears on both sides of the head, and it is often performed on wet skin to increase the conductivity of the electric current through the wool. Often pointed electrodes are used to create better contact with sheep's skin. However, maintenance of good electrical contact is often difficult. This was by far the most common method employed by slaughterhouses responding to the questionnaire, 14 out of 15 slaughterhouses employ this method for lamb and all slaughterhouse respondents employ this for adult sheep.

Electrocution is similar to electronarcosis but it also involves a simultaneous current through the heart of sheep; this is typically conducted with animals in a restrainer. Because of the cardiac fibrillation, the stun-to-stick interval is not critical. No slaughterhouse respondents to the survey apply this method.

3.1.3.2. Slaughter without prior stunning

Slaughter without prior stunning is also a prevalent slaughter method used for sheep and lamb in the EU. In a question to slaughterhouse operators about whether they conducted ritual slaughter, 44% of respondents indicated that they do slaughter in this manner. Two of these slaughterhouses, in Spain, slaughter 30% of their animals without prior stun, one Spanish slaughterhouse process 20% of their sheep in this way, and two Irish slaughterhouses and one Spanish slaughterhouse conduct slaughter without prior stun in less than 5% of their animals. In the questionnaire to competent authorities, several countries provided estimates regarding the percentage of sheep slaughtered with no stun application at all (see the following table). None of the responding authorities reported post-cut stunning (application of a stun which occurs immediately after the cut).

[44] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 75.

[45] Finnie et. al. (2000) as reported by EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 76.

[46] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 76.

Table 7: Slaughter without prior stun of sheep and lamb

Country	Percent of lamb without stun at all	Percent of sheep without stun at all
Belgium*	**40%**	**92%**
France**	**80%**	**80%**
Netherlands	?	**+/- 80%**
Spain	**15%**	**20%**
Austria	?	**< 5%**
UK***	**5.2%**	**2%**
Czech Republic	**0.97%**	0%
Cyprus	**0.08%**	0%
Germany[34]	marginal	marginal
Denmark[35], Estonia, Finland, Germany, Luxembourg, Slovenia, Sweden	0%	0%

* This data for Belgium is only an estimation of the percentage of animals slaughtered ritually as opposed to conventionally; it is not sure whether the animals are stunned beforehand.
** This data provided from OABA in response to survey of animal welfare organisations.
***The UK competent authority has expressed that this data is from 2003 and the numbers may have increased significantly since then for older sheep.
Source: Survey of competent authorities (France: OABA).

The French competent authority said that two-thirds of French sheep slaughterhouses conduct ritual slaughter. Also in France, it being discussed with Muslim religious authorities whether it will be acceptable to use electrical stunning (with constant current) in the future for ritual slaughter.[47]

It is estimated by OABA that the amount of meat slaughtered without prior stunning is exceedingly unnecessary for the 10% of the French population which is Muslim, though about 80% of the sheep and lamb in France are slaughtered without prior stunning.[48] Reasons for this could be that at the slaughterhouse level, differentiating between the which meat products and affiliated offals were slaughtered with or without prior stunning is expensive and it is simpler just to slaughter all animals without stunning and that way satisfy the demands of both the religious and non-religious markets (as consumers are unable themselves to differentiate without any labelling). Thus, slaughterhouses in some cases have an economic incentive to slaughter all animals without prior stunning.

The majority of stakeholders and competent authorities noted that there is an increasing demand for ritually slaughtered meat; the Spanish competent authority reported that the percentages reported in Table 7 are increasing.[49] Several animal welfare organisations have also reported that sheep slaughtered without prior stunning has increased in the last 5 years in their respective MS.[50]

Currently, there is also some gas stunning of sheep performed, for example, in Spain and Australia. This is often done in Europe with a pig stunner, which has been simply converted to parameters to

[47] Ministère de l'Agriculture et de la Pêche. Interview, 04 May 2007.
[48] OABA. Interview, 07 May 2007.
OABA response to survey of animal welfare organisations.
[49] Response to survey of competent authorities.
[50] Interviews with animal welfare organisations.

match sheep. One equipment producer suggested that considerably more interest has not developed in gas stunning for sheep because it is not entirely clear in legislation whether it is legal to gas stun sheep.

3.1.3.3. Bleeding techniques

Bleeding methods for sheep are either severing one carotid artery or severing two carotid arteries. EFSA reported a significant difference in the time to loss of brain responsiveness between severing one and two carotid arteries (and in both situations the external jugular veins): when only one common carotid artery is severed time to loss of brain consciousness for sheep averages 70 seconds and when both carotid arteries are severed it is only 14 seconds.[51] In the responses from slaughterhouses to the questionnaire, 5 operators sever one carotid artery for both lamb and sheep slaughterhouses and 8 lamb slaughterhouses and 6 sheep slaughterhouses sever both carotid arteries (see Table 6). It is possible in the case of lamb and sheep, as was mentioned above with cattle, that the slaughterhouses only severing one artery do so out of compliance with EU Regulation 853/2004.[52]

3.2. Production costs of slaughterhouses in the EU

The costs represented by that part of the slaughter chain where live animals are treated can be divided into four separate operational activities; namely: (1) unloading and lairage; (2) passageways and sometimes restraining; and (3) stunning and (4) shackling / hoisting and bleeding. Following these procedures red meat slaughterhouses often include the following activities: animals are then washed, de-haired or de-hided, eviscerated, chilled, partitioned, trimmed, packaged, and labelled. In some cases, slaughterhouses may only provide part of the facilities and sell the meat in large sections to butchers for further processing. As operations tend to vary, consequently, the costs accruing to slaughterhouses also vary. Also, slaughterhouses may specialise in one animal species or in an assortment, and the output of slaughterhouses can vary significantly.

The questionnaire circulated to slaughterhouse operators focused on the cost elements of each production stage of their operations. Slaughterhouse operators were asked to estimate the percentage of the total costs for producing a carcass (until the end of first chilling) that accrued to each stage. Slaughterhouse operators were asked to include all costs that accumulated due to labour, energy, water, gas, waste disposal, cleaning, veterinary control, maintenance, and depreciation (related to building and equipment for the relevant production stages). They were asked specifically not to include the purchase price of the animal and transportation to the slaughterhouse.

Cost estimations were provided by 34 slaughterhouse operators from 8 countries. Based on this sample, the table below gives an overview of the allocation of operating costs in the slaughterhouse production chain:

[51] EFSA. (2004). *Welfare aspects of animal stunning and killing methods*. p. 73.

[52] UECBV. Interview, 06 March 2007.

Table 8: Allocation of costs in the slaughterhouse production chain

Production stage	Median Percentage	Minimum Estimation	Maximum Estimation	Standard Deviation
Cost of reception and lairage of animals	7.0 %	0.6 %	15 %	3.6
Cost of restraining animals (from the beginning of the passageway until the beginning of stunning)	5.0 %	0.6 %	15 %	3.6
Cost of stunning	4.2 %	0.6 %	15 %	3.4
Cost of shackling / hoisting and bleeding	5.0 %	0.6 %	20 %	5.2
Cost of all other steps of the slaughter chain until after the first chilling has been completed (may include washing, dehairing / dehiding, evisceration, chilling)	80.0 %	50.0 %	98 %	12.3

Source: Survey of slaughterhouse operators (n=34).

Based on these estimations made by slaughterhouse operators, costs representing that part of the slaughter chain where live animals are treated (until and including bleeding) are on average[53] one fifth of the total costs for producing a carcass. It is important to note that this is the median value of estimates that tended to vary significantly; in Table 8 the minimum and maximum values are given to show the degree of deviation.

An analysis was performed to determine whether there are significant differences in the allocation of operating costs in the slaughterhouse production chain between different Member States, between different species, or between stunning techniques (i.e., mechanical, electrical, or gas) but no considerable differences were found.

The allocation of costs to the four production stages where live animals are treated is as follows:

Lairage costs were reported by the slaughterhouses as being on average 7.0 % of total costs for producing a carcass (until the end of first chilling). Cost factors contributing to costs in this production stage include mainly labour costs, but sometimes, heating / cooling of lairages for the animals' comfort will also increase costs.

Restraining animals refers to the production stage involving all activities from when animals enter the passageway until the beginning of stunning. This is not a factor intensive production step and consequently, costs tended to be lower (an estimated 5.0 % of total production costs). The most significant cost factor in this step is labour.

The stage involving the costs of stunning (on average reported to be 4.2 % of total production costs) and the costs of hoisting and bleeding (on average reported to be 5.0 %) are often located in one production area. In some cases, the labour responsible for the stunning may also be responsible for hoisting, as is sometimes the case for cattle. Significant cost factors associated with hoisting include labour.

The cost of stunning was the lowest of the four stages, on average estimated to be 4.2 %. This estimation for the cost of stunning ranged from 0.6 % to 15 % by slaughterhouse operators. Cost elements related to the stunning procedure are: (1) Interest and depreciation (i.e., for physical capital); (2) Labour; (3) Consumables (e.g., energy, water, gas); and (4) Repairs and maintenance.

[53] The use of the word "average" in this section refers to the median value calculated for cost estimations.

Depending on the stunning method and the size of the operations, these costs tend to vary. For example, larger operations – and therefore, in many cases more automated – will have lower labour costs but may have higher capital costs.

Most of the costs accruing to slaughterhouses go into the production steps after the animal has been stunned and killed; on average, the respondents estimated that 80.0% of the costs went into these processes. Often, the production steps after the animal is dead are much more extensive and specialised, contributing to higher costs. Significant cost factors contributing to this high percentage are labour costs and cooling costs.

3.3. Relationship of production costs to the price of meat

As has been pointed out before, the analysis of the slaughterhouse questionnaire did not reveal differences between stunning methods used and between red meat species slaughtered, one reason being the significant deviation between estimates in general, possibly caused by variations in accounting practices and data availability/quality. Another reason is the limited significance of the costs of stunning compared to other production costs of a slaughterhouse. The cost of stunning is even less relevant for the wholesale price of meat, which also includes the farm price of the animal, transportation costs, and the slaughterhouse operator's profit margin.

This can be illustrated by two examples:

- <u>Cattle stunning:</u> When considering that current EU prices for wholesale beef range from 2.21 EUR/kg for cows to 3.08 EUR/kg for heifers[54] and an average carcass weight for adult cattle in the EU of 317.6 kg[55], then the average wholesale value of a carcass costs between 702 EUR and 978 EUR. In comparison, cartridges for captive bolt stunners (the main stunning method in use for cattle) cost only 0.15 EUR per animal (about 0.02%). This implies that stunning costs tend to be of minor relevance compared to the wholesale value of meat, even when one considers associated labour costs and the cost of the captive bolt pistol[56].

- <u>Pig stunning:</u> Concerning operational costs the conclusion is similar to the first example. Running costs for electric stunning equipment were considered to be negligible. Gas stunning adds an estimated additional cost of 0.10 to 0.15 EUR per pig, due to gas consumption.[57] Considering that current EU prices for wholesale pig carcass is currently 1.32 EUR/kg[58] and the average carcass weight for pigs is 88.3 kg[59], then the average wholesale value of a pig carcass is approximately 117 EUR. At an additional 0.15 EUR per pig, this is a considerably small proportion of the costs of pig production until the wholesale stage (0.1%).

It has to be pointed out that in the case of gas stunning it is much more difficult to consider cost of capital, as gas stunning systems are much more expensive than, e.g. a captive bolt pistol and costs also very much depends on the specifics of the equipment (type of gas stunning system), the slaughterhouse (capacity and output, building constraints etc.) and local factors (including energy

[54] DG Agriculture (2007). Beef and veal, Internal market prices: Carcasses. Week 18.
[55] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.15.1.1.
[56] A captive bolt pistol was reported to cost approximately 600-700 Euro.
[57] Estimate by equipment producer.
[58] DG Agriculture (2007). Weekly market prices for pig carcass Grade E in the EU. Week 18.
[59] DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.16.1.1.

costs, administrative burden etc). In addition, labour costs vary by MS and are difficult to estimate for gas stunning systems, as these systems may need less labour input compared to other stunning systems and this may compensate for the higher investment costs. It seems therefore unlikely that an in-depth analysis of costs of gas stunning systems in the red meat sector would lead to a very different picture compared to what has been described for other methods. This being said, it is important to keep in mind that stunning costs may be negligible at the wholesale stage overall, but still important for slaughterhouses where the slaughterhouse added value as a proportion of the wholesale value is considerably smaller and margins are tight.

As stated before, the wholesale value of meat includes the farm price of the animal, transportation costs, slaughter costs and the slaughterhouse operator's profit margin. The wholesale price does not include other costs such as costs for further processing, distribution and the price mark-up to the retail price to consumers, which, for example, is an additional 60% price increase in some markets.[60] The cost of stunning therefore makes up a very small proportion of the final consumer price. On this basis, producers of stunning equipment do not expect the method of stunning to have any impact on the consumer price of red meat.

[60] The figure quoted refers to the US market. Economic Research Service, USDA. *Beef and Pork Price Spreads Explained.*2004. pg. 5.

4. Socio-economic analysis of slaughter practices

4.1. Design of restraining and stunning/killing equipments

4.1.1. Current practices

4.1.1.1. Design of stunning/killing equipment

Article 6 of Directive 93/119/EC provides that equipments for restraining, stunning or killing animals shall be designed and constructed "to achieve rapid and effective stunning or killing"[61] but no mechanism is requested to implement it. Legal requirements are mainly provided at the national level, with little consistency between measures in different EU countries, as the survey of competent authorities from 18 Member States revealed. When asked how is it currently ensured that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment, a wide variety of answers was given, reaching from a simple "No" to a detailed list of legislative provisions (for a detailed overview by country see results of the survey of competent authorities in Annex 6). Measures listed that are implemented in various Member States include:

- Specific requirements contained in <u>national legislation/rules</u>;
- <u>Official (pre-)approval for stunning equipment and methods.</u> Relevant equipment can also be approved during the approval procedure of a slaughterhouse.
- In many cases, official veterinarians are responsible for inspecting relevant equipment and ensure that it complies with legal requirements. Some competent authorities also emphasise the importance of <u>cooperation with or consultation of the official veterinarian</u> for developing new equipments for slaughterhouses.
- For developing new methods <u>specific procedures</u> can be in place. For example, in one response it was emphasised that for "development of new methods for restraining, stunning or killing animals field tests in slaughterhouses are common. To fulfil the animal welfare requirements [...] Certificates of exemption are issued by the competent authority during scientific investigation of new methods for restraining, stunning or killing of slaughter animals in practical surrounding in slaughterhouses".[62]
- In the UK, the Department for Environment, Food and Rural Affairs (Defra) has an active <u>animal welfare R&D programme</u> which includes work to assess the pre-slaughter handling, stunning, slaughter and killing of farmed livestock to determine the efficacy of existing and novel practices, and the development of alternative or novel systems for use both inside and

[61] "Instruments, restraint and other equipment and installations used for stunning or killing must be designed, constructed, maintained and used in such a way as to achieve rapid and effective stunning or killing in accordance with the provisions of this Directive. The competent authority shall check that the instruments, restraint and other equipment used for stunning or killing comply with the above principles and shall check regularly to ensure that they are in a good state of repair and will allow the aforementioned objective to be attained." Directive 93/119/EC, Official Journal L 340, 31/12/1993 P. 0021 – 0034.

[62] German response to survey of competent authorities.

outside of slaughterhouses.[63] A significant element of this programme aims to encourage the involvement of the industry and to draw closer research initiatives and industrial stakeholders.[64]

- Finally, several competent authorities emphasise the importance of <u>information sharing initiatives</u>. For example, authorities in the Czech Republic are active in informing stakeholders about the provisions of EU legislation as well as future trends (via seminars, online publications, and web links).[65]

The current process of official oversight is criticised by some stakeholders, with a main point of criticism being that official oversight concerning both equipment and the slaughterhouse facility comes at a relatively late stage. This is the case, for example, if the approval of a slaughterhouse occurs after construction is already finalised (and not during the planning phase), or if stunning equipment is controlled when it is in use at a slaughterhouse (but there has not been a formal approval procedure before placing it on the market). This could reduce the possibility to intervene and increase the costs of changes that may be needed. The French animal welfare organisation OABA emphasised that the current control of equipment/material was not satisfactory and suggested that an official body in charge of controlling equipment/material ex-ante should be set up at the European level.[66]

One producer of stunning equipment underlined the lack of technical standardisation in the area, with standards only available for specific aspects, such as regarding electrical safety of electrical stunning equipment. Facing a variety of national requirements, equipment producers tend to design equipment to satisfy the strictest requirements, even when it is marketed to other Member States. For example, for pig gas stunning systems, this has resulted in a majority of plants in the EU following German veterinary regulations regarding stunning time.

One manufacturer reported to be actively involved with testing stunning equipment on site for animal welfare.[67] Other manufacturers only consider animal welfare by following current trends in scientific research and meeting the legal requirements in the countries in which they place installations. Changes and improvements to technology designed by equipment manufacturers have been motivated in recent years often by client requests. Slaughterhouses are in some cases motivated to make demands of the equipment producers because: (1) they themselves are under pressure from some retailers to implement higher animal welfare standards or technologies that are being perceived as having animal welfare advantages; and (2) the connection between higher-quality meat and better handling of animals is widely recognised.[68] Equipment producers recognise that with a reduction of stress of the

[63] UK response to survey of competent authorities.

[64] Many of the Defra R&D programmes are in cooperation with the University of Bristol, where many animal welfare officers and veterinary authorities receive their animal welfare training for implementation in the slaughterhouses; in this way, these employees receive up-to-date scientific information which improves their understanding and enables them to suggest technological improvements for consideration at the slaughterhouse level. There is also a LINK programme associated with the Defra R&D programme bringing together government and industry research funding; equipment producers are also very proactive in cooperating with these researchers through this programme. Source: Defra. Interview, 11 May 2007.

[65] Czech Republic response to survey of competent authorities.

[66] OABA. Interview, 07 May 2007.

[67] For example, Butina is currently involved in a full scale test in the US, in cooperation with the American Meat Institute, the University of Iowa and a customer, to test for the difference in meat quality of different pig handling methods. They are testing for both meat quality and animal welfare in this case, but in others they are also actively monitoring animal behaviour (Butina. Interview, 22 January 2007).

[68] bsi Schwarzenbek. Interview, 10 May 2007. Butina. Interview, 22 January 2007. Karl Schermer. Interview, 03 May 2007. MPS Meat Processing Systems. Interview, 24 January 2007. Verband der Fleischwirtschaft e.V. (Germany). Interview, 15 May 2007.

animals and resulting higher quality meat the technology will be more successful on the market. This has caused equipment manufacturers not only to consider animal welfare when designing their technology but also has encouraged collaboration between them and the slaughterhouses in which they install their equipment.

In case that animal welfare problems with stunning technology occur, equipment producers unanimously emphasised that those were caused by:

- Problems with the way slaughterhouses operate the technology, e.g., caused by too high throughput;
- Problem with the way the employees are trained, e.g., poor training or a lack of training due to high staff turnover; and
- Problems with proper maintenance, e.g., possible lack of regular servicing.

Although some stakeholders agreed with the analysis of problems caused by the way slaughterhouses implement stunning and killing technology, others questioned that slaughter equipment producers developed stunning technology according to animal welfare criteria.[69]

4.1.1.2. Implementation in slaughterhouses

Slaughterhouses are generally not involved in designing stunning/killing equipment, but rather use the equipment according to producer specification. For analysing the implementation of relevant technologies at the slaughterhouse level, it was therefore decided during the inception phase to broaden up the focus beyond stunning and killing equipment. Ten different design technologies were identified as having particular impacts on animal welfare in slaughterhouses where animals are still alive. Of these measures, non-slip flooring in lairages and passageways is the most implemented measure according to responses from the slaughterhouse questionnaire (listed by 64 out of 80 respondents). Sixty-two respondents to the questionnaire indicated that they have implemented non-slip flooring in the stunning area (see Figure 9 in Annex 1).

Slipping and falling for all species is an animal welfare concern as it causes stress and limits the possibility to calmly handle the animals. Non-slip flooring in lairages is required in Directive 93/119/EC, Annex A as: “floors which minimize the risk of slipping and which do not cause injury to animals in contact with them;”[70] There are no specifications for non-slip flooring in stunning boxes in Directive 93/119/EC, although FAO Guidelines for humane slaughter recommend that the stunning box should be non-slip for cattle.[71]

Of 44 respondents to the question asking which of the measures has been the most beneficial for animal welfare, non-slip flooring in lairages and passageways ranked the highest with 22 respondents (50% of respondents); the aggregated French response also selected this to be the most beneficial technology (see Figure 10 in Annex 1). In discussions with stakeholders, several also identified non-slip flooring in the stunning box as the most beneficial measure for animal welfare improvements

[69] For example, a competent authority pointed out that the main problem was that no animal welfare criteria are considered when designing slaughter equipments.

[70] Directive 93/119/EC, Official Journal L 340 , 31/12/1993 P. 0021 – 0034.

[71] FAO. *Guidelines for Humane Handling, Transport and Slaughter or Livestock.* 2001. Chapter 7.

because the animals are less stressed, less falling, damages or injuries can be observed and the work of the staff is simplified.

Other design measures that several slaughterhouses considered to be very beneficial for animal welfare were one-way flows of lairages, specific only for cattle and pigs, to prevent balking and to promote easy movements of animals. Additionally, curved passageways without any sharp angles which take advantage of animals' natural tendency to circle and will encourage natural movements along the passageways; this was identified by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) as the most important measure to be installed in slaughterhouses.[72]

Ramp inclinations were identified as an area where severe animal welfare problems have occurred at the time when animals are arriving at the slaughterhouse. Directive 93/119/EC addresses this in Annex A; "Exit or entry ramps must have the minimum possible incline."[73] Experts recommend that ramps should not have a higher inclination than 20°.[74] More than 71% of respondents to the survey indicated they use ramps with an inclination of less than 20°.

No slaughterhouses ranked noise reducers or blinders as a very significant measure for animal welfare in comparison with the other measures. Noise reducers were identified by the French animal welfare organisation OABA as one of the most beneficial design technologies for slaughterhouses to install as it renders animals less excited and implies very low installation costs.[75]

Another important design consideration is the method of restraint in order to achieve a secure and effective stun. There have been little improvements in terms of animal welfare in the restraining mechanisms for cattle in recent years compared to improvements for other species, especially pigs (see below). Some experts insist that the pen size used for captive bolt stunning of cattle (most cattle in the EU are stunned with captive bolt) continue to be too small and do not take into consideration the welfare of cattle. Too often slaughterhouses using such restraining mechanisms depend on the working speed of the personnel, and when the cattle are not restrained properly, it makes it harder for employees to work quickly and effectively and this is when mis-stuns occur.

During ritual slaughter, it is sometimes the case that a rotating casting pen is used to place cattle on their sides. In some countries, for example the Netherlands, it is legally mandatory that animals slaughtered for ritual purposes are placed on their side.[76] In other countries, for example the UK, Sweden, and Denmark, these restraining mechanisms are legally banned from use (see Table 9).[77]

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[72] Royal Society for the Prevention of Cruelty to Animals (RSPCA). Interview, 22 May 2007.

[73] Directive 93/119/EC, Official Journal L 340 , 31/12/1993 P. 0021 – 0034.

[74] Grandin, Temple. *Recommended Animal Handling Guidelines and Audit Guide.*

[75] OABA. Interview, 07 May 2007.

[76] Netherlands response to survey of competent authorities.

[77] UK response to survey of competent authorities. Swedish response to survey of national meat associations. EFSA (2004). *Welfare aspects of animal stunning and killing methods.* Page 25.

Table 9: Use of rotating casting pen as a restraint mechanism for cattle (as a percentage of all cattle slaughtered in listed Member State)

	Calves (up to 8 months)	**Adult cattle**
France*	19%	19%
Belgium	20%	3%
Spain	5%	10%
Netherlands	5%	5%
Hungary	0%	4.75%
Czech Republic, Cyprus, Denmark, Estonia, Finland, Germany, Luxembourg, Portugal, Slovenia, Sweden, United Kingdom	0%	0%

Source: Survey of competent authorities.
* Figures from OABA response to survey of animal welfare organisations.

According to the survey, rotating casting pens are in use in France, Netherlands, Belgium, Spain, and Hungary.[78] Based on the estimates provided in the table above it can be calculated that at least 480,000 calves and 980,000 adult cattle were slaughtered in rotating casting pens in 2005.[79]

Unlike the limited improvements in cattle restraints, significant welfare improvements for pigs in recent years have been identified by many stakeholders in the move from single file, individual confinement (most often associated with electrical stunning systems) towards group stunning systems (especially the group-wise systems) as it takes advantage of pigs' natural tendency to move in groups, and therefore reduces the stress on these animals when they are isolated from one another.[80] It also nearly eliminates the need for electric prods/goads and reduces the amount of coaxing of the animal necessary, thereby limiting the handling of the pigs. This also yields significant benefits for stress-free movement of the pigs.[81] For further information on restraining mechanisms used by the respondents to the survey of slaughterhouse operators (for cattle, pigs, and sheep) please see Table 14 – 16 in the Annex.

In general terms, stakeholders noted that it can take considerable time before technology that has advantages in terms of animal welfare is implemented in slaughterhouses. Reasons given included:

- Slaughterhouses do not often change their technology. When slaughterhouses choose to make an investment in the design of their plant or technology, the priority is often given to technology leading to improvements related to hygiene, throughput and other factors which improve their competitive position; rarely are they motivated by primarily animal welfare incentives.

- Slaughterhouses are often not aware that there are other or better technologies available on the market.

[78] Responses to survey of competent authorities and animal welfare organisations.

[79] Estimations calculated as a percentage of total numbers of head slaughtered in each relevant Member State. Raw data from DG Agri (2007). *Agriculture in the European Union - Statistical and economic information 2006*. Table 4.15.

[80] bsi Schwarzenbek. Interview, 10 May 2007.

[81] Royal Society for the Prevention of Cruelty to Animals (RSPCA). Interview, 22 May 2007.

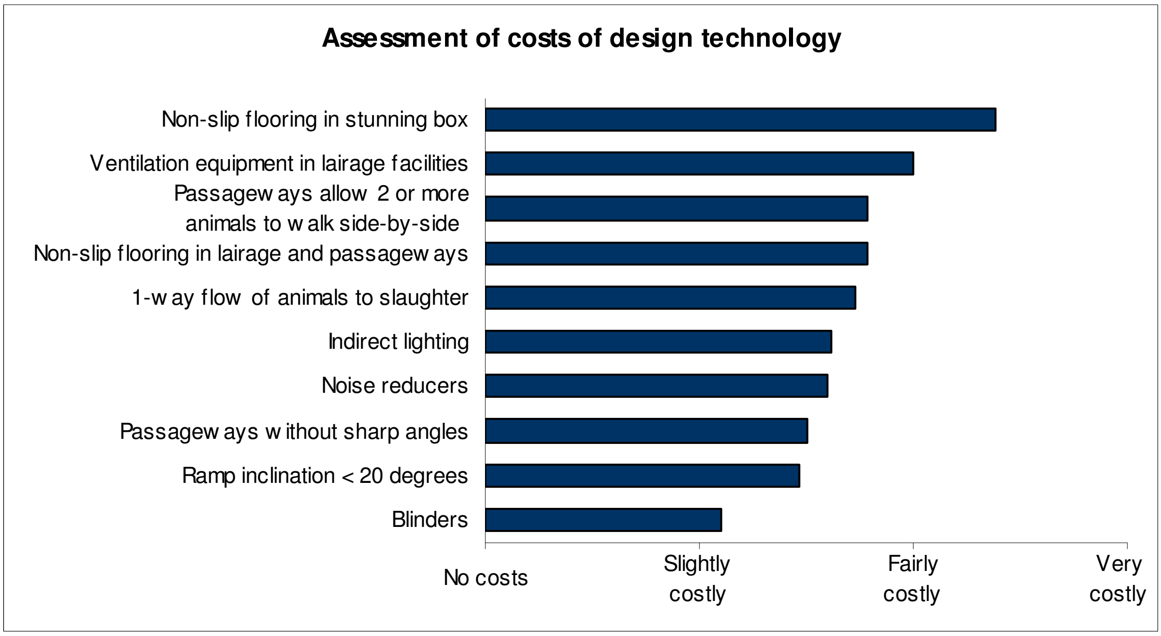
Often, the motivation for improvements in technological design of the slaughterhouse regarding animal welfare come from some retailers with an emphasis on high standards (see section 4.3).

4.1.2. Economic consequences

4.1.2.1. Consequences for operational costs and competitiveness of slaughter operation

Slaughterhouse operators were asked to assess the cost of the technology they had installed. The most costly measure was considered to be non-slip flooring in the stunning box given by 26 respondents to the questionnaire who had implemented the technology. Ventilation equipment in lairage facilities was also considered to be fairly costly by 26 respondents who had implemented this technology (51% of respondents). Many of the other measures were considered to imply only between slightly and fairly significant costs on average (see Figure 1). These costs are primarily related to investment costs, not operational costs[82]. In absolute terms, even the investment costs assessed as the most costly measure (non-slip flooring in the stunning box) cannot be considered to be very significant compared to the overall investment costs for a slaughterhouse, especially if already implemented in the construction phase.

Figure 1: Assessment of costs of technology by slaughterhouse operators



Source: Survey of slaughterhouse operators (n=varies for each technology, max. 37).

Consequently, many stakeholders identify as obstacles for slaughterhouses to implement technology with a high animal welfare standard not only a lack of resources to commit to such investment decisions but also a lack of information.

[82] With a possible exception of ventilation.

Slaughterhouse operators were asked to assess the impact on the competitiveness of their operations from the technology they identified as most beneficial for animal welfare. The majority of respondents (70%) considered that the impact of non-slip flooring in lairages and passageways had a fairly or very significantly positive impact on the competitiveness of their operations (see Figure 11 in Annex 1). None of the slaughterhouses indicated that there was a negative impact on operations when such technology was in use.

The positive impact on competitiveness indicates that investment costs for non-slip flooring are more than compensated by related gains in higher product prices due to improved meat quality. This argument seems also to hold true for some other measures that improve animal welfare: As mentioned above, demands from those retailers that have animal welfare standards were repeatedly mentioned to be a reason for technological change. For example, one slaughterhouse mentioned that a reason they would be changing from electric stunning to gas stunning of pigs by the end of 2007 was that customers in Great Britain prefer this method. A change in their systems will improve the competitiveness of their operations, as it means improved access to UK markets. This slaughterhouse also expected economic returns because of improved meat quality to compensate for the investment, despite slightly higher expected operational costs.

Obviously, there is a difference in the slaughterhouse perspective regarding design measures that are installed solely for animal welfare purposes and those that are considered to also yield benefits for meat quality, thereby indicating a possible return on investments. For example, one slaughterhouse indicated that ventilation equipment in the lairage is advantageous for animal welfare but such installations do not significantly impact meat quality[83], therefore such an investment is considered to be very costly; however, lairages designed to allow a one-way flow of animals from unloading to the point of slaughter (for cattle and pigs) is also considered to be very costly in terms of investment but is expected to yield a significant meat quality improvement, thereby decreasing the impact of the initial investment on the overall slaughterhouse economic situation.

4.1.2.2. Budgetary consequences for public authorities

No significant budgetary consequences for public authorities are expected beyond the cost for official veterinary control. Additional budgetary impacts could be expected with:

- An increasing role of public authorities in the approval of equipment and slaughterhouses. However, this would be in most cases likely to be recovered by related fees;
- An increasing role of public authorities in provision of information on best practices in animal welfare, e.g. by promoting information exchange on available technologies;
- Support to related research programmes. In the UK, the Defra research and development programme on animal welfare cost approximately £3.38 million (5.0 million EUR) in 2004/2005.[84]

[83] This is from a slaughterhouse perspective and does not imply that there is no correlation between such ventilation equipment and meat quality; there has been numerous studies documenting a relationship between cooled animals and reduced levels of PSE, for example see: Grandin, T. (2001). Livestock-handling quality assurance. *American Society of Animal Science*, *79,* E239-248.

[84] Defra (2007). *Animal Welfare: Research and Development Programme*. Retrieved from: http://www.defra.gov.uk/animalh/welfare/farmed/randd.htm. Converted at 2004/2005 average of 1 GBP = 1.47 EUR.

4.1.2.3. Consequences on specific regions or sectors

There is no evidence to suggest that there is any differential regional impact.

4.1.3. Social consequences

4.1.3.1. Consequences for meat safety and meat quality / occupational safety

Respondents to the slaughterhouse survey were also asked to assess the impact of the most beneficial technology on meat quality and occupational safety. The impact of non-slip flooring on meat quality was by a large majority of respondents (more than 80%) seen as positive, with a similar majority emphasising the positive impacts in terms of occupational safety (see Figure 12 in Annex 1).

The high correlation between slaughterhouse equipment with high animal welfare standards and meat quality was also substantiated during interviews with slaughterhouses and their national associations, animal welfare experts, and competent authorities. Such plant designs and technology aim to reduce the stress and injuries to animals and reduced stress of animals improves the meat quality in several ways. By reaching this objective, slaughterhouses can reduce physical injuries to animals (e.g., blood splashes or bruising) and meat quality problems related to stress (e.g., PSE and DFD). For a more detailed description of the relationship between animal handling and meat quality conditions, please see Annex 3.

Technology which aims to reduce physical contact with the animals will reduce bruises and blood splashes; for example, limiting the use of electric goads; non-slip flooring in lairages, passageways, and the stunning box and a gradual inclination of the ramp for off-loading will limit falling; and smooth passageways will prevent bruising. Other types of technology aim to reduce stress in animals to prevent PSE and DFD such as: ventilation equipment in lairage facilities; indirect lighting; noise reducers; blinders; limited use of electric goads; and wide passageways for sheep and pigs to walk side-by-side for as long as possible.

There is also a likely correlation between effective slaughterhouse design and technology for higher animal welfare and occupational safety, because less stressed and calmer animals are easier and safer to work with. For example, loud slaughterhouses cause animals to easily become wild and/or stuck, creating a dangerous workplace environment, especially for the handlers of large animals such as cattle.

4.1.3.2. Consequences for the protection of particular social groups

The use of rotating casting pens is relevant for Halal or Shechita slaughter methods. Rotating casting pens are restraining mechanisms often used for these methods of slaughter, particularly when these methods do not involve stunning prior to exsanguination. These restraints have been forbidden in several Member States, for example in the UK, Sweden and Denmark. In contrast, e.g. in the Netherlands a rotating casting pen is obligatory for slaughtering cattle without previous stunning. EFSA quotes research indicating that the total number of recorded vocalisations prior to neck cutting was significantly greater in the rotating casting pen than in the ASPCA (upright) pen for slaughter of cattle in an upright position.[85] It is also reported by stakeholders that the number of animals slaughtered without prior stunning is on the rise for both cattle and sheep in several Member States (see section 3.1) for reasons that are not necessarily related to the demand of specific religious groups residing in the EU but also caused by demand from some importers in third countries and also production efficiency (e.g. running one slaughter line in place of two).

4.1.4. Environmental consequences

Research conducted in the framework of this study does not indicate significant direct environmental impacts of slaughter technology selected for animal welfare reasons.

When assessing the impact of non-slip flooring in the lairages and passageways, a majority of the respondents indicated that there would be no impact on the environment (74% of respondents) whereas the other quarter of respondents indicated a fairly to significantly positive impact on the environment (see Figure 13 in Annex 1).[86]

An indirect relationship may exist between environmental aspects and the improvement of meat quality due to better animal welfare, which may affect the quality and durability of meat. Slaughterhouses which are designed to prevent stress or physical contact with the animals may have a higher meat yield and a lower amount of meat that needs to be cut away or discarded. However, in discussions with a pig meat slaughterhouse, this aspect was not seen as particularly relevant as meat with e.g. blood splashes can be used for the production of sausages and other food products excluding the fresh meat markets. Another possible indirect impact is the relationship between animal welfare and a reduced level of stress in animals. Stressed animals may have low levels of lactic acid in the muscle tissue enabling bacterial growth in meat products.[87] Bacterial growth may cause hygienic problems and spoilage of meat (e.g., smells, colour changes), also leading to a decrease in the shelf life of meat. An FAO publication identified this as "perhaps the biggest cause for meat wastage during the production process."[88] Better animal welfare can therefore contribute to reducing spoiled meat, limiting the amount of waste possibly released into the environment and increasing the efficiency of meat production.

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[85] The number of vocalisations quoted are for the Weinberg pen 4.6 ± 6.1 (means ± sd) compared to 0.3 ± 0.75 for the ASPCA pen. EFSA, *Welfare aspects of animal stunning and killing methods.* Page 25

[86] Answers to survey of slaughterhouse operators.

[87] At pH levels above 6.2 measured 24 hours after slaughter.

[88] Chambers, P., Grandin, T. (2001). *Guidelines for humane handling, transport and slaughter of livestock.* FAO Publication. Page 5.

4.2. Competence of slaughterhouse operators

4.2.1. Current practices

In relevant research, training has been identified as a important element to achieve high animal welfare standards.[89] Training of slaughterhouse staff improves the employees' attitude towards the animals and contributes to lower rates of inefficient stunning.[90] Article 7 of Council Directive 93/119/EC specifies that "No person shall engage in the movement, lairaging, restraint, slaughter or killing of animals unless he has the knowledge and skill necessary to perform the tasks humanely and efficiently, in accordance with the requirements of this Directive."[91] However, the Directive does not request a particular mechanism to implement this requirement.

4.2.1.1. Training measures

In the survey of red meat slaughterhouse operators, nearly all operators (92%)[92] answered that their employees working with live animals were systematically trained with respect to animal welfare. Relevant production steps of a slaughterhouse include: (1) unloading animals to lairage facilities; (2) handling animals from lairage to stunning facilities; (3) stunning; and (4) bleeding to hoisting. Training provided is relatively similar for all production steps both regarding the number of slaughterhouses providing training and the average duration (see Table 29 in Annex 1).

Further details on the training provided to employees is presented in the following table:

Table 10: Training requirements indicated in questionnaires

Training question	Responses	
Is this training done internally or externally?	Internally: 63	Externally: 32
Is this training with or without attestation, certification or diploma at the end of training?	With: 46	Without: 35
Is this training legally required or voluntary?	Legally: 39	Voluntary: 49
Is this training formally approved by the competent authority?	Yes: 37	No: 44

Source: Survey of slaughterhouse operators (n=varies for each question, max. 80).

Respondents indicate that there is a stronger emphasis on internal training of employees (80% of respondents), and 16 of these slaughterhouses marked that they provide both internal and external training to their employees. According to the majority of respondents, employees working with live animals receive a certificate, attestation, or diploma. However, the majority of responding slaughterhouses states that the training provided is not formally approved by the competent authority

[89] Grandin, Temple. *Recommended Animal Handling Guidelines and Audit Guide for Cattle, Pigs, and Sheep (2005 Edition),* 2005. American Meat Institute Foundation.

[90] As reported by EFSA, *Welfare aspects of animal stunning and killing methods.* Page 26 and 94.

[91] Council Directive 93/119/EC of 22 December 1993 on the protection of animals at the time of slaughter or killing. OJ L 340, 31/12/1993 P. 0021 – 0034.

[92] n=82.

(56% of respondents). The training is mainly provided on a voluntary basis (61% of respondents), including 7 responding slaughterhouses which provide voluntary training in addition to training provided to comply with legal requirements.

In some cases, equipment producers are involved in training the employees with new equipment, also with respect to animal welfare. Equipment producers cited primarily business and financial motivations, because trained slaughterhouse operators aware of animal welfare are important for a good stunning result as well as high meat quality.

4.2.1.2. Requirements of competent authorities / legal requirements

Article 7 of Council Directive 93/119/EC also defines the responsibility for the competent authority: "The competent authority shall ensure that persons employed for slaughtering possess the necessary skill, ability, and professional knowledge." The survey of competent authorities provides data on current practices in 18 EU MS (see detailed table in Annex 6: Results of surveys) to implement this requirement. Main results are:

- According to competent authorities, a common approach is training on the job, i.e. practical training by other employees. This was emphasised from the competent authorities in Belgium, Poland, Denmark and Finland. In some cases the industry also arranges training courses for employees (e.g. in Denmark).

- Training provided by or arranged in cooperation with the veterinary authority or another designated body is reported from Hungary, Slovenia and Estonia. In some cases, competent authorities approve or supervise "manuals" / training plans of slaughterhouses, such as in Italy and Spain.

- A legal measure implemented in some MS is to require a license or certification for employees working with live animals. This is true, for example in Poland, UK, and Germany. On the other hand, the majority of MS do not report licensing or certification requirements. In those countries where it was indicated that employees need a certificate or license, the emphasis placed on animal welfare to receive such documentation may differ.

- Supervision of competence of employees by official veterinarians or other officials was pointed out in many cases, such as in the replies from authorities in Luxembourg, Sweden, Denmark, Germany[93], Estonia, the Netherlands and Finland.

- Other measures to ensure competence include record keeping requirements. For example, in the Czech Republic, slaughterhouse operators are required to keep a record of the professional competence of persons carrying out activities related to slaughtering of animals and these records are to be kept for 3 years after the person is no longer employed in this area.

In summary, there are a variety of practices and requirements existing in Member States that aim at ensuring that slaughterhouse employees dealing with live animals are trained regarding animal welfare. In many cases the responsibility of slaughterhouse operators themselves to safeguard the competence of employees is emphasised by competent authorities. Official control is considered a relevant feature in many countries, however, its limitations are also stressed by one of the competent authorities that stated: "In large slaughterhouses during slaughter an official veterinarian is supervising

[93] Supplementary information from case-study.

the welfare handling full-time, in small slaughterhouses however the welfare supervision of official veterinarians is periodical. So in the former the welfare competence of employees can be assured reasonably, in the latter it cannot."[94]

Supervision of competence of slaughterhouse employees dealing with live animals by trained official veterinarians requires knowledge and awareness regarding animal welfare also on their side (as is required by Article 6 of Regulation (EC) No 882/2004). Some independent experts and animal welfare organisations pointed out that even where competence of employees regarding animal welfare is supervised by official veterinarians, in practice considerable problems may exist. Reasons given included that official veterinarians were not always considering animal welfare a priority, little supervision was done regarding how official veterinarians enforce related measures, and incentives for veterinarians were lacking to report welfare issues that may lead to problems with their superiors and/or the slaughterhouse.

Other factors that may contribute to an inadequate training of employees regarding handling of animals are a lack of emphasis on animal welfare in the training provided (i.e. with the emphasis being rather placed on the security of the employees and meat hygiene education). Also, the trend towards cheaper foods, driven by large retailers which have the capability to shop for the cheapest wholesale price throughout the European meat production industry, has caused slaughterhouses to cut costs where possible; this has in many cases resulted in slaughterhouses employing cheap labour, with high employee turnover and limited training provided to new employees. One stunning equipment manufacturer interviewed for the study identified a lack of staff training to be a significant source of animal welfare problems. Another manufacturer of such equipment emphasised that, though their contract specifies that they will train employees, high turnover rates of employees meant that often slaughterhouses do not continue to employ manufacturers' services in training employees. A related problem are language skills of employees, as often employees come from outside of the Member State in which the slaughterhouse operates, so that it may be difficult to effectively communicate training materials.

4.2.2. Economic consequences

4.2.2.1. Consequences for operational costs / competitiveness of operation

Training of staff regarding slaughter and animal welfare does involve some costs. For example in Germany, a 4-hour external training course provided by specialists for slaughterhouse staff costs about 200 EUR per participant for the theoretical and practical training and the exams. Internal training involves less costs. Training costs become relatively higher with a high turnover rates of employees, therefore leading to a situation that slaughterhouses with better working conditions and lower turnover of slaughtermen may have more incentives to invest in training than slaughterhouses with worse working conditions or where other factors lead to a high turnover (such as regional factors, e.g. other employers in the same region offering better salaries). This may lead to significant differences between slaughterhouses in training intensity and possibly to a positive bias in the questionnaire results, as slaughterhouses that do not care about animal welfare and training of employees may be underrepresented (see Annex 2 on methodology). However, this is not relevant when assessing the impact of training measures on production costs and on the competitiveness of operations, as only slaughterhouses that actually implement training can possibly provide an assessment in this respect. The majority of respondents (61%) considered that the impact of their training measures had no

[94] Netherlands response to survey of competent authorities.

significant impact on their production costs with a minority (29%) indicating that there was a fairly or very significantly positive impact on their production costs. A slight majority of slaughterhouses (46% of respondents) considered that there was no impact on the competitiveness of their operations though nearly the same number of slaughterhouses (43% of respondents) considered that there was a fairly to significantly positive impact on their competitiveness (see Figure 14 in Annex 1).

Slaughterhouse responses assess the impact of training on competitiveness of operations to be more positive than on production costs. Better animal handling (resulting from better training of employees) has a positive impact on meat quality (i.e. reduction in blood splashes, PSE, DFD, see Annex 3) which results in better quality products, which may increase meat products' competitive value on the market. There have been numerous studies that have been conducted on the economic loss related to poor meat quality for slaughterhouses. In a study conducted in 1994, it was suggested that the total loss from PSE-related problems was $1.05 per pig, of which $0.79 per pig was directly controllable by hog producers and pre-slaughter handling.[95] In 2001, it was reported that a total of $0.34 was lost on every hog in the US due to PSE, mainly from yield losses from shrinkage.[96] The US pork industry also estimated that they lose an additional $0.08 per pig due to bruises.[97]

These figures can be used for an indicative assessment of total losses to the EU meat industry due to PSE. Considering that in the EU-25 in total 238.9 million pigs were slaughtered in 2005, these figures suggest total losses to the EU meat industry due to PSE that could range from 60.5 million EUR to 140.5 million EUR (and an additional 14.2 million EUR for bruises).[98] Quiet, calm handling of slaughter hogs can reduce the incidence of carcasses with PSE muscle by 10% to 12% based on field studies conducted at two packing plants.[99] Using these figures, this would imply EU-wide economic loss reduction of 6.05 million EUR to 16.86 million EUR purely due to better handling in the slaughterhouses.

Similar gains can be had for the beef industry. US data indicates that bruises cost the US beef industry $1.00 per animal on feedlot beef and $3.91 per animal on cows and bulls.[100] 22.2 million heads of adult cattle were slaughtered in the EU in 2005 implying that bruising could lead to economic losses of between 16.5 million EUR to 64.6 million EUR.[101] Rough handling at either the slaughterhouse or the feedlot will increase bruising; bruising can occur at all phases of production, including after stunning but prior to bleeding.[102]

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[95] As reported by the Ontario Ministry of Agriculture, Food and Rural Affairs (2004). *Porcine Stress Syndrome Gene and Pork Production*. Referenced 01 June 2007 from http://www.omafra.gov.on.ca/english/livestock/swine/facts/04-053.htm

[96] Ontario Ministry of Agriculture, Food and Rural Affairs (2004).

[97] Reported by Grandin, T. (1996). *Animal Welfare in Slaughter Plants*. Referenced from: http://www.grandin.com/welfare/economic.html

[98] Figures are indicative in nature. Exchange rate at 1 USD = 0.74 EUR (June 2007). It should be noted that causes of PSE relate to slaughterhouse handling but also involve genetics, handling on the farm and during transport, and weight of the animal. Additionally, it is problematic to use US figures for European market estimates as production standards could vary. However, no similar EU figures were available. Results have therefore to be interpreted with care.

[99] Reported by Belk, K.E., Scanga, J.A., Smith, G.C., and Grandin, T (2002). *The Relationship between Good Handling / Stunning and Meat Quality in Beef, Pork, and Lamb.* Referenced from: http://www.grandin.com/meat/hand.stun.relate.quality.html

[100] Reported by Grandin, T. (1996). *Animal Welfare in Slaughter Plants*. Referenced from: http://www.grandin.com/welfare/economic.html

[101] Depending on the composition of steers and heifers and cows and bulls in the total numbers of adult cattle slaughtered in the EU.

[102] Reported by Grandin, T. (2000). *Livestock Conservation Institute*. Referenced from: http://www.grandin.com/references/LCIbruise.html

4.2.2.2. Budgetary consequences for public authorities

No significant budgetary consequences for public authorities are expected beyond the cost for official veterinary control. Additional budgetary impacts could be expected with an increasing role of public authorities in the training and/or certification of employees at the slaughterhouse level. However, this would likely be in most cases recovered by related fees, as it is already currently the case in Member States such as Germany (regarding certification of employees).

4.2.2.3. Consequences on specific regions or sectors

There is no evidence to suggest that there is any differential regional impact.

4.2.3. Social consequences

4.2.3.1. Consequences for meat safety and meat quality / occupational safety

A very large majority of respondents to the slaughterhouse questionnaire reported very or fairly significant positive impacts of training on meat quality and occupational safety, 74% and 73% respectively (see Figure 15 in Annex 1).

The relationship between training measures and meat quality has already been discussed above in detail. There is also a likely correlation between training measures and occupational safety, because better trained personnel may lead to less stressed and calmer animals, that are easier and safer to work with. Put the other way, if animals are prone to become wild or stuck when they are stressed, this may create a dangerous workplace environment, especially for the handlers of large animals such as cattle.

4.2.3.2. Protection of particular social groups

There are no foreseen consequences for the protection of particular social groups.

4.2.4. Environmental consequences

The majority of respondents to the slaughterhouse survey assessed a neutral impact on the environment when they implemented training measures, though 15 slaughterhouses (32%) assessed that there was a fairly significantly positive to very significantly positive impact on the environment (see Figure 16 in Annex 1). Research conducted in the framework of this study does not indicate significant direct environmental impacts of training measures implemented in slaughterhouses. Indirect impacts are possible and are discussed above in section 4.1.4.

4.3. Animal welfare operational procedures

4.3.1. Current practices

Directive 93/119/EC does not require slaughterhouse operators to apply particular methods to verify that animal welfare rules are implemented in their establishments. However, in the framework of their internal quality policy, some slaughterhouse operators do implement operational procedures in order to ensure that EU animal welfare rules and related technical parameters are subject to regular monitoring and correct implementation. This section analyses:

- Which point of reference for "good animal welfare practices" is commonly used;
- Who audits animal welfare measures taken; and
- What types of operational procedures relevant for animal welfare are applied.

4.3.1.1. Point of reference for "good animal welfare practices"

Many slaughterhouse operators use more than one point of reference when implementing animal welfare operational procedures (for the full list, see Table 18 in Annex 1). Slaughterhouses marked on average 3 different points of reference for their "good animal welfare" practices. National legislation was the leading point of reference for red meat slaughterhouse operators (87% of respondents). Requirements of clients also ranked highly, with about 70% of respondents marking this option. This corresponds with the information provided in interviews with equipment producers and other stakeholders that a client driven market demand for higher animal welfare standards exists to a certain extent. An example of this is the animal welfare audit program begun by McDonalds in 1999.[103] Several slaughterhouse operators specified that the McDonald's code of conduct was their point of reference. Other notable examples for retailers which have set animal welfare standards for their supply chain given by stakeholders include TESCO, KFC, Marks and Spencer.

According to the survey data, slaughterhouse operators seemingly also often have their own company code of good practice, with 61% of responding operators marking that they define their own good animal welfare practices.

4.3.1.2. Outside parties that perform a specific audit regarding animal welfare

All slaughterhouses indicated that they are monitored by outside parties at least on occasion regarding animal welfare and many indicated that they were monitored in the course of a year by several different kinds of auditors. Nearly all slaughterhouse operators are audited by a veterinary authority regarding animal welfare. Many commented that veterinary authorities are always available on their premises performing veterinary control, meat inspection, and also monitoring for animal welfare (see Table 19 in Annex 1). Clients also seem to be active to a significant degree in monitoring slaughterhouses for animal welfare; another indication that retail driven demand for animal welfare standards is a significant factor.

[103] McDonald's. 2006 Worldwide Corporate Responsibility Report (2006). pg. 37.

4.3.1.3. Operational procedures relevant for animal welfare

Maintenance of stunning equipment

One of the main causes for poor stunning is inadequate maintenance of stunning equipment.[104] Equipment producers assert that problems that may occur during the stunning process are generally not caused by the design of the equipment but by poor maintenance resulting in malfunctions or a high resistance leading to an insufficient electrical current.

Results from the survey of slaughterhouse operators, however, do not indicate that equipment is ineffectually cleaned or maintained in those slaughterhouses that provided data. All slaughterhouses responded that they keep a regular cleaning schedule for stunning equipment and all but two slaughterhouses responded that they keep a regular maintenance schedule. A strong majority of the slaughterhouse operators clean their equipment daily (82% of respondents) while 6 slaughterhouse operators indicated that they cleaned their equipment hourly.[105] A majority of slaughterhouse operators (57%) maintain their equipment daily while a significant portion indicated they maintain their equipment only weekly (35%). A few respondents, however, indicated that they only maintain their equipment monthly (5 respondents) and 3 respondents maintain their equipment quarterly.[106]

Operational procedures for animal welfare

The degree to which specific operational measures / procedures for animal welfare are implemented differs by country (for an example of the degree to which implementation varies in MS, see Table 20 in Annex 1. Survey results from red meat slaughterhouse operators are to a large extent in line with the answers of competent authorities; for example, installation of video equipment of the stunning/bleeding area was also assessed as being fairly uncommon (see Figure 17 in Annex 1).

These survey results suggest that many slaughterhouses returning the questionnaire implement a significant number of animal welfare operational procedures. Of the 80 red meat slaughterhouses that responded to this question, each implement on average about 7 of the above operational procedures / measures. The lowest number was a slaughterhouse that only implemented 1 procedure / measure; in contrast, two slaughterhouses recorded that they have implemented at least 10 measures.

Taken together, the results of the survey of slaughterhouse operators and of competent authorities identifies operational procedures / measures that are common in red meat slaughterhouses, namely: (1) Providing water for animals in lairages (legislative requirement in Directive 93/119/EC for animals not immediately slaughtered upon arrival); (2) Procedure to check animal on their arrival as to identify weak animals (3) Procedures for isolating / prioritising the slaughter of fragile animals; (4) Assigning an employee to be responsible for overseeing animal welfare (such as an AWO); and (5) Presence of an employee at the bleeding line to ensure that all animals have been cut properly.

A significant divergence between the survey of operators and the survey of competent authorities concerned the following measures / procedures:

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[104] Grandin, Temple (2000). *Animal Welfare during Transport and Slaughter*. Retrieved 06 March 2007 from http://www.agriculture.de/acms1/conf6/ws5atransport.htm

[105] Some respondents marked more than one cleaning schedule. Also, necessity for the frequency of cleaning can vary with the requirements of different stunning systems.

[106] Quarterly maintenance is standard for gas stunning systems.

- Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system (fairly common according to operators, however assessed as fairly or very common only by authorities from 10 of the 18 MS responding);

- Assigning an employee to be responsible for overseeing animal welfare such as an animal welfare officer (very common according to operators, however assessed as fairly or very common only by authorities from 9 of the 18 MS responding).

Explanations for the diverging views expressed in the survey of operators and the survey of competent authorities are the different countries covered by both surveys and the previously mentioned possible positive bias of the operator survey (see Annex 2: Methodology).

When slaughterhouses were asked which of the listed operational measures/procedures was most beneficial for animal welfare, respondents overwhelmingly identified the implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system (52% of respondents). The HSA reported that quality assurance schemes in the UK have made a big difference to animal welfare standards as they have extended welfare considerations to the point of slaughter.[107] The second most selected measure regarded as most beneficial was the assignment of an employee to be responsible for overseeing animal welfare (25%). This is consistent with the view of competent authorities[108] and animal welfare organisations.[109]

Plans of control for animal welfare aspects are either developed internally or are part of quality assurance schemes. These are schemes, which have been developed in the agri-food industry, setting production standards that are checked by independent auditors. Often the priority is on product quality and safety but can also include other factors such as animal welfare. Slaughterhouses need to comply with these voluntary standards and regularly undergo an audit; if compliance is satisfied, slaughterhouses will subsequently receive a certificate. Many schemes are based on an HACCP approach of definition of critical control points. For example, numerical scoring in beef and pork slaughterhouses could be conducted for: (1) Percentage of animals stunned correctly on the first attempt; (2) Percentage of animals that remain insensible; (3) Percentage of animals that do not vocalise during movement up the race and during handling and stunning; (4) Percentage of animals that do not fall or slip during handling; (5) Percentage of animals moved with no electric prod.[110] Quality assurance schemes with animal welfare aspects include, for example, the Assured British Meat (for beef and lamb), the Assured British Pigs schemes, and the British Quality Assured Pork Standard.

The second most often selected measure regarded as most beneficial by stakeholders was assigning an employee to be responsible for animal welfare. This was also emphasised by the Eurogroup for Animal Welfare as an important measure in slaughterhouses for the benefit of animal welfare.[111] In

[107] Humane Slaughter Association. Interview, 31 July 2007.

[108] Competent authorities selected as being most beneficial the implementation of a plan of control for animal welfare aspects (6 of 14 competent authorities) and 5 authorities chose the assignment of an AWO; in some responses, competent authorities expressed that these two measures would be beneficial in association with one another.

[109] An additional issue mentioned by animal welfare organisations and animal welfare experts is the current enforcement of existing legal standards concerning animal welfare. One expert emphasised that one of the most critical instruments for improving animal welfare is improving training and monitoring of local or regional authorities, as there were significant deficits in this respect. GAIA in Belgium stated that there was a serious reporting problem concerning the situation in slaughterhouses due to significant disincentives for official veterinarians to report animal welfare problems.

[110] Grandin, Temple (2006). *Animal Welfare Audits for Cattle, Pigs, and Chickens that use the HACCP Principles of Critical Control Points*. Retrieved November 2006, from http://www.grandin.com/welfare.audit.using.haccp.html

[111] Eurogroup for Animal Welfare. Interview, 06 March 2007.

some countries, it is required in national legislation that larger slaughterhouses[112], for example, have a designated animal welfare officer (AWO) on staff. AWOs are typically involved in every step from transport and delivery, to the time spent in lairage and up until the point of slaughter, and ideally also in the decision-making process concerning investment in new technology. Also, quality assurance schemes often require an AWO to be on site.

4.3.1.4. Animal welfare indicators monitored

Effectiveness of stun

Most slaughterhouses responding to the questionnaire monitored the effectiveness of the stun either after the stun (85%), after bleeding (39%), or indirectly through technical parameters (25%); in some cases slaughterhouses monitored in all three situations. The actual percentage of animals being monitored in these slaughterhouses for the effectiveness of the stun varied significantly; one slaughterhouse monitors only 0.001% of the animals. However, nearly half of the respondents (46%) indicated that they monitored all stunned animals, including indirect monitoring of technical parameters (e.g., monitoring the amperage and time of application during electrical stunning).

A majority of respondents (66%) marked that they systematically record the result of their monitoring activities regarding the effectiveness of stunning. Other parameters indicative of good animal welfare practices that are monitored in the responding slaughterhouses are presented in Figure 18 in Annex 1.

4.3.2. Economic consequences

4.3.2.1. Consequences for operational costs / competitiveness of operation

Direct costs to slaughterhouse operators may result from introducing specific operational procedures, e.g. related to staff time for developing and implementing the measure. In the survey of slaughterhouses, operators were asked to assess how costly operational measures / procedures they had already implemented had been; the results are presented in Figure 19 in Annex 1. The most costly measure was considered to be video surveillance, though this assessment was only given by 5 respondents who had implemented the procedure. Providing feed in lairages was also considered to be one of the most costly measures, with half of the respondents providing a cost estimation.

All other measures were considered by operators to only be slightly costly, including the two measures considered as most beneficial in terms of animal welfare, a quality assurance plan for animal welfare and assigning an animal welfare officer. In interviews, slaughterhouse operators pointed out that having a quality assurance plan for animal welfare was part of the overall quality management and the main input required was developing the plan at a management level (possibly with outside expertise) and training of employees accordingly. Assigning AWOs was also not considered to be a significant cost factor, as this was not the main activity of the employee and, for example if the supervisor of the lairage was chosen as AWO, the employee would anyhow be present in the live animal area. Training of AWOs and providing access for the AWO to the management also do not seem to imply significant costs. Both measures were even seen by a strong majority of slaughterhouses that had implemented the measure as having a fairly or very significantly positive impact on the competitiveness of their operations (see Figure 20 in Annex 1).

[112] In Germany, larger slaughterhouses are those slaughtering more than 50 large animal units (Großvieheinheiten) a week.

4.3.2.2. Budgetary consequences for public authorities

No budgetary consequences for public authorities are anticipated. Operational measures/procedures are in most cases voluntary and normally implemented by slaughterhouses due to quality management or client demand, rather than legislative standards. However, competent authorities are required by EU legislation "when carrying out auditing tasks, the competent authority shall take special care…to verify the food business operator's relevant records."[113] Therefore, it is likely that competent authorities have experienced increased work as they have additional records to audit.

4.3.2.3. Consequences on specific regions or sectors

There is no evidence to suggest that there is any differential regional impact.

4.3.3. Social consequences

4.3.3.1. Consequences for meat safety and meat quality / occupational safety

Respondents to the slaughterhouse survey were also asked to assess impact of the most beneficial operational measures / procedures on meat quality and occupational safety. The impact of both a quality assurance plan and the designation of an AWO was by a majority of respondents seen as positive, with a larger majority emphasising the positive impacts in terms of meat quality (see Figure 21 and Figure 22 in Annex 1).

The close relation between animal welfare operational measures / procedures and meat quality was also confirmed during interviews with slaughterhouses, national associations, animal welfare experts, and competent authorities. Operational measures and procedures aim to reduce the stress to animals and reduced stress of animals improves the meat quality in several ways (see Annex 3). For similar reasons, there is also a likely correlation between effective animal welfare operational procedures / measures and occupational safety, because calmer animals are easier and safer to work with.

4.3.3.2. Protection of particular social groups

There are no foreseen consequences for the protection of particular social groups.

4.3.4. Environmental consequences

From the slaughterhouse perspective, operators responding to the survey assess that both an animal welfare quality assurance plan (43% of respondents) and the designation of an animal welfare officer (50%) have a positive impact on the environment, while no slaughterhouse operators expect a negative impact. Research conducted in the framework of this study does not indicate significant direct environmental impacts of animal welfare operational procedures / measures. Possibly, an indirect positive relationship may exist due to the improvement of meat quality due to effective animal welfare measures, which may affect the quality and durability of meat (see section 4.1.4).

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[113] Regulation (EC) no. 854/2004, Article 4. Official Journal L 139, 30/04/2004 P. 0083 – 0127.

4.4. Use of electrical stunning or killing

4.4.1. Current practices

A number of essential requirements for electrical equipments are presently not provided by Directive 93/119/EC. Better monitoring in case of electrical stunning is particularly important as throughput is usually high and human handling limited, e.g. with automated pig stunning.

Electrical stunning of red meat species is performed either by head-only stunning or by head-to body stun involving cardiac arrest for killing. This is particularly relevant for pigs, sheep, and lambs but also for cattle (which are also stunned with an electric current, but to a lesser extent). According to the survey of slaughterhouses, about 36%-38% of pigs are slaughtered with an electric current and 93%-100% of sheep and lamb, and 5% of cattle.

The current flowing through the brain determines how quickly the unconsciousness sets in. The voltage must therefore be high enough to overcome the total electrical resistance in the pathway between the electrodes (i.e., electrode material, skin, thickness and porosity of skull, brain tissue and distance between the electrodes) such that the required amount of current can flow within the shortest possible time.[114] Good electrical contact must be maintained between the electrodes and the head/body during the stunning. The design and construction of the electrodes and the pressure applied during the initiation of the stun are important to delivering the current.[115] Poor electrode maintenance and/or contact with the head can be recognised from the burning of the skin due to the development of heat, which occurs due to increased electrical resistance.

4.4.1.1. Recording and verifying parameters during stunning/killing operations

Procedures and systems for recording parameters

Generally, when evaluating the effectiveness of stunning, the emphasis is placed on the electrical parameters (i.e. current, voltage, frequency) rather than the percentage of animals exhibiting signs of consciousness by the majority of stakeholders. Equipment producers often conduct their own studies on parameters when releasing new equipment with the help of scientists, experts and in consideration of official veterinarian requirements to ensure that animals receive an effective stun; these parameters are then recommended to slaughterhouses installing such equipment. There are, in national legislation of some MS, parameters defined that must be achieved during the stun. For example, in German legislation, slaughterhouses conducting electrical stunning must, in the first second, reach 1.3 amps per pig, 1.0 amps per sheep, goat or calf and 2.5 amps per cattle older than 6 months.[116] In other countries, for example in Poland, national legislation does not define relevant parameters and the majority of slaughterhouses then use the recommendations from equipment producers. Though the emphasis is placed on checking electrical parameters, many slaughterhouses have veterinarians, at

[114] Troeger, K. (1991). Slaughtering: Animal protection and meat quality. *Fleischwirtsch*. 71, 298-302.

[115] Sparrey, J.M., and S.B. Wotton (1997). The design of pig stunning electrodes – a review. *Meat Science*. 47, 125-133. Wotton, S.B., and M. O'Callaghan (2002). Electrical stunning of pigs: the effect of applied voltage on impedance to current flow and the operation of a fail-safe device. *Meat Science*. 60, 203-208.

[116] Tierschutzschlachtverordnung, Anlage 3.

least on occasion, checking the effectiveness of the stun.[117] Animal welfare organisations also place an emphasis on slaughterhouses adhering to defined minimum parameters rather than any form of systematic inspection of the effectiveness of the stun.[118]

According to survey results, slaughterhouses have electrical stunning equipment in use that provide a variety of signals indicating correct functioning or malfunction (see Table 21 and Table 22 in Annex 1). Most often, stunning technology is equipped with visual signals alerting the employee to a problem. 91% of pig slaughterhouses have a visual signal (18% of which also have an audio signal) and 76% of sheep and lamp slaughterhouses have a visual signal (no slaughterhouses have both an audio and visual signal), with more than half of responding slaughterhouses recording electrical parameters. In sheep and lamb electrical stunning, electrical parameters are only recorded in exceptional cases (see Table 23 in Annex 1).

Only a few slaughterhouses specified which parameters they recorded, these included: placement of electrodes; increase of amperage, voltage; duration of stun. Some national legislation requires data logging or registering of the stunning parameters; for example, larger German slaughterhouses[119] are required to record electric stunning parameters; however, one equipment manufacturer stated that also slaughterhouses that are not required to do so by legislation are buying recording equipment because it has advantages to identify quickly problems with the stunning process.

For slaughterhouses that do not systematically record electrical parameters for all stunned animals, the following sampling procedures were reported by slaughterhouses responses to the survey: 10 sheep per day; every two hours systematic recording of x-number of animals; checking of voltage twice per day; 1% of sheep; and periodical examinations according to an HACCP concept.

Procedures/systems for verifying parameters during stunning/killing operations

50% of pig slaughterhouses and 29% of sheep and lamb slaughterhouses stated that they did calibrate their stunning equipment (see Table 24 in Annex 1). A manufacturer of electrical stunning equipment estimated that less than 10% of slaughterhouses purchase stunning calibrators, primarily because they find stunning equipment to be reliable enough that calibration was not necessary. Another expert said that stunning calibration is “just not done” though in other countries, such as the UK, it was reported that this takes place more frequently (to see how frequently slaughterhouse respondents to the survey calibrate their equipment, see Table 25 in Annex 1). In some cases official veterinarians may also use stunning calibration tools to test the equipment and ensure proper functioning.

Verifying electrical parameters is a necessary procedure for both animal welfare and meat quality reasons. It is therefore in the interest of slaughterhouses to have some form of monitoring of stunning parameters because the effect of the electrical current of the stun on meat quality. However, it is reported that parameters during stunning/killing operations are not always verified properly. One animal welfare organisation considered the lack of stunning calibration to be a significant problem plaguing electrical stunning. Other persistent problems mentioned included: the equipment is very often defective; the equipment is very often not checked; equipment adjustment is not done systematically or in a sufficient manner.

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[117] Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz. Interview, 16 May 2007.

[118] Royal Society for the Prevention of Cruelty to Animals (RSPCA). Interview, 22 May 2007.

[119] Large slaughterhouses are defined as slaughterhouses stunning over 1,000 big animal units a year.

4.4.1.2. Constant current and constant voltage stunners

As stated before, effective stunning will occur when an electrical current of sufficient magnitude is passed through the brain. The total impedance in the pathway between the electrodes varies between animals depending upon the shape, size, material and cleanliness of the electrodes, tissue resistance, pressure applied during stunning and voltage used.[120] The time taken to breakdown this resistance seems to be shorter when high voltages (250 V or more) are employed, with other conditions being ideal. Nevertheless, when constant voltage stunners are used, the current starts to flow from zero to the maximum, which takes a certain amount of time depending upon the voltage. By contrast, constant current stunners are designed and constructed in such a way that they anticipate high resistance in the pathway and hence start with the maximum available voltage, which is usually in excess of 250 V. Owing to this, the target current is reached within the first few current cycles (possibly within milliseconds of the start of application) and the applied voltage may also be modulated according to the changes in the resistance. Therefore, constant current stunners are preferred to constant voltage stunners.[121]

The use of constant current stunners is becoming increasingly more common than the use of constant voltage stunners in many parts of Europe. The majority of slaughterhouses responding to our questionnaire use constant current stunners, though constant voltage stunners are still rather common (see Table 26 in Annex 1).

There is a difference in the prevalence of the use of constant current and constant voltage by species; in France, for example, the constant current stunners (electro-narcosis) represent 98% of the used techniques for sheep and 50% for pigs; for bovines, the constant current stunners are nearly not used.[122] The use of constant current stunners (electro-narcosis) is increasing in France and this evolution will further continue when/if the method is accepted and approved for ritual slaughter.[123] Pig slaughterhouses in Poland generally use constant current for electrical stunning. In many cases, larger slaughterhouses are switching to constant current stunners. One electrical equipment producer has stopped production altogether of constant voltage stunners because the effect on meat quality is significantly different from constant current stunners.

4.4.2. Economic consequences

4.4.2.1. Consequences for operational costs / competitiveness of operation

Costs of constant current and constant voltage stunners

According to a major producer of electrical stunning equipment, the price for a constant voltage transformer starts from 1,500 Euro and for a constant current transformer from about 5,000 Euro, because of the additional electronics required for the latter. For manual electric stunning this implies that there is a difference of more than 3,000 Euro in investment costs between the both systems that

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[120] Wotton, S.B., and M. O'Callaghan (2002). Electrical stunning of pigs: the effect of applied voltage on impedance to current flow and the operation of a fail-safe device. *Meat Science*. 60, 203-208.

[121] European Food Safety Authority (EFSA). (2004). *Welfare aspects of animal stunning and killing methods* - Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods (Question N° EFSA-Q-2003-093).

[122] Fédération Nationale de l'Industrie et des Commerces en Gros des Viandes. Interview, 14 May 2007.

[123] OABA. Interview, 07 May 2007.

may be especially relevant for small-scale slaughter operations.[124] However, for automatic systems, which are in general more expensive, there is according to another producer no significant price difference between the two systems. Beyond investment costs related to the two systems, there is no difference in operational costs between constant current stunners and constant voltage stunners (both are considered to be quite low or negligible for both systems).

Cost for recording/verifying electrical parameters

Costs for a system to record electrical stunning parameters were reported to start from approximately 3,500 EUR (additional to the costs for tongs and the transformer). Costs for a stunning calibration system are up to 1,000 EUR additional to other costs.

Costs for better monitoring of the stun and recording of electrical parameters as well as the use of constant current stunners as opposed to constant voltage stunners might be compensated by possible improvements in meat quality (see below) and related increased revenue of higher-quality products. However, no assessment of operators was available on whether investment costs for constant current stunners and recording units indeed paid off or not.

4.4.2.2. Budgetary consequences for public authorities

There are no budgetary consequences for public authorities to be expected.

4.4.2.3. Consequences on specific regions or sectors

There is no evidence to suggest that there is any differential regional impact.

4.4.3. Social consequences

4.4.3.1. Consequences for meat safety and meat quality

Monitoring and recording of electrical parameters as well as the use of constant current stunners as opposed to constant voltage stunners can be associated with improved meat quality as it will possibly reduce blood splash, broken bones, and PSE.

<u>Better monitoring</u> during the stunning process ensures that problems with the electrical equipment are detected earlier; otherwise it is only detected later once resulting problems with meat quality appear.

<u>Better recording</u> of electrical parameters during the stunning process also has meat quality implications. After analysing stunning records (manual tong stunning), Boosen and Roming (1993) found a uniform picture:[125] The stunning performance improved, after the personnel were advised of their mistakes. The authors conclude that record keeping is a good option for monitoring, because employees applying the stun are able to see the outcome of their modified working method. This not

[124] Not including tongs, which cost another 600-700 EUR.

[125] Boosen, M., and L. Roming (1993). Erfahrungen bei der Überwachung der Elektrobetäubung von Schlachtschweinen und der technischen Überprüfung von Betäubungseinrichtungen im Regierungsbezirk Weser-Ems. *Dtsch. Tierärztl. Wschr.* 100, 61-65.

only has implications for animal welfare, but also a direct relationship to an improvement in meat quality.

The use of constant current as opposed to constant voltage also ensures that each animal receives an appropriate current level, thereby also preventing instances of broken bones, blood splash and PSE.

However, there has been one problem identified with electrical stunning in which animal welfare and meat quality conflict. For pig stunning, low frequency stunning (around 50 Hz) induces the longest duration of unconsciousness;[126] however, it often results in blood splashes and broken bones. There is evidence that some slaughterhouses then use much higher frequency to improve the meat quality but this means that the duration of unconsciousness is shorter[127]; in such instances, there are incidences reported where animals after the stun exhibiting regular breathing patterns.[128]

4.4.3.2. Consequences for occupational safety

An insufficient electrical stun in a pig can induce immediate, excessive kicking (clonic activity) which can be quite violent; thereby making the job of the employee responsible for sticking and/or providing the emergency back-up stun dangerous.[129] With proper maintenance and cleaning of equipment, monitoring electric parameters as a preventative measure, and the use of constant current stunning equipment could be expected to lessen the frequency of mis-stuns and improve the occupational safety of employees working in the stunning and bleeding process.

4.4.3.3. Protection of particular social groups

There are no foreseen consequences for the protection of particular social groups.

4.4.4. Environmental consequences

Research conducted in the framework of this study does not indicate environmental impacts of current practices regarding the use of electrical stunning or killing. It is also unlikely that there are significant indirect environmental impacts as discussed in previous sections, as problems in the stunning process are likely to be resolved quickly with a sufficiently trained staff and quality control procedures in place.

[126] EFSA. (2004). *Welfare aspects of animal stunning and killing methods.* Page 93.

[127] EFSA. (2004). *Welfare aspects of animal stunning and killing methods.* Page 93.

[128] bsi Schwarzenbek. Interview, 10 May 2007.

[129] European Food Safety Authority (EFSA). (2004). *Welfare aspects of animal stunning and killing methods* - Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods (Question N° EFSA-Q-2003-093). Page 89, 19.

5. Conclusions

5.1. The EU red meat sector and the processing industry

Meat production

Livestock production makes up approximately one quarter of the total value of agricultural production within the EU. The EU red meat production sector has been particularly affected by health concerns in recent years due to several animal disease outbreaks (e.g., CSF in 1997 - 1998 and FMD in 2001), which depressed both production and consumption of pig meat, beef and sheep. Sheep and cattle sectors are both net importers and not self-sufficient. In contrast, the EU's pig meat sector continues to be a self-sufficient and strong sector.

Processing industry

There has been a high degree of concentration in the retail sector and vertical and horizontal consolidation of the meat chain that is influencing the processing industry. This has reinforced consolidation of slaughterhouses in many MS, resulting in larger and fewer slaughterhouses, and a strong pressure to streamline production. Price pressure in the processing industry is driven largely by consolidation in the retail sector and an increasing demand for more convenient and cheaper food; however, in recent years there has also been a demand from some large retailers for meat produced according to higher animal welfare standards. An example of this is the animal welfare audit program begun by McDonalds in 1999. Other notable examples for retailers which have set animal welfare standards for their supply chain given by stakeholders include TESCO, KFC, Marks and Spencer. According to survey results, client requirements are the second most frequently mentioned point of reference for animal welfare (quoted by 70% of respondents), with only legal standards being more frequently quoted. Both factors, the increasing price pressure and the establishment of animal welfare standards by some client have had an impact on the industry and for slaughterhouses, which have to produce according to higher animal welfare standards while in the same time cutting costs.

5.2. The competitive position of the EU red meat sector

The EU is the world's largest exporter and importer of agricultural products. However, its meat sector is relatively protected by sanitary barriers, export subsidies and protective tariffs, as well as by limited use of aid for private storage (primarily in the pig meat sector). Though efforts have been made in recent years, particularly with the implementation of the URAA, to liberalise trade and reform meat tariff structure, the sheep and especially the beef industries remain relatively highly protected; consequently, these sectors would be vulnerable to competitive pressure without this protection. Additionally, it is clear that imports increased once the URAA was fully implemented and the impact was most strongly felt in the beef sector, which became a net importer in 2002 and has since remained that way. Though pig meat imports also increased following the URAA, the pig meat sector remains strongly self-sufficient (107.6%), even without such high protection that the sheep and beef sectors enjoy.

The processing sector does not play as significant a role in the EU meat sector's competitive position on the global market in comparison to other stages of production. Higher costs in the EU for feed, labour, and land are the main factors contributing to higher costs of production in comparison to highly competitive meat producing countries such as Brazil, Chile, and Argentina. However, stricter environmental and hygiene regulations as well as additional costs associated with waste disposal also increase production costs in the EU.

The EU cattle and sheep sectors are relatively uncompetitive and are likely to be sensitive to increases in production cost. The pig sector is considered to be much more competitive. The main cost areas of concern to the industry are feed costs, costs of compliance with legislation and the cost of labour. The cost of stunning and killing is not seen as being significant in this context.

5.3. Stunning/killing methods used in the EU

The main stunning method used in the EU to slaughter *cattle* is the penetrating captive bolt. Bleeding techniques are predominantly chest sticking and cutting of two carotid arteries. There is also a certain amount of slaughter without prior stunning being conducted and this practice is increasing. Stunning and killing methods in the beef sector have not changed or improved significantly in recent years.

Stunning and killing in the *pig* sector has seen the largest changes with respect to animal welfare in recent years. For example, the introduction of gas stunning systems limits human handling of animals, which reduces stress to the pigs. Though gas stunning is increasingly introduced, electrical stunning of pigs continues to be quite common. Chest sticking is performed by the vast majority of slaughterhouses to kill pigs but neck cutting can still be found in the EU.

Sheep are predominantly slaughtered with an electrical current on the head (electronarcosis) and to a smaller extent with captive bolt (both penetrating and non-penetrating). Slaughter without prior stunning is quite prevalent for sheep and this practice varies between MS; some countries have prohibited this practice (for example, Sweden, Finland, Denmark) whereas in other countries the majority of sheep are slaughtered without prior stunning (e.g., in France, Belgium, the Netherlands). The leading killing methods are cutting of 2 carotid arteries though cutting of one artery is still common according to the survey of slaughterhouse operators.

5.4. Consequences of improved animal welfare at the slaughterhouse

Meat quality and related impact on revenue

It is well documented that animal welfare measures can lead to higher-quality meat. Better animal welfare reduces physical injuries to animals and prevents the internal release of stress hormones in the animal which have a damaging impact on meat quality. Physical injuries (e.g., blood splashes or bruising) and meat quality problems related to stress (e.g., PSE and DFD) may have two effects on slaughterhouse revenue: (1) poor meat quality can reduce the classification level of the meat and consequently the wholesale value of the meat; and (2) blood splashes or bruising must often be trimmed away, possibly resulting in lower meat yields.

Occupational safety

High animal welfare standards aim to reduce the stress to animals from the time they arrive at the slaughterhouse until slaughter. Animals are prone to become wild or stuck when they are stressed, this may create a dangerous workplace environment, especially for the handlers of large animals such as cattle. All measures that slaughterhouses take to compel animals to be less stressed and calmer will make the animals easier and safer to work with, thereby improving the occupational safety of employees working with live animals.

Environment

No direct impact was identified on the environment related to differing stunning and bleeding techniques. However, there are possible minor indirect impacts of a lack of animal welfare measures on the environment related to decreasing meat quality (see section 4.1.4).

5.5. Design of restraining and stunning/killing equipment

Article 6 of Directive 93/119/EC provides that equipments for restraining, stunning or killing animals shall be designed and constructed "to achieve rapid and effective stunning or killing" but no mechanism is requested to implement it. Legal requirements are mainly provided at the national level, with little consistency between measures in different EU countries, as the survey of competent authorities from 18 Member States revealed. The current process of official oversight is criticised by some stakeholders, with a main point of criticism being that official oversight concerning both equipment and the slaughterhouse facility comes at a relatively late stage. This is the case, for example, if the official approval of a slaughterhouse occurs after construction (and not during the planning phase), or if stunning equipment is controlled when it is in use at a slaughterhouse (but there has not been a formal approval procedure before placing it on the market). This could reduce the possibility to intervene and increase the costs of changes that may be needed.

A producer of stunning equipment underlined the lack of technical standardisation in the area, with standards only available for specific aspects, such as regarding electrical safety of electrical stunning equipment. Facing a variety of national requirements, equipment producers tend to design equipment to satisfy the strictest requirements, even when it is marketed to other Member States. Equipment producers recognise that with a reduction of stress of the animals and resulting higher quality meat the technology will be more successful on the market. This has reportedly caused equipment manufacturers not only to consider animal welfare when designing their technology but also to collaborate with slaughterhouses in which their equipment is installed. In case that animal welfare problems with stunning technology occur, equipment producers unanimously emphasised that those were caused by:

- Problems with the way slaughterhouses operate the technology, e.g., caused by too high throughput;
- Problem with the way the employees are trained, e.g., poor training or a lack of training due to high staff turnover; and
- Problems with proper maintenance, e.g., possible lack of regular servicing.

Although some stakeholders agreed with the analysis of problems caused by the way slaughterhouses implement stunning and killing technology, others questioned whether slaughter equipment producers develop stunning technology according to animal welfare criteria.

Slaughterhouses are generally not involved in designing stunning/killing equipment, but rather use the equipment according to producer specifications. Responses from the survey of slaughterhouse operators imply that certain general design features with high animal welfare considerations are prevalent in the responding slaughterhouses (e.g., gentle slopes at unloading, non-slip flooring).

Respondents overwhelmingly selected non-slip flooring in lairage and passageways as the most beneficial technology for animal welfare. This measure was identified as being beneficial for the competitiveness of operations and meat quality, and the majority identified non-slip flooring as being beneficial for occupational safety. In general terms, stakeholders noted that it can take considerable time before technology that has advantages in terms of animal welfare is implemented in slaughterhouses. Reasons given included:

- Slaughterhouses do not often change their technology. When slaughterhouses choose to make an investment in the design of their plant or technology, the priority is often given to technology leading to improvements related to hygiene, throughput and other factors which improve their competitive position; rarely are they motivated by primarily animal welfare incentives.

- Slaughterhouses are often not aware that there are other or better technologies in terms of animal welfare available on the market.

Drivers for considering animal welfare in designing slaughter equipment include national requirements, which strongly differ between MS, animal welfare standards of some retailers and a recognised relationship between animal welfare and meat quality. In consideration of the investment constraints of slaughterhouses, it is best when animal welfare decisions are taken into account *before* new slaughterhouses are constructed or modernised but it is according to stakeholders often the case that animal welfare considerations are not involved until *after* a slaughterhouse has been built or modernised.

5.6. Competence of slaughterhouse operators

In relevant research, training has been identified as an important element to achieve high animal welfare standards. Training of slaughterhouse staff improves the employees' attitude towards the animals and contributes to lower rates of inefficient stunning.

There are a variety of practices and requirements existing in Member States that aim at ensuring that slaughterhouse employees dealing with live animals are trained regarding animal welfare. In many cases the responsibility of slaughterhouse operators themselves to safeguard the competence of employees is emphasised by competent authorities. Official control is considered a valuable feature in many countries, however, this is not always the case in every MS nor in smaller slaughterhouses.

In the survey of red meat slaughterhouse operators, nearly all operators (92%) answered that their employees working with live animals were systematically trained with respect to animal welfare, with on average[130] 3.5-4 hours dedicated per employee/production stage. In some cases, equipment producers are involved in training the employees with new equipment, also with respect to animal welfare. Equipment producers cited primarily business and financial motivations, because trained slaughterhouse operators aware of animal welfare are important for a good stunning result as well as high meat quality.

However, some factors were identified that may contribute to an inadequate training of employees regarding handling of animals, including a lack of emphasis on animal welfare in the training provided (i.e. with the emphasis being rather placed on the security of the employees and meat hygiene

[130] The use of the word "average" in this report refers to the median value calculated from survey responses.

education). Also, the price pressure on the sector has in many cases resulted in slaughterhouses employing cheap labour, with high employee turnover and limited training provided to new employees. Additionally, language barriers are a significant problem for many slaughterhouses which employ non-nationals in their slaughterhouses.

There are a variety of practices and requirements existing in Member States that aim at ensuring that slaughterhouse employees dealing with live animals are trained regarding animal welfare. Although nearly all responding slaughterhouse operators answered that their employees were systematically trained with respect to animal welfare, some factors were identified that may contribute to an inadequate training of employees, such as employee turnover and language problems. There is evidence that improving animal handling could result in significant economic gains at the slaughterhouse level, due to increased revenue from higher-quality meat. Economic gains could be enough to compensate costs associated with training of employees handling animals. This is largely the view of slaughterhouse operators, with a minority indicating that there was even a positive impact of training on production costs.

5.7. Animal welfare operational procedures

Survey results from red meat slaughterhouse operators are to a large extent in line with the answers of competent authorities. Many of the slaughterhouses that participated in the survey implement a significant number of animal welfare operational procedures. Of the 80 red meat slaughterhouses that responded to this question, each implement on average about 7 of the above operational procedures / measures. The lowest number was a slaughterhouse that only implemented 1 procedure / measure; in contrast, two slaughterhouses recorded that they have implemented at least 10 measures.

The two most strongly recommended animal welfare operational procedures by nearly all stakeholders (slaughterhouses as well as competent authorities and animal welfare organisations) is the *implementation of a quality assurance scheme* with an emphasis on animal welfare and the presence of an *animal welfare officer employed by the slaughterhouse* (often quality assurance schemes require an AWO). A quality assurance scheme is highly beneficial for slaughterhouses because it not only improves meat quality (and hence, increases economic gains) but also allows selling wholesale products to a larger market segment (i.e. to those retailers demanding compliance with these schemes). Both measures were considered by operators that had implemented them on average to only be slightly costly. In interviews, slaughterhouse operators pointed out that having a quality assurance plan for animal welfare was part of the overall quality management and the main input required was developing the plan at a management level (possibly with outside expertise) and training of employees accordingly. Assigning AWOs was also not considered to be a significant cost factor, as this was not the main activity of the employee and, for example if the supervisor of the lairage was chosen as AWO, the employee would anyhow be present in the live animal area. Training of AWOs and providing access for the AWO to the management also do not seem to imply significant costs. Both measures were even seen by a majority of slaughterhouses that had implemented the measure as having a positive impact on the competitiveness of their operations, as well as on meat quality, and occupational safety.

There is a strong consensus by slaughterhouses, competent authorities and animal welfare organisations that the implementation of a quality assurance scheme with an emphasis on animal welfare and the presence of an animal welfare officer employed by the slaughterhouse are the two most beneficial operational procedures in terms of animal welfare. The costs of the measures seem to be more than compensated by potential benefits, as a large majority of slaughterhouses that have implemented the measures see an increase of competitiveness of their operations.

5.8. Relationship of production costs of slaughterhouse to the price of meat

Production costs of slaughterhouses vary according to many factors including capacity, output, the local situation, physical capital such as equipment and building materials, and labour costs. It also varies according to the type of operations, for example, costs vary depending on whether slaughterhouses specialise in one animal species or in an assortment, the degree of automation, and depending also on how specialised the products are at the wholesale level. The most expensive procedures in the slaughterhouse accrue in the post-mortem production steps; this includes all costs related to processing activities after slaughter including washing, de-hairing/de-hiding, evisceration, chilling, partitioning, trimming, packaging and labelling. The analysis of the survey of slaughterhouses conducted for this study did not reveal differences in costs between stunning methods used and between red meat species slaughtered, one reason being the significant deviation between estimates in general, possibly caused by variations in accounting practices and data availability/quality. Another reason is the limited significance of the costs of stunning compared to other production costs of a slaughterhouse. Costs representing that part of the slaughter chain where live animals are treated (until and including bleeding) are on average one fifth of the total costs for producing a carcass. The costs of stunning were on average reported to be 4.2 % of total production costs. The cost of stunning is even less relevant for the wholesale price of meat, which also includes the farm price of the animal, transportation costs, and the slaughterhouse operator's profit margin. The wholesale price does not include other costs such as costs for further processing, distribution and the price mark-up to the retail price to consumers, which, for example, is an additional 60% price increase in some markets. The cost of stunning therefore makes up a very small proportion of the final consumer price. On this basis, producers of stunning equipment do not expect the method of stunning to have any impact on the consumer price of red meat.

However, this is not meant to imply that the decisions to obtain different stunning and killing systems do not have economic consequences for slaughterhouses. The investment costs necessary to purchase these systems can be considerable.

Any voluntary change in the stunning method is unlikely to have any appreciable impact on the final consumer price for red meat. This would not necessarily be the case if change were mandated as some plants may not be suitable for conversion to e.g. gas stunning in the case of pig slaughter, or may not be of a sufficient scale to make the investment viable.

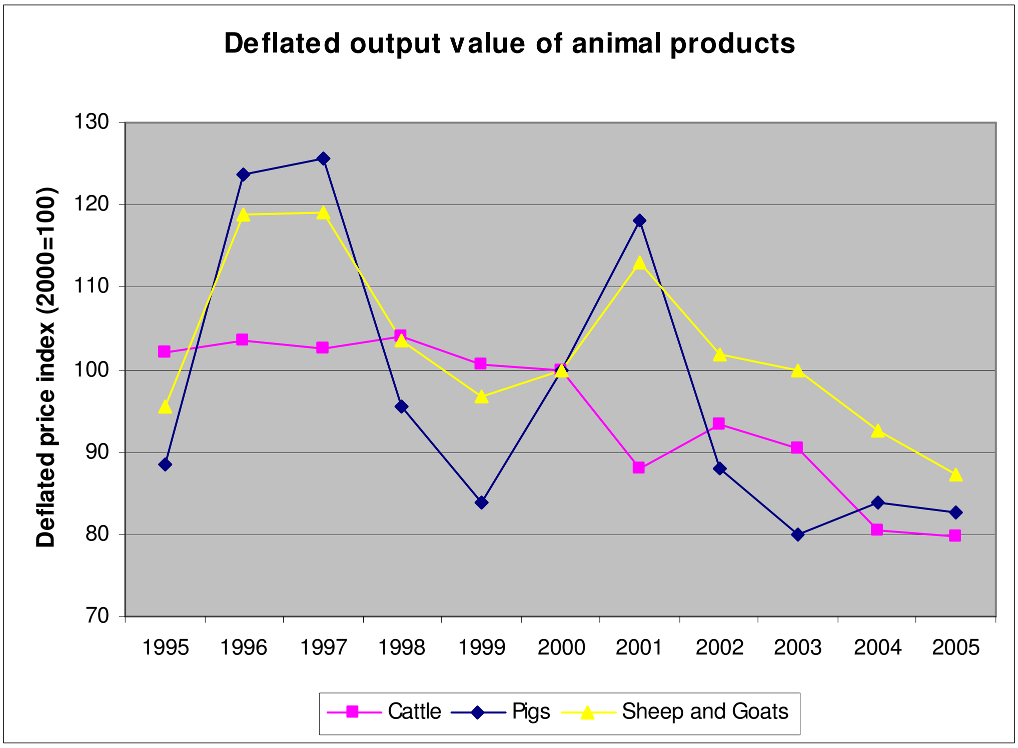
Annex 1: Supplementary figures and tables

Table 11: Gross domestic production over time (1,000 head)

	Cattle			Pigs			Sheep and goat		
	1995	**2000**	**2005**	**1995**	**2000**	**2005**	**1995**	**2000**	**2002[1]**
Belgium	1,175.1	1,051.8	921.1	11,007.8	11,316.1	10,670.7	147.5	181.3	:
Czech Rep.	641.0	:	:	5,600.7	:	:	:	:	:
Denmark	788.3	629	559.8	20,332.8	22,413.7	25,758.4	82.2	:	:
Germany	5,252.1	4,802.1	4,323.7	37,757.8	40,768.9	43,592.5	1,969.6	2,204.3	2,036.4
Estonia	187	:	:	527.0	:	:	:	:	:
Greece	276.3	:	:	2,250.7	:	:	12,009.5	:	:
Spain	1,959.1	:	:	26,661.9	:	:	22,086.9	:	:
France	7,269.1	6,816.9	6,598.1	24,541.4	26,690.4	25,917.1	8,826.1	8,178.5	7,944.8
Ireland	1,834.2	:	:	3,066.7	:	:	4,444.1		:
Italy	3,336.4	2,997.4	2,829.4	11,012.4	11,861.0	12,507.6	6,501.8	5,907.3	:
Cyprus	17.8	:	:	554.0	:	:	:	:	:
Latvia	214.7	173.4	:	738.2	400.4	:	44.0	:	:
Lithuania	614.0	547.0	:	1,080.0	968.0	:	2	:	:
Luxembourg	65.4		60.9	88.9		113.4	0	:	2.6
Hungary	310.0	54.5	:	6,116.0	6,043.9	:	:	:	:
Malta	:	:	:	:	:	:	:	:	:
Netherlands	1,931.7	:	:	24,079.7	:	:	989.3	:	:
Austria	761.4	783.6	726.4	4,930.2	5,035.6	4,711.2	278.1	422.4	391.3
Poland	:	1,573.0	:	:	22,650.0	:		:	:
Portugal	380.8	:	:	3,950.5	:	:	1,287.9	:	:
Slovenia	:	204.3	:	:	756.5	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	:
Finland	392.6	:	:	2,066.1	2,045.8	:	74.7	:	:
Sweden	532.0		:	3,743.0	:	:	188.7	:	:
UK	3,811.2	2,399.9	2,381.7	14,744.0	12,400.8	8,828.4	21,345.0	20,022.4	:

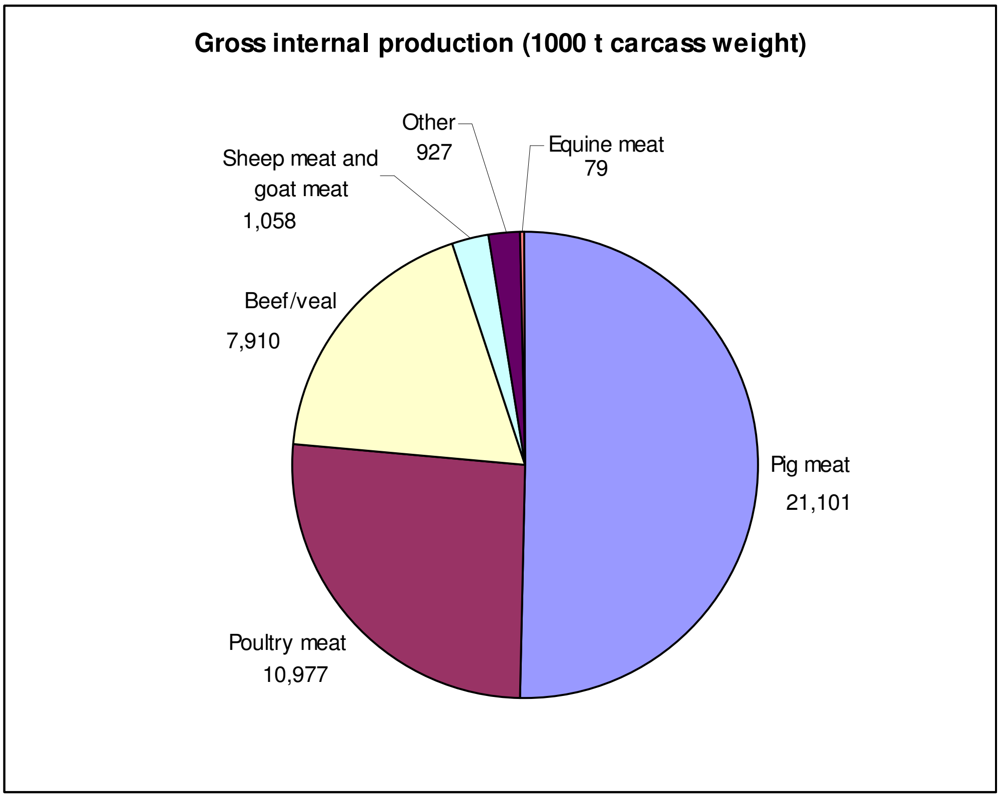
[1] Figures for 2005 were not yet available.
Source: Eurostat and DG Agriculture.

Figure 2: EU output value of animal products over time (basic prices received by the producer, without taxes)



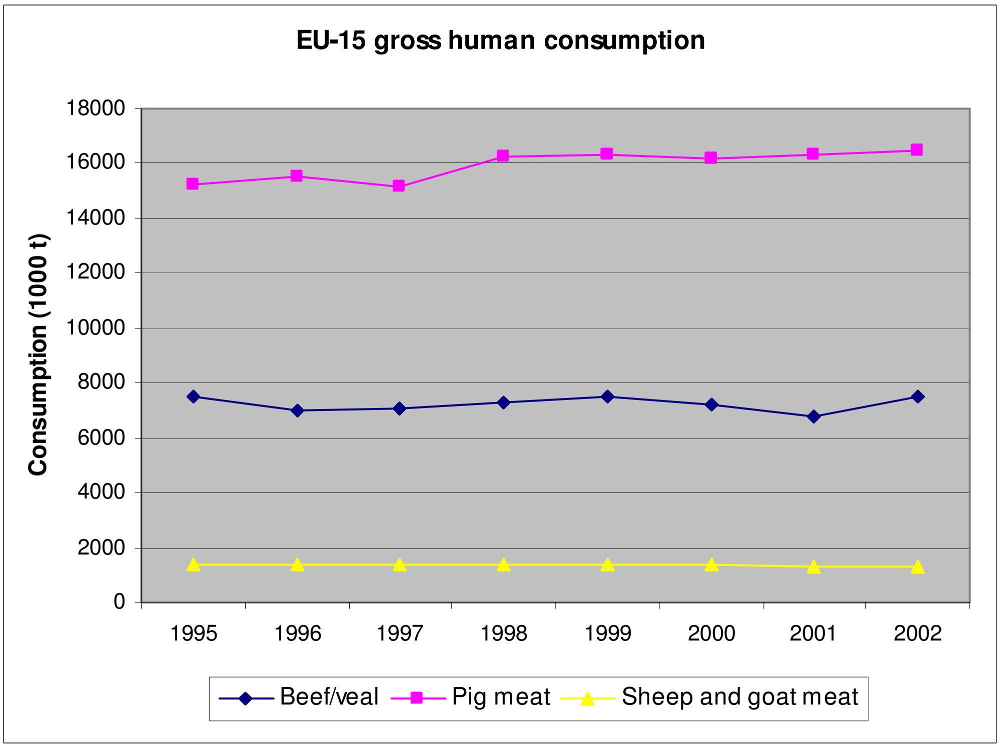
Source: Eurostat.

Figure 3: Gross internal EU production (2005)



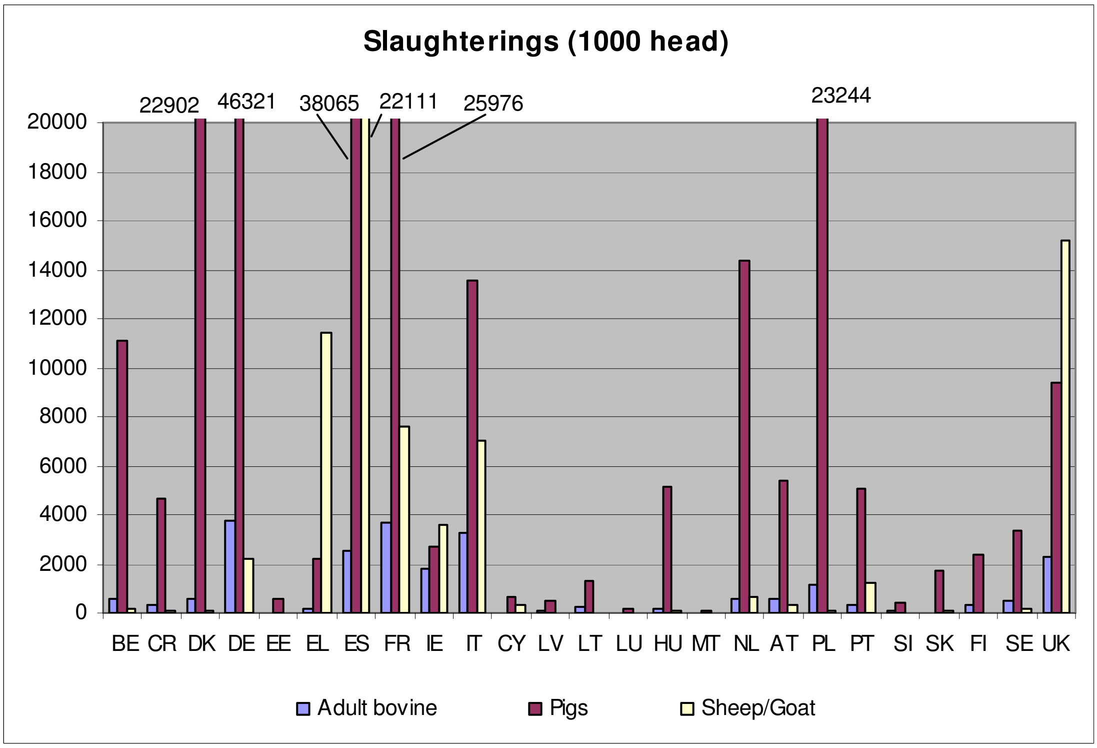
Source: DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.14.1.1.

Figure 4: Gross human consumption of red meat (1995-2002)



Source: Eurostat, Agriculture, forestry and fisheries statistics.

Figure 5: Slaughterings by MS (2004)



Source: DG Agriculture.

Table 12: Number of slaughterhouses in EU MS (survey data 2007)

Country	Red Meat (approved according to Regulation 853/2004)					Poultry (approved according to Regulation 853/2004)				Total red meat and poultry slaughterhouses	
	Cattle	Pigs	Sheep/Goats	Mixed/Other	Total red meat slaughterhouses	Chicken	Turkey	Mixed/Other	Total poultry slaughterhouses	Approved according to Regulation 853/2004	Total number officially registered
AT											5,058**
BE					23				16	39	67
CY					4				9	13	29
CZ					112				25	137	294
DE										340	5,000
DK										141	164
EE										76	76
ES					645				171	816	1,088
FI	3	14	7	57	81	4	2	23	29	39 slaughterhouses, 90 small scale	
HU					161				70	231	306
IT										495	no data
LU				3	3					3 (except poultry)	3
NL	--	--	--		249	33	0	3	36	285	285
PL										661	1,390
PT										187	187
SE*	1	5	1	75	82	11	3	10	24	21	106
SI					29				5	34	128
UK	18	13	13	268	312	62	9	36	107	419	419

*Figures for SE for each species include *total* establishments, not only just those approved according to Regulation No 853/2004.
** Number is relatively large due to a high number of small slaughterhouses.
Source: Survey of competent authorities.

Table 13: EU URAA commitments on import tariffs for cattle, pig, sheep and goat meat

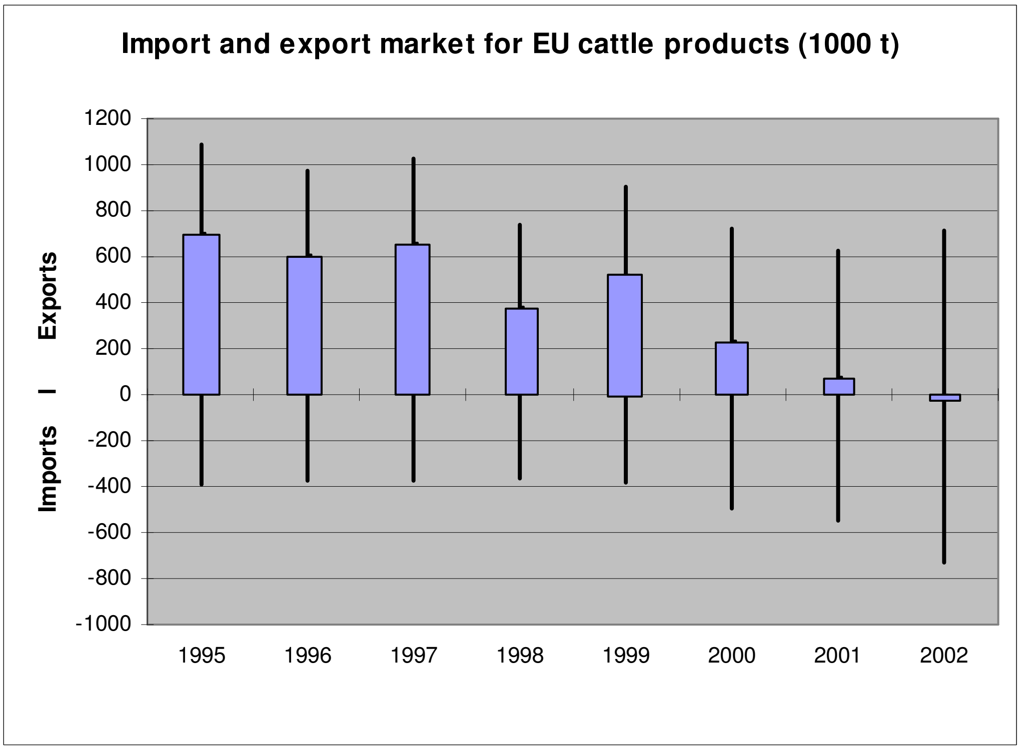
Tariff item number	Description of products	Base rate of duty	Bound rate of duty	Special Safeguard (SSG)
0201	Meat of bovine animals, fresh or chilled:			
0201.10.50	-Carcases and half-carcases	+ 2763 ECU/T	+ 1768 ECU/T	SSG
0201.20.15	--'Compensated' quarters	+ 2763 ECU/T	+ 1768 ECU/T	SSG
0201.20.35	--Unseparated or separated forequarters	+ 2210 ECU/T	+ 1414 ECU/T	SSG
0201.20.55	--Unseparated or separated hindquarters	+ 3315 ECU/T	+ 2122 ECU/T	SSG
0201.30.00	-Boneless	+ 4740 ECU/T	+ 3034 ECU/T	SSG
0202	Meat of bovine animals, frozen:			
0202.10.00	-Carcases and half-carcases	+ 2763 ECU/T	+ 1768 ECU/T	SSG
0202.20.10	--'Compensated' quarters	+ 2763 ECU/T	+ 1768 ECU/T	SSG
0202.20.30	--Unseparated or separated forequarters	+ 2210 ECU/T	+ 1414 ECU/T	SSG
0202.20.50	--Unseparated or separated hindquarters	+ 3454 ECU/T	+ 2211 ECU/T	SSG
0202.30	-Boneless:			
0202.30.10	.--Forequarters, whole or cut into a maximum of five pieces, each quarter being in a single block; 'compensated' quarters in two blocks, one of which contains the forequarter, whole or cut into a maximum of five pieces, and the other, the hindquarter, exc	+ 3454 ECU/T	+ 2211 ECU/T	SSG
0202.30.50	--Crop, chuck and blade and brisket cuts(3)	+ 3454 ECU/T	+ 2211 ECU/T	SSG
0203	Meat of swine, fresh, chilled or frozen:			
	-Fresh or chilled:			
0203.11	--Carcases and half-carcases:			
0203.11.10	---Of domestic swine	838 ECU/T	536 ECU/T	SSG
0203.12	--Hams, shoulders and cuts thereof, with bone in:			
	---Of domestic swine:			
0203.12.11	----Hams and cuts thereof	1215 ECU/T	778 ECU/T	SSG
0203.12.19	----Shoulders and cuts thereof	939 ECU/T	601 ECU/T	SSG
	---Of domestic swine:			
0203.19.11	----Fore-ends and cuts thereof	939 ECU/T	601 ECU/T	SSG

0203.19.13	----Loins and cuts thereof, with bone in	1358 ECU/T	869 ECU/T	SSG
0203.19.15	----Bellies (streaky) and cuts thereof	729 ECU/T	467 ECU/T	SSG
	-Frozen:			
0203.21	--Carcases and half-carcases:			
0203.21.10	---Of domestic swine	838 ECU/T	536 ECU/T	SSG
0203.22	--Hams, shoulders and cuts thereof, with bone in:			
	---Of domestic swine:			
0203.22.11	----Hams and cuts thereof	1215 ECU/T	778 ECU/T	SSG
0203.22.19	----Shoulders and cuts thereof	939 ECU/T	601 ECU/T	SSG
	---Of domestic swine:			
0203.29.11	----Fore-ends and cuts thereof	939 ECU/T	601 ECU/T	SSG
0203.29.13	----Loins and cuts thereof, with bone in	1358 ECU/T	869 ECU/T	SSG
0203.29.15	----Bellies (streaky) and cuts thereof	729 ECU/T	467 ECU/T	SSG
0204	Meat of sheep or goats, fresh, chilled or frozen:			
0204.10.00	-Carcases and half-carcases of lamb, fresh or chilled	+ 2677 ECU/T	+ 1713 ECU/T	SSG
0204.21.00	--Carcases and half-carcases	+ 2677 ECU/T	+ 1713 ECU/T	SSG
0204.22	--Other cuts with bone in:			
0204.22.10	---Short forequarters	+ 1874 ECU/T	+ 1199 ECU/T	SSG
0204.22.30	---Chines and/or best ends	+ 2945 ECU/T	+ 1885 ECU/T	SSG
0204.23.00	--Boneless	+ 4872 ECU/T	+ 3118 ECU/T	SSG
0204.30.00	-Carcases and half-carcases of lamb, frozen	+ 2013 ECU/T	+ 1288 ECU/T	SSG
	-Other meat of sheep, frozen:			
0204.41.00	--Carcases and half-carcases	+ 2013 ECU/T	+ 1288 ECU/T	SSG
0204.42.10	---Short forequarters	+ 1409 ECU/T	+ 902 ECU/T	SSG
0204.42.30	---Chines and/or best ends	+ 2214 ECU/T	+ 1417 ECU/T	SSG
0204.43.00	--Boneless	+ 3664 ECU/T	+ 2345 ECU/T	SSG
0204.50	-Meat of goats:			

	--Fresh or chilled:			
0204.50.11	---Carcases and half-carcases	+ 2677 ECU/T	+ 1713 ECU/T	SSG
0204.50.13	---Short forequarters	+ 1874 ECU/T	+ 1199 ECU/T	SSG
0204.50.15	---Chines and/or best ends	+ 2945 ECU/T	+ 1885 ECU/T	SSG
0204.50.19	---Legs	+ 3480 ECU/T	+ 2227 ECU/T	SSG
0204.50.31	----Cuts with bone in	+ 3480 ECU/T	+ 2227 ECU/T	SSG
0204.50.39	----Boneless cuts	+ 4872 ECU/T	+ 3118 ECU/T	SSG
	--Frozen:			
0204.50.51	---Carcases and half-carcases	+ 2013 ECU/T	+ 1288 ECU/T	SSG
0204.50.53	---Short forequarters	+ 1409 ECU/T	+ 902 ECU/T	SSG
0204.50.55	---Chines and/or best ends	+ 2214 ECU/T	+ 1417 ECU/T	SSG
0204.50.59	---Legs	+ 2617 ECU/T	+ 1675 ECU/T	SSG
0204.50.71	----Cuts with bone in	+ 2617 ECU/T	+ 1675 ECU/T	SSG
0204.50.79	----Boneless cuts	+ 3664 ECU/T	+ 2345 ECU/T	SSG

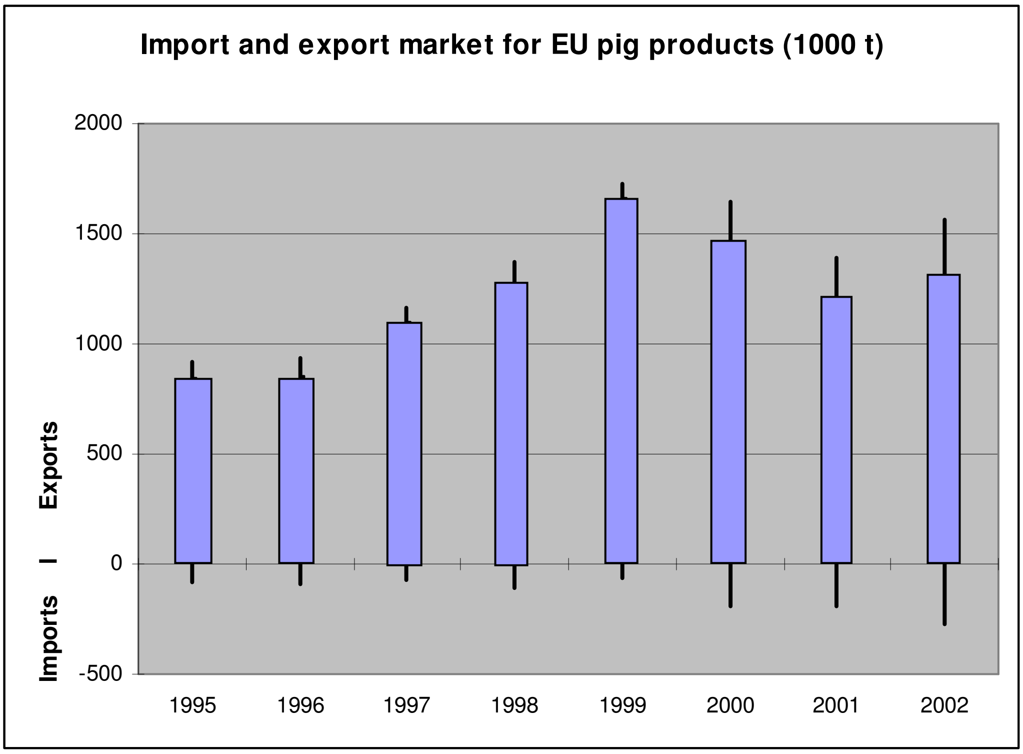
Source: European Communities Schedules for the Uruguay Round of Multilateral Trade Negotiations, GATT, 1994.

Figure 6: Net exports for EU-15 cattle meat products



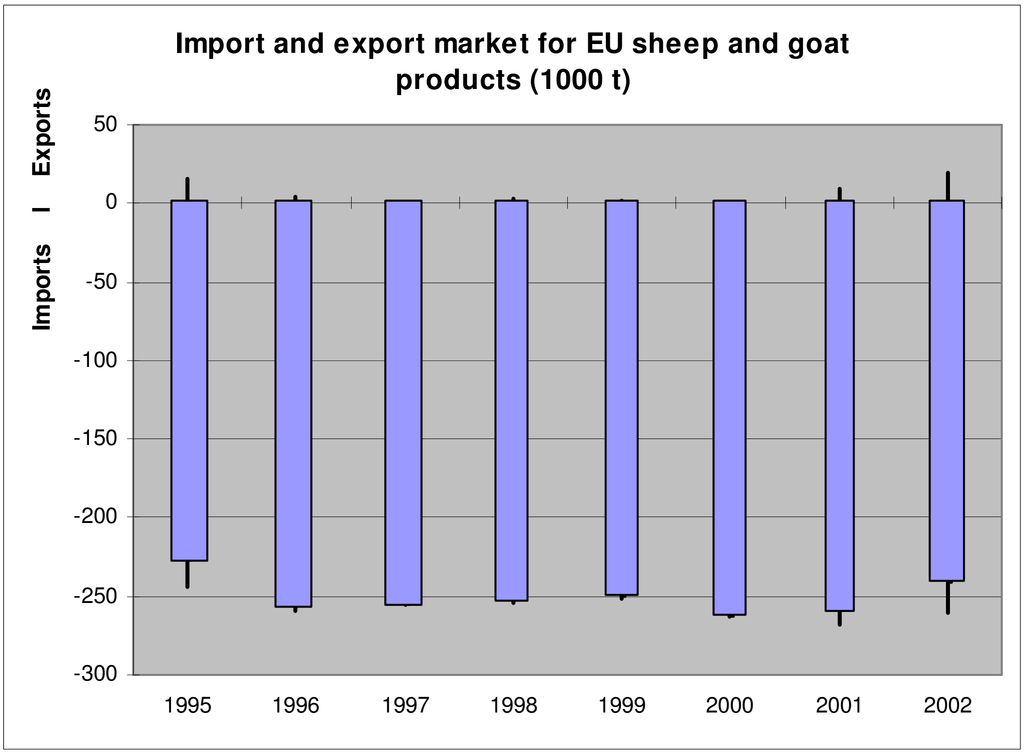
Boxes in the graph indicate net exports and the black line indicates spread between gross exports and imports
Source: Eurostat.

Figure 7: Net exports for EU-15 pig meat products



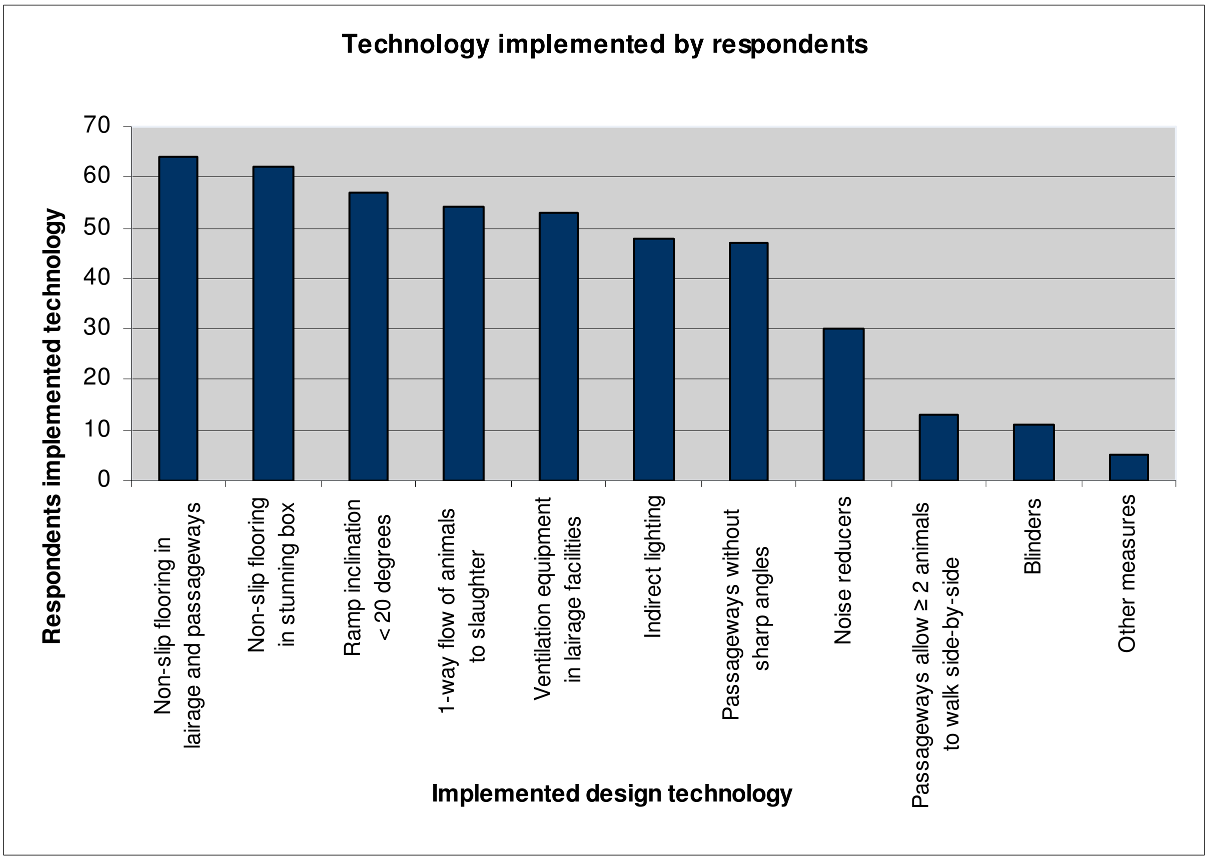
Boxes in the graph indicate net exports and the black line indicates spread between gross exports and imports
Source: Eurostat.

Figure 8: Net exports for EU-15 sheep and goat products



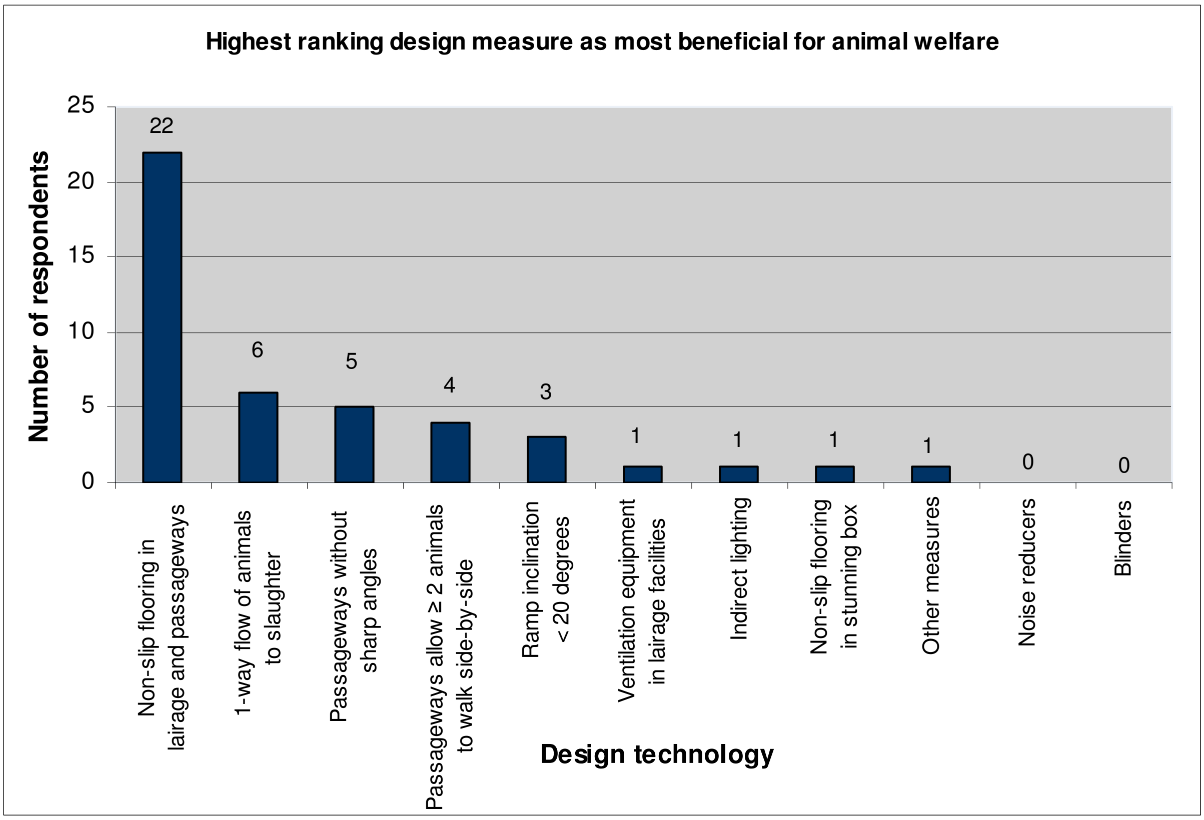
Boxes in the graph indicate net exports and the black line indicates spread between gross exports and imports.
Source: Eurostat.

Figure 9: Technologies implemented by respondents



Source: Survey of slaughterhouse operators (n=80).
Note: "Lairage: one-way flow of animals" is relevant only for cattle and pigs;
"Wide passageways" are relevant only for sheep and pigs. Additional measures implemented by slaughterhouses includes: passageways and races have solid sides (except when there is a double race), upright restraints only, max 10 degree slope at loading/unloading, and exclusive use of non-electric prodding/driver tools.

Figure 10: Highest ranking design measures as most beneficial for animal welfare



Source: Survey of slaughterhouse operators (n=44).

Table 14: Restraining mechanisms for cattle

	Calves (up to 8 months)	**Adult cattle**
Individual stunning box (no head restraint)	7	13
Individual stunning box (with head restraint)	15	29
Other	0	0

Source: Survey of slaughterhouse operators (n=43).

Table 15: Restraining mechanisms for pigs

	Adult pigs (up to 150 kg LW)	**Adult pigs** (more than 150 kg LW)
Group stunning pen (electric)	3	2
Group stunning pen (gas crate)	12	6
Individual confinement (no conveyer)	7	5
Individual confinement (with automated conveyer)	3	0
Other	1	1

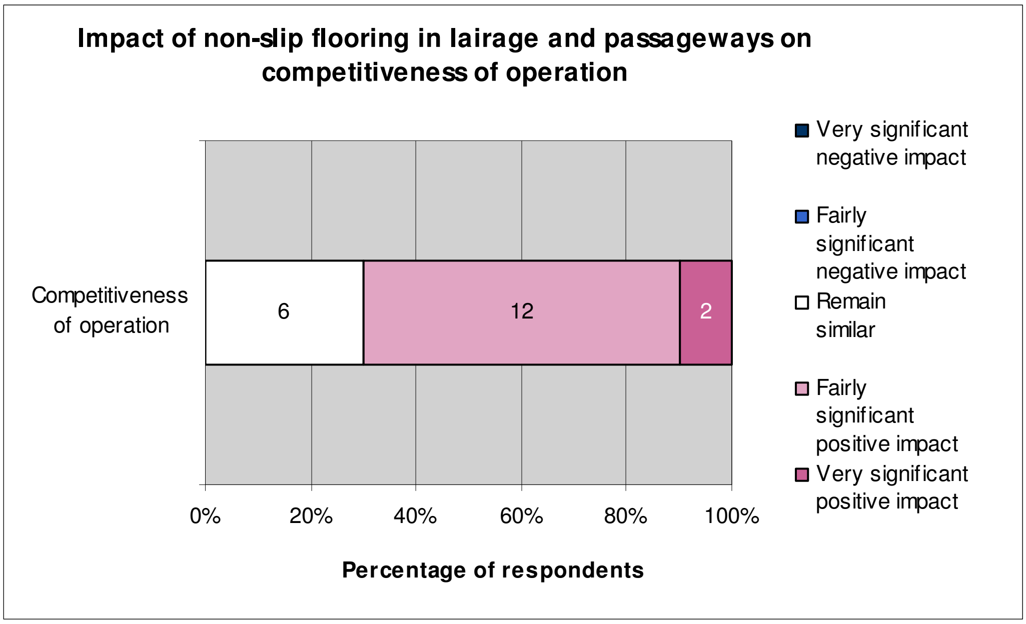
Source: Survey of slaughterhouse operators (n=25).

Table 16: Restraining mechanisms for sheep and lambs

	Lamb	Adult sheep
Group stunning pen (no restraint)	5	5
Individual confinement (without conveyer)	2	2
Individual confinement (with automated conveyer)	7	5
Other	2	1

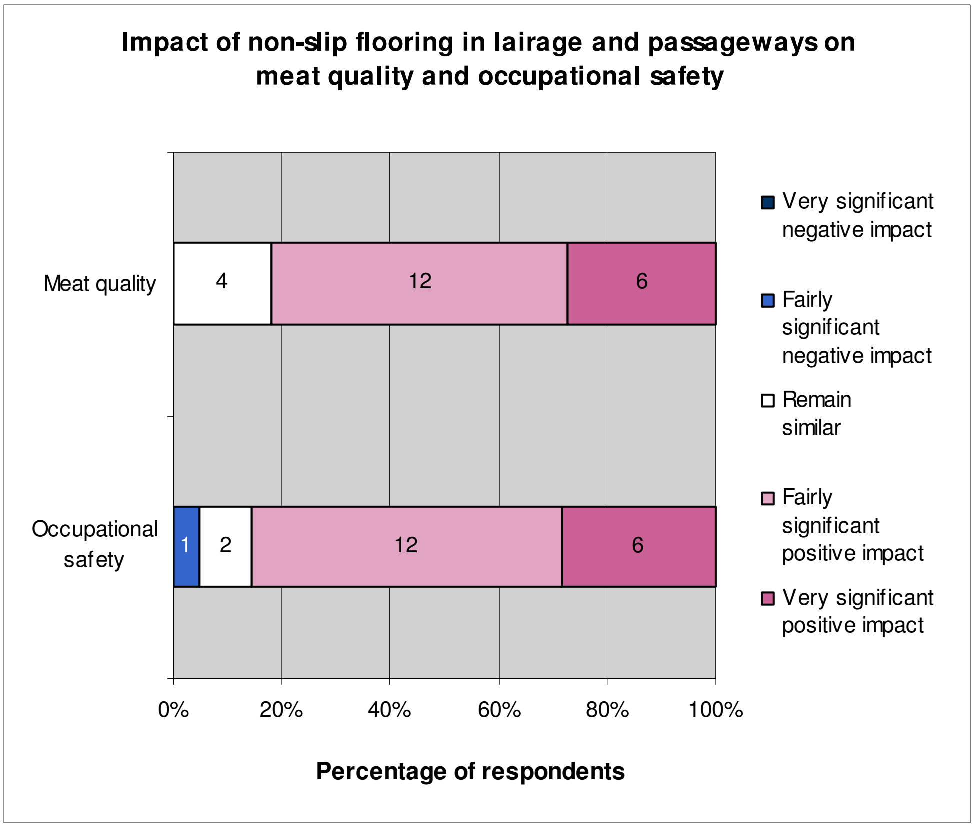
Source: Survey of slaughterhouse operators (n=16). Note: "Other" methods of restraint were identified by one slaughterhouse as group stunning without a box and another with an automated conveyer but the animals are entering the stunner without interruption (both in Spain).

Figure 11: Assessment of non-slip flooring in lairages and passageways on competitiveness of slaughterhouse operations



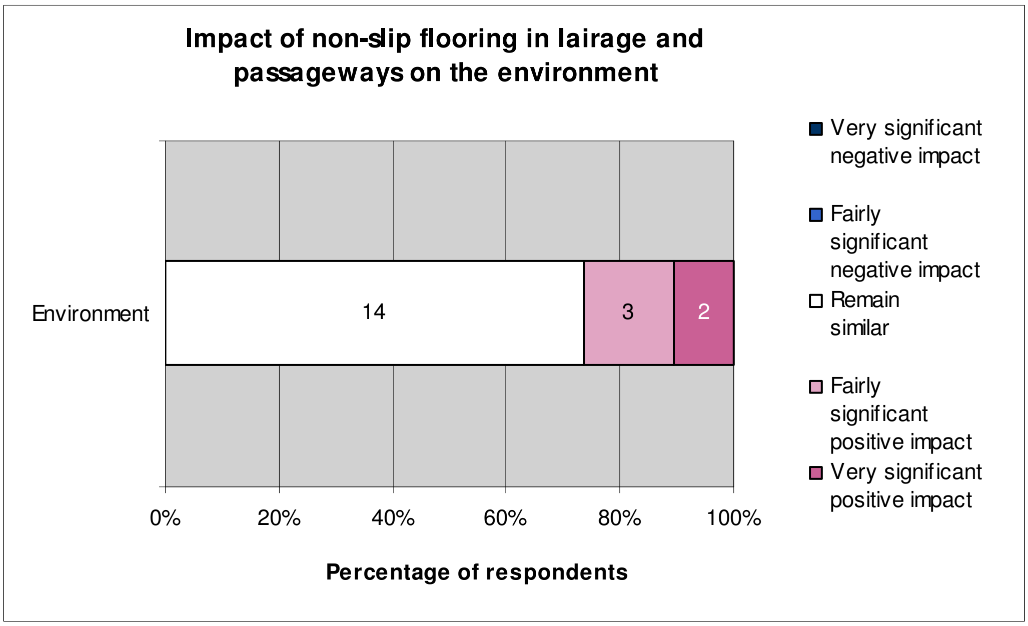
Source: Survey of slaughterhouse operators (n=20).

Figure 12: Assessment of impact of non-slip flooring



Source: Survey of slaughterhouse operators (meat quality: n=22, occupational safety: n=21).

Figure 13: Assessment of non-slip flooring in passageways and lairages by slaughterhouse operators



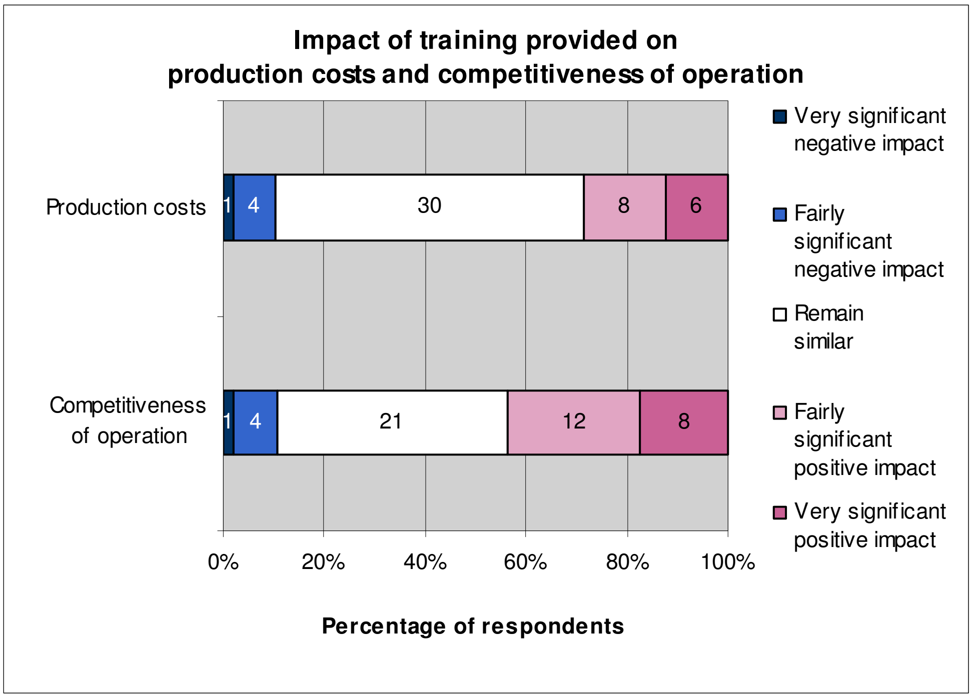
Source: Survey of slaughterhouse operators (n=19).

Table 17: Slaughterhouse training in different production stages for animal welfare

Production stage	Slaughterhouses providing training	Slaughterhouses did not indicate training	Average hours dedicated[131]
Unloading animals to lairage facilities	50	5	3.5
Handling animals from lairage to stunning facilities	49	6	3.5
Stunning	52	3	4
Bleeding to hoisting	47	8	4

Source: Survey of slaughterhouse operators (n=53).

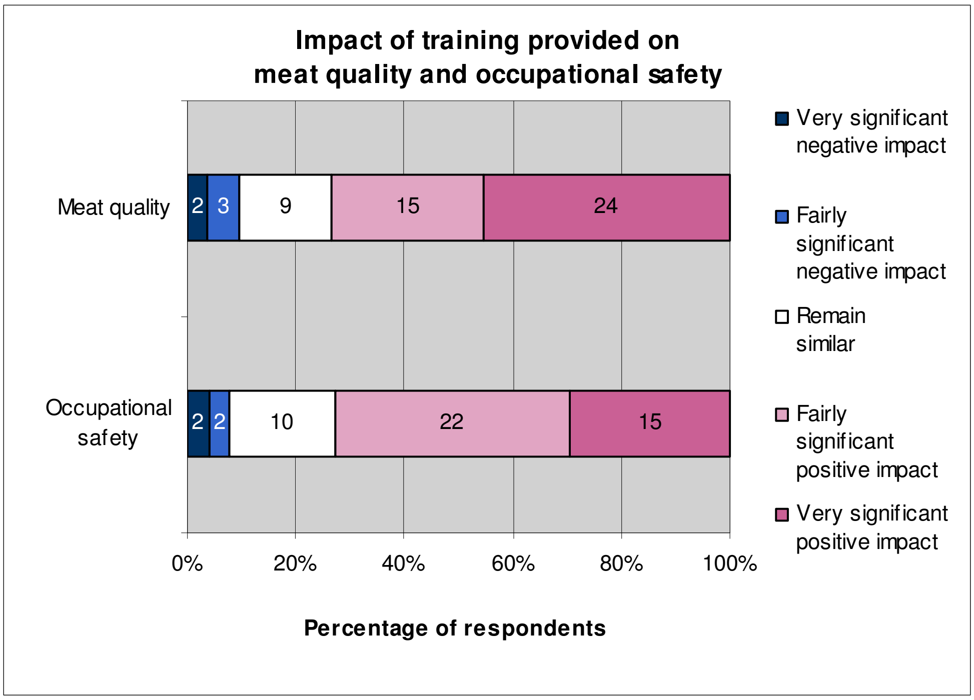
Figure 14: Assessment of training on competitiveness of slaughterhouse operations and production costs



Source: Survey of slaughterhouse operators (production costs: n=49, competitiveness: n= 46).

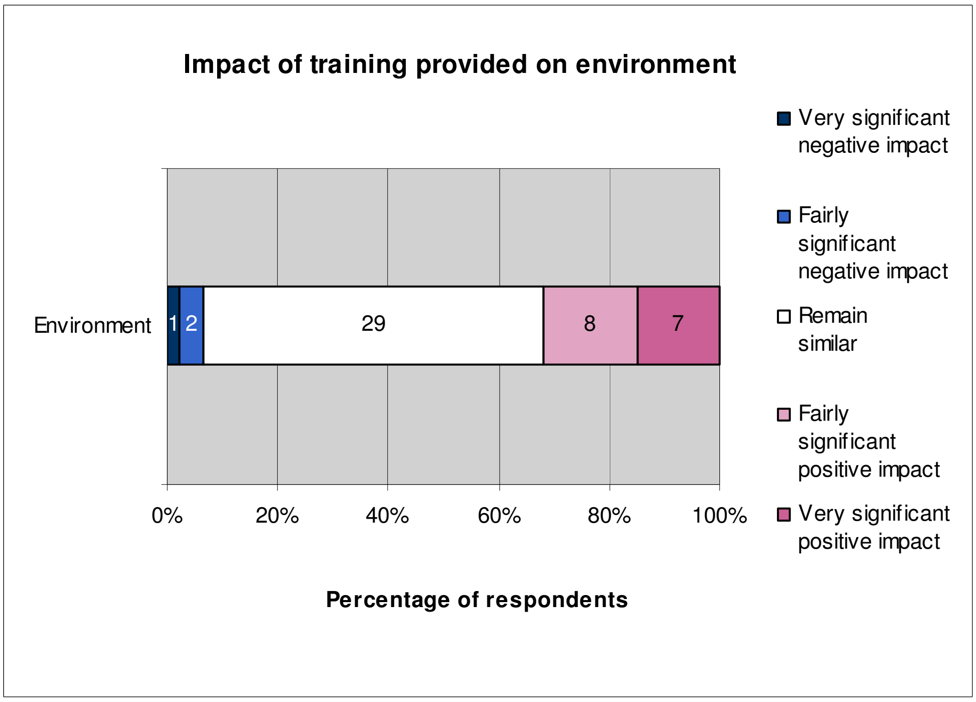
[131] The use of the word "average" in this section refers to the median value calculated for estimations of hours of training.

Figure 15: Assessment of training measures implemented by slaughterhouse operators



Source: Survey of slaughterhouse operators (meat quality: n=53, occupational safety: n=51).

Figure 16: Assessment of training on the environment



Source: Survey of slaughterhouse operators (n=47).

Table 18: Points of reference used by slaughterhouse operators for good animal welfare practices

Point of reference for "good animal welfare" practices	Number of respondents that use as point of reference
National legislation	47
Requirements of clients	38
Own company code of good practice	33
Code of good practice of national association of slaughterhouses or other relevant national body	14
Equipment manufacturers' recommendations	13
Animal welfare organisation code of practice	10
Code of good practice of European association of slaughterhouses or other European/international body	9
Other	0

Source: Survey of slaughterhouse operators (n=54).

Table 19: Outside audits in EU slaughterhouses each year

Outside parties that perform a specific audit regarding animal welfare	Number of respondents
Veterinary authority	49
Clients	42
Independent auditor	29
Animal welfare groups	9
Other	4

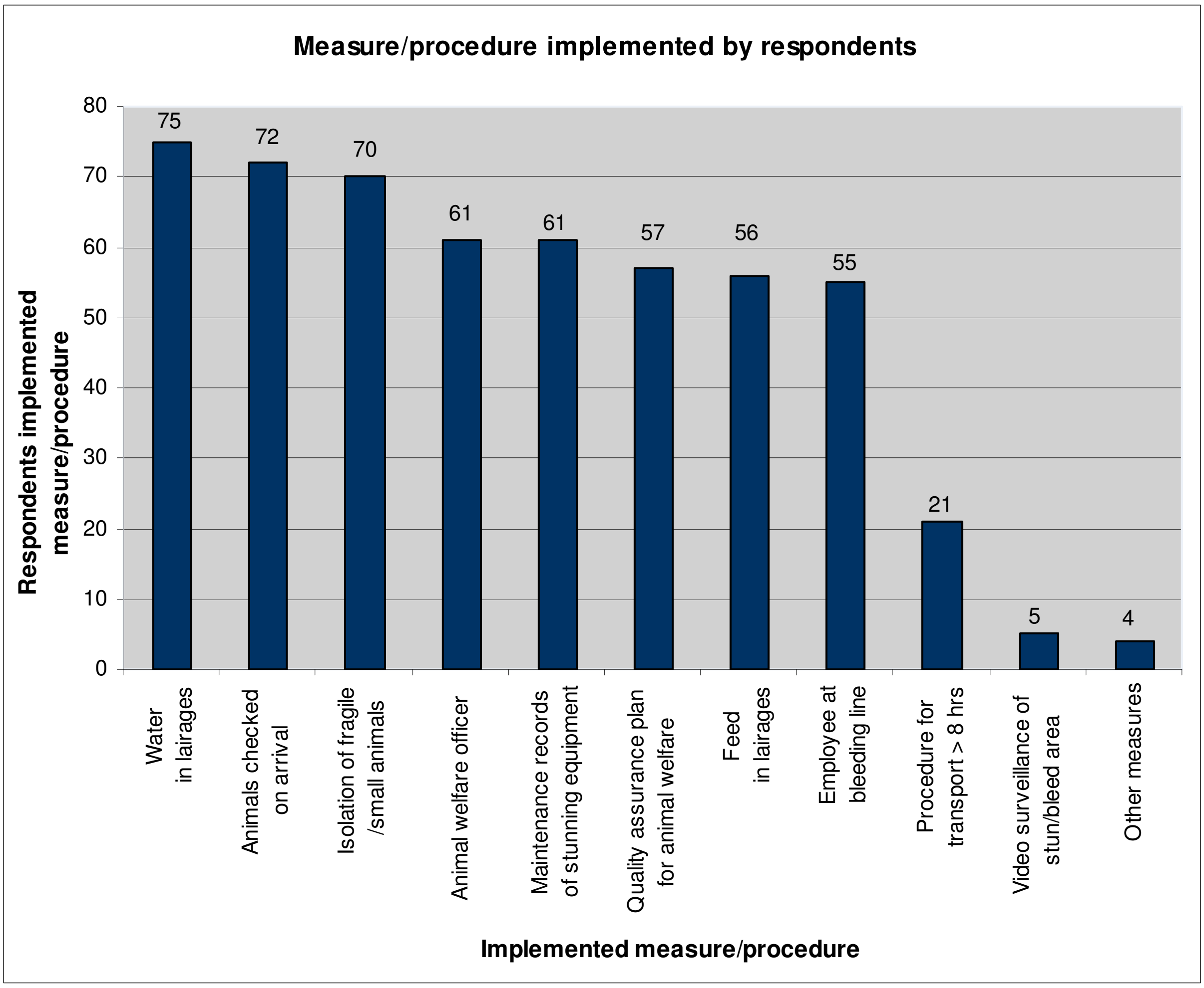
Source: Survey of slaughterhouse operators (n=55).

Table 20: Competent authorities' assessment of common operational measures/procedures

Operational measures / procedures	Degree to which measure is commonly in use				
	not common at all	fairly uncommon	fairly common	very common	don't know
Providing water to animals in lairages				LU, BE, AT, SI, EE, NL, PT, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Procedures for isolating/prioritising the slaughter of fragile animals			EE, PT	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Procedure to check animals on their arrival as to identify weak animals			EE, PT, ES	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, UK	
Keeping maintenance records of stunning equipment		BE, ES	LU, EE, NL, HU, SE	AT, SI, PT, FI, CY, PL, CZ, DK, DE, IT, UK	
Presence of an employee at the bleeding line to ensure that all animals have been cut properly	BE	LU, DK, ES	EE, NL, SE, DE, IT	AT, SI, PT, FI, CY, HU, PL, CZ, UK	
Providing feed to animals in lairages	BE, DE	NL, CY, ES	AT, PT, FI	LU, SI, EE, HU, PL, SE, CZ, DK, IT, UK	
Procedures to deal with animals being transported over eight hours	CY, PL, DK, DE	HU, ES	PT, FI	LU, BE, AT, SI, EE, CZ, UK, SE	NL, IT
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	UK	NL, PT, FI, PL, CZ, DE, ES	LU, BE, SI, HU, SE	AT, EE, CY, DK, IT	
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	BE, SI, PT, HU, PL, DK	SE, DE, ES	NL, IT	LU, AT, EE, FI, CY, CZ, UK	
Video surveillance of stunning/bleeding area	LU, BE, EE, PT, FI, CY, PL, SE, DK, DE, IT, ES	SI, NL, HU, CZ, UK			AT

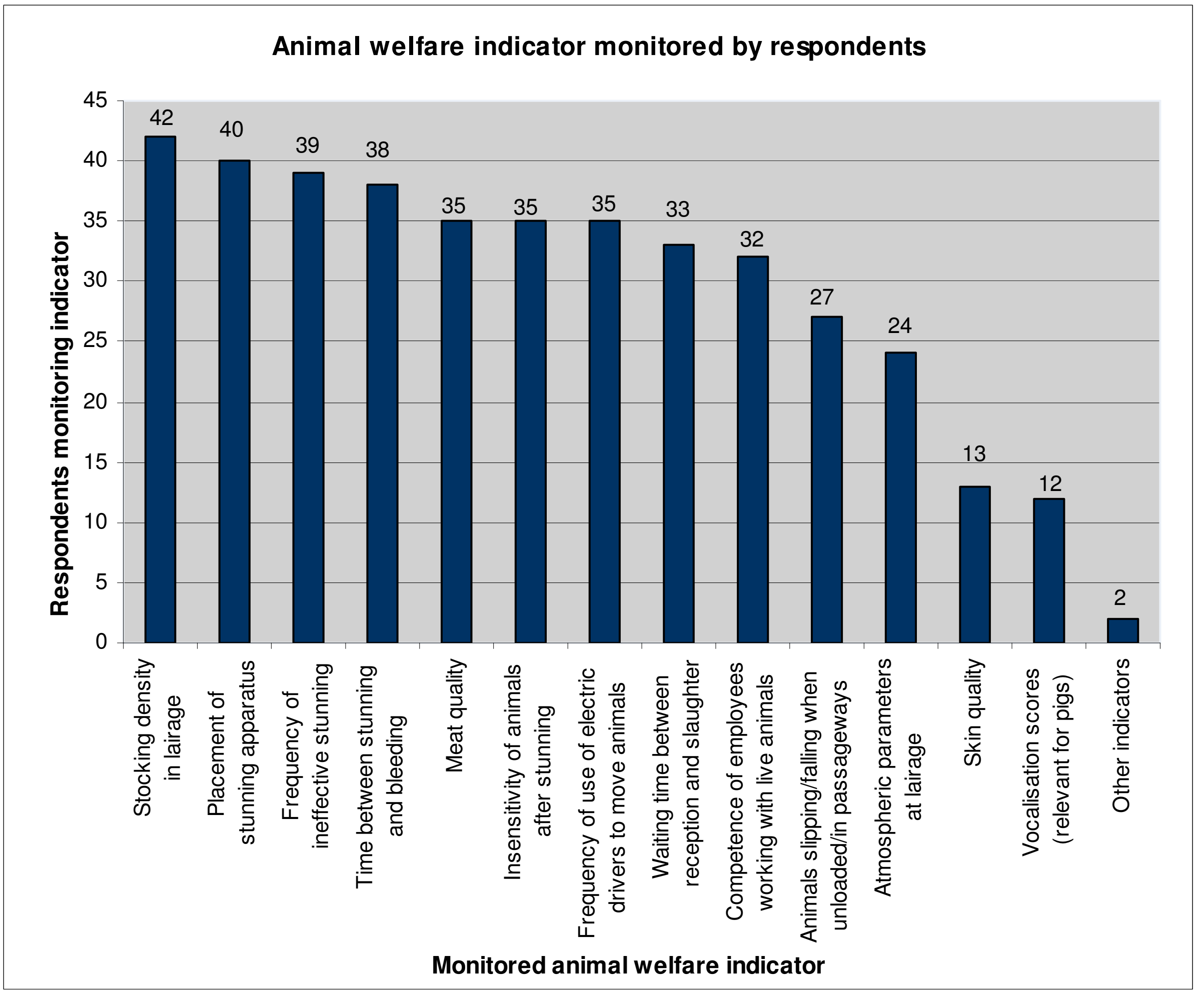
Source: Survey of competent authorities. Table is based on subjective assessment by the competent authorities which limits the possibility to compare answers of different Member States. Assessment refers to poultry and red meat slaughterhouses.

Figure 17: Operational measures/procedures implemented by slaughterhouse operators



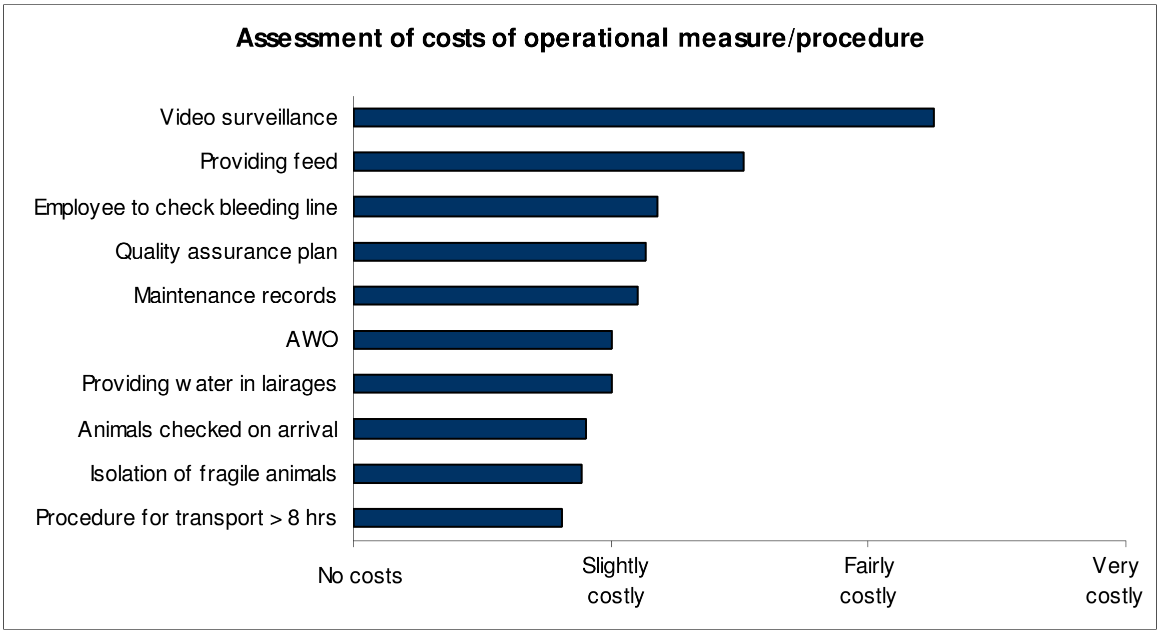
Source: Survey of slaughterhouse operators (n=80).

Figure 18: Number of slaughterhouses monitoring animal welfare indicators



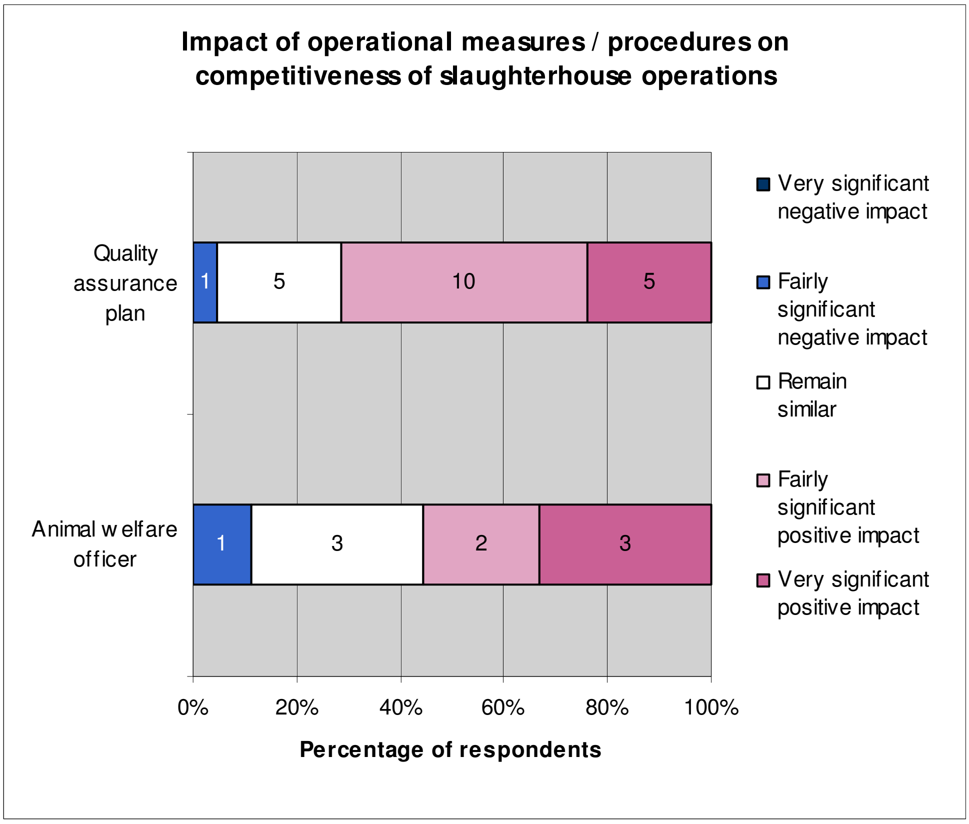
Source: Survey of slaughterhouse operators (n=53).

Figure 19: Assessment of costs of operational measures / procedures by slaughterhouse operators



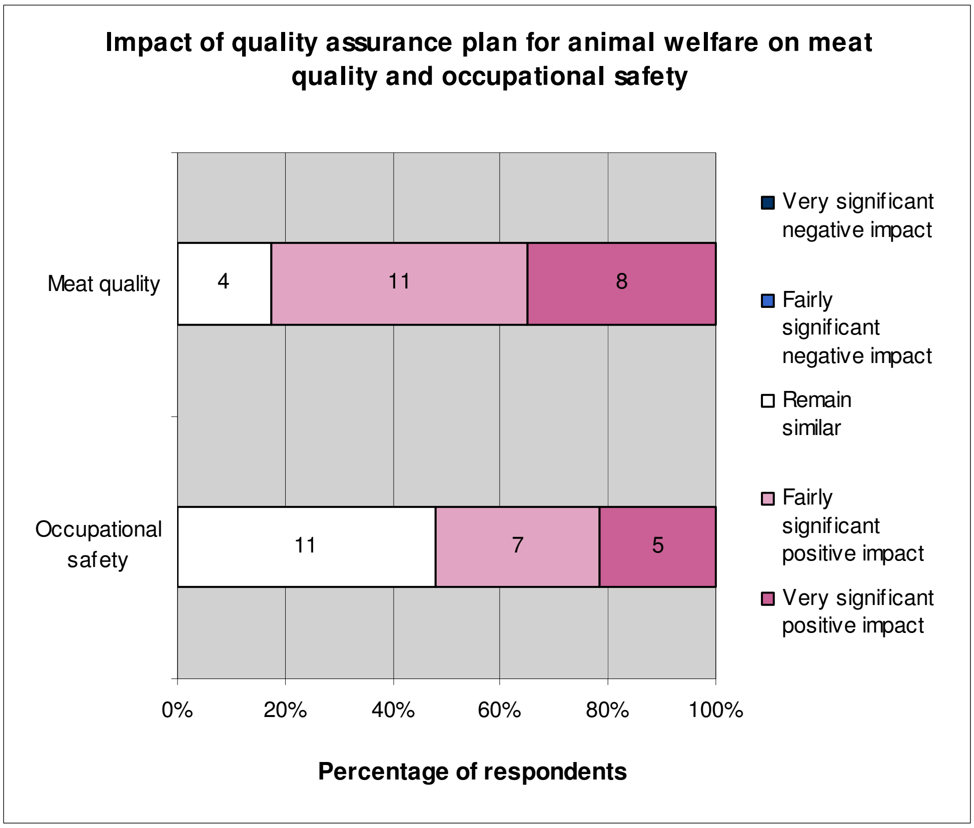
Source: Survey of slaughterhouse operators (n=varies for each measure/procedure, max. 45).

Figure 20: Assessment of operational measure / procedures on competitiveness of slaughterhouse operations



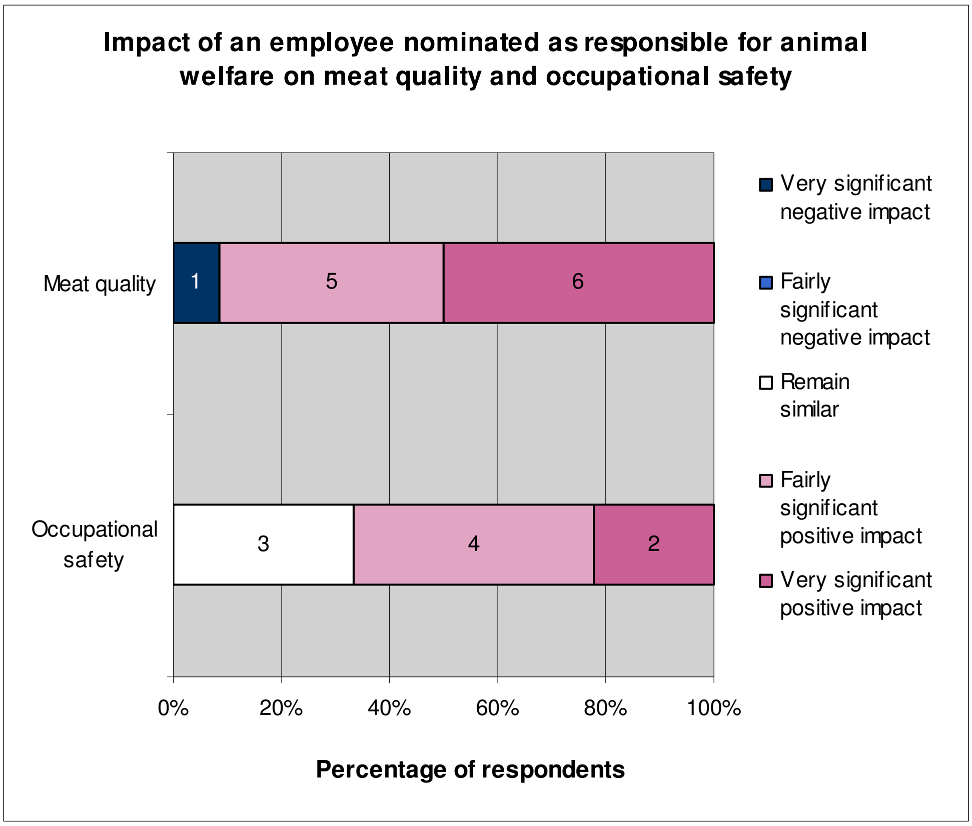
Source: Survey of slaughterhouse operators (quality assurance plan: n=21, animal welfare officer: n=9).

Figure 21: Assessment of a quality assurance plan on social aspects by slaughterhouse operators



Source: Survey of slaughterhouse operators (n=23)

Figure 22: Assessment of an AWO on social aspects by slaughterhouse operators



Source: Survey of slaughterhouse operators (meat quality: n=12, occupational safety: n=9).

Table 21: Signals provided by electrical stunning equipment for pigs

System equipped with signals indicating …	Yes	No	Don't know
Interruption of stunning	8	1	0
Insufficient duration of application	5	2	0
Excessive increase in the electrical resistance in the circuit	4	2	1
Voltage	6	2	0
Current	9	0	0
Other	0	0	0

Source: Survey of slaughterhouse operators (n=10).

Table 22: Signals provided by electrical stunning equipment for sheep

System equipped with signals indicating …	Yes	No	Don't know
Interruption of stunning	11	2	1
Insufficient duration of application	4	8	2
Excessive increase in the electrical resistance in the circuit	5	4	5
Voltage	11	2	1
Current	12	1	2
Other	0	1	1

Source: Survey of slaughterhouse operators (n=15).

Table 23: Recording of electrical parameters

	Pig	Sheep and lamb
Yes, for each animal	6	0
Yes, but not for each animal	1	3
No	4	12

Source: Survey of slaughterhouse operators (n=11, pigs; n=15, sheep).

Table 24: Use of stunning calibration for electrical equipment

	Pig	Sheep and lamb
Yes	5	4
No	5	10

Source: Survey of slaughterhouse operators (n=10, pigs; n=14, sheep).

Table 25: Frequency of stunning calibration for electrical equipment

	Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
Pig	2	1	0	1	2	0
Sheep and lamb	3	0	1	1	1	1

Source: Survey of slaughterhouse operators (n=6, pigs; n=7, sheep).

Table 26: Use of constant current vs. constant voltage stunners in slaughterhouses

	Constant current stunners	Constant voltage stunner
Adult pig (up to 150 kg LW)	6	2
Adult pigs (more than 150 kg LW)	6	3
Lamb	7	6
Adult sheep	6	5

Source: Survey of slaughterhouse operators (n=7, pigs; n=12, sheep).

Annex 2: Methodology

The analysis of this study has been based on the following resources:

- Review of existing studies and reports;
- Expert and stakeholder interviews with slaughterhouse operators, veterinarians, equipment producers, competent authorities, meat industry associations (both EU and MS level), and animal welfare organisations (both EU and MS level);
- Surveys of slaughterhouses, competent authorities, animal welfare organisations, and national meat industry associations;
- Case studies in four Member States (the UK, Germany, France and Poland), including visits to slaughterhouses and discussions with the competent authority, animal welfare organisation, and national meat industry associations.

Research topics

Issues addressed by the study include:

- *Presentation of the meat sector within the EU:* Presenting the main economic figures characterising the sector and a short analysis of the current situation and evolution in the last five years and possible evolution in the forthcoming years.
- *Production costs in the EU:* Analysing the costs represented by that part of the slaughter chain where live animals are treated compared to the overall production costs of a slaughterhouse and its relationship with the price of meat for the consumer.
- *Stunning/killing methods used in the EU:* Describing the main stunning/killing methods used for the different animal categories and their distribution within the EU.
- *Competitive position of the EU meat sector within the world:* Establishing the competitiveness of the EU meat sector on the world market with an assessment of the different sub-sectors' 'vulnerability'.
- *Competence of slaughterhouse operators:* Evaluating the current practices in relation to ensure the competence of slaughterhouse operators dealing with live animals.
- *Design of restraining and stunning/killing equipments:* Evaluating the current practices regarding the way animal welfare considerations are integrated in the development of restraining and stunning/killing equipments by the different sectors involved.
- *Animal welfare operational procedures:* Evaluating the current practices regarding the way animal welfare operational standards are monitored and implemented by the slaughterhouse operators themselves.
- *Electrical stunning or killing:* Evaluating the current practices regarding the use of electrical stunning or killing for red meat species.

Methodological approach

This study focuses on slaughtering activities carried out within slaughterhouses for cattle, calves, sheep, and pigs. Any stunning/killing (including for human consumption) taking place outside slaughterhouses as referred to in Article 2 of Directive 93/119/EC is not included in the study nor is killing of animals in slaughterhouses for purposes other than human consumption covered.

The study is based on the qualitative and quantitative data collected during the following research phases:

Interviews/meetings with key partners and stakeholders

Key partners and stakeholders have been involved throughout the whole process of the analysis by means of interviews and surveys. Depending on the availability, interviews were carried out face-to-face or by phone. The interviewed stakeholders can be found in the following table.

Table 27: Interviewed stakeholders

Organisation/Company	Relevance	Location
A K Stoddart Ltd.	Slaughterhouse	Scotland
Teterower Fleisch GmbH	Slaughterhouse	Germany
Weidemark Fleischwaren GmbH & Co. KG	Slaughterhouse	Germany
Główny Inspektorat Weterynarii (General Veterinary Inspectorate)	Competent Authority	Poland
Department for Environment, Food, and Rural Affairs (Defra)	Competent Authority	UK
Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV) (Federal Ministry of Food, Agriculture and Consumer Protection)	Competent Authority	Germany
Ministère de l'Agriculture et de la Pêche (Ministry of Agriculture and Fishing)	Competent Authority	France
bsi Schwarzenbek *(met with twice)*	Training and consulting institute	Germany
Eurogroup for Animal Welfare *(met with twice)*	Animal welfare organization	EU
Humane Slaughter Association	Animal welfare organisation	UK
Royal Society for the Prevention of Cruelty to Animals (RSPCA)	Animal welfare organization	UK
Œuvre d'Assistance aux Bêtes d'Abattoirs (OABA)	Animal welfare organization	France
Verband der Fleischwirtschaft e.V. (VDF) *(met with twice)*	National meat industry association	Germany
British Meat Processors Association (BMPA)	National meat industry association	UK
Fédération Nationale de l'Industrie et des Commerces en Gros des Viandes	National meat industry association	France
The European Livestock And Meat Trading Union (UECBV) *(met with twice)*	European meat industry association	EU
COPA COGECA	Agricultural	EU

	organization	
Butina	Equipment producer	Denmark
MPS Meat Processing Systems	Equipment producer	Netherlands
Karl Schermer	Equipment producer	Germany

Surveys

Four interrelated surveys were developed and circulated targeting the key stakeholders: slaughterhouse operators, national meat industry associations, competent authorities, and animal welfare organisations. The questionnaires were sent out by email to the relevant organisations, after comments from the European stakeholder groups on the draft questionnaires had been integrated. The questionnaire to slaughterhouses was forwarded by UECBV to the national meat industry associations, who in turn forwarded them to their members. The response rate was very satisfactory for both slaughterhouse operators and competent authorities. The following table describes the profile of the respondents:

Table 28: Number of respondents to the survey

Respondents	Questionnaires received	MS covered
Slaughterhouse operators	102*	10
Competent authorities	19	18
Animal welfare organisations	3	3
National meat industry associations	5	4

*Includes single questionnaires which were received representing aggregated responses from a larger number of slaughterhouses

From animal welfare organisations and national meat industry associations relatively few questionnaires were received. The number of responses from animal welfare organisations was low (three) as the questionnaire was rather technical and there are few animal welfare organisations with the level of detailed knowledge in this particular field that would have been necessary to complete the questionnaire. The questionnaire to the national meat industry associations was followed up on more than one occasion and the deadline was extended; despite this fact, only five responses from four countries were received. It is most likely due to the fact that many of these organisations had already contributed much of their time and energy into cooperating with the questionnaire to slaughterhouse operators and were unwilling to contribute further.

In contrast, responses to the surveys of slaughterhouse operators and competent authorities were received from 21 countries in total. Table 29 lists the countries from where questionnaires were received:

Table 29: Participation in survey by country

Country	Responses to survey of slaughterhouse operator survey	Responses to survey of competent authorities
Austria	5	1
Belgium	0	1
Cyprus	0	1
Czech Republic	0	1
Denmark*	22	1
Estonia	0	1
Finland	0	1
France*	27	0
Germany	12	1
Hungary	0	1
Ireland	8	0
Italy	7	1
Luxembourg	0	1
Netherlands	0	1
Norway	2	n/a
Poland	0	1
Portugal	0	1
Slovenia	0	1
Spain	11	1
Sweden	3	1
United Kingdom	5	2
TOTAL	**102**	**20**

*Received aggregated results only from these slaughterhouses rather than individual responses.

There were responses from slaughterhouses in Denmark and France that were received in an aggregated form from the national meat industry associations, rather than as individual slaughterhouse replies. For this reason it was not always possible to include this information in the statistical evaluation for a specific question where information on individual slaughterhouses was required. Also, not all slaughterhouses responded to all questions. Therefore figures and tables indicate how many slaughterhouse responses are being evaluated for that particular question (in the form n= xx).

Information regarding the species slaughtered by the responding slaughterhouses can be found in the table below:

Table 30: Species slaughtered

Species	Respondents
Cattle	75
Pigs	50
Sheep	37

Source: Survey of slaughterhouse operators (n=102).

These responses provide the most comprehensive overview of the situation of the EU slaughterhouse sector available so far. Several national meat industry associations (Scotland, Sweden, and Denmark) explicitly stated that answers given by them and their slaughterhouses were fully representative of their national situation. In other MS the national meat industry associations did not specify the degree to which the answers are representative, but for example in Germany the 12 responding slaughterhouses were roughly equal to 14% of the members of the national association, which represents nearly three quarters of total German beef and pig meat production, therefore indicating the relevance of the sample. Additionally, the evaluation of responses from slaughterhouses concerning the stunning and bleeding techniques used shows, for the most part, a coherence with information provided in literature on the use of such techniques in the EU; this may indicate that the sample of slaughterhouses responding to the survey has a representative character, at least regarding this aspect. A number of limitations of the slaughterhouse survey have, however, to be emphasised:

- Smaller slaughterhouses and operators from new MS are underrepresented;

- There is a possible bias in the results of the slaughterhouse questionnaire as it is possible that slaughterhouses with the highest animal welfare standards were more likely to fill in the questionnaire, thus reflecting in their answers higher standards than are implemented on average in the EU.

Therefore, results from the slaughterhouse survey have been interpreted with care. Whenever possible, results have been verified with complementary information.

Although the industry was very cooperative throughout the study; quantitative data regarding certain aspects was only available to a limited extent, including on the size/characteristics of slaughterhouse facilities within MS and regional markets. This made it impossible to analyse certain aspects in-depth, such as the economic consequences on specific regions.

Case studies

Case studies were conducted in the UK, France, Germany, and Poland, consisting of interviews with competent authorities, national meat industry associations, animal welfare organisations, and slaughterhouses[132]. Results of the case studies are used throughout the study to expand upon and further detail the information received from other data sources.

[132] Not in all case study-countries a slaughterhouse visit took place. In spite of significant efforts the French national meat industry association could not identify a slaughterhouse willing to accept a visit by the Contractor. Nor was a Polish red meat slaughterhouse able to cooperate within the time frame requested.

Annex 3: Description of meat quality conditions associated with animal handling

The following meat quality defects can plague slaughterhouses with low animal welfare standards:

- PSE: pale, soft, and exudative (PSE) quality meat typically affects pig meat but can also affect beef and lamb meat and is caused by numerous factors including: (1) genetic predisposition; (2) elevated metabolism stimulating the sympathetic nervous system; and/or (3) pre-slaughter short-term stress stimulating the sympathetic nervous system.[133] Typically, animal muscular activity proceeds when glycogen is broken down into glucose which is then converted into energy. When there is not enough oxygen in the blood for this process (such as is the case after slaughter), the by-products of this chemical reaction are lactic acid and water. When an animal experiences pre-slaughter stress, an abundant amount of stress hormones such as epinephrine are released into the body which accelerate the break-down of glycogen into glucose. After slaughter, these additional glucose level results in *a higher amount than normal of glucose being converted into lactic acid* in the muscles, resulting in PSE meat.

- DFD: dark, firm, and dry (DFD) quality meat affects beef, pork and lamb meat and can be caused by: (1) long-term stress; (2) too much physical activity; and (3) inadequate diet before slaughter.[134] If an animal has depleted its glycogen levels before slaughter, the *pH may not drop quickly enough after slaughter* because there is not enough lactic acid produced. This type of meat is more prone to spoilage as it does not have enough lactic acid to prevent the growth of micro-organisms.

- Blood splashes: These are typically caused *when small blood capillaries are ruptured* due to high blood pressure or excessive muscle contractions, often caused from electrical stunning procedures or the use of electrical goads but other methods before and after may cause this as well, such as an extended stun-to-stick time.[135] There is no associated health risk but blood splashes are visible and unacceptable to most customers. Such meat is therefore not suitable for certain markets, such as fresh cuts.[136]

- Bruises: Bruising is the escape of blood from *damaged blood vessels* into the surrounding muscle tissue caused by a physical blow by a stick, stone, animal horn, metal projection, fall, or any other physical pressure during handling, transport, penning, or stunning. This meat is typically wasted because: (1) it is not acceptable to the consumer; (2) it cannot be used for processing or manufacture; (3) it decomposes and spoils rapidly because it is an ideal medium for growth of contaminating bacteria; and (4) it must be condemned at meat inspection.[137]

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[133] Berg, Eric P. *Running Head: Effect of stress on meat yield and quality*. University of Missouri.

[134] Purdue University Animal Sciences. *Meat Quality Problems*.
Retrieved from: http://ag.ansc.purdue.edu/meat_quality/meat_quality_problems.html

[135] Meat and Livestock Commission (1999). *A glossary of carcase and meat quality terms.*

[136] University of Guelph. The Department of Animal and Poultry Science. *PSE*. Referenced from http://www.aps.uoguelph.ca/~swatland/ch9_1.htm

[137] Chambers, P., Grandin, T. (2001). *Guidelines for humane handling, transport and slaughter of livestock.* FAO Publication. Page 5.

Annex 4: Typology of stunning/bleeding methods used in the EU

Cattle		
Methods		**Description**
Stunning		
Mechanical	*Penetrating captive bolt*	Captive bolt gun has a sharp-rimmed steel bolt and is powered by a blank cartridge or air causing sufficient penetration force to cause trauma to the cortex. May be either trigger-operated or contact fired.
	Non-penetrating captive bolt	Captive bolt gun has a mushroom-headed steel bolt and is powered either by air or a cartridge causing sufficient force to cause trauma to the cortex (does not penetrate). May be either trigger-operated or contact firing.
Electrical	*Head-only stunning (electronarcosis)*	Involves trans-cranial application of an electric current by using a pair of tongs (or electrodes) placed on either side of the head. May be achieved manually, by the application of electrified tongs on either side of the head, or automatically, by purpose-built devices.
	Head-to-body stun/killing method (electrocution)	Involves induction of cardiac ventricular fibrillation, by passing an electric current across the heart of an unconscious animal that has been stunned by head-only electrical stunning; application involves first a transcranial application along with a second application of an electric current from head-to-body (behind the position of the heart) or across the chest (transthoracic). Involves application of an electric current throughout the body. Ventricular fibrillation can be induced using withers-to-back, head-to-back or head-to-leg application of an electrical current.
Other		
Bleeding		
Neck cutting	*1 carotid artery*	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	2carotid arteries	Severing of 2 major carotid arteries in the neck (skin and vessels cut simultaneously).
Chest sticking		Severing major blood vessels in the thorax or chest by inserting a knife in front of the brisket or sternum (double cut: first the skin, then, with another knife, the vessels).
Other		

Pigs		
Methods		**Description**
Stunning		
Mechanical	*Penetrating captive bolt*	Captive bolt gun has a sharp-rimmed steel bolt and is powered by either a blank cartridge or air causing sufficient penetration force to cause trauma to the cortex. Normally fired into the forehead but other sites are possible. May be either trigger-operated or contact firing.
Electrical	*Head-only stunning (electronarcosis)*	An electrical current is applied across the head to span the brain for stunning.
	Head-to-body stun/killing method (electrocution)	Involves induction of cardiac ventricular fibrillation, by passing an electric current across the heart of an unconscious animal that has been stunned by head-only electrical stunning; application involves an electrical current from a pair of tongs (or electrodes) placed on the head and body followed by application of an electric current from head-to-body (behind the position of the heart) or across the chest (transthoracic).
Gas	*Dip-lift stunning system*	Works discontinuously. Small groups of pigs in a box are lowered directly into the maximum carbon dioxide concentration at the bottom of the pit. This pit can have varying levels of carbon dioxide gradients. Exposure and subsequent inhalation of gas will induce unconsciousness.
	Paternoster system	Works continuously with gondolas (cradles) like a Ferris wheel where pigs are lowered successively into the maximum carbon dioxide concentration at the bottom of the pit with stops during the procedure through an increasing carbon dioxide gradient as live pigs enter or unconscious pigs leave the gondolas for shackling.
Other		
Bleeding		
Neck cutting	*1 carotid artery*	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	2 carotid arteries	Severing of 2 major carotid arteries in the neck (skin and vessels cut simultaneously).
Chest sticking		Severing major blood vessels in the thorax or chest by inserting a knife in front of the brisket or sternum (double cut: first the skin, then, with another knife, the vessels).
Other		

Sheep		
Methods		**Description**
Stunning		
Mechanical	*Penetrating captive bolt*	Captive bolt gun has a sharp-rimmed steel bolt and is powered by a blank cartridge or air causing sufficient penetration force to cause trauma to the cortex. May be either trigger-operated or contact firing.
	Non-penetrating captive bolt	Captive bolt gun has a mushroom-headed steel bolt and is powered either by air or a cartridge causing sufficient force to cause trauma to the cortex (does not penetrate). May be either trigger-operated or contact firing.
Electrical	*Head-only stunning (electronarcosis)*	Involves trans-cranial application of an electric current by using a pair of tongs (or electrodes) placed on either side of the head. May be achieved manually, by the application of electrified tongs on either side of the head, or automatically, by purpose-built devices.
	Head-to-body stun/killing method (electrocution)	Involves induction of cardiac ventricular fibrillation, by passing an electric current across the heart simultaneously when inducing unconsciousness with head electrical stunning equipment; application involves an electrical current from a pair of tongs (or electrodes) placed on the head and body.
Other		
Bleeding		
Neck cutting	*1 carotid artery*	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	2 carotid arteries	Severing of 2 major carotid arteries in the neck (skin and vessels cut simultaneously).
Chest sticking		Severing major blood vessels in the thorax or chest by inserting a knife in front of the brisket or sternum (double cut: first the skin, then, with another knife, the vessels).
Other		

Annex 5: Final questionnaires to stakeholders

fcec

STUDY ON SLAUGHTER PRACTICES IN EU MEMBER STATES
(IN PREPARATION FOR THE REVISION OF DIRECTIVE 93/119/EC)
*
SURVEY OF COMPETENT AUTHORITIES

Please return this questionnaire by email to survey@civic-consulting.de not later than

30.04.2007

(please return in Word format and do not convert to a pdf document)

INTRODUCTION

The Food Chain Evaluation Consortium (FCEC) has been commissioned by the European Commission to conduct research on stunning and killing practices in slaughterhouses and their economic, social and environmental consequences. The Commission is considering the revision of Directive 93/119/EC (on the protection of animals at the time of slaughter or killing) and will present a legislative proposal by 2007. In the light of this, Civic Consulting and Agra CEAS Consulting will, in close cooperation with European stakeholders, evaluate the current socio-economic situation in slaughterhouses and specify factors which affect animal welfare.

The information you provide through this questionnaire will be crucial in assessing the possible impacts of a revision of Directive 93/119/EC. We therefore greatly appreciate your contribution.

If you have any further questions, do not hesitate to contact:

Kristen Schubert (survey@civic-consulting.de) Phone: +49-30-2196-2295 Fax: +49-30-2196-2298

LOCATION DATA

1. Please identify your organisation:

a. Name of organisation:

Please specify

b. Organisation located in (country):

Please specify

c. Type of organisation:

☐ Competent authority

☐ Other

d. Questionnaire completed by (name of person, contact details):

Please specify

2. **How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment?** [1]

Please specify current practices and problems, if there are any

3. **How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare?** [2]

Please specify current practices and problems, if there are any

4. **Which of the following <u>operational measures/procedures</u> are – according to your knowledge – commonly in use in slaughterhouses in your country?**

	Operational measures / procedures	**Degree to which measure is commonly in use**				
		not common at all	**fairly uncommon**	**fairly common**	**very common**	**don't know**
A	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	☐	☐	☐	☐	☐
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	☐	☐	☐	☐	☐
C	Procedure to check animals on their arrival as to identify weak animals	☐	☐	☐	☐	☐
D	Procedures to deal with animals being transported over eight hours	☐	☐	☐	☐	☐
E	Providing water to animals in lairages	☐	☐	☐	☐	☐
F	Providing feed to animals in lairages	☐	☐	☐	☐	☐
G	Procedures for isolating/prioritising the slaughter of fragile animals	☐	☐	☐	☐	☐
H	Keeping maintenance records of stunning equipment	☐	☐	☐	☐	☐
I	Video surveillance of stunning/bleeding area	☐	☐	☐	☐	☐
J	Presence of an employee at the bleeding line to ensure that all animals have been cut properly	☐	☐	☐	☐	☐
K	*Please specify other measures*	☐	☐	☐	☐	☐

Please indicate the most beneficial measure/procedure of the options listed above in terms of animal welfare (write only one letter, A-K, indicating the option)

[1] Article 6 of Directive 93/119/EC requires that <u>equipment for restraining, stunning or killing of animals</u> shall be adequately designed but no mechanism is requested to implement it.

[2] Article 7 of Directive 93/119/EC requires particular <u>competences of personnel handling live animals</u> at slaughterhouses but no mechanism is requested to implement it.

5. Are there currently changes ongoing in the slaughterhouse industry (for any of the species - cattle, pigs, sheep, poultry) in your country regarding the stunning and killing systems used? (i.e., introduction of a new method or significantly change of the characteristics of an existing method)

Yes ☐ No ☐ Don't know ☐

If yes, please specify

6. Please estimate the percentage to which animals are slaughtered using the following methods.

a. Please estimate the percentage of <u>cattle and sheep</u> slaughtered without prior stunning in your country or are stunned after the cut.

Methods	**Calves** (up to 8 months)	**Adult cattle**	**Lamb**	**Sheep**	**Poultry**
Stunning					
Stunning applied prior to cutting/bleeding	.... %	.... %	.... %	.... %	.... %
No stunning applied prior to cutting, but animal is stunned directly after the cut	.... %	.... %	.... %	.... %	.... %
No stunning applied at all	.... %	.... %	.... %	.... %	.... %
Total	*100%*	*100%*	*100%*	*100%*	*100%*

b. Please estimate the percentage of <u>cattle</u> slaughtered in your country using a rotating casting pen as a restraint mechanism.

	Calves (up to 8 months)	**Adult cattle**
A rotating casting pen, placing cattle on their back or on their side for ritual slaughter	.... %	.... %
Other restraints or no restraint	.... %	.... %
Total	*100%*	*100%*

7. What is the number of slaughterhouses officially registered in your country?

a. What is the <u>number of slaughterhouses that are approved</u> by the competent authority according to Regulation (EC) No 853/2004 laying down specific rules for food of animal origin?

Please specify

b. What is the <u>total number of all slaughterhouses officially registered</u> in your country based on relevant EU or national legislation (in case these are more than the number given in 7a)?

Please specify

fcec

STUDY ON SLAUGHTER PRACTICES IN EU MEMBER STATES
(IN PREPARATION FOR THE REVISION OF DIRECTIVE 93/119/EC)
*
FCEC SURVEY OF SLAUGHTERHOUSE OPERATORS (RED MEAT)

Please return this questionnaire by email to your national association from which you have received it before 20.12.2006

INTRODUCTION

The Food Chain Evaluation Consortium (FCEC) has been commissioned by the European Commission to conduct research on stunning and killing practices in slaughterhouses and their economic, social and environmental consequences. The Commission is considering the revision of Directive 93/119/EC (on the protection of animals at the time of slaughter or killing) and will present a legislative proposal by 2007. In the light of this, Civic Consulting and Agra CEAS Consulting of the FCEC will, in close cooperation with European stakeholders, evaluate the current socio-economic situation in slaughterhouses and specify factors which affect animal welfare. Please note the following when filling in the questionnaire:

- The term "plant" in this questionnaire refers to the slaughterhouse identified in Question 1 (below). As the results of the survey will only be used in an aggregated manner, your questionnaire will only be identified by a code assigned to you by your national association of slaughterhouse operators. Your answers will therefore be anonymous to the consultants;
- If your company operates more than one slaughterhouse, please fill in one questionnaire per plant;
- Section I relates to the main species slaughtered at your slaughterhouse. Sections II-IV are relevant to all species slaughtered (cattle, pigs, and sheep). Section V is specific to cattle, Section VI is specific to pigs, Section VII is specific to sheep;
- The Annex provides an overview of slaughter methods and their definitions used in this survey;
- This questionnaire is available in English, German, and French.

The information you provide through this questionnaire will be crucial in assessing the possible impacts of a revision of Directive 93/119/EC. It is your chance to make your views count. We therefore greatly appreciate your contribution.

If you have any further questions, do not hesitate to contact either your national association or:
Kristen Schubert **(survey@civic-consulting.de)** **Phone: +49-30-2196 2295 Fax: +49-30-21962298**

LOCATION DATA

1. **Please identify your slaughterhouse:**

a. Slaughterhouse located in (country):

Please specify

b. Identification code for your slaughterhouse (assigned to each plant by your national association of slaughterhouse operators):

Please specify

I. SLAUGHTER OPERATION (GENERAL)

2. Please mark your <u>main</u> species slaughtered in your plant (only one answer possible):

Cattle ☐ Pigs ☐ Sheep ☐

<u>All questions about "animals" in this section refer only to the main species that you have selected here.</u>

3. Which other species are slaughtered at your plant (mark all that apply):

Cattle ☐
Pigs ☐
Sheep ☐
Goats ☐
Horses ☐
Other *Please specify*

4. Please provide data on the number of animals processed in your slaughterhouse (provide information only for the main species you slaughter indicated in Question 2):

a. What is <u>the average line capacity</u> for animals (per hour) in your plant?

Please indicate processing speed in animals per hour

b. What is the <u>output</u> in animals slaughtered per year (number of animals)?

Please indicate total number of animals slaughtered each year

c. What is the average slaughter weight (kilograms slaughter weight per animal)?

Please indicate average slaughter weight

5. **Please provide the following details on your cost structure related to producing a carcass of your main species indicated in Question 2 (until the end of first chilling):**

If the production cost at which you produce a carcass and its by-products were 100, what proportion of this would be accounted for by the following stages:

	Production stage	Percent
a	Cost of reception and lairage of animals	.... %
b	Cost of restraining animals (from the beginning of the passageway until the beginning of stunning)	.... %
c	Cost of stunning	.... %
d	Cost of shackling / hoisting and bleeding	.... %
e	Cost of all other steps of the slaughter chain until after the first chilling has been completed (may include washing, dehiding / dehiding, evisceration, chilling)	.... %
	TOTAL PRODUCTION COST OF CARCASS IN PERCENT (please check that the summation of all production costs equals 100)	**100%**

Note: please do not include purchase cost of the animal and transportation to the slaughterhouse. Please do include all other costs of slaughter until the end of first chilling including: personnel, energy, water, gas, waste disposal, cleaning, veterinary control, maintenance, and depreciation (related to building and equipment used for the above listed steps). All costs that you incur after production of chilled carcass (e.g., trimming, packaging) are not relevant for this analysis and should not be included.

6. **What type of stunning equipment is currently in use at your plant for the main species indicated in Question 2?**

a. Please mark the kind of stunning system currently in use:

Mechanical ☐ Electrical ☐ Gas ☐

b. When did you install or last significantly modify characteristics of the stunning equipment currently in use at your plant for the main species indicated in Question 2?

Please specify the year of introduction

c. What is typically the length of time over which your stunning equipment is in use at your plant (total lifecycle in years)?

Please specify

7. Do you plan to change your stunning method for your main species in the next five years (i.e., will you introduce a new stunning method or significantly change the characteristics of the existing method)?

Yes ☐ No ☐ Don't know ☐

If yes:

a. Please mark which kind of stunning system will be introduced:

Mechanical ☐ Electrical ☐ Gas ☐

b. Please specify which system will be introduced (e.g., electronarcosis, electrocution, gas with argon):

Please specify

c. What are your reasons for such a change (economic, meat quality, worker safety, animal welfare, legislative, consumer demands, etc.)?

Please specify

d. How do you expect your costs of production referred to under Question 5 will change when implementing this new stunning method (including depreciated investment costs):

Decrease very significantly (savings > 10%)	Decrease fairly significantly (savings of 5% - 9%)	Remain similar (+/- 4% change)	Increase fairly significantly (costs increase 5% - 9%)	Increase very significantly (costs increase > 10%)
☐	☐	☐	☐	☐

Please specify

If you are not introducing a new method:

e. Why have you decided not to change your current stunning method?:

- ☐ Current method is satisfactory
- ☐ Not financially capable to invest in a new method
- ☐ Production costs with new system will be too high
- ☐ Other

f. If other, please specify:

Please specify

II. STAFF TRAINING

The following questions refer to employment practices and only concern employees who are working in the part of the plant where the animals are still alive. Employees engaged in professional activities after the animals are slaughtered are not relevant here.

8. Are your employees appointed with the handling of animals trained with respect to animal welfare?

Yes ☐ No ☐

If yes:

a. Please mark in which of the following areas must employees be specifically trained regarding animal welfare and how many hours they were trained? (Only applies for employees working in that area).

Work area	Yes	How many hours training in the last 12 months (Total of practical and theoretical training)
Unloading animals to lairage facilities	☐	.... *hours per employee*
Handling animals from lairage to stunning facilities	☐	.... *hours per employee*
Stunning	☐	.... *hours per employee*
Bleeding to hoisting	☐	.... *hours per employee*

b. Is this training done:

Internally ☐ Externally ☐

c. Is this training with or without attestation, certification or diploma at the end of the training?

With ☐ Without ☐

d. Is this training legally required or voluntary?

Legally required ☐ Voluntary ☐

e. Is this training formally approved by the competent authority?

Yes ☐ No ☐

Further comments

9. Please assess impacts of the training measures that you implement?

	Training measures implemented have impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Animal welfare*	☐	☐	☐	☐	☐
b	*Meat quality*	☐	☐	☐	☐	☐
c	*Production costs*	☐	☐	☐	☐	☐
d	*Competitiveness of operation*	☐	☐	☐	☐	☐
e	*Occupational safety*	☐	☐	☐	☐	☐
f	*Environment*	☐	☐	☐	☐	☐

Not marked = Don't know

Please specify any significant impact

III. OPERATIONAL PROCEDURES

10. What is your point of reference for "good animal welfare practices" at your slaughterhouse?

- ☐ National legislation
- ☐ Code of good practice of European association of slaughterhouses or other relevant European/international body
- ☐ Code of good practice of national association of slaughterhouses or other relevant national body
- ☐ Own company code of good practice
- ☐ Animal welfare organisation code of practice
- ☐ Requirements of clients
- ☐ Equipment manufacturers recommendations
- ☐ Other

Please specify the piece of legislation and/or code of practice that is your frame of reference

11. Please mark with "yes" the animal welfare operational measures / procedures that you currently have implemented in your plant? If yes, please assess the costs of the measure.

	Operational measures / procedures	**Yes**	**If yes, please assess how costly the procedure /measure is**					
			--- very costly	**--** fairly costly	**-** slightly costly	**O** no costs	**+** savings	**Don't know**
A	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	☐	☐	☐	☐	☐	☐	☐
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	☐	☐	☐	☐	☐	☐	☐
C	Procedure to check animals on their arrival as to identify weak animals	☐	☐	☐	☐	☐	☐	☐
D	Procedures to deal with animals being transported over eight hours	☐	☐	☐	☐	☐	☐	☐
E	Providing water to animals in lairages	☐	☐	☐	☐	☐	☐	☐
F	Providing feed to animals in lairages	☐	☐	☐	☐	☐	☐	☐
G	Procedures for isolating/prioritising the slaughter of fragile animals	☐	☐	☐	☐	☐	☐	☐
H	Keeping maintenance records of stunning equipments	☐	☐	☐	☐	☐	☐	☐
I	Video surveillance of stunning/bleeding area	☐	☐	☐	☐	☐	☐	☐
J	Presence of an employee at the bleeding line to ensure that all animals have been cut properly	☐	☐	☐	☐	☐	☐	☐
K	*Please specify other measures*	☐	☐	☐	☐	☐	☐	☐

Comments

12. **Please indicate the most beneficial operational procedure of the options listed in Question 11 (please write only one letter, A-K, indicating the option)?**

Please list the most beneficial procedure from Question 11

13. **Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 12?**

	Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Meat quality*	☐	☐	☐	☐	☐
b	*Competitiveness of operation*	☐	☐	☐	☐	☐
c	*Occupational safety*	☐	☐	☐	☐	☐
d	*Environment*	☐	☐	☐	☐	☐

Not marked = Don't know

Please specify any significant impact

14. **What are the indicators that you currently monitor in your plant and how often is each monitored?**

	Animal welfare indicators monitored at your plant	Yes	Frequency (times per week)
a	Number of animals slipping or falling down when they are unloaded or in passageways	☐	.... *times per week*
b	Stocking density in the lairage (as to allow animals to lie down)	☐	.... *times per week*
c	Atmospheric parameters at lairage (temperature, humidity, air flow, noise level, light intensity, water consumption, etc.)	☐	.... *times per week*
d	Frequency of use of electric driver/goads to move animals through passageways	☐	.... *times per week*
e	Waiting time between reception and the beginning of the slaughtering procedure	☐	.... *times per week*
f	Vocalisation scores (relevant for pigs)	☐	.... *times per week*
g	Correct placement of captive bolt or electrical stunning apparatus	☐	.... *times per week*
h	Competence of employees working with live animals regarding animal welfare	☐	.... *times per week*
i	Frequency of ineffective stunning (i.e., number of cases in which a second stun is required)	☐	.... *times per week*
j	Insensitivity of animals after stunning	☐	.... *times per week*
k	Time between stunning and bleeding	☐	.... *times per week*
l	Meat quality (pH, DFD, PSE, blood splashes, bone fractures)	☐	.... *times per week*
m	Skin quality	☐	.... *times per week*
n	*Please specify other indicators*	☐	.... *times per week*

Comments

15. **How do you monitor the effectiveness of the stun?**

a. Please mark how your slaughterhouse <u>monitors</u> the effectiveness of the stun:

a ☐ No direct monitoring
b ☐ Sign of recovery after stunning
c ☐ Sign of recovery after bleeding
d ☐ Indirect monitoring through technical parameters (e.g., electrical)

b. Please specify what percentage of animals are actually monitored for the effectiveness of stun:

Please specify

c. Do you systematically record the results of your monitoring activity described in questions 15a and 15b:

Yes ☐ No ☐

d. If yes, could you please provide your average percentage of unsuccessful stunning:

Please specify

16. Do you have regular cleaning and maintenance schedules for your stunning equipment?

a. A regular cleaning schedule for stunning equipment:

Yes ☐ No ☐

If yes, please specify the frequency of cleaning:

Hourly	Daily	Weekly	Monthly	Quarterly	Don't know
☐	☐	☐	☐	☐	☐

b. A regular maintenance schedule for stunning equipment:

Yes ☐ No ☐

If yes, please specify the frequency of maintenance:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
☐	☐	☐	☐	☐	☐

17. Please mark outside parties that perform a specific audit regarding animal welfare and list the frequency with which you are audited?

	Outside party	Yes	Frequency (if marked yes)
a	Veterinary authority	☐	.... *times per year*
b	Clients	☐	.... *times per year*
c	Animal welfare groups	☐	.... *times per year*
d	Independent auditor	☐	.... *times per year*
e	*If others, please specify*	☐	.... *times per year*

IV.DESIGN OF EQUIPMENT

18. Please mark with "yes" the technology that has actively been implemented in your plant primarily for the sake of animal welfare during the last 10 years? If yes, please assess the costs of the measure.

	Technology	Yes	If yes, please assess how costly that has been					
			--- very costly	-- fairly costly	- slightly costly	0 no costs	+ savings	Don't know
A	Non-slip flooring in lairage and passageways	☐	☐	☐	☐	☐	☐	☐
B	Ventilation equipment in lairage facilities	☐	☐	☐	☐	☐	☐	☐
C	Indirect lighting	☐	☐	☐	☐	☐	☐	☐
D	Noise reducers	☐	☐	☐	☐	☐	☐	☐
E	Blinders	☐	☐	☐	☐	☐	☐	☐
F	Lairage is designed to allow a one-way flow of animals from unloading to the point of slaughter (for cattle and pigs only)	☐	☐	☐	☐	☐	☐	☐
G	Ramp inclination is not steeper than 20 degrees	☐	☐	☐	☐	☐	☐	☐
H	The passageways are wide enough to allow two or more animals to walk side-by-side as long as possible (for sheep and pigs only)	☐	☐	☐	☐	☐	☐	☐
I	Passageways with curves and no sharp angles	☐	☐	☐	☐	☐	☐	☐
J	Non-slip flooring in stunning box	☐	☐	☐	☐	☐	☐	☐
K	*Please specify other measures*	☐	☐	☐	☐	☐	☐	☐

Comments

19. Please indicate the most beneficial design measure of the options listed in Question 18 (please write only one letter, A-K, indicating the option)?

Please list the most beneficial measure from Question 18

20. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 19?

	Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Meat quality*	☐	☐	☐	☐	☐
b	*Competitiveness of operation*	☐	☐	☐	☐	☐
c	*Occupational safety*	☐	☐	☐	☐	☐
d	*Environment*	☐	☐	☐	☐	☐

Not marked = Don't know

Please specify any significant impact

V. SLAUGHTER OPERATION (CATTLE)

21. Please mark which restraint mechanism most describes the method in use at your plant:

		Calves (up to 8 months)	**Adult cattle**
a	Individual stunning box (no head restraint)	☐	☐
b	Individual stunning box (with head restraint)	☐	☐
c	Other	☐	☐

If other, please specify

22. Please mark with a cross (x) the stunning/bleeding methods in use for the different species/types of cattle in your slaughterhouse.

	Methods		**Calves** (up to 8 months)		**Adult cattle**	
			Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
	Stunning					
a	Mechanical	*Penetrating captive bolt*	☐	☐	☐	☐
b		*Non-penetrating captive bolt*	☐	☐	☐	☐
c	Electrical	*Head-only stunning (electronarcosis)*	☐	☐	☐	☐
d		*Head-to-body stun/killing method (electrocution)*	☐	☐	☐	☐
e	Other		☐	☐	☐	☐
	Bleeding					
f	Neck cutting	*1 carotid artery cut*	☐	☐	☐	☐
g		*2 carotid arteries cut*	☐	☐	☐	☐
h	Chest sticking		☐	☐	☐	☐
i	Other		☐	☐	☐	☐

* Back-up method (if applicable): to be employed in case of emergency, failure of another method, etc.
Note: For definition of methods see Annex

If other, please specify

23. Do you apply ritual slaughter for cattle?

Yes ☐ No ☐

If your answer is <u>yes</u>:

a. What percentage of cattle is ritually slaughtered at your plant <u>without</u> prior stunning?

Please specify

b. Do you use a rotating casting pen, placing cattle on their back or on their side for ritual slaughter?

Yes ☐ No ☐

VI. SLAUGHTER OPERATION <u>(PIGS)</u>

24. Please mark which restraining/shackling mechanism most describes the method in use at your plant:

		Adult pigs (up to 150 kg LW)	**Adult pigs** (more than 150 kg LW)
a	Group stunning pen (electric)	☐	☐
b	Group stunning pen (gas crate)	☐	☐
c	Individual confinement (no conveyer)	☐	☐
d	Individual confinement (with automated conveyer)	☐	☐
e	Other	☐	☐

If other, please specify

25. Please mark with a cross (x) the stunning/bleeding methods in use for the different species/types of pigs in your slaughterhouse.

	Methods		**Adult pigs** (up to 150 kg LW)		**Adult pigs** (more than 150 kg LW)	
			Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
	Stunning					
a	Mechanical	*Penetrating captive bolt*	☐	☐	☐	☐
b	Electrical	*Head-only stunning (electronarcosis)*	☐	☐	☐	☐
c		*Head-to-body stun/killing method (electrocution)*	☐	☐	☐	☐
d	Gas	*Dip-lift stunning system*	☐	☐	☐	☐
e		*Paternoster system*	☐	☐	☐	☐
f	Other		☐	☐	☐	☐
	Bleeding					
g	Chest sticking		☐	☐	☐	☐
h	Other		☐	☐	☐	☐

* Back-up method (if applicable): to be employed in case of emergency, failure of another method, etc.
Notes: For definition of methods see Annex; LW=live weight

If other, please specify

a. Is your main stunning method <u>automated</u> (i.e., no human intervention during restraining and stunning)?

Yes ☐ No ☐

26. If using <u>electric</u> stunning technology (if using gas, please proceed to Question 27)**:**

a. What are the details of the electric stun (i.e., average frequency, output voltage, output current, and minimum application time)?

	Species	Type of stunner:		Frequency*	Voltage*	Current*	Minimum time of application (per animal)	Maximum stun-to-stick interval
		constant current	constant voltage	(Hz)	(V)	(A)	(sec)	(sec)
aa	**Adult pigs** (up to 150 kg LW)	☐	☐	.... Hz	 V	.... A	.... sec	.... sec
ab	**Adult pigs** (more than 150 kg LW)	☐	☐	.... Hz	 V	.... A	.... sec	.... sec

*Notes: Frequency, voltage and current figures are relevant for the head stun circuit (not the heart circuit). Please leave Voltage blank if you apply a constant current stun. Please leave Current blank if you apply a constant voltage stun.

Additional comments

b. The electric stunning system is equipped with a signal which indicates:

	System equipped with signals indicating …	Yes	No	Don't know
ba	Interruption of stunning	☐	☐	☐
bb	Insufficient duration of application	☐	☐	☐
bc	Excessive increase in the electrical resistance in the circuit	☐	☐	☐
bd	Voltage	☐	☐	☐
be	Current	☐	☐	☐
bf	Other	☐	☐	☐

If other, please specify

c. Are these signals in Question b:

Audio ☐ Visual ☐ Both ☐

d. Do you <u>record electrical parameters</u> during the stun:

Yes, for each animal ☐ Yes, but not for each animal ☐ No ☐

e. If <u>yes</u>, which electrical parameters do you record?

Please specify

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Please specify

g. Do you use an electrical stunning calibrator[1]:

Yes ☐ No ☐

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
☐	☐	☐	☐	☐	☐

27. If using gas stunning technology:

Which gas concentrations do you use, for how long, and for how many pigs?

a. Initial step:

	Species	% CO_2	% N_2	% Argon	% O_2	Average length of exposure (sec)	Number of pigs exposed at the same time
a	**Adult pigs** (up to 150 kg LW)	.... %	.... %	.... %	.... %	.... sec	..... Number of pigs
b	**Adult pigs** (more than 150 kg LW)	.... %	.... %	.... %	.... %	.... sec	..... Number of pigs

b. Final step (if relevant):

	Species	% CO_2	% N_2	% Argon	% O_2	Average length of exposure (sec)	Number of pigs exposed at the same time
a	**Adult pigs** (up to 150 kg LW)	.... %	.... %	.... %	.... %	.... sec	..... Number of pigs
b	**Adult pigs** (more than 150 kg LW)	.... %	.... %	.... %	.... %	.... sec	..... Number of pigs

c. Do you record the above parameters listed in (a) and (b) and how frequently?

Please specify

d. What is the maximum stun-to-stick interval after stunning?

	Species	Maximum stun-to-stick interval (sec)
da	**Adult pigs** (up to 150 kg LW)	.... sec
db	**Adult pigs** (more than 150 kg LW)	.... sec

[1] Device used to test that the electrical parameters (voltage, frequency, and current) are as desired or to determine whether an adjustment to the stunning equipment is necessary.

VII. SLAUGHTER OPERATION (SHEEP)

28. Please mark which restraint mechanism most describes the method in use at your plant:

		Lamb	Adult sheep
a	Group stunning pen (no restraint)	☐	☐
b	Individual confinement (without conveyer)	☐	☐
c	Individual confinement (with automated conveyer)	☐	☐
d	Other	☐	☐

If other, please specify

29. Please mark the stunning/bleeding methods in use for lamb and sheep in your slaughterhouse.

	Methods		Lamb		Adult Sheep	
			Method in use	*Back-up method**	*Method in use*	*Back-up method**
	Stunning					
a	Mechanical	*Penetrating captive bolt*	☐	☐	☐	☐
b		*Non-penetrating captive bolt*	☐	☐	☐	☐
c	Electrical	*Head-only stunning (electronarcosis)*	☐	☐	☐	☐
d		*Head-to-body stun/killing method (electrocution)*	☐	☐	☐	☐
e	Other		☐	☐	☐	☐
	Bleeding					
f	Neck cutting	*1 carotid artery cut*	☐	☐	☐	☐
g		*2 carotid arteries cut*	☐	☐	☐	☐
h	Chest sticking		☐	☐	☐	☐
i	Other		☐	☐	☐	☐

* Back-up method (if applicable): to be employed in case of emergency, failure of another method, etc.
Note: For definition of methods see Annex

If other, please specify

30. Do you apply ritual slaughter for sheep?

Yes ☐ No ☐

a. If <u>yes</u>, what percentage of sheep is ritually slaughtered at your plant <u>without</u> prior stunning?

Please specify

31. If using electric stunning technology:

a. What are the details of the electric stun (i.e., average frequency, output voltage, output current, and minimum application time)?

	Species	Type of stunner:		Frequency*	Voltage*	Current*	Minimum time of application (per animal)	Maximum stun-to-stick interval
		constant current	constant voltage	(Hz)	(V)	(A)	(sec)	(sec)
aa	**Lamb**	☐	☐	.... Hz	 V	.... A	.... sec	.... sec
ab	**Adult sheep**	☐	☐	.... Hz	 V	.... A	.... sec	.... sec

*Notes: Frequency, voltage and current figures are relevant for the head stun circuit (not the heart circuit). Please leave Voltage blank if you apply a constant current stun. Please leave Current blank if you apply a constant voltage stun.

Additional comments

b. The electric stunning system is equipped with a signal which indicates:

	System equipped with signals indicating …	Yes	No	Don't know
ba	Interruption of stunning	☐	☐	☐
bb	Insufficient duration of application	☐	☐	☐
bc	Excessive increase in the electrical resistance in the circuit	☐	☐	☐
bd	Voltage	☐	☐	☐
be	Current	☐	☐	☐
bf	Other	☐	☐	☐

If other, please specify

c. Are these signals in Question b:

Audio ☐ Visual ☐ Both ☐

d. Do you record electrical parameters during the stun:

Yes, for each animal ☐ Yes, but not for each animal ☐ No ☐

e. If yes, which electrical parameters do you record?

Please specify

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Please specify

g. Do you use an electrical stunning calibrator[2]:

Yes ☐ No ☐

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
☐	☐	☐	☐	☐	☐

[2] Device used to test that the electrical parameters (voltage, frequency, and current) are as desired or to determine whether an adjustment to the stunning equipment is necessary.

Annex 6: Results of surveys

SURVEY OF COMPETENT AUTHORITES
19 responses

2. How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment? [1]

Country	How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment?
Austria	Die Tierschutzschlachtverordnung im BGBl II 2004/488 regelt die Vorgaben über die Ausstattung.
Belgium	No
Cyprus	The restraining, stunning and killing equipment is regularly checked, maintained and kept in good condition. Furthermore the personnel handling this equipment is under the relevant instructions of the veterinarian who is responsible for the ante-mortem examination.
Czech Republic	We inform the stakeholders about the provisions of EU legislation as well as future trends (seminars, publication on web-site, web links). The instruction "RECOMMENDATION OF THE COMMITTEE FOR WELFARE OF FARM ANIMALS FOR PROTECTION OF ANIMALS INTENDED FOR SLAUGHTER No. 1/2006" based on principles of the EFSA opinion and provisions of the Czech Republic has been edited by the Central Commission for Animal Welfare on 25 June 2006. The instruction contains also recommendation for stunning and bleeding of animals, using and maintenance and routine checks of stunning devices. According to Art. 6 of Directive 93/119/EC and the Czech national legislation (Act. No. 246/1992 Coll., as amended, hereinafter The Welfare Act) instruments, materials, restraint, equipment and facilities used for stunning, killing or euthanasia of animals shall be constructed, maintained and used in such a way that these actions are carried out fast and effectively. Operator of the slaughterhouse shall provide for the maintenance and regular checks of the instruments, materials, equipment and facilities used for restraining, stunning, killing or euthanasia of animals. The operator shall keep the records of such checks over the period of 3 years and make them available to the competent animal welfare authority upon request. The verification of restraining and stunning/killing equipment is included in approval procedure of a slaughterhouse as well as regular inspections by the official veterinarians competent for animal welfare issues.
Denmark	According to Article 13, subsection 1 of the Danish Act on the Welfare of Animals (Act no. 344 of 13 May 2005), any person, who wishes to kill an animal, has to make sure, that the animal is killed as quickly and as painlessly as possible. Killing by drowning may not take place. The Danish Ministry of Justice has issued an Executive Order on the Slaughtering and Killing of Animals (Executive Order no. 1037 of 14 December 1994 with later amendments). The Order adopts the Directive 93/119/EEC. But the following provisions in the Order go beyond Directive 93/119/EEC: - Article 1, subsection 1, second sentence - extending of the scope of application to horses, dog and cats. - Article 2, subsection 8 - day-old chicks are defined as all poultry less than 72 hours of age, which have not yet been feed. - Article 4 on children under 14 years of age - Article 7 on religious slaughter - Article 13 on requirements for the persons killing of slaughtering animals - Article 15 on bolt pistols in swine stocks - Article 25, fifth sentence on the use of instruments administering electrical shocks - Article 31, third and fourth sentence on lactating animals - Article 37 on slaughtering of ratites

[1] Article 6 of Directive 93/119/EC requires that <u>equipment for restraining, stunning or killing of animals</u> shall be adequately designed but no mechanism is requested to implement it.

	- Article 48, subsection 1, on stunning of ratites The Danish Parliament has passed the Act no. 269 of 21 April 2004 on prohibition on slaughter and killing of pregnant animals kept for farming purposes and horses in the last tenth part of the pregnancy period The Danish Veterinary and Food Administration Circular of 23 December 1988 on stunning of Animals for slaughter prescribes some requirements for technical procedures in relation to fixation of animals and stunning methods to be used as well as requirements for pre-approval of stunning equipment. The Council of Europe Recommendation no. R (91) of 17 June 1991 on the slaughter of animals has been distributed to all the Regional Veterinary and Food Administration Centre inspectors who carry out inspections in the slaughterhouses.
Estonia	The person responsible for animal welfare in slaughterhouse regularly checks the compliance of stunning and slaughtering means including their being in working order. Pursuant to Directive of the Director General of the Veterinary and Food Board, the animal health and/or animal protection expert also checks annually (more frequently if deficiencies are detected in post-inspection) the compliance of stunning and slaughtering means during general inspection of the slaughterhouse, including their being in working order. There must also be another stunning means in a slaughterhouse complying with the requirements.
Finland	Development of new equipments is usually made together with slaughterhouses and official veterinarians of the slaughterhouse.
Germany	In development of new methods for restraining, stunning or killing animals field tests in slaughterhouses are common. To fulfil the animal welfare requirements of law (Tierschutz-Schlachtverordnung) Certificates of exemption are issued by the competent authority during scientific investigation of new methods for restraining, stunning or killing of slaughter animals in practical surrounding in slaughterhouses.
Hungary	In the approval procedure all the animal health, animal welfare and food hygiene conditions are enforced as our authority is in charge to issue operational licenses of slaughterhouses. However, no building permits allowed to be issued unless preliminary professional endorsement of our authority. In case of any change on the slaughterhouse demanded on own initiative or as a consequence of an inspection a permit given by our authority is required.
Italy	On 7 December 2006 the Italian Ministry of Health issued a check-list addressed to the local competent authorities (Local Health Units - ASLs). This check-list was aimed at facilitating the verification of implementation of animal welfare standards by veterinary officers in slaughterhouses. Moreover, the check list also addresses the compliance of facilities and equipment with animal welfare standards as regards stunning and killing.
Luxembourg	By official rules
Poland	According to Regulation of MARD of 09.09.2004 on qualifications of person authorised for professional slaughter and conditions and methods of slaughter and killing animals: 1. The design and facilities, as well as equipment of slaughterhouses, shall be such as to spare animals any avoidable excitement, pain or suffering. 2. The instruments, equipment and installations used for stunning or killing of animals must be designed, constructed, maintained and used in such a way as to achieve rapid and effective stunning or killing. 3. Suitable additional equipment and instruments must be kept at the place of slaughter for emergency use. 4. The equipment and instruments referred to in paragraph 3 shall be inspected each time before slaughtering
Portugal	The equipment is approved in the same moment of the approval of the slaughterhouse.
Slovenia	National legislation is laying down that the stunning/killing/slaughter equipment must be designed, manufactured and maintained in such a way as to enable the rapid and effective stunning and slaughter. At approval of establishments, the compliance with certain animal welfare requirements for the restraint and stunning equipment is verified, among other things.

	As there are no stunning equipment producers in Slovenia, the business operators are purchasing foreign-made equipment. Compliance of the restraint equipment, which is frequently modified by the business operators, is verified within the regular official controls and auditing. With regard to killing equipment, recommendations contained in the Opinion of the Scientific Panel on Animal Health and Welfare related to welfare aspects of the main systems of stunning and killing the main commercial species of animals - (Question N EFSA-Q-2003-093), and the Report of the Scientific Veterinary Committee of 30 September 1997 - The Killing of Animals for Disease Control Purposes, were to be taken into account in designing and making the killing instruments (portable stunning/killing tongs).
Spain	Los S.V.O realizan inspecciones para autorizar el funcionamiento del matadero. Los fabricantes conocen la normativa vigente y se ajustan a ello.
Sweden	The methods allowing for restraining and stunning/killing animals are regulated in the legal text DFS 2004:12. Any new methods have to be approved by the central animal welfare authority before they may be put into practice. The local competent authority (municipality animal welfare inspectors) and the Official Veterinarian(-s) at the slaughterhouse both have the responsibility to inspect this type of equipment and ensure that it complies with the legal requirements.
The Netherlands	The development industry has the legal knowledge of RL 93/119 and national animal welfare laws, locally the official veterinarian is often consulted too when new equipment will be installed
UK - Great Britain	The Defra R&D programme includes work to assess the pre-slaughter handling, stunning, slaughter and killing of farmed livestock, fish and poultry to determine the efficacy of existing and novel practices, and the development of alternative or novel systems for use both inside and outside of slaughterhouses.
United Kingdom - Northern Ireland	DARD involves itself with the FBO in the design and development stage of establishment approval. In a new establishment approval is not recommended until animal welfare concerns have been addressed. To date, the industry have co-operated with this approach and formal enforcement has never been tested.

3. How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare? [2]

Country	How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare?
Austria	Die Tierschutzschlachtverordnung im BGBl II 2004/488 Anh.I regelt die Ausbildung der betroffenen Personen
Belgium	On the floor training.
Cyprus	Slaughterhouse employees carry out their tasks in accordance with the principles of animal welfare as they have attended relevant seminars and guidelines have been issued for their training.
Czech Republic	According to The Welfare Act - Art. 5a (6) and Art. 5a (7) (in compliance with Art. 7 Directive 93/119/EC) persons slaughtering animals at slaughterhouses shall be professionally competent pursuant to the ministerial implementing legal regulation; other persons carrying out activities related to guiding, accommodation or restraint of these animals, shall be instructed by the operator of the slaughterhouse to perform these activities in a qualified manner; operator of the slaughterhouse shall keep records of the professional competence of persons carrying out activities referred to in Art 5a (6). Operator of the slaughterhouse shall keep these records over the period of 3 years following after the time these persons ceased performing these activities and make them available to the competent animal welfare authority upon request.
Denmark	Only persons with the necessary knowledge and technical skills are allowed to be engaged in the movement, lairaging, restraint, slaughter or killing of animals. The slaughterhouse is responsible for the fulfilment of these requirements, while the Regional Veterinay and Food Administration Centre is responsible for supervision. New employees are trained by experienced and skilled employees at

[2] Article 7 of Directive 93/119/EC requires particular competences of personnel handling live animals at slaughterhouses but no mechanism is requested to implement it.

	slaughterhouses. Training courses for employees are arranged by the industry.
Estonia	In Estonia, the Agriculture University and Veterinary- and Food Board provide the training courses on Animal Welfare in slaughterhouses. The person responsible for animal welfare in slaughterhouse checks regularly and animal welfare inspector annually the competence and skills of people, dealing with live animals in slaughterhouse.
Finland	Employees in slaughterhouses are usually educated by the slaughterhouses and they practise working under the guidance of skilled workers. Official veterinarians in slaughterhouses are also supervising them.
Germany	Slaughterhouse employees dealing with stunning, killing or bleeding of animals are holders of certificates of competence. Therefore they have visited courses for theoretical and practical training and have passed theoretical and practical examinations as required by Federal Regulation (Tierschutz-Schlachtverordnung). Employees dealing with animal handling have passed training courses.
Hungary	1. Workers on slaughterhouses have appropriate qualification (they mainly have a graduation of an agricultural technical college as butcher). 2. All employees of FBOs must fulfil a special training given by our service covering minimal requirements of food-hygiene. 3. A national guideline has just been issued by our authority that is compulsory to comply with by official veterinarians. This guideline says as follows: The veterinarian who is in charge to supervise a slaughterhouse or an FBO is obliged to give a short training to the personnel of the establishment on following topics: - anatomical basis of stunning of species in question - physical features of stunning equipment in use, - appropriate use of stunning equipment, - frequency of maintenance of stunning equipment.
Italy	The training of slaughterhouse employees is not directly managed by the competent authorities. However, the own-check plan (HACCP) implemented by the slaughterhouses provides for a training course addressing animal welfare, among other things, to be attended by employees dealing with live animals. Furthermore, the relevant own-check manuals are submitted to and supervised by the competent authorities.
Luxembourg	By the control and surveillance of official veterinarians.
Poland	According to Regulation of MARD of 09.09.2004 on qualifications of person authorised for professional slaughter and conditions and methods of slaughter and killing animals, person who deals with stunning and killing animals has to be trained. The training has to include theoretical part and 3-month length practice supervised by someone with 3 years practical experience of stunning and slaughter of animals. Qualifications have to be confirmed by the official document. The person who deals with movement and keeping of animals has to have 1 month length of practical experience supervised by someone with 3 years of practical experience of movement and keeping animals. The supervised person is nominated by the entity after receiving the permit of district veterinary officer.
Portugal	Slaughterhouses have HACCP systems, which include animal welfare items.
Slovenia	Staff training is arranged by the slaughterhouse management in cooperation with OVs. Slaughterhouse staff training programme of 2007 has been prepared in cooperation with the National Veterinary Institute. National legislation specifically requires the specialised training of slaughterhouse staff in animal welfare.
Spain	El operador económico diseña, mantiene e implementa un plan de formación, supervisado por la Autoridad compente. En las listas de comprobación utilizadas por los S.V.O se incluye lo relativo la formación.
Sweden	The local competent authorities (municipality animal welfare inspectors) are expected to check this when inspecting the plants. There are legal requirements regarding certificates of education in the field of animal welfare, in the legal text DFS 2004:12. According to the legislation, any company engaged in the slaughter or killing of animals shall ensure that all staff involved in handling, stunning, slaughtering or otherwise killing animals have participated in courses covering animal welfare, suitable stunning and killing methods and the correct use of these methods. This should be certified in written course documents. The course should have both theoretical and practical content, related to the species in question. After this, it is recommended that the recently trained person initially works together with more

	experienced staff.
The Netherlands	Large slaughterhouses have welfare procedures and sometimes also in house training on welfare aspects for their personnel; smaller slaughterhouses mostly depend on their own experience and skills. In large slaughterhouses during slaughter an official veterinarian is supervising the welfare handling full-time, in small slaughterhouses however the welfare supervision of official veterinarians is periodical. So in the former the welfare competence of employees can be assured reasonably, in the latter it cannot.
UK - Great Britain	UK legislation requires that any person carrying out restraint of an animal prior to stunning or killing, stunning an animal, slaughtering an animal, killing an animal, assessing effective stunning or killing of an animal, shackling or hoisting an animal or bleeding an animal that is not dead must hold a licence. A licence may be issued by an authorised veterinary surgeon only after assessment of the applicant's competence in carrying out the operations for which they are seeking a certificate, their understanding of relevant statutory requirements (including Codes of Practice) and how they work to protect the welfare of animal. Trainee slaughtermen must be over 18 years of age and must obtain a Provisional Licence.
United Kingdom - Northern Ireland	Every establishment is required to have an Animal Welfare Officer who has received accredited training. All OVs receive specific training (from Bristol) on welfare of animals at slaughter and deal directly with welfare problems as they arise. Industry generally co-operate on animal welfare issues.

4. Which of the following <u>operational measures/procedures</u> are – according to your knowledge – commonly in use in slaughterhouses in your country?

Operational measures / procedures	Degree to which measure is commonly in use				
	not common at all	fairly uncommon	fairly common	very common	don't know
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	UK	NL, PT, FI, PL, CZ, DE, ES	LU, BE, SI, HU, SE	AT, EE, CY, DK, IT	
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	BE, SI, PT, HU, PL, DK	SE, DE, ES	NL, IT	LU, AT, EE, FI, CY, CZ, UK	
Procedure to check animals on their arrival as to identify weak animals			EE, PT, ES	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, UK	
Procedures to deal with animals being transported over eight hours	CY, PL, DK, DE	HU, ES	PT, FI	LU, BE, AT, SI, EE, CZ, UK, SE	NL, IT
Providing water to animals in lairages				LU, BE, AT, SI, EE, NL, PT, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Providing feed to animals in lairages	BE, DE	NL, CY, ES	AT, PT, FI	LU, SI, EE, HU, PL, SE, CZ, DK, IT, UK	
Procedures for isolating/prioritising the slaughter of fragile animals			EE, PT	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Keeping maintenance records of stunning equipment		BE, ES	LU, EE, NL, HU, SE	AT, SI, PT, FI, CY, PL, CZ, DK, DE, IT, UK	

Video surveillance of stunning/bleeding area	LU, BE, EE, PT, FI, CY, PL, SE, DK, DE, IT, ES	SI, NL, HU, CZ, UK			AT
Presence of an employee at the bleeding line to ensure that all animals have been cut properly	BE	LU, DK, ES	EE, NL, SE, DE, IT	AT, SI, PT, FI, CY, HU, PL, CZ, UK	
Other measures					

Please indicate the most beneficial measure/procedure of the options listed above in terms of animal welfare.

Country	Most beneficial measure
Austria	
Belgium	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Cyprus	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer).
Czech Republic	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Denmark	Procedure to check animals on their arrival as to identify weak animals
Estonia	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Finland	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system.
Germany	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system in connection with Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Hungary	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Italy	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Luxembourg	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer) Video surveillance of stunning/bleeding area Keeping maintenance records of stunning equipment
Poland	
Portugal	
Slovenia	Video surveillance of stunning/bleeding area.
Spain	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Sweden	Comment regarding nr 4/The national legislation does not allow animals to be transported more than 8 hours. This time limit might be exceeded by 3 hours if the transport will reach the slaughterhouse within this time. If not, the transport has to stop after 8 hours and the animals must be unloaded.
The Netherlands	Presence of an employee at the bleeding line to ensure that all animals have been cut properly: in

	poultry slaughterhouses the presence of an employee at the bleeding line is obligatory, in other slaughterhouses it is not obligatory, and not common. Other measures are in place in several slaughterhouses: how to avoid overcrowding in lairaging; how to avoid fighting as much as possible. It is difficult to point at the most important issue of the list above. Because it is in the current industrial plants important that there are as well a) well trained responsible welfare supervising employees; b) procedures developed for all possible situations that can locally occur daily, for example how to handle when stunning equipment suddenly breaks down; c) competence of planners to avoid traffic jams of animal transports on the parking place and during lairaging including measures to meet weather changes e.d; d) high standard of technical staff including the keeping of maintenance records of stunning equipment. So when I definitively have to choose I will choose ' Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)' (in the expectation that a responsible welfare employee will emphasize the development of ' Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system '.
UK	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system. This would include all of the procedures listed (with the possible exception of video-surveillance).
UK, Northern Ireland	Procedures to deal with animals being transported over eight hours: Uncommon for animals to be transported for more than 8 hours. Presence of an employee at the bleeding line to ensure that all animals have been cut properly: Compulsory for automatic poultry neck cutting, otherwise uncommon. Animal welfare officer is the most beneficial procedure.

5. **Are there currently changes ongoing in the slaughterhouse industry (for any of the species - cattle, pigs, sheep, poultry) in your country regarding the stunning and killing systems used? (i.e., introduction of a new method or significantly change of the characteristics of an existing method)?**

Yes	No	Don't Know
8	8	3

If yes, please specify

Country	Ongoing changes
Cyprus	One red meat slaughterhouse which operates since August 2006, introduced the method of carbon dioxide exposure for pig stunning, a method used for the first time in Cyprus.
Czech Republic	Introduction of CO2 stunning/killing systems
Germany	Gas-stunning of poultry, electric stunning of cattle, gassing of animal houses for depopulation.
Italy	Currently no new method or significant changes are being introduced as regards the stunning and killing methods used. However, a study was performed by Dr Franco Panunzi, from a private company, envisaging an electrical stimulation of the animal after stunning and cutting of the jugular vein in order to favour bleeding and meat tendering. This study was subsequently

	scrutinised by the National Reference Centre for Animal Welfare of the Experimental Zooprophylactic Institute of Region Lombardy and Emilia-Romagna, according to which the procedure contains "no elements conflicting with animal welfare aspects. On the other hand, it prolongs the stunning period, thus favouring the animal's welfare and protection." Therefore, we would even suggest this procedure to be evaluated at the EU level due to its beneficial effects on the welfare of slaughter animals.
Luxembourg	Especially pig stunning and killing for reasons of the meat quality.
Spain	Gas stunning in rabbits (in place) Gas stunning in sheep (on trial)
Sweden	For pigs, almost all major slaughterhouses have changed from electrical stunning to carbon dioxide gas stunning. The same transition has begun for poultry. For cattle, there is a shift towards more automatic restraint systems, linked to an interest in pneumatic captive bolt systems as a replacement for metallic cartridge-powered captive bolt stunners, the latter being kept as back-up weapons (Swedish legislation requires slaughterhouses to have reserve stunning apparatus immediately available at the line´s place of stunning).
The Netherlands	There is a trend towards using more gas stunning. In the poultry slaughterhouses the newer waterbath- electric stunning is developed in a way that it is difficult to establish the level of the unconsciousness of the stunned poultry. This is because the legally obliged parameters (Rl 93/119) are limited. The prescribed amperage is produced accordingly, but in the same time the Herz number is made so high that this can influence the result of the amperage. So it would be better to prescribe all the parameters that can influence the result of the stunning legally. The animal welfare policy department plans to investigate the best combination of Hz and amperage in relation to meat quality and effective stunning.
UK, Great Britain	Waterbath stunners - effect of frequency, current and time on effectiveness of stunning and meat quality.
UK, Northern Ireland	We have one cattle electrical stunning facility

6. Please estimate the percentage to which animals are slaughtered using the following methods.

a. Please estimate the percentage of cattle and sheep slaughtered without prior stunning in your country or are stunned after the cut.

Calves and Cattle

Country	Percent of calves with post-cut stun	Percent of cattle with post-cut stun	Percent of calves without stun at all	Percent of cattle without stun at all
Belgium*	0%	0%	21%	10%
Spain	0%	0%	5%	10%
Netherlands	0%	0%	+/- 5%	+/- 5%
Hungary	0%	0%	0%	5%
UK**	0.4%	0.8%	0.4%	0.8%
Austria	0%	0%	0%	< 1%
Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Luxembourg, Slovenia, Sweden	0%	0%	0%	0%

* This data for Belgium is only an estimation of the percentage of animals slaughtered ritually as opposed to conventionally; it is not sure whether the animals are stunned beforehand.
** The UK competent authority has expressed that this data is from 2003 and the numbers may have increased significantly since then for older sheep.

Lamb and Sheep

Country	Percent of lamb with post-cut stun	Percent of sheep with post-cut stun	Percent of lamb without stun at all	Percent of sheep without stun at all
Belgium*	0%	0%	40%	92%
Netherlands	0%	0%	?	+/- 80%
Spain	0%	0%	15%	20%
Austria	0%	0%	?	< 5%
UK**	0%	0%	5.2%	2%
Czech Republic	0%	0%	0.97%	0%
Cyprus	0%	0%	0.08%	0%
Denmark, Estonia, Finland, Germany, Luxembourg, Slovenia, Sweden	0%	0%	0%	0%

* This data for Belgium is only an estimation of the percentage of animals slaughtered ritually as opposed to conventionally; it is not sure whether the animals are stunned beforehand.
**The UK competent authority has expressed that this data is from 2003 and the numbers may have increased significantly since then for older sheep.

b. Please estimate the percentage of <u>cattle</u> slaughtered in your country using a rotating casting pen as a restraint mechanism.

	Calves (up to 8 months)	**Adult cattle**
Belgium	20%	3%
Spain	5%	10%
Netherlands	5%	5%
Hungary	0%	4.75%
Austria	*siehe oben a.)*	
Czech Republic, Cyprus, Denmark, Estonia, Finland, Germany, Luxembourg, Portugal, Slovenia, Sweden, United Kingdom	0%	0%

Comments:

Country	**Ongoing changes**
Austria	No stunning, nur für nationale Versorgung aus rituellen Gründen in geringem Ausmaß (ca. Rinder weniger als 1%, Schafe weniger als 5%)
Belgium	Data for calves, adult cattle and sheep are based on a recent questionnaire in Belgian slaughterhouses. The data for lamb are estimated on the ground of a registration system: however this system makes the difference between ritual and conventional slaughter, it is not mentioned if the animals were stunned before the ritual slaughtering.
Cyprus	The percentage of lambs slaughtered without the application of stunning is for religious purposes.
Czech Republic	The Czech national legislation - The Welfare Act - Art. 5: Slaughtering farm animals by bleeding may only commence after their stunning ensuring the loss of sensibility and loss of consciousness which lasts throughout the bleeding. Slaughterhouse dressing of an animal prior to its bleeding shall be prohibited; Derogations from the provisions of Art. 3 may be authorised by the Ministry for the purposes of churches and religious societies, the regulations of which shall specify another way of animal slaughter. Slaughtering shall be carried out by a professionally competent person who shall ensure that the slaughtered animals are spared any avoidable suffering.
Finland	In Finland it is prohibited to bleed animals without prior stunning. There is an exception that poultry may be slaughtered without prior stunning by cutting the throat quickly using a sharp instrument. There is also a possibility to slaughter animals due to religious causes by stunning and cutting them at the same time. This method may only be used in slaughterhouse or in small scale slaughterhouse in the presence of official veterinarian of the slaughterhouse.
Germany	Figures are not given on federal level
Hungary	There is only one slaughterhouse in Hungary where kosher slaughter of adult cattle is carried out according to kosher rules.
Slovenia	National legislation requires the warm-blooded animals to be stunned prior to slaughter in a professional way and in accordance with a prescribed stunning method. Derogations from these legal requirements may be allowed by the authority competent for the veterinary sector under the

	exceptional circumstances only, including the ritual slaughter, emergency slaughter, and other circumstances where the animals' life is at risk. Ritual slaughter is carried out from time to time by four poultry slaughterhouse business operators only. It needs to be pointed out here that these four business operators are carrying out all the slaughter procedures before slaughter, during slaughter and upon slaughter in an identical way as with the normal slaughter - including the preliminary stunning - the only difference being that the very act of slaughter (cutting the blood vessels) is carried out by a specifically authorised representative of a religious community.
Spain	This number are approximate. The most important point is that there is an increasing demand of Halal meat.
Sweden	There is an absolute requirement for stunning prior to cutting for all animals slaughtered (or killed by any other reason) in slaughterhouses or elsewhere.
The Netherlands	The percentages mentioned are only very rough estimations, because in the Netherlands the number of animals that is slaughtered without previous stunning is only locally recorded
UK, Great Britain	Figures are based on 2003 survey. Figures for the non-stunning of, calves and older sheep in Halal slaughterhouses may have increased significantly since then.

7. What is the number of slaughterhouses officially registered in your country?

Country	Red Meat (approved according to Regulation No 853/2004)					Poultry (approved according to Regulation No 853/2004)				Total red meat and poultry slaughterhouses	
	Cattle	Pigs	Sheep/Goats	Mixed/Other	Total red meat slaughterhouses	Chicken	Turkey	Mixed/Other	Total poultry slaughterhouses	Total number of all slaughterhouses officially registered	Total approved by the competent authority according to Regulation (EC) No 853/2004
AT										5,058**	
BE					23				16	67	39
CY					4				9	29	13
CZ					112				25	294	137
DE										5,000	340
DK										164	141
EE										76	76
ES					645				171	1,088	816
FI	3	14	7	57	81	4	2	23	29		39 slaughterhouses, 90 small scale slaughterhouses
HU					161				70	306	231
IT										not available	495
LU				3	3					3	3 (except poultry)
NL	*	*	*		249	33	0	3	36	285	285
PL										1,390	661
PT										187	187
SE*	1	5	1	75	82	11	3	10	24	106	21

SI					29				5	128	34
UK	18	13	13	268	312	62	9	36	107	419	419

*Figures for SE for each species include *total* establishments, not only just those approved according to Regulation No 853/2004.
** Number is relatively large due to a high number of small slaughterhouses.

SURVEY OF RED MEAT SLAUGHTERHOUSE OPERATORS
75 responses

I. SLAUGHTER OPERATION (GENERAL)

2. Please mark your main species slaughtered in your plant:

Species	Total
Cattle	47
Pigs	29
Sheep	4

3. Which other species are slaughtered at your plant:

Species	Total
Cattle	7
Pigs	10
Sheep	15

4. Please provide data on the number of animals processed in your slaughterhouse (provide information only for the main species you slaughter indicated in Question 2):

a. What is the average line capacity for animals (per hour) in your plant?

Species	Cattle	Pigs	Sheep
Average	52	271	300
Median	49	285	300
Minimum	9	45	300
Maximum	140	430	300

b. What is the output in animals slaughtered per year (number of animals)?

Species	Cattle	Pigs	Sheep
Average	50343	480391	438814
Median	49500	50000	438814
Minimum	40	25,000	377628
Maximum	140000	1492308	500000

c. What is the average slaughter weight (kilograms slaughter weight per animal)?

Species	Cattle	Pigs	Sheep
Average	342	115	21
Median	323	95	21
Minimum	257.4	74	20.5
Maximum	600	350	21

5. Please provide the following details on your cost structure related to producing a carcass of your main species indicated in Question 2 (until the end of first chilling):

	Median Percentage	Minimum Estimation	Maximum Estimation	Standard Deviation
Cost of reception and lairage of animals	7.0%	0.6%	15.0%	3.6
Cost of restraining animals (from the beginning of the passageway until the beginning of stunning)	5.0%	0.6%	15.0%	3.6
Cost of stunning	4.2%	0.6%	15.0%	3.4
Cost of shackling / hoisting and bleeding	5.0%	0.6%	20.0%	5.2
Cost of all other steps of the slaughter chain until after the first chilling has been completed (may include washing, dehiding / dehiding, evisceration, chilling)	80.0%	50.0%	98.0%	12.3

6. What type of stunning equipment is currently in use at your plant for the main species indicated in Question 2?

a. Please mark the kind of stunning system currently in use:

Species	Cattle	Pigs	Sheep
Mechanical	29	2	0
Electrical	4	5	1
Gas	1	11	0

b. When did you install or last significantly modify characteristics of the stunning equipment currently in use at your plant for the main species indicated in Question 2?

Data used for cost analysis…not reproduced here.

c. What is typically the length of time over which your stunning equipment is in use at your plant (total lifecycle in years)?

Data used for cost analysis…not reproduced here.

7. Do you plan to change your stunning method for your main species in the next five years (i.e., will you introduce a new stunning method or significantly change the characteristics of the existing method)?

Yes	No	Don't Know
7	42	6

If yes:

a. Please mark which kind of stunning system will be introduced:

Mechanical	Electrical	Gas
2	0	5

b. Please specify which system will be introduced:

Cattle	Pigs
Penetrating captive bolt in modern stunning box facilitating voluntary entering	Gasbetäubung
CO2	CO2
CO2	
Backloader mit CO2 Gas	

c. What are your reasons for such a change?

Cattle	Pigs
Animal welfare, Worker safety	Steigerung der Schlachtzahl, Tierschutz
Bienestar animal, calidad de la carne y seguridad del trabajador	Tierschutz; Rechtsvorschrift, Fleischqualität u. wirtschaftlichkeit
Bien être des animaux, qualité de la viande, et sécurité du personnel	
Meat quality & welfare	

d. How do you expect your costs of production referred to under Question 5 will change when implementing this new stunning method (including depreciated investment costs):

Decrease very significantly	Decrease fairly significantly	Remain similar	Increase fairly	Increase very significantly
1	1	4	1	0

If you are not introducing a new method:

e. Why have you decided not to change your current stunning method?:

Current method is satisfactory	41
Not financially capable to invest in a new method	2
Production costs with new system will be too high	2
Other	2

f. If <u>other</u>, please specify:

Cattle	Pigs
More research needed on other methods	Aktuelle Methode ist am Stand der Technik
	Die Verfahren werden ständig in Eigenleistung verbessert,übererfüllen die Anforderungen

8. Are your employees appointed with the handling of animals trained with respect to animal welfare?

Yes	No
53	2

If <u>yes</u>:

a. Please mark in which of the following areas must <u>employees be specifically trained</u> regarding animal welfare and how many hours they were trained? (Only applies for employees working in that area).

Production stage	Slaughterhouses providing training	Slaughterhouses did not indicate training	Median hours dedicated
Unloading animals to lairage facilities	50	5	3.5
Handling animals from lairage to stunning facilities	49	6	3.5
Stunning	52	3	4
Bleeding to hoisting	47	8	4

b. Is this training done internally or externally:

Internally	Externally
43	26

c. Is this training with or without attestation, certification or diploma at the end of the training?

With	Without
39	17

d. Is this training legally required or voluntary?

Legally required	Voluntary
39	22

e. Is this training formally approved by the competent authority?

Yes	No
37	17

9. Please assess impacts of the training measures that you implement?

	Very significantly negative impact	Fairly significantly negative impact	Remain similar	Fairly significantly positive impact	Very significantly positive impact
Animal welfare	3	3	0	19	27
Meat quality	2	3	9	15	24
Production costs	1	4	30	8	6
Competitiveness of operation	1	4	21	12	8
Occupational safety	2	2	10	22	15
Environment	1	2	29	8	7

II. OPERATIONAL PROCEDURES

10. What is your point of reference for "good animal welfare practices" at your slaughterhouse?

Point of Reference	Respondents
National legislation	47
Code of good practice of European association of slaughterhouses or other relevant European/international body	9
Code of good practice of national association of slaughterhouses or other relevant national body	14
Own company code of good practice	33
Animal welfare organisation code of practice	10
Requirements of clients	38
Equipment manufacturers recommendations	13
Other	0

11. Please mark with "yes" the animal welfare operational measures / procedures that you currently have implemented in your plant? If yes, please assess the costs of the measure.

Operational measures / procedures	Yes	If yes, please assess how costly the procedure /measure is					
		--- very costly	-- fairly costly	- slightly costly	O no costs	+ savings	Don't know
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	47	3	12	20	5	2	3
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	45	2	10	18	6	4	0
Procedure to check animals on their arrival as to identify weak animals	45	2	10	15	11	3	1
Procedures to deal with animals being transported over eight hours	21	1	2	11	6	1	0
Providing water to animals in lairages	48	2	9	20	9	2	0
Providing feed to animals in lairages	29	3	10	12	2	0	0
Procedures for isolating/prioritising the slaughter of fragile animals	46	1	12	12	12	1	5
Keeping maintenance records of stunning equipments	44	5	2	25	5	1	1
Video surveillance of stunning/bleeding area	5	2	1	1	0	0	0

Presence of an employee at the bleeding line to ensure that all animals have been cut properly	28	2	4	19	1	1	0
Other measures	4	1	0	1	2	0	0

12. Please indicate the most beneficial operational procedure of the options listed in Question 11 (please write only one letter, A-K, indicating the option)?

Operational procedure	Respondents
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	23
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	11
Procedure to check animals on their arrival as to identify weak animals	5
Procedures to deal with animals being transported over eight hours	0
Providing water to animals in lairages	1
Providing feed to animals in lairages	0
Procedures for isolating/prioritising the slaughter of fragile animals	1
Keeping maintenance records of stunning equipments	1
Video surveillance of stunning/bleeding area	0
Presence of an employee at the bleeding line to ensure that all animals have been cut properly	0
Other measures	2

13. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 12?

a. Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system:

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	4	11	8
Competitiveness of operation	0	1	5	10	5
Occupational safety	0	0	11	7	5
Environment	0	0	12	7	2

b. Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer):

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	1	0	0	5	6
Competitiveness of operation	0	1	3	2	3
Occupational safety	0	0	3	4	2
Environment	0	0	4	2	2

14. What are the indicators that you currently monitor in your plant and how often is each monitored?

Animal welfare indicators monitored at your plant	Yes	Frequency (times per week)
Number of animals slipping or falling down when they are unloaded or in passageways	27	1/month - 25
Stocking density in the lairage (as to allow animals to lie down)	42	1 - 55
Atmospheric parameters at lairage (temperature, humidity, air flow, noise level, light intensity, water consumption, etc.)	24	1/semester - 7
Frequency of use of electric driver/goads to move animals through passageways	35	1/month - 10 (when permitted)
Waiting time between reception and the beginning of the slaughtering procedure	33	1 - continuous
Vocalisation scores (relevant for pigs)	12	1/semester - 25
Correct placement of captive bolt or electrical stunning apparatus	40	1 - continuous
Competence of employees working with live animals regarding animal welfare	32	6/year - continuous
Frequency of ineffective stunning (i.e., number of cases in which a second stun is required)	39	1 - continuous
Insensitivity of animals after stunning	35	1/month - continuous
Time between stunning and bleeding	38	5/year - 50
Meat quality (pH, DFD, PSE, blood splashes, bone fractures)	35	1 - continuous
Skin quality	13	1 - continuous
Other indicators	2	

15. How do you monitor the effectiveness of the stun?

a. Please mark how your slaughterhouse monitors the effectiveness of the stun:

Monitoring	Respondents
No direct monitoring	2
Sign of recovery after stunning	44
Sign of recovery after bleeding	20
Indirect monitoring through technical parameters (e.g., electrical)	13

b. Please specify what percentage of animals are actually monitored for the effectiveness of stun:

Responses
5%
Every animal is checked in effective stuns are recorded as they happen.
Both operators occupied with shackling and sticking are observing 100 % of the animals for signs of an ineffective stun. The operator sticking the animals do observe each animals until the bleeding ceases.
Both operators occupied with stunning and sticking is observing 100 % of the animals for signs of an ineffective stun. The operator sticking the animals do observe each animal until the bleeding ceases.
4%
25%
5%
100%
100%
100%
100%
Todos
2.50%
Todos los lotes
10%
5%
100%
100%
100%
2.5%
100%

100% Every animal is checked before sticking
10 per week (All double stuns recorded each day)
100%
100%
0.001%
5%
1-3 %
5-15 %
100%
Die betreffende MA prüft jedes Tier.Betriebsleitung schlachttäglich etwa 5 Tiere
100%
100%
100%
100%
5%
7- 10% / Schlachttag
Täglich Stichproben durch den Veterinär und durch die Qualitätssicherung
Ausführung durch geschulte Mitarbeiter, Betäubungen zu 99 % sicher, da Kopffixierung.
Schwein 100%
BOVINES: 1.5% --- PIGS: 0.2%
1.03%
TWICE A DAY. TOTAL: 40 PIGS
5%
100%
25%
100%

c. Do you systematically record the results of your monitoring activity described in questions 15a and 15b:

Yes	No
35	18

d. If yes, could you please provide your average percentage of unsuccessful stunning:

Responses
<1%
1%
Pigs 0 %, Cattle: < 5 % , the animals are immediately re-stunned (ER)
0.56 %
1%
1.50%
1.50%
1.50%
2.5 %
0%
2%
0.50%
3%
0.1%
Less than 2%
2%
0.016881% per month
0.70%
0.32% on average
1.70%
1%
6-8%
0%
0%
Unter 1% der überwachten Tiere
Unter 3%
2%
Kleiner 1 %
Bitte angeben
1%
2 % Doppelbetäubung; 5 % Backup-Methode (ist nicht immer Doppelbetäubung, kann auch andere Gründe haben)
0%

Nahe 0 %
Bei ca. 0.5% der Tiere ist eine Doppelbetäubung notwendig.
1% höchsten, eher weniger
Schweine <2%
BOVINES: 4.8% --- PIGS: 0%
1.99%
0%
0%
5%

16. Do you have regular cleaning and maintenance schedules for your stunning equipment?

a. A regular cleaning schedule for stunning equipment:

Yes	No
55	0

If yes, please specify the frequency of cleaning:

Time frame	Respondents
Hourly	6
Daily	45
Weekly	5
Monthly	3
Quarterly	0
Don't Know	0

b. A regular maintenance schedule for stunning equipment

Yes	No
52	2

If yes, please specify the frequency of maintenance:

Time frame	Respondents
Daily	31
Weekly	19
Monthly	5
Quarterly	3
Yearly	0
Don't Know	0

17. Please mark outside parties that perform a specific audit regarding animal welfare and list the frequency with which you are audited?

Outside party	Yes	Frequency (in times per year)
Veterinary authority	49	1-daily
Clients	42	1-20
Animal welfare groups	9	1-12
Independent auditor	29	0.2-10
Other parties	4	0.5-12

IV. DESIGN OF EQUIPMENT

18. Please mark with "yes" the technology that has actively been implemented in your plant primarily for the sake of animal welfare during the last 10 years? If yes, please assess the costs of the measure.

Technology	Yes	If yes, please assess how costly that has been					
		--- very costly	-- fairly costly	- slightly costly	o no costs	+ savings	Don't know
Non-slip flooring in lairage and passageways	40	7	18	9	2	0	1
Ventilation equipment in lairage facilities	27	7	13	5	1	0	0
Indirect lighting	27	4	8	6	1	0	2
Noise reducers	13	2	4	2	1	0	1
Blinders	11	0	1	9	0	0	0

Lairage is designed to allow a one-way flow of animals from unloading to the point of slaughter (for cattle and pigs only)	33	8	8	5	4	0	1
Ramp inclination is not steeper than 20 degrees	36	5	9	11	2	0	3
The passageways are wide enough to allow two or more animals to walk side-by-side as long as possible (for sheep and pigs only)	17	5	2	6	0	0	1
Passageways with curves and no sharp angles	26	6	5	5	3	0	3
Non-slip flooring in stunning box	35	5	11	9	0	0	1
Other measures	5	2	0	1	0	0	0

19. Please indicate the most beneficial design measure of the options listed in Question 18?

Technology	Highest ranking design measure as most beneficial for animal welfare
Non-slip flooring in lairage and passageways	22
Ventilation equipment in lairage facilities	1
Indirect lighting	1
Noise reducers	0
Blinders	0
Lairage is designed to allow a one-way flow of animals from unloading to the point of slaughter (for cattle and pigs only)	6
Ramp inclination is not steeper than 20 degrees	3
The passageways are wide enough to allow two or more animals to walk side-by-side as long as possible (for sheep and pigs only)	4
Passageways with curves and no sharp angles	5
Non-slip flooring in stunning box	1
Other measures	1

20. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 19?

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	4	12	6
Competitiveness of operation	0	0	6	12	2
Occupational safety	0	1	2	12	6
Environment	0	0	14	3	2

V. SLAUGHTER OPERATION (CATTLE)

21. Please mark which restraint mechanism most describes the method in use at your plant:

	Calves (up to 8 months)	Adult cattle
Individual stunning box (no head restraint)	7	13
Individual stunning box (with head restraint)	15	29
Other	0	0

22. Please mark with a cross (x) the stunning/bleeding methods in use for the different species/types of cattle in your slaughterhouse.

Methods		Calves (up to 8 months)		Adult cattle	
		Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
Stunning					
Mechanical	*Penetrating captive bolt*	23	12	34	20
	Non-penetrating captive bolt	1	2	3	4
Electrical	*Head-only stunning (electronarcosis)*	0	0	2	0
	Head-to-body stun/killing method (electrocution)	0	0	3	0
Other		0	0	1	0
Bleeding					
Neck cutting	*1 carotid artery cut*	5	1	7	1

	2 carotid arteries cut	8	3	15	6
Chest sticking		15	4	22	6
Other		0	0	0	0

23. Do you apply ritual slaughter for cattle?

Yes	No
12	31

If your answer is yes:

a. What percentage of cattle is ritually slaughtered at your plant without prior stunning?

Responses
1%
1%
0%
0%
30%
30%
20%
0%
0%
0%
25%
Killing without prior stunning is forbidden in Denmark, with prior stunning it is approximately 75%. Penetrating captive bolt is used for both ritual and normal slaughter.

b. Do you use a rotating casting pen, placing cattle on their back or on their side for ritual slaughter?

Yes	No
3	6

VI. SLAUGHTER OPERATION (PIGS)

24. Please mark which restraining/shackling mechanism most describes the method in use at your plant:

	Adult pigs (up to 150 kg LW)	**Adult pigs** (more than 150 kg LW)
Group stunning pen (electric)	3	2
Group stunning pen (gas crate)	12	6
Individual confinement (no conveyer)	7	5
Individual confinement (with automated conveyer)	3	0
Other	1	1

25. Please mark with a cross (x) the stunning/bleeding methods in use for the different species/types of pigs in your slaughterhouse.

Methods		**Adult pigs (up to 150 kg LW)**		**Adult pigs (more than 150 kg LW)**	
		Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
Stunning					
Mechanical	*Penetrating captive bolt*	0	7	0	8
Electrical	*Head-only stunning (electronarcosis)*	2	8	3	4
	Head-to-body stun/killing method (electrocution)	6	0	2	0
Gas	*Dip-lift stunning system*	5	1	3	1
	Paternoster system	9	0	5	0
Other		0	0	0	0
Bleeding					
Chest sticking		19	4	14	4
Other		3	0	1	0

a. Is your main stunning method automated (i.e., no human intervention during restraining and stunning)?

Yes	No
15	8

26. If using electric stunning technology:

a. What are the details of the electric stun (i.e., average frequency, output voltage, output current, and minimum application time)?

Species	Type of stunner:	
	constant current	constant voltage
Adult pigs (up to 150 kg LW)	6	2
Adult pigs (more than 150 kg LW)	6	3

Responses	Frequency (per pig)	Voltage (per pig)	Current (per pig)	Minimum time of application (per pig)	Maximum stun-to-stick interval
	(Hz)	(V)	(mA)	(sec)	(sec)
1	500	Max 400	1.3	3.2	20
2		240	13		10
3				8	2
4			1.3	2.5	
5	50-60	230	1.3	4	10
6	50	220	0-3	3	5
7		257	2.5	7	15
8			1.3	7.5	2

b. The electric stunning system is equipped with a signal which indicates:

System equipped with signals indicating …	Yes	No	Don't know
Interruption of stunning	8	1	0
Insufficient duration of application	5	2	0
Excessive increase in the electrical resistance in	4	2	1

the circuit			
Voltage	6	2	0
Current	9	0	0
Other	0	0	0

c. Are these signals in Question b:

Audio	Visual	Both
1	8	2

d. Do you record electrical parameters during the stun:

Yes, for each animal	Yes, but not for each animal	No
6	1	4

e. If yes, which electrical parameters do you record?

Responses
Time of the stun-Increase-holding time-stunning time -Current (As)
Amps and Volts
Anstieh innerhalb der 1 sec., Betäubungsdauer
Betäubungsdauer

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Responses
Il controllo avviene per partita macellata
Im Zuge des HACCP-Konzeptes erfolgen periodische Überprüfungen

g. Do you use an electrical stunning calibrator[1]:

Yes	No
5	5

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
2	1	0	1	2	0

27. If using gas stunning technology:

Which gas concentrations do you use, for how long, and for how many pigs?

Adult pigs (up to 150 kg LW)

	% CO_2	% N_2	% Argon	% O_2	Average length of exposure (sec)	Number of pigs exposed at the same time
Response 1 (initial step)	91	0	0	0	135	2-5
(second step)	90	7.8		2.09	145	2-5
Response 2 (initial step)	90			10	100	1
Response 3 (initial step)	88					1-3
Response 4 (initial step)	85				120	6
(second step)	85				120	6
Response 5 (initial step)	90				10	2

[1] Device used to test that the electrical parameters (voltage, frequency, and current) are as desired or to determine whether an adjustment to the stunning equipment is necessary.

Response 6 (initial step)	> 90				148	4
Response 7 (initial step)	94				230	5
Response 8 (initial step)	92				40	5
Response 9 (initial step)	90				90	2
Response 10 (initial step)	92				60	2
Response 11 (initial step)	80-85				100	3-4
Response 12 (initial step)	84					
Response 13 (initial step)	85				40	3
Response 14 (initial step)	85				40	3
Response 15 (initial step)	85					5-8
(second step)	90				> 140	5-8

Adult pigs (more than 150 kg LW)

	% CO_2	% N_2	% Argon	% O_2	Average length of exposure (sec)	Number of pigs exposed at the same time
Response 1 (initial step)	91				135	1-3
(second step)	90	7.8		2.09	145	1-3
Response 2 (initial step)	85-90				50-80	10
Response 3 (initial step)	> 90				148	4
Response 4 (initial step)	94				230	1
Response 5 (initial step)	92				40	2
Response 6 (initial step)	90				100	1
Response 7 (initial step)	92				60	1
Response 8 (initial step)	85				40	2
Response 9 (initial step)	85				40	2
Response 10 (initial step)	85					1
(second step)	90				> 140	1

a. Do you record the above parameters and how frequently?

Responses
Continuously by operator + registration in journal every 2. hour
NO
Si, a diario
SI DIARIA
Once a day
Automatically recorded
No
Täglich

Täglich
täglich
ja / übers Jahr hinweg
YES (WEEKLY)

b. What is the maximum stun-to-stick interval after stunning?

Species	Average (sec)	Median (sec)	Minimum (sec)	Maximum (sec)
Adult pigs (up to 150 kg LW)	55	50	10	120
Adult pigs (more than 150 kg LW)	51	43	3	120

II. SLAUGHTER OPERATION (SHEEP)

28. Please mark which restraint mechanism most describes the method in use at your plant:

	Lamb	Adult sheep
Group stunning pen (no restraint)	5	5
Individual confinement (without conveyer)	2	2
Individual confinement (with automated conveyer)	7	5
Other	2	1

29. Please mark the stunning/bleeding methods in use for lamb and sheep in your slaughterhouse.

Methods		Lamb		Adult Sheep	
		Method in use	*Back-up method**	*Method in use*	*Back-up method**
Stunning					
Mechanical	*Penetrating captive bolt*	0	6	0	6
	Non-penetrating captive bolt	1	0	0	0
Electrical	*Head-only stunning (electronarcosis)*	14	2	12	1
	Head-to-body stun/killing method (electrocution)	0	1	0	1
Other		0	0	0	0

Bleeding						
Neck cutting	*1 carotid artery cut*	5	1	5	1
	2 carotid arteries cut	8	1	6	1
Chest sticking		0	0	0	0
Other		0	0	0	0

30. Do you apply ritual slaughter for sheep?

Yes	No
7	9

31. If using electric stunning technology:

a. What are the details of the electric stun (i.e., average frequency, output voltage, output current, and minimum application time)?

Species	Type of stunner:	
	constant current	constant voltage
Adult pigs (up to 150 kg LW)	7	6
Adult pigs (more than 150 kg LW)	6	5

Lamb

Responses	Frequency (per sheep)	Voltage (per sheep)	Current (per sheep)	Minimum time of application (per sheep)	Maximum stun-to-stick interval
	(Hz)	(V)	(mA)	(sec)	(sec)
1	50	240	1.5	3	40
2	50	320	1-3	3	3-5
3	50	320	1-3	3	3-5
4		150	1		10
5			0.3	2	2
6				20	5
7		70-300	1.25	2	2-5
8				3	60

9		220		1-4	
10		400	1	4	30
11	50-60	220	1	4	15
12	50	220	0-1.15	3	4

Sheep

Responses	Frequency (per sheep)	Voltage (per sheep)	Current (per sheep)	Minimum time of application (per sheep)	Maximum stun-to-stick interval
	(Hz)	(V)	(mA)	(sec)	(sec)
1	50	320	1-2	3	3-5
2	50	320	1-2	3	3-5
3		150	1		10
4			0.3	2	2
5				20	5
6		70-300	1.25	2	2-5
7				3	60
8		220		3-4	15
9		400	1	4	30
10	50-60	220	1	4	15

b. The electric stunning system is equipped with a signal which indicates:

System equipped with signals indicating …	Yes	No	Don't know
Interruption of stunning	11	2	1
Insufficient duration of application	4	8	2
Excessive increase in the electrical resistance in the circuit	5	4	5
Voltage	11	2	1
Current	12	1	2
Other	0	1	1

c. Are these signals in Question b:

Audio	Visual	Both
4	13	0

d. Do you record electrical parameters during the stun:

Yes, for each animal	Yes, but not for each animal	No
0	3	12

e. If yes, which electrical parameters do you record?

Responses
Placement of electrodes, increase, amperage, stunning time
Placement of electrodes, increase, amperage, stunning time
At the start of each break period Amps and Volts

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Responses
10 per day
Every two hours systematic recording of xx animals are protocol
Voltage is Checked twice per day
1%

g. Do you use an electrical stunning calibrator:

Yes	No
4	10

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don’t know
3	0	1	1	1	1

SURVEY OF RED MEAT SLAUGHTERHOUSE OPERATORS –FRENCH RESPONSE
27 responses

Etude sur les pratiques d'abattage dans les Etats membres de l'UE
Enquête CIVIC consulting

Localisation

- Pays : France
- Code identification abattoirs :
  27 abattoirs ont répondu au questionnaire de toutes les régions françaises.

I- OPERATION D'ABATTAGE

- Espèce principale :
  Bovins = 12 ; Ovins = 9 ; Porcins = 6

- Espèces abattues :
  Bovins : 21
  Porcins : 11
  Ovins : 18
  Caprins : 15
  Chevaux : 12

- Capacité moyenne :
  Bovins : 20 à 80 bovins/heure
  Porcins : 100 à 500 porcs/heure
  Ovins : 100 à 300 ovins/heure

- Production annuelle :
  Bovins : 7 700 à 280 000
  Porcins : 6 000 à 900 000
  Ovins : 2 000 à 270 000

- Poids moyen :
  Bovins : 360 kg
  Porcins : 80 kg
  Ovins : 19 kg

- Structure des coûts de production :
  Bovins : 0,2 à 0,4 €/kg
  Porcins : 0,2 à 0,4 €/kg
  Ovins : 0,6 à 0,8 €/kg

- Type de procédé d'étourdissement :
  Mécanique : bovins 100%
  Electronarcose : ovins 90 %, porcins 80 %
  Gaz : porcins 20 %

- Date d'installation du système d'étourdissement :
  > 10 ans

- Durée d'utilisation :
  Non définie

- Prévoyez-vous de modifier le procédé d'étourdissement dans les 5 prochaines années
  OUI : 31 %
  NON : 69 %
  - ✓ Système mécanique non perforant
  - ✓ Amélioration du poste entier de tuerie
  - ✓ Restrainer + saignée horizontale

- Motif de changement
  - ✓ Vétusté du matériel
  - ✓ Législation

- Coût de production : non calculé

- Pourquoi avez-vous décidé de ne pas changer le procédé d'étourdissement
  - ✓ Procédé actuel satisfaisant 80 %
  - ✓ Impossibilité financière d'investir dans un nouveau procédé 60 %
  - ✓ Autre : qualité produits satisfaisante, non stratégique

II- FORMATION DU PERSONNEL

- Les membres du personnel chargés du traitement des animaux ont-ils reçus une formation relative au bien-être des animaux.
  OUI : 85 %
  NON : 15 %

- Type de formation
  - ✓ Interne : 77 %
  - ✓ Externe : 23 %

- Formation sanctionnée par un certificat, un diplôme
  - ✓ Avec diplôme : 28 %
  - ✓ Sans diplôme : 72 %

- Formation légalement requise ou volontaire
  Volontaire : 100 %

- Formation agréée officiellement par l'autorité compétente
  OUI : 0 %
  NON : 100 %

- Impact formation
  Positif

III- PROCEDURES OPERATIONNELLES

- Références pour les bonnes pratiques
  - ✓ Législation nationale
  - ✓ Recommandations de fabricants de matériel
  - ✓ Référentiel Mc Donalds
  - ✓ Cahier des charges clients

- Mesures opérationnelles
  - ✓ HACCP bien-être : 37 %
  - ✓ Désignation responsable bien-être : 60 %
  - ✓ Contrôle animaux faibles à l'arrivée : 100 %
  - ✓ Procédure prise en charge animaux transportés plus de 8 heures : sans objet
  - ✓ Abreuvement des animaux dans les locaux de stabulation : si nécessaire, 100 % équipés
  - ✓ Nourrissement animaux : si nécessaire, 100 % équipés > 24h00 / mise à jeun sanitaire
  - ✓ Isolement, abattage prioritaire animaux fragiles : 90 %
  - ✓ Tenue registre maintenance équipements étourdissement : 65 %
  - ✓ Vidéo surveillance : 0 %
  - ✓ Personnel pour s'assurer que tous les animaux ont été saignés : 100 %, personnel non dédié

- Procédure la plus favorable au bien-être des animaux
  Mesures C et G

- Les mesures indiquées - impact
  Impact neutre

- Indicateurs contrôlés actuellement par l'entreprise
  - ✓ OUI : 42 %
  - ✓ NON : 58 %
  - ✓ Délai buvée-abattage
  - ✓ Délai attente en bouverie
  - ✓ Boiteries
  - ✓ Chutes
  - ✓ Glissades
  - ✓ Meuglements
  - ✓ Doubles assommages
  - ✓ Reflexes oculaires

- Contrôle efficacité de l'étourdissement
  - ✓ OUI : 48 %
  - ✓ NON : 52 %
  - ✓ Signes reprise conscience après étourdissement
  - ✓ Signes reprise de conscience après saignée (rituel)

- Programme de nettoyage et entretien
  - ✓ Nettoyage hebdomadaire
  - ✓ Entretien : hebdomadaire à annuel

- Intervenants extérieurs bien-être
  - ✓ Autorité vétérinaire : tous les jours
  - ✓ Clients : variable
  - ✓ Organisation de protection animale : 0,5 fois/an

IV- CONCEPTION DE L'EQUIPEMENT

- Technologies mises en œuvre
  - ✓ Planchers non glissants : 90 %
  - ✓ Ventilation : 98 %
  - ✓ Eclairage indirect : 80 %
  - ✓ Réducteurs de bruit : 50 %
  - ✓ Œillères ?
  - ✓ Circulation sens unique : 80 %
  - ✓ Inclinaison 20° : 85 %
  - ✓ Passages longes ?
  - ✓ Courbes sans angles serrés : 78 %
  - ✓ Box non glissant : 98 %

- Mesure la plus favorable au bien-être
  Mesure A

- Impact mesure A
  Neutre

V- OPERATION D'ABATTAGE (BOVINS)

- Mécanisme d'immobilisation
  Etourdissement individuel (avec immobilisation de la tête)

- Méthodes d'étourdissement
  Pistolet à tige perforante

- Saignée
  Egorgement (rituel)
  Perforation poitrine (conventionnel)

- Abattage rituel
  Si rituel 100 % sans étourdissement selon prescriptions religieuses
  Cage culbutative : oui

V- OPERATION D'ABATTAGE (PORCINS)

- Mécanisme d'immobilisation
  Gaz : étourdissement collectif
  Electrique : confinement individuel

- Méthodes d'étourdissement et saignée
  - ✓ Etourdissement
    Mécanique : rare
    Electrique : 80 %
    Gaz : 20 %
  - ✓ Saignée
    Perforation poitrine

- Système d'étourdissement automatisé
  OUI : 80 %

- Système d'étourdissement électrique
  - ✓ Voltage : 300 à 700
  - ✓ Intensité : 2 àt 4 (variable)
  - ✓ Fréquence : 50 (variable)

- Système étourdissement équipé
  - ✓ Interruption étourdissement : OUI 47 % ; NON 53 %
  - ✓ Durée d'application trop courte : NON 93 %
  - ✓ Accroissement excessif de la résistance électrique : NON 87 %
  - ✓ Tension, Intensité : NON 73 %

- Signaux
  - ✓ Sonores
  - ✓ Visuels

- Enregistrement paramètres ?
  OUI : 7 % mais pas pour chaque animal

- Technique d'étourdissement au gaz
  - ✓ 88 % CO_2
  - ✓ Intervalle étourdissement saignée : 10 secondes maxi

V- OPERATION D'ABATTAGE (OVINS)

- Mécanisme d'immobilisation
  Box collectif
  Confinement individuel avec ou sans convoyeur

- Méthode d'étourdissement
  Electronarcose

- Méthode saignée
  Egorgement

- Abattage rituel
  OUI : 80 %
  Quand rituel sans étourdissement conformément aux prescriptions religieuses ?

- Paramètres d'étourdissement
  - ✓ Voltage : 170 à 300
  - ✓ Intensité : 4
  - ✓ Fréquence : 50
  - ✓ Application : 0,8 s à 5 s
  - ✓ Délai : 5 s à 10 s

- Système équipé
  - ✓ Interruption : OUI 60 %
  - ✓ Durée trop courte : OUI 95 %
  - ✓ Accroissement excessif de la résistance électrique : OUI 15 %
  - ✓ Voltage et intensité, recommandation fabricants respectée : OUI 35 %

Annex 7: List of stakeholders that replied to surveys

Slaughterhouses

Stakeholders responding to slaughterhouse surveys were kept anonymous. For a list of responses by country see Annex 2: Methodology.

National Meat Industry Associations

Stakeholder	Country
Danish Meat Association and Danske Slagtermestres Landsforening	Denmark
Scottish Association of Meat Wholesalers	UK
Swedish Meat Industry Association	Sweden
Verband der Fleischwirtschaft	Germany

Competent Authorities

Stakeholder	Country
Bundesministerium für Gesundheit, Familie und Jugend (BMGFJ)	Austria
C.I.M. Consorzio Italiano Macellatori Industriali	Italy
Central Agricultural Office	Hungary
DARD Northern Ireland	UK
Department for Environment, Food and Rural Affairs	UK
Direcção Geral de Veterinária	Portugal
Federal Agricultural Research Centre, Institute for Animal Welfare and Animal Husbandry	Germany
Federal Public Service: Health, Food chain safety and environment	Belgium
Finnish Food Safety Authority (Evira)	Finland
Food and Consumer Safety Authority (VWA)	Netherlands
General Veterinary Inspectorate	Poland
Ministerio de Agricultura, Pesca y Alimentación	Spain
Ministero della Salute - Direzione Generale della Sanità Animale e del Farmaco Veterinario - Ufficio VI	Italy
Ministry of Agriculture, Natural resources and Environment, Veterinary Services	Cyprus

State Veterinary Administration of the Czech Republic	Czech Republic
Swedish Animal Welfare Agency	Sweden
The Danish Ministry of Justice and Danish Veterinary and Food Administration	Denmark
Veterinary Administration of the Republic of Slovenia (VARS)	Slovenia
Veterinary and Food Board	Estonia
Veterinary Services of Luxembourg	Luxembourg

Animal Welfare Associations

Stakeholder	Country
Dutch society for the Protection of Animals	Netherlands
Global Action in the Interest of Animals (GAIA)	Belgium
Œuvre d'Assistance aux Bêtes d'Abattoirs (OABA)	France

European Commission
Directorate General for Health and Consumer Protection

Study on the stunning/killing practices in slaughterhouses and their economic, social and environmental consequences

Assignment 3 of the Framework Contract for evaluation and evaluation related services - Lot 3: Food Chain (awarded through tender n° 2004/S 243-208899)

Final Report
Part II: Poultry

Submitted by:

Food Chain Evaluation Consortium (FCEC)

Civic Consulting - Agra CEAS Consulting -

Bureau van Dijk - Arcadia International

Project Leader: Civic Consulting

Part II prepared by: Agra CEAS Consulting

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25.06.2007

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Final Report

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Acronyms

AVEC: Association of Poultry Processors and Poultry Trade in the EU countries

CAHP: Community Animal Health Policy

CAP: Common Agricultural Policy

COPA-COGECA: Committee of Professional Agricultural Organisations and General Confederation of Agricultural Co-operatives in the European Union

DG: Directorate General

EFSA: European Food Safety Authority

FAO: Food & Agriculture Organisation

FCEC: Food Chain Evaluation Consortium

MS: Member State/s

NMS: New Member State/s

OIE: Organisation Mondiale de la Santé Animale – World Animal Health Organisation

SCFCAH: Standing Committee on the Food Chain and Animal Health

SG: Steering Group (for this study)

ToR: Terms of Reference

UECBV: European Livestock And Meat Trading Union

URAA: GATT Uruguay Round Agreement on Agriculture

WTO-SPS: World Trade Organisation - Sanitary & Phytosanitary Agreement

Executive Summary

The European Commission is in the process of revising Directive 93/119/EC which covers slaughter practices. DG SANCO commissioned this study to present a socio-economic overview of the situation of the meat sector in the EU with regards to the protection of animals at the time of slaughter. The overall study was conducted by Civic Consulting (lead) and Agra CEAS Consulting of the Food Chain Evaluation Consortium, with support from Bureau van Dijk. Part II of the report (poultry meat) was prepared by Agra CEAS Consulting.

The main conclusions are as follows:

- The EU poultry sector is relatively uncompetitive in global terms and is likely to be sensitive to increases in production cost. However, the cost of stunning and killing is not seen by the industry as being significant in this context and this is borne out by the analysis in this report.

- There are two main slaughter methods in use: electrical water bath stunning and controlled atmosphere stunning. The proportion of slaughterhouses using each system is unknown, but electrical techniques are more prevalent. The number of controlled atmosphere plants in the EU is at least 25.

- Equipment design to ensure good animal welfare has positive economic impacts, although the extent to which these offset costs is not always clear. This is also the case with regard to measures to safeguard animal welfare. Slaughterhouses will adopt animal welfare friendly designs and measures which go beyond legislative requirements in order to gain advantage from the economic benefits whether these are simply better revenues or in order to conform with customer requirements which ensures access to certain markets. Customer requirements are driven by product quality and, in some parts of the EU at least, demand for high animal welfare standards.

- A survey of Member State Competent Authorities made clear that the situation regarding training and certification of slaughterhouse operators differs according to Member State. Some require formal training and the issuing of licenses or certificates of competence whilst others rely on slaughterhouses themselves to ensure that staff are competent to deal with live animals. The survey of slaughterhouses showed that the vast majority ensure that employees dealing with live animals have received appropriate training. In some cases voluntary training takes place in addition to mandatory training.

- Information gathered during the course of this research suggests that the additional purchase, installation and running costs associated with controlled atmosphere systems can be recovered fairly quickly as a result of the financial advantages stemming from improved output yield and quality.

- The small proportion of consumer price that is accounted for by the cost of stunning means that more expensive methods, such as controlled atmosphere stunning, are unlikely to have any appreciable impact on the final consumer price for poultry.

1. Introduction

1.1. Aim of the study

The European Commission has been developing animal welfare legislation for over 30 years. The first Council Directive with respect to slaughtering practices for meat production was Directive 74/577/EC on the stunning of animals before slaughter, which was replaced in 1993 with Council Directive 93/119/EEC with a broader scope, both in terms of species concerned and slaughter circumstances[1]. This legislation stipulates that the killing of domestic animals for human consumption will be performed so as to avoid any unnecessary suffering of the animals during slaughtering practices through the use of proper approved methods to stun and kill animals, based on scientific knowledge and practical experience. Since 1993, the industry has changed along with methods for stunning and killing; likewise, much new scientific evidence has emerged regarding such methods. In this context, the European Food Safety Authority issued in 2004 an opinion and report on the welfare aspects of the main systems of stunning and killing the main commercial species of animals and in 2005, the World Organisation for Animal Health (OIE) adopted guidelines for the slaughter of animals for human consumption. In the light of the scientific data and technical developments the European Commission is in the process of revising Directive 93/119/EC.

For this purpose DG SANCO has commissioned this study to present an overview of the situation of the meat sector in the EU with regards to the protection of animals at the time of slaughter, taking into account the main socio-economic consequences of the current practices. The overall study was conducted by Civic Consulting (lead) and Agra CEAS Consulting of the Food Chain Evaluation Consortium, with support from Bureau van Dijk. Part II of the report (poultry meat) was prepared by Agra CEAS Consulting.

1.2. Acknowledgements

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[1] DG SANCO (2007). Animal welfare at the time of slaughter and killing. Available at: http://ec.europa.eu/food/animal/welfare/slaughter/index_en.htm

2. The EU poultry sector

2.1. Presentation of the poultry sector within the EU [Task 1.1]

The European poultry meat sector is the second largest meat-producing sector after pig meat. Poultry meat production in the EU in 2005 reached 11.1 million tonnes (see Table 1) with France accounting for 17% of total EU-25 production. The other major producers are the UK (14%), Spain (12%), Germany (11%), Italy (10%) and Poland (9%). The EU is 106% self-sufficient in poultry meat.

Table 1: Poultry meat production in the EU-25, 2000-05 ('000 tonnes)

	2000	2001	2002	2003	2004	2005
Austria	106	108	110	112	114	118
Belgium/Luxembourg	296	291	*321*	304	310	297
Denmark	205	218	219	205	213	205
Finland	64	76	83	84	87	86
France	2,243	2,269	2,145	2,015	1,975	1,920
Germany	923	*986*	1,026	1,077	1,166	1,196
Greece	164	163	164	169	166	165
Ireland	121	121	121	120	122	122
Italy	1,080	1,134	1,169	1,097	1,128	1,092
Netherlands	695	717	705	485	555	565
Portugal	293	317	311	270	281	286
Spain	1,125	1,305	1,331	1,336	1,310	1,302
Sweden	99	106	111	106	105	104
UK	1,526	1,572	1,544	1,574	1,574	1,606
EU-15	**8,939**	**9,381**	**9,360**	**8,954**	**9,106**	**9,064**
Cyprus	34	36	37	37	37	37
Czech Republic	214	234	238	227	228	235
Estonia	7	9	11	14	15	9
Hungary	470	472	515	492	490	490
Latvia	7	9	11	12	14	15
Lithuania	25	30	33	39	42	45
Malta	6	6	7	8	8	8
Poland	581	695	794	860	915	1,020
Slovakia	57	64	69	70	74	74
Slovenia	66	72	77	76	80	80
EU-25	**10,406**	**11,008**	**11,152**	**10,789**	**11,009**	**11,077**

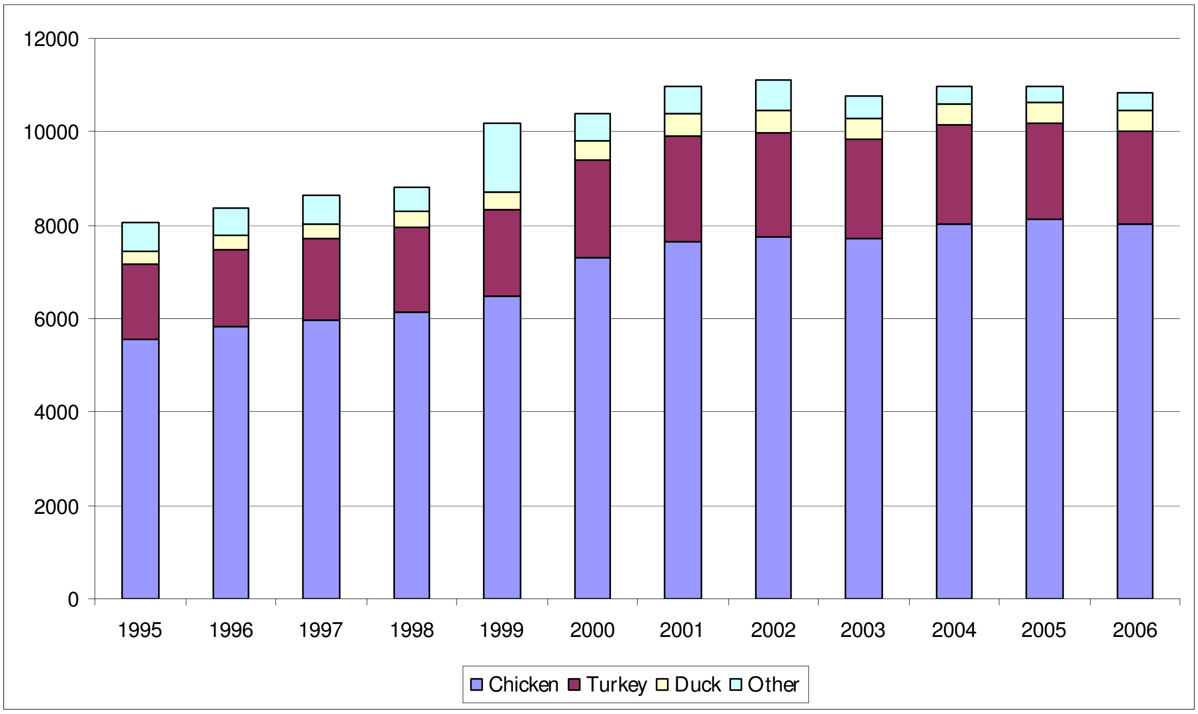
Source: AVEC 2006 yearbook. Original source ZMP from Eurostat and national statistics. Numbers in italics are provisional/partly estimated.

The biggest threat that the poultry industry in the EU has faced in recent years has been avian influenza. The outbreak of avian flu in the Netherlands in 2003 caused a fall in poultry production of 31% and overall EU poultry production decreased by more than 3%.

Chicken and turkey are the main poultry species produced, with chickens comprising around three quarters of total EU poultry production and turkeys 20%. The balance is accounted for by ducks and fowl. The UK was the largest producer of chickens in 2005 with a share of 17% of total EU chicken production. It was followed by Spain (13%), and France (12%). Among the New Member States, Poland is the biggest chicken producer supplying over 11% of EU broilers. As far as turkeys are concerned, the biggest producers are France (30%), Germany (18%), Poland (14%), and Italy (14%).

Figure 1 presents the development of EU poultry production over the past 11 years. Broilers increased their share of overall rising production while the shares of other poultry species have remained relatively stable. Total EU poultry production has increased by some 35% over the period examined, from 8 million tonnes in 1995 to approximately 11 million tonnes in 2005. This increase is almost entirely due to the growth in broiler production, much of which took place between 1995 and 2001.

Figure 1: EU poultry meat production, by species 1995-2006 ('000 tonnes)



Note: 2006 numbers are estimates
Source: AVEC

EU poultry production has partially recovered from the 2003 avian flu crisis, but production levels still remain below 2002 levels. To date, 14 EU Member States (Spain, Greece, Italy, Slovenia, Hungary, Austria, Germany, France, Slovakia, Sweden, Poland, Denmark, Czech Republic and UK) have reported cases of highly pathogenic avian influenza H5N1 in wild birds, with most recent case being in Spain in July 2006. Avian influenza H5N1 was also confirmed in poultry in 5 EU Member States (France, Sweden, Germany, Denmark and Hungary). One outbreak of H5N1 was reported in a commercial turkey farm in France in February 2006, which led to a ban on French poultry exports to many countries. Outbreaks within the EU, and the ban on exports from the biggest EU poultry producer have had a negative impact on the industry.

Poultry meat consumption

Per capita consumption of poultry meat in the EU in 2005 was 23.6 kg. The average EU per capita consumption of broilers is approximately 15 kg while the average EU annual per capita consumption of turkeys is 5 kg. Consumption of poultry meat in the EU has been stable in the last 5 years, though it has been decreasing since the avian flu outbreak in 2003, and is projected to decrease further in 2006. Data for poultry consumption in the EU are sparse as there is no legislative requirement for Member States to report this information, however, it is understood that the main producing Member States are also the main consumers of poultry meat.

According to DG Agriculture market projections, production and consumption of poultry meat in the EU are expected to increase only marginally for the period until 2012 (from 11.0 million tonnes of carcass weight equivalent in 2006 to 11.6 million tonnes in 2012 and from 10.8 million tonnes of carcass weight equivalent to 11.4 million tonnes, respectively).

Poultry processing industry

The EU poultry meat processing sector is characterised by strong regional concentration and specialisation (driven by increased competition) and vertical integration, particularly between the animal feed industry, broiler producers, and the slaughtering and distribution sectors.

Data on the nature and structure of the poultry slaughtering industry in the EU are not available from a common source, partly because there is no legislative requirement to provide such data to the Commission. Contact was made with individual sector associations and Member State governments and this resulted in some limited data on the structure of the slaughtering sector, but this is by no means comprehensive, nor is it comparable[2]. Due to its disparate nature, the information gathered is presented and discussed in Annex 3 to this report.

The material in Annex 3 has been used to generate Table 2 which presents poultry slaughterhouse numbers and annual capacity for those Member States where such data exist. Although the number of slaughterhouses has remained fairly stable in some Member States (for example, Austria, Finland, Germany and Hungary), in others the number of poultry slaughterhouses has clearly declined over the period (Belgium, Latvia, Netherlands, Poland and the UK). However, in most cases the number of birds slaughtered per year has either increased or remained reasonably stable meaning that, in combination with stable slaughterhouse numbers or declining slaughterhouse numbers the average throughput has typically increased. For example, average annual throughput in Finland was 1.8 million birds per slaughterhouse in 2000 and 2.2 million in 2006; in Latvia average annual throughput increased from 0.4 million in 2003 to 1.7 million in 2006. There were some exceptions to this general trend with average annual production remaining similar in Hungary and declining in Austria. These exceptions aside, the data show that generally speaking the poultry slaughter industry in the EU is consolidating over time.

[2] It is also at times inconsistent with total production data.

Table 2: Number of poultry slaughterhouses and slaughter capacity 2000-2006

	2000	2001	2002	2003	2004	2005	2006
	Number of slaughterhouses						
Austria	9	8	8	9	10	10	11
Belgium	94	N/A	78	N/A	N/A	72	N/A
Finland	26	26	26	25	25	23	25
Germany	112	112	121	117	117	N/A	N/A
Hungary	47	44	46	51	50	46	49
Latvia	N/A	N/A	N/A	15	9	8	8
Lithuania	N/A	N/A	N/A	N/A	15	19	19
Netherlands	N/A	N/A	N/A	32	26	23	N/A
Poland	N/A	N/A	N/A	429	N/A	385	N/A
UK	119	114	106	103	101	98	89
	Slaughter output (million birds/year)						
Austria	63.9	67.3	66.7	67.9	69.4	70.7	67.5
Belgium	238.2	N/A	248.9	N/A	N/A	237.7	N/A
Finland	46.1	53.7	54.8	52.8	54.8	54.5	55.1
Germany	406.0	412.9	424.0	447.2	492.9	N/A	N/A
Hungary	187.5	205.8	213.5	217.3	214.9	208.0	193.9
Latvia	N/A	N/A	N/A	6.4	8.2	6.3	13.2
Lithuania	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Netherlands	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Poland	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UK	786.9	795.2	781.4	786.8	788.9	804.1	779.9

Notes: Hungarian output data converted from kg per year to number of birds assuming 2.2 kg weight.

Sources: ZMP, Meat Hygiene Service, VIP vzw, Hungarian Poultry Product Board, Food and Veterinary Service (Latvia), Animal Health and Welfare Unit (Finland), PVE/RVV, Lithuanian Ministry of Agriculture, Polish Ministry of Agriculture and Agra CEAS Consulting calculations.

2.2. Competitive position of the EU poultry sector [Task 1.4]

The competitiveness of the EU poultry sector was undertaken by reviewing the evolution of imports given the prevailing system of import protection. This ultimately provides an indication of the potential vulnerability of the sector to imports from third countries.

2.2.1. Overview of the import tariff instrument

The main instrument of import protection for poultry meat, is the fixed rate import tariff. The aim of this instrument is to protect the EU market from lower priced imports. The import duty is therefore intended to help cover the gap between the lower world market price and the EU price. Prior to the Uruguay Round Agreement on Agriculture (URAA) the EU operated a system of variable levies fixed quarterly. As poultry meat is a cereal based product the levy was based on the difference in feed grain costs between the EU and its major competitors on the world market and a factor relating to processing costs as well as the exchange rate between the Euro (ECU) and the US $.

As part of the URAA, the EU's variable import levies on most agricultural products had to be converted into fixed import tariffs ("tariffication"). These tariffs were subject to reduction commitments over the implementation period. For poultry meat, the tariffs had to be cut by 36% between July 1995 and July 2001. The tariffs on fresh "83% chicken" had to be reduced from €410/tonne to €262/tonne and for boneless chicken cuts (fresh, chilled or frozen) from €1,600/tonne to €1,024/tonne (see Table 22 in Annex 3).

As part of the URAA, minimum access quotas were established for the import of poultry meat into the EU:

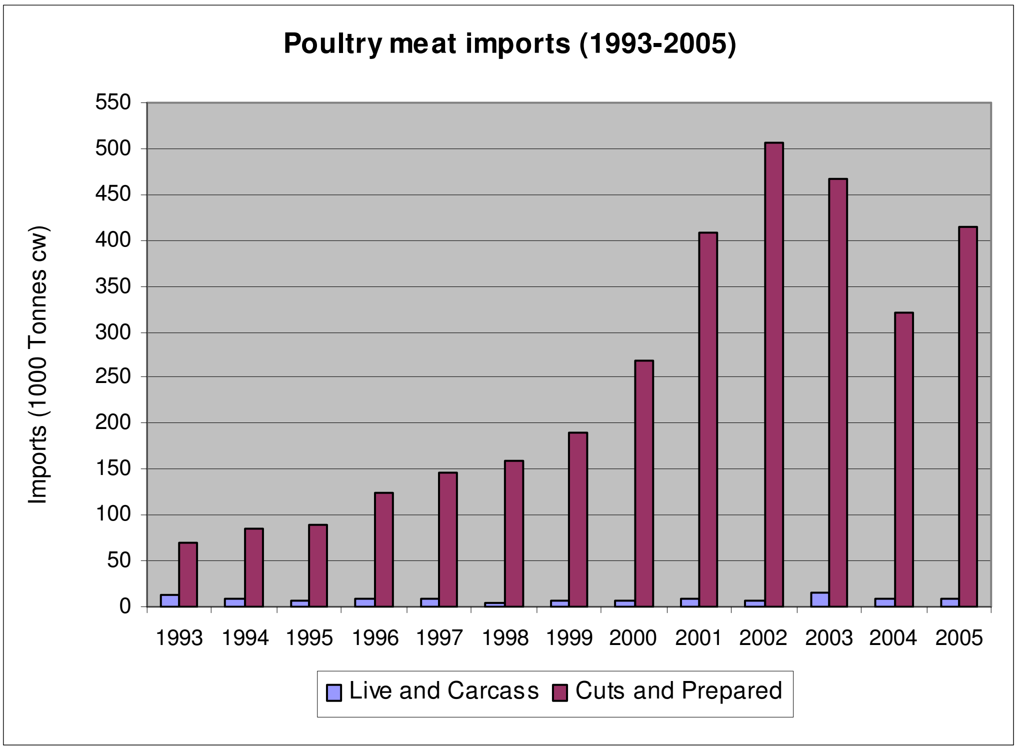
- Fresh, chilled or frozen chicken carcasses: 0 tonnes in 1995 rising to 6,000 tonnes by July 2001, at various tariffs (depending on the tariff item number);
- Fresh, chilled or frozen chicken cuts: 0 tonnes in 1995 rising to 4,000 tonnes by July 2001, at various tariffs (depending on the tariff item number);
- Certain categories of poultry cuts of fowls of the species *Gallus domesticus*: 15,500 tonnes from 1995 onwards, at a zero tariff;
- Fresh, chilled or frozen turkey meat: 0 tonnes in 1995 rising to 1,000 tonnes by July 2001, at various tariffs (depending on the tariff item number);
- Certain categories of poultry cuts of turkeys: 2,500 tonnes from 1995 onwards, at a zero tariff.

As part of an agreement with the United States relating to the enlargement of the European Union to 25 Member States in 2005, from the start of August 2006 the quotas for fresh chilled and frozen chicken carcasses was increased by 49 tonnes and the quota for fresh chilled and frozen chicken cuts was increased by 4,070 tonnes. At the same time it was also agreed that the quota for cuts of fowl be increased by 1,605 tonnes and that for fresh, chilled and frozen turkey meat by 201 tonnes.

2.2.2. Evolution of EU-15 imports and comparison with quotas

Figure 2 shows the level of poultry meat imports into the EU-15 between 1993 and 2005, the data are sub-divided into live and carcass imports, and cuts and preparations.

Figure 2: Poultry meat imports into the EU-15 between 1993 and 2005



Source: DG Agriculture.

In the period from 1993 to 2002 imports of poultry meat rose sharply to reach a peak of 512,000 tonnes in 2002. This increase was largely due to the fact that there was a very substantial increase in imports of salty frozen poultry meat under the CN heading (0210 9939) which attracted a lower customs duty during this period. There was also an increase in imports under heading 1602. Imports of salted poultry meat under this heading rose from 3,680 tonnes in 1996 to 226,408 tonnes in 2001 before dropping back to 128,454 tonnes in 2003 after additional clarification of the tariff was provided. The bulk of these imports came from Brazil and Thailand. In 2006 the EU ruled that the restriction applied to such imports was not WTO compatible and from June 27, 2006 such imports at reduced tariffs have once again been allowed. Imports of turkey meat (as well as cuts and preparations) also rose substantially from 25,000 tonnes to 8,000 tonnes.

This analysis of trade data shows that following the introduction of the URAA, but particularly in the period 1997-2001, there has been a very substantial increase in EU imports of poultry meat and poultry meat products. In part this has been due to the aforementioned issue in relation to the level of tariff attracted by products in the CN categories 1602 and 0210 which effectively created a breach in the protection afforded to most types of poultry meat and poultry meat product. It should, however, be noted that imports of carcasses and cuts have risen well in excess of the volumes entering under the preferential Tariff Rate Quotas (TRQ) indicating that a significant proportion of product is entering having paid the full rate of duty. Given the tariff levels prevailing this suggests that the competitiveness of third country producers is high.

2.2.3. Possible impacts of trade liberalisation

This assessment that the sector is vulnerable is borne out by an evaluation of the market organisation for poultry meat undertaken by Agra CEAS for DG Agriculture of the European Commission (Evaluation of the Common Market Organisations (CMOs) for Pigmeat, Poultrymeat and Eggs, Contract 30-CE-0009330/00-42, 2005). Econometric modelling of the impact of removal of import tariffs (and export refunds) on the sector estimated the level of imports which would have occurred in three separate periods (1990-1992,1995-1997 and 2000-2002) if import tariffs (and export subsidies) had not been in place, i.e. a counterfactual. The results indicated that, as would be expected *a priori*, the import protection provided first by variable levies in the 1990-1992 period and subsequently by fixed tariffs are estimated to have led to substantially lower volumes of total annual imports than would otherwise have taken place. The presence of import tariffs resulted in an annual average reduction in the volume of imports in the three periods of 72% in 1990-92; 77% in 1995-97; and 52% in 2000-02. Expressed in absolute terms the tariffs are estimated to have reduced imports by over 1.5 million tonnes in the 1990-92 period and by over 1.0 million tonnes in the subsequent two periods (1995-97 and 2000-02).

2.2.4. Conclusions concerning 'vulnerability' of sector

The above analysis suggests that the poultry sector is relatively uncompetitive in global terms and is potentially likely to be highly vulnerable/'sensitive' to a potential reduction in tariffs, or alternatively, an increase in costs[3]. The industry and equipment manufacturers noted in interview that the biggest threats to the EU poultry industry are (not ordered):

- domestic production costs (of which feed is by far the most significant accounting for the majority of production cost);
- the costs of complying with legislation (related to animal welfare requirements, environmental legislation on-farm or the need to dispose of by-products at the slaughterhouse[4]); and,
- the cost of labour.

The cost of the stunning/killing method itself is not seen as being significant in this context by the industry. That said, there is a perception that slaughterhouses in some third countries are less likely to be able to invest in controlled atmosphere stunning systems due to a lack of access to credit and a relatively uncertain economic environment which together alter the payback calculation[5]. For example, there are no controlled atmosphere stunning plants in Thailand and less than five in Brazil (partly as a result of the need to produce to Halal specification to facilitate worldwide exports). These countries are mainly supplying raw frozen product for the ready meal market.

The industry believes that the most significant threat to the EU poultry sector is posed by Brazil and Thailand. The product of particular concern is boneless meat, especially breast fillet, which is typically destined for the growing ready meal and processed product markets, although some is also used in the catering trade. Imports of further processed (i.e. cooked to some degree) products are increasing, particularly as a proportion of imports from Thailand[6], and these often carry a lower tariff than frozen meat. However, European retailers do not generally import fresh, chilled products from third countries

[3] Grethe (2006) notes in this context that future costs of compliance with obligatory animal welfare standards in the EU for poultry production are significant and may lead to relocation of production to third countries. Grethe, H. (2006) "*High animal welfare standards in the EU and international trade – How to prevent potential 'low animal welfare havens'?*" In: Food Policy Volume 32, Issue 3, June 2007, Pages 315-333.

[4] These by-products may even attract additional revenue in some third countries.

[5] In the case of turkey slaughtering there is also likely to be an impact from access to cheaper labour, this is not so important with regard to chicken.

[6] Partly in response to restrictions in place on raw product following Avian Influenza.

because these products have a relatively short shelf-life of around 14 days, although research is on-going to extend this, and most retailers prefer to operate with shorter supply lines for key products to avoid potential supply disruption.

Finally, a small number of poultry slaughterhouses in north America use controlled atmosphere stunning methods, a small number of very early models were installed in Japan between 15 and 20 years ago (these still involved live shackling, so do not confer the same financial benefits as modern controlled atmosphere systems) and there is at least one slaughterhouse known to be performing controlled atmosphere stunning in Australia.

3. The slaughter chain for poultry production

3.1. Stunning/killing methods used in the EU [Task 1.3]

EFSA (2004)[12] reports that poultry may be stunned using electrical water bath systems with high frequency currents (i.e. above 50 Hz) that do not result in cardiac arrest. Stunning/killing techniques[7] include electrical water bath supplied with 50 Hz sine wave AC and controlled atmosphere systems using a range of gas mixes. As the remainder of the slaughter process is the same for both electrical stunning and electrical stunning/killing, there are no economic differences between these two approaches.

Electrical techniques are more prevalent in the EU, partly because they have been in commercial use for longer and partly because there is no harmonised legislation for controlled atmosphere stunning systems. The exact number of EU slaughterhouses using controlled atmosphere stunning systems is not known. However, there are at least 25 plants using this method[8]. Raj (2006)[9] estimates that 75% of turkeys and 25% of chickens slaughtered for human consumption in the UK are killed using either inert gas mixes or less than 30% CO_2 mixed with inert gases. A UK slaughterhouse Director supported this in estimating that around 10% of UK slaughterhouses processing chickens use controlled atmosphere systems, but because these are large plants, they account for some 20% of broilers slaughtered. Interviews in France suggest there are only two controlled atmosphere plants, both using CO_2 methods. Interviews in Germany indicate that around 20% of poultry are slaughtered using controlled atmosphere systems.[10]

It is also worth mentioning that a vacuum stunning method is in development and is undergoing trials in the US in conjunction with an EU equipment manufacturer. This operates on a similar principle to controlled atmosphere stunning in that the birds enter a chamber (in crates) from which air is withdrawn to the point of asphyxiation. Once dead the birds are processed in the same way as set out in the section for controlled atmosphere stunning. The electrical and controlled atmosphere stunning systems are explained in the sub-sections below.

3.1.1. Electrical stunning

Raj (2006)[11] reports that electrical water bath stunning is the most common method of stunning (or stunning/killing) poultry under commercial conditions. The waveform and frequency of the current used, the amount of current applied to individual birds, the number of birds in the water bath simultaneously and the number of blood vessels severed in the neck vary widely in commercial

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[7] In this context the term stunning/killing is used to denote processes which stun and then kill, i.e. the stunning is irreversible, as compared to processes which result in reversible stun only.

[8] O' Keefe, T. (2006) "*Advances in CAS Technology*". In WATT Poultry USA. February 2006 and Shane, S.M. (2005) "*Future of Gas Stunning*". In WATT Poultry USA. April, 2005.

[9] Raj, A.B.M. (2006) "*Recent developments in stunning and slaughter of poultry*". In World's Poultry Science Journal, Vol 62, September 2006.

[10] Member of the Bundesverband der Geflügelschlachtereien e.V. Written communication. 07 June 2007.

[11] Raj, A.B.M. (2006) "*Recent developments in stunning and slaughter of poultry*". In World's Poultry Science Journal, Vol 62, September 2006.

practice. However, EFSA (2004)[12] makes clear that water bath stunning is normally carried out using frequencies well above 50 Hz, usually between 400 and 1,500 Hz of sine wave AC and pulsed DC (but see section 3.2 where a survey of slaughterhouses suggests that lower frequency stunning is used by almost a third of responses). The frequency used is of particular importance in animal welfare terms as the combination of high frequency with low current intensity can lead to immobilisation without stunning.

Electrical stunning can be either reversible or irreversible (i.e. stunning/killing). In the former case, a high frequency stun is administered (200 Hz or more) and in the latter, a lower frequency stun is used (between 50 and 60 Hz) which can induce cardiac arrest (irreversible stun) in some birds depending upon the amount of current delivered to them. The incidence of cardiac arrest increases with the amount of current received by the birds. Lower frequencies can lead to bone shattering and burst blood vessels which has implications for both meat quality and yield in that affected areas might be trimmed for presentational purposes. A higher frequency stun requires a shorter period between stunning and bleeding, which must be completed before the bird is able to regain consciousness, but can provide better results in terms of meat quality[13]. Comparisons between stunning methods are often made using a frequency of 50 Hz and the economic impact in terms of meat quality and yield should therefore be borne in mind where this is the case.

In either case electrical stunning involves the birds being unloaded at the slaughterhouse and shackled upside down whilst conscious. The processing line then moves through a water bath where the stun is administered (at various possible combinations of voltage, duration and, critically, frequency, see above). There are then two broad ways in which the birds are killed. One method is to cut a combination of veins/arteries[14] in the neck and the other is decapitation. Decapitation is not currently widely used in the EU, although some equipment manufacturers believe the method may become more prevalent in the future.

Following bleeding the birds enter a scalding tank prior to defeathering, are then eviscerated and chilled prior to further processing/packaging and labelling.

Electrical stunning methods are relatively quick to take effect (around 10 seconds on average, see section 3.2) and do not require very much space within the processing line. Birds dead on arrival are easily identified and discarded. The main disadvantage is that birds are shackled live. This results in a dusty and noisy atmosphere and the task must be carried out in low-light to keep the birds as calm as possible. This procedure is stressful for both workers and birds.

There are a few uncommon techniques used to stun poultry, but these are not considered by key stakeholders in the industry to be commercially significant[15]. Typically these techniques are used either to cull on-farm or as back-up methods in the event of ineffective stun in slaughterhouses.

[12] European Food Safety Authority (2004) Welfare Aspects of Animal Stunning and Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. (Question N° EFSA-Q-2003-093). Accepted on the 15th of June 2004.

[13] Developments in electrical stunning systems in the US have resulted in a low voltage pulsed DC current followed by a constant low voltage AC current being used. It is claimed that this approach does not impact on meat quality and is used in some plants supplying McDonald's in both the US and the UK (McDonald's (2005) McDonald's Animal Welfare Feasibility Study Controlled Atmosphere Stunning for Broilers. Report prepared for McDonald's management by McDonald's animal welfare team. June, 2005.

[14] Either two carotid arteries, one carotid artery and one external jugular vein or one jugular vein.

[15] In most cases these techniques are time consuming and, as a consequence, throughput is too small to be commercially viable.

Examples include head-only stunning where the bird is restrained in a cone or shackle; neck dislocation; dry plate stunning where the head is pushed onto an electric grid; captive bolt; and, neck cutting with an electric current running through the blade[16].

3.1.2. Controlled atmosphere stunning

Controlled atmosphere stunning/killing was developed in the UK in the 1980s in response to impaired meat quality following electrical stunning techniques widely used at the time[17].

EFSA (2004)[18] note the following EU use of various controlled atmosphere systems.

Table 3: Use of controlled atmosphere systems in the EU

System	Usage
Anoxic gases only (argon, nitrogen and their mixtures with up to 2% by volume of residual oxygen in the atmosphere):	No data.
Anoxic gases and low concentrations of CO_2 (argon, nitrogen and their mixtures with up to 5% by volume of oxygen and up to 30% by volume CO_2):	Up to 5 plants in the UK and one in Belgium.
Two stage CO_2 (40% CO_2, 30% oxygen and 30% nitrogen followed by 80% CO_2 for two minutes):	6 chicken processing plants in Finland, Belgium, Germany, France, UK and Sweden, 3 turkey plants in Italy, France and Germany.
CO_2 only (30% to 80% CO_2 in air):	4 plants, one for broiler chickens and one for turkeys in Germany and two in Italy.

Carbon dioxide mixes are used for turkeys as they appear to be more susceptible to carbon dioxide than anoxia. Chickens can be processed using any of the gas mixes above.

The basic process for controlled atmosphere stunning involves the birds being transferred to the controlled atmosphere chamber, either loose or still within crates on a conveyor belt. The time required to achieve effective stun depends on the gas mixture and size of the birds, but is in the order of 15 to 45 seconds; however, birds are exposed to gas mixtures for longer, typically two to three minutes, to ensure they do not recover consciousness after returning to atmospheric air for shackling and bleeding to be performed. Prolonged exposure time requires a long enough controlled atmosphere chamber (or a slow enough line speed) to facilitate this where a conveyor system is used (a pit system[19] takes up less space). More processing space is therefore sometimes required compared to electrical stunning systems in order to achieve the same throughput.

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16 For further details of these techniques see European Food Safety Authority (2004) Welfare Aspects of Animal Stunning and Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. (Question N° EFSA-Q-2003-093). Accepted on the 15th of June 2004.

17 Raj, A.B.M. (2006) "*Recent developments in stunning and slaughter of poultry*". In World's Poultry Science Journal, Vol 62, September 2006.

18 European Food Safety Authority (2004) Welfare Aspects of Animal Stunning and Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. (Question N° EFSA-Q-2003-093). Accepted on the 15th of June 2004.

19 A pit system is a one stage CO_2 technique, but, because the gas concentration increases with depth, it approximates a two (or multi-stage) system in that the birds are rendered unconscious at a certain level before going on to be irreversibly stunned.

After exiting the controlled atmosphere chamber, the birds are shackled whilst inanimate before proceeding to the bleeding stage and on to defeathering, chilling, further processing, etc.

Some controlled atmosphere systems require more space for comparable throughputs to electrical stunning systems because of the long exposure times required. It is also harder to identify and remove birds that are dead on arrival. However, shackling the birds whilst inanimate removes the need for workers to operate in noisy, dusty and low-light conditions, although ventilation may still be required to remove gas trapped within the feathers.

3.2. Stunning/killing methods used by survey respondents

Despite the considerable assistance of the Association of Poultry Processors and Poultry Trade in the EU countries (AVEC) and the granting of two extensions to the survey response deadline, only 29 poultry slaughterhouses returned completed questionnaires; while the survey provides useful information it should not be considered representative. Of these, 18 (62%) slaughter chickens, 6 (21%) slaughter turkeys and 5 (17%) mainly slaughter chickens, but also slaughter turkeys. All but 1 operate electrical stunning systems. Table 4 presents the electrical stunning methods used by respondents. The most common main method used for chickens (15 respondents) is reversible water bath stunning with at least 200 Hz. This is also the case with respect to turkeys. In both cases this method is used around twice as often as irreversible water bath stunning at between 50 and 60 Hz.

Table 4: Electrical stunning methods in use

Stunning technique	Chickens		Turkeys	
	Main method	*Emergency back-up*	*Main method*	*Emergency back-up*
Head only stunning	3	0	0	0
Reversible water bath above 200Hz	15	0	7	1
Reversible water bath 120-150Hz	1	0	0	0
Irreversible water bath 50-60Hz	7	0	4	0
Other				
Neck dislocation	0	3	0	0

Source: EU survey of slaughterhouse operators.

Note: there is a total of 22 slaughterhouses processing chickens and 11 processing turkeys. Four slaughterhouses processing chickens have more than one main method, only 3 have a back-up method. No slaughterhouse processing turkeys has more than one main method and only 1 has a back-up method in use.

Some 8 respondents slaughtering chickens reported that they use constant current and 11 use constant voltage; 4 use both constant current and constant voltage and 13 use variable current and voltage. For those slaughtering turkeys, 6 use constant current and 6 use constant voltage with 2 using both and 1 using variable current and voltage.

Respondents were asked to record the frequency, voltage and current used per bird. With respect to chickens, whilst a number of higher frequencies are used, the most common frequency used is 50Hz (5 respondents), which is not considered to be the most effective electrical stunning method in terms of meat quality (see Section 3.1.1). In terms of voltage, 69% of respondents used between 30 and 100 volts. Finally, 79% of respondents use at least 100 mA per bird. Minimum stun time varied from 4 to 24 seconds with an average of 10.8 seconds. The maximum stun to stick interval ranged from 3 to 18 seconds with an average of 8.5 seconds.

The range of frequency used for stunning turkeys also varied, but no discernible pattern is evident. Respondents typically used between 50 and 200 volts with around 150 being most common. Finally, half the respondents who provided information about current use 150 mA with all but one of the remainder using higher currents. The minimum stun application time varied from 4 to 27 seconds with an average of 14.5 seconds. Maximum stun to stick time ranged from 2 to 30 seconds with an average of 10.7 seconds.

Respondents were asked whether their electrical stunning system is equipped with a signal indicating a number of individual problems or values of operating parameters. The results in Table 5 show that typically equipment will alert operators if there is an interruption in stunning and will notify voltage and current. None of the respondents reported that their equipment alerts them to insufficient duration of application and the majority would not be made aware of an excessive increase in the electrical resistance in the circuit. Five respondents noted that frequency is monitored and one respondent commented that it is not necessary to have automated alerts when malfunctions occur because these would be detected instantly by employees stationed at the bleeding point of the line.

Table 5: System equipped with a signal indicating problems or values of operating parameters

	Yes	No	Don't know
Interruption of stunning	16	10	0
Insufficient duration of application	0	22	0
Excessive increase in the electrical resistance in the circuit	5	15	2
Voltage	24	2	0
Current	24	1	0
Other	8	0	1

Source: EU survey of slaughterhouse operators.

Signals provided are visual in all 27 cases, but 6 respondents noted that there is also an audio warning. Respondents were asked whether electrical parameters are recorded during the stun. Just over half (54%) indicated that they were recorded (typically current, voltage and frequency), but not for each bird. Whilst 7% note that all electrical parameters are recorded for all birds, 39% do not record parameters at all. Where parameters are recorded this is done either manually or automatically by the stunning equipment. Few respondents supplied the sampling procedure used where parameters are not systematically recorded, but where this information was provided it ranged from 1% to 10% of throughput with some slaughterhouses performing hourly or monthly checks. Some 70% of respondents use an electrical stunning calibrator which is calibrated daily by 37% of these respondents and yearly by 32%. A further 32% calibrate either weekly, monthly or quarterly.

When asked which measures have been introduced with regard to occupational safety, respondents offered the following:

- fencing the stunning equipment (4 respondents);
- installation of emergency stop procedures (1 respondent); and,
- electrical danger warning signs (1 respondent).

Only two respondents indicated that any environmental measures had been taken and in both cases the measure related to the efficient use of water in the water bath.

Table 6 shows bleeding methods in use by respondents. The most popular method for bleeding chickens amongst respondents is to cut 1 carotid artery and 1 external jugular vein, although cutting 2 carotid arteries is also frequently used. Cutting 2 carotid arteries is by far the most common method for turkeys.

Table 6: Bleeding methods in use

Bleeding methods	Chickens		Turkeys	
	Main method	*Emergency back-up*	*Main method*	*Emergency back-up*
1 carotid artery cut and 1 external jugular vein cut	12	0	1	0
2 carotid arteries cut	7	1	9	0
1 jugular vein cut	2	0	1	0
Manual knife	0	1	0	0
Decapitation	1	0	0	0

Source: EU survey of slaughterhouse operators.

Note: there is a total of 21 slaughterhouses processing chickens and 10 processing turkeys (one respondent did not answer this element of the question). One slaughterhouse processing chickens has more than one main method of bleeding, only 2 have a back-up method. One slaughterhouse processing turkeys has more than one main method and none has a back-up method in use.

The slaughterhouse using controlled atmosphere stunning stuns chickens to kill using a two stage CO_2 process involving 40% CO_2, 30% O_2 and 30% air in the first stage followed by 80% CO_2 mixed with air in the second stage (gas mixes are continually monitored). Bleeding takes place through either cutting 1 carotid artery and 1 external jugular vein, 2 carotid arteries or 1 jugular vein. No further information was provided on the use of this method by this respondent.

All respondents noted that the stunning method is fully automated. Whilst 19 slaughterhouses mainly processing chicken have a fully automated bleeding system, 3 do not. The automated systems have one or two rotating blades, which determine the position of the cut and number of blood vessels cut. None of the slaughterhouses processing only turkey have fully automated bleeding systems. This is probably due to the wide variation in the age, size and weight of turkeys slaughtered for human consumption.

Ritual slaughter comprises a small, but important, market segment in many Member States. Key stakeholders have different perceptions of the extent to which ritual slaughter involves prior stunning with one researcher into slaughter techniques suggesting that prior stunning is less widely applied in some Member States than in others.

An interview with an official from the UK Competent Authority suggested that in the UK, the vast majority of ritually slaughtered poultry are pre-stunned. A UK industry body estimated that just over 1% of poultry in the UK are killed without prior stunning and noted that this market is only growing slowly. At least one company in the UK sells poultry meat under a non-stunned logo, although major food companies using or selling ritually slaughtered meat insist on pre-stunning. An interviewee from a UK slaughterhouse noted that there is no price premium available for ritually slaughtered meat and no significant cost implication. Official UK policy is to permit and respect ritual slaughter, although its practice is very carefully monitored and an Official Veterinarian is always present.

Interviews with the Competent Authority in France reported that around two thirds of poultry are ritually slaughtered (with or without prior stunning), although the market for ritually slaughtered poultry only accounts for around 8%-9% of the total with the balance sold through normal channels according to a French industry body. An animal welfare organisation pointed out that the ritual slaughter of poultry in France often takes place without prior stunning and that demand is increasing, a point corroborated by Raj (2007)[20]. Ritually slaughtered French poultry meat without prior stunning is also exported to Germany, Austria and Scandinavian countries (slaughter without prior stunning is not permitted for animal welfare reasons in Sweden and in some Austrian Länder).

Just under half of the slaughterhouses responding to the questionnaire carry out ritual slaughter (48%). Of these, the vast majority provide a pre-stun. From the answers provided to the survey it is unclear if the three respondents who reported that no pre-stunning is used (at least for a proportion of birds) interpreted the question correctly.

Respondents were asked whether they were planning to change their slaughter technique in the next five years. Only 5 respondents indicated that they are considering this[21]. Of these, 3 are considering switching to CO_2 controlled atmosphere stunning systems and 1 is considering a CO_2 or argon gas mix. The final respondent considering a change is considering an electrical system where the current and voltage can be adjusted. The reasons given for considering a switch to controlled atmosphere stunning include meat quality, animal welfare considerations, worker safety issues and consumer demand. Two respondents expect such a change to result in a very significant increase in costs, one expects a fairly significant increase and the other expects costs to remain approximately the same. However, it is assumed that these respondents expect an increase in revenue to at least offset the expected cost increase. The increased revenue is most likely to result from a substantial improvement in carcass and meat quality and increased yield from gas stunned poultry (see section 4.4.1.3). The respondent suggesting a change to a more flexible electrical system cited improvements in meat quality and animal welfare as the driving factors and expects costs to decrease fairly significantly.

Respondents were asked why they would not be changing their stunning method and were allowed to provide multiple answers. The fact that the current method is judged satisfactory was cited by 15 respondents (83% of those answering this question). A third of respondents suggested that a change would entail excessive production costs. Eleven percent said that they were not financially capable of investing in a new method and 17% cited other reasons including a lack of space in the existing plant; the need for reversible stunning for ritual slaughter; and, a lack of clarity on the relative animal welfare characteristics compared to electrical stunning systems.

[20] Personal communication.

[21] Those answering “don’t know” are assumed to not be making any plans.

4. Socio-economic analysis of slaughter practices

4.1. Design of restraining and stunning/killing equipment [Task 2.2]

This section considers the extent to which animal welfare considerations are taken into account in the design of stunning/killing equipment. Economic, social and environmental impacts are considered.

4.1.1. Current practice

Equipment manufacturers take a number of factors into account when designing stunning systems, although as commercial companies, profit is the main driving force. This means that issues such as reliability, durability, workforce safety, cleaning requirements, the weight range that can be processed, processing speed and efficiency are very important. However, because profit is ultimately driven by the ability to make sales, manufacturers have to take into account other attributes demanded by the market (for example, animal welfare requirements[22], energy efficiency, efficiency of water use) and existing legislation. It is important to note that a link between increased stress and reduced meat quality is recognised throughout the industry and ways of reducing stress are therefore important in the design process. Government funds are often available for research into novel slaughter designs and equipment manufacturers often work closely with the research sector. Beyond this, a survey of Member State Competent Authorities made clear that slaughterhouses and their equipment/operating procedures need to be approved before operation. Usually the need to kill the animal as quickly as possible and without causing avoidable pain and suffering is a stated aim and this objective therefore feeds back into the design of equipment in order to ensure that it will be approved for use.

The results from the survey demonstrate the importance of animal welfare in the responding slaughterhouses and that a number of different (overlapping) codes are followed which reflect both legislative requirements and consumer demands (as reflected by retailers). Retailer demands are (by definition) higher than the base legislation and are more important to slaughterhouses because failure to follow these demands would mean that the lucrative retail market would not be available. That said, retailer demands tend to be based on individual indicators[23] (perhaps for simplicity) and the balance between these indicators is not always considered appropriate by animal welfare organisations. Retailer codes also have to ensure that cost-effective production is still possible, so there is a clear compromise between animal welfare and economics. These codes/demands are fed back into equipment design, not least because poor animal welfare results in lower quality meat and consequentially reduced revenues. This does not, however, mean that animal welfare standards are necessarily as high as animal welfare organisations would like, or think appropriate.

A European animal welfare organisation pointed out that it is not just the design of equipment that is important in this context, but also the cultural attitude to animal welfare. Equipment may be designed to result in high animal welfare, for example, breast plates on shackles to increase comfort, but unless employees take care to ensure animal welfare, these benefits may not be apparent. In this context the survey results make clear that training for animal welfare is widespread which indicates that the correct cultural attitude is in place, at least in those plants responding. It should, however, be noted

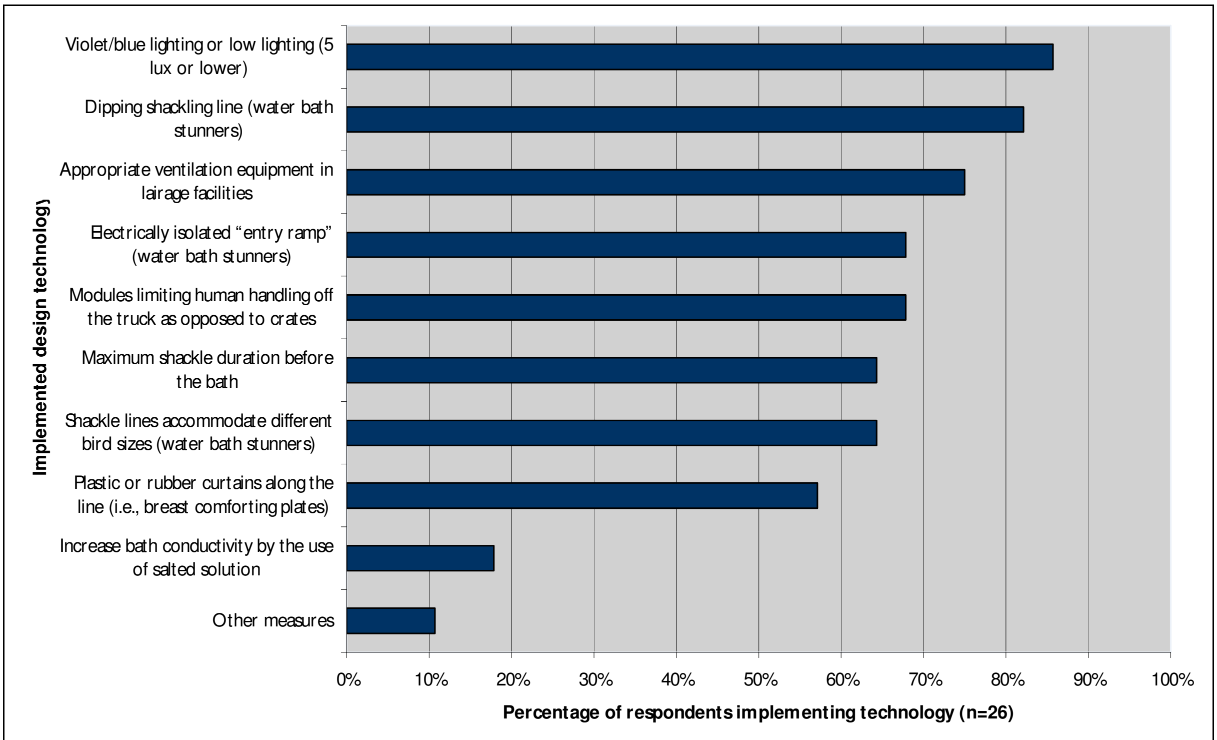
[22] This does not mean that equipment manufacturers would otherwise be indifferent to animal welfare issues.

[23] For example, time shackled prior to stun, time between stunning and bleeding, etc. rather than outcomes such as minimising discomfort and distress.

that slaughterhouses with a poor cultural attitude to animal welfare are unlikely to make this clear in their response; the survey results therefore probably present a more favourable picture than reality.

Respondents were asked to indicate which technologies have been actively implemented in their plants, primarily for the sake of animal welfare, in the last ten years (see Figure 3). Most (24 from 28, 86%) had implemented blue or low level lighting. However, an animal welfare organisation indicated that in their experience these forms of lighting are not common. The majority of those using electrical stunning (23 from 27, 85%) had introduced dipping shackle lines. Three quarters of respondents had ensured appropriate ventilation in the lairage (in agreement with the perception of animal welfare organisations). The least implemented technology is the use of salt to increase conductivity (5 from 27, 19%). This may be either because this technique has been in use for a long time or because its effectiveness is questioned[24]. In the UK, water is sometimes sprinkled on empty shackles, just prior to live bird shackling, in order to improve electrical conductivity/reduce resistance, although the prevalence of this practice is unknown.

Figure 3: Technologies implemented by respondents



Source: EU survey of slaughterhouse operators.

[24] A UK industry organisation pointed out that the water in a water bath is constantly replaced which makes it difficult to maintain a saline solution, although other sources state that the addition of salt can increase conductivity and indeed recommend it European Food Safety Authority (2004) Welfare Aspects of Animal Stunning and Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. (Question N° EFSA-Q-2003-093). Accepted on the 15th of June 2004.

When asked which of the technologies above had been most beneficial in animal welfare terms, 10 from 26 respondents (38%) highlighted systems to minimise human handling of live birds[25]. A French animal welfare organisation also commented that this measure is the most beneficial in terms of animal welfare[26]. It should be pointed out, however, that some module systems require birds to be tipped out onto a conveyor and this raises a different animal welfare issue. A further 6 respondents (23%) cited appropriate ventilation in the lairage. Two respondents in each case mentioned plastic or rubber breast comforting plates, dipping shackling line and maximum shackle duration (also mentioned as being very beneficial in animal welfare terms by a French animal welfare organisation). One respondent in each case mentioned low level lighting, isolated entry ramps and salted solution to increase conductivity. Shackle lines to accommodate different bird sizes were not mentioned by any respondents. One animal welfare organisation noted that from their point of view it is not possible to choose between measures in terms of importance of impact on animal welfare.

4.1.2. Economic assessment

The economic impact of animal welfare technologies is difficult to assess. On the one hand the cost of implementing such measures might be expected to be known, although in practice this will be dependent on the individual circumstances of slaughterhouses. On the other hand, the economic benefits realised through improved meat quality are harder to quantify (by equipment manufacturers, operators and other key stakeholders), although it is recognised by all actors that they do exist. Given these problems, it was only possible to make a relatively qualitative assessment of economic impact through the survey of operators. The impact of the two most beneficial technologies (reduced live bird handling and ensuring appropriate lairage ventilation) were assessed in terms of impact on meat quality and the competitiveness of the operation. The reduction of live bird handling resulted in a positive impact in both areas in the majority of cases (four respondent noting a very significant positive impact, four a fairly significant positive impact) with no negative impacts recorded (two respondents in both case reported no impact). Positive impacts are likely to arise from a reduction in stress on the birds and reduced labour costs. This finding is consistent with the view of equipment manufacturers and other key stakeholders who emphasised the link between human handling, stress on the birds and the cost of labour. In terms of ventilation in the lairage, two thirds of respondents reported a fairly significant positive impact and one a very significant positive impact on meat quality and the competitiveness of the operation with one respondent reporting no impact in terms of meat quality and one noting a very significant negative impact in terms of the competitiveness of the operation.

Clearly it is possible for there to be a conflict between animal welfare and economics in that measures introduced to improve the former tend to have a cost associated with them. However, it is also important to consider the potentially positive impacts on revenue that animal welfare measures can provide. This impact ranges from tangible benefits such as a reduction in live handling which can have an impact in terms of reducing employment costs, to less tangible benefits such as improved meat quality from birds that are less exposed to stress in the slaughterhouse (arising, for example, from the use of appropriate ventilation in the lairage, low level lighting in the shackling area or breast plates on the shackle). The economic benefit of welfare improvement measures depends upon the marketing chain. For example, the whole carcass market would demand no visible damage or bruises. In contrast,

[25] Some respondents listed more than one technology. In these cases the technology listed first was taken as the most beneficial. One respondent noted that it was not possible to isolate one technology as all are part of an integrated processing chain.

[26] A UK animal welfare organisation noted that this measure is often introduced as a result of human safety rather than animal welfare concerns.

the fresh portions market would demand no internal bruises. Traditionally, a slight improvement in the value of breast meat, which is the most expensive portion of a carcass, is more valuable than a significant improvement in the quality of, for example, wings. However, increases in the popularity of other products, for example processed wings may change the traditional economic analysis.

The industry agrees that, at least in general terms, equipment design to ensure good animal welfare has positive economic impacts. However, the extent to which these offset costs is not always clear because of the difficulty of quantifying benefits. Slaughterhouses will adopt animal welfare friendly designs which go beyond legislative requirements in order to gain advantage from the economic benefits whether these are simply better revenues or in order to conform with customer requirements which ensures access to certain markets. Customer requirements are driven by product quality and, in some parts of the EU at least, demand for high animal welfare standards.

4.1.2.1. Budgetary consequences for public authorities

No significant budgetary consequences for public authorities are expected other than in relation to official veterinary control. Additional budgetary impact might, however, be expected with an increasing role for public authorities in terms of:

- the approval of equipment for slaughterhouses, although this could be recovered through fees;
- the provision of information on animal welfare best practice through, for example, the exchange of information on available technologies; and,
- support to related research programmes (many Member States already support research programmes relating to animal welfare).

4.1.3. Social and environmental assessment

Some animal welfare measures clearly also carry benefits for employees. For example, measures taken to calm bird such as low-level lighting will also result in a safer and more pleasant working environment. Reducing the need to deal with live birds through a modular system could also be expected to bring benefits to employees. Indeed, it was noted by an animal welfare organisation that health and safety concerns are often the drivers of measures which incidentally lead to improvements in animal welfare.

Section 4.1.1 considered the impact of certain technologies on animal welfare according to survey respondents. The impact of the two most beneficial technologies (reduced live bird handling and ensuring appropriate lairage ventilation) were assessed in terms of occupational safety and the environment. Fairly positive impacts arising from reduced live bird handling were noted by six of the respondents with respect to occupational safety and the environment (possibly interpreted as the operating environment). However, three respondents reported very significant positive impacts on occupational safety compared to only one on the environment. In contrast, three respondents reported no impact on the environment compared to only one on occupational safety. This finding is consistent with the view expressed above that occupational safety is often the driver of modifications to the processing line. With regard to lairage ventilation, only one respondent recorded a fairly positive impact in terms of occupational safety with the other five claiming no impact in this regard. Three respondents noted a fairly significant positive impact on the environment (again, possibly interpreted as operating environment) with three noting no impact.

A potential environmental impact with respect to controlled atmosphere stunning systems relates to the discharge of gas. Some controlled atmosphere stunning systems for pigs are known to recycle CO_2, before it is ultimately discharged into the atmosphere, although it is not thought that any poultry systems currently recycle gas. One equipment manufacturer explained that CO_2 is extracted through a chimney and is discharged at least 4 metres above ground level which ensures that the gas has diffused by the time it reaches ground level. In terms of emissions of greenhouse gases, approximately 1 gram of CO_2 is necessary per kilo liveweight which is not significant. Water requirements are approximately similar between electrical and controlled atmosphere stunning systems with the later requiring more water for cleaning.

4.1.3.1. Consequences for the protection of particular social groups

There are no foreseen consequences for the protection of particular social groups.

4.1.3.2. Regional impact

There is no evidence to suggest that there is any differential regional impact.

4.2. Competence of slaughterhouse operators [Task 2.1]

This section discusses the extent to which slaughterhouse employees are trained with respect to animal welfare and sets out the economic, social and environmental impacts arising from this.

4.2.1. Current practices to ensure that slaughterhouse employees dealing with live animals are competent regarding animal welfare

An interview with the Competent Authority in the UK revealed that those wishing to work in a slaughterhouse must undergo a training process (except those working in the lairage). This involves the issuing of a provisional certificate whilst the slaughterman undertakes around a year of training. This period is followed by an assessment which, if satisfactory, is followed by the issuing of a certificate of competence[27]. At this point the slaughterman can apply for a full license which is required in order to be employed.

In addition to the above, an interview with a Director of a major UK slaughterhouse informed that employees all receive task-specific training covering animal welfare, health and safety. Refresher courses as well as induction courses are provided. A Poultry Welfare Officer, qualified on a course run by Bristol University[28], is present in the plant in addition to the Official Veterinarians. Technical and production managers are all trained in animal welfare, as is a member of staff in live bird reception. A representative from an industry organisation noted that some 85% of chickens in the UK are reared to Assured Food Standards (which are independently audited) and part of this standard requires additional animal welfare training for operators and the presence of a Poultry Welfare Officer.

The situation in France appears to be different. An interview with the Competent Authority revealed that there is no legal obligation for slaughterhouses to train their workers to ensure animal welfare during the slaughter process (and an animal welfare organisation noted that slaughterhouse operators are indeed not trained). However, their activities should be in accordance with animal welfare standards. The point was made that the trend in France is to take greater account of animal welfare considerations, but that there is a need to organise some training in this area (confirmed by the industry body). A good practice guide has been developed and is currently undergoing testing. Additionally, there are plans to carry out training for slaughtermen carrying out ritual slaughter. An industry body commented that slaughterhouse operators are not very concerned about animal welfare due to the additional costs that this implies.

A depth interview was undertaken with a slaughterhouse in Poland and in this case the provision of animal welfare training is a requirement of participation in the Assured Chicken Production (ACP) Scheme[29]. The training is provided by a major UK retailer who draws supplies from this slaughterhouse and reduces the price paid for poultry meat accordingly. Employees do not have to

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[27] Unique to the species and slaughter method.

[28] The Competent Authority indicated that whilst attendance at animal welfare training courses is voluntary, it is considered to be good practice.

[29] Assured Chicken Production (ACP) is an industry-wide UK initiative (but open to businesses beyond the UK) that addresses a range of issues concerning the production of chicken. It is independently assessed and covers the whole chain from breeders to slaughter.

formally pass a test, but those not considered competent to deal with live animals are moved to other areas of the plant. Assessments of employee performance are made monthly.

An organisation providing training for slaughterhouse operatives in Germany explained that slaughterhouse employees typically undergo both a theoretical and a practical assessment. However, it is possible to work in a slaughterhouse without certification; there is no Federal overview of slaughterhouse operation with responsibility lying with the Bundeslands. Training is considered to be both time consuming and expensive with a three hour training session[30] and a one-hour exam costing €200. This cost is exacerbated by a relatively high staff turnover rate in slaughterhouses.

A survey of Member State Competent Authorities revealed that the situation differs between those Member States requiring formal training and the issuing of licences or certificates of competence to those where training is less regulated and relies more on slaughterhouses themselves to ensure that their staff are competent to deal with live animals. Although it is not possible to conclude from the results of the survey whether better results are observed from more formalised methods of training, it is likely that this is the case on average because there will be less variability in terms of the standards achieved.

The survey of slaughterhouse operators contained a series of questions concerning staff training and operational procedures. The vast majority of slaughterhouses responding noted that their employees handling live birds are trained in animal welfare procedures (96%, 26 of 27 responding to this question). One slaughterhouse where employees do not receive training operates a controlled atmosphere stunning system and no live bird handling takes place. This suggests that where live bird handling is involved, animal welfare training is generally provided by survey respondents. However, this does not mean that this is necessarily the case for all slaughterhouses, and an animal welfare organisation explained that training standards do differ across the EU.

In those cases where animal welfare training is provided for workers, training relating to unloading birds into the lairage occurs in 81% of slaughterhouses (21 from 26[31]). Training in handling birds between the lairage and the stunning facilities is provided in a just under two thirds of cases (65%). Some 81% of slaughterhouses indicated that training is provided for employees engaged in shackling and stunning and 72% provide training for employees at the bleeding point of the process.

The amount of time spent on training by respondents varied from half an hour to 16 hours. Mean and median training time provided per employee in the last 12 months is provided per processing stage in the Table below[32]. This shows that, on average, most time is spent on training in relation to tasks on the bleeding line. There is little difference in the amount of time spent training in relation to other activities. The median figures demonstrate that the mean is biased upwards by some respondents and that typically the time spent training employees is around 2 hours at any point in the process. The Humane Slaughter Association commented that the training they provide on request can last for between 2 hours and 2 days depending on the slaughterhouse requirements.

[30] With additional time necessary for study.

[31] One respondent who indicated that training is provided did not answer this question.

[32] Only those respondents provided answers are included.

Table 7: Time spent training per employee in last 12 months (hours)

	Mean	Median
Unloading	3.8	1.5
Handling between lairage and stunning	3.7	2.0
Shackling to stunning	3.8	2.0
Bleeding	5.3	2.0

Source: EU survey of slaughterhouse operators.

Twenty-five of the twenty-six respondents who noted that employees received animal welfare training went on to answer questions on the nature of this training. All explained that animal welfare training is carried out internally, although 9 slaughterhouses (36%) also implement external training. In 13 cases (52%) the training results in a certification or diploma with almost half of slaughterhouses awarding certificates (6) following internal training only.

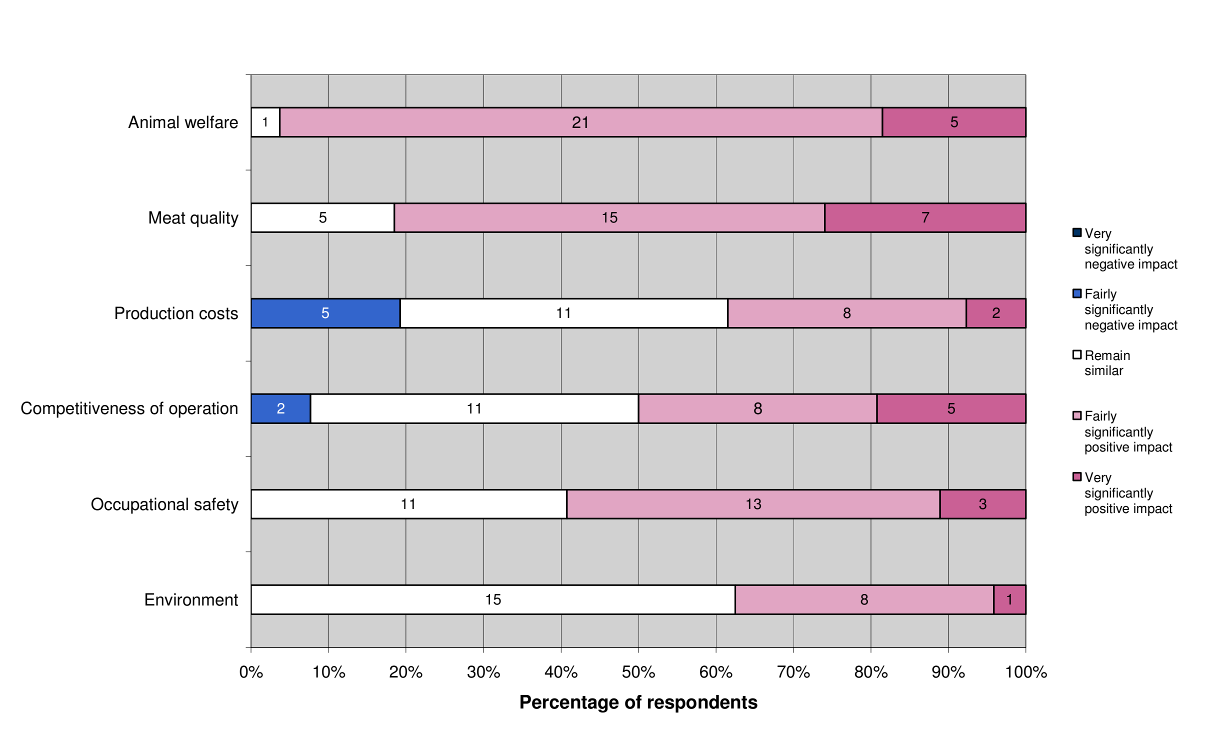
Over half (60%) of slaughterhouses responding felt that training is provided on a voluntary basis, with some 48% stating that training was a legal requirement (it was possible to state that there is both mandatory and voluntary training). The implication from the two respondents who noted that training was both a legal requirement and was carried out voluntarily is that voluntary training goes beyond the legal requirements and this was in fact noted in one of the cases. In all cases where training is a legal requirement it is approved by the Competent Authority.

One respondent did not answer the closed questions on animal welfare training, but did explain that employees transporting live birds must pass examinations in animal welfare which result in the issuing of a license to ensure correct loading and unloading procedures. This respondent also noted that training in worker safety covers some aspects of animal welfare and that since this procedure has been in place, the proportion of second quality meat arising from damage in the slaughterhouse has decreased.

It is clear from the survey results that training is in place for employees dealing with live birds. Although the nature of the training varies, it is considered that at least a base level of training is provided and that in some cases training goes beyond this.

Figure 4 below shows the perceived impact of the training measures offered by slaughterhouses. Although respondents were given the opportunity to identify negative impacts, no very significantly negative impacts and few fairly significant negative impacts were recorded. These were in relation to production costs where 5 respondents noted a fairly significant negative impact and in the related area of competitiveness of the operation (2 respondents). However, even in these two areas, the majority of respondents recorded positive impacts. The impact of training on animal welfare and meat quality were generally perceived to be most positive. Least impact, either positive or negative, was recorded in relation to the environment. One respondent noted that the reduction in second quality meat resulting from training had reduced the cost of waste.

Figure 4: Impact of training provided



Source: EU survey of slaughterhouse operators.

4.2.2. Economic assessment

As was noted in section 4.1.2, the economic impact of animal welfare technologies is difficult to assess and it was only possible to make a relatively qualitative assessment through the survey of operators. As mentioned in section 4.1, the link between reduced stress and improved meat quality is recognised by the industry and animal welfare organisations. This means that measures taken to improve animal welfare will have a positive economic impact, although they will, in many cases also have a cost. In some cases, this cost is unavoidable, for example, where training in animal welfare or the requirement to have an Official Veterinarians present are mandatory. In other cases, for example, additional voluntary staff training, it can be assumed that slaughterhouses feel the benefits to their business are at least balanced by the additional cost. Figure 4 noted the generally positive impacts of staff training in terms of animal welfare (which is likely to impact positively on meat quality), meat quality directly and even production costs and the competitiveness of the operation.

It was pointed out in an interview with an industry organisation in the UK that poor animal welfare would not result in significant production cost savings. This organisation considers that up to date technology, with a more favourable animal welfare profile, will result in better meat quality. The point was made that once collected from farm, good animal welfare practices result in good economic performance, for example, birds Dead On Arrival represent a real disposal cost, not just a reduction in revenue. An animal welfare organisation agreed that the cost of better animal welfare training should be compensated for by higher revenue resulting from better meat quality.

4.2.2.1. Budgetary consequences for public authorities

No significant budgetary consequences are expected beyond the costs for official veterinary control. Should public authorities take an increasing role in training and certification of employees within slaughterhouses then additional budgetary resources could be required, but these could be recouped through fees.

4.2.3. Social and environmental assessment

Slaughterhouses are reasonably dangerous places in that injury can in theory be caused by either equipment or birds. Appropriate training mitigates against these risks and increases worker safety. Figure 4 presented the impact of training on occupational safety and 59% of respondents recorded a positive impact with the balance reporting no impact. No respondent suggested a negative impact.

Little impact on the environment is expected to follow from training with respect to animal welfare, although Figure 4 did show that 38% of respondent believe that there is a positive impact. It may be the case that environment has been interpreted as operating environment. However, one respondent did note that the reduction in second quality meat had resulted in reduced waste.

4.2.3.1. Regional impact

There is no evidence to suggest that there is any differential regional impact.

4.3. Animal welfare operational procedures [Task 2.3]

There is no requirement in Directive 93/119/EC for slaughterhouses to apply particular methods to verify that animal welfare standards are correctly implemented. However, many apply methods on a voluntary basis. This section assesses the points of reference for good animal welfare practices that are used; how these are monitored; the measures taken to ensure good animal welfare; and, the impacts that these have in economic, social and environmental terms.

4.3.1. Current practices

4.3.1.1. Reference points for good animal welfare

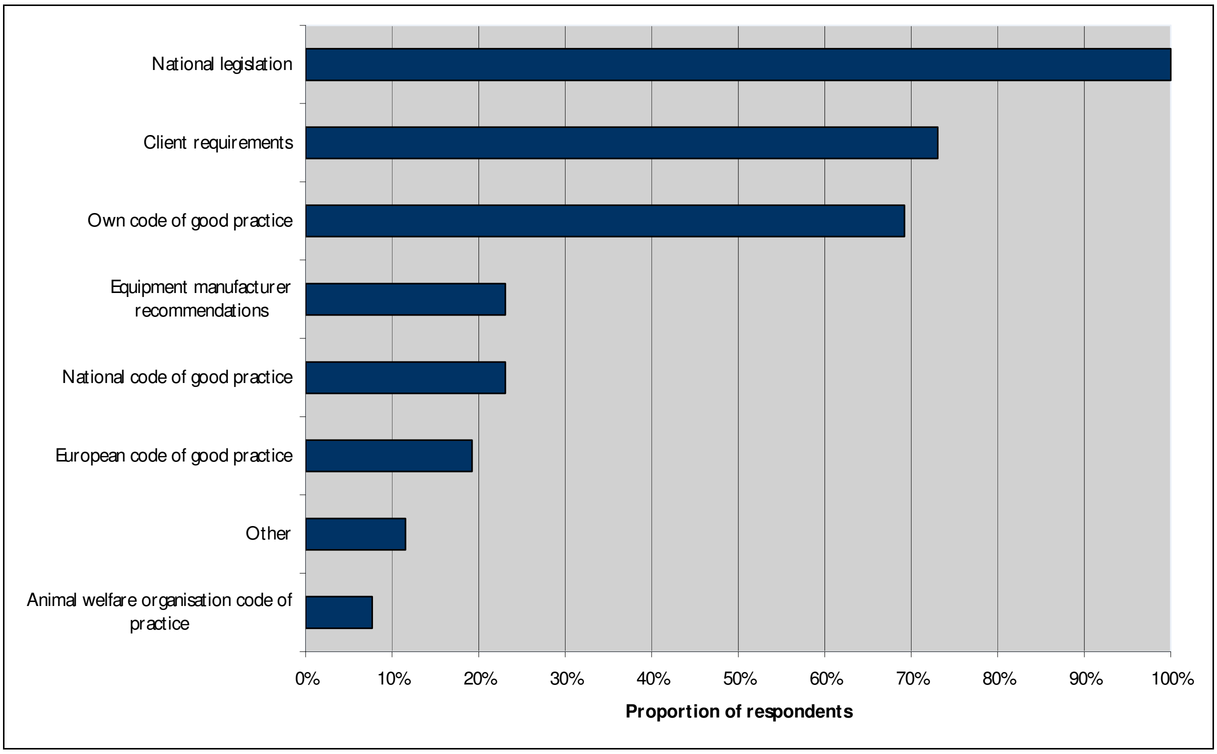
All but two respondents have more than one point of reference for good animal welfare practices, although it should be noted that there is considerable overlap between different reference points, particularly European and national legislation/codes. Figure 5 reveals that all respondents follow national legislation and, the majority (73%), as might be expected, follow the requirements of clients (the implication is that client requirements are at least as stringent as national legislation, although in many Member States retailer demands often exceed national requirements[33]). Where slaughterhouses are producing to client codes of conduct they are typically audited at random at least once a year. A German animal welfare organisation explained that large retailers are very good at ensuring animal welfare standards are improved and adhered to. However, the retailers contract with the larger slaughterhouses and, in Germany at least, there is a general disparity in standards between these larger plants and smaller-scale operations in terms of animal welfare with standards in the former typically being higher[34]. Some 69% of respondents also have their own code of good practice (which is likely to reflect national legislation and client requirements to a very high degree).

Compliance is ensured in the first instance through the monitoring of equipment and systems which are designed to alert operators to operational problems. Detailed interviews in the UK made clear that the Official Veterinarians would be very well aware of any systematic failures in plants and would ensure that these were addressed. The Competent Authority pointed out that daily checks are made by the Meat Hygiene Service through the Official Veterinarians and Animal Welfare Officers present in plants. In contrast, the Competent Authority in France indicated that there is no homogeneous way to monitor operational procedures in France. An industry body, however, reported that operational procedures are monitored by the veterinary services, although a French animal welfare organisation expressed the concern that the vets are not always fully aware of good practice with respect to animal welfare.

[33] This is certainly the case in the UK where the Competent Authorities noted that retailers require higher standards than the legislative base. An official from an industry body reported that 85% of chickens in the UK are reared to Assured Food Standards which go beyond legislative requirements. It is also the case for the Polish slaughterhouse that provided a depth interview.

[34] Of course, individual slaughterhouses may have high or low standards irrespective of their size.

Figure 5: Proportion of respondents following types of good practice codes for animal welfare



Source: EU survey of slaughterhouse operators.

A number of outside parties perform specific animal welfare audits. All but one of the 29 slaughterhouses responding to the survey undergo audits by the veterinary authorities[35]. The frequency of these audits varies from daily (in the vast majority of cases) to weekly in one case. One respondent claims to be audited twice daily and one twice weekly. Just over three quarters of respondents (76%) are inspected by clients at a frequency of between 1 and 20 times per year (in most cases the inspection rate is towards the low end of this range). Fourteen respondents (48%) noted that they are independently audited (at a frequency of between once a month and once a year) and two respondents reported audits by animal welfare organisations once or twice a year.

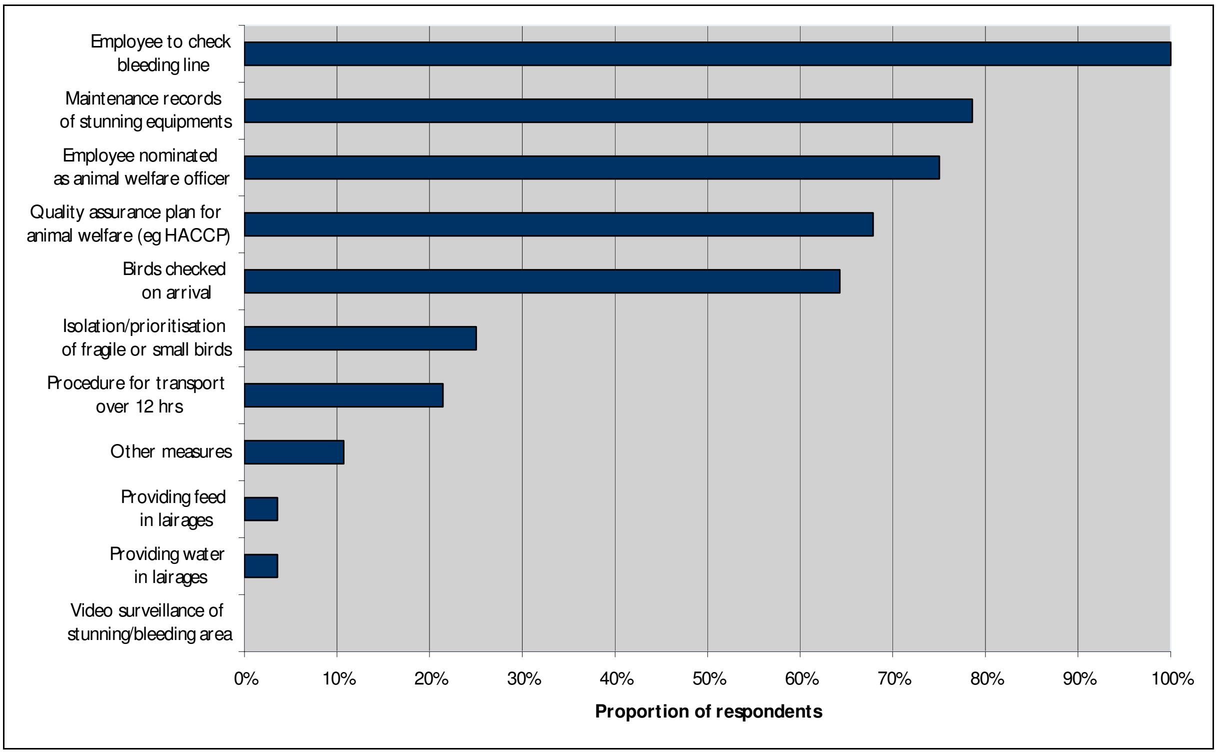
It appears on the basis of this evidence that good animal welfare practices are demanded by clients (especially the major UK retailers, according to an animal welfare organisation) as well as through legislation. Although there is a range of practices, it is likely that these are fairly similar and are ultimately based on similar codes operated in several Member States, although some may go beyond this.

[35] It is assumed that the slaughterhouse indicating that it does not undergo an audit made an error in completing the questionnaire.

4.3.1.2. Implementation of animal welfare friendly measures

Figure 6 presents the proportion of respondents who have implemented certain animal welfare procedures in their plants[36]. All respondents have an employee to check the bleeding line. Some 79% of respondents (22 from 28 answering this question) keep a maintenance log of the stunning equipment and three quarters have a nominated animal welfare officer. Interviews in the UK and Germany suggested that this is common practice in these countries, at least for larger slaughterhouses (an animal welfare organisation noted that all slaughterhouses have to be licensed and that there should be at least a base of good animal welfare practice). Just over two thirds of respondents (68%, 19 from 28) have a quality assurance plan to ensure animal welfare (although this does not necessarily mean it is followed). Just under two thirds of respondents (64%, 18 from 28) ensure that birds are inspected on arrival.

Figure 6: Animal welfare measures implemented by slaughterhouses



Source: EU survey of slaughterhouse operators.

A number of animal welfare indicators are monitored in slaughterhouses. The frequency with which they are monitored by the survey respondents is set out in Table 8. Although a range is presented, most respondents indicated that most indicators were assessed daily (usually based on five times a week, which can be interpreted as once per day, based on a five day operational week). Many indicators are assessed on a continual basis, in some cases, for example the time between stunning and bleeding, this

36 Three other measures/procedures not set out in the figure were included as options, but are not implemented by any respondents: providing water in the lairage, providing feed in the lairage and operating video surveillance of the stunning area.

is an automated part of the process. Other indicators of animal welfare mentioned include bird condition/feather coverage, hock burn and bruising.

Table 8: Frequency of monitoring animal welfare indicators

Animal welfare indicators	Number of respondents	Frequency of monitoring
Insensitivity of birds after stunning	24	4 times per week-continuous monitoring
Meat quality (pH, DFD, PSE, blood splashes, bone fractures)	18	4 times per week-continuous monitoring
Waiting time between reception and the beginning of the slaughter process	23	Once per day-each batch
Correct application of stunning apparatus	26	4 times per week-hourly monitoring
Frequency of ineffective stunning (i.e. number of cases in which a second stun is required)	13	2 times per week-continuous monitoring
Skin quality	21	4 times per week-continuous monitoring
Atmospheric parameters at lairage (temperature, humidity, air flow, noise level, light intensity, water consumption, etc.)	18	2 times per week-continuous monitoring
Competence of employees working with live birds in terms of animal welfare	16	Once per year-continuous monitoring
Time between stunning and bleeding	21	1-60 times per week
Amount of time birds spend in shackles before stunning	18	1-20 time per week/each batch
Other	4	Daily monitoring-200+ times per week

Source: EU survey of slaughterhouse operators (n=29).

All, but one respondent monitors the effectiveness of stun. This is done in a number of ways. In some cases respondents indicated that they use more than one method. Of the 28 respondents answering this question, 86% look for any signs of post-stun recovery, 36% look for signs of recovery post-bleeding and 82% carry out indirect monitoring through technical parameters. The effectiveness of stun is therefore widely monitored, often in more than one way. An animal welfare organisation pointed out that employees on the bleeding line will monitor the effectiveness of stun. Whilst the occasional bird may not be adequately stunned, systematic failure to adequately stun would result in the stopping of the processing line.

The percentage of birds monitored for the effectiveness of stun varies widely according to respondent. Ten respondents (37% of the 27 respondents answering this question) reported that all birds are monitored (in one case this monitoring is performed by workers on the processing line with the Official Veterinarians also assessing 2% of all birds). The respondent operating a controlled atmosphere stunning plant explained that all birds are monitored because birds are shackled manually post-stunning and are therefore checked at this time. One respondent indicated that checks are performed hourly and one daily. Others noted that checks are performed on a percentage of bird ranging from 0.005% to 10%. Some respondents explained that a number of birds per batch (ranging from 1 to 20) are monitored for stun effectiveness. Just over half the respondents (52%) systematically record the results of their stun monitoring effectiveness, the other 48% do not. Those respondents who record ineffective stuns noted rates from 0% to less than 1%. Animal welfare organisations do not feel that significant numbers of birds are inadequately stunned.

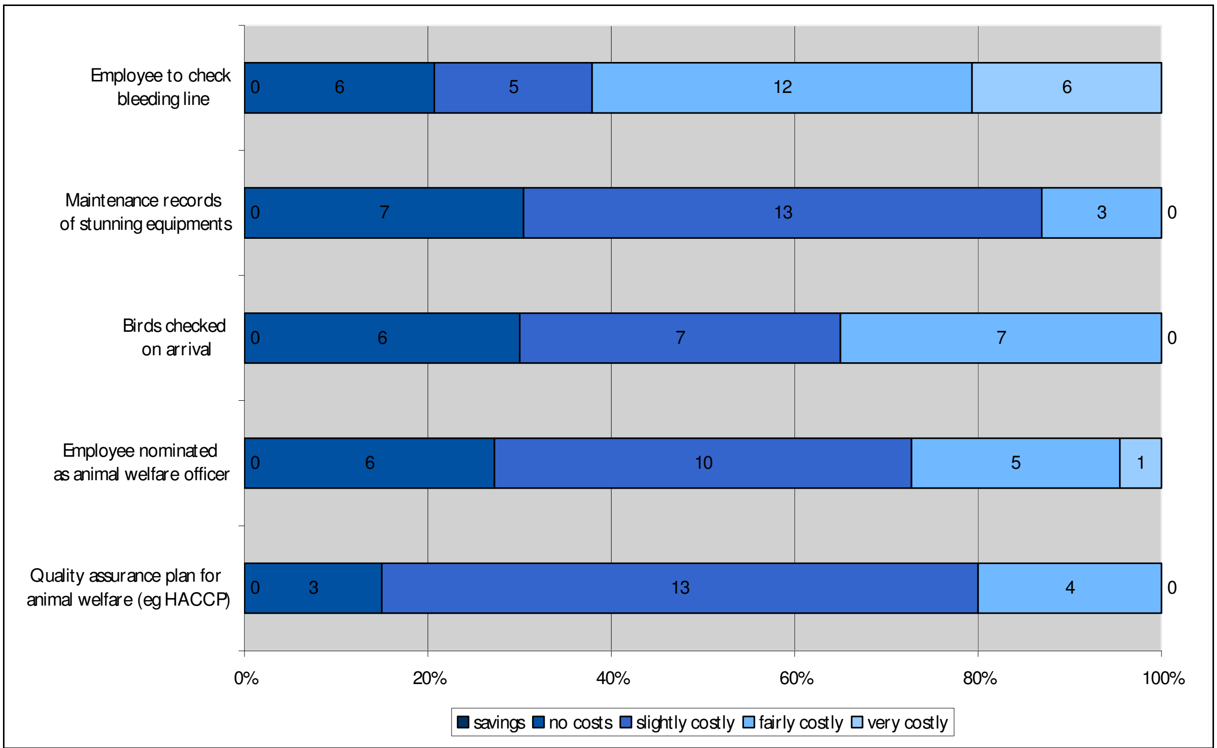
4.3.2. Economic consequences

Respondents were asked to consider the impact of animal welfare measures on costs[37]. Figure 7 presents the results for those measures implemented by more than 20 respondents. None of the measures resulted in cost savings. The most costly measure was implementing a quality control plan for animal welfare with 85% of respondents indicating an additional cost of varying magnitudes. Placing an employee on the bleeding line also has a significant cost impact with 79% of respondents indicating cost increases. Some 21% of respondents noted that the impact was very costly. The least impact on costs is in relation to checking birds on arrival and keeping maintenance records of stunning equipment with 30% of respondents noting no impact in each case.

A detailed interview with a UK slaughterhouse suggested that although certain measures taken to improve animal welfare did entail additional cost, the fact that in most cases these measures are not voluntary in the sense that they are demanded either by legislation or by clients, means that the cost is viewed simply as the price of doing business rather than an animal welfare cost *per se*. The UK industry body added that animal welfare is part of the operating ethos and is not something that can be ignored. It is therefore not considered a big issue in the UK, it is simply part of the slaughter process.

[37] Where a measure was marked as being implemented, but no information was provided on cost, we have assumed that there is no cost (a "don't know" option was also included).

Figure 7: Impact of animal welfare measures on costs



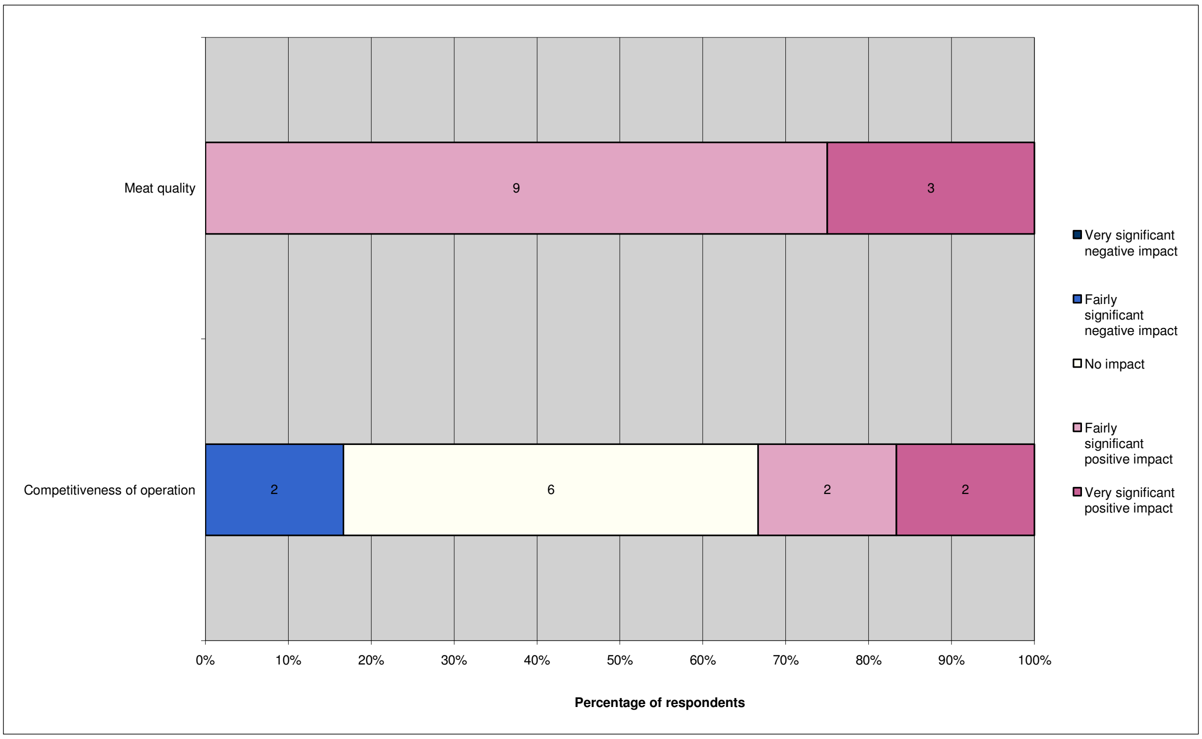
Source: EU survey of slaughterhouse operators.

Respondents were asked to identify which of the animal welfare measures above is the most beneficial. Almost half (48%, 12 from the 25 respondents answering this question) identified the presence of an employee to check the bleeding line. Some 44% of respondents (11 from 25) identified the implementation of a quality control plan for animal welfare as being the most beneficial measure, although it should be noted that the presence of a plan does not necessarily mean that it is successfully implemented. One respondent identified the designation of an employee as animal welfare officer and another highlighted procedures for isolating/prioritising the slaughter of fragile or small birds.

Respondents were asked to comment on the impact of the most beneficial animal welfare measure/procedure on a range of economic issues. The impact of having an employee on the bleeding line is considered to have the greatest positive impact on meat quality (Figure 8). In terms of the competitiveness of the operation, two respondents noted a fairly significant negative impact whilst four respondents recorded positive impacts.

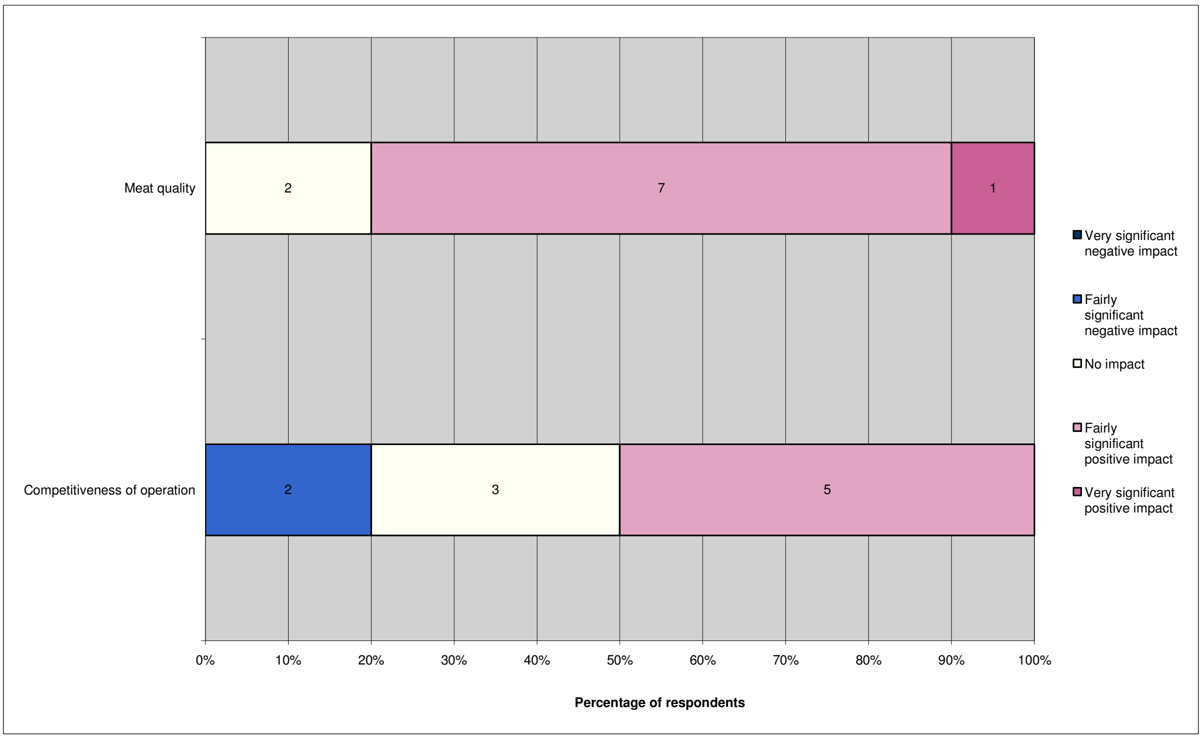
The economic impact of implementing a quality control plan for animal welfare is presented in Figure 9 and shows that the most positive impact is again on meat quality (assuming the plan is implemented successfully). Impact on competitiveness of the operation shows a more mixed response with five respondents indicating a fairly positive impact, two reporting a fairly negative impact and three recording no impact. It is possible that the negative impacts are in the context of non-EU competition and that the positive impacts relate to the ability to sell to customers who require the implementation of a quality control plan for animal welfare. It is also possible that respondents are commenting on the cost of implementing measures when responding on competitiveness, but not taking into account the impact of improved meat quality. This may be because improvements in meat quality are less easy to identify in financial terms as the benefit may be felt through, for example, an increase in Grade A fillets, rather than through a higher product price.

Figure 8: Economic impact of having an employee on the bleeding line



Source: EU survey of slaughterhouse operators.

Figure 9: Impact of a quality control plan for animal welfare



Source: EU survey of slaughterhouse operators.

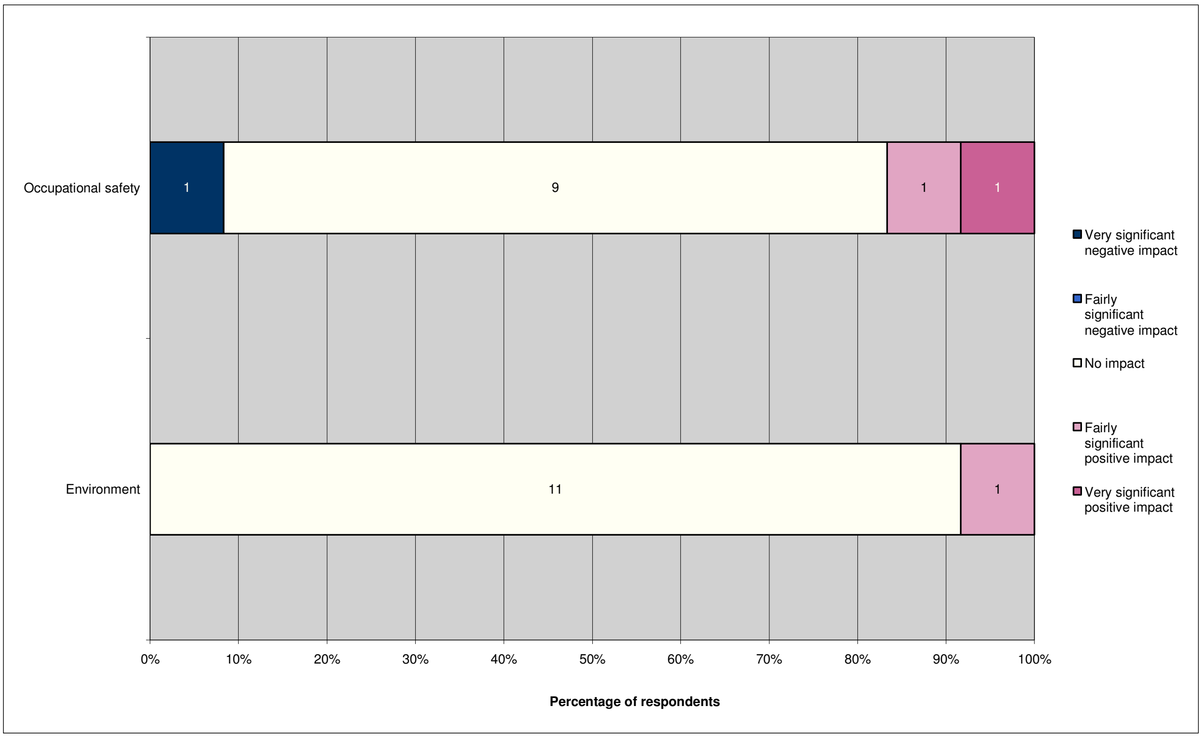
4.3.2.1. Budgetary consequences for public authorities

No budgetary consequences are anticipated for public authorities. The cost of operational measures are carried by private companies and in most cases are demanded by clients and are therefore the price of doing business.

4.3.3. Social and environmental consequences

Respondents to the slaughterhouse survey were asked to comment on the impact of the most beneficial animal welfare measure/procedures identified on social and environmental issues. There was generally no impact in terms of occupational safety or the environment[38] from having an employee on the bleeding line (Figure 10). The social and environmental impact of implementing a quality control plan for animal welfare was also assessed and again, little impact was recorded in terms of occupational safety or the environment (Figure 11); in the latter case two respondents did note a positive impact, although this was interpreted as referring to the operational environment.

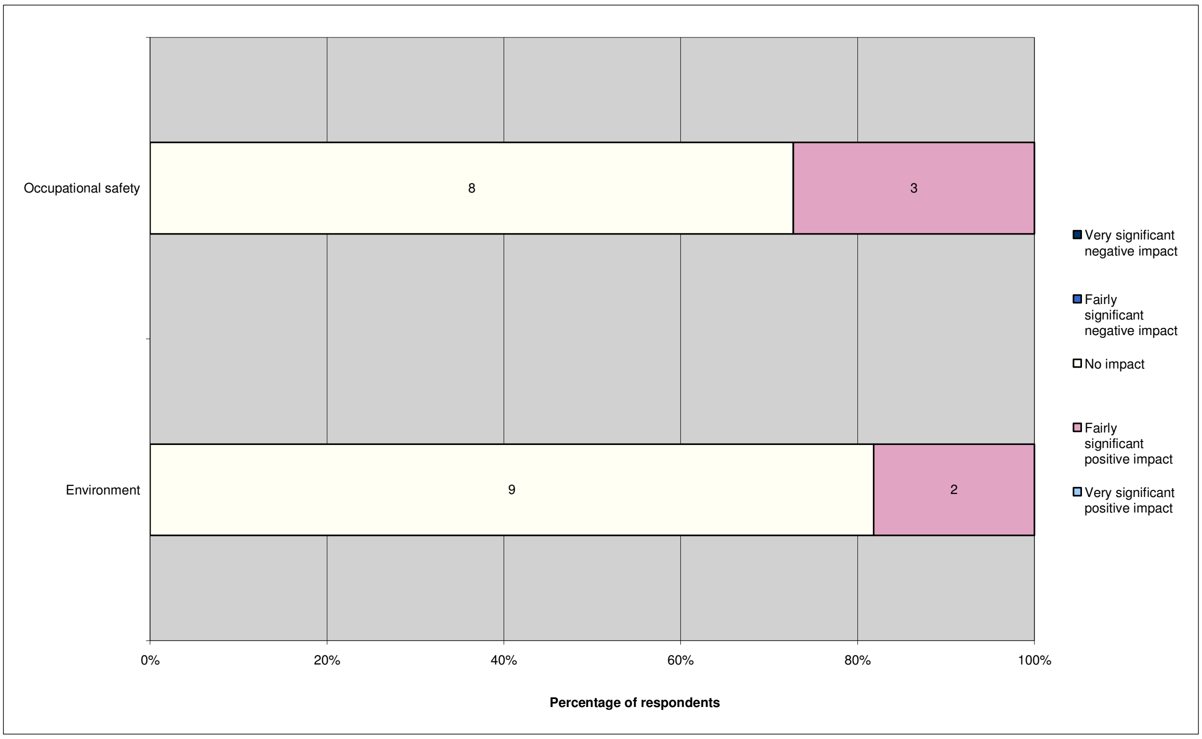
Figure 10: Social and environmental impact of having an employee on the bleeding line



Source: EU survey of slaughterhouse operators.

[38] There are guidelines covering environmental impact under the Integrated Pollution Prevention and Control legislation.

Figure 11: Social and environmental impact of a quality control plan for animal welfare



Source: EU survey of slaughterhouse operators.

4.3.3.1. Regional impact

There is no evidence to suggest that there is any differential regional impact.

4.4. Poultry stunning and killing [Task 2.5]

4.4.1. Production costs of slaughterhouses in the EU [Task 1.2]

The slaughter element of poultry production represents a fairly small portion of overall production costs. In turn, the cost of stunning makes up a small component of total slaughter costs and, as such, an even smaller portion of total production cost and hence final consumer price (see section 4.5).

The survey of slaughterhouses asked respondents to separate the production cost of a whole chicken into a number of different elements as set out in Table 9. This cost includes all steps up to the production of a chilled whole carcass; it does not include any further processing. The one respondent using controlled atmosphere stunning did not answer this question and the results therefore refer exclusively to slaughter using electrical stunning techniques. The first point to note is that the number of respondents answering this question completely is small and as such no attempt has been made to distinguish between different methods of electrical stunning. As a result of the small sample size it is not possible to generalise these results with confidence and they should be considered indicative only.

The proportion of cost accounted for by electrical stunning is relatively small at 2.9% in the case of chickens, 0.8% in the case of turkeys and 2.1% for all respondents. The greatest proportion of cost is incurred in transportation and other steps (which includes defeathering, evisceration, veterinary control, washing and first chilling and the personnel, machinery, power and water costs associated with these tasks).

Table 9: Proportion of production cost of chilled whole bird

	Mainly chickens (n = 8)	Mainly turkeys (n = 5)	All (n = 13)
Transportation	30.3%	28.0%	29.4%
Reception	6.0%	0.9%	4.0%
Shackle	9.4%	4.6%	7.5%
Water bath stunning	*2.9%*	*0.8%*	*2.1%*
Bleeding	3.7%	0.8%	2.6%
Other steps	24.4%	44.9%	32.3%
Waste disposal	7.5%	9.6%	8.3%
Cleaning	5.0%	3.0%	4.2%
Depreciation	11.0%	7.4%	9.6%
TOTAL	100.0%	100.0%	100.0%

Source: EU survey of slaughterhouse operators.

Making cost comparisons between generic stunning methods is very difficult because there is likely to be some variation in cost between different electrical stunning systems depending on specification. However, Dr Mohan Raj indicated in a personal communication that while capital costs might differ according to whether AC or DC systems are used and according to frequency, there would be no difference in running costs. With respect to controlled atmosphere systems, capital costs are less likely to differ depending on gas mix (although more gas tanks are required where more gases are mixed), but running costs will differ in that CO_2 is relatively cheap compared to Argon and Nitrogen.

Equipment manufacturers agree that controlled atmosphere stunning systems are generally more expensive to purchase and that they entail higher running costs than electrical stunning methods. This is essentially because they are more complicated systems with more moving parts. In considering differences in capital and running cost, it is also important to consider differences in revenue, or areas where costs might be reduced through using particular stunning methods. Manufacturers explained that slaughterhouses are increasingly considering the total cost of ownership when making investment decisions[39]. This involves combining the purchase and installation price with running costs, expected revenues and repairs and maintenance and annualising this over the expected life span of the equipment. This means that the individual solution for each slaughterhouse will be different and will be influenced by the assumptions made. These in turn will reflect the operator's attitude to risk and their planning horizon.

Initial purchase and installation costs are discussed in section 4.4.1.1 and running costs in section 4.4.1.2. Financial benefits are considered in section 4.4.1.3.

4.4.1.1. Purchase and installation costs

Estimates of the difference in purchase and installation cost varied widely according to manufacturer. One of those interviewed suggested that controlled atmosphere stunning systems would cost between three and four times as much as comparable electrical systems to purchase and install, another thought the difference in investment cost would be ten-fold. Another suggested that controlled atmosphere stunning systems would cost around five times as much as comparable electrical systems to purchase, but added that installation costs could vary from €10,000 to €1,000,000 depending on the circumstances of the plant (throughput and integration with the existing processing line). Other manufacturers put the cost of purchasing controlled atmosphere stunning equipment as high as €1 million[40] (also the quote for changing from electrical stunning to a controlled atmosphere stunning system for a slaughterhouse in Poland that has investigated this; a national industry body in Germany reported a cost for installation of controlled atmosphere systems in excess of €1.5 million) or as low as between €120,000 and €270,000[41]. Part of the difficulty in establishing costs results from the different types of system available. A two-chamber system, for example, would obviously incur a higher capital cost. In comparison, electrical stunning systems were expected to cost between €15,000 and €18,000 with installation costs of around €1,000 (in both cases these costs do not include the rest of the processing line, etc.).

Based on the type of systems produced by the manufacturers spoken to and their market share it is estimated that controlled atmosphere stunning systems range from three to five times the price of comparable electrical systems to purchase and install according to individual circumstances. One manufacturer noted, however, that the cost of controlled atmosphere stunning systems will reduce over time due to further research and greater competition. Although experimental, it is expected that a vacuum stunning system would cost approximately €150,000, i.e. slightly closer to controlled atmosphere systems in cost terms.

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[39] Another way of thinking about investments is the payback period (of installation and running costs). This is typically two years for a controlled atmosphere plant, although the payback period when further processing does not take place is longer as the benefits in terms of blood splashing and bone fragments are not in evidence.

[40] This cost includes a modular bird handling system which accounts for almost 60% of the total cost.

[41] In this case throughput would be around 11,000 birds per hour, although controlled atmosphere systems can have higher throughputs where chilling facilities are sufficiently large.

4.4.1.2. Running costs

Running costs per bird depend heavily on the system being used and also on throughput. It is therefore very difficult to make generic comparisons between systems. However, equipment manufacturers are unanimous in the view that controlled atmosphere systems result in a higher running cost per bird compared to electrical stunning systems. The cost of actually administering stun using electrical stunning systems is considered by most equipment manufacturers and slaughterhouses to be negligible, although one manufacturer did provide an estimate of 0.1 Euro cents per bird, i.e. it costs €1 to administer stun to 1,000 birds.

The additional cost incurred through using controlled atmosphere stunning depends on the gas mix used as well as the individual circumstances of the plant, for example, around 50% of the cost of gas is transport and therefore location will make a significant difference to cost. Scale is also important and it should be noted that slaughterhouses using controlled atmosphere stunning tend to have relatively higher throughputs. In this context it should be noted that the unit price of gas can be reduced as the total quantity of gas required increases as a result of increased market power. Larger plants, especially those using modified atmosphere packing facilities, and/or CO_2 to freeze, will therefore be able to achieve more favourable gas prices than smaller-scale users. One manufacturer explained that gas prices tend to be more volatile than electricity prices and that as a result running costs for controlled atmosphere systems are more uncertain. Again, slaughterhouses using larger quantities of gas might be able to secure more stable price agreements than smaller-scale operators.

Argon is relatively expensive and a nitrogen/argon mix would, according to one manufacturer, add about 0.5 Euro cents per bird (an additional €5 per 1,000 birds) to the cost of electrical stunning (these figures are corroborated by O' Keefe, 2006, who quotes a figure between 0.4 and 0.5 pence, i.e. approximately between 0.56 Euro cents and 0.70 Euro cents per bird, i.e. €5.60 per 1,000 birds to €7.00 per 1,000 birds[42]).

According to one equipment manufacturer, cheaper carbon dioxide/nitrogen mix would add around 0.45 Euro cents per bird above the cost of electrical stunning (an additional €4.50 per 1,000 birds). Another equipment manufacturer reported that a two-stage carbon dioxide process would cost around an additional 0.075 Euro cents over the cost of electrical stunning (an additional €0.75 per 1,000 birds).

Although there is general agreement that the running costs of electrical stunning are insignificant, there is a wide discrepancy in the figures presented above for controlled atmosphere systems. Different sources disagree on the exact difference in costs between the two systems, although it is clear that even if controlled atmosphere stunning systems are relatively more expensive than electrical stunning methods, the actual cost of administering stun per bird remains relatively small[43].

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[42] O' Keefe, T. (2006) "Advances in CAS Technology". In WATT Poultry USA. February, 2006.

[43] The lowest estimate for running costs put at 0.5 Euro cents per bird and the highest at 4.0 Euro cents, an eight-fold difference (according to one equipment manufacturer it is possible to save around 90% of gas costs using a pit rather than a conveyor system). Interestingly, an equipment manufacturer who only produces electrical stunning systems estimated that there would be a nineteen-fold difference in running costs whilst a manufacturer producing both types of systems suggested that there could be a hundred-fold difference in running costs. Finally, Shane (2005) estimated the running costs for controlled atmosphere stunning to be some 8% higher than electrical stunning. This includes fixed costs inclusive of interest and depreciation in addition to variable costs comprising maintenance, labour and gas (Shane, S.M. (2005) "Future of Gas Stunning". In WATT Poultry USA. April, 2005). With discrepancies like this it is only possible to conclude that the running costs for controlled atmosphere stunning systems are higher than for electrical stunning systems. However, it should be reiterated that as the running costs for electrical stunning are considered to be negligible, the actual impact of up to one

4.4.1.3. Financial benefits of different systems and net running cost differences

The additional costs of controlled atmosphere stunning are offset to some degree (depending on the view of the manufacturer) by direct and indirect cost advantages. In some cases the advantages may not be financial, but may have an impact on the ability to supply certain markets. The technical differences between systems are examined in Appendix 4 with a tabular summary below.

Table 10: Technical differences between electrical and controlled atmosphere stunning systems

Throughput	Greater throughput on same size footprint for electrical systems, but there is no difference if space is not limited. Deep pit controlled atmosphere systems require less space than conveyor systems.
Product quality	Controlled atmosphere systems confer many benefits in terms of product quality including increased breast fillet yields, enhanced through reductions in bone shattering and blood splashing which otherwise require trimming out; increased proportion of grade A fillets; greater tenderness; faster maturation where anoxic gases are used; reduced severity of wing tip damage; lighter and more consistent fillet colour; and, prolonged product shelf-life. Electrical systems can provide better defeathering as this can take place more quickly after death.
Retailer demands	Retailer/food industry product quality demands imply an advantage for controlled atmosphere systems, although retailers and the food industry are not yet suggesting a preference for either stunning method.
Labour requirements	Controlled atmosphere systems require less labour as birds are not shackled live and the labour required does not need to be so skilled as a result. It is also easier to recruit labour as the job is less unpleasant.
Repairs and maintenance	Repairs and maintenance are a function of machinery complexity and are typically a percentage of the initial purchase price which will be higher in controlled atmosphere systems.
Cleaning	This is the same as repairs and maintenance and will be higher for controlled atmosphere systems.
Equipment lifespan	Given greater complexity it is expected that the lifespan of controlled atmosphere systems will not be as long as electrical systems.
Power requirements	Power usage for the stunning operation itself is marginal.
Birds dead on arrival	It is easier to identify birds dead on arrival in electrical systems.
Worker welfare	The main point of difference relates to hanging live birds and controlled atmosphere systems therefore offer an advantage over electrical systems.

It is not possible to use the information gathered through this interview process to net off potential financial benefits against additional running costs. To do this would require a differentiation of particular stunning systems and there would be considerable variation according to the systems selected and the individual circumstances of the plants, including the distance over which gas must be transported to the plant in respect of controlled atmosphere systems. The usefulness of carrying out such an exercise is also questionable given the range of unique circumstances that each slaughterhouse will face. However, one manufacturer did provide an example of a slaughterhouse which introduced controlled atmosphere stunning at an additional running cost of €4,500 per week for gas with weekly

hundred times this cost in controlled atmosphere stunning systems may also be very small. Finally, running costs in a vacuum stunning system are expected to be comparable to those in electrical systems.

benefits through labour saving and yield improvements of €45,500 making the net benefit some €41,000 per week. This cost comparison does not include consideration of the cost of purchase, installation or additional repairs and maintenance. Shane (2005) noted that despite significant capital investment (which he notes can be in excess of €500,000) costs of installing a controlled atmosphere stunning system can be recouped in the UK within one year as a result of the higher yield of saleable product and the higher premiums that UK retailers will pay for this product[44]. That said, a high degree of caution should be exercised over these examples (or any others) because the individual circumstances of the slaughterhouse are unknown. What is clear is that as commercial businesses, slaughterhouses using controlled atmosphere stunning are doing so because they consider it economically advantageous. The clear implication is therefore that the benefits of controlled atmosphere stunning at least equal the additional investment and running costs. That said, there will be examples where, for individual slaughterhouses, electrical stunning systems will prove more cost effective.

4.5. Relationship of production costs to the price of meat [Task 1.2 continued]

Farm gate prices for chicken are in the order of €1.65 per bird[45]. An analysis of questionnaire responses received suggests that the total slaughter costs to produce a whole bird using electrical stunning (net of profit margin) range from €0.21 to €1.20[46] with a median of €0.76. The cost of production ex-slaughterhouse (net of profit margin) is therefore between €1.86 and €2.85. The cost of slaughter therefore comprises between 11.3% and 42.1% of total production cost to the whole bird stage[47]. The upper end of this range is consistent with information provided by equipment manufacturers who estimate the ex-slaughterhouse price to be two thirds live bird production and one third slaughter house costs. The respondent using controlled atmosphere stunning reported a cost of producing a whole bird of €1.79, considerably more than the average using electrical stunning. However, it would be unwise to draw any conclusions from this one observation.

Interviews with equipment manufacturers and responses to the questionnaire indicate that the cost of stunning itself ranges from €0.000225 per bird to €0.04[48]. This equates to a cost for stunning of between 1.4% and 2.1% of ex-slaughterhouse price (net of profit margin) using the upper estimate for stunning cost[49]. The lower estimate results in a stunning cost of no more than 0.01% of total ex-slaughterhouse cost (net of profit margin). Stunning/killing cost therefore comprises a small proportion of total slaughterhouse cost, although the industry claims that this can still be significant

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[44] Elsewhere in the paper the author notes a 39% increase in running costs when comparing controlled atmosphere stunning against an efficient pulsed-DC stunner in the US. In this case higher costs would be harder to recoup as this form of electrical stunning has many product quality advantages over the AC methods used in the EU.

[45] Taken from Eurostat (€0.75 per kg, assuming a 2.2 kg bird). Data are only available from a few Member States and prices fluctuate considerably both geographically and by Member State. The figure quoted here is considered a reasonable estimation given this problem.

[46] One respondent quoted a slaughter cost of €2.60 per bird. This is assumed to be either an error or the cost including production.

[47] Further processing adds additional production cost and profit margin.

[48] The lower end of this range is calculated from a questionnaire response suggesting total slaughter cost of €0.1023 per kg, 0.1% of the cost of which is accounted for by an electrical stun and assuming a 2.2 kg bird. The upper range is the highest estimate for controlled atmosphere stunning provided in interviews with equipment manufacturers (€0.04 per bird) which is also the median cost derived from the questionnaire responses. The lowest estimate for controlled atmosphere stunning provided was €0.005 per bird giving a more restricted range of €0.000225 to €0.005.

[49] Questionnaire responses indicate an average cost for electrical stunning of 2.9% of total slaughterhouse cost (median 1.5%) which corroborates the figures presented here.

because margins are tight. It is not possible to verify this claim because information on margins within the industry were not made available to the researchers.

Consumer price includes the production cost to the whole bird stage, plus further processing costs, profit margin for the slaughterhouse, transport and wholesale or retail profit margin. A roasting chicken of between 2.05 kg and 2.45 kg currently (January 2007) costs around €1.50 per kg wholesale in the UK[50]. Assuming a 2.2 kg bird this gives a price of €3.30 per bird. On this basis the cost of stunning comprises 1.2% of wholesale price using the upper estimate of €0.04 per bird from the previous paragraph. The cost of stunning and killing therefore makes up a very small proportion of final consumer price and is diluted further, even if the whole cost of stunning is applied to a selected cut such as breast fillet (in reality stunning cost should be apportioned between all products). Equipment manufacturers do not therefore expect the method of stunning to have any impact on the consumer price of poultry and this is borne out by this analysis.

[50] Price per kg deadweight ranges from £0.92/kg in London, £1.04/kg in Birmingham and £1.24/kg in Bristol (source: Defra). Converted to Euros at a rate of €1.47 to £1.

5. Conclusions

5.1. The EU poultry sector and its competitive position

The European poultry meat sector is the second largest meat-producing sector after pig meat. The EU is 106% self sufficient in poultry meat production and almost all this production is consumed domestically. France is the main producer and accounted for 17% of total EU-25 production in 2005 with the UK, Spain, Germany and Italy all accounting for more than 10% each. Chicken production accounts for three quarters of total poultry production with turkeys accounting for a further 20%.

The biggest threat to the industry in recent years has been Avian Influenza which caused a 3% reduction in poultry production in 2003 from which the industry has yet to fully recover. Since 2003 some 14 Member States have reported outbreaks of Avian Influenza in wild birds and 5 in poultry.

Poultry meat consumption in the EU amounts to 23.6 kg per capita. Consumption was relatively stable to 2002, but has fallen back slightly in the wake of Avian Influenza. DG Agriculture forecasts expect poultry production and consumption to increase only slightly to 2012.

The EU poultry processing industry exhibits strong regional concentration and specialisation. There is a high degree of vertical integration from feed production to the processing and distribution sectors.

The main instrument of protection for poultry meat from lower priced imports is the fixed rate import tariff. As part of the Uruguay Round Agreement on Agriculture (URAA), minimum access quotas were established for the import of poultry meat into the EU. There were increases in some quota following enlargement of the EU to 25 Member States.

Analysis of trade data reveals that post-URAA, particularly between 1997 and 2001, there was a substantial increase in EU imports of poultry meat and poultry meat products. Although part of this increase results from the level of tariff attached to salted poultry meat, a significant proportion of product is entering the EU having paid full import duty. Given the tariff levels prevailing this suggests that the competitiveness of third country producers, particularly in Brazil and Thailand, is high.

The fact that the EU poultry sector is vulnerable to third country competition is borne out by previous research by Agra CEAS Consulting for DG Agriculture[51]. This demonstrated that the absence of the import tariff system in the period 1995-2002 would have resulted in some 1 million tonnes of additional poultry imports.

The EU poultry sector is relatively uncompetitive in global terms and is likely to be sensitive to increases in production cost. The main cost areas of concern to the industry are feed costs, costs of compliance with legislation and the cost of labour. The cost of stunning and killing is not seen by the industry as being significant in this context and this is borne out by the analysis in this report.

[51] Evaluation of the Common Market Organisation (CMOs) for Pigmeat, Poultry and Eggs. Contract 30-CE-0009330/00-42, DG Agri, European Commission, 2005.

5.2. Stunning/killing methods used in the EU

There are two main methods in use: electrical water bath stunning and controlled atmosphere stunning. Electrical techniques are more prevalent having been in commercial use for longer. The proportion of slaughterhouses using each system is unknown, but the number of controlled atmosphere plants is at least 25. The UK is one of the main users of controlled atmosphere stunning systems with some 25% of chickens and 75% of turkeys slaughtered using this technique.

The type of electrical stunner used varies widely in commercial practice according to waveform, frequency of current used, the amount of current applied to individual birds and the number of birds in the water bath simultaneously. Electrical water bath stunning can be reversible or irreversible (i.e. stunning/killing). However, the basic process involves the birds being unloaded at the slaughterhouse and shackled upside down whilst conscious. The birds then move through the water bath, are stunned by an electrical current, and are killed by cutting a combination of veins/arteries. Following bleeding the birds enter a scalding tank prior to defeathering, evisceration and chilling prior to further processing/packaging and labelling.

Controlled atmosphere stunning/killing uses a number of combinations of gases, with or without carbon dioxide. The basic process involves birds being transferred to the controlled atmosphere chamber either loose or within transport crates on a conveyor belt. After exiting the chamber the birds are shackled whilst inanimate before proceeding to the bleeding stage as under the electrical systems.

5.3. Design of restraining and stunning/killing equipment

Although, as commercial companies, equipment manufacturers are essentially driven by profit, other attributes are also taken into account in the design of equipment; most obviously legislative requirements. A link between increased bird stress and reduced meat quality is recognised throughout the poultry industry and ways to reduce stress (i.e. improve animal welfare) are important factors in the design process. Government funds are often available for research into slaughter methods and equipment manufacturers work closely with the research sector.

Slaughterhouses follow a number of overlapping codes of practice, many of which go beyond basic legislative requirements in terms of animal welfare. Where the following of codes of practice is a requirement to supply, often to the lucrative retail market, the requirements of the codes of practice are fed back into equipment design.

The most beneficial measures in terms of animal welfare are systems to reduce the need for the need to handle live birds. Survey respondents also identified the installation of appropriate ventilation in the lairage as being particularly beneficial. The recognised link between reduced bird stress and meat quality means that positive impacts are evident where live bird handling is reduced. There are also reductions in labour costs. Survey respondents also noted positive impacts on competitiveness and meat quality as a result of improved ventilation in the lairage.

It is also clear that there is a relationship between reduced bird stress and occupational safety and that this consideration is often a main driver of measures which might be considered to be animal welfare friendly. Positive impacts arising from reduced live bird handling and appropriate ventilation in the lairage were noted in terms of occupational safety.

Used CO_2 is extracted through a chimney and is discharged at least 4 metres above ground level which ensures that the gas has diffused by the time it reaches ground level. In terms of emissions of greenhouse gases, approximately 1 gram of CO_2 is necessary per kilo liveweight which is not significant. Water requirements are approximately similar between electrical and controlled atmosphere stunning systems with the later requiring more water for cleaning.

Equipment design to ensure good animal welfare has positive economic impacts. However, the extent to which these offset costs is not always clear because of the difficulty of quantifying benefits. Slaughterhouses will adopt animal welfare friendly designs which go beyond legislative requirements in order to gain advantage from the economic benefits whether these are simply better revenues or in order to conform with customer requirements which ensures access to certain markets. Customer requirements are driven by product quality and, in some parts of the EU at least, demand for high animal welfare standards.

5.4. Competence of slaughterhouse operators

A survey of Member State Competent Authorities made clear that the situation regarding training and certification of slaughterhouse operators differs according to Member State. Some require formal training and the issuing of licenses or certificates of competence whilst others rely on slaughterhouses themselves to ensure that staff are competent to deal with live animals. The survey of slaughterhouses showed that the vast majority ensure that employees dealing with live animals have received appropriate training. In some cases voluntary training takes place in addition to mandatory training.

It is clear that the requirement for training entails a cost. However, as noted above, there is a recognised link between good animal welfare and improved meat quality. Where voluntary training takes place the benefits must be considered to outweigh the costs. This is borne out by the fact that more respondents noted a negative impact on production costs as a result of training than noted a negative impact on competitiveness.

Slaughterhouses are reasonably dangerous places in that injury can in theory be caused by equipment or birds. Appropriate training mitigates against these risks and increases worker safety. Appropriate training may also reduce waste arising from lower quality meat and in this sense there may also be environmental benefits.

5.5. Animal welfare operational procedures

As noted previously, slaughterhouses follow a number of codes of good practice which cover, *inter alia*, animal welfare. Almost three quarters of slaughterhouses responding to the survey reported that they followed client requirements which are more stringent than the base legislation. Compliance with client (usually retailers) codes of conduct are typically audited at random at least once a year. However, compliance with good animal welfare practice is underpinned through the regular monitoring of equipment which alerts operators to operational problems. The presence/auditing of Official Veterinarians in slaughterhouses also ensures that systematic failures in animal welfare are noted and addressed.

The survey of slaughterhouses established that there is an impact on costs, as might be expected, from taking measures specifically in respect of animal welfare. However, it was also pointed out that as these measures are required under client codes of conduct the cost is viewed as the price of doing business rather than the cost of animal welfare *per se*. As noted above, there may also be economic benefits from improved animal welfare and the impact on cost is therefore perhaps less relevant than the impact on competitiveness and most respondents noted positive impacts on this and on meat quality from both the presence of an employee on the bleeding line and from having a quality control plan for animal welfare, although the point was made by other key stakeholders that the presence of a quality control plan alone does not mean that it is necessarily followed adequately. That said, other stakeholders did agree that there is a positive link between animal welfare and meat quality.

Whilst there is a cost involved in taking measures to safeguard animal welfare, there are also economic benefits in terms of competitiveness and meat quality.

5.6. Production costs of slaughterhouses in the EU

Making cost comparisons between generic stunning methods is very difficult because there will be some variation in cost within electrical and controlled atmosphere systems depending on specification as well as between them. For example, while capital costs might differ according to whether AC or DC electrical systems are used and according to frequency, there would be no appreciable difference in running costs. With respect to controlled atmosphere systems, capital costs are less likely to differ depending on gas mix (although more gas tanks are required where more gases are mixed), but running costs will differ in that CO_2 is relatively cheap compared to Argon and Nitrogen.

Based on interviews with equipment manufacturers, available literature, interviews with slaughterhouse operators and other key industry stakeholders it is estimated that the purchase and installation costs of controlled atmosphere systems is between three and five times the cost for comparable electrical systems, although it is expected that costs will decrease over time due to further research and greater competition. Controlled atmosphere stunning systems also entail higher running costs than electrical stunning methods, in the order of an additional 0.075 Euro cents (for a two-stage CO_2 system) to 0.7 Euro cents (Argon/Nitrogen systems) per bird. This is essentially because they are more complicated systems with more moving parts and because of the cost of gas.

However, equipment manufacturers and other key stakeholders agree that, at least in general terms, controlled atmosphere stunning results in certain advantages in terms of product quality. These advantages include an absence of wishbone and rib cage shattering, burst blood vessels and blood splashing. The presence of these in an electrical stunning system can result in lower revenue as breast yield is reduced through trimming and small percentages loses can result in a significant financial impact. There will also be an impact in terms of labour demand. Controlled atmosphere systems also offer a slight advantage in terms of the percentage of A grade fillets, again this will have consequences in terms of revenue. Other advantages include increased meat tenderness, slightly higher meat yield before trimming, a lighter and more consistent fillet colour, earlier maturation which reduces chilling time and a prolonged shelf life. On the other hand, electrical stunning systems allow more prompt defeathering which makes the process easier.

Controlled atmosphere stunning systems are also less labour intensive because there is no need to shackle live birds. This can translate to a reduction of between 15% and 20% in labour requirements for chickens, but is far more significant in the case of turkeys. Labour savings can also arise because fillet trimming for bone fragments and blood splashing is not necessary. In terms of labour quality, greater training is required for workers dealing with live birds. On the other hand, controlled atmosphere systems require greater skill in identifying birds dead on arrival. Finally, live shackling is an unpleasant and physically demanding job and worker recruitment/retention is becoming an issue in some Member States.

The costs of repairs and maintenance and cleaning are both proportional to machinery purchase price as this reflects machine complexity. The costs associated with controlled atmosphere stunning will therefore be higher.

It is not possible to net off the potential financial advantages of controlled atmosphere stunning systems against the additional running costs, partly because many of the advantages cannot be accurately quantified and also because there would be variation between systems used and also the individual circumstances of the plants.

Equipment manufacturers explained that slaughterhouses are increasingly considering the total cost of ownership when making investment decisions. This involves combining the purchase and installation price with running costs, expected revenues and repairs and maintenance and annualising this over the expected life span of the equipment. This means that the individual solution for each slaughterhouse will be different and will be influenced by the assumptions made. The fact that some operators are choosing to use controlled atmosphere stunning systems is evidence that these systems are considered to be economically advantageous in these cases.

Information gathered during the course of this research suggests that the additional purchase, installation and running costs associated with controlled atmosphere systems can be recovered fairly quickly as a result of the financial advantages stemming from improved output yield and quality.

5.7. Relationship of production costs to the price of meat

Equipment manufactures estimate that two thirds of ex-slaughterhouse price is accounted for by live bird production cost and one third by the costs of slaughter. This is corroborated by survey results where the cost of slaughter was estimated to be between 11% and 42% of total production cost to the whole bird stage. The cost of stunning itself ranges from €0.000225 per bird to €0.04 (although it should be noted that this upper estimate is considerably higher than most figures quoted). This equates to a cost for stunning of between 1.4% and 2.1% of ex-slaughterhouse price (net of profit margin) using the upper estimate for stunning cost. The lower estimate results in a stunning cost of no more than 0.01% of total ex-slaughterhouse cost (net of profit margin). Stunning/killing cost therefore comprises a small proportion of total slaughterhouse cost.

Consumer price includes the production cost to the whole bird stage, plus further processing costs, profit margin for the slaughterhouse, transport and wholesale or retail profit margin. A roasting chicken of between 2.05 kg and 2.45 kg costs around €1.50 per kg wholesale. Assuming a 2.2 kg bird this gives a price of €3.30 per bird. On this basis the cost of stunning comprises 1.2% of wholesale price using the upper estimate of €0.04 per bird from the previous paragraph. The cost of stunning and killing therefore makes up a very small proportion of final consumer price and is diluted further, even if the whole cost of stunning is applied to a selected cut such as breast fillet (in reality stunning cost should be apportioned between all products). Equipment manufacturers do not therefore expect the method of stunning to have any impact on the consumer price of poultry and this is borne out by this analysis.

The small proportion of consumer price that is accounted for by the cost of stunning means that more expensive methods, such as controlled atmosphere stunning, are unlikely to have any appreciable impact on the final consumer price for poultry.

Annex 1: Typology of stunning/killing methods used in the EU

Methods		**Description**
Stunning		
Electrical	*Head-only stunning*	Involves the application of an electric current across the head.
	Waterbath stunning (reversible method, above 200 Hz)	Conscious birds are hung upside down on a moving metal shackle line and passed through an electrified water bath, such that the current flows through the whole body towards the shackle.
	Waterbath stun/killing (above 50-60 Hz)	Difference between this and electric water bath stunner is the frequency of the electric current employed which can induce cardiac ventricular fibrillation.
Gas	*Gas stunning (e.g., CO_2 concentration below 30%)*	Exposing animals, contained in cages, cradles, crates or conveyer, to a gas mixture contained within a well or tunnel. Is used for mixtures of: (1) carbon dioxide in air; (2) carbon dioxide, oxygen and nitrogen; (3) argon and nitrogen with 2% by volume of residual oxygen; or (4) argon, nitrogen and carbon dioxide with up to 5% by volume of oxygen.
	Gas stun/killing (e.g., CO_2 concentration above 30%)	Similar procedure as gas stunning except that exposure period is long enough to induce death. Gas mixtures used for stun/killing poultry: (1) argon, nitrogen or other inert gases in atmospheric air and a maximum of 2% residual oxygen by air; (2) argon, nitrogen or other inert gases with atmospheric air and carbon dioxide; or (3) carbon dioxide, oxygen, and nitrogen followed by 80% carbon dioxide by volume in air.
Neck Dislocation		Displacement of the neck to initiate insensibility.
Other		
Bleeding		
Neck cutting	*2 carotid arteries cut*	2 carotid arteries are severed during the cut for the bleed out process.
	1 carotid artery cut and 1 external jugular vein cut	1 carotid artery and 1 external jugular vein is severed during the cut for the bleed out process.
	1 jugular vein cut	1 jugular vein is severed during the cut for the bleed out process.
Decapitation		Removal of the head in the bleed out process.
Other		

Annex 2: Methodology

This study focuses on the slaughter of chicken and turkey species. Any stunning/killing (including for human consumption) taking place outside slaughterhouses as referred to in Article 2 of Directive 93/119/EC is not included in the study, nor is killing of animals in slaughterhouses for purposes other than human consumption.

The study is based on the qualitative and quantitative data collected during the following research phases:

Interviews/meetings with key partners and stakeholders

Key partners and stakeholders have been involved throughout the whole process of the analysis by means of interviews and surveys. Depending on the availability, interviews were carried out face-to-face or by phone. The interviewed stakeholders can be found in the following table.

Table 1: Interviewed stakeholders

Organisation/Company	Relevance	Location
Association of Poultry Processors and Poultry Import and Trade in the EU (AVEC) (*met with twice*)	European Association	EU
Główny Inspektorat Weterynarii (General Veterinary Inspectorate)	Competent authority	Poland
Department for Environment, Food, and Rural Affairs (Defra)	Competent authority	UK
Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz (Federal Minister of Food, Agriculture and Consumer Protection)	Competent authority	Germany
Ministère de l'Agriculture et de la Pêche (Ministry of Agriculture and Fishing)	Competent authority	France
The British Poultry Council (*met with twice*)	National meat industry association	UK
Bundesverband der Geflügelschlachtereien e.V *(provided three written responses from members)*	National meat industry association	Germany
Fédération des Industries Avicoles	National meat industry association	France
Faccenda Group	Slaughterhouse	UK
Wiesenhof Geflügekontor GmbH	Slaughterhouse	Germany
Konspol Bis	Slaughterhouse	Poland
bsi Schwarzenbek *(met with twice)*	Training and consulting institute	Germany
Eurogroup for Animal Welfare *(met with twice)*	Animal welfare organization	EU
Humane Slaughter Association	Animal welfare organization	UK
Royal Society for the Prevention of Cruelty to Animals (RSPCA)	Animal welfare organization	UK
Œuvre d'Assistance aux Bêtes d'Abattoirs (OABA)	Animal welfare organization	France

COPA COGECA	Agricultural organization	EU
Dr Mohan Raj, University of Bristol	Researcher	UK
Dr med vet Michael Südbeck, Lohmann & Co.	Veterinarian	Germany
Stork Food Systems Poultry Processing	Equipment producer	Netherlands
Meyn Food Processing Technology BV	Equipment producer	Netherlands
Linco Food Systems A/S	Equipment producer	Denmark
Cattaruzzi	Equipment producer	Italy
Anglia Autoflow	Equipment producer	UK

Surveys

Four inter-related surveys were developed and circulated targeting the key stakeholders: slaughterhouse operators; national meat industry associations; Competent Authorities; and, animal welfare organisations. The questionnaires were sent out by email, after comments from the European stakeholder groups on the draft questionnaires had been integrated, to the relevant organisations. The questionnaire to slaughterhouses was sent to the national industry associations, who in turn forwarded them to their members. The response rate from slaughterhouses was lower than was hoped (and lower than in the red meat sector), despite numerous follow-ups, two extensions to the response deadline and the gratefully acknowledged assistance of AVEC. The response rate from competent authorities was more satisfactory. Table 2 describes the profile of the respondents.

Table 2: Number of respondents to the survey

Respondents	Questionnaires received	MS covered
Slaughterhouse operators	29	8
Competent Authorities	19	18
Animal welfare organisations	3	3
National meat industry associations	4	4

*Includes single questionnaires which were received representing aggregated responses from a larger number of slaughterhouses

Responses to the surveys of slaughterhouse operators and competent authorities are broken down in more detail in Table 3.

Table 3: Country information regarding survey results

Country	Responses to survey of slaughterhouse operator survey	Responses to survey of Competent Authorities
Austria	3	1
Belgium	5	1
Cyprus	0	1
Czech Republic	0	1
Denmark	0	1

Estonia	0	1
Finland	1	1
France	8	0
Germany	7	1
Hungary	1	1
Ireland	0	0
Italy	1	1
Luxembourg	0	1
Netherlands	0	1
Norway	0	n/a
Poland	0	1
Portugal	0	1
Slovenia	0	1
Spain	0	1
Sweden	0	1
United Kingdom	3	2
TOTAL	**29**	**20**

Information regarding the types of species slaughtered can be found in Table 4 below:

Table 4: Types of species slaughtered in surveys received

Species	Respondents
Chickens only	18
Turkeys only	6
Chickens and turkeys	5

Despite the low response rate, these responses provide the most comprehensive overview of the situation of the EU slaughterhouse sector available so far. Several national meat industry associations (Belgium, Netherlands, and Italy) explicitly stated that answers given by them and their slaughterhouses were fully representative of their national situation. This then represents 80% of the chicken and 100% of the turkey produced in Belgium, 99% of the chicken and 100% of the turkey produced in the Netherlands, and 94.2% of the chicken and 96.4% of the turkey produced in Italy. This, therefore, indicates the relevance of the sample. The Polish national meat association said their answers were partly representative. A number of limitations of the slaughterhouse survey have, however, to be emphasised:

- Smaller slaughterhouses and operators from new Member States are under-represented;

- There is a possible bias in the results of the slaughterhouse questionnaire as it is feasible that slaughterhouses with the highest animal welfare standards were more likely to fill in the questionnaire, thus reflecting in their answers higher standards than are implemented on average in the EU.

Therefore, results from the slaughterhouse survey have been interpreted with care. Whenever possible, results have been verified with complementary information. In general, results have been consistent with both the information that has been provided by Competent Authorities and other stakeholders and also previous research.

Case studies

Case studies were conducted in the UK, France, Germany, and Poland, consisting of a programme of interviews with Competent Authorities, national poultry meat industry associations, animal welfare organisations, and slaughterhouses[1]. Results of the case studies are used throughout the study to add further depth and detail to the information received from other data sources.

[1] Not in all case study-countries a slaughterhouse visit took place. In spite of significant efforts the French national meat industry association could not identify a slaughterhouse willing to accept a visit by the Contractor. Nor was the Polish slaughterhouse able to co-operate within the time frame requested.

Annex 3: Additional tables and charts

A1.1. Slaughterhouse structure

The data in this section present the structure of the poultry slaughter sector for those Member States where data exist.

Table 5 presents data for the German poultry slaughtering sector. In the period 2000-2004, the number of slaughterhouses peaked in 2002, but there were more at the end of the period than at the beginning. Although the relative proportion of small slaughterhouses stayed the same, there was an increase in the proportion of the largest size group and decreases in the proportion of slaughterhouses with a monthly capacity between 100,000 and 499,999. As might be expected from this, the proportion of birds slaughtered in the largest slaughterhouses increased while the proportion of those slaughtered in mid-sized slaughterhouses decreased. The German industry has therefore seen a consolidation and polarisation over the period with small slaughterhouses remaining and very large ones increasing their share of total production at the expense of mid-sized plants.

Table 5: Poultry slaughterhouses and slaughter capacity in Germany, 2000-2004

Monthly slaughter capacity	**Number of slaughterhouses**				
Number of birds ('000):	**2000**	**2001**	**2002**	**2003**	**2004**
2.000 - 29.999	57	58	65	62	60
30.000 - 49.999	11	8	9	9	9
50.000 - 99.999	7	9	10	8	11
100.000 - 199.999	9	9	8	8	6
200.000 - 499.999	9	8	10	8	7
500.000 - 999.999	9	9	9	11	11
1.000.000 and above	10	11	10	11	13
Total	**112**	**112**	**121**	**117**	**117**
	Slaughter output				
Number of birds ('000):					
2.000 - 29.999	476.9	497.0	553.9	485.1	509.8
30.000 - 49.999	433.8	289.2	339.3	346.0	356.0
50.000 - 99.999	471.0	612.0	668.0	492.0	738.0
100.000 - 199.999	1,196.8	1,247.8	1,123.8	1,090.1	839.8
200.000 - 499.999	5,095	2,780	3,745	2,970	2,760
500.000 - 999.999	6,999	7,293	7,523	8,873	8,198
1.000.000 and above	19,162.6	21,687.5	21,379.3	23,008.9	27,724.1
Total	**33,835.1**	**34,406.4**	**35,332.3**	**37,265.1**	**41,075.7**

Source: ZMP.

Table 6 shows presents the structure of the poultry slaughtering sector in the UK (England, Scotland and Wales only). Between 2000 and 2006, the number of slaughterhouses in the UK declined in all but two size categories, showing signs of industry concentration. The most dramatic decline was observed for medium and small slaughterhouses. Although the numbers of the second and third smallest size categories increased, their joint share in the total poultry slaughtering remained marginal at around

1%. The proportional importance of the largest abattoirs increase over the period, even through their absolute numbers declined.

Table 6: Poultry slaughterhouses and slaughter capacity in the UK, 2000-2006

Monthly slaughter capacity	Number of slaughterhouses						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
2,000 - 29,999	45	43	38	33	32	30	29
30,000 - 49,999	4	3	3	7	6	9	6
50,000 – 99,999	5	7	7	7	9	6	7
100,000 - 199,999	11	6	8	9	6	6	4
200,000 – 499,999	17	20	16	14	16	18	14
500,000 – 999,999	14	11	12	12	10	10	11
1,000,000 and above	23	24	22	21	22	19	18
Total	**119**	**114**	**106**	**103**	**101**	**98**	**89**
	Slaughter output						
Number of birds ('000):	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
2,000 – 29,999	356.4	340.8	287.1	236.3	233.5	229.7	248.0
30,000 - 49,999	162.3	123.8	120.7	266.7	245.5	362.4	235.0
50,000 – 99,999	236.2	498.6	498.8	512.9	648.1	430.7	439.4
100,000 - 199,999	1,506.1	743.5	1,229.0	1,361.8	952.4	859.7	567.7
200,000 – 499,999	5,260.4	6,180.5	5,189.6	4,662.3	5,158.8	5,839.1	4,473.5
500,000 – 999,999	11,066.3	8,207.9	9,024.2	9,560.4	7,727.1	7,918.2	8,528.8
1,000,000 and above	46,870.1	50,172.7	48,766.1	48,962.6	50,779.6	51,371.7	50,500.1
Total	**65,577.8**	**66,267.8**	**65,115.5**	**65,563.0**	**65,745.0**	**67,011.5**	**64,992.5**

Source: Meat Hygiene Service.

The table below summarises structural information for the Belgian sector. There was an overall decline in the number of slaughterhouses over the period with the sharpest decline noted for those companies with an annual slaughter capacity of between 0.5 million and 1 million birds). There were two exceptions to this trend. First, the number of the largest slaughterhouses (annual capacity over 1 million birds) increased from 8 in 2000 to 10 in 2005. Second, the number of slaughterhouses with an annual capacity between 5 million and 10 million birds remained the same. As a result of the changes in size structure, the largest abattoirs increased their annual share in poultry slaughtering from 71% to over 82%.

Table 7: Poultry slaughterhouses and slaughter capacity in Belgium, 2000, 2002 and 2005

Annual slaughter capacity	Number of slaughterhouses		
('000 birds per year)	**2000**	**2002**	**2005**
<100	55	44	43
100-500	12	11	7
500-1,000	7	7	4

1,000-5,000	7	3	3
5,000-10,000	5	5	5
>10,000	8	8	10
Total	**94**	**78**	**72**
	Slaughter output		
<100	1,275	1,092	1,093
100-500	1,974	2,064	1,722
500-1,000	5,017	4,976	2,725
1,000-5,000	17,111	5,907	6,587
5,000-10,000	42,756	43,951	29,186
>10,000	170,028	190,909	196,358
Total	**238,162**	**248,899**	**237,671**

Source: VIP vzw.

As shown in Table 8, in Hungary, between 2000 and 2005, the number of slaughterhouses peaked at 51 in 2003, dropped by 5 in 2005, to recover again to 49 by the end of 2006. The share of the smallest units in the overall number of slaughterhouses declined over time, while the most pronounced growth was observed for the medium and lower-medium capacity range. This was followed by an increase in the market share for all of these groups. The number of the largest abattoirs was relatively stable in comparison, although their market share declined from 72% in 2000 to only 44% at the end of the period.

Table 8: Poultry slaughterhouses and slaughter capacity in Hungary (members of Poultry Product Board only), 1995, 2000-2006

Slaughter capacity	**Number of slaughterhouses**							
Number of chickens per hour:	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
100 - 999	2	19	17	15	14	13	12	14
1.000 - 1.999	3	10	12	13	15	15	13	14
2.000 - 2.999	1	3	2	4	5	6	4	4
3.000 - 3.999	0	3	1	1	3	3	4	5
4.000 - 4.999	1	2	3	3	3	2	1	2
5.000 - 5.999	3	1	1	2	4	5	3	2
6.000 and above	12	9	8	8	7	6	9	8
Total	**22**	**47**	**44**	**46**	**51**	**50**	**46**	**49**
	Slaughter output ('000 kg per year)							
Number of chickens per hour:								
100 - 999	1,133	15,182	18,408	21,031	25,944	14,048	24,374	26,837
1.000 - 1.999	7,568	24,403	31,295	33,534	45,171	60,507	56,120	58,758
2.000 - 2.999	2,551	10,911	12,610	11,850	12,311	15,711	24,998	34,311

3.000 - 3.999	0	8,042	6,758	21,847	44,709	60,699	38,791	31,396
4.000 - 4.999	1,184	23,902	24,948	35,813	24,880	26,192	6,673	44,203
5.000 - 5.999	36,200	34,854	39,540	29,780	30,826	69,939	50,799	43,115
6.000 and above	289,597	295,250	319,123	315,775	294,169	225,631	255,753	187,948
Total	**338,233**	**412,544**	**452,682**	**469,630**	**478,010**	**472,727**	**457,508**	**426,568**

Source: Hungarian Poultry Product Board.

In Latvia (see Table 9) the total number of slaughterhouses almost halved from 15 in 2003 to only 8 in 2006, with this decline taking place mainly amongst abattoirs with medium and low capacity. Despite the fact that there were only three slaughterhouses in the two largest size categories, throughout the period covered, these together accounted for between 95% and 99% of total annual slaughterings and thus showing a high degree of concentration in the sector.

Table 9: Poultry slaughterhouses and slaughter capacity in Latvia, 2003-2007

	Number of slaughterhouses				
Annual slaughter capacity (head)	**2003**	**2004**	**2005**	**2006**	**2007 (6 months)**
<2,000	6	3	3	2	3
2,000-29,000	4	1	0	0	0
30,000-49,999	1	1	0	2	1
50,000-99,999	0	1	0	0	0
100,000-199,999	1	0	2	1	0
200,000-499,999	0	0	0	0	0
500,000-999,999	1	1	1	1	1
>1,000,000	2	2	2	2	2
Total	**15**	**9**	**8**	**8**	**7**
	Slaughter output (heads)				
<2,000	1,662	845	1,245	1,275	685
2,000-29,000	124,792	4,416	0	0	0
30,000-49,999	40,176	45,415	0	66,023	0
50,000-99,999	0	52,756	0	0	0
100,000-199,999	149,057	0	296,085	10,079	0
200,000-499,999	0	0	0	0	0
500,000-999,999	701,633	799,562	618,889	887,051	0
>1,000,000	5,377,826	7,321,001	5,382,165	12,276,102	6,898,494
Total	**6,395,146**	**8,223,995**	**6,298,384**	**13,240,530**	**6,899,179**

Source: Food and Veterinary Service, Latvia.

The Finnish slaughtering sector has been highly concentrated over the 7 year period from 2000-2006 (Table 10) with the two largest slaughterhouses accounting for around 80% of total slaughterings. Although the number of small slaughterhouses remained reasonably static over the period, their relative importance diminished as the total number of slaughterings increased.

Table 10: Poultry slaughterhouses and slaughter capacity in Finland, 2000-2006

	Number of slaughterhouses						
Annual slaughter capacity (head)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
<2,000	12	11	12	14	11	12	13
2,000-29,999	4	5	5	4	6	4	4
30,000-49,999	0	1	1	0	0	0	0
50,000-99,999	4	2	1	1	1	1	2
100,000-199,999	1	1	0	0	0	0	1
200,000-499,999	0	1	2	2	1	2	0
500,000-999,999	0	0	0	0	3	1	2
1,000,000-4,999,999	2	2	2	1	0	0	0
5,000,000-9,999,999	1	1	1	1	1	1	1
10,000,000-14,999,999	1	0	0	0	0	0	0
15,000,000-19,999,999	0	1	1	1	1	1	1
>20,000,000	1	1	1	1	1	1	1
Total	**26**	**26**	**26**	**25**	**25**	**23**	**25**
	Slaughter output (head)						
<2,000	6,760	5,351	5,738	10,479	4,828	8,605	6,743
2,000-29,999	24,710	14,536	33,726	36,875	56,608	34,265	25,377
30,000-49,999	0	35,818	34,182	0	0	0	0
50,000-99,999	290,000	133,744	82,833	85,227	79,389	76,002	150,281
100,000-199,999	159,879	172,603	0	0	0	0	131,411
200,000-499,999	0	221,516	472,684	601,410	351,992	638,912	0
500,000-999,999	0	0	0	0	1,991,607	818,774	1,365,910
1,000,000-	2,486,502	3,127,148	2,614,339	1,045,944	0	0	0

4,999,999							
5,000,000-9,999,999	7,632,273	8,082,009	8,492,415	7,651,994	7,612,910	7,559,552	7,328,533
10,000,000-14,999,999	14,773,963	0	0	0	0	0	0
15,000,000-19,999,999	0	18,245,231	18,176,642	17,683,625	18,804,819	18,603,177	18,867,374
>20,000,000	20,721,174	23,638,794	24,883,906	25,722,696	25,892,469	26,805,727	27,272,363
Total	**46,095,261**	**53,676,750**	**54,796,465**	**52,838,250**	**54,794,622**	**54,545,014**	**55,147,992**

Source: Animal health and welfare unit, Finland.

Table 11 presents available data for the Netherlands. The total number of slaughterhouses decreased substantially from 54 in 1995 to 32 in 2003 and then have dropped further to 23 by 2005. Only mid-capacity slaughterhouses and those in the largest size category increased in number between 2003 and 2005, indicating that the sector continued to consolidate.

Table 11: Poultry slaughterhouses and slaughter capacity in the Netherlands, 1991, 1995, 2003-2005

	Number of slaughterhouses				
Annual slaughter capacity (tonnes)	**1991**	**1995**	**2003**	**2004**	**2005**
<1,000	37	27	9	7	4
1,000-19,999	8	11	8	5	4
20,000-29,999	9	8	4	6	6
30,000-49,999	5	8	9	6	6
>50,000	22	27	2	2	3
Total	**59**	**54**	**32**	**26**	**23**

Source: PVE/RVV.

A1.2. EU URAA commitments on import tariffs for poultry meat

This section presents the EU URAA commitments on import tariffs for poultry meat (Table 12) and presents salted poultry meat imports (Figure 1).

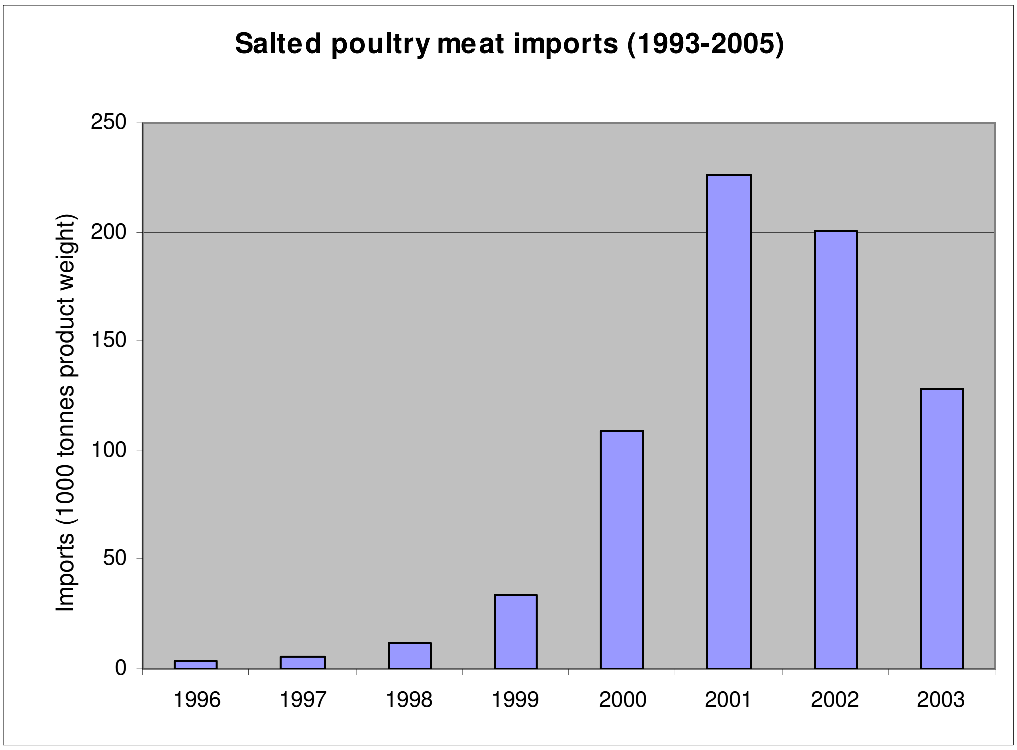
Table 12: EU URAA commitments on import tariffs for poultry meat

Tariff item number	Description of products	Base rate of duty	Bound rate of duty	Special Safeguard (SSG)
0207	Meat and edible offal, of the poultry of heading no 0105, fresh, chilled or frozen:			
020710	-Poultry not cut in pieces, fresh or chilled:			
	--Fowls of the species Gallus domesticus:			
02071011	---Plucked and gutted, with heads and feet, known as ‘83% chickens’	€410/tonne	€262/tonne	SSG
02071015	---Plucked and drawn, without heads and feet but with necks, hearts, livers and gizzards, known as ‘70% chicken’	€467/tonne	€299/tonne	SSG
02071019	---Plucked and drawn, without heads and feet and without necks, hearts, livers and gizzards, known as ‘65% chicken’, or otherwise presented	€508/tonne	€325/tonne	SSG
	-Poultry not cut in pieces, frozen:			
020721	--Fowls of the species Gallus domesticus:			
02072110	---Plucked and drawn, without heads and feet but with necks, hearts, livers and gizzards, known as ‘70% chicken’	€467/tonne	€299/tonne	SSG
02072190	---Plucked and drawn, without heads and feet and without necks, hearts, livers and gizzards, known as ‘65% chicken’, or otherwise presented	€508/tonne	€325/tonne	SSG
	-Poultry cuts and offal (including livers), fresh or chilled:			
020739	--Other:			
	---Of fowls of the species Gallus domesticus:			
	----Cuts:			
02073911	-----Boneless	€1,600/tonne	€1,024/tonne	SSG
	-----With bone in:			
02073913	------Halves or quarters	€559/tonne	€358/tonne	SSG
02073915	------Whole wings, with or without tips	€421/tonne	€269/tonne	SSG
02073917	------Backs, necks, backs with necks attached, rumps and wing tips	€292/tonne	€187/tonne	SSG
02073921	------Breasts and cuts thereof	€940/tonne	€602/tonne	SSG
02073923	------Legs and cuts thereof	€724/tonne	€463/tonne	SSG
02073925	------Other	€1,575/tonne	€1,008/tonne	SSG

Tariff item number	Description of products	Base rate of duty	Bound rate of duty	Special Safeguard (SSG)
	-Poultry cuts and offal other than livers, frozen			
020741	--Of fowls of the species Gallus domesticus:			
	---Cuts:			
02074110	----Boneless	€1,600/tonne	€1,024/tonne	SSG
	----With bone in:			
02074111	-----Halves or quarters	€559/tonne	€358/tonne	SSG
02074121	-----Whole wings, with or without tips	€421/tonne	€269/tonne	SSG
02074131	-----Backs, necks, backs with necks attached, rumps and wing tips	€292/tonne	€187/tonne	SSG
02074141	-----Breasts and cuts thereof	€940/tonne	€602/tonne	SSG
02074151	-----Legs and cuts thereof	€724/tonne	€463/tonne	SSG
02074171	-----Other	€1,575/tonne	€1,008/tonne	SSG
02109020/ 02109939	Other meat, salted in brine, dried or smoked	24% ad valorem	15.4% ad valorem	
16023211	Uncooked poultry of heading 0105,other than turkey	€1355/tonne	€867/tonne	SSG
16023219	Turkey	10.9% ad valorem		

Source: European Communities Schedules for the Uruguay Round of Multilateral Trade Negotiations, GATT, 1994.

Figure 1: Salted poultry meat imports into the EU-15 between 1996 and 2003



Source: DG Agriculture.
Note: This figure shows product code 02109939.

Annex 4: Technical comparison of electrical and controlled atmosphere stunning systems

The technical differences between electrical and controlled atmosphere stunning systems is presented below. The information here is summarised in tabular form in the main report.

A1.3. Throughput

The throughput of birds in any system depends on a number of factors which are independent of the method of stunning. Essentially throughput is related to the scale of the plant and is ultimately limited by the space for chilling following bleeding. However, controlled atmosphere stunning can, depending on the system[2], require more space for the stunning to take place and as a result, for the same size facility, less space would be available for chilling and this would limit throughput in a controlled atmosphere stunning plant. This means that for plants where expansion is not possible, a switch from electrical to controlled atmosphere stunning might entail a reduction in throughput.

The stunning technique does not therefore result in any direct difference in running costs as a result of throughput. However, indirectly this is likely to result in a larger building footprint for the same throughput and this will lead to higher investment costs for controlled atmosphere systems.

A1.4. Improved product quality

Equipment manufacturers, as might be expected, have different views on product quality according to the systems they produce. Before considering differences in product quality between electrical and controlled atmosphere stunning systems it is worth noting that the specifications of the systems being compared are often crucial in contextualising the results[3]. One manufacturer explained that comparisons are often made between controlled atmosphere stunning and a 50 Hz electrical stunner. Other electrical stunning techniques involving different frequency, current and duration can result in higher quality meat[4]. That said, manufacturers agreed that, at least in general terms, controlled atmosphere stunning results in certain advantages in terms of product quality.

The main advantage for controlled atmosphere stunning systems (and the experimental vacuum stunning system) relates to **wish bone and rib cage shattering, burst blood vessels and blood spots**. These can occur in some electrical stunning systems, but do not in controlled atmosphere stunning. Of course, the use of additional labour on the further processing line can result in a similar quality final product, but the process of cutting out blood spots and bone fragments incurs a labour cost and reduces

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[2] A deep pit system rather than a conveyor system reduces the space requirements.

[3] For example, tipping live birds from transport modules onto a conveyor belt can result in scratches to the skin which can reduce carcass value and become a potential site for microbial infection. Whilst this process is necessary for all electrical stunning systems, some controlled atmosphere stunning systems allow stunning within transport crates thus eliminating this problem. However, other controlled atmosphere stunning systems still require the removal of birds from transport crates and therefore do not confer this advantage.

[4] Developments in electrical stunning systems in the US have resulted in a low voltage pulsed DC current followed by a constant low voltage AC current being used. This approach does not impact on meat quality and is used in some plants supplying McDonald's in both the US and the UK (McDonald's (2005) McDonald's Animal Welfare Feasibility Study Controlled Atmosphere Stunning for Broilers. Report prepared for McDonald's management by McDonald's animal welfare team. June, 2005.

the yield from breast fillets. This issue is of less importance in the whole bird market where blood spots and burst blood vessels are not visible.

A manufacturer producing only electrical stunning systems noted that although the **percentage of grade A fillets** produced using good quality electrical stunning systems would be very close to the percentage achieved using controlled atmosphere stunning systems, the latter system would have an advantage. The University of Bologna has conducted a meat quality comparison between controlled atmosphere stunning and electrical stunning and the results show that 80.0% of all meat resulting from controlled atmosphere stunning had no defect compared to just 37.5% of meat resulting from electrical stunning[5]. However, the type of electrical stunning used is not mentioned and this result should be interpreted with this in mind. Although not all manufacturers agree that this potential for improved product quality leads to higher financial return (and it may not when birds do not undergo further processing), this is at least the logical conclusion to draw where additional labour (and sometimes x-ray machinery) is required to trim fillets to remove bone fragments and blood spots. This also results in reduced fillet weight with a consequential impact on revenue. One manufacturer estimated that an argon/nitrogen gas mix results in a 1.5% yield benefit for fillets compared to electrical stunning[6].

Controlled atmosphere stunning systems are reported by equipment manufacturers to have a slight advantage in terms of **tenderness**[7] and the vacuum stunning system is also believed by proponents to show promise in this regard. Another manufacturer producing both types of stunning system stated that the controlled atmosphere system resulted in a slightly **higher meat yield** of between 0.05% and 0.1% per bird before any trimming takes place[8]. They also noted that this advantage could be increased to around 0.5% with the use of on-line maturation and de-boning and that therefore other parts of the process post-stun can confer greater yield benefits. This benefit in terms of cooked yield can be ten-fold when trimming is taken into account.

Maturation, the process during which the muscles relax, is essential to producing tender meat. UK retailers, for example, have stringent requirements in terms of the length of maturation to avoid tough and/or stringy meat. However, according to an equipment manufacturer, requirements for retailers in other Member States are often less prescribed. Controlled atmosphere stunning systems can, if an anoxic[9] gas mix is used, induce wing flap as brain control is lost[10]. This burns up residual oxygen, promotes the early onset of *rigor mortis* and results in early maturation of the meat. The same effect is induced by decapitation[11], but not following death by bleeding[12]. Some retailers require up to 14 hours

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[5] Reported in Linco Food Systems Maxiload Live Bird Handling System sales literature (Linco produce both controlled atmosphere and electrical stunning systems).

[6] Based on a throughput of 8,000 birds an hour, an 8 hour day, a 2.2 kg bird and 27% breast meat, this equates to some 570 kg of extra breast meat per day, which is financially significant.

[7] See also Raj, A.B.M. (1999). "*Effect of stunning and slaughter methods on carcass and meat quality*". In: Richardson, R.I. and Mead, G.C. (eds) Poultry Meat Science, CABI (Pub) Vol. 25, pp 231-254 which reports that, in contrast to earlier work in this area, broilers stunned with argon-induced anoxia produced slightly more tender breast meat than those stunned with either 45% CO_2 in air or a 50 Hz, 107 mA per bird electrical current.

[8] Using the same assumptions as in footnote 6, this equates to between 19 and 38 kg of breast meat per day.

[9] Anoxic mixes kill by denying oxygen rather than increasing levels of other gases to toxic concentrations.

[10] According to McDonald's (McDonald's (2005) McDonald's Animal Welfare Feasibility Study Controlled Atmosphere Stunning for Broilers. Report prepared for McDonald's management by McDonald's animal welfare team. June, 2005) researchers differ on whether birds are still conscious when wing flap begins and, if conscious, whether the flapping is associated with distress or pain.

[11] Used more widely in the US than in the EU.

[12] It is possible to enhance maturation through the use of electrical stimulus at the chilling stage, irrespective of the stunning system used.

of maturation when electrical stunning is used, so early maturation using a controlled atmosphere stunning method can result in a fresher product. Controlled atmosphere stunned birds can be breast filleted around one hour after killing (as long as the proper temperature has been attained). Electrically stunned carcasses would require between three and five hours to obtain similar meat quality[13]. A side effect of early maturation is reduced chill time which provides a direct cost saving in terms of power required to chill and a marginal increase in revenue in that there is reduced moisture loss (of around 0.25%) during the chilling process.

Some equipment manufacturers state that controlled atmosphere and vacuum stunning methods result in **lighter and more consistent fillet colour**[14]. However, this is contested by other manufacturers who also point out that this depends to a great extent on the electrical stunning system used for comparison and on the use of other techniques unrelated to stunning which can also lead to improvements in product quality. Finally, the impact of any advantage in terms of lighter and more consistent meat colour in economic terms is considered marginal by these manufacturers.

In contrast to the potential advantages of controlled atmosphere stunning considered above, this method can, when anoxic gases are used, result in **wing tip damage** as a result of the induced wing flap. However, wing tip damage can also occur when birds are shackled live in electrical stunning systems and from pre-stun electric shocks[15], although the incidence and duration of wing flapping can be reduced through the use of breast comforters and low level or blue lighting[16]. Raj (1999) notes that wing flap damage arising in controlled atmosphere stunning is less severe than that induced by live shackling because of the differential nature of the wing flap that takes place[17]. Damage is especially likely to occur for larger birds and poses a particular problem in the US market where wing tips are a more important commodity than in the European market.

The sooner after death that **defeathering** takes place, the easier the process is. As *rigor mortis* sets in, the incidence of wing breakage and missed feathers increases. Electrical stunning systems usually allow defeathering within seven minutes of death whereas it takes longer to reach the defeathering stage using controlled atmosphere stunning because the process of stunning takes longer. This can confer a quality advantage on electrical stunning methods. That said, equipment manufacturers report that suitable modifications to the defeathering process in controlled atmosphere systems can reduce this advantage considerably.

Controlled atmosphere stunning using anoxic methods can lead to **prolonged product shelf-life** due to the slow rate of development of off-odours and discoloration[18]. However, some equipment manufacturers are sceptical about this. This results from faster bleeding, earlier defeathering and faster development of *rigor mortis*[19]. If longer shelf life is conferred through using this method, then there

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[13] Summers, J. (no date) Gas Versus Electrical Stunning. Accessed from: http://www.poultryindustrycouncil.ca/Factsheets/Factsheets/fact14.htm.

[14] Nitrogen/argon gas mixtures offer the best fillet colour followed by a two-stage carbon dioxide process and then a nitrogen/carbon dioxide mix.

[15] Raj, A.B.M. (1999). "*Effect of stunning and slaughter methods on carcass and meat quality*". In: Richardson, R.I. and Mead, G.C. (eds) Poultry Meat Science, CABI (Pub) Vol. 25, pp 231-254.

[16] European Food Safety Authority (2004) Welfare Aspects Of Animal Stunning And Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. (Question N° EFSA-Q-2003-093). Accepted on the 15th of June 2004.

[17] Wing flap induced by live shackling results from tetanic muscle contraction whereas wing flap induced by anoxic stunning is driven by twitch contractions which is a similar process to flight and the bird is thus less likely to incur damage.

[18] Raj, M. personal communication.

[19] Summers, J. (no date) Gas Versus Electrical Stunning. Accessed from:

will be cost savings for retailers through reduced wastage, which should be passed back down the supply chain assuming reasonable price transmission in this direction[20].

A1.5. Retailers demands

Equipment manufacturers state that reduced stress on live birds results in more tender meat and longer product shelf-life. One manufacturer explained that the most significant driving force for slaughterhouses in terms of stunning method is the *perception* of animal welfare in the market[21]. If retailers and consumers believe that controlled atmosphere stunning is more animal welfare friendly than electrical stunning (whether on the basis of the stunning process itself or associated live-bird handling) then they may demand that slaughterhouses use this method. Failure to use stunning methods demanded by retailers could deny access to this lucrative market. Currently retailers and large food companies are not generally suggesting a preference for either stunning method, but many are examining the subject (for example, McDonalds and Tyson). That said, some UK retailers are now stating a preference for controlled atmosphere stunning, although they are yet to insist upon its use.

A1.6. Labour requirements

There are three main issues to consider in relation to the labour required for stunning and killing: quantity, quality and availability.

- **Labour quantity.** Clearly in absolute terms this depends on the scale of the plant and the degree of further processing undertaken, but, for plants with similar throughputs, there are some differences between controlled atmosphere and electrical stunning methods which derive from whether the birds are shackled whilst inanimate (controlled atmosphere and vacuum stunning) or live (electrical stunning). One equipment manufacture estimated that a 20% saving in labour requirement could be made where a workforce of five or more could be cut. Savings in relation to turkey processing are likely to be even greater, at around 80%.

  By way of example, one manufacturer noted that a shackling rate for live birds of between 1,500 and 1,700 per worker per hour is considered to be typical. With a workforce of five this implies a throughput of between 7,500 and 8,500 birds per hour. Using this manufacturer's controlled atmosphere system, one worker can shackle around 2,000 inanimate birds per hour[22] implying that a workforce of between 3.75 and 4.25 full-time equivalents would be able to maintain this level of throughput. However, it was pointed out that the relationship was not linear and that for workforces below this level it was not likely that any labour savings could be made whilst maintaining throughput.

  Another manufacturer suggested that the throughput provided in a plant using 10 workers and live shackling could be achieved by just 4 workers shackling inanimate birds. Part of the time saving relates to the design of the shackling equipment. For live shackling the birds have to be raised to a height of around 50cm to allow hanging clearance. When shackling inanimate birds the shackles

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http://www.poultryindustrycouncil.ca/Factsheets/Factsheets/fact14.htm.

[20] Price transmission can be asymmetric meaning that while costs are passed in one direction, they may be passed with a lag or not at all in the other direction. This will depend on the balance of power in the supply chain.

[21] This perception may not be shared by others and may not be scientifically justified.

[22] Another manufacturer claimed that shackling speed could not be increased for inanimate birds, but this manufacturer was the only one with this opinion.

can be lower as there is no need for the birds to hang freely at the point of shackling[23]. This also reduces the physical demands on the workers as well as the time required to shackle each bird. A third manufacturer estimated that a 15% saving in labour requirements could be made at the shackling point in a controlled atmosphere plant and that this saving would increase with scale. Labour for live shackling is one of the best paid jobs in a slaughterhouse (as a result of the unpleasant operating conditions and physical demands). As such, any labour savings would be significant if they could be realised.

- **Labour quality.** Live shackling in electrical stunning systems is a difficult job that requires a significantly higher level of training than inanimate shackling, both in terms of worker safety and in order to ensure acceptable levels of animal welfare. One equipment manufacturer noted that inanimate shackling (in controlled atmosphere stunning systems), as well as being less physically demanding, could be carried out with virtually no training at all and labour is therefore cheaper. However, controlled atmosphere stunning systems do require trained staff to operate the controlled atmosphere chamber and cleaning staff may require a greater level of training than in electrical stunning systems. Greater skill is also required to identify birds that are dead on arrival.

- **Labour availability.** As stated above, live shackling is an unpleasant job that is carried out in low-level lighting in a noisy and dusty environment. Birds do not like being handled and will attempt to stop themselves being shackled upside down which adds to the physical demands of the job which are already high given the repetitive action and weight of the birds. Shackling inanimate birds in a controlled atmosphere stunning system may also take place in a controlled atmosphere to allow for the extraction of any residual gas in the feathers. Worker recruitment is increasingly becoming an issue. One manufacturer mentioned that in some Member States the difficulty in recruiting workers was one of the factors driving the uptake of controlled atmosphere stunning systems. A plant switching to inanimate shackling in the US noted a 75% decrease in turnover among hangers following the change in conditions[24]. Lower staff turnover will result in savings in recruitment costs as, at least in some Member States, recruitment of workers to carry out live shackling is becoming difficult.

Total labour requirement in a plant will depend on the extent of further processing undertaken. Whilst this is independent of the stunning method, there are some implications on further processing labour demand arising from the stunning system used. The impact of stunning method on product quality is considered above. Some of these differences have a knock-on impact in terms of labour demand. For example, the greater incidence of wish bone and rib cage shattering, blood spotting and burst blood vessels arising from electrical stunning systems requires additional labour, and hence incurs additional cost, in trimming operations.

Repairs and maintenance

Repairs and maintenance requirements are a function of equipment complexity and, because this is reflected in the initial purchase price, equipment manufacturers report that the cost of repairs and maintenance is usually considered to be a percentage of this. Controlled atmosphere stunning systems are more mechanically complex than electrical stunning systems, which leads to a higher initial investment cost and hence higher repair and maintenance costs. Based on the difference in purchase price, the cost of repairs and maintenance in controlled atmosphere stunning systems is likely to be between three and five times higher than in electrical stunning systems.

[23] The processing line then rises after the point of shackling to allow the birds to hang freely.
[24] Bagel, A. "*Stunning Results*". In Poultry. June-July, 2005.

Whilst most equipment manufacturers do not consider that there is any difference in reliability between the two systems, one pointed out that some controlled atmosphere stunning systems had electrical back-ups. However, this may be to allow a different stunning method to be used if desired.

That said, should a stoppage occur in a controlled atmosphere stunning system, the potential wastage is considerably higher than in a comparable electrical stunning system because more birds are between the killing point and the defeathering point and these birds would need to be discarded.

Equipment life span

The life span of stunning equipment differs according to make and also according to usage and is therefore highly variable. However, because controlled atmosphere stunning systems have more moving parts, they will generally need to be replaced before electrical stunning systems. The life span of electrical stunning systems for poultry is estimated by equipment manufacturers at between ten and fifteen years as a minimum. Although the life span of controlled atmosphere systems is not expected to be as long, it is acknowledged that there is insufficient experience of these systems to make a fully informed judgement. One manufacturer dissented from this view and noted that modern controlled atmosphere stunning plants for poultry would have the same life span as electrical stunning plants as long as they are installed and maintained properly. It is not possible to reach a judgement on any financial impact with the current level of knowledge of controlled atmosphere systems.

A1.7. Cleaning requirements

None of the interviewed equipment manufacturers suggested that slaughterhouses operate continuously, even at times of peak demand. All cleaning operations in all systems are therefore conducted in downtime and do not involve additional opportunity costs. Cleaning requirements, like repair and maintenance costs, are a function of complexity, which is reflected in the initial purchase price. On this basis the costs of cleaning a controlled atmosphere stunning system is likely to be between three and five times higher than those of cleaning an electrical system, not least because of the requirement to purge the unit of gas. The only equipment unique to an electrical stunning system is the water bath and cleaning this is fairly straightforward and takes a matter of minutes. In contrast, it takes around an hour to clean a typical size controlled atmosphere chamber. Cleaning requirements for vacuum stunning systems are likely to be similar to electrical stunning systems although feathers and other debris are removed from the chamber in operation.

A1.8. Power requirements

The use of power specifically for electrical stunning (as opposed to power for the whole plant) is considered by equipment manufacturers to be marginal. One manufacturer noted that no slaughterhouses appear to be concerned about the cost of power under either system.

A1.9. Birds dead on arrival

Birds which are dead on arrival need to be identified and removed before they enter the processing line. This is relatively straightforward in electrical stunning systems where the birds are shackled live. However, in controlled atmosphere and vacuum stunning systems where birds can remain in crates, dead birds are identified at the shackling point through the presence of *rigor mortis* and/or body temperature. Any birds that are not successfully identified at this point would be identified later as they will not bleed in the same way as a freshly dead bird. In systems where birds are removed from crates prior to stun, birds dead on arrival are identified and removed at this point. The difference between the systems is not considered likely to have any financial implications.

A1.10. Worker welfare

The differences in working environment for electrical and controlled atmosphere stunning systems have been noted above. Shackling live birds in an electrical stunning system is an unpleasant and physically demanding job which is undertaken in low light, noisy and dusty conditions. There is also a risk of injury from struggling birds; in the case of larger species there is potential for quite serious injury (and consequent compensation payments and sick leave). Based on a liveweight of 2.3 kg and an hourly work rate of between 1,500 and 1,700 birds, each worker raises the equivalent of between 3.45 and 3.91 tonnes by around 50 cm each hour. In contrast, workers shackling inanimate birds in a controlled atmosphere/vacuum stunning system are able to work in a quieter, less dusty atmosphere with full light (although ventilation may be required to remove gas trapped in feathers) and may not have to lift the birds at all[25] (a particular benefit when dealing with heavier chickens and especially turkeys[26]). According to one equipment manufacturer, the US is now seeing the first legal cases where workers are claiming compensation for damage to lungs as a result of working in this dusty atmosphere. This will provide an incentive for slaughterhouses to seek alternatives to live hanging.

There is little labour on the processing line in either system and no danger is posed to workers as long as safety procedures are followed. Controlled atmosphere stunning systems include air quality monitoring as a precaution and a trapped key system ensures that gas cannot be present in the stunning chamber when accessed by staff. Gas is discharged at least four metres into the atmosphere which ensures safe concentrations at ground level.

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[25] Terry Fowler of Deans Foods in the UK noted that the introduction of controlled atmosphere stunning has helped Deans' ability to control staff welfare and makes working overtime and weekends more acceptable to employees. Accessed at: http://www.upc-online.org/slaughter/91104deanfoods.htm.

[26] Humane Society of the United States (2004) Controlled Atmosphere Killing for Chickens and Turkeys. September, 2004.

Annex 5: Final questionnaires to stakeholders

fcec

STUDY ON SLAUGHTER PRACTICES IN EU MEMBER STATES
(IN PREPARATION FOR THE REVISION OF DIRECTIVE 93/119/EC)
*
SURVEY OF COMPETENT AUTHORITIES

Please return this questionnaire by email to survey@civic-consulting.de not later than

30.04.2007

(please return in Word format and do not convert to a pdf document)

INTRODUCTION

The Food Chain Evaluation Consortium (FCEC) has been commissioned by the European Commission to conduct research on stunning and killing practices in slaughterhouses and their economic, social and environmental consequences. The Commission is considering the revision of Directive 93/119/EC (on the protection of animals at the time of slaughter or killing) and will present a legislative proposal by 2007. In the light of this, Civic Consulting and Agra CEAS Consulting will, in close cooperation with European stakeholders, evaluate the current socio-economic situation in slaughterhouses and specify factors which affect animal welfare.

The information you provide through this questionnaire will be crucial in assessing the possible impacts of a revision of Directive 93/119/EC. We therefore greatly appreciate your contribution.

If you have any further questions, do not hesitate to contact:

Kristen Schubert (survey@civic-consulting.de) Phone: +49-30-2196-2295 Fax: +49-30-2196-2298

LOCATION DATA

1. **Please identify your organisation:**

a. Name of organisation:

Please specify

b. Organisation located in (country):

Please specify

c. Type of organisation:

☐ Competent authority

☐ Other

d. Questionnaire completed by (name of person, contact details):

Please specify

2. **How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment?** [1]

Please specify current practices and problems, if there are any

3. **How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare?** [2]

Please specify current practices and problems, if there are any

4. **Which of the following <u>operational measures/procedures</u> are – according to your knowledge – commonly in use in slaughterhouses in your country?**

	Operational measures / procedures	**Degree to which measure is commonly in use**				
		not common at all	**fairly uncommon**	**fairly common**	**very common**	**don't know**
A	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	☐	☐	☐	☐	☐
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	☐	☐	☐	☐	☐
C	Procedure to check animals on their arrival as to identify weak animals	☐	☐	☐	☐	☐
D	Procedures to deal with animals being transported over eight hours	☐	☐	☐	☐	☐
E	Providing water to animals in lairages	☐	☐	☐	☐	☐
F	Providing feed to animals in lairages	☐	☐	☐	☐	☐
G	Procedures for isolating/prioritising the slaughter of fragile animals	☐	☐	☐	☐	☐
H	Keeping maintenance records of stunning equipment	☐	☐	☐	☐	☐
I	Video surveillance of stunning/bleeding area	☐	☐	☐	☐	☐
J	Presence of an employee at the bleeding line to ensure that all animals have been cut properly	☐	☐	☐	☐	☐
K	*Please specify other measures*	☐	☐	☐	☐	☐

Please indicate the most beneficial measure/procedure of the options listed above in terms of animal welfare (write only one letter, A-K, indicating the option)

[1] Article 6 of Directive 93/119/EC requires that <u>equipment for restraining, stunning or killing of animals</u> shall be adequately designed but no mechanism is requested to implement it.

[2] Article 7 of Directive 93/119/EC requires particular <u>competences of personnel handling live animals</u> at slaughterhouses but no mechanism is requested to implement it.

5. **Are there currently changes ongoing in the slaughterhouse industry (for any of the species - cattle, pigs, sheep, poultry) in your country regarding the stunning and killing systems used? (i.e., introduction of a new method or significantly change of the characteristics of an existing method)**

Yes ☐ No ☐ Don't know ☐

If yes, please specify

6. **Please estimate the percentage to which animals are slaughtered using the following methods.**

   a. Please estimate the percentage of cattle and sheep slaughtered without prior stunning in your country or are stunned after the cut.

Methods	**Calves** (up to 8 months)	**Adult cattle**	**Lamb**	**Sheep**	**Poultry**
Stunning					
Stunning applied prior to cutting/bleeding	.... %	.... %	.... %	.... %	.... %
No stunning applied prior to cutting, but animal is stunned directly after the cut	.... %	.... %	.... %	.... %	.... %
No stunning applied at all	.... %	.... %	.... %	.... %	.... %
Total	*100%*	*100%*	*100%*	*100%*	*100%*
Comments					

   b. Please estimate the percentage of cattle slaughtered in your country using a rotating casting pen as a restraint mechanism.

	Calves (up to 8 months)	**Adult cattle**
A rotating casting pen, placing cattle on their back or on their side for ritual slaughter	.... %	.... %
Other restraints or no restraint	.... %	.... %
Total	*100%*	*100%*
Comments		

7. **What is the number of slaughterhouses officially registered in your country?**

   a. What is the number of slaughterhouses that are approved by the competent authority according to Regulation (EC) No 853/2004 laying down specific rules for food of animal origin?

Please specify

   b. What is the total number of all slaughterhouses officially registered in your country based on relevant EU or national legislation (in case these are more than the number given in 7a)?

Please specify

fcec

STUDY ON SLAUGHTER PRACTICES IN EU MEMBER STATES
(IN PREPARATION FOR THE REVISION OF DIRECTIVE 93/119/EC)
*
FCEC SURVEY OF SLAUGHTERHOUSE OPERATORS (POULTRY)

Please return this questionnaire by email to your national association from which you have received it before 20.12.2006

INTRODUCTION

The Food Chain Evaluation Consortium (FCEC) has been commissioned by the European Commission to conduct research on stunning and killing practices in slaughterhouses and their economic, social and environmental consequences. The Commission is considering the revision of Directive 93/119/EC (on the protection of animals at the time of slaughter or killing) and will present a legislative proposal by 2007. In the light of this, Civic Consulting and Agra CEAS Consulting of the FCEC will, in close co-operation with European stakeholders, evaluate the current socio-economic situation in slaughterhouses and specify factors which affect animal welfare. Please note the following when filling in the questionnaire:

- The term "plant" in this questionnaire refers to the slaughterhouse identified in Question 1 (below). As the results of the survey will only be used in an aggregated manner, your questionnaire will only be identified by a code assigned to you by your national association of slaughterhouse operators. Your answers will therefore be anonymous to the consultants;
- The scope of questionnaire is only concerned with chicken and turkey; all other types of poultry are not relevant for this analysis;
- If your company operates more than one slaughterhouse, please fill in one questionnaire per plant;
- Section I of the questionnaire only applies to the main species slaughtered in your plant. All other sections relate to all birds slaughtered (chicken or turkey).
- The Annex provides an overview of slaughter methods and their definitions used in this survey;
- This questionnaire is available in English, German, and French.

The information you provide through this questionnaire will be crucial in assessing the possible impacts of a revision of Directive 93/119/EC. It is your chance to make your views count. We therefore greatly appreciate your contribution.

If you have any further questions, do not hesitate to contact either your national association or:

Kristen Schubert **(survey@civic-consulting.de)** **Phone: +49-30-2196 2295 Fax: +49-30-2196-2298**

LOCATION DATA

1. Please identify your slaughterhouse:

a. Slaughterhouse located in (country):

Please specify

b. Identification code for your slaughterhouse (assigned to each plant by your national association of slaughterhouse operators):

Please specify

I. PRODUCTION AND RELATED COST ISSUES

2. What is the <u>main species</u> slaughtered at your plant (only one answer possible):

Chicken ☐
Turkey ☐

<u>All questions about "bird(s)" in this section refer only to the main species that you have selected here.</u>

3. Which other species are slaughtered at your plant (mark all that apply):

Chicken ☐
Spent hens ☐
Turkey ☐
Duck ☐
Geese ☐
Guinea Fowl ☐
Other *Please specify*

4. Please provide data on the capacity of your slaughterhouse:

a. How many slaughter lines do you have?

Please indicate number of slaughter lines

b. What is the total annual output (number of chicken or turkeys slaughtered at this slaughterhouse)?

< 2,000,000 ☐
2,000,000 - 3,999,999 ☐
4,000,000 - 5,999,999 ☐
6,000,000 - 7,999,999 ☐
8,000,000 - 9,999,999 ☐
10,000,000 - 11,999,999 ☐
12,000,000 - 13,999,999 ☐
14,000,000 - 15,999,999 ☐
16,000,000 - 17,999,999 ☐
18,000,000 - 19,999,999 ☐
20,000,000 - 21,999,999 ☐
22,000,000 - 23,999,999 ☐
24,000,000 - 25,999,999 ☐
> 26,000,000 ☐

c. What is the average slaughter weight (kilograms slaughter weight per bird)?

Please indicate average slaughter weight

<u>The following questions only refer to costs in the whole bird area</u>

5. **Please provide data about the costs that you incur in producing whole birds**.

a. The data in this section refers to:

2005 ☐ 2004 ☐

b. If the price at which you produce a whole bird and its by-products were 100, what proportion of this would be accounted for by the following stages? Please indicate the percentage you consider realistic for each element including all inputs such as labour, electricity, gas, water, depreciation of machinery (excluding the processing line which should be included with the building), overhead, etc.:

	Production stage		Percent
ba	Transport costs to your slaughterhouse		.... %
bb	Costs of reception/lairaging (including associated personnel, machinery, power and water costs)		.... %
bc	Cost of shackling birds (dead or alive) (including associated personnel, machinery and power costs)		.... %
bd	Cost of stunning (please answer only for the method in use in your slaughterhouse) (including associated personnel, machinery, power and water costs)	a) Waterbath	.... %
be		b) Gas	.... %
bf	Cost of bleeding (including associated personnel, machinery and power costs)		.... %
bg	Cost of further steps of the slaughter chain until after the first chilling has been completed (including, defeathering, evisceration, veterinary control, washing, first chilling) (including associated personnel, machinery, power and water costs)		.... %
bh	Waste disposal (whole bird area) (including associated personnel, machinery, power and water costs)		.... %
bi	Cleaning (whole bird area) (including associated personnel, machinery, power and water costs)		.... %
bj	Cost of depreciation of building[1] and processing line		.... %
bk	TOTAL PRODUCTION COST OF WHOLE CHICKEN IN PERCENT (summation of all production costs should equal 100)		**100%**

NOTE: All production costs after production of chilled whole carcass are not relevant for this analysis and should not be included

Comments

c. What are the <u>costs that you incur in producing a whole bird</u> including its by-products? (i.e., the cost price of a whole prepared bird and its by-products, excluding your profit margin and the purchase price of the bird)?

Please indicate euro per bird

6. **We would also like to understand the significance of different cost elements that you have listed above, (the cost of labour, electricity, etc.) <u>from the point of entry into the slaughterhouse up until end of the first chilling</u>.**

[1] Please allocate the proportion of your building depreciation cost that relates to the process from reception to first chilling (i.e. excluding further processing).

a. What was your total employment cost in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

b. What was your total cost of waste disposal (including by-products) in this year relating to the production steps listed in 5b?

Please provide total costs in euro per year

c. What was your total cost of official veterinary control at your plant[2] (including the proportion of cost of any staff assisting officials if relevant) relating to the production steps listed in 5b?

Please provide total costs in euro per year

d. What was your total electricity costs in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

e. What was your total gas cost in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

f. What was your total additional input costs (e.g., water) in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

g. What was your total equipment depreciation and repairs/maintenance in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

h. What was your total building depreciation and repairs/maintenance in this year related to the production steps listed in 5b?

Please provide total costs in euro per year

i. In which year was your stunning machinery installed or significantly modified?

Please specify

[2] Mark zero if this cost is borne by the competent authorities.

II. STAFF TRAINING

The following questions refer to employment practices and only concern employees who are working in the part of the slaughterhouse where the birds are still alive. Employees engaged in professional activities after the birds are slaughtered are not relevant here.

7. Are your employees appointed with the handling of birds trained with respect to animal welfare?

Yes ☐ No ☐

If yes:

a. Please mark in which of the following areas must employees be specifically trained regarding animal welfare and how many hours they were trained? (Only applies for employees working in that area).

Work area	Yes	How many hours training in the last 12 months (Total of practical and theoretical training)
Unloading animals to lairage facilities	☐	.... *hours per employee*
Handling animals from lairage to stunning facilities	☐	.... *hours per employee*
Shackling to Stunning	☐	.... *hours per employee*
Bleeding	☐	.... *hours per employee*

b. Is this training done:

Internally ☐ Externally ☐

c. Is this training with or without attestation, certification or diploma at the end of the training?

With ☐ Without ☐

d. Is this training legally required or voluntary?

Legally required ☐ Voluntary ☐

e. Is this training formally approved by the competent authority?

Yes ☐ No ☐

Further comments

8. Please assess impacts of the training measures that you implement?

	Training measures implemented have impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Animal welfare*	☐	☐	☐	☐	☐
b	*Meat quality*	☐	☐	☐	☐	☐
c	*Production costs*	☐	☐	☐	☐	☐
d	*Competitiveness of operation*	☐	☐	☐	☐	☐
e	*Occupational safety*	☐	☐	☐	☐	☐
f	*Environment*	☐	☐	☐	☐	☐

Not marked = Don't know

Please specify any significant impact

III. OPERATIONAL PROCEDURES

9. What is your point of reference for "good animal welfare practices" at your slaughterhouse?

- ☐ National legislation
- ☐ Code of good practice of European association of slaughterhouses or other relevant European/international body
- ☐ Code of good practice of national association of slaughterhouses or other relevant national body
- ☐ Own company code of good practice
- ☐ Animal welfare organisation code of practice
- ☐ Requirements of clients
- ☐ Equipment manufacturers recommendations
- ☐ Other

Please specify the piece of legislation and/or code of practice that is your frame of reference

10. Please mark with "yes" the animal welfare operational measures / procedures that you currently have implemented in your plant? If yes, please assess the costs of the measure.

	Operational measures / procedures	**Yes**	**If yes, please assess how costly the procedure /measure is**					
			--- very costly	**--** fairly costly	**-** slightly costly	**O** no costs	**+** savings	**Don't know**
A	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar method	☐	☐	☐	☐	☐	☐	☐
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	☐	☐	☐	☐	☐	☐	☐
C	Procedure to check birds on their arrival to identify weak birds	☐	☐	☐	☐	☐	☐	☐
D	Procedure to deal with birds being transported over twelve hours	☐	☐	☐	☐	☐	☐	☐
E	Providing water to birds in lairages	☐	☐	☐	☐	☐	☐	☐
F	Providing feed to birds in lairages	☐	☐	☐	☐	☐	☐	☐
G	Video surveillance of stunning/bleeding area	☐	☐	☐	☐	☐	☐	☐
H	Procedures for isolating/prioritising the slaughter of fragile or small birds	☐	☐	☐	☐	☐	☐	☐
I	Keeping maintenance records of stunning equipments	☐	☐	☐	☐	☐	☐	☐
J	Presence of an employee at the bleeding line to ensure that all birds have been cut properly	☐	☐	☐	☐	☐	☐	☐
K	*Please specify other measures*	☐	☐	☐	☐	☐	☐	☐

Comments

11. Please indicate the most beneficial operational procedure of the options listed in Question 10 (please write only one letter, A-K, indicating the option)?

Please list the most beneficial procedure from Question 10

12. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 11?

	Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Meat quality*	☐	☐	☐	☐	☐
b	*Competitiveness of operation*	☐	☐	☐	☐	☐
c	*Occupational safety*	☐	☐	☐	☐	☐
d	*Environment*	☐	☐	☐	☐	☐

Not marked = Don’t know

Please specify any significant impact

13. What are the indicators that you currently monitor in your plant and how often is each monitored?

	Animal welfare indicators	**Yes**	**Frequency (times per week)**
a	Atmospheric parameters at lairage (temperature, humidity, air flow, noise level, light intensity, water consumption, etc.)	☐	.... *times per week*
b	Waiting time between reception and the beginning of the slaughtering procedure	☐	.... *times per week*
c	Amount of time birds spend in shackles before stunning	☐	.... *times per week*
d	Competence of employees working with live birds regarding animal welfare	☐	.... *times per week*
e	Correct application of electrical stunning apparatus	☐	.... *times per week*
f	Frequency of ineffective stunning (i.e., number of cases in which a second stun is required)	☐	.... *times per week*
g	Insensitivity of birds after stunning	☐	.... *times per week*
h	Time between stunning and bleeding	☐	.... *times per week*
i	Meat quality (pH, DFD, PSE, blood splashes, bone fractures)	☐	.... *times per week*
j	Skin quality	☐	.... *times per week*
k	Please specify other indicators	☐	.... *times per week*

Comments

14. How do you monitor the effectiveness of the stun?

a. Please mark how your slaughterhouse monitors the effectiveness of the stun:

a ☐ No direct monitoring
b ☐ Sign of recovery after stunning
c ☐ Sign of recovery after bleeding
d ☐ Indirect monitoring through technical parameters (e.g., electrical)

b. Please specify what percentage of birds are actually monitored for the effectiveness of stun:

Please specify

c. Do you systematically record the results of your monitoring activity described in questions 14a and 14b:

Yes ☐ No ☐

d. If yes, could you please provide your average percentage of unsuccessful stunning:

Please specify

15. Do you have regular cleaning and maintenance schedules for your stunning equipment?

a. A regular cleaning schedule for stunning equipment:

Yes ☐ No ☐

If yes, please specify the frequency of cleaning:

Hourly	Daily	Weekly	Monthly	Quarterly	Don't know
☐	☐	☐	☐	☐	☐

b. A regular maintenance schedule for stunning equipment:

Yes ☐ No ☐

If yes, please specify the frequency of maintenance:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
☐	☐	☐	☐	☐	☐

16. Please mark outside parties that perform a specific audit regarding animal welfare and list the frequency with which you are audited?

	Outside party	Yes	Frequency (if marked yes)
a	Veterinary authority	☐	.... *times per year*
b	Clients	☐	.... *times per year*
c	Animal welfare groups	☐	.... *times per year*
d	Independent auditor	☐	.... *times per year*
e	*If other, please specify*	☐	.... *times per year*

IV. DESIGN OF EQUIPMENT

17. Please mark with "yes" the technology which has actively been implemented in your plant primarily for the sake of animal welfare during the last 10 years? If yes, please assess the costs of the measure.

	Technology	Yes	If yes, please assess how costly that has been					
			--- very costly	-- fairly costly	- slightly costly	0 no costs	+ savings	Don't know
A	Modules limiting human handling off the truck as opposed to crates	☐	☐	☐	☐	☐	☐	☐
B	Appropriate ventilation equipment in lairage facilities	☐	☐	☐	☐	☐	☐	☐
C	Violet/blue lighting or low lighting (5 lux or lower)	☐	☐	☐	☐	☐	☐	☐
D	Plastic or rubber curtains along the line (i.e., breast comforting plates)	☐	☐	☐	☐	☐	☐	☐
E	Dipping shackling line (water bath stunners)	☐	☐	☐	☐	☐	☐	☐
F	Electrically isolated "entry ramp" (water bath stunners)	☐	☐	☐	☐	☐	☐	☐
G	Shackle lines accommodate different bird sizes (water bath stunners)	☐	☐	☐	☐	☐	☐	☐
H	Increase bath conductivity by the use of salted solution	☐	☐	☐	☐	☐	☐	☐
I	Maximum shackle duration before the bath	☐	☐	☐	☐	☐	☐	☐
J	*Please specify other measures*	☐	☐	☐	☐	☐	☐	☐

Comments

18. Please indicate the most beneficial design measure of the options listed in Question 17 (please write only one letter, A-J, indicating the option)?

Please list the most beneficial measure from Question 17

19. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 18?

	Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
a	*Meat quality*	☐	☐	☐	☐	☐
b	*Competitiveness of operation*	☐	☐	☐	☐	☐
c	*Occupational safety*	☐	☐	☐	☐	☐
d	*Environment*	☐	☐	☐	☐	☐

Not marked = Don't know

Please specify any significant impact

V. SLAUGHTER OPERATION

The following questions are relevant for all birds slaughtered in your plant (chicken or turkey).

20. Please mark which restraining/shackling mechanism most describes the method in use at your plant?

a	Birds stunned in containers and shackled unconscious	☐
b	Birds emptied out of containers, stunned, shackled unconscious	☐
c	Shackled conscious	☐
d	Other	☐

If other, please specify

21. Please mark the main stunning/bleeding methods in use for the different species/types of poultry in your slaughterhouse (not including religious slaughter).

a. Methods currently in use:

	Methods		Chicken		Turkeys	
			Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
	Stunning					
aa	Electrical	*Head-only stunning*	☐	☐	☐	☐
ab		*Waterbath stunning (reversible method, above 200 Hz)*	☐	☐	☐	☐
ac		*Waterbath stun/killing (irreversible method, around 50-60 Hz)*	☐	☐	☐	☐
ad	Gas	*Gas stunning*	☐	☐	☐	☐
ae		*Gas stun/killing*	☐	☐	☐	☐
af	Neck Dislocation		☐	☐	☐	☐
ag	Other		☐	☐	☐	☐
	Bleeding					
ah	Neck cutting	*1 carotid artery cut and 1 external jugular vein cut*	☐	☐	☐	☐
ai		*2 carotid arteries cut*	☐	☐	☐	☐
aj		*1 jugular vein cut*	☐	☐	☐	☐
ak	Decapitation		☐	☐	☐	☐
al	Other		☐	☐	☐	☐

* Back-up method (if applicable): to be employed in case of emergency, failure of another method, etc.
Note: For definition of methods see Annex

If other, please specify

b. Is your main <u>stunning method automated</u> (i.e., no human intervention during the restraining and stunning process)?

Yes ☐ No ☐

c. Is your main <u>bleeding method automated</u> (i.e., no human intervention during the bleeding process)?

Yes ☐ No ☐

22. Do you apply ritual slaughter?

Yes ☐ No ☐

If your answer is <u>yes</u>:

a. What percentage of birds is ritually slaughtered at your plant <u>without</u> prior stunning?

Please specify

23. If using <u>electric</u> stunning technology (if using gas, please proceed to Question 24)**:**

a. What are the details of the electric stun per bird (i.e., average frequency, output voltage, output current, and minimum application time)?

	Species	Type of stunner:		Frequency (per bird)	Voltage* (per bird)	Current* (per bird)	Minimum time of application (per bird)	Maximum stun-to-stick interval
		constant current	constant voltage	(Hz)	(V)	(mA)	(sec)	(sec)
aa	**Chicken**	☐	☐	.... Hz	 V	.... mA	.... sec	.... sec
ab	**Turkeys**	☐	☐	.... Hz	 V	.... mA	.... sec	.... sec

*Notes: Please leave Voltage blank if you apply a constant current stun. Please leave Current blank if you apply a constant voltage stun.

Additional comments

b. The electrical stunning system is equipped with a signal which indicates:

	System equipped with signals indicating …	Yes	No	Don't know
ba	Interruption of stunning	☐	☐	☐
bb	Insufficient duration of application	☐	☐	☐
bc	Excessive increase in the electrical resistance in the circuit	☐	☐	☐
bd	Voltage	☐	☐	☐
be	Current	☐	☐	☐
bf	Other	☐	☐	☐

If other, please specify

c. Are these signals in Question b:

Audio ☐ Visual ☐ Both ☐

d. Do you record electrical parameters during the stun:

Yes, for each bird ☐ Yes, but not for each bird ☐ No ☐

Please specify technology

e. If yes, which electrical parameters do you record?

Please specify

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Please specify

g. Do you use an electrical stunning calibrator[1]:

Yes ☐ No ☐

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
☐	☐	☐	☐	☐	☐

i. Which measures related to the stunning method used have been taken with regard to occupational safety of your workforce?

Measure	**Voluntary**	**Mandatory**
Please specify	☐	☐
Please specify	☐	☐
Please specify	☐	☐

j. Which measures related to the stunning method used have been taken with regard to the protection of the environment?

Measure	**Voluntary**	**Mandatory**
Please specify	☐	☐
Please specify	☐	☐
Please specify	☐	☐

[1] Device used to test that the electrical parameters (voltage, frequency, and current) are as desired or to determine whether an adjustment to the stunning equipment is necessary.

24. If using <u>gas</u> stunning technology:

Which <u>gas concentrations</u> do you use, for how long, and for how many birds?

a. First step:

	Species	% CO_2	% N_2	% O_2	% Argon	Average length of exposure of bird to gas (sec)	How many birds are exposed at the same time?
aa	Chicken	.... %	.... %	.... %	.... %	.... sec	..... Number of birds
ab	Turkeys	.... %	.... %	.... %	.... %	.... sec	..... Number of birds

b. Second step (if relevant):

	Species	% CO_2	% N_2	% O_2	% Argon	Average length of exposure of bird to gas (sec)	How many birds are exposed at the same time?
ba	Chicken	.... %	.... %	.... %	.... %	.... sec	..... Number of birds
bb	Turkeys	.... %	.... %	.... %	.... %	.... sec	..... Number of birds

c. Do you record the above parameters listed in (a) and (b) and how frequently?

Please specify

d. What is the maximum stun-to-stick interval after stunning?

	Species	Maximum stun-to-stick interval (sec)
da	Chicken	.... sec
db	Turkeys	.... sec

e. Which measures related to the stunning method used have been taken with regard to <u>occupational safety</u> of your workforce?

Measure	Voluntary	Mandatory
Please specify	☐	☐
Please specify	☐	☐
Please specify	☐	☐

f. Which measures related to the stunning method used have been taken with regard to the <u>protection of the environment</u>?

Measure	Voluntary	Mandatory
Please specify	☐	☐
Please specify	☐	☐
Please specify	☐	☐

25. Do you plan to change your stunning method for your main species in the next five years (i.e., will you introduce a new stunning method or significantly change the characteristics of the existing method)?

Yes ☐ No ☐ Don't know ☐

If yes:

a. Please mark which kind of stunning system:

Electric system ☐
Gas system ☐

b. Please specify which system will be introduced (e.g., electrocution, gas stunning with CO_2, argon, etc):

Please specify

c. What are your reasons for such a change (economic, meat quality, worker safety, animal welfare, legislative, consumer demands, etc.):

Please specify

d. How do you expect your costs of production referred to under Question 5 will change once you have implemented this new stunning method (including depreciated investment costs):

Decrease very significantly (savings > 10%)	Decrease fairly significantly (savings of 5% - 9%)	Remain similar (+/- 4% change)	Increase fairly significantly (costs increase 5% - 9%)	Increase very significantly (costs increase >10%)
☐	☐	☐	☐	☐

Please specify

If you are not introducing a new method:

e. Why have you decided not to change your current stunning method?:

☐ Current method is satisfactory
☐ Not financially capable of investing in a new method
☐ Production costs with new system will be too high
☐ Other

f. If other, please specify:

Please specify

Annex 6: Results of surveys

SURVEY OF COMPETENT AUTHORITES
19 responses

2. How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment? [1]

Country	How is it currently ensured in your country that animal welfare considerations are integrated in the development of restraining and stunning/killing equipment?
Austria	Die Tierschutzschlachtverordnung im BGBl II 2004/488 regelt die Vorgaben über die Ausstattung.
Belgium	No
Cyprus	The restraining, stunning and killing equipment is regularly checked, maintained and kept in good condition. Furthermore the personnel handling this equipment is under the relevant instructions of the veterinarian who is responsible for the ante-mortem examination.
Czech Republic	We inform the stakeholders about the provisions of EU legislation as well as future trends (seminars, publication on web-site, web links). The instruction "RECOMMENDATION OF THE COMMITTEE FOR WELFARE OF FARM ANIMALS FOR PROTECTION OF ANIMALS INTENDED FOR SLAUGHTER No. 1/2006" based on principles of the EFSA opinion and provisions of the Czech Republic has been edited by the Central Commission for Animal Welfare on 25 June 2006. The instruction contains also recommendation for stunning and bleeding of animals, using and maintenance and routine checks of stunning devices. According to Art. 6 of Directive 93/119/EC and the Czech national legislation (Act. No. 246/1992 Coll., as amended, hereinafter The Welfare Act) instruments, materials, restraint, equipment and facilities used for stunning, killing or euthanasia of animals shall be constructed, maintained and used in such a way that these actions are carried out fast and effectively. Operator of the slaughterhouse shall provide for the maintenance and regular checks of the instruments, materials, equipment and facilities used for restraining, stunning, killing or euthanasia of animals. The operator shall keep the records of such checks over the period of 3 years and make them available to the competent animal welfare authority upon request. The verification of restraining and stunning/killing equipment is included in approval procedure of a slaughterhouse as well as regular inspections by the official veterinarians competent for animal welfare issues.
Denmark	According to Article 13, subsection 1 of the Danish Act on the Welfare of Animals (Act no. 344 of 13 May 2005), any person, who wishes to kill an animal, has to make sure, that the animal is killed as quickly and as painlessly as possible. Killing by drowning may not take place. The Danish Ministry of Justice has issued an Executive Order on the Slaughtering and Killing of Animals (Executive Order no. 1037 of 14 December 1994 with later amendments). The Order adopts the Directive 93/119/EEC. But the following provisions in the Order go beyond Directive 93/119/EEC: - Article 1, subsection 1, second sentence - extending of the scope of application to horses, dog and cats. - Article 2, subsection 8 - day-old chicks are defined as all poultry less than 72 hours of age, which have not yet been feed. - Article 4 on children under 14 years of age - Article 7 on religious slaughter - Article 13 on requirements for the persons killing of slaughtering animals - Article 15 on bolt pistols in swine stocks - Article 25, fifth sentence on the use of instruments administering electrical shocks - Article 31, third and fourth sentence on lactating animals - Article 37 on slaughtering of ratites

[1] Article 6 of Directive 93/119/EC requires that <u>equipment for restraining, stunning or killing of animals</u> shall be adequately designed but no mechanism is requested to implement it.

	- Article 48, subsection 1, on stunning of ratites The Danish Parliament has passed the Act no. 269 of 21 April 2004 on prohibition on slaughter and killing of pregnant animals kept for farming purposes and horses in the last tenth part of the pregnancy period The Danish Veterinary and Food Administration Circular of 23 December 1988 on stunning of Animals for slaughter prescribes some requirements for technical procedures in relation to fixation of animals and stunning methods to be used as well as requirements for pre-approval of stunning equipment. The Council of Europe Recommendation no. R (91) of 17 June 1991 on the slaughter of animals has been distributed to all the Regional Veterinary and Food Administration Centre inspectors who carry out inspections in the slaughterhouses.
Estonia	The person responsible for animal welfare in slaughterhouse regularly checks the compliance of stunning and slaughtering means including their being in working order. Pursuant to Directive of the Director General of the Veterinary and Food Board, the animal health and/or animal protection expert also checks annually (more frequently if deficiencies are detected in post-inspection) the compliance of stunning and slaughtering means during general inspection of the slaughterhouse, including their being in working order. There must also be another stunning means in a slaughterhouse complying with the requirements.
Finland	Development of new equipments is usually made together with slaughterhouses and official veterinarians of the slaughterhouse.
Germany	In development of new methods for restraining, stunning or killing animals field tests in slaughterhouses are common. To fulfil the animal welfare requirements of law (Tierschutz-Schlachtverordnung) Certificates of exemption are issued by the competent authority during scientific investigation of new methods for restraining, stunning or killing of slaughter animals in practical surrounding in slaughterhouses.
Hungary	In the approval procedure all the animal health, animal welfare and food hygiene conditions are enforced as our authority is in charge to issue operational licenses of slaughterhouses. However, no building permits allowed to be issued unless preliminary professional endorsement of our authority. In case of any change on the slaughterhouse demanded on own initiative or as a consequence of an inspection a permit given by our authority is required.
Italy	On 7 December 2006 the Italian Ministry of Health issued a check-list addressed to the local competent authorities (Local Health Units - ASLs). This check-list was aimed at facilitating the verification of implementation of animal welfare standards by veterinary officers in slaughterhouses. Moreover, the check list also addresses the compliance of facilities and equipment with animal welfare standards as regards stunning and killing.
Luxembourg	By official rules
Poland	According to Regulation of MARD of 09.09.2004 on qualifications of person authorised for professional slaughter and conditions and methods of slaughter and killing animals: 1. The design and facilities, as well as equipment of slaughterhouses, shall be such as to spare animals any avoidable excitement, pain or suffering. 2. The instruments, equipment and installations used for stunning or killing of animals must be designed, constructed, maintained and used in such a way as to achieve rapid and effective stunning or killing. 3. Suitable additional equipment and instruments must be kept at the place of slaughter for emergency use. 4. The equipment and instruments referred to in paragraph 3 shall be inspected each time before slaughtering
Portugal	The equipment is approved in the same moment of the approval of the slaughterhouse.
Slovenia	National legislation is laying down that the stunning/killing/slaughter equipment must be designed, manufactured and maintained in such a way as to enable the rapid and effective stunning and slaughter. At approval of establishments, the compliance with certain animal welfare requirements for the restraint and stunning equipment is verified, among other things.

	As there are no stunning equipment producers in Slovenia, the business operators are purchasing foreign-made equipment. Compliance of the restraint equipment, which is frequently modified by the business operators, is verified within the regular official controls and auditing. With regard to killing equipment, recommendations contained in the Opinion of the Scientific Panel on Animal Health and Welfare related to welfare aspects of the main systems of stunning and killing the main commercial species of animals - (Question N EFSA-Q-2003-093), and the Report of the Scientific Veterinary Committee of 30 September 1997 - The Killing of Animals for Disease Control Purposes, were to be taken into account in designing and making the killing instruments (portable stunning/killing tongs).
Spain	Los S.V.O realizan inspecciones para autorizar el funcionamiento del matadero. Los fabricantes conocen la normativa vigente y se ajustan a ello.
Sweden	The methods allowing for restraining and stunning/killing animals are regulated in the legal text DFS 2004:12. Any new methods have to be approved by the central animal welfare authority before they may be put into practice. The local competent authority (municipality animal welfare inspectors) and the Official Veterinarian(-s) at the slaughterhouse both have the responsibility to inspect this type of equipment and ensure that it complies with the legal requirements.
The Netherlands	The development industry has the legal knowledge of RL 93/119 and national animal welfare laws, locally the official veterinarian is often consulted too when new equipment will be installed
UK - Great Britain	The Defra R&D programme includes work to assess the pre-slaughter handling, stunning, slaughter and killing of farmed livestock, fish and poultry to determine the efficacy of existing and novel practices, and the development of alternative or novel systems for use both inside and outside of slaughterhouses.
United Kingdom - Northern Ireland	DARD involves itself with the FBO in the design and development stage of establishment approval. In a new establishment approval is not recommended until animal welfare concerns have been addressed. To date, the industry have co-operated with this approach and formal enforcement has never been tested.

3. How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare? [2]

Country	How is it currently ensured in your country that slaughterhouse employees dealing with live animals are competent regarding animal welfare?
Austria	Die Tierschutzschlachtverordnung im BGBl II 2004/488 Anh.I regelt die Ausbildung der betroffenen Personen
Belgium	On the floor training.
Cyprus	Slaughterhouse employees carry out their tasks in accordance with the principles of animal welfare as they have attended relevant seminars and guidelines have been issued for their training.
Czech Republic	According to The Welfare Act - Art. 5a (6) and Art. 5a (7) (in compliance with Art. 7 Directive 93/119/EC) persons slaughtering animals at slaughterhouses shall be professionally competent pursuant to the ministerial implementing legal regulation; other persons carrying out activities related to guiding, accommodation or restraint of these animals, shall be instructed by the operator of the slaughterhouse to perform these activities in a qualified manner; operator of the slaughterhouse shall keep records of the professional competence of persons carrying out activities referred to in Art 5a (6). Operator of the slaughterhouse shall keep these records over the period of 3 years following after the time these persons ceased performing these activities and make them available to the competent animal welfare authority upon request.
Denmark	Only persons with the necessary knowledge and technical skills are allowed to be engaged in the movement, lairaging, restraint, slaughter or killing of animals. The slaughterhouse is responsible for the fulfilment of these requirements, while the Regional Veterinay and Food Administration Centre is responsible for supervision. New employees are trained by experienced and skilled employees at

[2] Article 7 of Directive 93/119/EC requires particular <u>competences of personnel handling live animals</u> at slaughterhouses but no mechanism is requested to implement it.

	slaughterhouses. Training courses for employees are arranged by the industry.
Estonia	In Estonia, the Agriculture University and Veterinary- and Food Board provide the training courses on Animal Welfare in slaughterhouses. The person responsible for animal welfare in slaughterhouse checks regularly and animal welfare inspector annually the competence and skills of people, dealing with live animals in slaughterhouse.
Finland	Employees in slaughterhouses are usually educated by the slaughterhouses and they practise working under the guidance of skilled workers. Official veterinarians in slaughterhouses are also supervising them.
Germany	Slaughterhouse employees dealing with stunning, killing or bleeding of animals are holders of certificates of competence. Therefore they have visited courses for theoretical and practical training and have passed theoretical and practical examinations as required by Federal Regulation (Tierschutz-Schlachtverordnung). Employees dealing with animal handling have passed training courses.
Hungary	1. Workers on slaughterhouses have appropriate qualification (they mainly have a graduation of an agricultural technical college as butcher). 2. All employees of FBOs must fulfil a special training given by our service covering minimal requirements of food-hygiene. 3. A national guideline has just been issued by our authority that is compulsory to comply with by official veterinarians. This guideline says as follows: The veterinarian who is in charge to supervise a slaughterhouse or an FBO is obliged to give a short training to the personnel of the establishment on following topics: - anatomical basis of stunning of species in question - physical features of stunning equipment in use, - appropriate use of stunning equipment, - frequency of maintenance of stunning equipment.
Italy	The training of slaughterhouse employees is not directly managed by the competent authorities. However, the own-check plan (HACCP) implemented by the slaughterhouses provides for a training course addressing animal welfare, among other things, to be attended by employees dealing with live animals. Furthermore, the relevant own-check manuals are submitted to and supervised by the competent authorities.
Luxembourg	By the control and surveillance of official veterinarians.
Poland	According to Regulation of MARD of 09.09.2004 on qualifications of person authorised for professional slaughter and conditions and methods of slaughter and killing animals, person who deals with stunning and killing animals has to be trained. The training has to include theoretical part and 3-month length practice supervised by someone with 3 years practical experience of stunning and slaughter of animals. Qualifications have to be confirmed by the official document. The person who deals with movement and keeping of animals has to have 1 month length of practical experience supervised by someone with 3 years of practical experience of movement and keeping animals. The supervised person is nominated by the entity after receiving the permit of district veterinary officer.
Portugal	Slaughterhouses have HACCP systems, which include animal welfare items.
Slovenia	Staff training is arranged by the slaughterhouse management in cooperation with OVs. Slaughterhouse staff training programme of 2007 has been prepared in cooperation with the National Veterinary Institute. National legislation specifically requires the specialised training of slaughterhouse staff in animal welfare.
Spain	El operador económico diseña, mantiene e implementa un plan de formación, supervisado por la Autoridad compente. En las listas de comprobación utilizadas por los S.V.O se incluye lo relativo la formación.
Sweden	The local competent authorities (municipality animal welfare inspectors) are expected to check this when inspecting the plants. There are legal requirements regarding certificates of education in the field of animal welfare, in the legal text DFS 2004:12. According to the legislation, any company engaged in the slaughter or killing of animals shall ensure that all staff involved in handling, stunning, slaughtering or otherwise killing animals have participated in courses covering animal welfare, suitable stunning and killing methods and the correct use of these methods. This should be certified in written course documents. The course should have both theoretical and practical content, related to the species in question. After this, it is recommended that the recently trained person initially works together with more

	experienced staff.
The Netherlands	Large slaughterhouses have welfare procedures and sometimes also in house training on welfare aspects for their personnel; smaller slaughterhouses mostly depend on their own experience and skills. In large slaughterhouses during slaughter an official veterinarian is supervising the welfare handling full-time, in small slaughterhouses however the welfare supervision of official veterinarians is periodical. So in the former the welfare competence of employees can be assured reasonably, in the latter it cannot.
UK - Great Britain	UK legislation requires that any person carrying out restraint of an animal prior to stunning or killing, stunning an animal, slaughtering an animal, killing an animal, assessing effective stunning or killing of an animal, shackling or hoisting an animal or bleeding an animal that is not dead must hold a licence. A licence may be issued by an authorised veterinary surgeon only after assessment of the applicant's competence in carrying out the operations for which they are seeking a certificate, their understanding of relevant statutory requirements (including Codes of Practice) and how they work to protect the welfare of animal. Trainee slaughtermen must be over 18 years of age and must obtain a Provisional Licence.
United Kingdom - Northern Ireland	Every establishment is required to have an Animal Welfare Officer who has received accredited training. All OVs receive specific training (from Bristol) on welfare of animals at slaughter and deal directly with welfare problems as they arise. Industry generally co-operate on animal welfare issues.

4. Which of the following <u>operational measures/procedures</u> are – according to your knowledge – commonly in use in slaughterhouses in your country?

Operational measures / procedures	Degree to which measure is commonly in use				
	not common at all	fairly uncommon	fairly common	very common	don't know
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system	UK	NL, PT, FI, PL, CZ, DE, ES	LU, BE, SI, HU, SE	AT, EE, CY, DK, IT	
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	BE, SI, PT, HU, PL, DK	SE, DE, ES	NL, IT	LU, AT, EE, FI, CY, CZ, UK	
Procedure to check animals on their arrival as to identify weak animals			EE, PT, ES	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, UK	
Procedures to deal with animals being transported over eight hours	CY, PL, DK, DE	HU, ES	PT, FI, SE	LU, BE, AT, SI, EE, CZ, UK	NL, IT
Providing water to animals in lairages				LU, BE, AT, SI, EE, NL, PT, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Providing feed to animals in lairages	BE, DE	NL, CY, ES	AT, PT, FI	LU, SI, EE, HU, PL, SE, CZ, DK, IT, UK	
Procedures for isolating/prioritising the slaughter of fragile animals			EE, PT	LU, BE, AT, SI, NL, FI, CY, HU, PL, SE, CZ, DK, DE, IT, ES, UK	
Keeping maintenance records of stunning equipment		BE, ES	LU, EE, NL, HU, SE	AT, SI, PT, FI, CY, PL, CZ, DK, DE, IT, UK	

Video surveillance of stunning/bleeding area	LU, BE, EE, PT, FI, CY, PL, SE, DK, DE, IT, ES	SI, NL, HU, CZ, UK			AT
Presence of an employee at the bleeding line to ensure that all animals have been cut properly	BE	LU, DK, ES	EE, NL, SE, DE, IT	AT, SI, PT, FI, CY, HU, PL, CZ, UK	
Other measures					

Please indicate the most beneficial measure/procedure of the options listed above in terms of animal welfare.

Country	Most beneficial measure
Austria	
Belgium	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Cyprus	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer).
Czech Republic	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Denmark	Procedure to check animals on their arrival as to identify weak animals
Estonia	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Finland	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system.
Germany	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system in connection with Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)
Hungary	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Italy	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Luxembourg	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer) Video surveillance of stunning/bleeding area Keeping maintenance records of stunning equipment
Poland	
Portugal	
Slovenia	Video surveillance of stunning/bleeding area.
Spain	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system
Sweden	Comment regarding nr 4/The national legislation does not allow animals to be transported more than 8 hours. This time limit might be exceeded by 3 hours if the transport will reach the slaughterhouse within this time. If not, the transport has to stop after 8 hours and the animals must be unloaded.
The Netherlands	Presence of an employee at the bleeding line to ensure that all animals have been cut properly: in

	poultry slaughterhouses the presence of an employee at the bleeding line is obligatory, in other slaughterhouses it is not obligatory, and not common. Other measures are in place in several slaughterhouses: how to avoid overcrowding in lairaging; how to avoid fighting as much as possible. It is difficult to point at the most important issue of the list above. Because it is in the current industrial plants important that there are as well a) well trained responsible welfare supervising employees; b) procedures developed for all possible situations that can locally occur daily, for example how to handle when stunning equipment suddenly breaks down; c) competence of planners to avoid traffic jams of animal transports on the parking place and during lairaging including measures to meet weather changes e.d; d) high standard of technical staff including the keeping of maintenance records of stunning equipment. So when I definitively have to choose I will choose ' Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)' (in the expectation that a responsible welfare employee will emphasize the development of ' Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system '.
UK	Implementation of a plan of control for animal welfare aspects based on HACCP or a similar quality assurance system. This would include all of the procedures listed (with the possible exception of video-surveillance).
UK, Northern Ireland	Procedures to deal with animals being transported over eight hours: Uncommon for animals to be transported for more than 8 hours. Presence of an employee at the bleeding line to ensure that all animals have been cut properly: Compulsory for automatic poultry neck cutting, otherwise uncommon. Animal welfare officer is the most beneficial procedure.

5. Are there currently changes ongoing in the slaughterhouse industry (for any of the species - cattle, pigs, sheep, poultry) in your country regarding the stunning and killing systems used? (i.e., introduction of a new method or significantly change of the characteristics of an existing method)?

Yes	No	Don't Know
8	8	3

If yes, please specify

Country	Ongoing changes
Cyprus	One red meat slaughterhouse which operates since August 2006, introduced the method of carbon dioxide exposure for pig stunning, a method used for the first time in Cyprus.
Czech Republic	Introduction of CO2 stunning/killing systems
Germany	Gas-stunning of poultry, electric stunning of cattle, gassing of animal houses for depopulation.
Italy	Currently no new method or significant changes are being introduced as regards the stunning and killing methods used. However, a study was performed by Dr Franco Panunzi, from a private company, envisaging an electrical stimulation of the animal after stunning and cutting of the jugular vein in order to favour bleeding and meat tendering. This study was subsequently

	scrutinised by the National Reference Centre for Animal Welfare of the Experimental Zooprophylactic Institute of Region Lombardy and Emilia-Romagna, according to which the procedure contains "no elements conflicting with animal welfare aspects. On the other hand, it prolongs the stunning period, thus favouring the animal's welfare and protection." Therefore, we would even suggest this procedure to be evaluated at the EU level due to its beneficial effects on the welfare of slaughter animals.
Luxembourg	Especially pig stunning and killing for reasons of the meat quality.
Spain	Gas stunning in rabbits (in place) Gas stunning in sheep (on trial)
Sweden	For pigs, almost all major slaughterhouses have changed from electrical stunning to carbon dioxide gas stunning. The same transition has begun for poultry. For cattle, there is a shift towards more automatic restraint systems, linked to an interest in pneumatic captive bolt systems as a replacement for metallic cartridge-powered captive bolt stunners, the latter being kept as back-up weapons (Swedish legislation requires slaughterhouses to have reserve stunning apparatus immediately available at the line´s place of stunning).
The Netherlands	There is a trend towards using more gas stunning. In the poultry slaughterhouses the newer waterbath- electric stunning is developed in a way that it is difficult to establish the level of the unconsciousness of the stunned poultry. This is because the legally obliged parameters (Rl 93/119) are limited. The prescribed amperage is produced accordingly, but in the same time the Herz number is made so high that this can influence the result of the amperage. So it would be better to prescribe all the parameters that can influence the result of the stunning legally. The animal welfare policy department plans to investigate the best combination of Hz and amperage in relation to meat quality and effective stunning.
UK, Great Britain	Waterbath stunners - effect of frequency, current and time on effectiveness of stunning and meat quality.
UK, Northern Ireland	We have one cattle electrical stunning facility

6. Please estimate the percentage to which animals are slaughtered using the following methods.

Country	Percent of poultry with stunning applied prior to cutting/bleeding	Percent of poultry with no stunning applied prior to cutting, but animal is stunned directly after the cut	Percent of poultry No stunning applied at all
Luxembourg	80%	20%	0%
Hungary	99.9%	0%	0.1%
Poland			
Sweden	100%		
Czech Republic	--	--	--
UK, Northern Ireland			
Italy			
Spain	95%	0%	5%
UK, Great Britain	98.8%	0%	1.2%
Austria			0%

Slovenia	100%	0%	0%
Estonia	100%	0%	0%
Netherlands	+/- 98%	0%	+/- 2%
Portugal	99%		
Finland	100%		
Cyprus	100%	0%	0%
Germany	100% intended		
Belgium	80%	0%	20%
Denmark	100%	0%	0%

Comments:

Country	Ongoing changes
Hungary	There is only one slaughterhouse in Hungary where kosher slaughter of turkey is carried out.
Sweden	There is an absolute requirement for stunning prior to cutting for all animals slaughtered (or killed by any other reason) in slaughterhouses or elsewhere.
Czech Republic	The Czech national legislation - The Welfare Act - Art. 5: Slaughtering farm animals by bleeding may only commence after their stunning ensuring the loss of sensibility and loss of consciousness which lasts throughout the bleeding. Slaughterhouse dressing of an animal prior to its bleeding shall be prohibited; Derogations from the provisions of Art. 3 may be authorised by the Ministry for the purposes of churches and religious societies, the regulations of which shall specify another way of animal slaughter. Slaughtering shall be carried out by a professionally competent person who shall ensure that the slaughtered animals are spared any avoidable suffering.
Spain	This number are approximate. The most important point is that there is an increasing demand of Halal meat.
UK, Great Britain	Figures are based on 2003 survey.
Germany	Figures are not given on federal level
Belgium	The data for lamb and poultry are estimated on the ground of a registration system: however this system makes the difference between ritual and conventional slaughter, it is not mentioned if the animals were stunned before the ritual slaughtering.
Austria	No stunning, nur für nationale Versorgung aus rituellen Gründen in geringem Ausmaß.
Slovenia	National legislation requires the warm-blooded animals to be stunned prior to slaughter in a professional way and in accordance with a prescribed stunning method. Derogations from these legal requirements may be allowed by the authority competent for the veterinary sector under the exceptional circumstances only, including the ritual slaughter, emergency slaughter, and other circumstances where the animals' life is at risk. Ritual slaughter is carried out from time to time by four poultry slaughterhouse business operators only. It needs to be pointed out here that these four business operators are carrying out all the slaughter procedures before slaughter, during slaughter and upon slaughter in an identical way as with the normal slaughter - including the preliminary stunning - the only difference being that the very act of slaughter (cutting the blood vessels) is carried out by a specifically authorised representative of a religious community.

The Netherlands	The percentages mentioned are only very rough estimations, because in the Netherlands the number of animals that is slaughtered without previous stunning is only locally recorded
Finland	In Finland it is prohibited to bleed animals without prior stunning. There is an exception that poultry may be slaughtered without prior stunning by cutting the throat quickly using a sharp instrument. There is also a possibility to slaughter animals due to religious causes by stunning and cutting them at the same time. This method may only be used in slaughterhouse or in small scale slaughterhouse in the presence of official veterinarian of the slaughterhouse.

7. What is the number of slaughterhouses officially registered in your country?

Country	Red Meat (approved according to Regulation No 853/2004)					Poultry (approved according to Regulation No 853/2004)				Total red meat and poultry slaughterhouses	
	Cattle	Pigs	Sheep/Goats	Mixed/Other	Total red meat slaughterhouses	Chicken	Turkey	Mixed/Other	Total poultry slaughterhouses	Total number of all slaughterhouses officially registered	Total approved by the competent authority according to Regulation (EC) No 853/2004
AT										5,058**	
BE					23				16	67	39
CY					4				9	29	13
CZ					112				25	294	137
DE										5,000	340
DK										164	141
EE										76	76
ES					645				171	1,088	816
FI	3	14	7	57	81	4	2	23	29		39 slaughterhouses, 90 small scale slaughterhouses
HU					161				70	306	231
IT										not available	495
LU				3	3					3	3 (except poultry)
NL	*	*	*		249	33	0	3	36	285	285
PL										1,390	661
PT										187	187
SE*	1	5	1	75	82	11	3	10	24	106	21

SI					29				5	128	34
UK	18	13	13	268	312	62	9	36	107	419	419

*Figures for SE for each species include *total* establishments, not only just those approved according to Regulation No 853/2004.

** Number is relatively large due to a high number of small slaughterhouses.

SURVEY OF SLAUGHTERHOUSE OPERATORS
29 responses

I. PRODUCTION AND RELATED COST ISSUES

2. What is the main species slaughtered at your plant:

Species	Respondents
Chicken	22
Turkey	6

3. Which other species are slaughtered at your plant:

Species	Respondents
Chicken	6
Spent hens	4
Turkey	5
Duck	3
Geese	0
Guinea Fowl	0
Other	3

4. Please provide data on the capacity of your slaughterhouse

a. How many slaughter lines do you have?

Lines	Respondents
1 line	21
2 lines	7

b. What is the total annual output (number of chicken or turkeys slaughtered at this slaughterhouse)?

Output	Respondents
< 2,000,000	2
2,000,000 - 3,999,999	1
4,000,000 - 5,999,999	4
6,000,000 - 7,999,999	1
8,000,000 - 9,999,999	3

10,000,000 - 11,999,999	1
12,000,000 - 13,999,999	4
14,000,000 - 15,999,999	0
16,000,000 - 17,999,999	2
18,000,000 - 19,999,999	1
20,000,000 - 21,999,999	1
22,000,000 - 23,999,999	1
24,000,000 - 25,999,999	2
> 26,000,000	8

c. What is the average slaughter weight (kilograms slaughter weight per bird)?

Species	Responses
Chicken	2.300
	1,1 kg
	2,2
	2,1 kg
	1,98 Kg average in 2006 Please indicate average slaughter weight
	2,450 Kg/bird
	2.1Kk (live weight)
	2.1Kg
	1900
	1.100 g
	2.1kg
	1,945 Kg
	1.22 kg
	1,3 kg geschlachtet
	1,80 kg
	1,30 kg
	2.100 kg vif
	2100 GRAMMES
	2,000 à 2,200 Kg
	2,200 KG
	1.777 kg (moyenne 2005)
	Pds moyen = 1.850 kg

Turkey	11.5 kg
	11,80 kg (15,6 kg Hahn und 7,7 kg Henne)
	Ø 11,80 kg (15,6 kg Hahn und 7,7 kg Henne)
	Ø 11,80 kg (15,6 kg Hahn und 7,7 kg Henne)
	15
	12 kg vif pour les mâles et 6 kg pour les femelles

5. Please provide data about the costs that you incur in producing whole birds:

	Median Percentage	Minimum Estimation	Maximum Estimation	Standard Deviation
Transport costs to your slaughterhouse	29,3%	4,5%	51,0%	10,2
Costs of reception/lairaging (including associated personnel, machinery, power and water costs)	3,1%	0,0%	18,0%	5,1
Cost of shackling birds (dead or alive) (including associated personnel, machinery and power costs)	6,6%	2,0%	18,0%	4,2
Cost of stunning (including associated personnel, machinery, power and water costs) WATERBATH STUNNING	1,0%	0,0%	30,3%	8,5
GAS STUNNING	1,0%	0,0%	3,0%	1,5
Cost of bleeding (including associated personnel, machinery and power costs)	1,0%	0,0%	5,0%	1,9
Cost of further steps of the slaughter chain until after the first chilling has been completed (including, defeathering, evisceration, veterinary control, washing, first chilling) (including associated personnel, machinery, power and water costs)	39,8%	11,0%	47,0%	13,3
Waste disposal (whole bird area) (including associated personnel, machinery, power and water costs)	7,5%	3,4%	17,8%	3,5
Cleaning (whole bird area) (including associated personnel, machinery, power and water costs)	4,0%	1,6%	18,2%	4,9
Cost of depreciation of building[1] and processing line	7,0%	1,0%	34,1%	9,2

[1] Please allocate the proportion of your building depreciation cost that relates to the process from reception to first chilling (i.e. excluding further processing).

c. What are the costs that you incur in producing a whole bird including its by-products? (i.e., the cost price of a whole prepared bird and its by-products, excluding your profit margin and the purchase price of the bird)?

Measurement	Median	Minimum	Maximum
Per kg	0.6 EUR/kg	0.5 EUR/kg	0.8 EUR/kg
Per bird	1.8 EUR/bird		2.6 EUR/bird

6. We would also like to understand the significance of different cost elements that you have listed above, (the cost of labour, electricity, etc.) from the point of entry into the slaughterhouse up until end of the first chilling.

Cost data used for cost analysis…not reproduced here.

7. Are your employees appointed with the handling of birds trained with respect to animal welfare?

Yes	No
25	2

If yes:

a. Please mark in which of the following areas must employees be specifically trained regarding animal welfare and how many hours they were trained? (Only applies for employees working in that area).

Work area	Slaughterhouses providing training	Slaughterhouses did not indicate training	Median hours dedicated
Unloading animals to lairage facilities	21	8	2
Handling animals from lairage to stunning facilities	17	12	2
Shackling to Stunning	21	8	2
Bleeding	25	10	2

b. Is this training done:

Internally	Externally
25	9

c. Is this training with or without attestation, certification or diploma at the end of the training?

With	Without
13	12

d. Is this training legally required or voluntary?

Legally	Voluntarily
12	15

e. Is this training formally approved by the competent authority?

Yes	No
13	12

8. Please assess impacts of the training measures that you implement?

	Very significantly negative impact	Fairly significantly negative impact	Remain similar	Fairly significantly positive impact	Very significantly positive impact
Animal welfare	0	0	1	21	5
Meat quality	0	0	5	15	7
Production costs	0	5	11	8	5
Competitiveness of operation	0	2	11	8	5
Occupational safety	0	0	11	13	3
Environment	0	0	15	8	1

II. OPERATIONAL PROCEDURES

9. What is your point of reference for "good animal welfare practices" at your slaughterhouse?

Point of Reference	Respondents
National legislation	26
Code of good practice of European association of slaughterhouses or other relevant European/international body	5
Code of good practice of national association of slaughterhouses or other relevant national body	6
Own company code of good practice	18

Animal welfare organisation code of practice	2
Requirements of clients	19
Equipment manufacturers recommendations	6
Other	3

10. Please mark with "yes" the animal welfare operational measures / procedures that you currently have implemented in your plant? If yes, please assess the costs of the measure.

Operational measures / procedures	Yes	If yes, please assess how costly the procedure /measure is					
		--- very costly	-- fairly costly	- slightly costly	O no costs	+ savings	Don't know
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar method	19	0	4	12	2	0	0
Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	21	1	5	9	6	0	0
Procedure to check birds on their arrival to identify weak birds	18	0	7	6	4	0	1
Procedure to deal with birds being transported over twelve hours	6	0	1	4	0	1	0
Providing water to birds in lairages	1	0	1	0	0	0	0
Providing feed to birds in lairages	1	1	0	0	0	0	0
Video surveillance of stunning/bleeding area	0	0	0	0	0	0	0
Procedures for isolating/prioritising the slaughter of fragile or small birds	7	0	3	1	1	0	0
Keeping maintenance records of stunning equipments	22	0	3	12	2	0	0
Presence of an employee at the bleeding line to ensure that all birds have been cut properly	28	6	11	5	3	0	0
Other measures	3	0	2	0	0	0	0

11. Please indicate the most beneficial operational procedure of the options listed in Question 10?

Operational procedure	Respondents
Implementation of a plan of control for animal welfare aspects based on HACCP or a similar method	11
Assigning an employee to be responsible for overseeing animal welfare (such as an	1

animal welfare officer)	
Procedure to check birds on their arrival to identify weak birds	0
Procedure to deal with birds being transported over twelve hours	0
Providing water to birds in lairages	0
Providing feed to birds in lairages	0
Video surveillance of stunning/bleeding area	0
Procedures for isolating/prioritising the slaughter of fragile or small birds	1
Keeping maintenance records of stunning equipments	0
Presence of an employee at the bleeding line to ensure that all birds have been cut properly	12
Other measures	0

12. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 11?

a. Presence of an employee at the bleeding line to ensure that all birds have been cut properly:

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	0	9	3
Competitiveness of operation	0	2	6	2	2
Occupational safety	1	0	9	1	1
Environment	0	0	11	1	0

b. Implementation of a plan of control for animal welfare aspects based on HACCP or a similar method:

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	2	7	1
Competitiveness of operation	0	2	3	5	0
Occupational safety	0	0	8	3	0
Environment	0	0	9	2	0

13. What are the indicators that you currently monitor in your plant and how often is each monitored?

Animal welfare indicators monitored at your plant	Yes	Frequency (times per week)
Atmospheric parameters at lairage (temperature, humidity, air flow, noise level, light intensity, water consumption, etc.)	18	2-continuous
Waiting time between reception and the beginning of the slaughtering procedure	23	5-each batch
Amount of time birds spend in shackles before stunning	18	1-each lot
Competence of employees working with live birds regarding animal welfare	16	annual evaluation-continuous
Correct application of electrical stunning apparatus	26	4-continuous
Frequency of ineffective stunning (i.e., number of cases in which a second stun is required)	13	2-continuous
Insensitivity of birds after stunning	24	1-continuous
Time between stunning and bleeding	20	1-automatic
Meat quality (pH, DFD, PSE, blood splashes, bone fractures)	18	4-continuous
Skin quality	21	4-continuous
Please specify other indicators	4	Daily-200+

14. How do you monitor the effectiveness of the stun?

a. Please mark how your slaughterhouse monitors the effectiveness of the stun:

Monitoring	Respondents
No direct monitoring	1
Sign of recovery after stunning	24
Sign of recovery after bleeding	10
Indirect monitoring through technical parameters (e.g., electrical)	23

b. Please specify what percentage of animals are actually monitored for the effectiveness of stun:

Responses
100%, Continuous
100% (All birds are hanged manual after stunning)
100%
100%
0,01%
There is no any markable situation, instead of electricity and powerless situation, when the bleeding is would be stopped immediately.

100% under control of an operator.
Hourly checks
0,01%
100%
Ca. 0,4 %
Ca. 0,4 %
Ca. 0,5 %
10%
100%
approx 5%
1 par heure
100%
100%
0,2 %
100 % durch Kontrolle-Nachstecher, ~ 2 % durch Veterinär
1poulets par lot
1 fois jour
20 volailles par lot (test pupillaire) et 1 volaille en réveil
par le contrôle indirect 100% des animaux passes sont sous controle
0,01%
5 poulets /lot
Au plus 1/ lot

c. Do you systematically record the results of your monitoring activity described in questions 14a and 14b:

Yes	No
16	13

d. If yes, could you please provide your average percentage of unsuccessful stunning:

Responses
<0.5%
<1%
None any record , because of maintenance of machine is daily routine at the start of the work.
0% checked during the validation of the stunner

0%y
0%
Ca. 0,2 %
Keine
Please specify 0%
0
< 1%
< 1 %
aucun ; les non étourdis n'existent pas, seulement les morts.
Non mesuré
0%

15. Do you have regular cleaning and maintenance schedules for your stunning equipment?

a. A regular <u>cleaning</u> schedule for stunning equipment:

Yes	No
28	0

If <u>yes</u>, please specify the frequency of cleaning:

Time frame	Respondents
Hourly	0
Daily	29
Weekly	0
Monthly	0
Quarterly	0
Don't Know	0

b. A regular maintenance schedule for stunning equipment

Yes	No
28	1

If yes, please specify the frequency of maintenance:

Time frame	Respondents
Daily	9
Weekly	9
Monthly	7
Quarterly	4
Yearly	1
Don't Know	0

16. Please mark outside parties that perform a specific audit regarding animal welfare and list the frequency with which you are audited?

Outside party	Yes	Frequency (in times per year)
Veterinary authority	28	2-daily
Clients	22	1-20
Animal welfare groups	2	1-2
Independent auditor	14	1-12
Other parties	3	1-2

IV. DESIGN OF EQUIPMENT

17. Please mark with "yes" the technology that has actively been implemented in your plant primarily for the sake of animal welfare during the last 10 years?

Technology	Yes	If yes, please assess how costly that has been					
		--- very costly	-- fairly costly	- slightly costly	o no costs	+ savings	Don't know
Modules limiting human handling off the truck as opposed to crates	19	12	3	1	0	3	0
Appropriate ventilation equipment in lairage facilities	21	3	12	3	0	1	1
Violet/blue lighting or low lighting (5 lux or lower)	24	0	5	14	2	0	1
Plastic or rubber curtains along the line (i.e., breast comforting plates)	16	0	3	9	1	0	2
Dipping shackling line (water bath stunners)	23	1	6	13	1	0	2
Electrically isolated "entry ramp" (water bath stunners)	19	0	5	12	0	0	1

Shackle lines accommodate different bird sizes (water bath stunners)	18	0	8	9	0	0	0
Increase bath conductivity by the use of salted solution	5	1	2	2	0	0	0
Maximum shackle duration before the bath	18	0	6	4	5	0	0
Other measures	3	1	2	0	0	0	0

18. Please indicate the most beneficial design measure of the options listed in Question 17?

Technology	Highest ranking design measure as most beneficial for animal welfare
Modules limiting human handling off the truck as opposed to crates	9
Appropriate ventilation equipment in lairage facilities	7
Violet/blue lighting or low lighting (5 lux or lower)	2
Plastic or rubber curtains along the line (i.e., breast comforting plates)	3
Dipping shackling line (water bath stunners)	3
Electrically isolated “entry ramp” (water bath stunners)	2
Shackle lines accommodate different bird sizes (water bath stunners)	0
Increase bath conductivity by the use of salted solution	1
Maximum shackle duration before the bath	2
Other measures	2

19. Please assess impacts of the measure listed as most beneficial for animal welfare by you in Question 18?

a. Modules limiting human handling off the truck as opposed to crates

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	2	4	4
Competitiveness of operation	0	0	2	4	4
Occupational safety	0	0	1	6	3
Environment	0	0	3	6	1

b. Appropriate ventilation equipment in lairage facilities:

Operational measure implemented has impact on …	very significant negative impact	fairly significant negative impact	remain similar	fairly significant positive impact	very significant positive impact
Meat quality	0	0	1	4	1
Competitiveness of operation	1	0	0	4	1
Occupational safety	0	0	5	1	0
Environment	0	0	3	3	0

V. SLAUGHTER OPERATION

20. Please mark which restraining/shackling mechanism most describes the method in use at your plant?

Restraint mechanism	Respondents
Birds stunned in containers and shackled unconscious	0
Birds emptied out of containers, stunned, shackled unconscious	1
Shackled conscious	27
Other	1

21. Please mark the main stunning/bleeding methods in use for the different species/types of poultry in your slaughterhouse (not including religious slaughter).

a. Methods currently in use:

Methods		Chicken		Turkeys	
		Method in use	*Back-up* method*	*Method in use*	*Back-up* method*
Stunning					
Electrical	*Head-only stunning*	3	0	0	0
	Waterbath stunning (reversible method, above 200 Hz)	15	2	7	2
	Waterbath stun/killing (irreversible method, around 50-60 Hz)	7	2	4	1
Gas	*Gas stunning*	0	0	0	0
	Gas stun/killing	1	0	0	0
Neck Dislocation		0	3	0	0

Other		1	0	0	0
Bleeding					
Neck cutting	*1 carotid artery cut and 1 external jugular vein cut*	13	1	1	1
	2 carotid arteries cut	8	2	9	0
	1 jugular vein cut	3	0	1	0
Decapitation		1	0	0	0
Other		0	1	0	0

b. Is your main stunning method automated (i.e., no human intervention during the restraining and stunning process)?

Yes	No
28	0

c. Is your main bleeding method automated (i.e., no human intervention during the bleeding process)?

Yes	No
20	9

22. Do you apply ritual slaughter?

Yes	No
14	15

If your answer is yes:

a. What percentage of birds is ritually slaughtered at your plant without prior stunning?

Average	Median	Minimum	Maximum
8.5%	0%	0%	100%

23. If using electric stunning technology:

a. What are the details of the electric stun per bird (i.e., average frequency, output voltage, output current, and minimum application time)?

Species	Type of stunner:	
	constant current	constant voltage
Chicken	8	11
Turkeys	6	7

Chickens

Responses	Frequency (per bird)	Voltage* (per bird)	Current* (per bird)	Minimum time of application (per bird)	Maximum stun-to-stick interval
	(Hz)	(V)	(mA)	(sec)	(sec)
1	50	220	100	5	10
2	275	140	250		
3	350	80-100	100	3-5	7
4	350	30		24	
5			1.3		
6	50		105	10	10
7	50	230	140	5	15
8	< 100	120-150	100-125	9	5
9	1000	50		11	6
10	50	6.5	120		
11	375	60	900	13	5
12	50			4	10
13		DC 18 V AC 32 V	DC 12 mA	15	7
14	300		100	10	6
15			120		6
16	800	30			
17	+/- 400 Hz	+/- 100 V		7-27	3
18	150	5.45	0.09	12	18
19	503	53		8	11
20	360	80	2	16	7
21	200	110		10	10

Turkeys

Responses	Frequency (per bird)	Voltage* (per bird)	Current* (per bird)	Minimum time of application (per bird)	Maximum stun-to-stick interval
	(Hz)	(V)	(mA)	(sec)	(sec)
1	50	50-150	300-500	15	30
2		25	0.03	17	
3	60	200	150	17-21	7-10
4	60	130-200	> 150	27	3-10
5	400	150	150	15	< 3
6	400	180	150	15	5
7	175	175	500	13	5
8				6	10
9			120		6
10	1030	160			
11	503	128		14	26
12		120-150	600-800	4	2

b. The electrical stunning system is equipped with a signal which indicates:

System equipped with signals indicating …	Yes	No	Don't know
Interruption of stunning	16	10	0
Insufficient duration of application	0	22	0
Excessive increase in the electrical resistance in the circuit	5	15	2
Voltage	24	2	0
Current	24	1	0
Other	8	0	1

c. Are these signals in Question b:

Audio	Visual	Both
2	23	5

d. Do you record electrical parameters during the stun:

Yes, for each animal	Yes, but not for each animal	No
2	15	11

e. If yes, which electrical parameters do you record?

Parameters	Responses
Current, Voltage, Frequency	8
Current	1
Current and Voltage	6
Frequency and voltage	1

f. Where stunning parameters are not systemically recorded, what kind of sampling procedure do you use (e.g., percentage of each lot):

Responses
Continuous by person doing the manual killing
10%
Hourly
Monthly check
Visuell mehrmals täglich durch Tierschutzbeauftragten und Veterinär
1%
100%
Fleischuntersuchungstierarzt überwacht den Betäuber nach einem Stichprobenplan und zeichnet händisch die Spannung und Stromstärke auf,und prüft den Corneareflex der Tiere
Stichproben durch Veterinär
Visuel, par les opérateurs présents

g. Do you use an electrical stunning calibrator[1]:

Yes	No
15	10

[1] Device used to test that the electrical parameters (voltage, frequency, and current) are as desired or to determine whether an adjustment to the stunning equipment is necessary.

h. If using electric stunning calibration, how often at least do you calibrate your equipment:

Daily	Weekly	Monthly	Quarterly	Yearly	Don't know
7	1	3	2	6	1

i. Which measures related to the stunning method used have been taken with regard to occupational safety of your workforce?

Responses	Voluntary or Mandatory
Manufacture description	
rif. 626/94	Mandatory
Guarded stun bath	Mandatory
Not-Aus	Mandatory
alle gesetzlich vorgegebenen Maßnahmen	Mandatory
Contrôle des installations électrique	Mandatory
arrêt urgence électrique	Mandatory
formation technique	Mandatory
Transformateur séparé du réeaux	Mandatory
triangle de signalisation éléctrique	Mandatory
Earthed entry ramp	Mandatory
Komformitätserklärung	Mandatory
Access controlled with auto-cutout	Mandatory
Fenced	Voluntary
fully guarded and interlocked	Voluntary
Zusätzlicher Schutz des Abstechers durch eine Kunststoffschiene	Voluntary
MA-Schulung	Voluntary
Education	Voluntary
zone d anesthesie peu accessible en fonctionnement	Voluntary
Nachbetäubung	Voluntary

j. Which measures related to the stunning method used have been taken with regard to the protection of the environment?

Responses	Voluntary or Mandatory
Herstellerangabe	Mandatory
économie d'eau (appareil mal fait)	Voluntary
recirculation du bain d'eaur	Voluntary

24. If using gas stunning technology:
only one respondent to Question 24

Which gas concentrations do you use, for how long, and for how many birds?

a. First step:

Species	% CO_2	% N_2	% O_2	% Argon	Average length of exposure of bird to gas (sec)	How many birds are exposed at the same time?
Chicken	40		30			

b. Second step:

Species	% CO_2	% N_2	% O_2	% Argon	Average length of exposure of bird to gas (sec)	How many birds are exposed at the same time?
Chicken	80					

c. Do you record the above parameters listed in (a) and (b) and how frequently?

- Continuous, Automatically

d. What is the maximum stun-to-stick interval after stunning?

No answer

e. Which measures related to the stunning method used have been taken with regard to occupational safety of your workforce?

No answer

f. Which measures related to the stunning method used have been taken with regard to the protection of the environment?

No answer

25. Do you plan to change your stunning method for your main species in the next five years (i.e., will you introduce a new stunning method or significantly change the characteristics of the existing method)?

Yes	No	Don't know
6	15	8

If yes:

a. Please mark which kind of stunning system:

Electric system	Gas system
7	2

b. Please specify <u>which system</u> will be introduced (e.g., electrocution, gas stunning with CO_2, argon, etc):

Responses
We are planning some tests on the gas stunning in order to evaluate its impact in our process
Gas skilling CO2/Argon
Gasbetäubung mit CO2
If we are to change it will be a gas system
CO2
Electrocution avec possibilité de réglage, ampérage, voltage (prévu en 2007- coût 30Ke)
GAZ - CO2 / O2

c. What are your <u>reasons</u> for such a change (economic, meat quality, worker safety, animal welfare, legislative, consumer demands, etc.):

Responses
We are planning some tests on the gas stunning in order to evaluate its impact in our process
Meat Quality, Worker Safety, Animal welfare
Fleischqualität, Tierschutz, Rechtsvorschrift, Verbraucherforderungen
Animal welfare/consumer demands
Amélioration qualité viande et bien-être animal
Qualité de la viande - sécurité des travailleurs - bien être des animaux

d. How do you expect your <u>costs of production</u> referred to under Question 5c will change once you have implemented this new stunning method (including depreciated investment costs):

Decrease very significantly (savings > 10%)	Decrease fairly significantly (savings of 5% - 9%)	Remain similar (+/- 4% change)	Increase fairly significantly (costs increase 5% - 9%)	Increase very significantly (costs increase >10%)
0	2	1	2	2

If you are <u>not introducing a new method</u>:

e. Why have you <u>decided not to change</u> your current stunning method?:

Current method is satisfactory	Not financially capable of investing in a new method	Production costs with new system will be too high	Other
15	2	6	3

f. If other, please specify:

Responses
Gas stunning (frequently) kills animals, which is why it is not allowed when Halal slaughtering. Not possible to introduce gas stunning in the current facility due to lack of place.
Too much debate on which is most humane system
Souhaitons poursuivre à faire de l'abattage rituel halal

Annex 7: List of stakeholders that replied to surveys

Slaughterhouses

Stakeholders responding to slaughterhouse surveys were kept anonymous. For a list of responses by country see Annex 2: Methodology.

National Meat Industry Associations

Stakeholder	Country
VIP-België vzw, National Federation of Industrial Poultry Slaughterhouses	Belgium
Association of the Dutch Poultry Processing Industries (NEPLUVI)	Netherlands
UNA Unione Nazionale dell'Avicoltura	Italy
National Poultry Board – Chamber of Commerce	Poland

Competent Authorities

Stakeholder	Country
Bundesministerium für Gesundheit, Familie und Jugend (BMGFJ)	Austria
C.I.M. Consorzio Italiano Macellatori Industriali	Italy
Central Agricultural Office	Hungary
DARD Northern Ireland	UK
Department for Environment, Food and Rural Affairs	UK
Direcção Geral de Veterinária	Portugal
Federal Agricultural Research Centre, Institute for Animal Welfare and Animal Husbandry	Germany
Federal Public Service: Health, Food chain safety and environment	Belgium
Finnish Food Safety Authority (Evira)	Finland
Food and Consumer Safety Authority (VWA)	Netherlands
General Veterinary Inspectorate	Poland
Ministerio de Agricultura, Pesca y Alimentación	Spain
Ministero della Salute - Direzione Generale della Sanità Animale e del Farmaco Veterinario - Ufficio VI	Italy
Ministry of Agriculture, Natural resources and Environment, Veterinary Services	Cyprus
State Veterinary Administration of the Czech Republic	Czech Republic

Swedish Animal Welfare Agency	Sweden
The Danish Ministry of Justice and Danish Veterinary and Food Administration	Denmark
Veterinary Administration of the Republic of Slovenia (VARS)	Slovenia
Veterinary and Food Board	Estonia
Veterinary Services of Luxembourg	Luxembourg

Animal Welfare Associations

Stakeholder	Country
Dutch society for the Protection of Animals	Netherlands
Global Action in the Interest of Animals (GAIA)	Belgium
Œuvre d'Assistance aux Bêtes d'Abattoirs (OABA)	France

Tender specifications SANCO/D2/2006/10128

Study on the stunning/killing practices in slaughterhouses and their economic, social and environmental consequences

1. BACKGROUND

The killing of animals is necessary for the production of meat. However, as part of the values of European citizens to ensure the protection of animals, EU legislation stipulates that killing will be performed so as to avoid any unnecessary suffering of the animals. Directive 93/119/EC[1] provides for specific requirements within slaughterhouses in order to ensure that animals are spared any avoidable excitement, pain or suffering during movement, lairaiging, restraint, stunning, slaughter or killing.

However this Directive needs a revision as scientific and technical knowledge in this field made significant progress. In 2004 the European Food Safety Authority adopted several recommendations[2] on the subject accompanied with a report on the stunning and killing methods available for the main commercial species. Furthermore, in 2005, the General Session of the World Organisation for Animal Health adopted guidelines[3] on the stunning and killing for human consumption.

Possible new measures will be evaluated in the light, not only of the possible benefits for the welfare of the animals where social demand is high, but also considering the implications for other dimensions related to the slaughtering/killing activities.

However for this purpose it is necessary for the Commission to collect data on the current situation and the economic, social and possible environmental consequences of the current practices from the different stakeholders' point of view.

The purpose of the study is therefore to establish a detailed picture of the present situation of the meat sector in the EU and its main trading partners with regards to the protection of animals at the time of slaughter taking into account the main socio-economic consequences of the current practices. The data collected by the study may be used for a further impact assessment.

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[1] OJ L 340, 31.12.1993, p. 21.

[2] Opinion of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to welfare aspects of the main systems of stunning and killing the main commercial species of animals. (Question N° EFSA-Q-2003-093). See http://www.efsa.eu.int/science/ahaw/ahaw_opinions/495_en.html

[3] Terrestrial Animal Health Code (2005), Section 3.7, Appendices 3.7.5 and 3.5.6. See http://www.oie.int/eng/normes/mcode/a_summry.htm

2. SCOPE OF THE STUDY

The scope of the present contract is limited to the slaughtering activities carried out within slaughterhouses for the following animals: bovine animals, sheep, pigs, chickens and turkeys. Any stunning/killing (including for human consumption) taking place outside slaughterhouses as referred to in Article 2 of Directive 93/119/EC will not be part to the study. Similarly killing of animals in slaughterhouses for other purpose than human consumption is not covered by this study.

Data to be collected and analysed in the study will cover the period from 1999-2005.

The study shall cover all Member States (including the 10 new Member States before accession) and with particular emphasis on those which together represent 90% or more of the EU production in carcass weight for each species concerned.

3. OBLIGATIONS OF THE CONTRACTOR

3.1 General objectives of the contract

The main purpose of the present contract is to establish the economical, social and environmental consequences of the most representative stunning/killing practices in the EU.

The study will be divided in two separate parts as follows:

a) PART 1 – Red meat (bovine animals, sheep and pigs): Study on the stunning/killing practices in slaughterhouses and their economic, social and environmental consequences.

b) PART 2 – Poultry meat (chickens and turkeys): Study on the stunning/killing practices in slaughterhouses and their economic, social and environmental consequences.

Each part of the study shall include:

a) A general presentation of the situation regarding the stunning/killing methods used including the economic aspects taking into account regional diversity within the EU;

b) An in depth analysis of particular factors listed in Task 2 (such as operators' competence, equipment design, operational procedures, etc.) from the perspectives of the different stakeholders (meat industry, equipment manufacturers, farming sector, consumers, slaughterhouse workers, etc.).

c) A summary of the main findings and conclusions of the two previous parts.

3.2 Task 0 – Planning and methodology

This task will include a written and oral presentation on the detailed planning of the study, including methodology, data sources and contacts (list of organisations to be consulted) to be used during the overall study. Annex I provides a list of potential stakeholders.

3.3 Task 1 – General presentation of the situation

This task will be divided in the following elements:

Task 1.1: Presentation of the meat sector within the EU

This task will include a presentation of the main economic figures characterising the sector and a short analysis of the current situation and evolution in the last five years (Number of slaughterhouses, meat production, average throughput, etc.). Possible evolution in the forthcoming years will be also considered in light of the reform of the Common Agriculture Policy and the recent outcomes of the WTO negotiations.

Task 1.2: Production costs in the EU

This task will include an analysis of the costs represented by that part of the slaughter chain where live animals are treated (unloading facilities, lairages, restrainers, stunning/killing operations) compared to the overall production costs of a slaughterhouse and its relationship with the price of meat for the consumer. The analysis shall take into account differences between the animal categories' covered by the study and the degree of homogeneity between Member States.

Task 1.3: Stunning/killing methods used in the EU

This task will describe the main stunning/killing methods[4] used for the different animal categories and their distribution within the EU. When several stunning/killing methods are commonly used in the EU for one animal category, a short socio-economic analysis of the main advantages and disadvantages of each method will be made (except if the method is covered by task 2).

Task 1.4: Competitive position of the EU meat sector within the world

This task will include a short analysis to establish the competitiveness of the EU meat sector on the world market with an assessment of the different sub-sectors' 'vulnerability', in particular focusing on price differences with major meat exporting countries and possible developments resulting from CAP reform and WTO agreements. This part should in particular analyse if price differences between third countries and the EU may be related to the existence of different stunning/killing practices.

3.4 Task 2 – In depth analysis

3.4.1 Data to be collected and nature of the analysis

This part of the study will consist in collecting data and analysing more in detail particular factors of the slaughter chain in order to evaluate their consequences on dimensions that concern the EU citizen.

For each factor to be examined, the study will define a typology based on the most representative current practices within the EU (e.g. percentage of production involved for each species covered by the study). However typologies should also take into account practices that would be potentially representing a future trend in the sector. In particular each typology should be considered in the light of the EFSA recommendations as well as the OIE guideline above mentioned. Typologies should also try to analyse the extent to which the

[4] including main typologies for each method when differences in applying a method are likely to have substantial welfare and economical impacts.

practices observed mainly result from legal/administrative requirements or from market forces.

For each of the factors analysed, the study will provide a summary of the analysis under a comparative table listing for each typology considered, the positive and negative consequences, possibly with quantitative relationship, on the dimensions as referred to in 3.4.2.

3. 4. 2. Dimensions to be evaluated

Each factor will be evaluated under their economic, social and possibly environmental consequences. The word "consequences" used in this document should consider the perspectives of the different stakeholders (i.e. meat industry, equipment manufacturers, farmers, consumers' organisations, animal welfare organisations, trade unions of personnel working in slaughterhouses, veterinarians, etc.) and take into account the following dimensions:

- The *economic* evaluation shall take particular attention of:
    a) the consequences on the competitiveness of slaughterhouse operators taking into account production costs in detail and the possible consequences on the price of meat for the consumer;
    b) the consequences on specific regions or sectors;
    c) the budget aspects for public authorities;
- *Social* consequences to be considered shall include:
    a) meat safety and meat quality;
    b) occupational safety and qualification of slaughterhouses workers;
    c) Protection of particular social groups (e.g. religious groups);
- *Environmental* consequences shall be considered if necessary.

3.4.3 List of factors to analyse

Task 2.1: Competence of slaughterhouse operators (parts 1 and 2)

Article 7 of Directive 93/119/EC provides for particular competences of personnel handling animals at slaughterhouses but no mechanism is requested to implement it. This task will evaluate the current practices in relation to ensure the competence and behaviour of slaughterhouse operators dealing with live animals.

Task 2.2: Design of restraining and stunning/killing equipments (parts 1 and 2)

Article 6 of Directive 93/119/EC provides that equipments for restraining, stunning or killing animals shall be adequately designed but no mechanism is requested to implement it. This task will evaluate the current practices regarding the way animal welfare considerations are integrated in the development of restraining and stunning/killing equipments by the different sectors involved (equipment manufacturers, slaughterhouse operators, competent authorities, etc).

Task 2.3: Animal welfare operational procedures (parts 1 and 2)

Directive 93/119/EC does not request slaughterhouse operators particular methods to verify that animal welfare rules are implemented in their establishments. However in the framework of their internal quality policy, some slaughterhouse operators implement procedures in order to ensure that EU animal welfare rules and related technical parameters are subject to regular monitoring and correct implementation.

This task will evaluate the current practices regarding the way animal welfare operational standards are monitored and implemented by the slaughterhouse operators themselves. Detailed elements covered in tasks 2.4 and 2.5 do not need to be included in this task.

Task 2.4: Electrical stunning or killing (part 1 - only red meat)

A number of essential requirements for electrical equipments are presently not provided by Directive 93/119/EC. Better monitoring in case of electrical stunning is particularly important as throughput is usually high and human handling limited.

This task will evaluate the current practices regarding the use of electrical stunning or killing for red meat species.

The task will in particular include collecting information on:

a) Procedures or systems for recording and verifying electrical parameters during stunning/killing operations, as well as for stunners calibration;

b) The comparative use of constant current stunners vs. constant voltage stunners.

Task 2.5: Poultry stunning/killing (part 2 - only for poultry)

Directive 93/119/EC does not envisage the use of gas stunning/killing for poultry and does not provide detailed requirements for the use of waterbath stunning. However technical developments have been achieved for both methods by the poultry meat industry and there is a need for a comprehensive update on these aspects. This task will evaluate the current practices regarding the poultry stunning or killing. The task will in particular include collecting information on the main technical characteristics used for gas stunning/killing and waterbath stunning. A detailed comparative quantitative costs analysis between the two methods shall also be provided, in addition to the comparison of the dimensions to be evaluated (see 3.4.2).

3.5 Task 3 – Conclusion and executive summary

This task will include a summary of the main findings and the overall conclusions based on the findings and evidence of the study. This part will not exceed 10% of the overall volume of the final document. The task should also mention if, among the various stakeholders consulted during the study, other concerns than the factors listed in the study were raised. In these cases, the contractor will shortly describe the corresponding positions of the stakeholders. The contractor will also provide an executive summary, not exceeding 1 page at the front of the final version.

4. REPORTS AND DOCUMENTS TO BE SUBMITTED

4.1 General requirements

The following requirements will separately apply for each part of the study.

Reports and power point presentations will be provided in English under electronic format compatible with Commission's software. Each deliverable will be followed with a power point presentation of not more than 45 minutes in Commission's office in Brussels.

Deliverables will be submitted to a Commission's steering group, which may ask for complementary information or propose adjustments in order to redirect the work when necessary. Deliverables must be accepted by the Commission. With work progressing and in the light of new findings, revisions of deliverables already approved may show necessary.

Deliverables shall be drafted in a concise and easily understandable language. The presentation of the texts, tables and graphs has to be clear and complete and correspond to commonly recognised standards for studies to be published.

The volume of final deliverable text will not exceed 50 pages (Times New Roman 12 or equivalent, excluding annexes). The core text has to concentrate on the assessment of the main study items. Statistical and background information should be presented in annexes.

4.2 Timetable of the contract

The contract will be performed within 12 months from the date of signature of the contract. The contractor is expected to start working immediately after the contract has been signed. The contract involves regular meeting in Brussels between the steering group and the contractor in accordance with the programme set up in Table 1.

Expected date to start the contract: 15 April 2006.

Deadlines of the table refer to the date of delivery by the contractor to the Commission. Oral presentation should take place in Brussels in Commission's office after each delivery within one month after the delivery.

Table 1- Timetable and deliverables

<table>
<tr><th>Deliverables</th><th>Deadline after signature</th><th>PART 1 (read meat)</th><th>PART 2 (poultry)</th></tr>
<tr><td>Kick off meeting</td><td>1 month</td><td colspan="2">Task 0</td></tr>
<tr><td>Inception report</td><td>3 months</td><td colspan="2">Tasks 1.1 and parts of 1.4, final methodology, draft typology</td></tr>
<tr><td>Powerpoint presentation intermediate results + progress report</td><td>7 months</td><td colspan="2">Tasks 1.2, 1.3, 1.4, initial results of consultation of stakeholders regarding 2.1 to 2.3, final typology</td></tr>
<tr><td>Draft final report</td><td>11 months</td><td>Tasks 2.1 to 2.4 and 3</td><td>Tasks 2.1 to 2.3, 2.5 and 3</td></tr>
<tr><td>Final report</td><td>12 months</td><td>Final document</td><td>Final document</td></tr>
</table>

Annex I

List of possible stakeholders or contact points to be consulted

UECBV www.uecbv.be/

COPA-COGECA www.copa-cogeca.be/

Eurogroup for Animal Welfare www.eurogroupanimalwelfare.org/

Compassion in World Farming (CIWF) http://www.ciwf.org.uk/

Humane Slaughter Association (HSA) www.hsa.org.uk

Federation of Veterinarians of Europe (FVE) www.fve.org/

Accles and Shelvoke www.acclesandshelvoke.co.uk/

Karl Schermer GmbH www.karl-schermer.de

Anglia Autoflow www.aaflow.com

European Bureau of Shechita (Pinchas Kornfeld kornfeld@pandora.be)

Dr. Florence Bergeaud-Blackler (Halal Slaughter) fbb@aofood.org

AVEC www.avec.dk/sw210.asp

BEUC www.beuc.org Ms Barbara Gallani consumers@beuc.org