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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

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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.

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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 production³ 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 production⁵ 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%),

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 slaughterhouse¹⁴ 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 deboning 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 comparable¹⁹. Due to its disparate nature, the information gathered is presented in Table 12 in Annex 1 of this report.

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](http://www.agrifood-forum.net/publications/guide), 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 that feed prices will increase due to a worldwide growth in demand exceeding supply; for European cattle which are mostly fed 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.

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 stunning³⁰ 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 cases³⁶, 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 UECEBV. 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% CO₂). 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 UECEBV. 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 average⁵³ 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:

- Cattle stunning: When considering that current EU prices for wholesale beef range from 2.21 EUR/kg for cows to 3.08 EUR/kg for heifers⁵⁴ and an average carcass weight for adult cattle in the EU of 317.6 kg⁵⁵, 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 pistol⁵⁶.
- Pig stunning: 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/kg⁵⁸ and the average carcass weight for pigs is 88.3 kg⁵⁹, 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 national legislation/rules;
- Official (pre-)approval for stunning equipment and methods. 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 cooperation with or consultation of the official veterinarian for developing new equipments for slaughterhouses.
- For developing new methods specific procedures 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 animal welfare R&D programme 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 information sharing initiatives. 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 of 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

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.

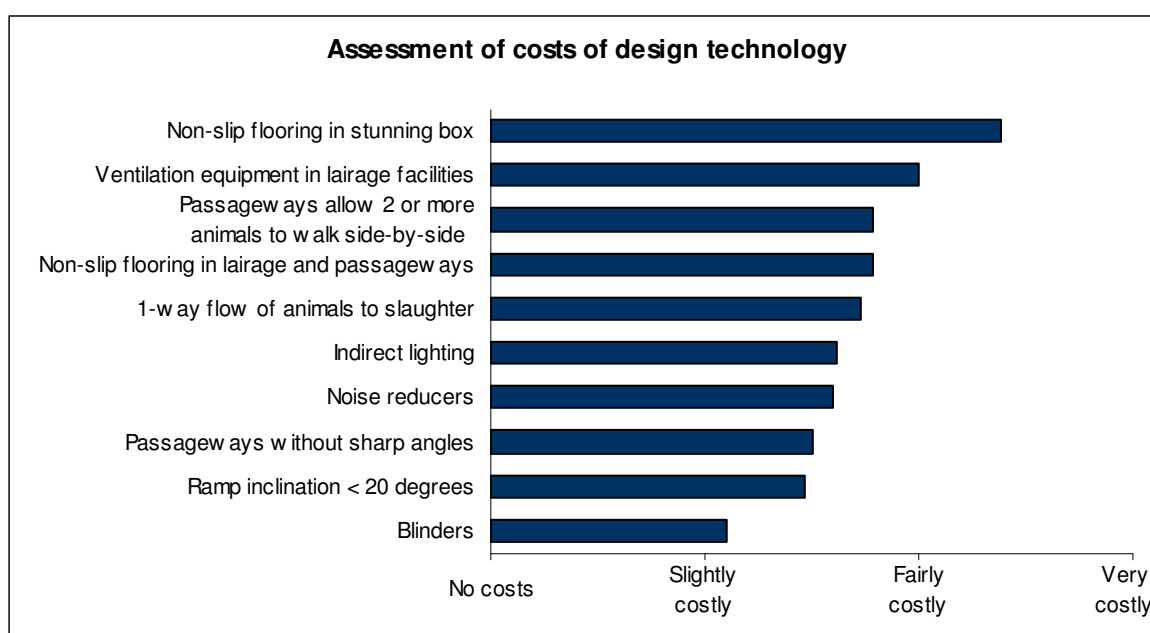
Often, the motivation for improvements in technological design of the slaughterhouse regarding animal welfare come from some retailers with an emphasis on high standards (see section 4.3).

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 costs⁸². 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 quality⁸³, 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.

⁸⁵ The number of vocalisations quoted are for the Weinberg pen 4.6 ± 6.1 (means \pm 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, Germany⁹³, 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

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.omafr.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:

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 authorities¹⁰⁸ 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 slaughterhouses¹¹², 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).

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 lamb 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 slaughterhouses¹¹⁹ 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.

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

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.

Better monitoring 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.

Better recording 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 shorter¹²⁷; 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 average¹³⁰ 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.

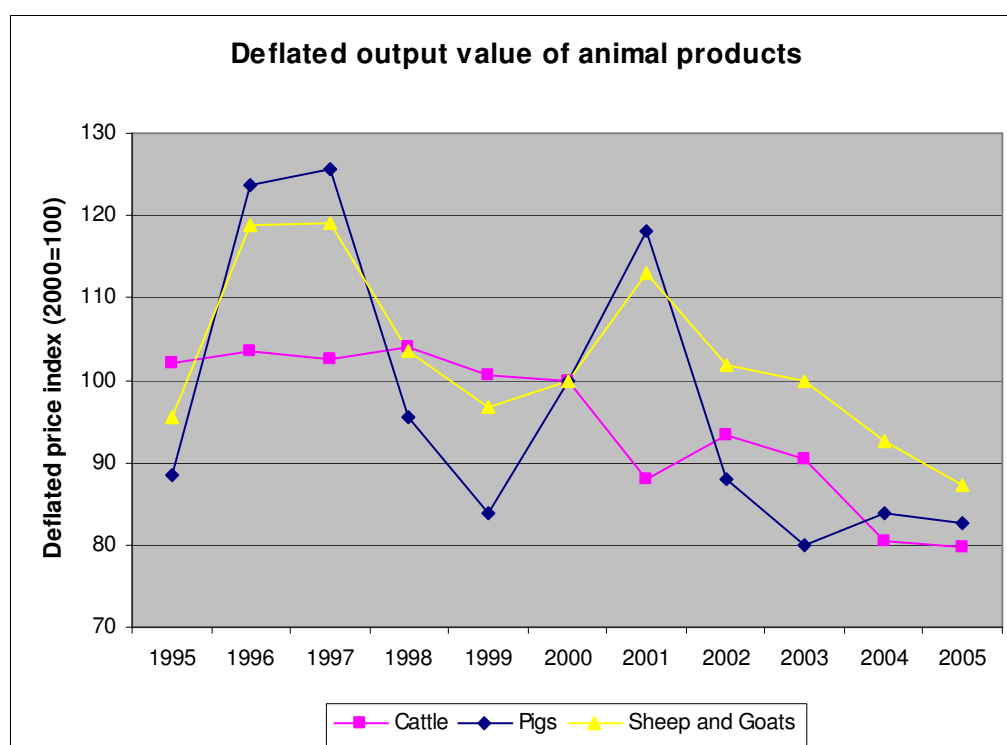
Annex 1: Supplementary figures and tables

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	:

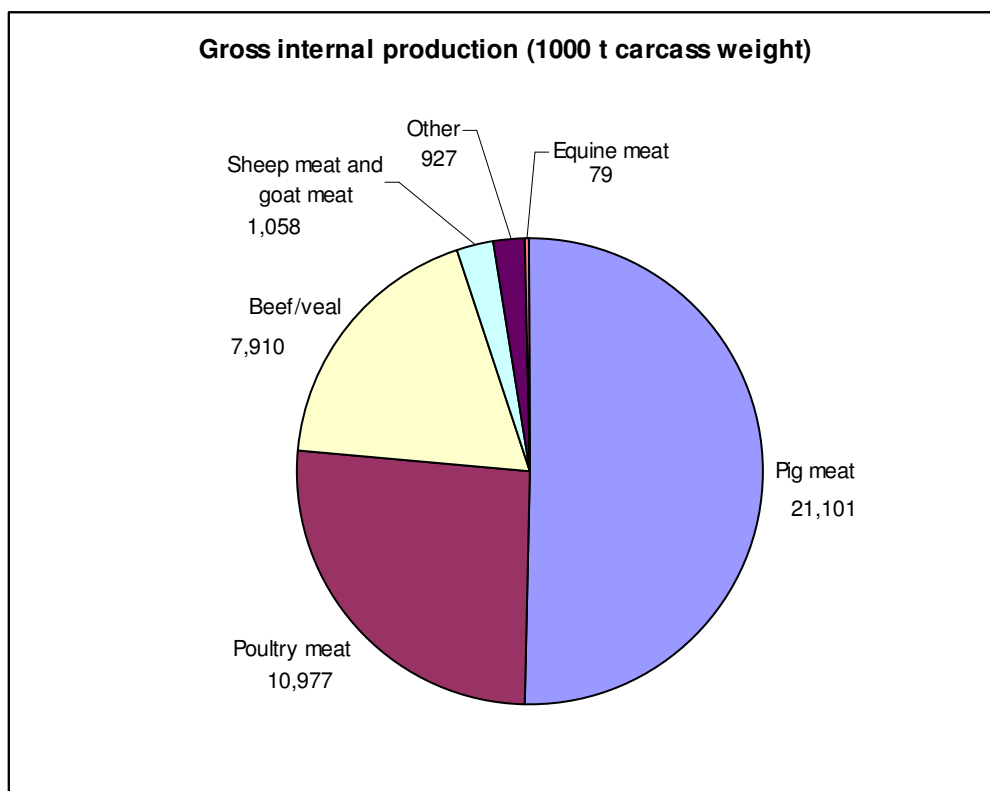
¹ Figures for 2005 were not yet available.
Source: Eurostat and DG Agriculture.

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



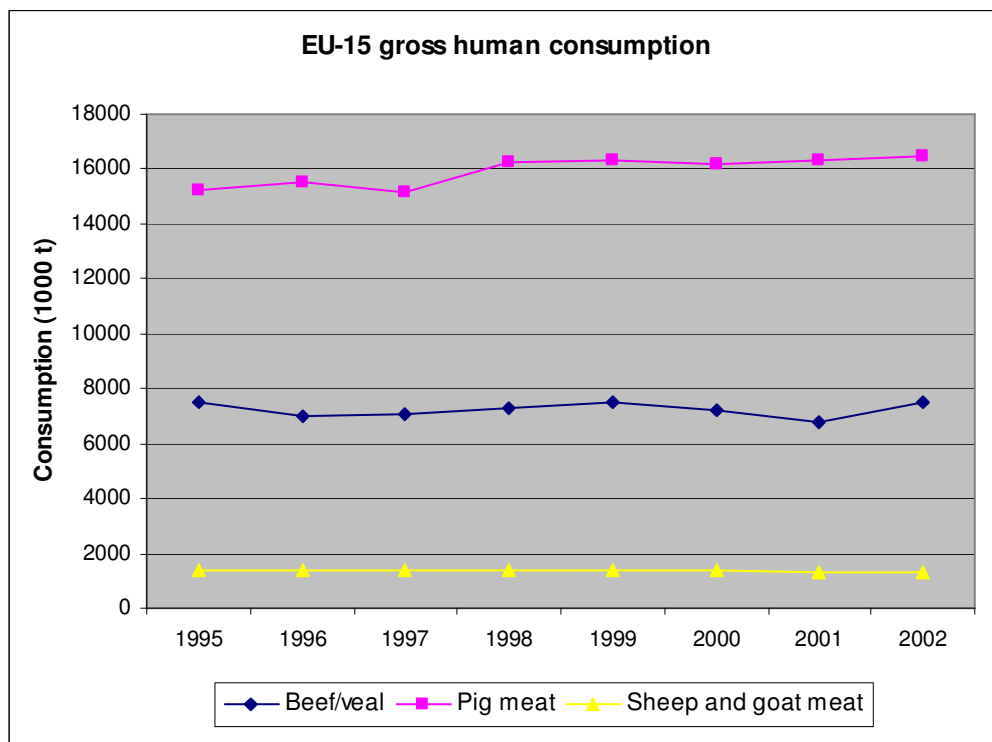
Source: Eurostat.

Figure 3: Gross internal EU production (2005)



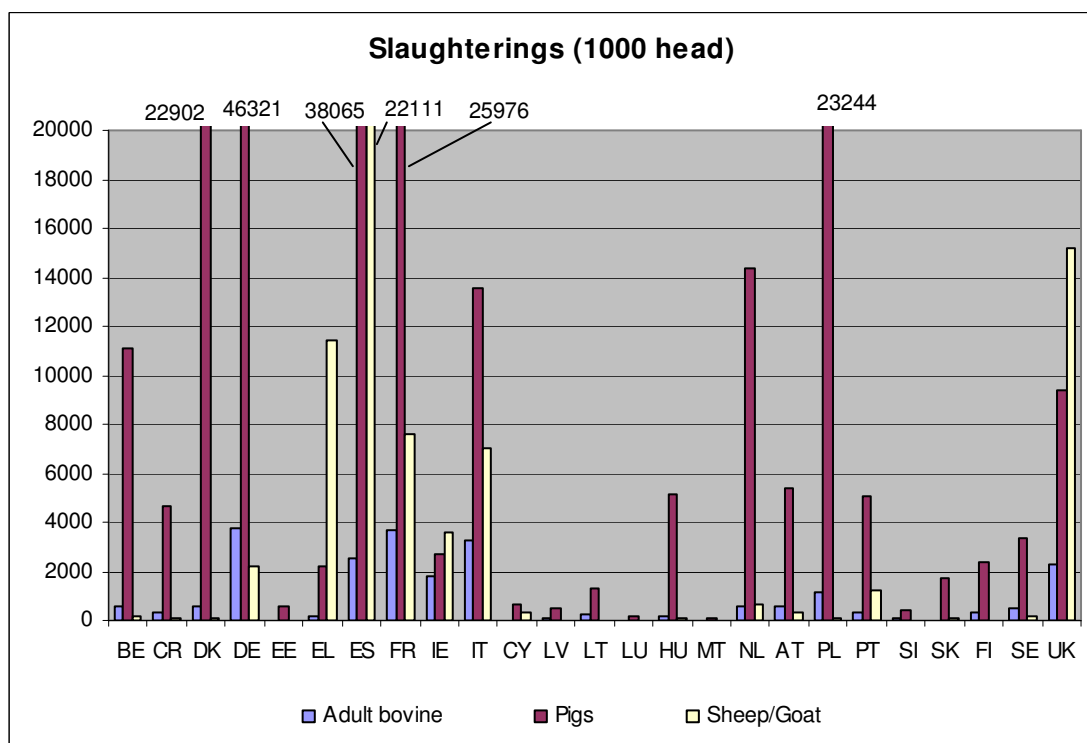
Source: DG Agriculture (2007). *Agriculture in the European Union – Statistic and economic information 2006*. Table 4.14.1.1.

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

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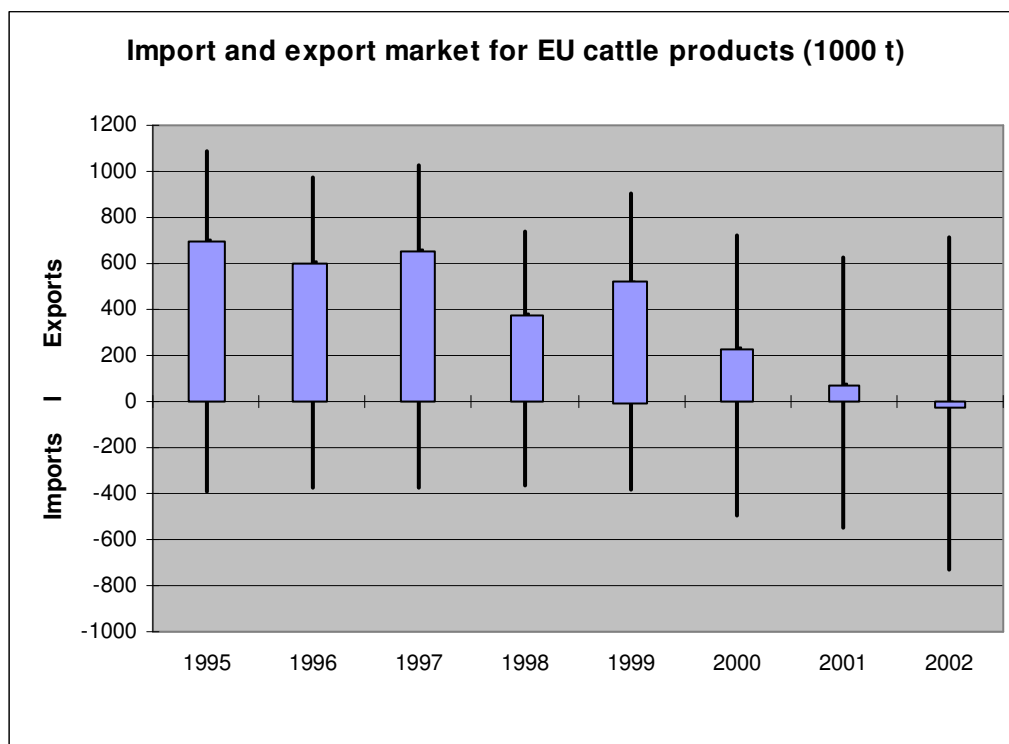
0203.19.13	----Loins and cuts thereof, with bone in	1358 ECU/T	869 ECU/T	SSG
0203.19.15	----Bellies (streaky) and cuts thereof	729 ECU/T	467 ECU/T	SSG
	-Frozen:			
0203.21	--Carcases and half-carcases:			
0203.21.10	---Of domestic swine	838 ECU/T	536 ECU/T	SSG
0203.22	--Hams, shoulders and cuts thereof, 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:			

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	--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

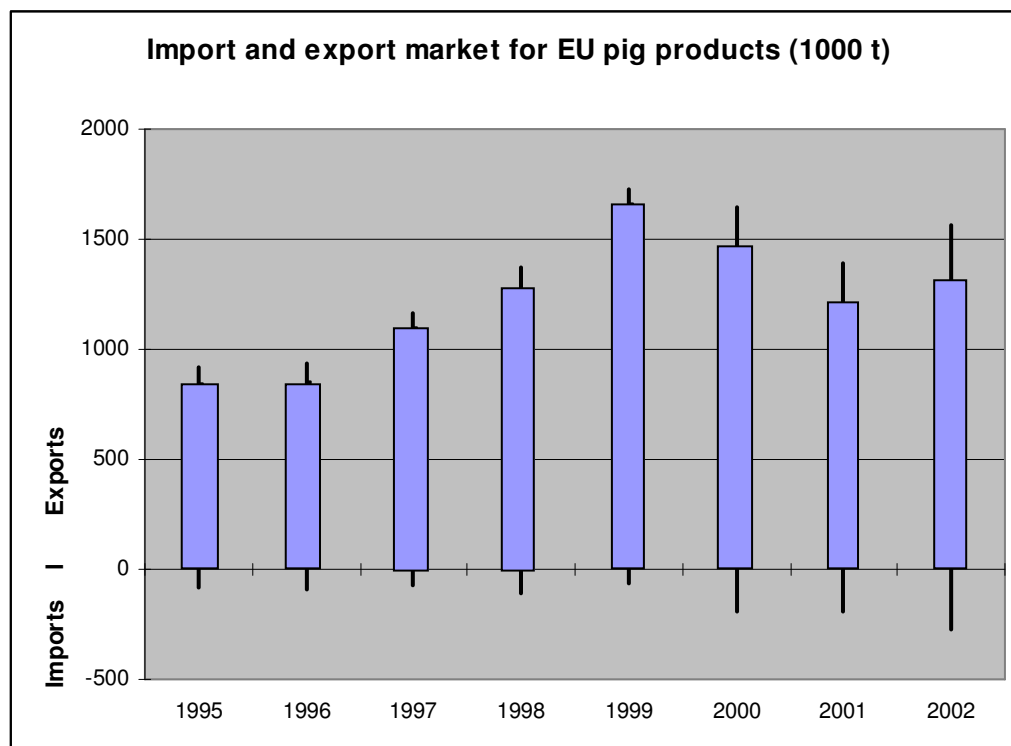
Source: European Communities Schedules for the Uruguay Round of Multilateral Trade Negotiations, GATT, 1994.

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



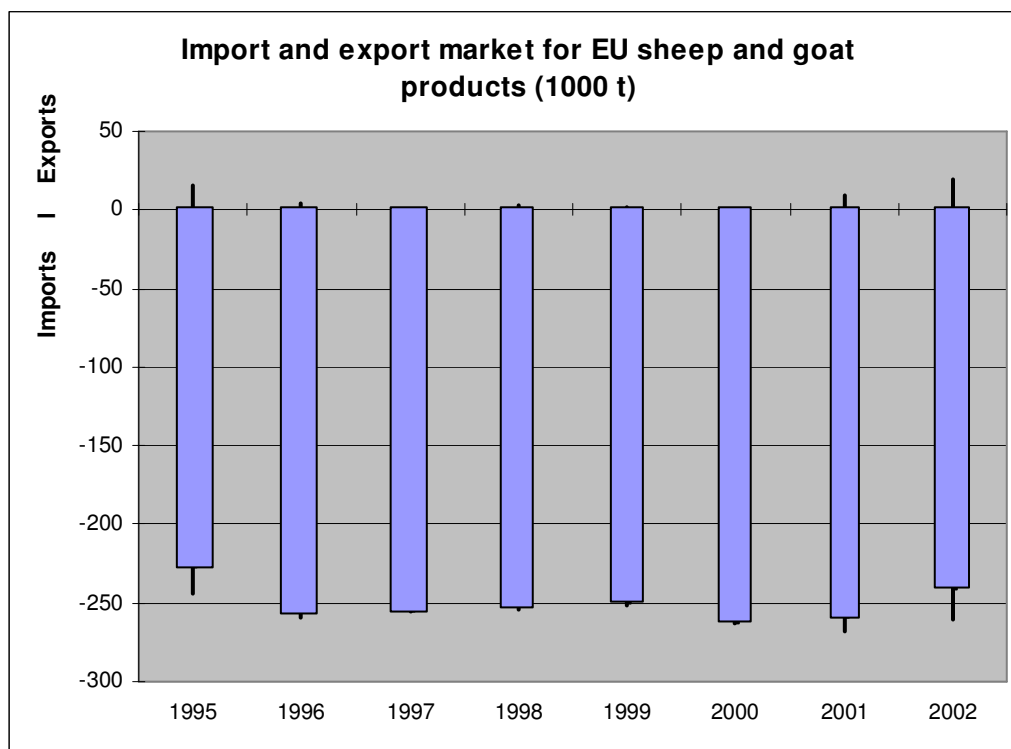
Boxes in the graph indicate net exports and the black line indicates spread between gross exports and imports
Source: Eurostat.

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



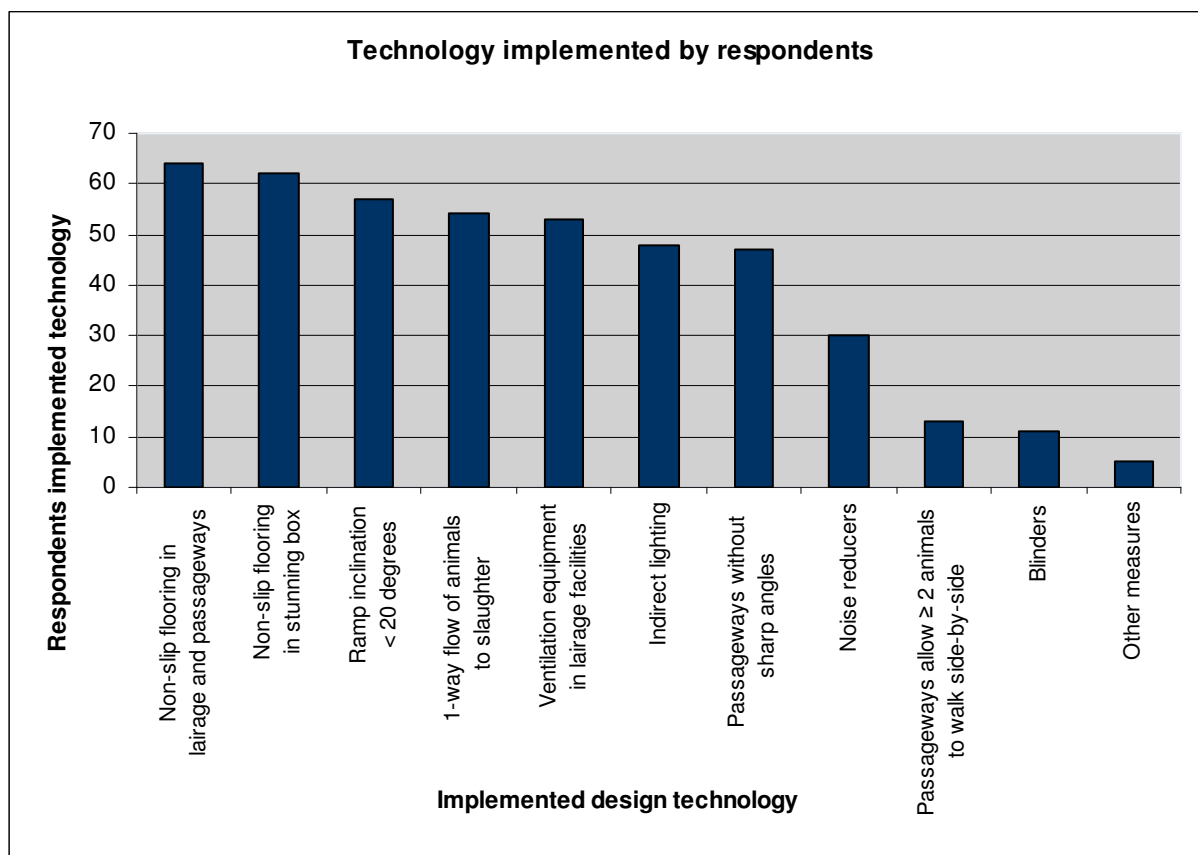
Boxes in the graph indicate net exports and the black line indicates spread between gross exports and imports
Source: Eurostat.

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

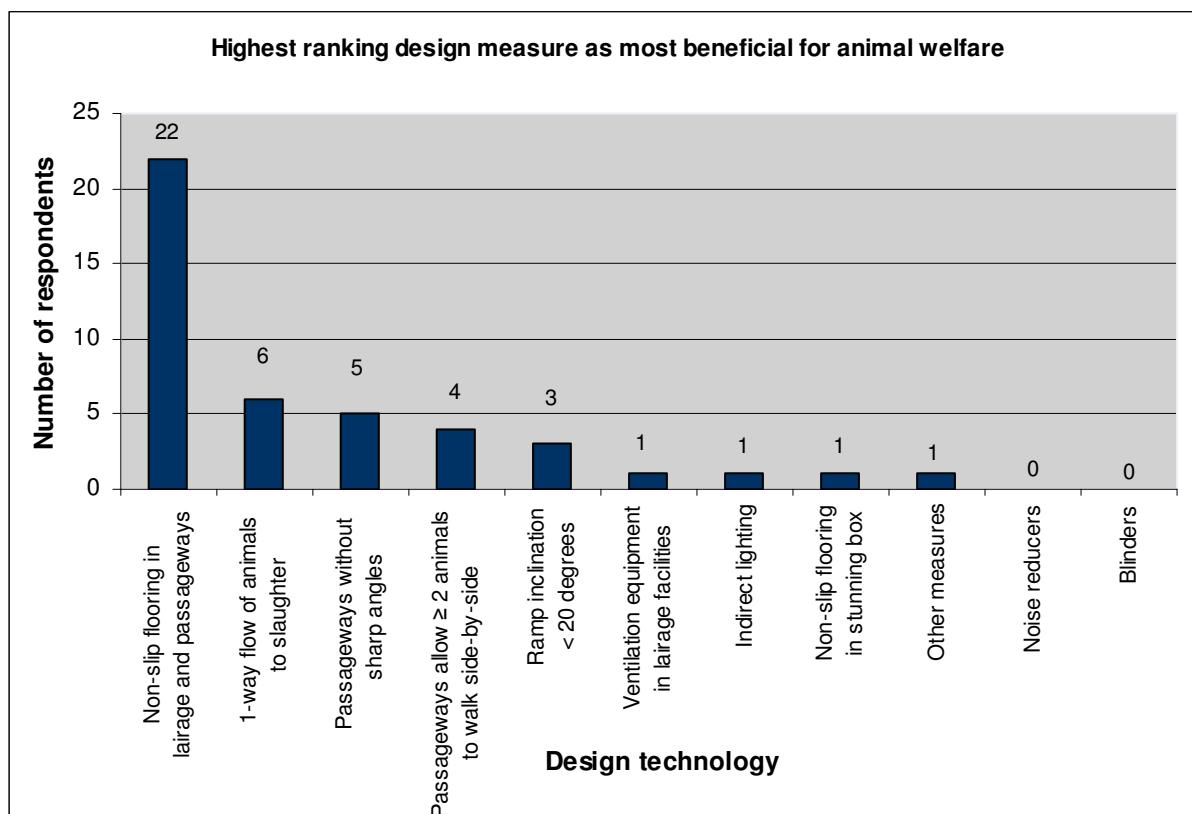


Source: Survey of slaughterhouse operators (n=80).

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

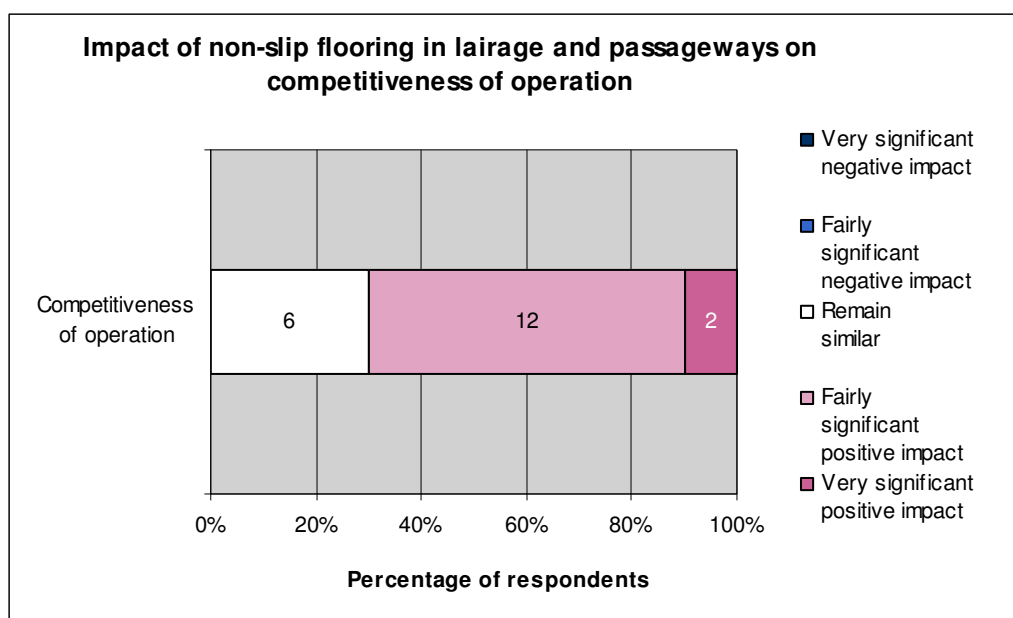
Source: Survey of slaughterhouse operators (n=25).

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

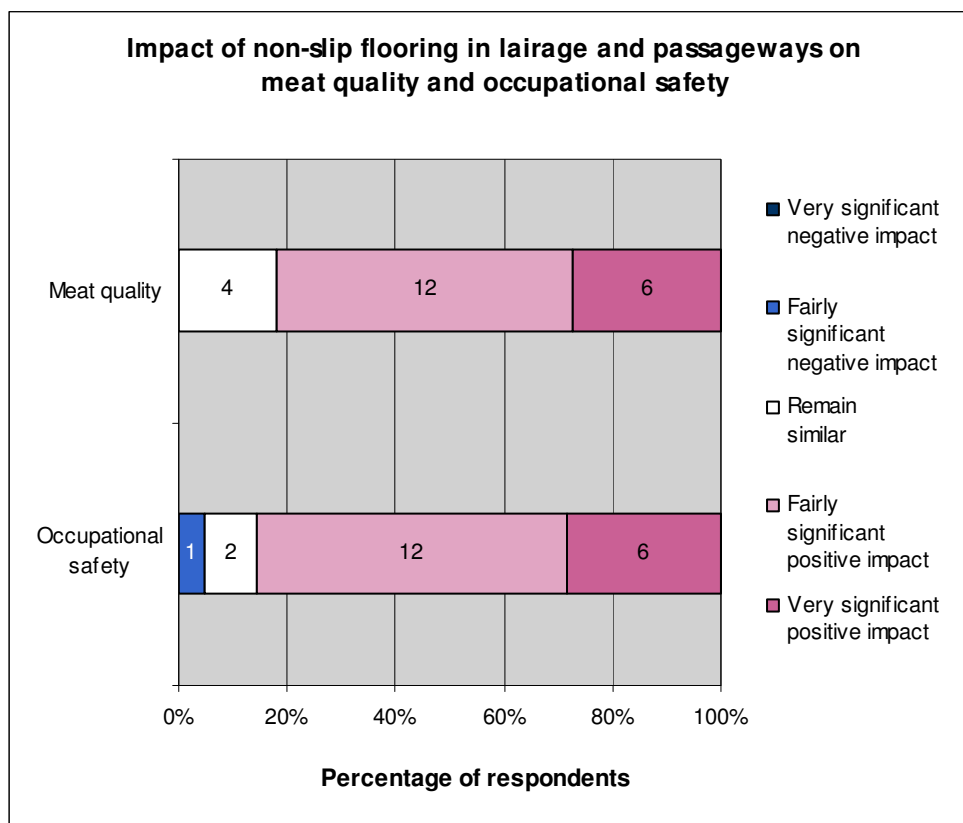
Source: Survey of slaughterhouse operators (n=16). Note: “Other” methods of restraint were identified by one slaughterhouse as group stunning without a box and another with an automated conveyer but the animals are entering the stunner without interruption (both in Spain).

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



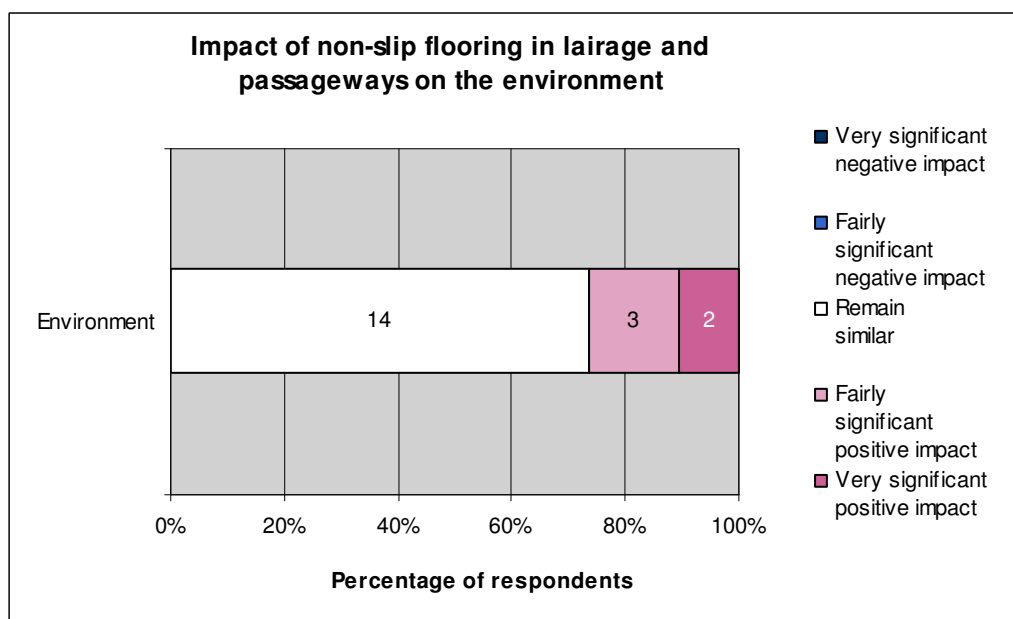
Source: Survey of slaughterhouse operators (n=20).

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



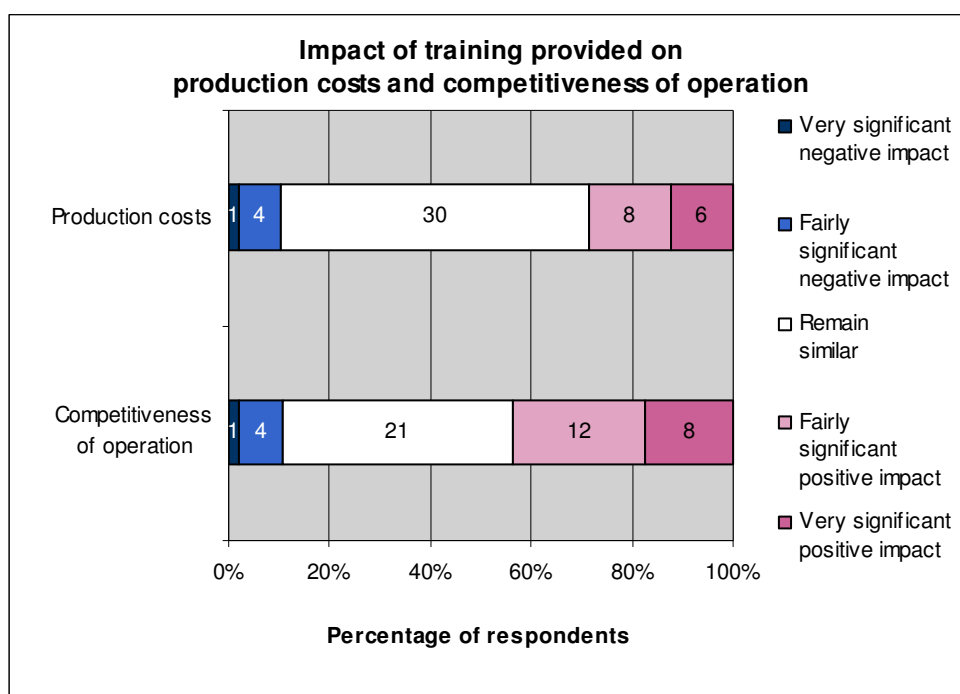
Source: Survey of slaughterhouse operators (n=19).

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).

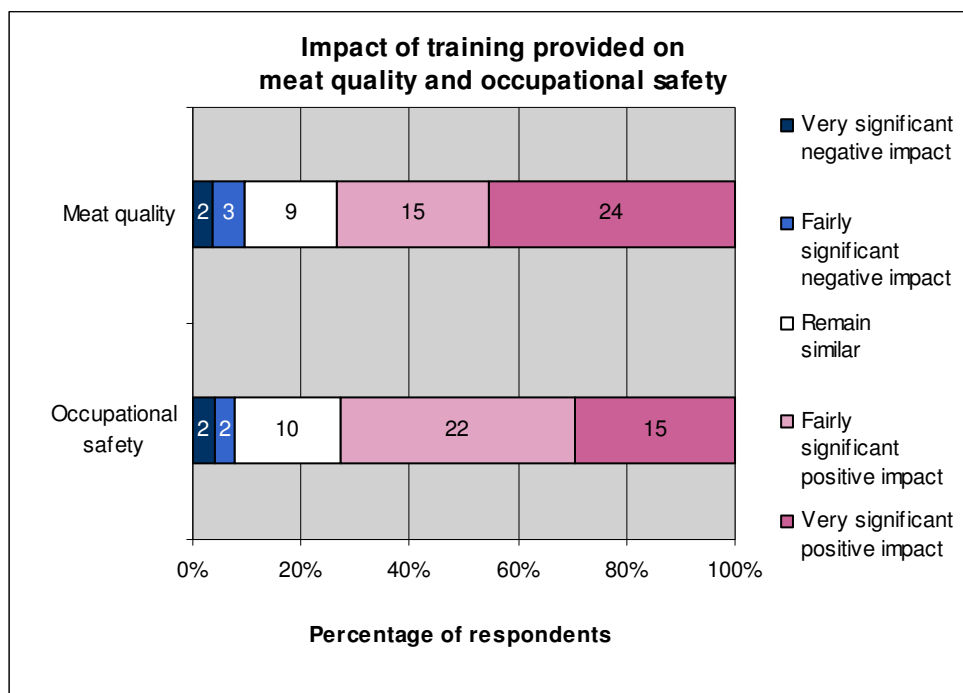
Figure 14: Assessment of training on competitiveness of slaughterhouse operations and production costs



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

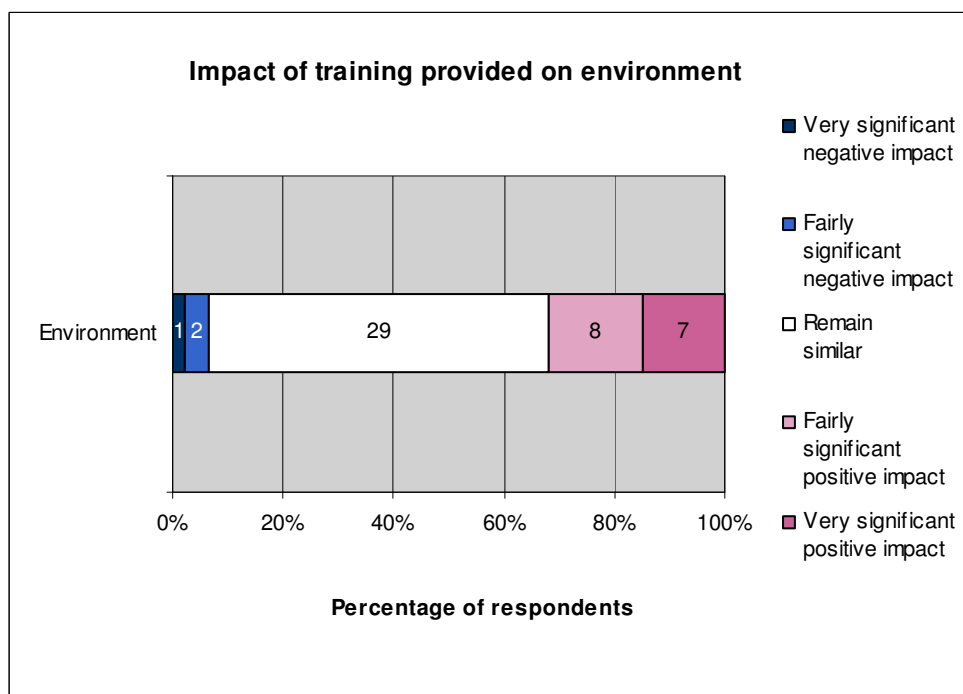
¹³¹ The use of the word “average” in this section refers to the median value calculated for estimations of hours of training.

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

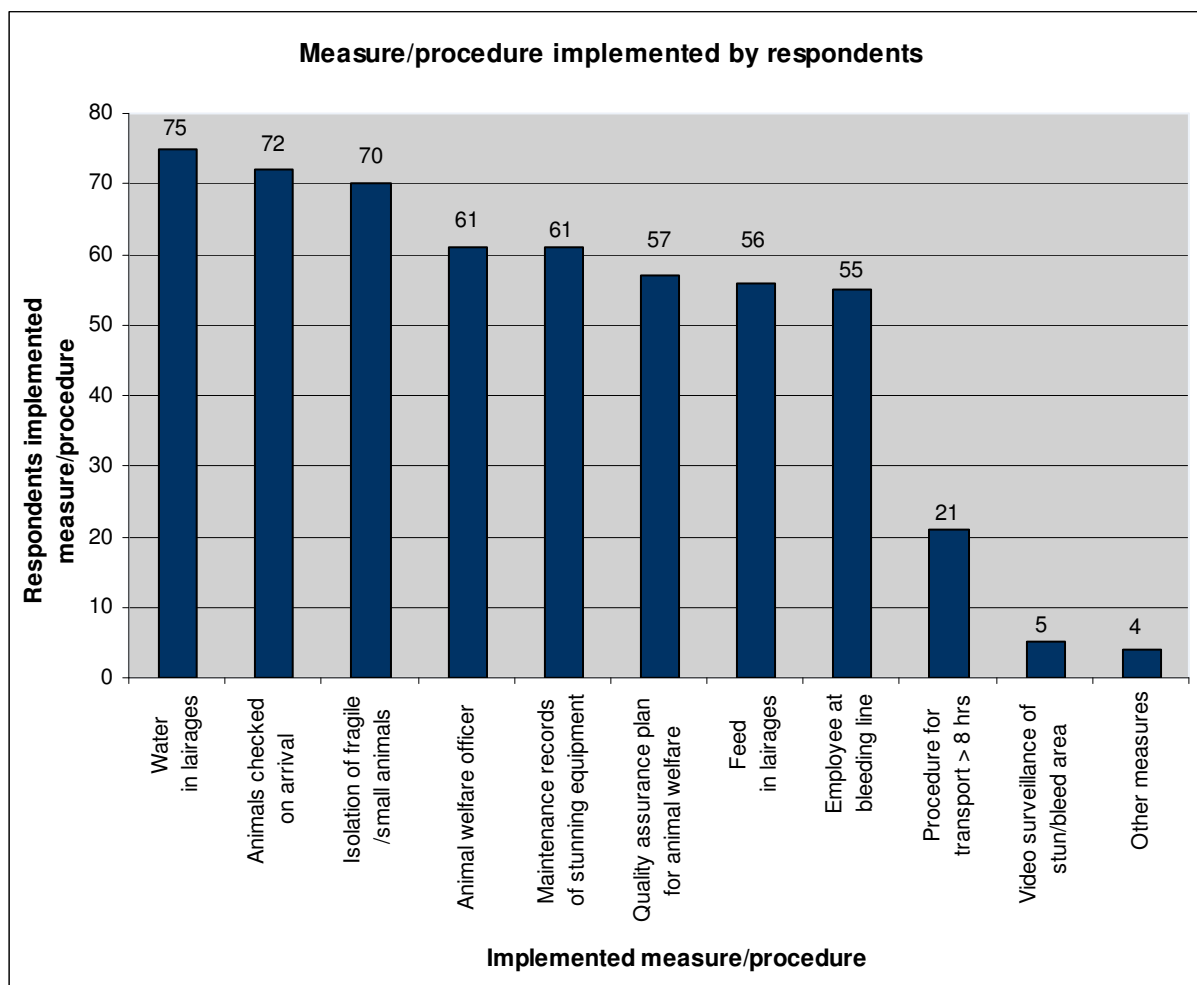
Source: Survey of slaughterhouse operators (n=55).

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

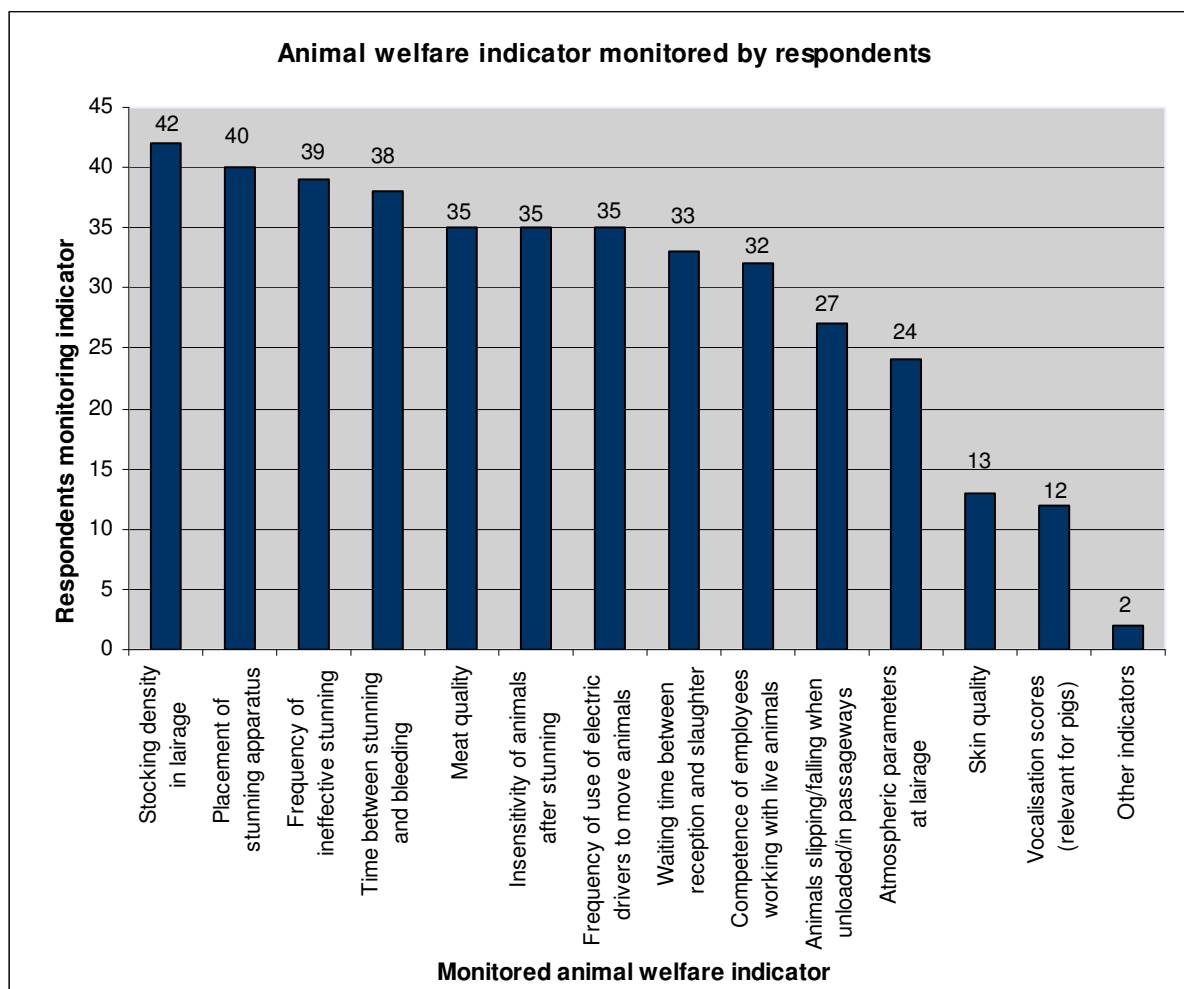
Source: Survey of competent authorities. Table is based on subjective assessment by the competent authorities which limits the possibility to compare answers of different Member States. Assessment refers to poultry and red meat slaughterhouses.

Figure 17: Operational measures/procedures implemented by slaughterhouse operators



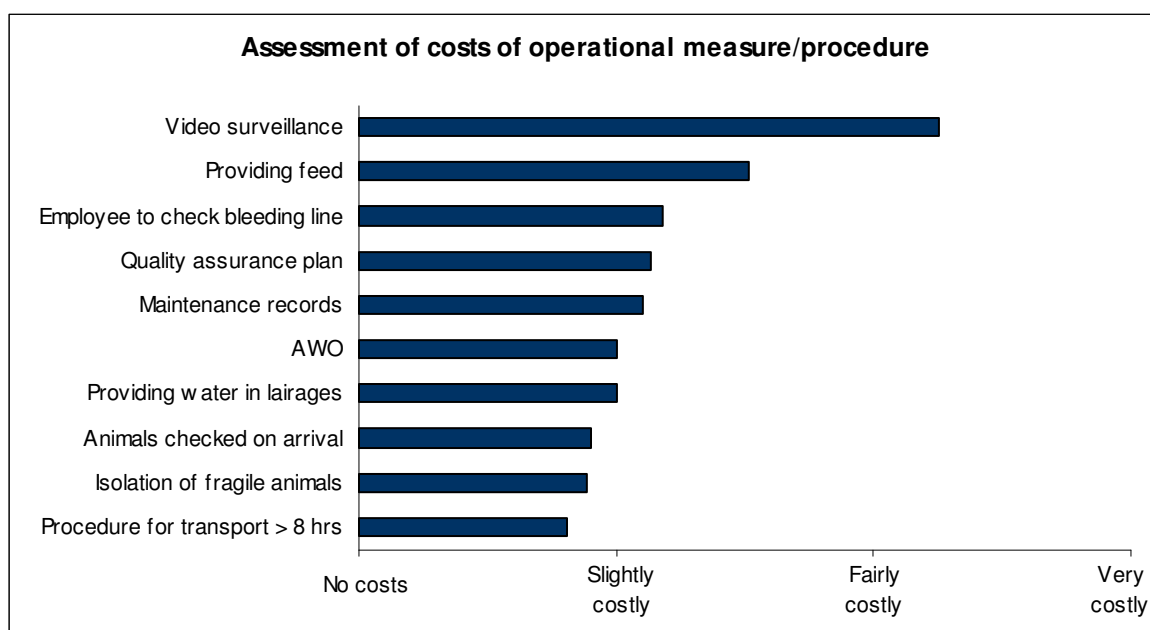
Source: Survey of slaughterhouse operators (n=80).

Figure 18: Number of slaughterhouses monitoring animal welfare indicators



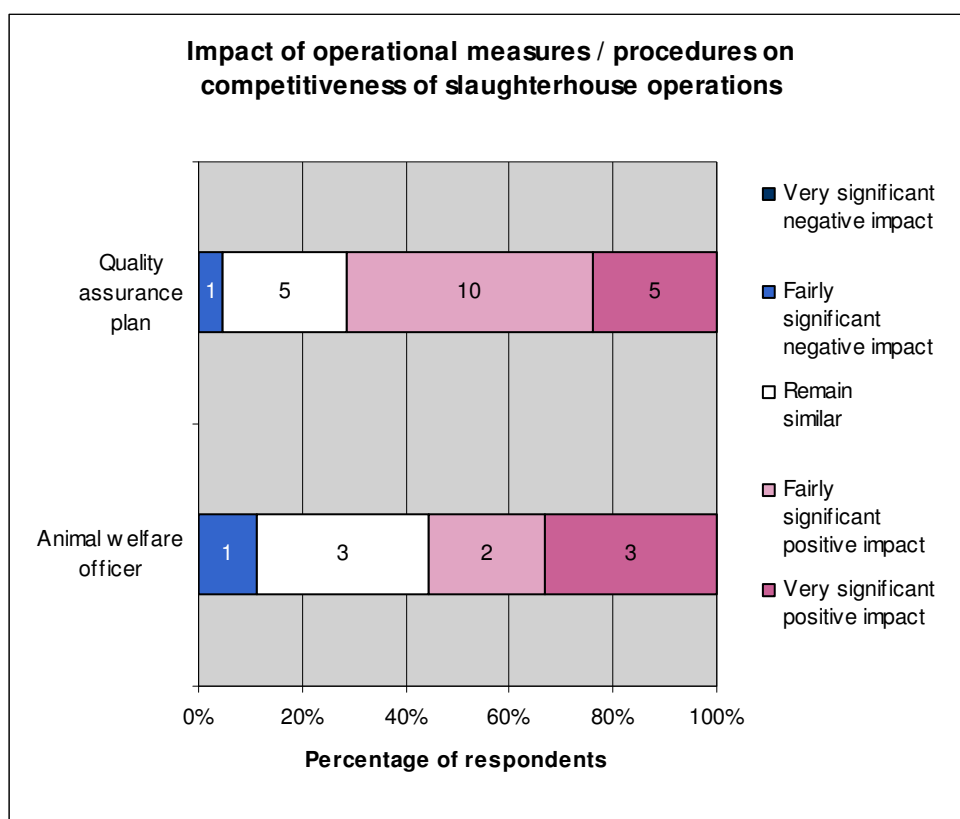
Source: Survey of slaughterhouse operators (n=53).

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



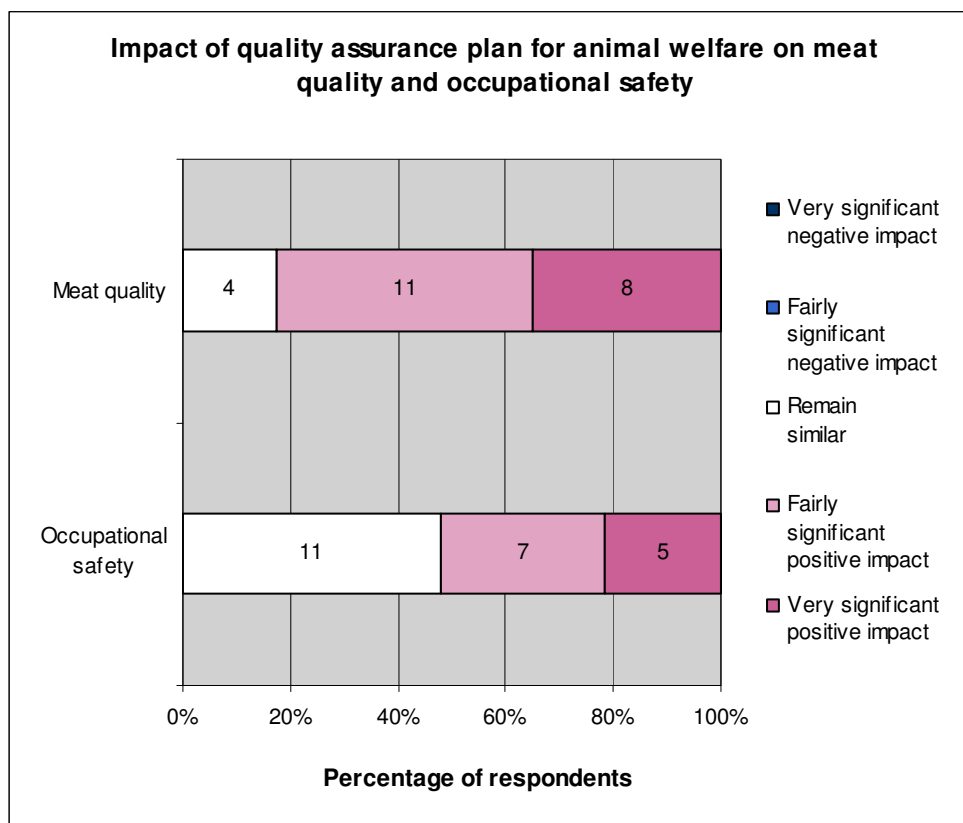
Source: Survey of slaughterhouse operators (n=varies for each measure/procedure, max. 45).

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



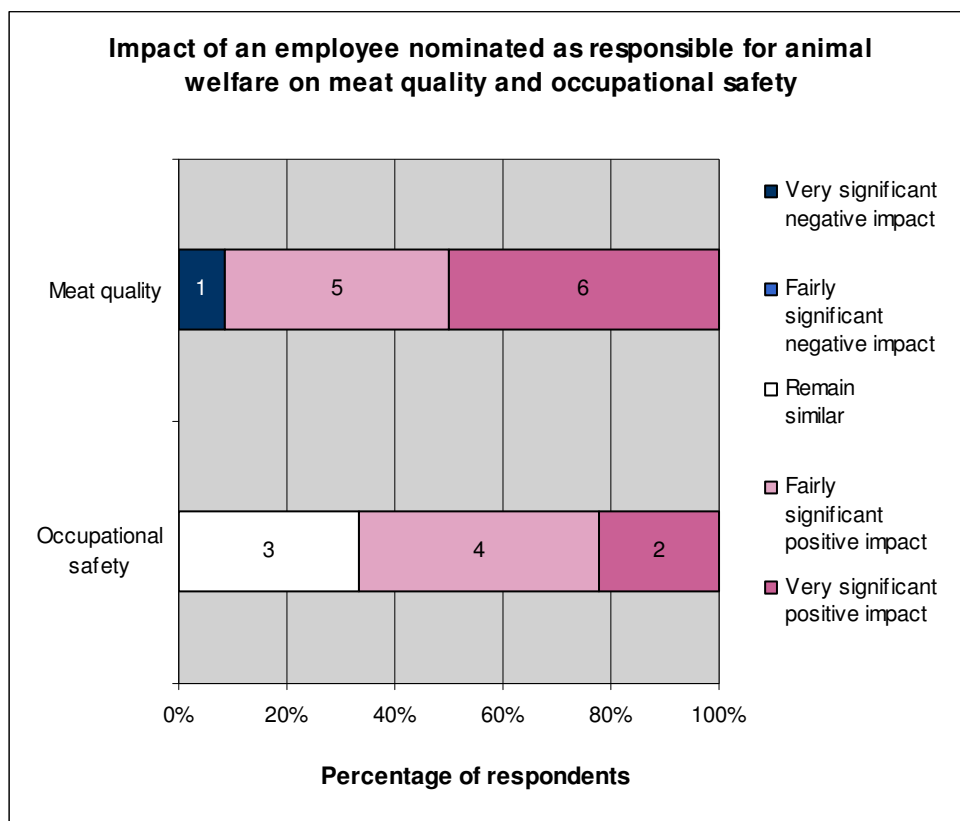
Source: Survey of slaughterhouse operators (quality assurance plan: n=21, animal welfare officer: n=9).

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 (<i>met with twice</i>)	Training and consulting institute	Germany
Eurogroup for Animal Welfare (<i>met with twice</i>)	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) (<i>met with twice</i>)	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) (<i>met with twice</i>)	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 slaughterhouses¹³². 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

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

Study on stunning / killing practices in slaughterhouses: Final Report - Part I: Red meat

DG SANCO Evaluation Framework Contract Lot 3 (Food Chain)

Cattle		
Methods		Description
Stunning		
Mechanical	<i>Penetrating captive bolt</i>	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.
	<i>Non-penetrating captive bolt</i>	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	<i>Head-only stunning (electronarcosis)</i>	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.
	<i>Head-to-body stun/killing method (electrocution)</i>	<p>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).</p> <p>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.</p>
Other		
Bleeding		
Neck cutting	<i>1 carotid artery</i>	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	<i>2 carotid arteries</i>	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		

Study on stunning / killing practices in slaughterhouses: Final Report - Part I: Red meat

DG SANCO Evaluation Framework Contract Lot 3 (Food Chain)

Pigs		
Methods		Description
Stunning		
Mechanical	<i>Penetrating captive bolt</i>	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	<i>Head-only stunning (electronarcosis)</i>	An electrical current is applied across the head to span the brain for stunning.
	<i>Head-to-body stun/killing method (electrocution)</i>	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	<i>Dip-lift stunning system</i>	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.
	<i>Paternoster system</i>	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	<i>1 carotid artery</i>	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	<i>2 carotid arteries</i>	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		

Study on stunning / killing practices in slaughterhouses: Final Report - Part I: Red meat

DG SANCO Evaluation Framework Contract Lot 3 (Food Chain)

Sheep		
Methods		Description
Stunning		
Mechanical	<i>Penetrating captive bolt</i>	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.
	<i>Non-penetrating captive bolt</i>	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	<i>Head-only stunning (electronarcosis)</i>	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.
	<i>Head-to-body stun/killing method (electrocution)</i>	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	<i>1 carotid artery</i>	Severing of 1 major carotid artery in the neck (skin and vessels cut simultaneously).
	<i>2 carotid arteries</i>	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

**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 operational measures/procedures 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	Procedure to check animals on their arrival as to identify weak animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	Procedures to deal with animals being transported over eight hours	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Providing water to animals in lairages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	Providing feed to animals in lairages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	Procedures for isolating/prioritising the slaughter of fragile animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	Keeping maintenance records of stunning equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I	Video surveillance of stunning/bleeding area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
J	Presence of an employee at the bleeding line to ensure that all animals have been cut properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K	<i>Please specify other measures</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 equipment for restraining, stunning or killing of animals shall be adequately designed but no mechanism is requested to implement it.

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.

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%

- 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%

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

**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 main species slaughtered in your plant (only one answer possible):

Cattle ☐

Pigs ☐

Sheep ☐

All questions about “animals” in this section refer only to the main species that you have selected here.

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 the average line capacity for animals (per hour) in your plant?

Please indicate processing speed in animals per hour

b. What is the output 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 / dehidng, 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%) <input type="checkbox"/>	Decrease fairly significantly (savings of 5% - 9%) <input type="checkbox"/>	Remain similar (+/- 4% change) <input type="checkbox"/>	Increase fairly significantly (costs increase 5% - 9%) <input type="checkbox"/>	Increase very significantly (costs increase > 10%) <input type="checkbox"/>
--	---	---	---	---

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	<input type="checkbox"/> hours per employee
Handling animals from lairage to stunning facilities	<input type="checkbox"/> hours per employee
Stunning	<input type="checkbox"/> hours per employee
Bleeding to hoisting	<input type="checkbox"/> 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b	Meat quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	Production costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	Competitiveness of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	Occupational safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f	Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 <u>yes</u> , 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	Assigning an employee to be responsible for overseeing animal welfare (such as an animal welfare officer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	Procedure to check animals on their arrival as to identify weak animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	Procedures to deal with animals being transported over eight hours	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Providing water to animals in lairages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	Providing feed to animals in lairages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	Procedures for isolating/prioritising the slaughter of fragile animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	Keeping maintenance records of stunning equipments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I	Video surveillance of stunning/bleeding area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
J	Presence of an employee at the bleeding line to ensure that all animals have been cut properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K	<i>Please specify other measures</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b	Competitiveness of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	Occupational safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

Comments

15. 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 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 <input type="checkbox"/>	Daily <input type="checkbox"/>	Weekly <input type="checkbox"/>	Monthly <input type="checkbox"/>	Quarterly <input type="checkbox"/>	Don't know <input type="checkbox"/>
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- b. A regular maintenance schedule for stunning equipment:

Yes ☐ No ☐

If yes, please specify the frequency of maintenance:

Daily <input type="checkbox"/>	Weekly <input type="checkbox"/>	Monthly <input type="checkbox"/>	Quarterly <input type="checkbox"/>	Yearly <input type="checkbox"/>	Don't know <input type="checkbox"/>
-----------------------------------	------------------------------------	-------------------------------------	---------------------------------------	------------------------------------	--

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	<input type="checkbox"/> times per year
b	Clients	<input type="checkbox"/> times per year
c	Animal welfare groups	<input type="checkbox"/> times per year
d	Independent auditor	<input type="checkbox"/> times per year
e	If others, please specify	<input type="checkbox"/> 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 <u>yes</u> , 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	Ventilation equipment in lairage facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	Indirect lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	Noise reducers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Blinders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	Lairage is designed to allow a one-way flow of animals from unloading to the point of slaughter (for cattle and pigs only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	Ramp inclination is not steeper than 20 degrees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I	Passageways with curves and no sharp angles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
J	Non-slip flooring in stunning box	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K	Please specify other measures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b	Competitiveness of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	Occupational safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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)	<input type="checkbox"/>	<input type="checkbox"/>
b	Individual stunning box (with head restraint)	<input type="checkbox"/>	<input type="checkbox"/>
c	Other	<input type="checkbox"/>	<input type="checkbox"/>

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 <i>Penetrating captive bolt</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b	<i>Non-penetrating captive bolt</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	Electrical <i>Head-only stunning (electronarcosis)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	<i>Head-to-body stun/killing method (electrocution)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bleeding					
f	Neck cutting <i>1 carotid artery cut</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g	<i>2 carotid arteries cut</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h	Chest sticking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

* 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 yes:

a. What percentage of cattle is ritually slaughtered at your plant without 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 (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)
a	Group stunning pen (electric)	<input type="checkbox"/>	<input type="checkbox"/>
b	Group stunning pen (gas crate)	<input type="checkbox"/>	<input type="checkbox"/>
c	Individual confinement (no conveyer)	<input type="checkbox"/>	<input type="checkbox"/>
d	Individual confinement (with automated conveyer)	<input type="checkbox"/>	<input type="checkbox"/>
e	Other	<input type="checkbox"/>	<input type="checkbox"/>

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)	
		<i>Method in use</i>	<i>Back-up* method</i>	<i>Method in use</i>	<i>Back-up* method</i>
<i>Stunning</i>					
a	Mechanical <i>Penetrating captive bolt</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b	Electrical <i>Head-only stunning (electronarcosis)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c	<i>Head-to-body stun/killing method (electrocution)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d	Gas <i>Dip-lift stunning system</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e	<i>Paternoster system</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Bleeding</i>					
g	Chest sticking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

* 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 automated (i.e., no human intervention during restraining and stunning)?

Yes ☐

No ☐

26. If using electric 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					
aa	Adult pigs (up to 150 kg LW)	<input type="checkbox"/>	<input type="checkbox"/> Hz	..... V	..... A	..... sec	..... sec
ab	Adult pigs (more than 150 kg LW)	<input type="checkbox"/>	<input type="checkbox"/> 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bb	Insufficient duration of application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bc	Excessive increase in the electrical resistance in the circuit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bd	Voltage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
be	Current	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bf	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 calibrator¹:

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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)	<input type="checkbox"/>	<input type="checkbox"/>
b	Individual confinement (without conveyer)	<input type="checkbox"/>	<input type="checkbox"/>
c	Individual confinement (with automated conveyer)	<input type="checkbox"/>	<input type="checkbox"/>
d	Other	<input type="checkbox"/>	<input type="checkbox"/>

If other, please specify

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

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

* 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 yes, what percentage of sheep is ritually slaughtered at your plant without 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					
aa	Lamb	<input type="checkbox"/>	<input type="checkbox"/> Hz	..... V	..... A	..... sec	..... sec
ab	Adult sheep	<input type="checkbox"/>	<input type="checkbox"/> 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bb	Insufficient duration of application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bc	Excessive increase in the electrical resistance in the circuit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bd	Voltage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
be	Current	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
bf	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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:

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 AUTHORITIES

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 BGBI 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	<p>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.</p> <p>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.</p> <p>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.</p>
Denmark	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> - 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 equipment for restraining, stunning or killing of animals shall be adequately designed but no mechanism is requested to implement it.

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	<p>- Article 48, subsection 1, on stunning of ratites</p> <p>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</p> <p>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.</p> <p>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.</p>
Estonia	<p>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.</p> <p>There must also be another stunning means in a slaughterhouse complying with the requirements.</p>
Finland	<p>Development of new equipments is usually made together with slaughterhouses and official veterinarians of the slaughterhouse.</p>
Germany	<p>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.</p>
Hungary	<p>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.</p> <p>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.</p>
Italy	<p>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.</p>
Luxembourg	<p>By official rules</p>
Poland	<p>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:</p> <ol style="list-style-type: none"> 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	<p>The equipment is approved in the same moment of the approval of the slaughterhouse.</p>
Slovenia	<p>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.</p> <p>At approval of establishments, the compliance with certain animal welfare requirements for the restraint and stunning equipment is verified, among other things.</p>

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	<p>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.</p> <p>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).</p>
Spain	<p>Los S.V.O realizan inspecciones para autorizar el funcionamiento del matadero.</p> <p>Los fabricantes conocen la normativa vigente y se ajustan a ello.</p>
Sweden	<p>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.</p>
The Netherlands	<p>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</p>
UK - Great Britain	<p>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.</p>
United Kingdom - Northern Ireland	<p>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.</p>

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.

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	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	<p>1. Workers on slaughterhouses have appropriate qualification (they mainly have a graduation of an agricultural technical college as butcher).</p> <p>2. All employees of FBOs must fulfil a special training given by our service covering minimal requirements of food-hygiene.</p> <p>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:</p> <p>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:</p> <ul style="list-style-type: none"> - 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 competente. 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

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	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 OV's 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 operational measures/procedures 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	

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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

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	<p>poultry slaughterhouses the presence of an employee at the bleeding line is obligatory, in other slaughterhouses it is not obligatory, and not common.</p> <p>Other measures are in place in several slaughterhouses: how to avoid overcrowding in lairaging; how to avoid fighting as much as possible.</p> <p>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.</p> <p>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 '.</p>
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	<p>Procedures to deal with animals being transported over eight hours: Uncommon for animals to be transported for more than 8 hours.</p> <p>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.</p> <p>Animal welfare officer is the most beneficial procedure.</p>

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

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	scrutinised by the National Reference Centre for Animal Welfare of the Experimental Zooprophyllactic 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 (RI 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.

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- 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
Belgium	20%	3%
Spain	5%	10%
Netherlands	5%	5%
Hungary	0%	4.75%
Austria	<i>siehe oben a.)</i>	
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

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	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.

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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 <u>approved</u> 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

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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

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- 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

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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 other, 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 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).

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 <u>yes</u>, please assess how costly the procedure /measure is					
		--- very costly	-- fairly costly	- slightly costly	0 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

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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

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- 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/goats 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%

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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 schlachttätig etwa 5 Tiere
100%
100%
100%
100%
5%
7- 10% / Schlachtttag
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

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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 <u>yes</u> , please assess how costly that has been					
		--- very costly	-- fairly costly	- slightly costly	0 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

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

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	<i>2 carotid arteries cut</i>	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)	
		<i>Method in use</i>	<i>Back-up* method</i>	<i>Method in use</i>	<i>Back-up* method</i>
Stunning					
Mechanical	<i>Penetrating captive bolt</i>	0	7	0	8
Electrical	<i>Head-only stunning (electronarcosis)</i>	2	8	3	4
	<i>Head-to-body stun/killing method (electrocution)</i>	6	0	2	0
Gas	<i>Dip-lift stunning system</i>	5	1	3	1
	<i>Paternoster system</i>	9	0	5	0
Other		0	0	0	0
Bleeding					
Chest sticking		19	4	14	4
Other		3	0	1	0

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- 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

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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
Anstieg 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

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g. Do you use an electrical stunning calibrator¹:

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.

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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

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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

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

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<i>Bleeding</i>					
Neck cutting	<i>1 carotid artery cut</i>	5	1	5	1
	<i>2 carotid arteries cut</i>	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

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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

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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 longues ?
 - ✓ 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 à 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 % CO2
 - ✓ 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 Slagtermestre 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

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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