Competitiveness of the UK egg sector, base year 2018

International comparison of production costs

P.L.M. van Horne

WAGENINGEN
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British Egg Industry Council

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Companies in the UK egg sector have to comply with EU legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a comprehensive high quality production, it also confronts the sector with additional costs. Countries outside the UK and the EU do not have the same extensive legislation. This report presents the results of a study on the competitiveness of the UK egg sector. The production costs for eggs and egg products are calculated for the UK and several EU and non-EU countries. Different scenarios are outlined to illustrate the impact of changes in import levies and exchange rates.

Key words: competitiveness, eggs, egg powder, production costs, international trade, UK, EU

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Contents

Preface

Companies in the UK egg sector have to comply with EU legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a comprehensive high quality product, it also results in the sector facing additional costs. An example of legislation is Council Directive 1999/74/EC regulating minimum standards for the housing of laying hens in enriched cages, barn and free range systems. Countries outside the UK and the EU do not have the same extensive legislation. At the same time the UK and EU are involved in bilateral trade negotiations with different partners – among them India, Mercosur and the USA - which are intended to further liberalise trade by reducing or abolishing import levies. This causes concerns within the UK egg sector regarding its competitiveness. The Deep and Comprehensive Free Trade Agreement with Ukraine is an example of this. It is noted that there has been little progress in the WTO Doha Development Round multilateral trade negotiations, hence countries are currently focusing on bilateral trade agreements.

In this report Wageningen Economic Research, an independent research institute of Wageningen University & Research in the Netherlands, presents the results of a study on the competitiveness of the UK egg sector. The production costs for eggs and egg products are calculated for the UK and several EU and non-EU countries using data from the year 2018. Based on these data, different scenarios are outlined and their effects are calculated to illustrate the impact of lower levies and changes in exchange rates.

The study has been initiated and funded by the British Egg Industry Council (BEIC). We thank BEIC for their cooperation.

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Summary

S.1 Executive summary

In this report the impact of reducing or removing import levies on the competitiveness of the UK egg sector is studied, for both shell eggs and whole egg powder. For shell eggs, it is not expected that the import from non-EU third countries to the UK imports will become substantial, because of the costs of transportation and the effect on product quality and safety. In contrast, for whole egg powder, severe competition from third countries can be expected with reduced import levies.

Current UK/EU import levies on whole egg powder provide protection for the UK and EU egg sector. In a scenario with 50% lower import levies, Ukraine and the USA have a lower offer price of whole egg powder[1] compared to the UK. In a scenario with 50% lower import levies combined with a 10% lower exchange rate, all non-EU countries have a considerably lower offer price of whole egg powder compared to the UK egg sector.

Figure S.1 provides the offer price of whole egg powder in the UK,[2] compared to Ukraine, the USA, Argentina and India. The offer price is the price at which whole egg powder can be offered in Birmingham, and includes primary production costs, transportation costs and import levies. Figure S.1 shows that import levies protect the UK from large volumes of imports from third countries, because the offer price of whole egg powder with the current import levies from most non-EU countries is above the offer price of UK producers. However, egg powder from the USA and Ukraine could almost compete, despite the full import levies. The offer price of egg powder from the USA is slightly below the level of the producers in the UK.

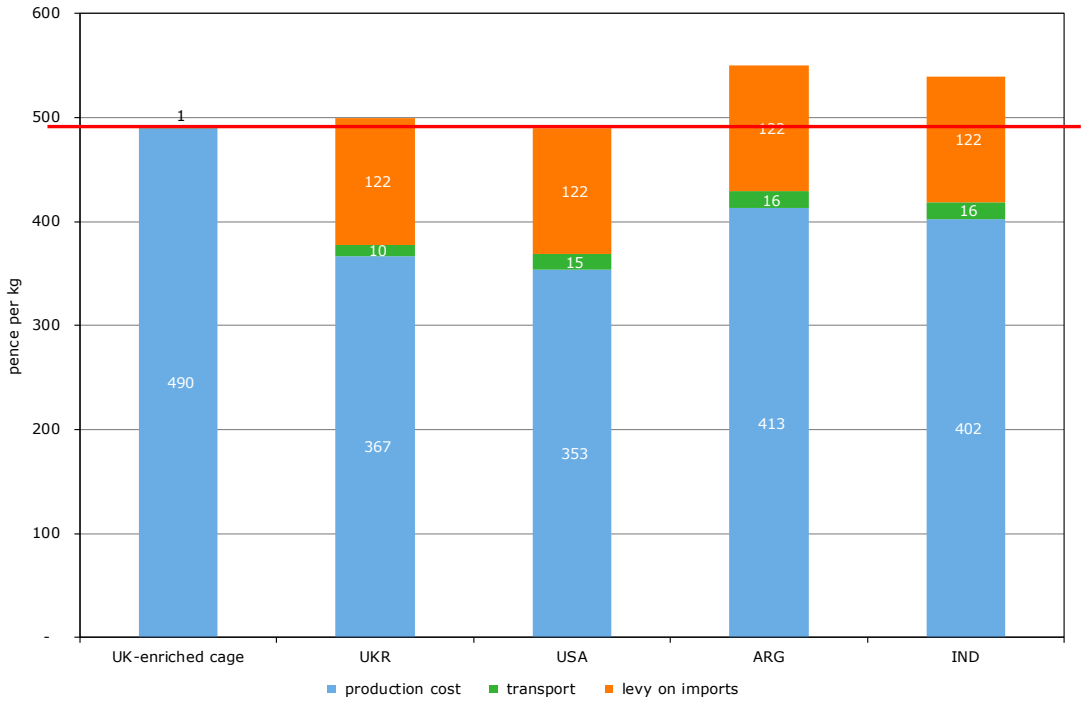

Figure S.1 *Offer price in Birmingham of whole egg powder from enriched cage system eggs produced in the UK (horizontal line) and conventional cage system eggs produced in Ukraine, USA, Argentina and India in pence per kilogram in 2018*

[1] After the removal of the shell and drying of the egg contents.
[2] It is noted that the UK does not currently produce egg powder, but for comparative purposes, it is assumed that powder is produced in the UK.

Figure S.2 illustrates the 'worst-case scenario' with no import levies and a 10% devaluation of the exchange rates for the non-EU currencies. Offer prices in Birmingham were estimated to be 21% (Argentina) to 31% (Ukraine) and 32% (USA) below the offer price from UK producers. All non-EU countries would be very competitive suppliers of whole egg powder to the UK market. Large volumes of whole egg powder can be expected to be imported from these countries.

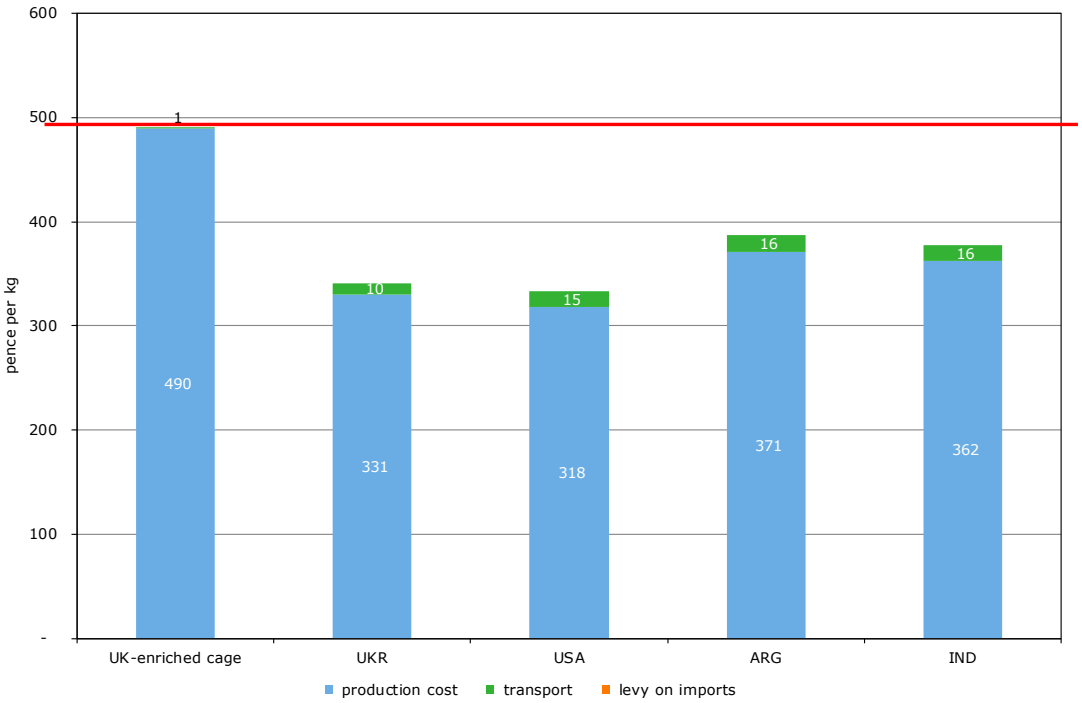

Figure S.2 *Offer price in Birmingham of whole egg powder from enriched cage system eggs produced in the UK (horizontal line) and conventional cage system eggs produced in Ukraine, USA, Argentina and India in pence per kilogram without import levies and 10% lower exchange rate of the third countries' currencies compared to the UK pound (base year 2018)*

S.2 Complementary findings

The production costs of shell eggs produced in enriched cages in the UK in 2018 was on average 81 pence per kg of eggs. Between the main egg producing countries in the EU, the production costs of shell eggs in 2018 ranged from 89 pence in Denmark to 74 pence per kg of eggs in Poland. Compared to the cost level in the UK, the production costs for shell eggs in 2018 were lower in USA (-32%), Ukraine (-27%), Argentina (-18%) and India (-17%).

For whole egg powder the non-EU countries were even more competitive. Compared to the average level in the UK, the production costs of whole egg powder in 2018 were lower in the USA (-28%), Ukraine (-25%), India (-18%) and Argentina (-16%). Because the costs of transportation of powder are low after the liquid content is removed, the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the UK from imports from non-EU countries.

In the UK, egg producers have to comply with European legislation covering environmental protection, animal welfare and food safety. The additional costs directly related to European legislation are estimated to be 16% of the total production costs of eggs at farm level. Most of these additional costs are because of enriched cages (additional living space and other enrichments).

In Argentina, India and Ukraine there is no legislation on animal welfare and laying hens are housed in conventional cages with a space allowance of 400 to 450 cm^2 per hen. In the USA there is no federal legislation on laying hen welfare. Between countries, regions and farms the stocking density differs

due to climate and management strategy. Table S.1 gives an overview of the regulations and political and societal interest of environmental, food safety and animal welfare issues in four selected non-EU countries.

Table S.1 *Regulation in selected non-EU countries (Ukraine, USA, Argentina and India)*

	Political and societal interest	Regulations in place	Situation in practice
Environment			
-Manure disposal	Medium	Differs [1]	Most farmers receive revenues from manure
-Ammonia emission	Low	No	No measures taken to limit emission
Food Safety			
-Zoonosis control	Medium	Differs [2]	Action different per country/company
-Meat-and-bone-meal	Low	No	Meat-and-bone-meal is used
-GMOs	Low	No	All GMOs are used
Animal Welfare			
-Stocking density	Low [3]	No [3]	High density in conventional cages

1. Regulations in some regions, for example in the USA.

2. Regulations in some countries, for example in the USA or only export-oriented companies.

3. In the USA the market is changing towards non-cage eggs. Some states (e.g. California) already have legislation.

S.3 Methodology

Egg producers in the UK have to comply with EU legislation dealing with environmental protection, animal welfare and food safety. The result of all this legislation is an increase in the cost of producing eggs. After the UK leaves the EU ('Brexit') the UK will open negotiations with non-EU countries with a view to liberalising trade in agricultural products. In this report, Wageningen Economic Research studied the impact of reducing or removing import levies on the competitiveness of the UK egg sector.

The production costs of shell eggs and whole egg powder were calculated for the United Kingdom and seven EU egg producing countries: Germany, France, the Netherlands, Spain, Italy, Poland and Denmark and four non-EU countries: Ukraine, the USA, Argentina and India. In all countries, data were collected on prices (feed, young hens), technical results (egg production, feed intake, mortality), investment (poultry house, cages) and other costs (interest rate, labour, manure disposal). For egg processing, data were collected on investment in buildings, equipment and labour costs. The base year for the data was 2018. The total costs were converted to Pound sterling with the average exchange rate in the year 2018. Account was taken of the implementation of enriched cages in the EU, being the minimum standard for egg production from 2012.

Based on the 2018 situation four scenarios were developed:
- 50% reduction in import levies for eggs and whole egg powder, to illustrate the result of any multi - or bilateral agreement.
- 10% lower exchange rate of the third countries' currencies compared to the UK pound.
- Combination of a 50% reduction in import levies and 10% lower exchange rates.
- 'Worst case' scenario based on no import levies and 10% lower exchange rates.

1 Legislation

1.1 Introduction

This chapter provides an overview of legislation in the UK/EU. Poultry farmers and other food business operators in the production chain in the UK/EU have to comply with this European legislation. This legislation is the translation of societal and political choices made in the UK/EU and its standards and demands may exceed international standards and practices. Most UK/EU legislation relates to environmental protection, animal welfare and food safety. Section 1.2 gives an overview of the most important legislation. Section 1.3 presents the additional costs of alternative housing systems for laying hens. Section 1.4 presents the economic impact of the legislation while Section 1.5 gives a short overview of the current situation of (animal welfare) legislation in some third (non-EU) countries. Although all links in the supply chain are confronted with legislation, this chapter mainly focuses on the situation and consequences at farm level.

1.2 UK/EU Legislation

Egg producers in the UK / EU have to comply with a set of European legislation. This legislation mainly relates to environmental protection, animal welfare and food safety. In this section, UK / EU legislation directly relevant to the egg sector is briefly presented. It should be noted that some Member States choose to go beyond EU standards by implementing more stringent national or regional legislation. This national legislation is not, or just briefly, discussed in this chapter. In a report of the European Parliament an overview is given of EU legislation related to the livestock sector (Chotteau et al., 2009).

Environmental protection
The EU has taken measures to limit the pollution of land, water and air. The main environmental legislation affecting poultry production in the UK/EU is the Nitrates Directive (91/676/EC). The Nitrates Directive aims to control pollution and protect water quality, by preventing nitrates from agricultural sources from polluting ground and surface waters and by promoting the use of good farming practices. The Nitrates Directive forms an integral part of the Water Framework Directive and is one of the key instruments to protect waters against agricultural pressures. The Directive has established action programmes to be implemented by farmers, such as limitation of fertiliser application and/or a maximum amount of livestock manure that can be applied per hectare per year (170 kg of nitrogen). Some countries have additional national environmental legislation to limit manure spreading to certain periods or specific soil types. This is especially relevant in areas with a high concentration of pigs and poultry, such as the south and east of the Netherlands, Flanders in Belgium, Bretagne in France, Catalonia in Spain, and the Po valley in the north of Italy. Because of this legislation, poultry farmers in these regions have to pay for the disposal of manure (Van Horne, 2012).

In the UK/EU, all poultry farms which exceed a threshold size of 40,000 bird places are requested through legislation to hold an environmental permit (Directive 2010/75). Operators are required to carry out activities in compliance with their environmental permit and they must use 'Best Available Techniques' (BAT) in order to achieve a high level of environmental protection (ADAS, 2016). The aim of the Directive is to apply the best available techniques to prevent or to reduce ammonia or other emissions to air, land and water from these activities, since pollution from poultry houses need to be controlled. In Directive 2011/92 it is regulated that poultry farms need to have an Environmental impact assessment (EIA). This is required for all larger farms. Smaller farms may also require such an assessment at the discretion of the Member State. A fee is charged to cover the costs of the assessment. The Directive also requires an odour or noise management plan in case of potential odour or noise complaints (Van Wagenberg et al., 2012). In addition, Directive 2001/81/EC gives National Emission

Ceilings to ammonia emission for every Member State. Some countries, such as the Netherlands and Germany, have additional national regulations to reduce ammonia emissions from poultry houses.

The UK and EU countries have to meet maximum limit values for certain substances to ensure air quality, following Directive 2008/50/EC. The Directive offers 3- or 5-year extensions to comply with the maximum limit values based on conditions and the assessment by the European Commission. Several EU Member States will have to take measures to reduce emissions of fine dust from the most important sources, such as poultry houses, in which the dust arises from feathers, bedding material and manure (Aarnink and Ellen, 2008). National authorities can set emission standards for fine dust from poultry houses based on the BAT. Examples are the Netherlands and Germany with legislation for poultry farms to control the emission of fine dust.

On 27 October 2003, the European Union's Council of Ministers adopted The Energy Taxation Directive (2003/96/EC), restructuring the European Community framework to tax energy products and electricity. The Directive widens the scope of the EU's minimum rate system for energy products, previously limited to mineral oils, to all energy products, including coal, natural gas and electricity. The taxation leads to an increase in energy prices for poultry farmers, resulting in higher costs of electricity.

Food safety and public health
The European legislation on animal feed provides a framework to ensure that feedstuffs do not endanger human or animal health. The legislation sets rules on the circulation and use of feed materials, requirements for feed hygiene, rules on undesirable substances in animal feed, legislation on genetically modified food and feed, and conditions for the use of additives in animal nutrition. For example, in the UK/EU the use of meat-and-bone meal in poultry feed is still banned. The consequence is higher costs for poultry feed. A large proportion of protein sources for poultry feed is imported from outside the UK/EU. An increasing share of world production of soya crops is from genetically modified hybrids. The asynchronous EU approval of GM crops, coupled with the operation of almost zero tolerance, is negatively affecting the UK/EU supply of feed ingredients (Backus et al., 2008), resulting in higher feed costs.

Foodstuffs of animal origin may present microbiological and chemical risks. Such risks require the adoption of rules of hygiene, traceability and labelling. For the egg sector, the Zoonoses Directive is especially relevant. Zoonoses Directive 2003/99/EC and Regulation 2160/2003 regulate sampling, monitoring and control measures. Between the UK and other Member States, there is a large variation in Salmonella prevalence. In response to the European Food Safety Authority (EFSA) baseline study, the UK and each Member State had to make a plan to reduce the salmonella prevalence in laying flocks.

Animal welfare
All Member States have ratified the European Convention for animal protection with principles relating to animal housing, feed and care appropriate to their needs (98/58/EC). The aim is to prevent animals from all unnecessary suffering in three main areas: farming, transport and slaughter. Minimum standards are established to protect and to avoid competition distortions between producers in the UK and various Member States.

In the UK and EU, all mutilation is prohibited (annex of Directive 99/74/EC). However, in order to prevent feather pecking and cannibalism, Member States may authorise beak trimming provided it is carried out by qualified adult staff on chickens that are less than 10 days old.

Especially relevant for the egg sector is Directive 99/74/EC, laying down minimum standards for the protection of laying hens. The welfare Directive required that from 1 January 2003 the space allowance per hen in conventional cages increased from 450 cm^2 to 550 cm^2 per hen. From 2012, the use of conventional ('battery') cages was banned. Laying hens can only be kept in enriched cages or alternative (non-cage) systems. The enriched cage gives each hen 750 cm^2 surface area, increased cage height, a perch, a nest box and litter. Since this change towards enriched cages has large consequences for the sector, resulting in high additional costs, the impact of this Directive is discussed in Section 1.3.

1.3 Costs of alternative housing systems

The welfare Directive 99/74/EC required that from 1 January 2012 laying hens are housed in enriched cages or in alternative (non-cage) systems. The alternative system described in the EU Directive most resembles the barn/aviary system. Two different housing systems can be distinguished:

- Enriched cages
  In comparison to conventional battery cages, the group size is enlarged. The enriched cage gives each hen 750 cm^2 surface area, increased height, a perch, a nest box and litter.
- Barn/Aviary systems
  This system is based on floor accommodation (comparable to barn housing) whereby via levels, the hens can also use the vertical space in the house. Each hen has 1,100 cm^2 of usable area, part of the surface area of the house is covered with litter and in the house, there are enough nest boxes and perches for the hens.
- Free range systems
  The housing system is the same as for barn/aviary systems, but in free range systems, the birds have access to the outside range area during daylight hours.

To calculate the additional production costs of eggs we compare three different housing systems: a conventional cage with 550 cm^2 per hen, an enriched cage and the non-cage system, based on the barn/aviary system. Based on results at research stations, field data of layer farms in different countries and expert opinions, assumptions were made on labour input and investments for enriched cages and barn/aviary systems. It is evident that increasing the space allowance per bird will lower the bird density per m^2 of poultry house. As a result, the investment for housing and equipment will increase. For the enriched cage and the barn/aviary, the labour needs and investments for house and equipment per hen place are higher. Table A1.1 in Appendix 1 provides the details.

Based on the field data of layer farms, it can be concluded that there are no major differences between the conventional and the enriched cage regarding egg production, mortality and daily feed intake. In barn/aviary systems egg production is slightly lower and feed intake and mortality are higher than in the cage system. Table A1.2 in Appendix 1 gives the details.

The costs for housing and equipment are calculated for all housing systems. The other variable costs are also calculated for each system (electricity, litter, etcetera). Table 1.1 provides the results. In enriched cages the costs are higher for other variable costs (because of the use of litter material), housing and labour. In the barn/aviary system all cost components are higher and the revenue for the spent hen is slightly lower (due to a higher mortality). In the enriched cage, the production costs compared to the situation before 2012 (conventional cage accommodation with 550 cm^2 per hen) are 6% higher. In the barn/aviary system this is +23%.

Table 1.1 *Production costs (in Pound sterling) for various housing systems for laying hens (situation Northwestern Europe, prices spring 2017)*

	Conventional cage	Enriched cage	Barn/Aviary
Cost (in pound sterling) per hen housed:			
Hen (pullet at 17 weeks)	3.17	3.17	3.57
Feed	10.43	10.43	11.33
Other variable costs	1.05	1.23	1.13
Housing	1.75	2.48	2.96
Labour	0.79	0.84	1.53
General costs	0.22	0.23	0.37
Revenue spent hen	-0.24	-0.24	-0.24
Total cost	17.17	18.15	20.66
Total cost per egg (pence)	4.30	4.54	5.29
Total cost per kg (pound sterling)	0.69	0.73	0.85
Increase (base 550 cm^2), %		6	23

The conclusion is that after implementation of EU Council Directive 99/74/EC, the housing system with enriched cages produces eggs at the lowest cost. Compared to the situation with conventional cages (before 2012), the production costs of eggs are 6% higher. The production costs in aviaries are higher compared to enriched cages. This means the market price should be higher to keep the income for the egg producer at a constant level. In this context, it has to be mentioned that other alternative housing systems, such as free range and organic, have even higher production costs than enriched cages and aviaries. Eggs produced in these systems need an even higher premium from the market to compensate the egg producer for the additional costs.

1.4 Economic impact of legislation

As has been described in Section 1.2, during the last two decades the UK/EU laying hen sector has been subjected to more stringent environmental protection, animal welfare and food safety legislation. This legislation can result in additional production costs for laying hen producers in the UK/EU. For the following aspects, an estimate was made of these additional costs:

Environmental protection
- Manure disposal costs (as result of the Nitrate directive).
- Reduction of ammonia emissions (at manure application, manure storage and in the poultry house).

Food safety
- Salmonella control. Costs of hygiene measures, collection of samples and testing, and vaccination.
- Meat-and-bone meal (MBM). The ban on the use of meat-and-bone meal in the EU results in higher feed costs.
- Genetic Modified Organisms (GMO). The strict rules in the EU on the use of GMO crops results in higher feed costs.

Animal Welfare
- Beak trimming. Beak trimming of layers in the UK is only permitted at day-old using infra-red beak treatment technology (up to 10 days in many EU countries). Compared to the situation without any legislation, in which beak trimming would take place at six weeks, there will be additional feed costs (higher feed intake during rearing) and higher mortality rates.
- Density. Additional housing costs for increasing the space allowance per hen from 450 cm^2 to 550 cm^2.
- Enriched cages. Costs of conversion from conventional to enriched cages.

In this study the costs were estimated for the year 2017,based on the average situation in the UK and other illustrated EU countries using the method described by Van Horne (2012). It should be stated that there can be a difference in the actual situation per region in these countries. Manure disposal costs are an example for this, with high costs in certain high poultry concentration regions and low, or no costs at all, in other regions with a small number of poultry farms. Figure 1.1 provides all the cost components of the specific legislation. The additional costs directly related to UK/EU legislation are 16% of the total production costs of eggs for the situation in 2017.

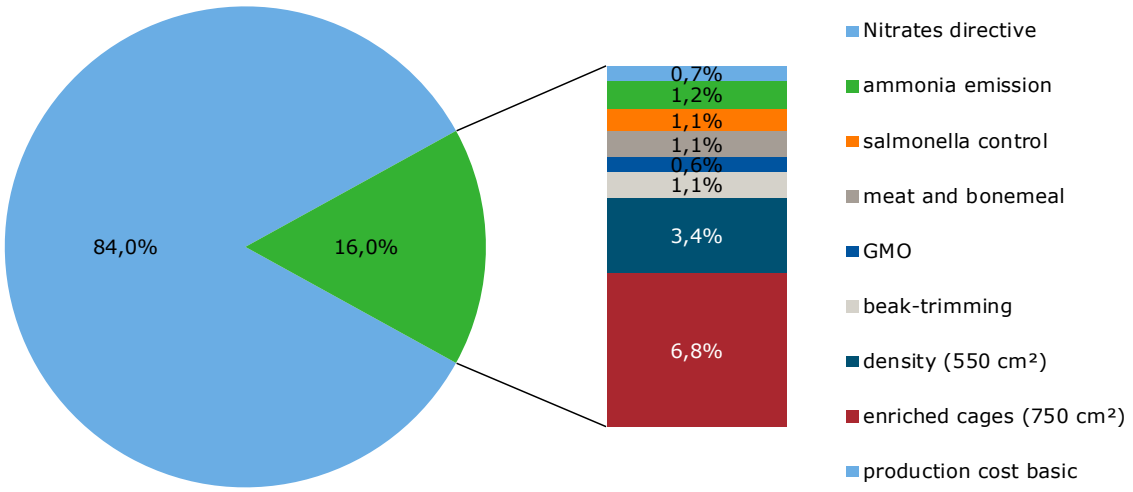

Figure 1.1 *Basic production costs (84%) and costs directly related to EU legislation (16%) in 2017*

Animal welfare legislation gives the largest increase in production costs, comprising 71% of the additional costs. This is mainly caused by an increase in the space allowance from 450 cm^2 to 550 cm^2 (43% of the additional costs) and the requirement to use enriched cages (21%). Food safety and public health legislation cause 18% of the additional costs, mainly through the ban on the use of meat-and-bone meal in animal feed and salmonella control. Finally, environmental protection legislation causes 11% of the additional costs, mainly due to ammonia emission reduction requirements.

Next to this legislation implemented EU wide, several EU Member States have adopted or are planning to adopt additional legislation on animal welfare and public health. Examples are reduction of fine dust emission (Germany and the Netherlands) and a ban on beak trimming (Germany and the Netherlands). Such more stringent national legislation could further increase the production costs of laying hen producers.

1.5 Situation in some third countries

Several reports give an overview of legislation in selected third countries. Van Wagenberg et al. (2012) extensively studied the standards on food safety, environment and animal welfare in several non-EU countries. A study at Wageningen UR (Bracke, 2009) focused on animal welfare regulations and husbandry standards in the poultry sector with special attention for the poultry sector in Brazil and the USA. Also, Van Horne (2012) mapped the situation in the USA, India, Ukraine and Argentina in the egg layer sector. More recently Lichter and Kleibrink (2016) did an extensive analysis on standards for poultry production in 16 important poultry producing countries worldwide.

In general, non-EU countries do not have, or have limited, legislation on environmental protection, food safety, and animal welfare. In some countries, for example the USA, the standards for food safety and animal health are considered by some to be equivalent to those in the UK/EU. Nevertheless, standards between the UK/EU and third countries do differ with regard to the type of veterinary drugs allowed and GMOs that are approved. Specifically for animal welfare, research shows that the UK/EU standards are the highest in the world with detailed and strict regulations to protect the welfare of poultry (Lichter and Kleibrink, 2016).

In most third countries, the standards for the environment and animal welfare are lacking or the standards are lower than they are in the UK/EU. These topics are not incorporated or only marginally incorporated into trade agreements. Internationally accepted conventions or standards exist for food safety (Codex Alimentarius), animal health and animal welfare (World Health Organisation for Animal Health - OIE), but do not exist for the environment. OIE codes are a recommendation to its members

and the OIE has no power to force their members to follow the recommendations or standards laid down in the codes. Food safety and animal health are important aspects in negotiating and establishing trade agreements, but the environment and animal welfare are not, or are not high on the agenda (Van Wagenberg et al., 2012).

Important exporters of eggs and egg products to the EU are USA, India, Argentina and Ukraine. These countries have less stringent food safety regulations than the UK/EU. For example, they do not have the ban on the use of meat-and-bone meal in poultry feed and have less or no restrictions on the use of GMO crops as ingredients in poultry feed. Furthermore, these countries have no or limited environmental protection legislation, partly because it is not needed. Because animal welfare legislation is the main cause for the additional costs related to legislation, we give a more detailed overview of the animal welfare legislation and standards in these countries. This is complemented with a summary of the main characteristics of the egg sector and the export position in these countries.

USA

Egg production in the USA is mainly concentrated in the Mid-West. In the commercial egg sector numerous independent producers are marketing on a local basis, applying price competition as a major component of their marketing strategy. The top 20 egg producers have in total 230 million layers, representing 80% of the sector. These companies have the 'economies of scale' and have a high efficiency in production, marketing and distribution. The USA is a large exporter of eggs and egg products.

The issue of animal welfare has become a more significant consumer concern in the USA in recent years. Although there is minimal legislation with regard to laying hen welfare, the producers' organisation United Egg Producers (UEP), has established voluntary guidelines to improve the welfare of laying hens. The guidelines include provisions for more space for layers in cages, conditions for moulting and standards for beak trimming. Within the UEP programme the birds have more space in the cage. The space allowance per bird is 432 cm^2 for white layers. White layers constitute 93% of the total layer population. Participating producers will be audited annually through an independent certification programme. At this point the market for alternative (non-cage) eggs in the USA is around 14% (IEC, 2018). There is no federal legislation in the USA governing laying hen welfare. A proposal for federal legislation in 2011 to replace conventional cages by enriched cages (similar to UK/EU standards), after a transition period of 15 to 18 years, was not accepted by the government. Some individual States have animal welfare legislation. For example, the State of California has additional legislation for the housing of layers. Also, some other states, with no significant production of eggs, have some kind of legislation with various effective dates. In 2015 almost all major retailers, foodservice and food companies announced to purchase only cage-free shell egg and egg products by the year 2020 or 2025. This change in market demand is expected to increase the share of layers kept in enriched cage or non-cage systems to around 60% in 2025, although it is suggested that this transition might not happen on time.

Ukraine

After Ukraine became independent in 1991 the principles of the free market economy were introduced. Since the egg sector was privatised in 1998, it has shown remarkable progress. Although all major laying breeds can be found in the country, bird performance often lags behind their capabilities. However, in recent years performance has improved as a result of better management, improved feed quality and a modern health service. Two large companies with each millions of layers dominate the egg market in Ukraine: Ovostar and Avangard. Ukraine exports grew rapidly in recent years and in 2016 Ukraine was the dominant supplier of eggs and egg products to the EU.

In Ukraine there is no governmental legislation for a minimum space allowance for laying hens. It is estimated that on the farms the hens have between 400 and 450 cm^2 per bird. The Ministry of Agriculture has the objective to adapt national legislation on animal welfare to the standards of the UK/EU. The exact time schedule is not known, but the year 2020 was mentioned (ITAVI, 2016).

Argentina
The egg sector in Argentina is growing steadily in terms of production, value and exports. In 2018 Argentina had 42 million layers. Beside the production of shell eggs, Argentina also has a growing egg processing sector. The egg sector has contributed to reversing the country's situation from being an importer of egg products to being an important exporter.

No legislation regulating specific animal welfare practices for laying hens exists in Argentina. In 2009 a survey was conducted and interviews with producers and businessmen in the egg sector were held. The survey was undertaken by the University of Buenos Aires and included 30 operations (UBA, 2009). Factors directly related to layer welfare include space allowances and methods of beak trimming. All farms in the survey kept layers in cages. The type of cage differed between farms. The average space allowance was 372 cm^2 per hen. However, there was a wide range from 278 cm^2 (8 companies) to 500 cm^2 per hen (1 company). All surveyed farms used pullets that had their beaks trimmed. The average age at which this was performed was 12 days with a range of 6 to 28 days. The beak trimming also differed in how much of the beak was trimmed, with the majority of farms trimming between one quarter and one third of the beak. A report from Wageningen UR (van Horne et al., 2010) gives an extensive overview of the animal welfare situation in the layer, broiler and pig sector in Argentina.

India
India is a large egg producer and exports shell eggs and dried egg products. A number of egg powder plants have been developed for export. There are 20,000 farms around the country. The farm size varies from 5,000 birds per farm to a maximum of 500,000 birds. Most of the farms keep laying hens until 76 weeks of age and forced moulting is not practiced in India. Although western breeds are used in India, the local breed BV-300 has a high market share. This breed is completely acclimatised to the Indian agroclimatic and feed conditions, resulting in high egg production.

Most commercial layers kept on modern farms have open-sided houses where birds are housed in 3 to 4 rows and three-tier conventional cages. The standard cage size for 3 birds is 37.5 cm by 30 cm. The space allowance is 375 cm^2 per bird. This is much lower than the current UK/EU standard of 750 cm^2 per bird. Animal welfare standards do not exist. Animal welfare is not an issue for the government in India and in real life improving animal welfare is limited by the poverty of a great part of the population and the life philosophy within the Hindu culture (Bracke, 2009). The growing population in India will increase the local market for eggs, making export efforts unnecessary for Indian producers. However, some of the larger companies are exporting egg powder to the UK/EU and Japan.

2 Production costs of eggs in the UK and selected EU countries

2.1 Production costs of enriched cage eggs

The production costs of shell eggs produced by hens housed in enriched cages has been researched for the following countries: the United Kingdom (UK), the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). All of these countries, apart from Denmark, are important egg producing countries within the EU. The results presented in this chapter relate to the year 2018. All costs in this report are given in pound sterling.

2.1.1 Production costs at primary farm

Figure 2.1 and Table 2.2 provide an insight into the build-up of primary production costs. Table 2.1 provides the data used in the calculations. The production costs can be divided into six components: hen (costs of young hen at 20 weeks, less the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (costs of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general (book-keeping, clothing, insurance and, if relevant, manure disposal costs). The costs of primary production (in pence per kilogram of eggs) are the highest in Denmark (89.3 pence) and in the UK: 81.4 pence per kg of eggs. The costs in the Netherlands, Germany, France and Italy are 77 to 79 pence per kg. In Spain and Poland the costs of production are at the lowest level of the selected EU countries. The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets), housing costs and manure disposal costs. Of all countries the prices of feed in the UK and Denmark are the highest and the prices in France are the lowest. Young hens (pullets) are relatively cheap in Spain and Italy. Poland has the advantage of low labour costs and the UK has the highest revenues for manure. While farmers in the Netherlands and Germany have good technical results, the production costs in an EU context are on an average level. This is caused by higher housing costs, but also by the high manure disposal costs. All countries have a revenue for spent hens, except for the UK and Denmark.

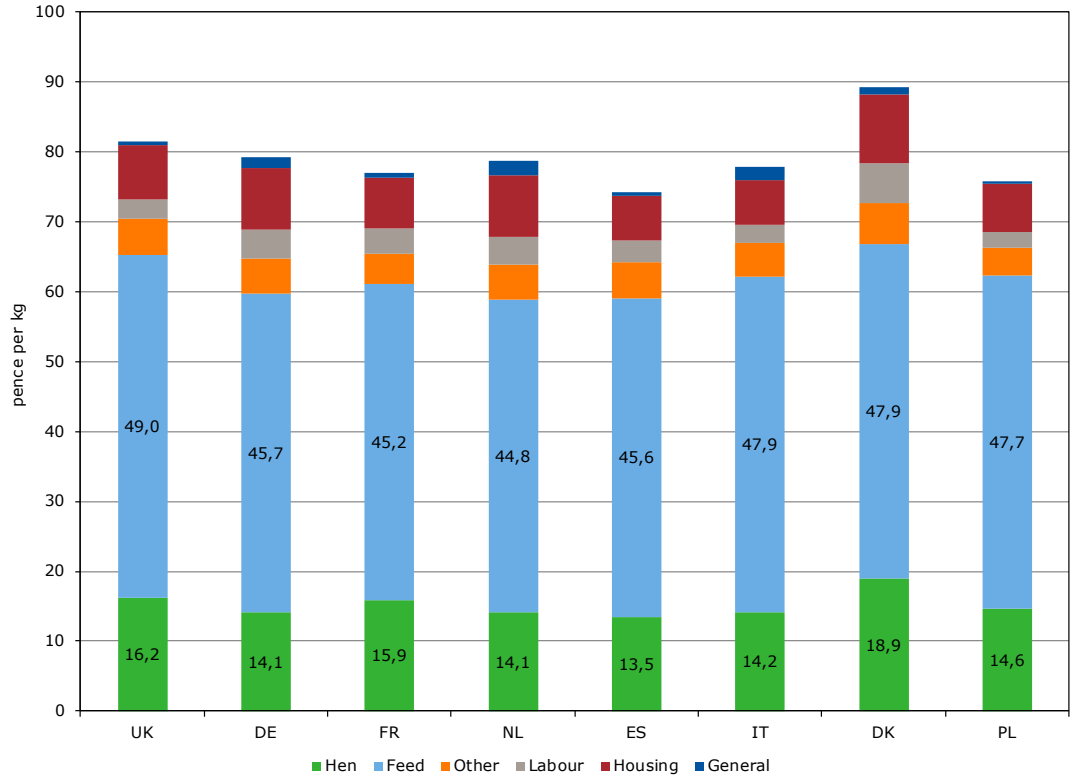

Figure 2.1 *Costs of primary production in* enriched cages *in the UK and seven EU countries (pence per kilogram of eggs) in 2018*

Table 2.1 *Data on egg production in the UK and seven EU countries in 2018 (enriched cages)*

	UK	DE	FR	NL	ES	IT	DK	PL
Feed price (pound sterling / 100 kg)	24.5	22.8	21.5	22.4	22.6	23.7	24.7	23.3
Price hen at 20 weeks (pound st. / hen)	3.60	3.84	3.73	3.83	3.40	3.50	4.28	3.75
Laying period (days)	395	450	415	450	430	420	395	420
Eggs per hen	347	400	350	400	370	365	358	365
Egg weight (g)	64.0	61.0	62.0	61.0	64.0	63.0	62.9	62.0
Feed conversion	2.00	2.00	2.10	2.00	2.02	2.02	1.94	2.05

Table 2.2 *Costs of primary production (in pence per kilogram of enriched cage eggs) in the UK and selected EU countries in 2018*

	UK	DE	FR	NL	ES	IT	DK	PL
Total costs inclusive labour	81.4	79.2	77.0	78.7	74.1	77.9	89.3	75.9
Total costs exclusive labour	78.7	75.2	73.3	74.7	71.0	75.4	83.6	73.7
Hen cost at 20 weeks	16.2	15.7	17.2	15.7	14.3	15.2	19.0	16.6
Feed	49.0	45.7	45.2	44.8	45.6	47.9	47.9	47.7
Other	5.3	5.0	4.3	5.0	5.1	4.9	5.8	4.1
Labour	2.8	4.0	3.7	4.0	3.2	2.6	5.7	2.2
Housing	7.8	8.9	7.2	8.7	6.4	6.3	9.8	6.9
General	0.8	0.9	0.7	0.9	0.7	0.7	0.8	0.6
Manure disposal	-0.4	0.6	0.0	1.2	-0.3	1.3	0.3	-0.3
Revenue spent hen	0.0	-1.6	-1.2	-1.6	-0.8	-1.0	0.0	-2.0

2.1.2 Production costs of egg powder

The costs of producing egg powder are made up of the costs of eggs and the costs of processing. The costs are calculated based on processing in a large commercial egg powder plant. The basic assumption is that the dry matter content of the eggs is 20.5%. The main components in the processing are building and equipment (39%), labour (26%) and energy (22%). The other costs (13%) are for packaging and costs of sales. These costs vary from EU country to country. However, because all processing plants in the EU use advanced modern equipment, it is assumed that the differences in processing between countries are mainly a result of differences in labour costs. Also, differences in interest rates between countries are taken into account and have an impact on the annual costs of building and equipment. Figure 2.2 gives the final results of costs at farm level and the costs of processing in pence per kg of egg powder. The results show that the processing costs amount to approximately 20% of the total cost to produce egg powder. The difference between the cost levels of the most expensive country (Denmark) and the cheapest country (Poland) is 12% above and 6% below the EU average.

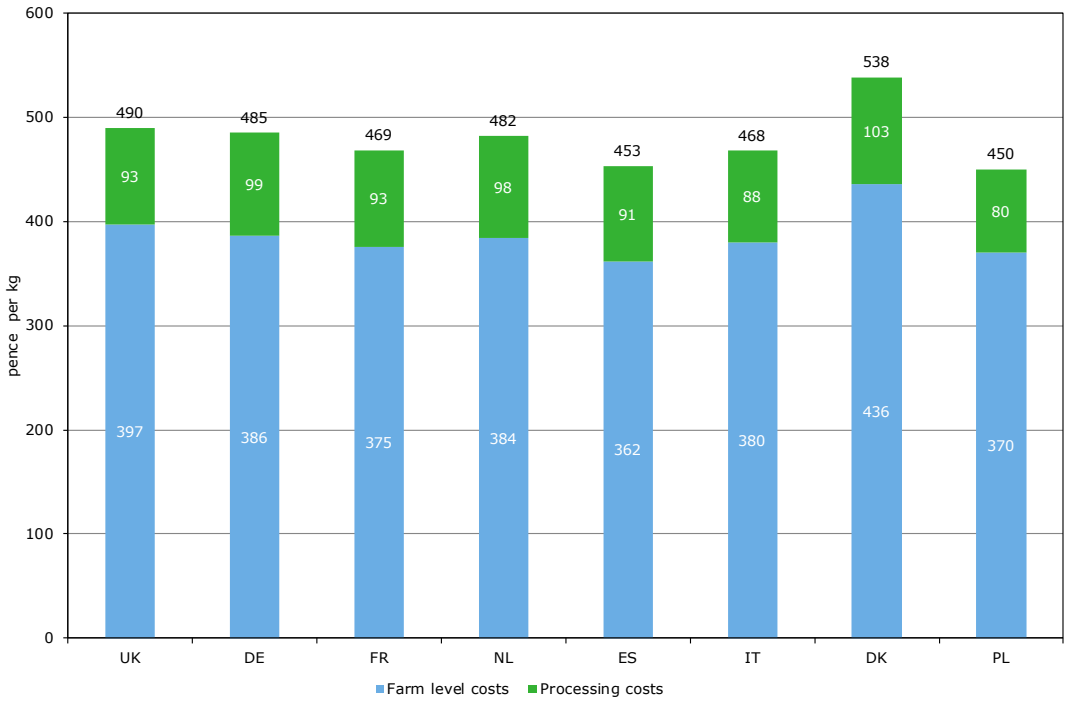

Figure 2.2 *Costs of production of whole egg powder from* enriched cages *in the UK and seven EU countries (pence per kilogram of egg powder) in 2018*

2.2 Production costs of barn eggs

The production costs of shell eggs produced by hens housed in barns were estimated for the UK, the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). Calculations are based on keeping hens in an aviary system with a density of a maximum of 18 hens per square metre poultry house.

2.2.1 Production costs at primary farm

Figure 2.3 and Table 2.3 provide an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (costs of young hen at 20 weeks, less the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (costs of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general (book-keeping,

clothing, insurance and, if relevant, manure disposal costs). The costs of primary production (in pence per kilogram of eggs) are the highest in the United Kingdom and Denmark. The average production costs in the UK are 98.1 pence per kg of eggs. This is 20% higher compared to the average of 81.4 pence per kg for the enriched cage eggs in the UK. The costs to produce barn eggs in Germany, France, the Netherlands and Italy are 90 to 92 pence per kg of eggs. In Poland and Spain the costs of production of barn eggs are at the lowest level of the selected EU countries. The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets) and housing costs. Similar to the comparison for enriched cage eggs, Denmark and the UK have the highest production costs for barn eggs.

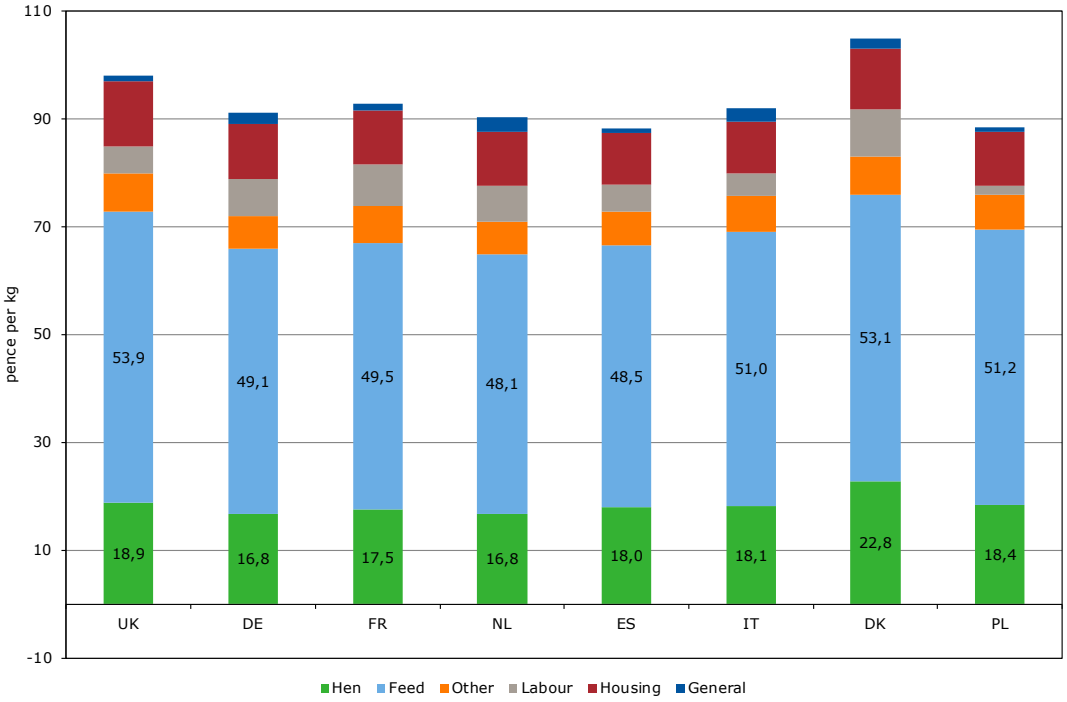

Figure 2.3 *Costs of primary production in* barns *in the UK and seven EU countries (pence per kilogram of eggs) in 2018*

Table 2.3 *Costs of primary production (in pence per kilogram) of barn eggs in seven EU countries in 2018*

	UK	DE	FR	NL	ES	IT	DK	PL
Total costs inclusive labour	98.1	91.1	92.9	90.3	88.4	91.9	105.0	88.5
Total costs exclusive labour	93.1	84.3	85.1	83.5	83.4	87.6	96.1	86.7
Hen cost at 20 weeks	18.9	18.8	19.2	18.5	19.3	18.8	22.9	20.3
Feed	53.9	49.1	49.5	48.1	48.5	51.0	53.1	51.2
Other	7.2	6.1	6.9	6.0	6.3	6.6	7.1	6.3
Labour	5.0	6.9	7.8	6.8	5.0	4.3	8.9	1.8
Housing	12.0	10.2	10.0	9.9	9.6	9.4	11.3	10.1
General	1.5	1.5	1.2	1.4	1.2	1.2	1.5	1.1
Manure disposal	-0.5	0.7	0.0	1.3	-0.3	1.3	0.4	-0.3
Revenue spent hen	0.0	-2.0	-1.7	-1.7	-1.2	-0.7	0.0	-1.9

2.2.2 Production costs egg powder

The costs of producing egg powder are made up of the costs of eggs and the costs of processing. The costs are calculated based on processing in a large commercial egg powder plant. The basic assumptions are similar to those of processing enriched cage eggs (see Section 2.1.2). Figure 2.4 gives the final results of costs at farm level and the costs of processing in pence per kg of egg powder. The average production costs of egg powder, based on barn eggs in the UK is 571 pence per kg of eggs. The processing costs amount to approximately 17% of the total cost to produce egg powder. The difference between the cost levels of the most expensive country (Denmark) and the cheapest country (Poland) is 12% above and 7% below the EU average. The average production costs in the UK of whole egg powder from barn eggs are 17% higher than the average for enriched cage eggs (490 pence per kg, Section 2.1.2).

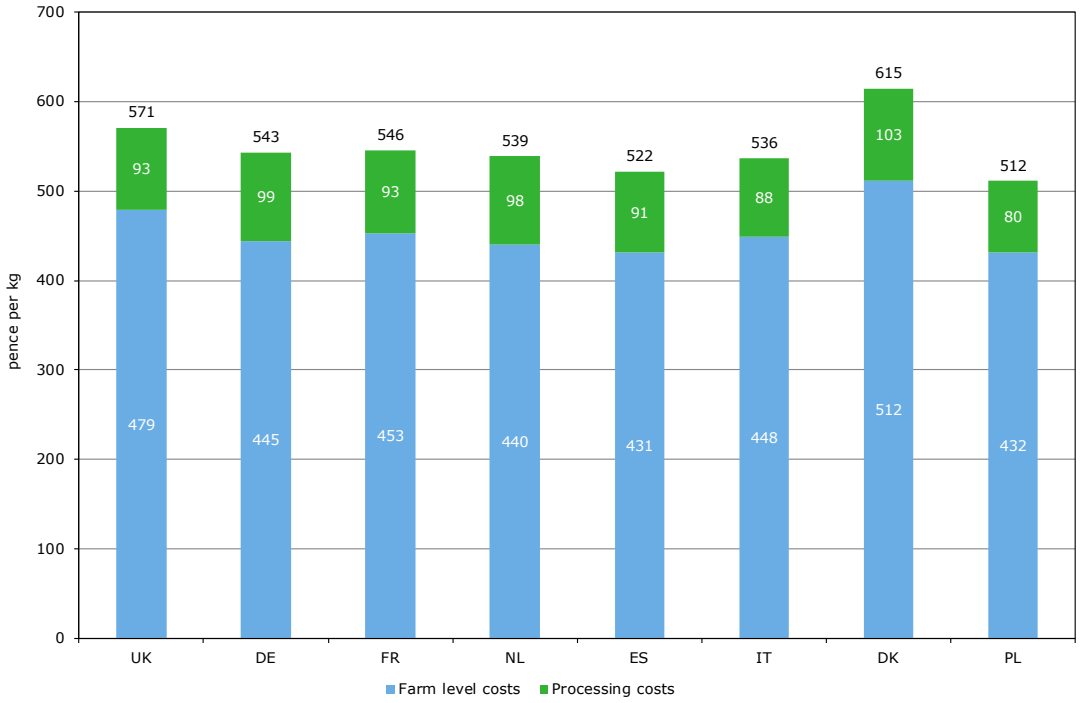

Figure 2.4 *Costs of production of whole egg powder from* barns *in the UK and some EU countries (pence per kilogram of egg powder) in 2018*

2.3 Production costs of free range eggs

The production costs of shell eggs produced by hens housed in free range systems were estimated for the UK, the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). Calculations are based on keeping hens in an aviary system with a density of a maximum of 18 hens per square metre poultry house with access to an outdoor range.

2.3.1 Production costs at primary farm

Figure 2.5 and Table 2.4 provide an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (costs of young hen at 20 weeks, less the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (costs of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general (book-keeping, clothing, insurance and, if relevant, manure disposal costs). The costs of primary production (in pence per kilogram of eggs) are the highest in Denmark and the United Kingdom. The average production costs in the UK are 114.9 pence per kg of eggs. This is 41% higher compared to the average of

81.4 pence per kg for the enriched cage eggs in the UK. The costs of free range eggs in Germany, France and the Netherlands are 103 to 106 pence per kg of eggs. In Poland and Spain the costs of production of free range eggs are at the lowest level of the selected EU countries. The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets) and housing costs.

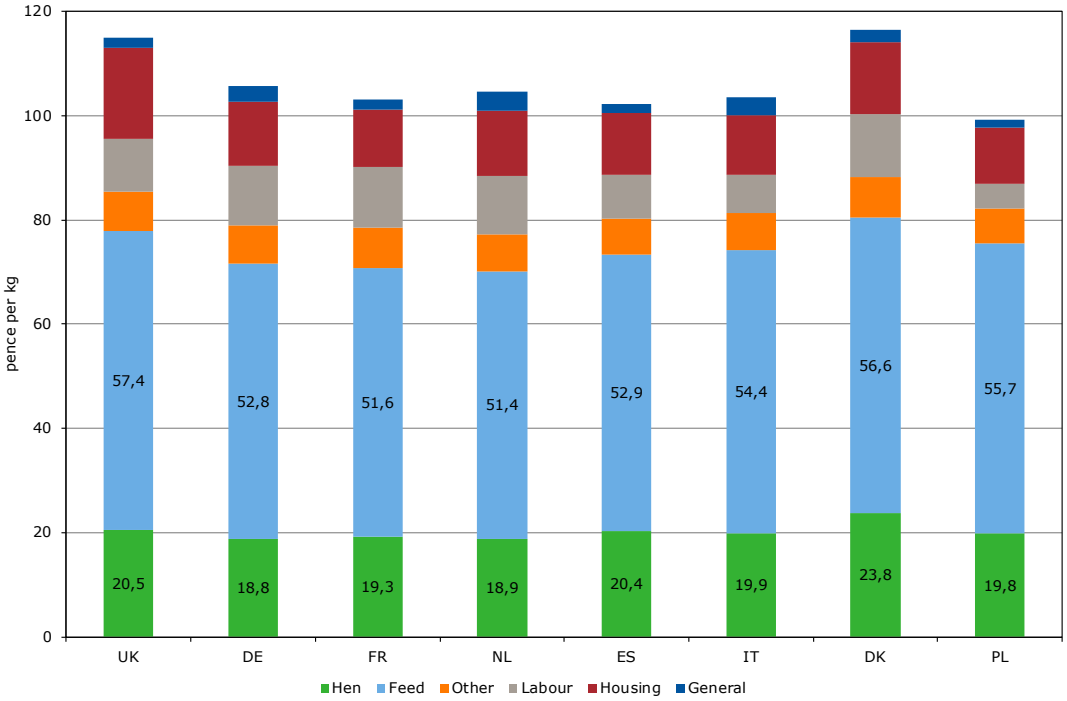

Figure 2.5 *Costs of primary production in free range systems in the UK and some EU countries (pence per kilogram of eggs) in 2018*

Table 2.4 *Costs of primary production (in pence per kilogram) of free range eggs in some EU countries in 2018.*

	UK	DE	FR	NL	ES	IT	DK	PL
Total costs inclusive labour	114.9	105.7	103.2	104.7	102.4	103.5	116.5	99.2
Total costs exclusive labour	104.8	94.3	91.4	93.5	94.0	96.3	104.5	94.5
Hen cost at 20 weeks	20.5	21.0	21.1	20.7	21.8	20.6	23.9	21.9
Feed	57.4	52.8	51.6	51.4	52.9	54.4	56.6	55.7
Other	7.6	7.2	7.6	7.1	7.0	7.1	7.8	6.7
Labour	10.1	11.4	11.8	11.2	8.4	7.2	12.1	4.7
Housing	17.3	12.3	10.9	12.4	11.9	11.5	13.9	10.8
General	2.5	2.4	2.0	2.4	2.0	2.0	2.3	1.7
Manure disposal	-0.5	0.7	0.0	1.3	-0.3	1.4	0.0	-0.3
Revenue spent hen	0.0	-2.2	-1.9	-1.8	-1.4	-0.6	0.0	-2.1

2.3.2 Production costs egg powder

The costs of producing egg powder are made up of the costs of eggs and the costs of processing. The costs are calculated based on processing in a large commercial egg powder plant. The basic assumptions are similar to those of processing enriched cage eggs (see Section 2.1.2). Figure 2.6 gives the final results of costs at farm level and the costs of processing in pence per kg of egg powder. The average production costs of egg powder, based on free range eggs in the UK is 653 pence per kg of eggs. The processing costs amount to approximately 15% of the total cost to produce egg powder. The difference between the cost levels of the most expensive country (Denmark) and the cheapest country (Poland) is 10% above and 8% below the EU average. The average production costs in the UK of whole egg powder from free range eggs are 33% higher than the average for enriched cage eggs (490 pence per kg, Section 2.1.2).

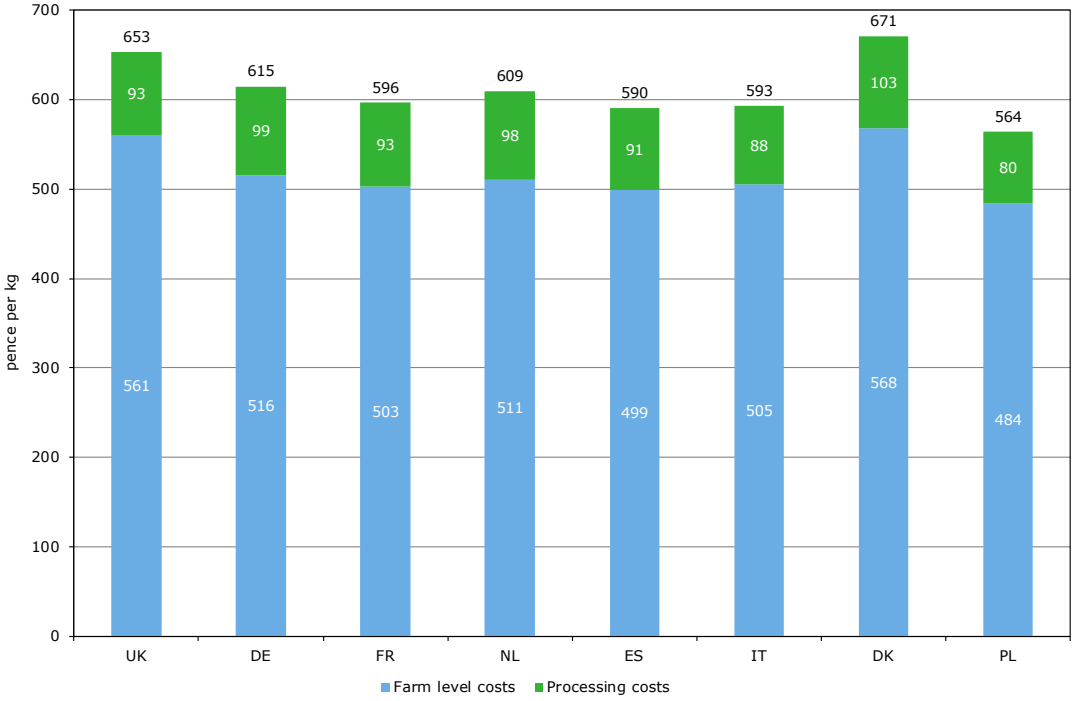

Figure 2.6 *Costs of production of whole egg powder from free range in the UK and some EU countries (pence per kilogram of egg powder) in 2018*

3 Production costs of eggs in selected non-EU countries

3.1 Production costs of cage eggs

The production costs of shell eggs for consumption has been researched for the following non-EU countries, which were the main exporters of eggs and egg products to the EU in 2018: Ukraine (UKR), the United States of America (USA) and Argentina (ARG). India (IND) has also been a significant exporter to the EU. The production costs of the third countries are presented in pence.

3.1.1 Production costs at primary farm

Figure 3.1 and Table 3.2 compare the average primary production costs in the four third countries with those in the UK. Table 3.1 gives input data used in the calculations. The hen costs are defined as the hen cost at 20 weeks, less the revenue of the spent hen. General costs are the actual general costs plus the manure disposal costs, or less the revenue of manure. The costs of primary production in all four third countries are lower than in the UK. In USA and Ukraine the costs are 32 and 27% lower than the UK level of 81.4 pence per kg of eggs, in Argentina and India 18 and 17% lower. The feed price determines the total production costs to a significant extent. The feed price is considerably lower in Ukraine and USA than it is in the UK, mainly because of the domestic availability of sizeable quantities of feed ingredients such as maize and soy beans. British egg producers partly depend on South American imports for some of their feed ingredients. The costs of storage, transport and merchant's profit increase the price of feed ingredients in the UK. The price of a young hen in the UK is also higher because of the high feed price. In addition to these differences, some third countries also have the advantage of lower housing costs and labour costs. Wages are much lower in Ukraine and India. Furthermore, in all mentioned third countries, producers have lower costs because legislation on environment, food safety and animal welfare is either less stringent or non-existent compared with the UK (see Chapter 1).

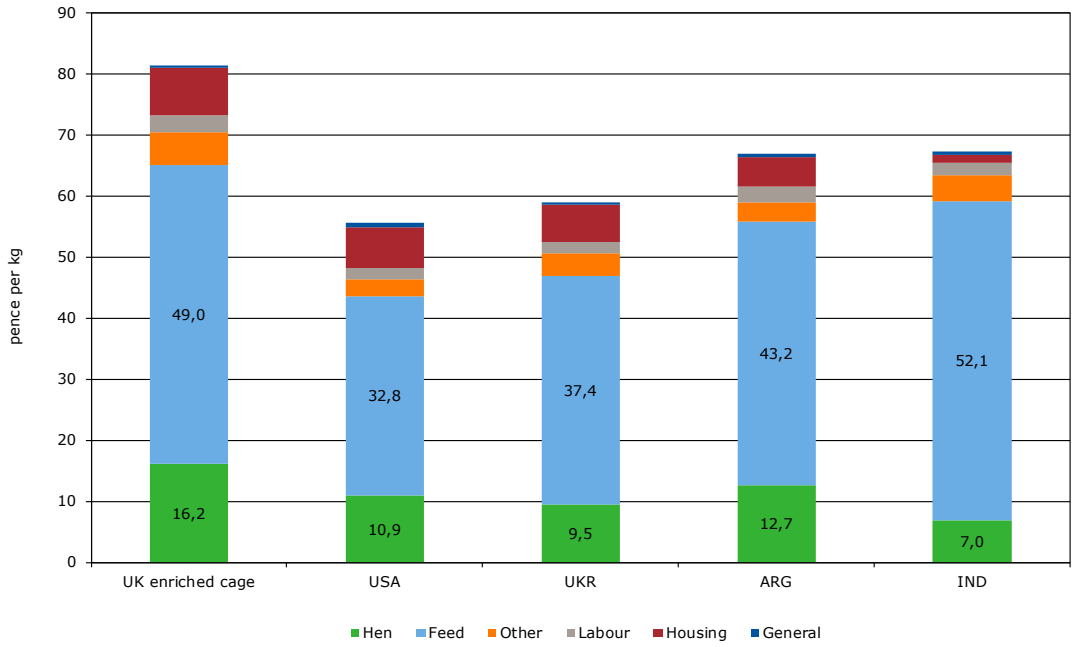

Figure 3.1 *Costs of primary production in* enriched cages *in the UK and conventional cages in some non-EU countries (pence per kilogram of eggs) in 2018*

Table 3.1 *Data on egg production in the UK and selected non-EU countries in 2018*

	UK	USA	UKR	ARG	IND
Feed price (pound sterling/100 kg)	24.5	16.5	17.8	20.1	21.4
Price hen at 20 weeks (pound sterling/hen)	3.6	2.83	2.95	3.30	2.22
Laying period (days)	395	490	420	430	420
Eggs per hen	347	414	345	360	350
Egg weight (g)	64.0	60.0	63.5	63.0	56.0
Feed conversion	2.0	1.98	2.10	2.15	2.43

Table 3.2 *Costs of primary production (in pence per kilogram of eggs) in the UK and some non-EU countries in 2018*

	UK	USA	UKR	ARG	IND
Total costs inclusive labour	81.4	55.6	59.0	67.0	67.3
Total costs exclusive labour	78.7	53.8	57.1	64.3	65.4
Hen cost at 20 weeks	16.2	11.4	13.5	14.5	11.3
Feed	49.0	32.8	37.4	43.2	52.1
Other	5.3	2.7	3.7	3.1	4.4
Labour	2.8	1.8	1.9	2.7	1.9
Housing	7.8	6.7	6.1	4.8	1.4
General	0.8	0.7	0.5	0.4	0.5
Manure disposal	-0.4	0.0	0.0	0.0	0.0
Revenue spent hen	0.0	-0.5	-4.0	-1.8	-4.4

3.1.2 Production costs of egg powder

The costs of producing egg powder consists of the costs of eggs and the costs of processing. The costs are calculated based on processing in a large commercial egg powder plant. The calculations are similar to the method described in Section 2.1.2. Figure 3.2 shows that the production costs of whole egg powder in the USA and Ukraine are 28% and 25% lower than in the UK. The production costs in India and Argentina are 18% and 16% lower, respectively, than in the UK. Differences are mainly due to the differences in primary egg production costs.

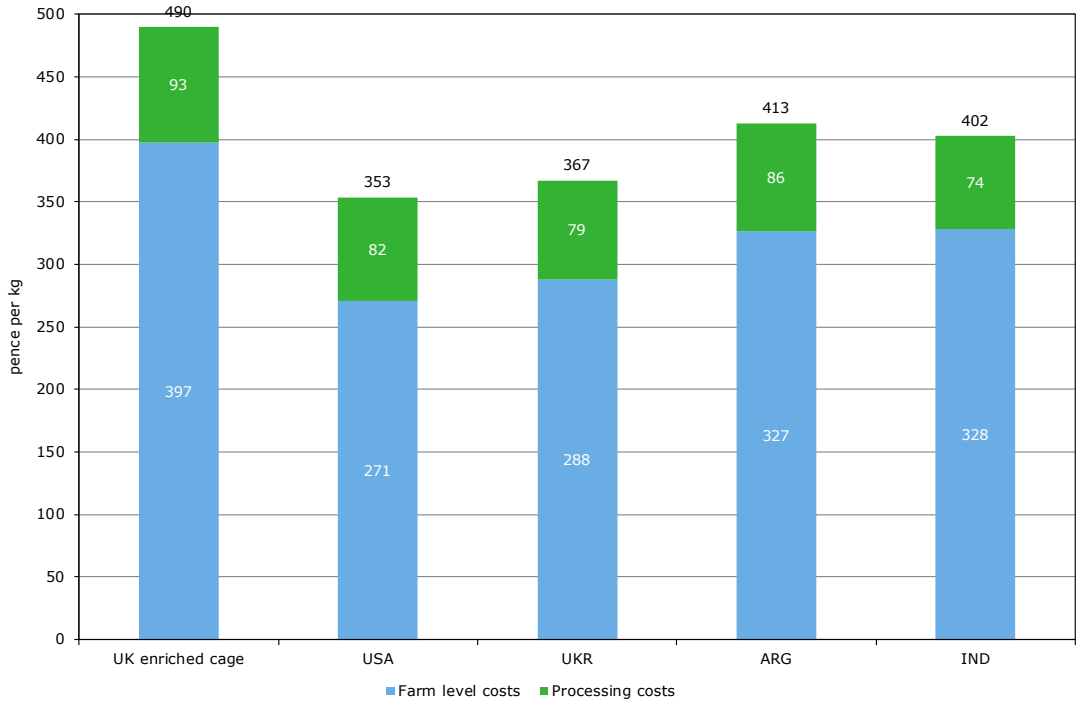

Figure 3.2 *Costs of production of whole egg powder in the UK and four non-EU countries (pence per kilogram of egg powder) in 2018*

4 Results of different scenarios

In this chapter four scenarios have been defined (Section 4.1), which have been examined for shell eggs (Section 4.2) and for whole egg powder (Section 4.3).

4.1 Description of the scenarios

To show the impact of a possible change in import levies and a change in the exchange rate on the competitiveness of UK egg producers and egg processors, four scenarios have been developed:

1. 50% reduction of the UK import levies on egg and egg products, as a possible result of a new bilateral trade agreement (or multilateral (WTO) agreement).
2. 10% lower exchange rates of the US dollar, Argentine peso, Ukrainian hryvnia and Indian rupee compared to the UK pound.
3. Combination of 50% lower import levies and a 10% lower exchange rate of the third countries' currencies.
4. Combination of no import levies and a 10% lower exchange rate of the third countries' currencies. This is the 'worst-case' scenario.

4.2 Shell eggs

4.2.1 Basic situation

To estimate the offer price of shell eggs in the UK, we add the transportation costs from the major production area of a third country to an important market region in the UK, in this case Birmingham. Transportation costs have been estimated based on a full truck load of shell eggs. The offer price in Birmingham is the sum of production costs (farm level and processing), transportation costs and import levies.

Figure 4.1 shows the estimated offer price in Birmingham of enriched cage shell eggs produced in the UK and of conventional cage system shell eggs from Ukraine, the USA, Argentina and India. The horizontal line indicates the UK level of total costs, including the 1 pence/kg costs of transport to Birmingham. The Ukraine and USA could be a threat for British egg producers, but the current 27 pence/kg levy on imports means that it is not cost effective to export shell eggs to the UK market. In addition, the UK/EU requirements on egg marketing standards, with a best-before data of 28 days from lay, plus Salmonella control requirements, effectively preclude imports of shell eggs, apart from Ukraine. Figure 4.1 also shows that imports from Argentina and India will not be competitive in a situation if there were to be no import levies, because of the high transport costs.

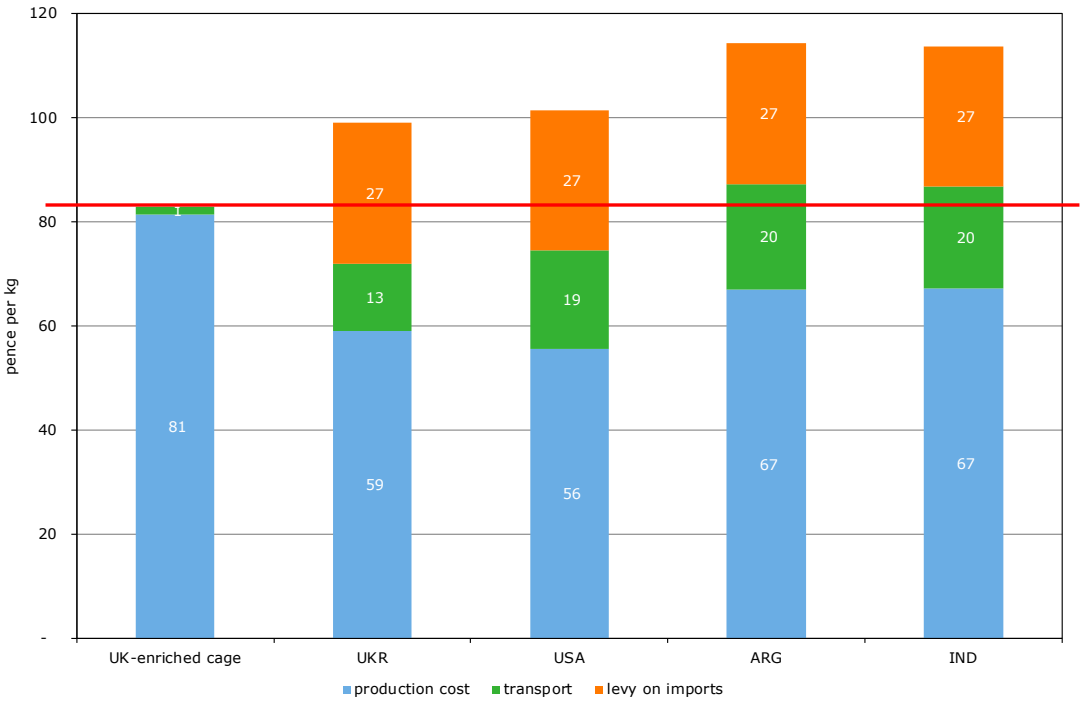

Figure 4.1 *Offer price of shell eggs (*cage eggs*) in Birmingham from the UK (*enriched cages*; horizontal line) and non-EU countries in pence per kilogram of egg (basic situation)*

Figure 4.2 shows that cage system shell eggs from Ukrainian producers could be competitive with barn system shell eggs produced in the UK, even in a situation with import levies. However, this is not really the case, because barn eggs are sold on another market than cage eggs. Therefore, this is not included in the scenarios.

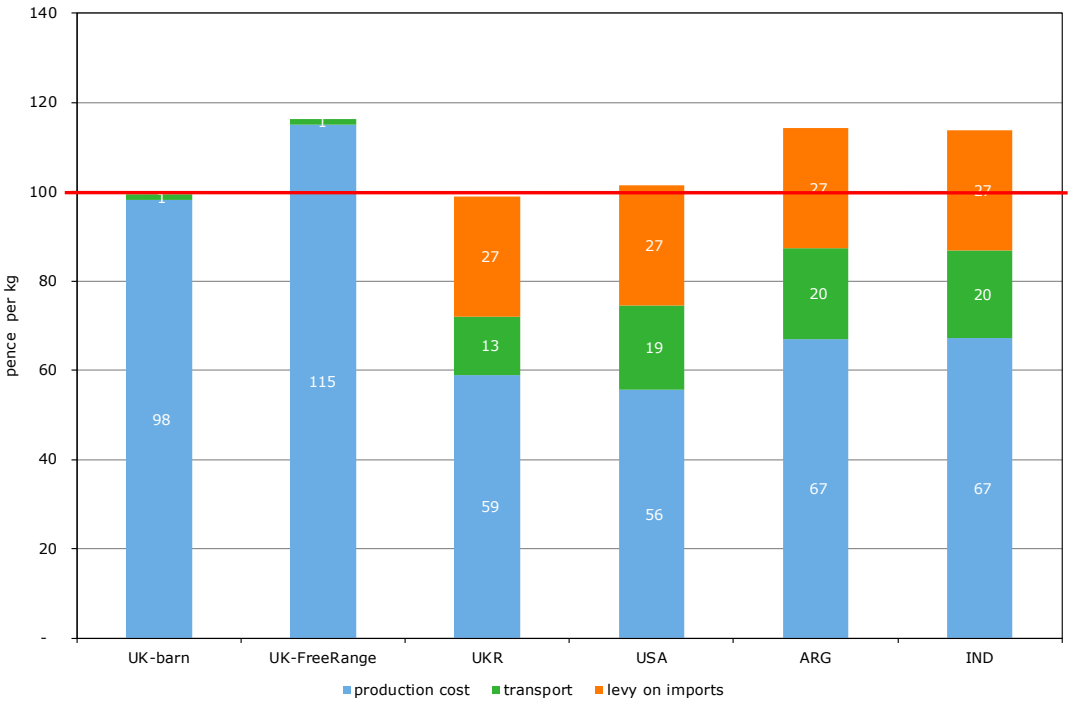

Figure 4.2 *Offer price of shell eggs in Birmingham from the UK (*barn and free range eggs*) and non-EU countries (*cage eggs*) in pence per kilogram of egg (basic situation)*

4.2.2 Scenario 1 - Lower import levies

In the first scenario the impact of 50% lower levies on imports into the UK has been examined. As Figure 4.3 illustrates, none of the non-EU countries would be competitive on the UK market in a situation with an import levy of 13 pence per kg.

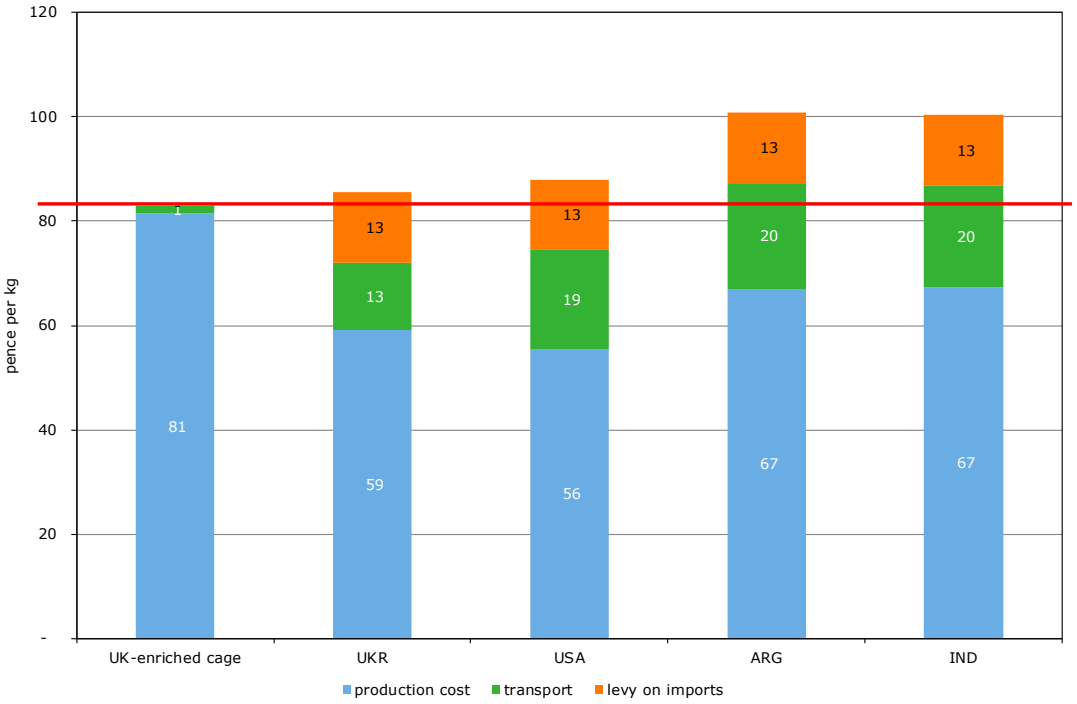

Figure 4.3 *Offer price of shell eggs (*cage eggs*) in Birmingham from the UK (horizontal line) and non-EU countries in pence per kilogram of egg (scenario 1: 50% lower import levies)*

4.2.3 Scenario 2 - Lower exchange rates

This second scenario evaluates the consequences of 10% lower exchange rates of the currencies of all non-EU countries. Lower exchange rates have less impact than the lower import levies of scenario 1. Figure 4.4 shows that in the case of 10% lower exchange rates none of the non-EU countries would be real competition on the UK market.

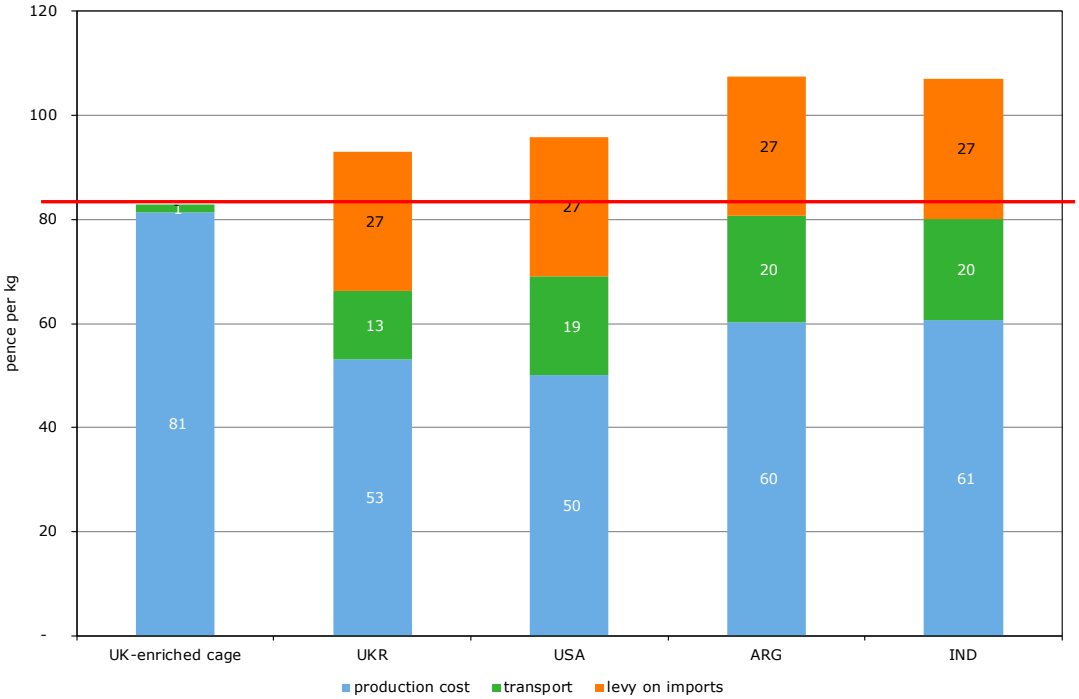

Figure 4.4 *Offer price of shell eggs (*cage eggs*) in Birmingham from the UK (horizontal line) and non-EU countries in pence per kilogram of egg (scenario 2: 10% lower exchange rates)*

4.2.4 Scenario 3 - Combination of lower import levies and lower exchange rates

The third scenario is a combination of the previous scenarios: 50% lower import levies and also 10% lower exchange rates of all non-EU currencies (Figure 4.5). In this scenario, Ukraine obtains a very competitive position on the UK market for shell eggs and also the USA could compete. Argentina and India would not be competitive.

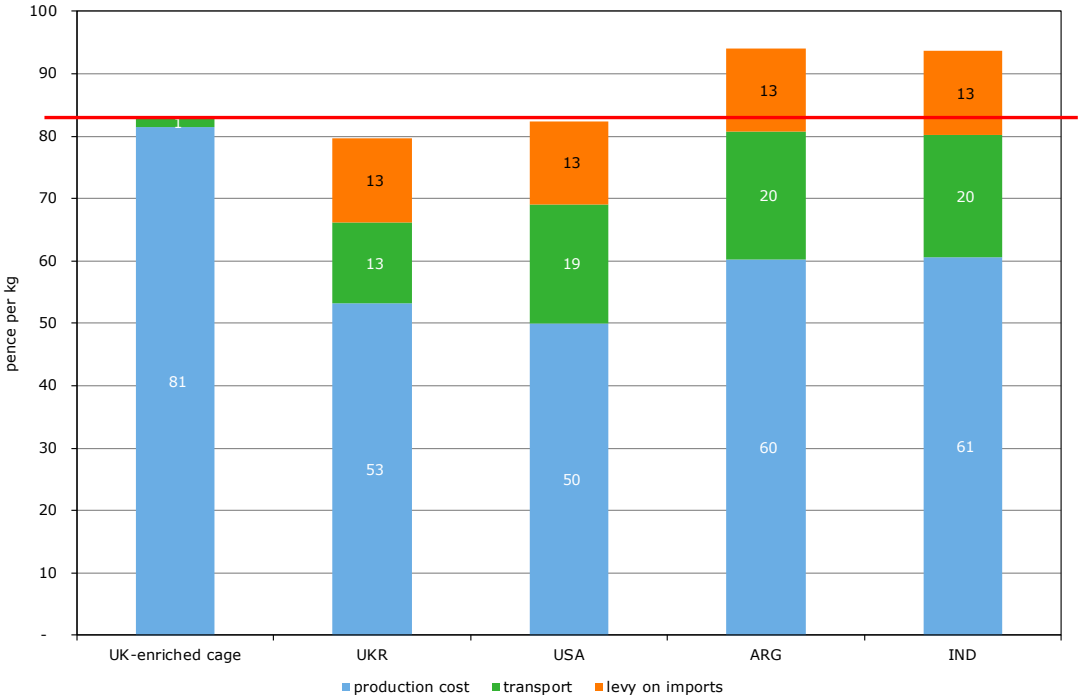

Figure 4.5 *Offer price of shell eggs (*cage eggs*) in Birmingham from the UK (horizontal line) and non-EU countries in pence per kilogram egg (scenario 3: 50% lower import levies and 10% lower exchange rate)*

4.2.5 Scenario 4 - Combination of zero import levies and lower exchange rates

This scenario is a combination of zero import levies and 10% lower exchange rates of all non-EU currencies (Figure 4.6). In this scenario all non-EU countries have a lower offer price than UK egg producers.

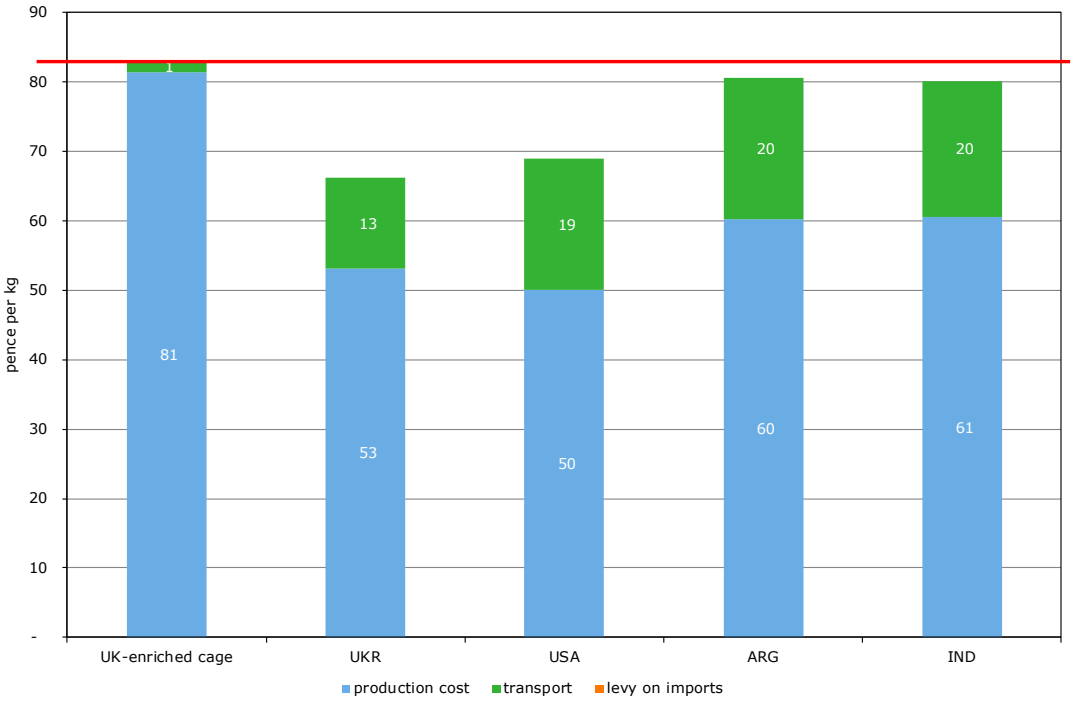

Figure 4.6 *Offer price of shell eggs (*cage eggs*) in Birmingham from the UK (horizontal line) and non-EU countries in pence per kilogram egg (scenario 4: zero import levies and 10% lower exchange rates)*

4.3 Whole egg powder

Egg powder is more suitable for long distance transport than shell eggs because there is no decrease in product quality after months of storage. Another advantage of egg powder are the relatively low costs of transport as the product is dried.

4.3.1 Basic situation

The assumed market location is Birmingham in the UK, for which an offer price has been calculated. The offer price is the total of production costs, processing costs, transportation costs and import levies. Figure 4.7 shows that the levies on imports provide only enough protection for whole egg powder made from cage system eggs produced in Argentina and India with egg powder made from enriched cage system eggs produced in the UK. Egg powder from the USA and Ukraine could almost compete, despite the full import levies.

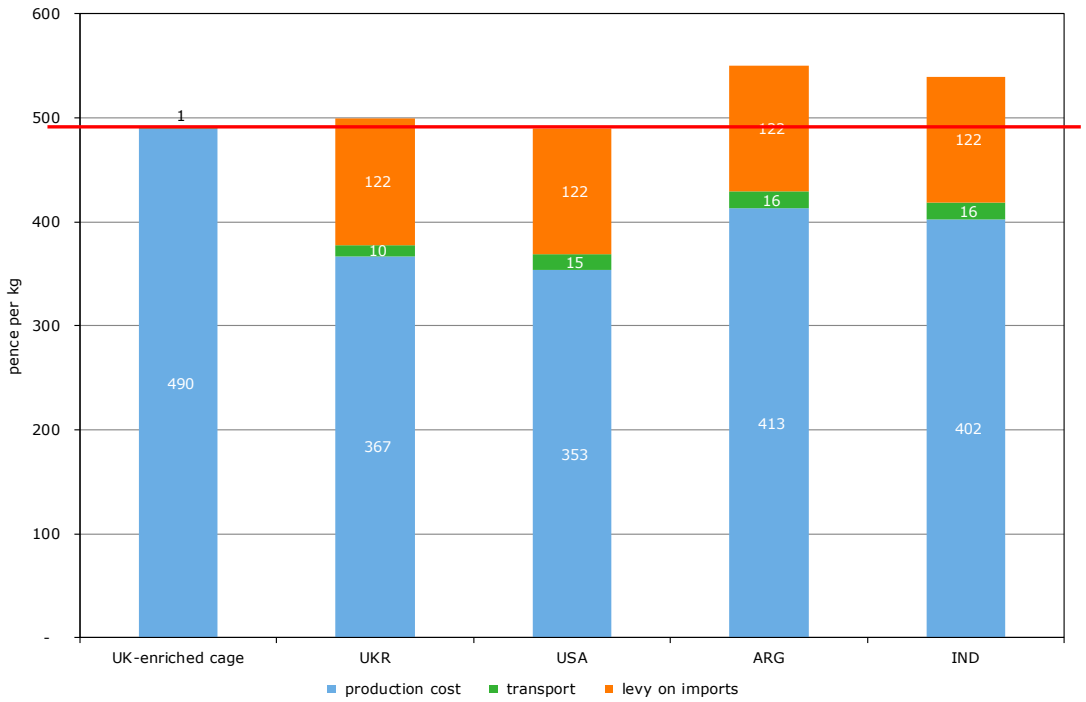

Figure 4.7 *Offer price of whole egg powder (*cage eggs*) in Birmingham from the UK (enriched cage; horizontal line) and non-EU countries in pence per kilogram (basic situation)*

Figure 4.8 shows that egg powder made from barn and free range system eggs in the UK cannot compete with egg powder made from conventional cage system eggs produced in these non-EU countries, even in a situation with full import levies. However, in practice egg powder made from barn or free range eggs is sold to a specific market. Therefore, this is not included in the scenarios.

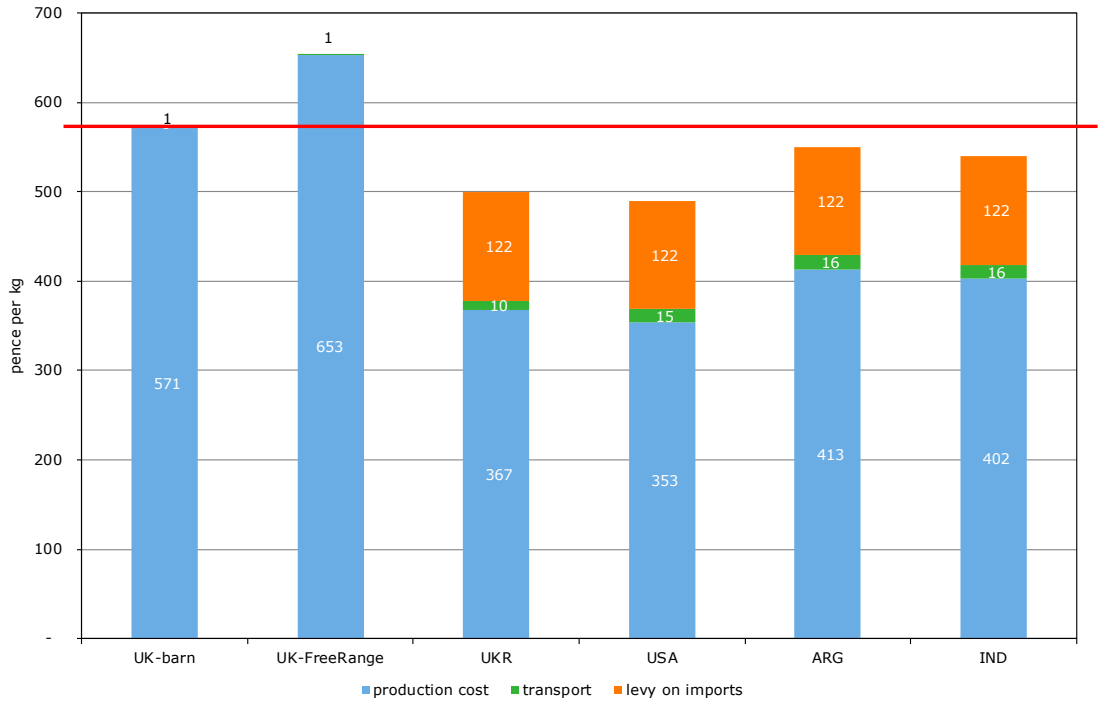

Figure 4.8 *Offer price of whole egg powder in Birmingham from the UK (*barn and free range eggs*) and non-EU countries (conventional* cage eggs*) in pence per kilogram (basic situation)*

4.3.2 Scenario 1 - Lower EU import levies

Figure 4.9 shows that with 50% lower import levies all non-EU countries can be relatively cheap suppliers of egg powder to Birmingham. The total costs of production, transport and import levies of the Ukraine and USA are substantially below the UK level.

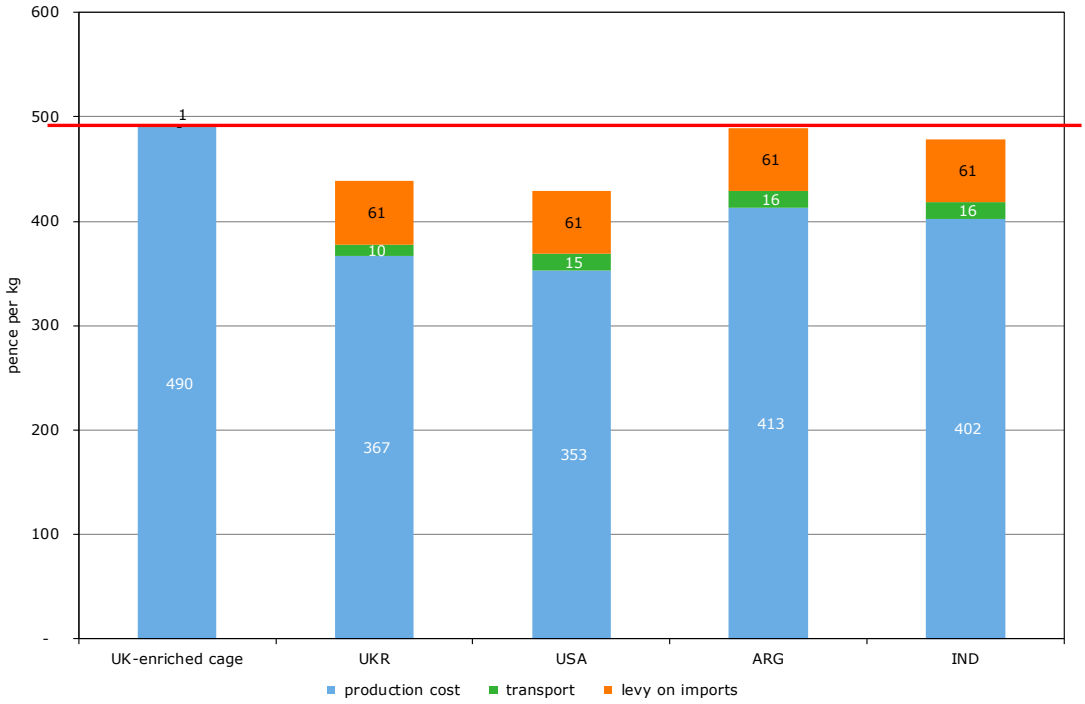

Figure 4.9 *Offer price of whole egg powder (*cage eggs*) in Birmingham from the UK (enriched cage; horizontal line) and non-EU countries in pence per kilogram (scenario 1: 50% lower import levies)*

4.3.3 Scenario 2 - Lower exchange rates

This second scenario evaluates the consequences of 10% lower exchange rates of all non-EU currencies (Figure 4.10) In this scenario Ukraine and USA can be relatively cheap suppliers of whole egg powder in Birmingham. However, this scenario has less impact than the previous scenario with the lower import levies.

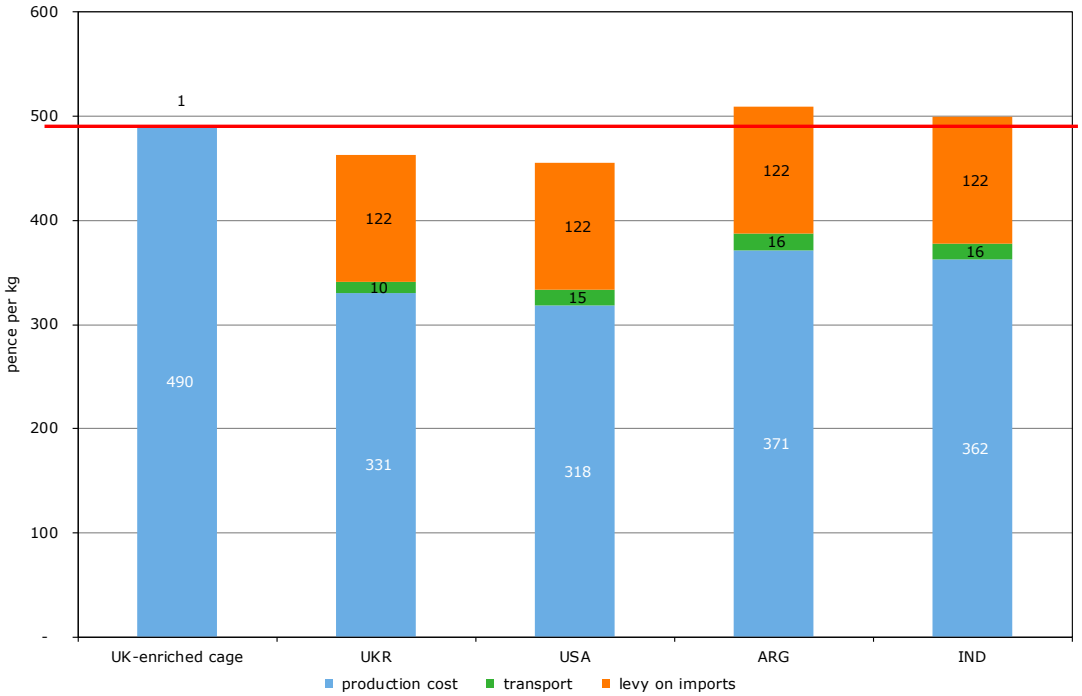

Figure 4.10 *Offer price of whole egg powder (*cage eggs*) in Birmingham from the UK (enriched cage; horizontal line) and non-EU countries in pence per kilogram (scenario 2: 10% lower exchange rate)*

4.3.4 Scenario 3 - Combination of lower import levies and lower exchange rates

This scenario is a combination of the previous two scenarios: 50% lower import levies (scenario 1) and also 10% lower exchange rates of all non-EU currencies (scenario 2). Figure 4.11 shows that all non-EU countries would be very cheap suppliers of whole egg powder to the UK market. Offer prices in Birmingham of all non-EU countries are clearly below the UK level.

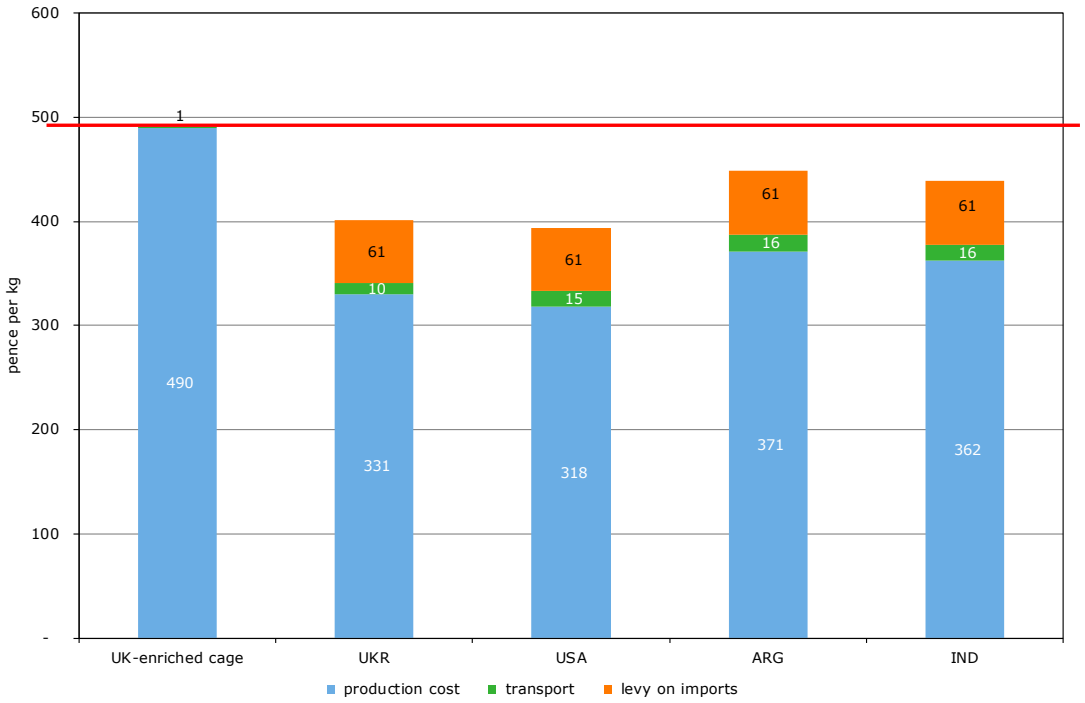

Figure 4.11 *Offer price of whole egg powder (*cage eggs*) in Birmingham from the UK (enriched cage; horizontal line) and non-EU countries in pence per kilogram (scenario 3: 50% lower import levies and 10% lower exchange rate)*

4.3.5 Scenario 4 - Combination of zero import levies and lower exchange rates

This scenario is a combination of zero import levies and 10% lower exchange rates of all non-EU currencies. Figure 4.12 shows that all non-EU countries would be very cheap suppliers of whole egg powder to the UK market. Offer prices in Birmingham could be 21% (Argentina) to 32% (USA) below the UK level.

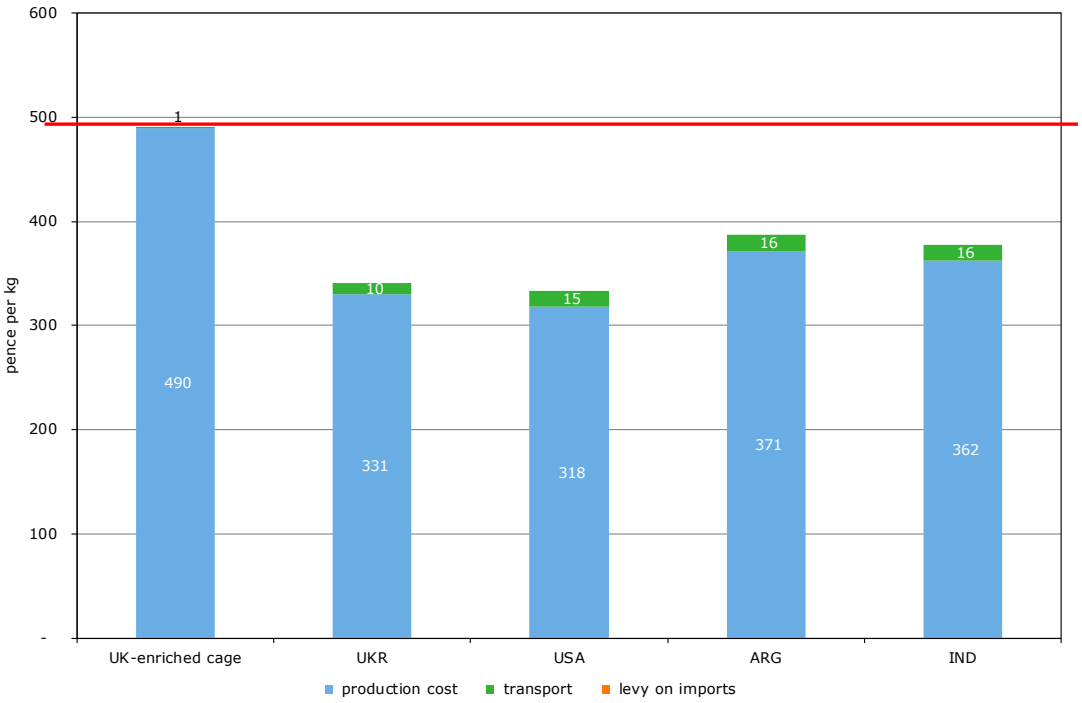

Figure 4.12 *Offer price of whole egg powder (*cage eggs*) in Birmingham from the UK (enriched cage; horizontal line) and non-EU countries in pence per kilogram (scenario 4: zero import levies)*

5 Conclusions

Production costs in 2018 within the UK and EU countries
The production costs of shell eggs produced in enriched cages were calculated for the United Kingdom and seven EU countries: Germany, France, the Netherlands, Spain, Italy, Denmark and Poland. Between these egg producing countries, the production costs of shell eggs in 2018 ranged from 89 pence per kg of eggs in Denmark to 76 in Poland and 74 pence per kg of eggs in Spain. In the UK, production costs are 81 pence per kg of eggs. The total production costs for whole egg powder also differ within the seven EU countries from 538 pence per kg of egg powder in Denmark to 450 pence per kg in Poland. In the UK average production costs are 490 pence per kg of egg powder.

Production costs in 2018 in non-EU countries
Compared to the average level within the UK, the costs of production for shell eggs in 2018 were lower in USA (-32%), Ukraine (-27%), Argentina (-18%) and India (-17%). As a result of the costs of transportation, import levies and the effects on product quality and safety (especially from Argentina and India), there are barely any imports of shell eggs from those countries to the UK. In addition, in the UK/EU requirements on egg marketing standards, with a best-before data of 28 days from lay, plus Salmonella control requirements, effectively preclude imports of shell eggs. For whole egg powder the non-EU countries are more competitive. Compared to the UK level (enriched cages), the production costs of whole egg powder from conventional cages in 2018 were lower in USA (-28%), Ukraine (-25%), Argentina (-16%) and India (-18%). Because the costs of transportation of powder are low (10 to 16 pence per kg), the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the UK market from large quantities of imports from these countries.

EU legislation
In the UK and the EU, egg producers have to comply with European legislation. This legislation deals with environmental protection, animal welfare and food safety, amongst others. The additional costs of EU legislation were estimated to be 16% of the total production costs of eggs at farm level. In these calculations the following legislation was taken into account:

- *Environmental protection*
  Nitrates directive to protect land and water and the reduction of ammonia emissions to protect air.
- *Food safety*
  Reduction of Salmonella prevalence, ban on meat-and-bone meal in poultry feed and regulations on GMO feed ingredients.
- *Animal welfare*
  Minimum standards on space allowance and legislation on beak trimming.

An important EU law causing an increase in production costs is Council Directive 1999/74/EC 'welfare of laying hens'. This legislation was implemented in 2012 on UK/EU egg laying farms. There was a 6% increase in the costs of production as the sector moved from conventional cages to enriched cages. This EU legislation, mainly related to environment, animal welfare and food safety, is less stringent or non-existent in non-EU countries.

Welfare legislation in non-EU countries
In the countries outside the EU illustrated in this report only the USA have a voluntary programme to increase the space allowance per hen towards 432 cm^2. However, the most common system of egg production in the USA still is the conventional cage system, which was banned in the EU from 1 January 2012. The USA have no federal legislation in place for laying hen welfare. In Argentina, India and Ukraine there is no legislation on laying hen welfare and hens are kept in conventional cages with a space allowance of 400 to 450 cm^2 per hen. Between countries, regions and farms, the stocking density can change due to expected market prices (high density when high egg prices are expected), climate (lower density in hot areas) and housing systems (open or climate controlled houses).

American literature shows that purely from an economic point of view, 350 to 400 cm^2 per hen gives the highest income for the egg producer (Bell, 2000).

Scenarios on import levies and exchange rates
To show the impact of a possible change in import levies and a change in exchange rate on the competitiveness of the UK egg sector, four scenarios were developed. In the first scenario 50% lower import levies on shell eggs and whole egg powder was taken as an example to illustrate the impact of any multi- or bilateral agreement with lower import levies. For shell eggs, competition from the selected third countries is not expected to increase a lot, because of the specific market for barn and free range eggs and the UK requirements on egg marketing standards, with a best-before data of 28 days from lay, plus Salmonella control requirements.

However, for egg powder, the results show that in this scenario all non-EU countries can be relatively cheap suppliers of egg powder to Birmingham. The offer price of the Ukraine and the USA are substantially below the UK level.

In the second scenario with a 10% lower exchange rate, the price of whole egg powder from Ukraine and the USA would be lower than the UK level. In the third scenario with a combination of 50% lower import levies and a 10% lower exchange rate, all four selected non-EU countries would be very cheap suppliers of whole egg powder to the UK market. Offer prices in Birmingham could be 9% (Argentina) to 18% (Ukraine) and even 20% (USA) below the UK level. This is even more the case in scenario 4, in which the import levies are totally removed and there is a 10% lower exchange rate of all non-EU countries.

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Data sources

The basic data for calculating the production costs were obtained from several organisations, institutes and companies in the countries. For some countries, data are from the International Egg Commission annual report. The following are the main sources per country:

Netherlands	Wageningen Economic Research
France	Institut Technique de l'Aviculture (ITAVI)
Spain	Asociacion Espanola de Productores de Huevos (ASEPHRU)
Italy	Vito Mastrangelo, consultant
UK	British Egg Industry Council (BEIC)
Poland	Wageningen Economic Research, based on several sources
Denmark	Danish Egg Association
Ukraine	Wageningen Economic Research, based on several sources
USA	Egg Industry Center at Iowa State University
Argentina	Wageningen Economic Research, based on several sources School of Agronomy of the University of Buenos Aires (UBA)
India	National Egg Co-ordination Committee (NECC)

Appendix 1 Main assumptions in different housing systems for layers

Table A1.1 *Main assumptions for labour and investments in housing systems for laying hens*

	Conventional cage	Enriched cage	Barn/Aviary
Labour:			
Number of hens per worker	75,000	70,000	40,000
Buildings:			
Density (hen per m^2)	35	27	18
Surface area per house (gross m^2)	2,336	2,788	2,414
Investment:			
Housing (pound sterling per hen housed)	5.18	6.63	10.04
Inventory (pound sterling per hen housed)	5.28	8.61	7.51
Other inventory (pound sterling per hen housed)	2.19	2.35	3.82

Table A1.2 *Main assumptions for the production results in housing systems for laying hens*

	Conventional cage	Enriched cage	Barn/Aviary
Laying period (days)	450	450	450
Eggs per hen housed (number)	400	400	390
Feed consumption/hen/day (gram)	110	110	120
Egg production per hen housed (kg)	24.8	24.8	24.2

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