Competitiveness of the EU egg sector, base year 2017

International comparison of production costs

P.L.M. van Horne

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Companies in the European Union egg sector have to comply with European legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a high quality poultry production, it also confronts the sector with extra costs. Countries outside the EU do not have the same extensive legislation. This report presents the results of a study on the competitiveness of the EU egg sector. The production costs for eggs and egg products are calculated for 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, EU

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Preface

Companies in the European Union egg sector have to comply with European legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a high quality product, it also confronts the sector with extra 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 EU do not have the same extensive legislation. At the same time the EU is involved in bilateral negotiations with different partners – among them Mercosur, India and others - which are intended to further liberalise trade by reducing or abolishing import levies. This causes concerns within the EU egg sector regarding its competitiveness.

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 EU egg sector. The production costs for eggs and egg products are calculated for several EU and non-EU countries based on the year 2017. 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 EUWEP, the EU trade association for Egg Packers, Traders and Processors. This report is an update of an earlier study for the year 2015 (van Horne, 2017). We want to thank EUWEP for providing the country data and for comments on the draft report.

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Summary

S.1 Key findings

In this report the impact of reducing or removing import levies on the competitiveness of the EU egg sector is studied, for both shell eggs and whole egg powder. As a result of the costs of transportation, import levies and the effects on product quality and safety, there will barely be imports of shell eggs from third countries to the EU. Competition from non-EU countries is especially a threat when it comes to egg powder.

Current EU import levies on whole egg powder provide protection for the EU egg sector. In a scenario with 50% lower import levies, Ukraine and the USA already have a lower offer price of whole egg powder compared to the EU egg sector. 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 EU egg sector.

The results for 2017 are presented in Figure S.1 and Figure S.2. Figure S.1 provides the production costs of whole egg powder in the EU, with the addition of transportation costs and the current import levies, compared to Ukraine, the USA, Argentina and India. Figure S.1 shows that import levies protect the EU from large volumes of imports from third countries. With the current import levies, the offer price of whole egg powder from all non-EU countries is above the offer price of EU producers.

Compared to the 2015 base line (van Horne and Bondt, 2017) the EU offer price of eggs and egg powder slightly decreased. The offer price of the USA also decreased a little, because of lower feed prices. The offer price of India, Argentina and Ukraine showed a very small increase compared to the 2015 base line. This was the result of higher feed prices and a change in exchange rate to the euro.

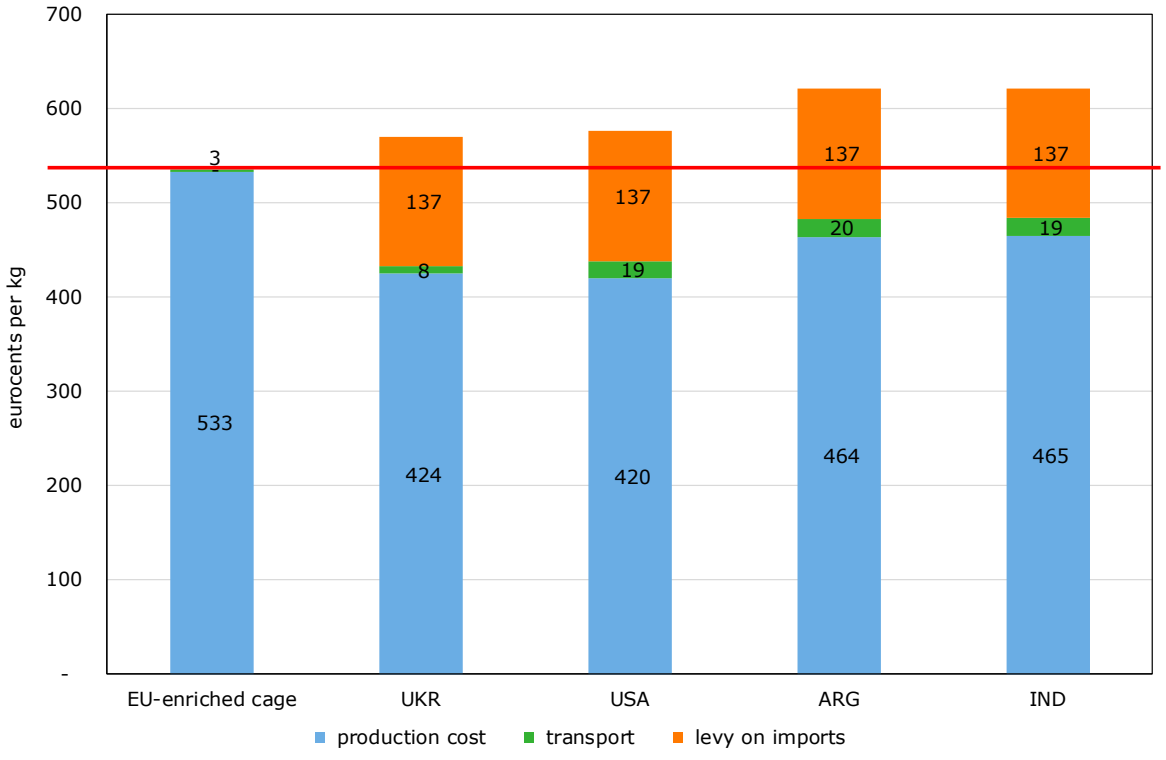

Figure S.1 *Offer price of whole egg powder in Frankfurt am Main from EU average (horizontal line) and non-EU countries (Ukraine, USA, Argentina, India) in eurocents per kilogram in 2017*

Figure S.2 illustrates the scenario with a 50% decrease in import levies and a 10% devaluation of the exchange rates for the non-EU currencies. In this situation all third countries have a lower offer price of whole egg powder compared to the EU egg sector, and large volumes of whole egg powder can be expected to be imported from these countries. Offer prices in Frankfurt could be 6% (Argentina, India) to even 14% (Ukraine) below the average EU level.

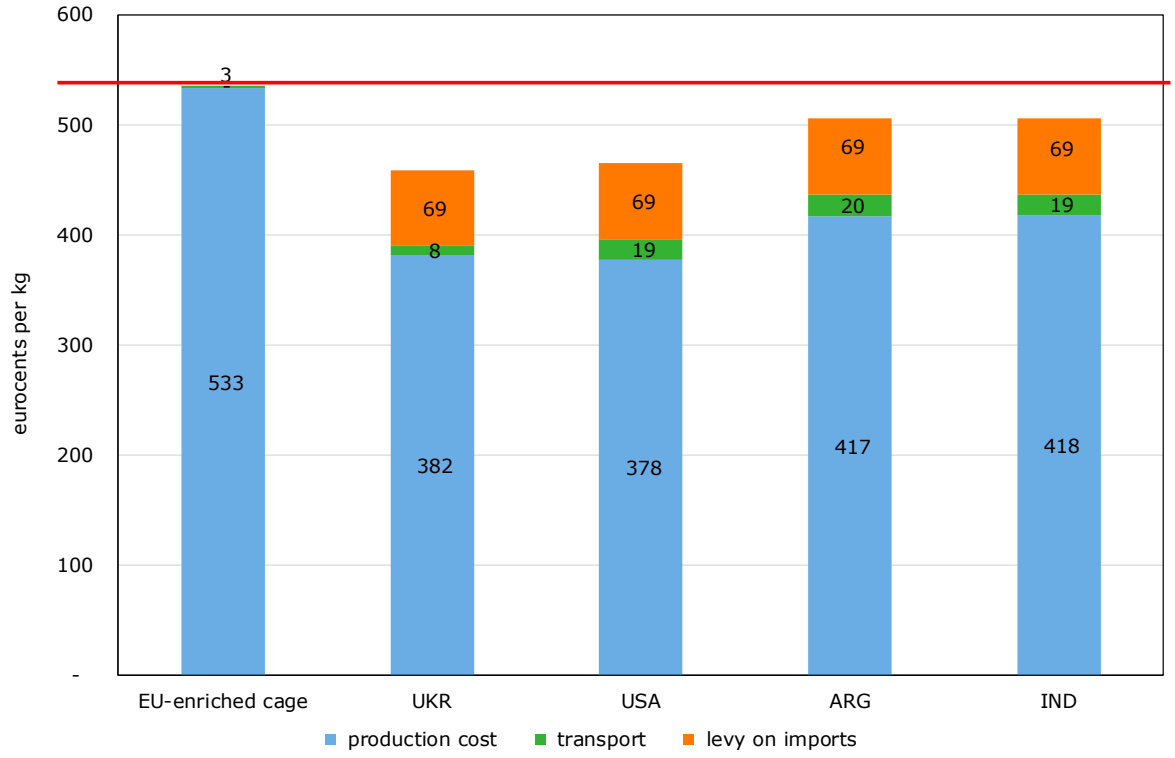

Figure S.2 *Offer price of whole egg powder in Germany from EU average (horizontal line) and non-EU countries (Ukraine, USA, Argentina, India) in eurocents per kilogram based on scenario 3: 50% lower import levies and 10% lower exchange rate*

The 'worst-case scenario' consists of no import levies and a 10% lower exchange rate for the non-EU currency. In this scenario all non-EU countries would be very cheap suppliers of whole egg powder to the EU market. Offer prices in Frankfurt could be 18% (Argentina, India) to even 27% (Ukraine) below the average EU level.

S.2 Complementary findings

The production costs of shell eggs produced in enriched cages in the EU in 2017 were on average 88 eurocents per kg of eggs. Between the main egg producing countries, the production costs of shell eggs in 2017 ranged from 96.3 eurocents per kg of eggs in the Denmark to 82.3 eurocents per kg of eggs in Spain. The costs in the Netherlands, France and Italy are around the EU average. Compared to the average level within the EU, the production costs of shell eggs in 2017 were lower in USA (-24%), Ukraine (-22%), Argentina (-14%) and India (-11%).

For whole egg powder the non-EU countries were even more competitive. Compared to the average level within the EU, the production costs of whole egg powder in 2017 were lower in USA (-21%), Ukraine (-20%), Argentina (-13%) and India (-13%). Because the cost of transportation of powder is low, the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the EU from imports from the four non-EU countries.

In the EU, egg producers have to comply with European legislation on 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 in 2017. The extra costs of keeping layers in enriched cages account for a large share of these additional costs.

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. Between countries, regions and farms the density differs due to climate and management strategy. Literature shows that from an economic point of view 350 to 400 cm^2 per hen gives the highest income for the egg producer. 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 a)	Most farmers receive revenues from manure
-Ammonia emission	Low	No	No measures taken to limit emission
Food Safety			
-Zoonosis control	Medium	Differs b)	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 c)	High density in conventional cages

a) Regulations in some regions, for example in the USA; b) Regulations in some countries, for example in the USA or only export-oriented companies; c) In the USA the market is changing towards non-cage eggs. Some states (e.g. California) already have some kind of legislation.

S.3 Methodology

Egg producers in the EU have to comply with legislation dealing with environmental protection, animal welfare and food safety. The result of all this legislation is an increase in the costs of producing eggs. At the same time the EU is negotiating with other countries or groups of countries to liberalise trade in agricultural products. In this report, Wageningen Economic Research studied the impact of reducing or removing import levies on the competitiveness of the EU egg sector.

The production costs of shell eggs and whole egg powder were calculated for eight EU egg-producing countries: the Netherlands, Germany, France, Spain, Italy, United Kingdom, 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 2017. The total costs were converted to euros with the average exchange rate in the year 2017. Account was taken of the implementation of enriched cages in the EU, being the minimum standard for egg production from 2012.

Based on the 2017 situation, four scenarios were developed:

- A 50% reduction in import levies for eggs and whole egg powder, to illustrate the result of any multi - or bilateral agreement of the EU with non-EU countries.
- A 10% lower exchange rate for the currency of the non-EU countries. A comparison of the exchange rate in 2018 and 2017 showed that for some non-EU countries this was a realistic scenario.
- A combination of a 50% reduction in import levies and a 10% lower exchange rate.
- A 'worst-case' scenario based on no import levies and a 10% lower exchange rate.

1 Legislation

1.1 Introduction

This chapter provides an overview of legislation in the EU. Poultry farmers and other food business operators in the production chain in the EU have to comply with this European legislation. This legislation is the translation of societal and political choices made in the EU and its standards and demands may exceed international standards and practices. Most 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 cost of alternative housing systems for layers. 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 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 EU Legislation

Egg producers in the EU have to comply with a set of European legislation. This legislation is the translation of societal choices made in the EU and especially relates to environmental protection, animal welfare and food safety. In this section, 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 EU is the Nitrates Directive (91/676/EC). The Nitrates Directive aims to control pollution and protect water quality in Europe, 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 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 needs 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.

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
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 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 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 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 Member States, there is a large variation in Salmonella prevalence. In response to the European Food Safety Authority (EFSA) baseline study, 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 various Member States.

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

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, 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 Cost of alternative housing systems

The welfare Directive 99/74/EC required that from 1 January 2012 laying hens are housed in so-called enriched cages or in alternative (non-cage) systems. The alternative system described in the EU Directive most resembles the barn/aviary system. 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 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 A3.1 in Appendix 3 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 A3.2 in Appendix 3 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 euro) for various housing systems for laying hens (situation North West Europe, prices spring 2017)*

	Conventional cage	Enriched cage	Barn/Aviary
Cost (in euro) per hen housed:			
Hen (pullet at 17 weeks)	3.90	3.90	4.40
Feed	12.85	12.85	13.95
Other variable costs	1.29	1.51	1.39
Housing	2.16	3.05	3.65
Labour	0.97	1.04	1.88
General costs	0.27	0.28	0.46
Revenue spent hen	-0.30	-0.30	-0.29
Total cost	21.14	22.35	25.44
Total cost per egg (eurocent)	5.29	5.59	6.52
Total cost per kg (euro)	0.85	0.90	1.05
Increase (base 550 cm^2), %		6	23

The conclusion is that after implementation of EU Directive 99/74/EC, the housing system with enriched cages produces eggs at the lowest cost. Compared to the situation before 2012 (with conventional cages), 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. 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 EU legislation

The poultry sector is governed by EU legislation and its implementation almost always results in additional costs. Especially the layer sector is dealing with additional costs for environmental protection, animal welfare and food safety legislation. An estimate was made of the additional costs for the following aspects:

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

Food safety
- Salmonella control. Cost 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 EU is only permitted up to 10 days of age. Compared to the situation without any legislation 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 with an increase in space allowance towards 750 cm^2

In this study the costs were estimated for the year 2017 based on the average situation in the illustrated EU countries, using the method described by Van Horne (2012). The actual situation can differ per country or per region. Manure disposal costs are an example for this, with high costs in certain high poultry concentration areas and much lower costs 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 EU legislation are 16% of the total production costs of eggs for the situation in 2017.

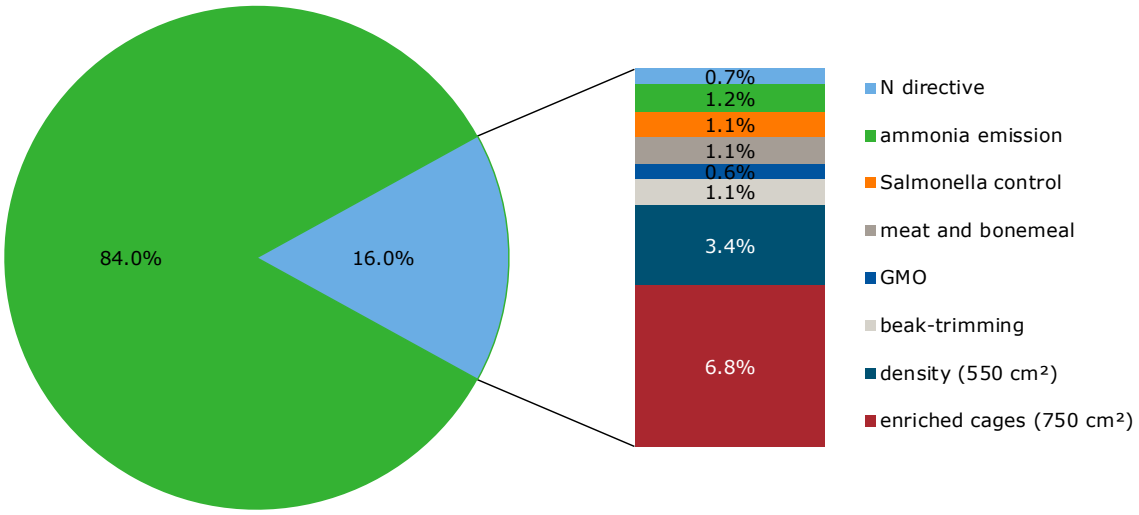

Figure 1.1 *Basic production costs (84%) and costs directly related to EU legislation (16%) in 2017*

Animal welfare legislation gives the largest increase in production costs. First, by increasing the space allowance from 450 cm^2 to 550 cm^2 in 2003, followed by the minimum standard with enriched cages (minimum 750 cm^2 per hen) in 2012. Other important legislation causing an increase in costs are environmental protection (reduction of ammonia emission), a ban on meat and bone meal and Salmonella control.

Future European and national legislation may further increase the production costs of eggs. The Member States have the competence to impose stricter rules for their territory in a number of areas. Additional legislation has already been implemented or will be implemented on several topics in the coming years. Examples are reduction of fine dust emission (Germany and the Netherlands) and no beak trimming (Germany and the Netherlands).

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. ADAS (2016) made a comparison of regulatory requirement and key practices in the poultry meat supply chain in the EU and USA. This report gives an extensive overview covering the key areas of farm production systems and feed supply.

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 EU. Nevertheless, standards between the 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 EU standards are the highest in the world. No country outside Europe has such 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 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 (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 standard 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 the USA, India, Argentina and Ukraine (see Appendix 2). These countries have no food safety regulations that are similar to those in the EU, such as the ban on meat and bone meal and lack of rules on the use of GMO crops as ingredients in poultry feed. In the following sections we summarise the main characteristics of the egg sector, the export position, the legislation on animal welfare and the production standards for these egg-producing 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 no federal 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). Proposed federal legislation (2011 proposal) that would have set national standards for egg production in the USA were not accepted by the government. The proposal was to replace conventional cages by enriched cages (similar to EU standards), after a transition period of 15 to 18 years. The State of California already 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

Ukraine is one of the eastern neighbours of the EU. 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. Ukrainian exports grew rapidly in recent years and in 2017 Ukraine was the second largest supplier of eggs and egg products to the EU.

In Ukraine there is no governmental legislation requiring 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 EU. A report from the government on aligning standards with the EU still has to be published. 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 2016 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 becoming 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 climate 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 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 EU and Japan.

2 Structure and employment

2.1 Introduction

This chapter describes the economic importance of the EU egg sector. Section 2.2 describes the total egg production and Section 2.3 gives information on the structure of the sector with the number of farms. Section 2.4 deals with employment numbers while Section 2.5 gives the total economic value of the EU egg sector. Finally, Section 2.6 describes the importance of alternative housing systems in the EU countries.

2.2 Egg production

In 2017, the total egg production in the EU-28 was 6,757,000 tonnes. Seven leading countries each produce more than 500,000 tonnes of eggs: France, Germany, Italy, Spain, UK, the Netherlands and Poland. Combined, these seven countries are responsible for 70% of the EU's egg production. Table 2.1 gives an overview of the egg production for all EU member states.

Table 2.1 *EU egg production (1,000 tonnes) in 2017*

	2017	% of total
France	913	13.5%
Germany	813	12.0%
Italy	768	11.4%
Spain	721	10.7%
UK	659	9.8%
Netherlands	606	9.0%
Poland	519	7.7%
Romania	375	5.5%
Czech Republic	150	2.2%
Belgium	143	2.1%
Hungary	131	1.9%
Sweden	115	1.7%
Portugal	112	1.7%
Austria	109	1.6%
Greece	100	1.5%
Bulgaria	88	1.3%
Denmark	75	1.1%
Finland	65	1.0%
Slovakia	64	0.9%
Ireland	58	0.9%
Lithuania	49	0.7%
Latvia	41	0.6%
Croatia	37	0.5%
Slovenia	21	0.3%
Estonia	9	0.1%
Cyprus	9	0.1%
Malta	7	0.1%
EU total	6,757	100.0%

Source: European Commission (2018b).

2.3 Structure

A large number of farms produce eggs. The most recent data on poultry farms are from 2013 and published by Eurostat (MEG, 2018). Table 2.2 shows the total number of farms with laying hens for 26 EU countries. For Croatia and Luxembourg no data are available. Table 2.2 gives the number of farms for three categories: 1 to 349 hens, 350 to 2,999 hens and more than 3,000 hens. According to Eurostat, the total number of farms with laying hens in the EU was more than 3.9 million in 2013. However, only 11,740 farms can be described as 'commercial', because they have more than 3,000 laying hens. The countries with the highest number of 'commercial' farms are France, the UK, Germany, the Netherlands, Poland, Italy and Spain. The data also illustrate that the total number of farms with laying hens is extremely high (more than 100,000) in Romania, Poland, Hungary, Greece, Portugal and Bulgaria. These countries have a high number of very small farms with less than 350 layers, which are mainly non-commercial 'backyard flocks'.

Table 2.2 *Number of farms with laying hens per country in the EU in 2013*

	1 to 349	350 – 2,999	3,000 and more	total
France	43,820	710	2,910	47,440
Germany	51,130	1,530	1,430	54,090
Italy	10,180	120	670	10,970
Spain	72,290	70	530	72,890
UK	24,100	670	1,700	26,470
Netherlands	280	80	1,210	1,570
Poland	514,500	550	970	516,020
Romania	2,366,180	70	120	2,366,370
Czech Republic	7,750	20	60	7,830
Belgium	2,480	20	340	2,840
Hungary	203,800	250	140	204,190
Sweden	3,940	40	250	4,230
Portugal	118,150	0	100	118,250
Austria	51,020	550	460	52,030
Greece	166,990	180	160	167,330
Bulgaria	107,140	50	110	107,300
Denmark	3,030	20	160	3,210
Finland	680	70	220	970
Slovakia	7,420	10	30	7,460
Ireland	7,140	40	100	7,280
Lithuania	70,680	0	10	70,690
Latvia	21,450	0	0	21,450
Slovenia	35,440	30	50	35,520
Estonia	3,670	10	0	3,680
Cyprus	8,250	0	0	8,250
Malta	730	30	10	770
EU total	3,902,240	5,120	11,740	3,919,100

Source: MEG (2018).

In the supply chain, different companies are involved in supplies and packing/processing of eggs. Examples are farms with parent stock supplying hatching eggs to hatcheries, hatcheries supplying day-old chicks and feed mills supplying feed to the farmers. The EU does not collect information on the number of companies in the supply chain. There is only very fragmented information of some member states. This information is too limited to give an estimate of the number of farms with parent stock, number of hatcheries, slaughterhouses for layers, packing stations, egg-processing companies or feed mills.

2.4 Employment

No sources are available on the total employment in the egg supply chain in the EU. Research carried out by the International Egg Commission (IEC) gives some information (IEC, 2018b). The IEC collects information on the direct and indirect employment by asking their country rapporteurs. Some rapporteurs from EU countries gave the numbers for their country. Based on this information, we estimated the employment in the egg sector for the EU-28.

Direct employment relates to employment on the poultry farms, including the work for packing and processing. Indirect employment relates to all suppliers. These companies produce a wide range of items such as poultry feed (feed mills), day-old chicks (hatcheries), poultry houses (constructors), equipment, packing material, services (e.g. veterinarians) and transportation. The direct employment is 12 full-time workers per 1,000 tonnes of eggs. The indirect employment is 1.3 times the direct employment. Based on the total egg production of 6,757,000 tonnes in 2017, the direct employment is 81,000 persons. The indirect employment is 105,300 persons. The total employment in the EU egg sector is estimated to be 186,000 full-time workers in 2017.

2.5 Production value

The production value of the EU egg sector can be calculated by multiplying the total production by the average EU price. This can be done with farm prices or retail prices.

The International Egg Commission (IEC) collects the average prices in selected countries (IEC, 2018). In 2017 the average price at farm level of the EU countries was 1.22 euro per kg. In 2017 the average price at retail level of the EU countries was 2.15 euro per kg. Based on the total production in the EU in 2017 of 6,757,000 tonnes, the total production at farm level prices is 8,240m euros. The total production value of the EU egg sector at retail prices is 14,530m euros.

The EU is an important player in the international trade of eggs and egg products. In 2017, the EU-28 exported 209,379 tonnes of egg equivalent with a value of 221m euros. At the same time, the EU-28 is an importer of eggs and egg products. In 2017 the EU-28 imported 21,800 tonnes of egg equivalent with a value of 31m euros. Table 2.3 gives the development of the import and export in volume and value from 2013 to 2017. In 2017 the main suppliers of eggs and egg products to the EU were from USA, Ukraine and Argentina. Exports from the EU mainly go to Japan and Switzerland. Appendix 2 gives more detailed information on the EU import of egg and egg products.

Table 2.3 *Import and export of eggs of the EU in volume (1,000 tonnes egg equivalent) and value (million euro)*

	2013	2014	2015	2016	2017
export volume	220	233	281	247	209
import volume	20	14	19	17	22
export value	266	278	385	283	221
import value	29	22	33	30	31

Source: European Commission (2018).

2.6 Housing systems

In the EU laying hens are kept in different housing systems. Since 2012 laying hens can only be kept in enriched cages or alternative (non-cage) systems. Eggs produced in the EU have to be labelled according to the housing system in which the laying hens are kept (EC 589/2008). The codes printed on the eggs are as follows: 3 is enriched cage, 2 is barn, 1 is free range and 0 is organic. Table 2.4

gives the basic requirements for the various production systems defined by the EU. In the EU the minimum standard for the cage system is enriched cages. Non-cage systems are barn, free range and organic, in which hens are kept on a litter floor on one level or multi-level (aviary).

Table 2.4 *Legal requirements for the various production systems in the EU*

Production system	code	Stocking density indoor	Access to outdoor run
Enriched cage	3	750 cm^2 per hen	No
Barn	2	9 birds per m^2	No
Free range	1	9 birds per m^2	Yes, 4 m^2 per hen
Organic	0	6 birds per m^2	Yes, 4 m^2 per hen

Laying hens in the EU are kept in a wide variety of housing systems. Table 2.5 gives an overview for the situation in 2017 in the EU member states. Countries in East and Southern Europe predominantly have enriched cages systems for laying hens. More than 80% of the hens are kept in enriched cages in Spain, Poland, Portugal, Czech Republic, Greece, Slovakia, Malta and the Baltic States. Countries with less than 20% laying hens in enriched cages are Germany, the Netherlands, Austria and Sweden. The data also show the differences in barn and free range systems: France, UK and Ireland mainly have free range as the alternative system and barely have any barn systems. In many countries, the trend for the coming years will be a further move towards alternative systems. This trend will be led by the large retailers as many supermarkets have already announced a move towards cage-free systems by 2022 or 2025.

Table 2.5 *Number of laying hens (million) and share (%) of housing systems in EU member states (2017 data)*

	Laying hens	Enriched cage	Barn	Free range	Organic
Germany	52.7	6.9	63.0	18.5	11.6
France	49.0	64.8	6.4	20.1	8.7
Spain	46.7	87.9	6.0	5.4	0.7
Poland	46.3	86.9	9.6	3.2	0.3
UK	44.1	37.1	4.7	55.6	2.6
Italy	35.0	61.8	31.1	2.7	4.4
Netherlands	34.3	18.2	60.0	16.0	5.8
Belgium	9.4	39.2	42.6	13.8	4.4
Portugal	9.3	92.8	5.1	1.6	0.5
Sweden	8.1	12.3	67.9	3.0	16.8
Romania	8.0	59.8	35.9	3.6	0.7
Hungary	7.0	63.4	35.5	0.7	0.4
Austria	6.7	0.9	65.0	22.3	11.8
Czech Republic	5.8	83.9	15.6	0.2	0.3
Bulgaria	4.8	56.5	39.9	3.6	0.0
Denmark	4.4	19.6	42.1	8.4	29.9
Finland	4.3	59.9	31.7	3.0	5.4
Greece	4.3	84.4	9.7	2.9	3.0
Ireland	3.5	54.2	1.1	41.7	3.0
Slovakia	3.1	84.5	14.5	0.8	0.2
Latvia	2.8	86.5	11.8	1.6	0.1
Lithuania	2.8	95.7	3.8	0.1	0.4
Croatia	1.9	73.2	25.2	1.6	0.0
Slovenia	1.2	57.4	37.4	3.2	2.0
Estonia	1.1	86.3	7.3	3.0	3.4
Cyprus	0.5	71.7	16.3	9.9	2.1
Malta	0.3	97.0	3.0	0.0	0.0
Luxembourg	0.1	0.0	79.0	10.5	10.5
EU total	397.3	53	27	15	5

Source: European Commission (2018b).

3 Production costs of eggs in selected EU countries

3.1 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 Netherlands (NL), Germany (DE), France (FR), the UK, Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). These countries are important egg-producing countries within the EU. All costs in this report are given in euros, and relate to the year 2017.

3.1.1 Production costs at primary farm

Figure 3.1 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost 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 (cost 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).

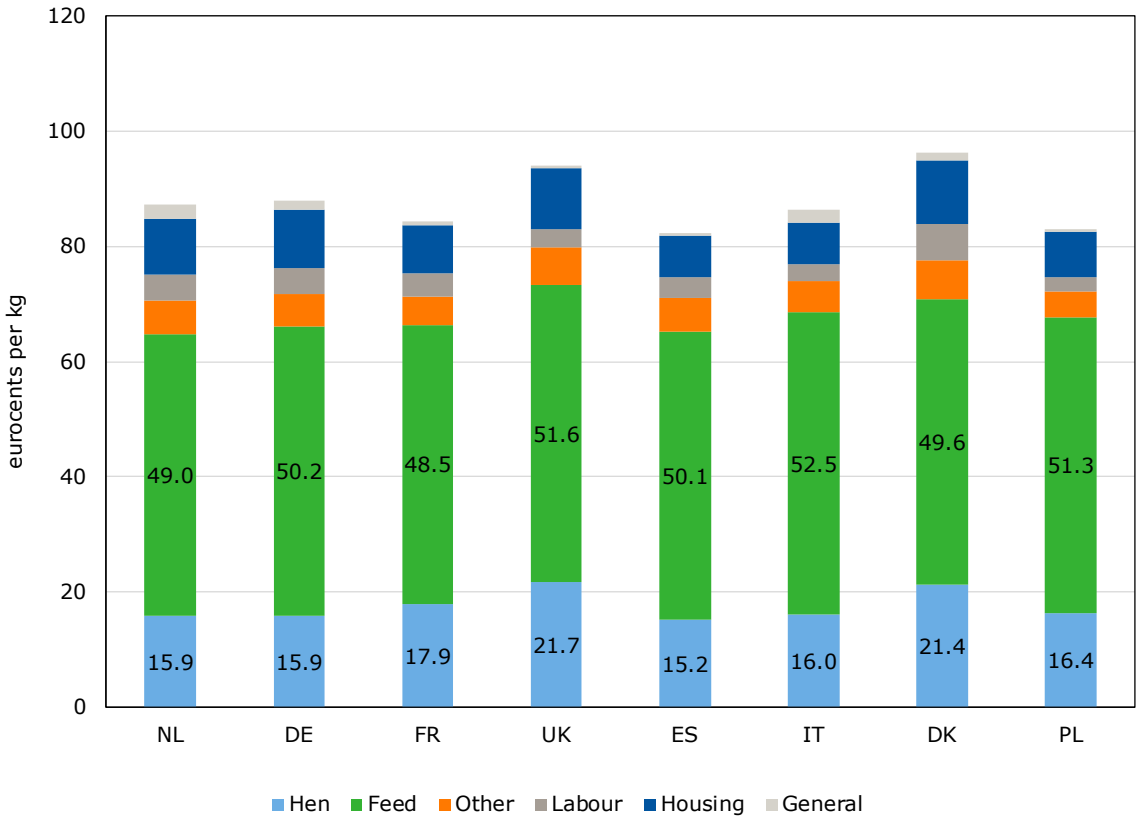

Figure 3.1 *Cost of primary production in* enriched cages *in some EU countries (eurocents per kilogram of eggs) in 2017*

The costs of primary production (in eurocents per kilogram of eggs) are the highest in Denmark and in United Kingdom. The costs in the Netherlands, Germany and Italy are approximately at the average level of 88 eurocents per kg of eggs. Spain and Poland have the lowest costs of production of the selected EU countries.

Table 3.1 shows the data used in the calculations. Table 3.2 gives the results.

Table 3.1 *Data on egg production in selected EU countries in 2017 (enriched cages)*

	NL	DE	FR	UK	ES	IT	DK	PL
Feed price (euro/100 kg)	24.5	25.1	23.1	25.8	24.8	26.0	25.5	25.0
Price/hen at 20 weeks (euro)	4.31	4.32	4.20	4.82	3.83	3.94	4.83	4.22
Laying period (days)	450	450	415	395	430	420	395	420
Eggs per hen	400	400	350	347	370	365	358	365
Egg weight (g)	61.0	61.0	62.0	64.0	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 3.2 *Costs of primary production (in eurocents per kilogram of enriched cage eggs) in selected EU countries in 2017*

	NL	DE	FR	UK	ES	IT	DK	PL
Total costs inclusive labour	87.3	88.0	84.4	94.0	82.3	86.4	96.3	82.9
Total costs exclusive labour	82.7	83.5	80.2	90.9	78.7	83.5	89.8	80.5
Hen cost at 20 weeks	17.7	17.7	19.3	21.7	16.2	17.1	21.4	18.6
Feed	49.0	50.2	48.5	51.6	50.1	52.5	49.6	51.3
Other	5.7	5.7	4.8	6.5	5.8	5.6	6.6	4.6
Labour	4.5	4.5	4.1	3.1	3.6	2.9	6.5	2.5
Housing	9.9	10.1	8.1	10.7	7.2	7.2	11.0	7.8
General	1.0	1.0	0.8	0.9	0.8	0.8	0.9	0.7
Manure disposal	1.4	0.7	0.0	-0.6	-0.3	1.4	0.4	-0.3
Revenue spent hen	-1.8	-1.8	-1.4	0.0	-1.0	-1.1	0.0	-2.3

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. Within the selected EU countries Italy has the highest feed price, and France the lowest. Young hens (pullets) are relatively cheap in Spain and Italy (see Table 3.1). Poland has the advantage of low labour costs and the revenues for manure (see Table 3.2). 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 Denmark and the UK. The average production cost in the EU, based on these eight countries, is 88 eurocents per kg of eggs.

3.1.2 Production costs of egg powder

The cost of producing egg powder are made up of the cost of eggs and the cost of 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 sales, and vary from 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. Table 3.3 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.2 gives the same data in a graph.
The results show that the processing costs amount to approximately 20% of the total cost to produce egg powder. The most expensive country (Denmark) is 10% above, and the cheapest country (Poland) 7% below the EU cost average.

Table 3.3 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder made of enriched cage eggs in 2017*

	NL	DE	FR	UK	ES	IT	DK	PL
Farm level costs	426	429	412	459	402	421	470	405
Processing costs	111	112	105	105	103	99	116	90
Total	537	541	517	563	504	521	586	495

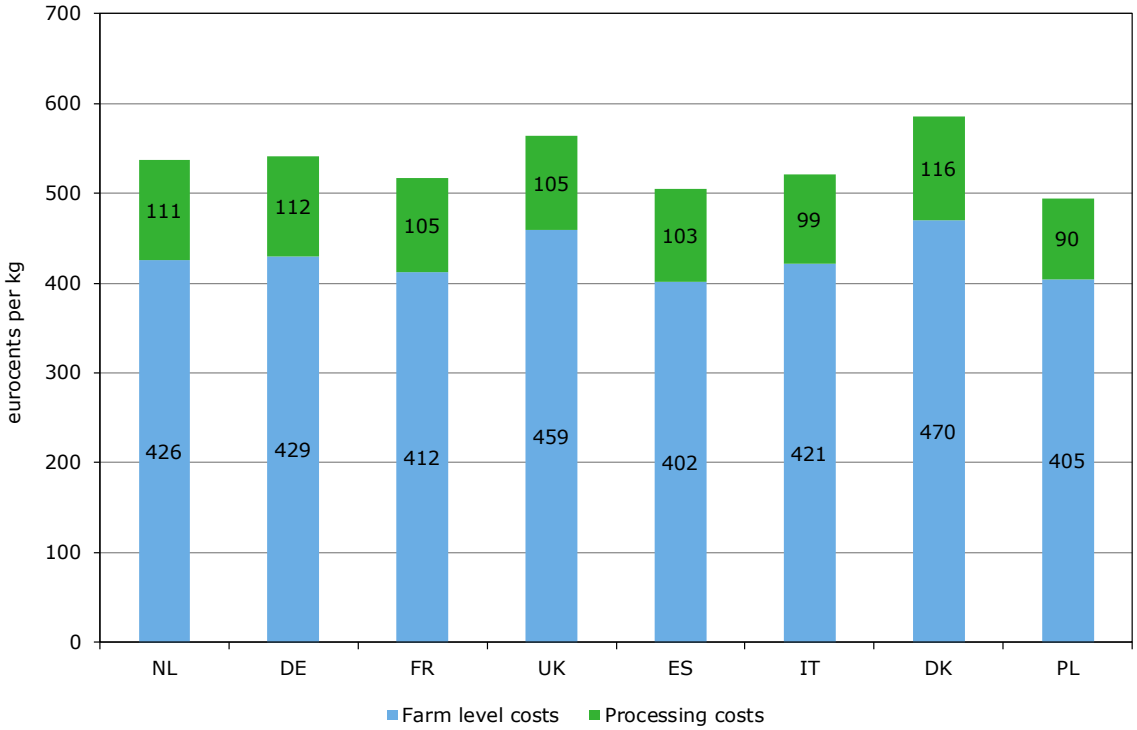

Figure 3.2 *Cost of production of whole egg powder from* enriched cages *in some EU countries (eurocents per kilogram of egg powder) in 2017*

3.2 Production costs of barn eggs

The production costs of shell eggs produced by hens housed in the barn system has been researched for the same EU countries: the Netherlands (NL), Germany (DE), France (FR), the UK, Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). Calculations are based on keeping hens in an aviary system with a density of maximum 9 hens per square meter of usable area (equal to around 18 hens per square meter poultry house). All countries provided the following production results: laying period, number of eggs, feed conversion and mortality. Also investment in building and equipment and labour input was estimated.

3.2.1 Production costs at primary farm

Figure 3.3 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost 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 (cost of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general costs (book-keeping, clothing, insurance and, if applicable, manure disposal costs).

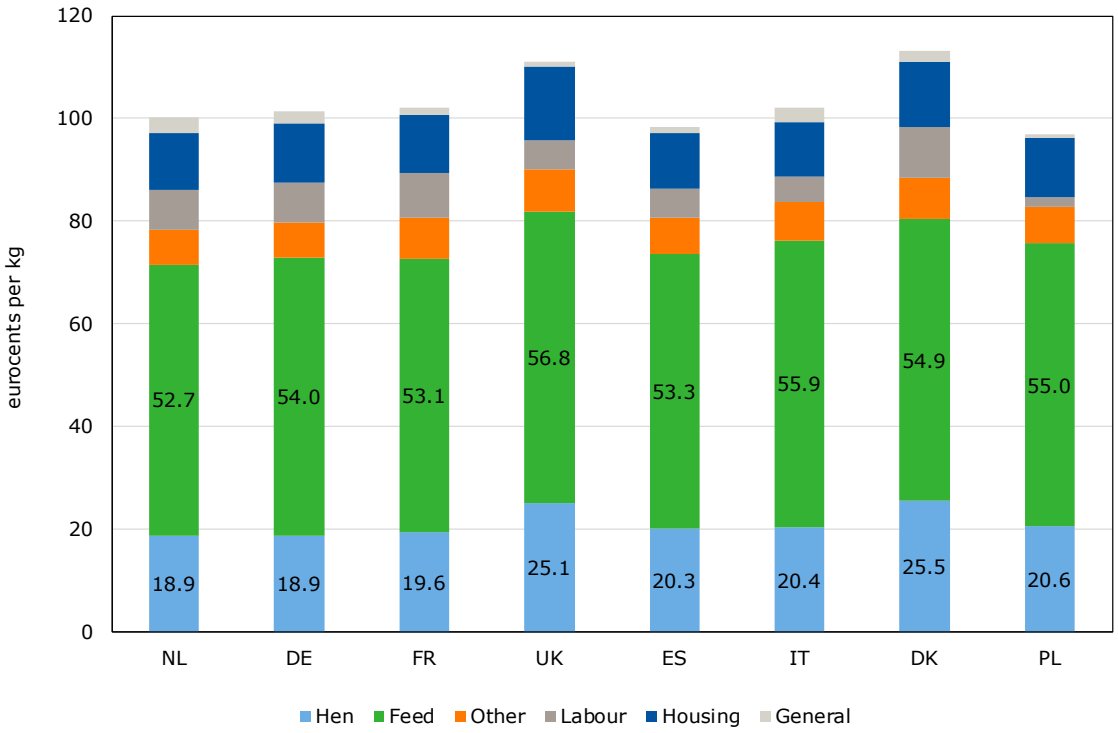

Figure 3.3 *Cost of primary production in* barns *in some EU countries (eurocents per kilogram of eggs) in 2017*

The costs of primary production (in eurocents per kilogram of eggs) are the highest in Denmark and United Kingdom. Italy and France are approximately on the EU average of 103 eurocents 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. Table 3.4 gives the detailed results.

Table 3.4 *Costs of primary production (in eurocents per kilogram) of barn eggs in some EU countries in 2017*

	NL	DE	FR	UK	ES	IT	DK	PL
Total costs inclusive labour	100.2	101.4	102.0	111.1	98.3	102.1	113.2	97.0
Total costs exclusive labour	92.6	93.7	93.3	105.4	92.7	97.2	103.2	95.0
Hen cost at 20 weeks	20.9	21.2	21.5	25.1	21.7	21.2	25.6	22.8
Feed	52.7	54.0	53.1	56.8	53.3	55.9	54.9	55.0
Other	6.8	6.9	7.8	8.1	7.2	7.4	8.0	7.1
Labour	7.6	7.7	8.8	5.7	5.6	4.9	10.0	2.0
Housing	11.1	11.5	11.3	14.3	10.8	10.6	12.7	11.4
General	1.6	1.6	1.4	1.7	1.4	1.3	1.7	1.2
Manure disposal	1.5	0.7	0.0	-0.6	-0.3	1.5	0.4	-0.3
Revenue spent hen	-2.0	-2.3	-1.9	0.0	-1.4	-0.7	-0.1	-2.2

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. The Netherlands has relatively low production costs, as a result of good performance with a high egg production. Similar to the comparison for enriched cage eggs, Denmark and UK have the highest production costs for barn eggs. The average production costs in the EU, based on these eight countries, are 103 eurocents per kg of eggs. This is 17% higher compared to the average for enriched cage eggs.

3.2.2 Production costs of egg powder

The cost of producing egg powder is made up of the cost of eggs and the cost of processing, in a large commercial egg powder plant. The basic assumptions are similar to those of processing enriched cage eggs (see Section 3.1.2). Table 3.5 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.4 gives the same data in a graph.

The results show that 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 10% above and 7% below the EU average.

Table 3.5 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of barn eggs in 2017*

	NL	DE	FR	UK	ES	IT	DK	PL
Farm level costs	489	495	498	542	479	498	552	473
Processing costs	111	112	105	105	103	99	116	90
Total	600	606	603	647	582	597	668	563

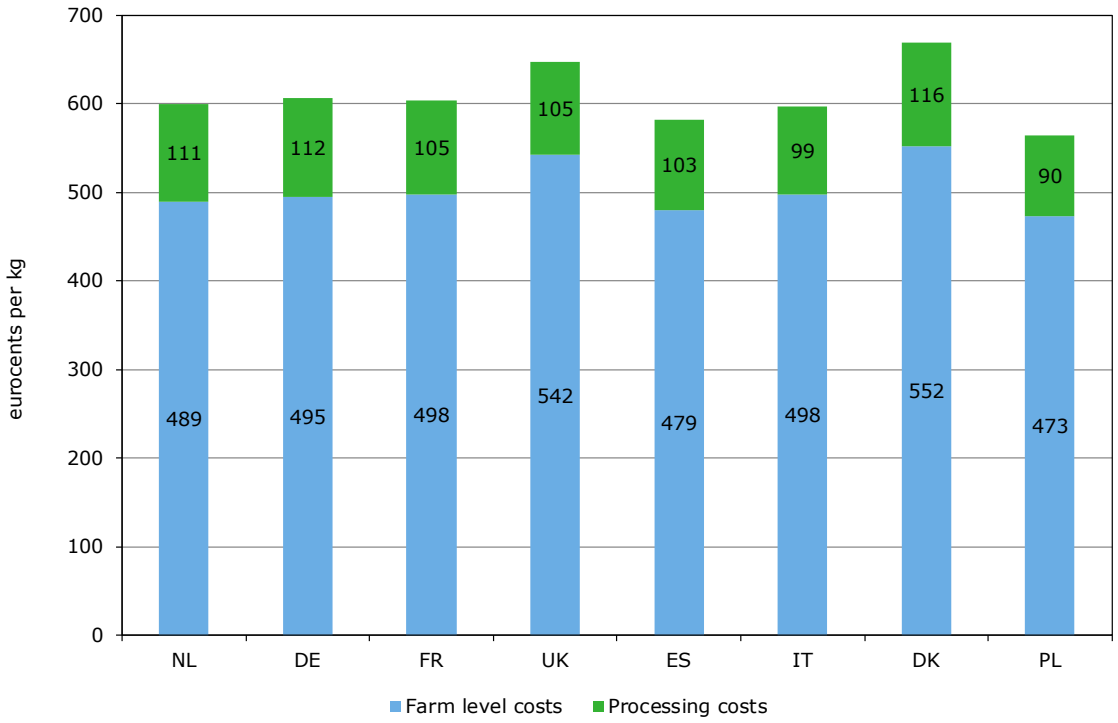

Figure 3.4 *Cost of production of whole egg powder from* barns *in some EU countries (eurocents per kilogram of egg powder) in 2017*

The average production cost of egg powder from barn eggs in the EU, in these eight countries, is 608 eurocents per kg of egg powder. This is 16% higher compared to the average for the offer price of egg powder produced from enriched cage eggs.

3.3 Production costs of free range eggs

The production costs of shell eggs produced by hens housed in free range systems was researched for the same EU countries: the Netherlands (NL), Germany (DE), France (FR), the UK, Spain (ES), Italy (IT), Denmark (DK) and Poland (PL). Calculations are based on keeping hens in an aviary system with access to an outdoor range. All countries provided the following production results: laying period, number of eggs, feed conversion and mortality. Also investment in building and equipment and labour input was estimated.

3.3.1 Production costs at primary farm

Figure 3.5 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost 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 (cost 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).

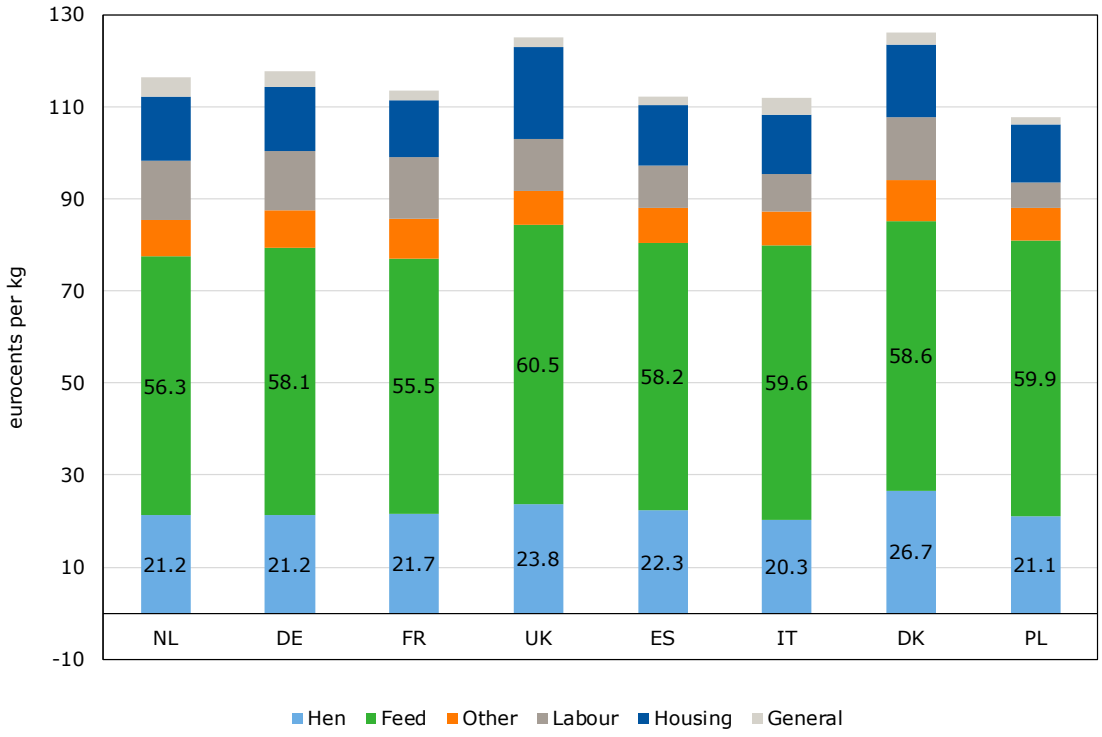

Figure 3.5 *Cost of primary production in free range systems in some EU countries (eurocents per kilogram of eggs) in 2017*

The costs of primary production (in eurocents per kilogram of eggs) are the highest in Denmark and United Kingdom. The costs in Germany and the Netherlands are approximately the EU average of 116 eurocents per kg of eggs. In Poland the costs of production of free range eggs are at the lowest level of the selected EU countries. Table 3.6 gives the details of the results.

Table 3.6 *Costs of primary production (in eurocents per kilogram) of free range eggs in some EU countries in 2017*

	NL	DE	FR	UK	ES	IT	DK	PL
Total costs inclusive labour	116.4	117.8	113.6	125.1	112.2	112.0	126.1	107.7
Total costs exclusive labour	103.7	104.9	100.3	113.9	103.1	103.9	112.4	102.3
Hen cost at 20 weeks	23.3	23.7	23.8	23.8	23.8	21.0	26.7	23.3
Feed	56.3	58.1	55.5	60.5	58.2	59.6	58.6	59.9
Other	8.0	8.2	8.6	7.5	7.7	7.3	8.8	7.1
Labour	12.7	12.9	13.3	11.1	9.1	8.1	13.6	5.4
Housing	14.0	13.9	12.3	20.0	13.0	12.9	15.7	12.4
General	2.7	2.7	2.3	2.7	2.2	2.2	2.6	1.9
Manure disposal	1.5	0.8	0.0	-0.6	-0.3	1.6	0.0	-0.3
Revenue spent hen	-2.1	-2.5	-2.1	0.0	-1.6	-0.7	-0.1	-2.2

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. The Netherlands and Germany have average production costs as a result of good performance with a high egg production. Similar to the comparison for enriched cage eggs, Denmark and UK have the highest production costs for free range eggs. The average production costs in the EU, based on these eight countries, are 116 eurocents per kg of eggs. This is 32% higher compared to the average for the enriched cage eggs.

3.3.2 Production costs egg powder

The cost of producing egg powder is made up of the cost of eggs and the cost 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 3.1.2). Table 3.7 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.6 gives the same data in a graph.

The results show that the processing costs amount to approximately 16% 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 9% above and 9% below the EU average.

Table 3.7 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of free range eggs*

	NL	DE	FR	UK	ES	IT	DK	PL
Farm level costs	568	575	554	610	547	546	615	525
Processing costs	111	112	105	105	103	99	116	90
Total	679	686	659	715	650	646	731	616

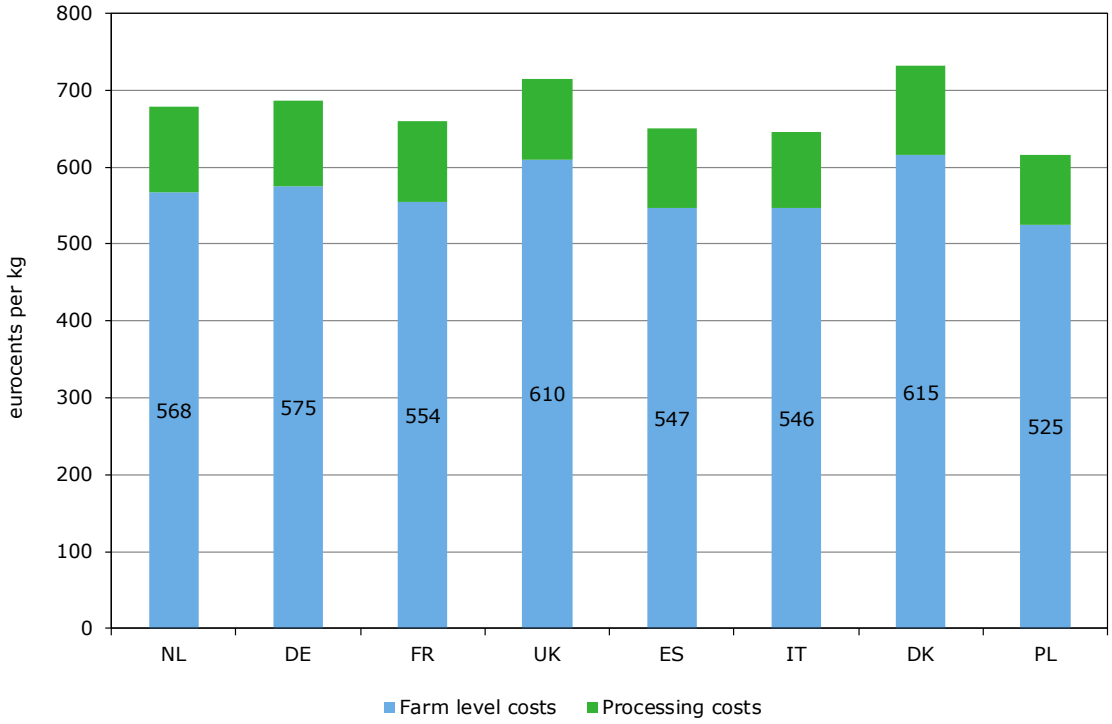

Figure 3.6 *Cost of production of whole egg powder from free range eggs in some EU countries (eurocents per kilogram of egg powder) in 2017*

The average production cost of egg powder, based on egg from free range systems in the EU, and based on these eight countries, is 673 eurocents per kg of egg powder. This is 26% higher compared to the average for egg powder produced from enriched cage eggs.

4 Production costs of eggs in selected non-EU countries

4.1 Production costs of cage eggs

The production costs of shell eggs for consumption has been researched for the following non-EU countries: Ukraine (UKR), the United States of America (USA), Argentina (ARG) and India (IND). These four countries are the main exporters of eggs and egg products to the EU. Appendix 2 gives an overview of the main exporters of eggs and egg products (in egg equivalent) to the EU. The production costs of the third countries are presented in euros.

4.1.1 Production costs at primary farm

Figure 4.1 provides an insight into the build-up of primary production costs, and includes a comparison with the average EU level. 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 (see Table 4.1 for the details).

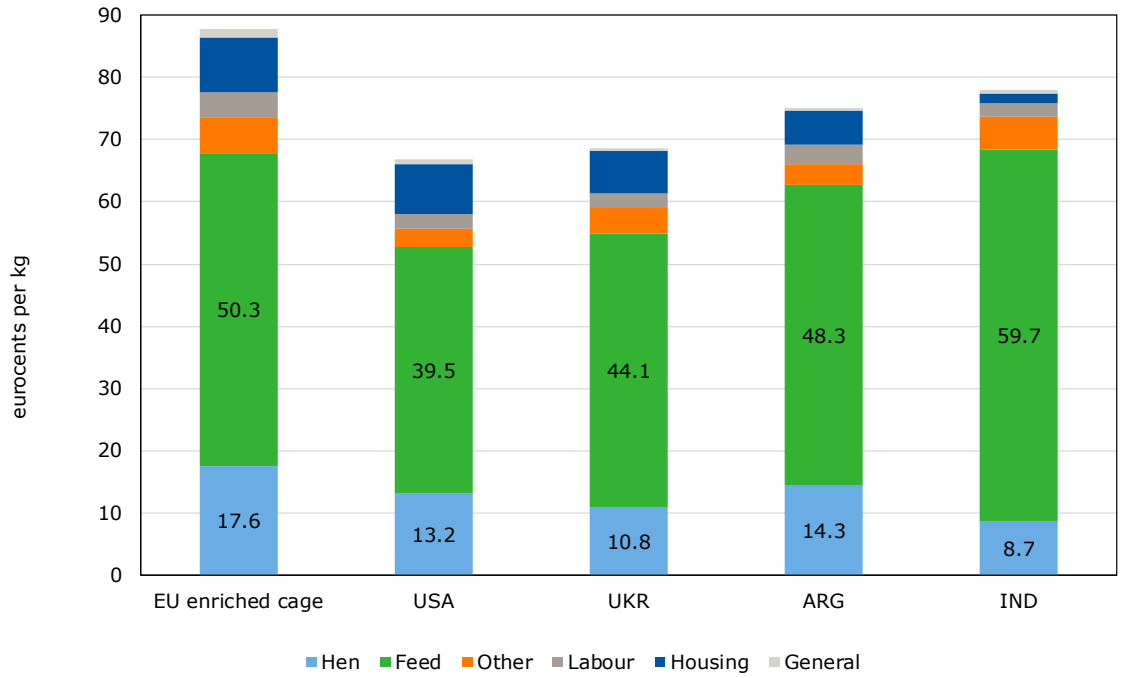

Figure 4.1 *Cost of primary production in* enriched cages *in the EU (average) and conventional cages in some non-EU countries (eurocents per kilogram of eggs) in 2017*

The costs of primary production in all four third countries are clearly lower than in the EU. In the United States and Ukraine the costs are 24 and 22% lower than the EU level. The difference with Argentina and India is smaller; the production costs are 14 to 11% below the EU average of 88 eurocents per kg of eggs. Table 4.1 gives an overview of the input data used for the calculation and Table 4.2 indicates the results.

Table 4.1 *Data on egg production in selected non-EU countries in 2017*

	EU	USA	UKR	ARG	IND
Feed price (euro/100 kg)	25.0	20.0	21.0	22.5	24.6
Price/hen at 20 weeks (euro)	4.31	3.41	3.35	3.72	2.80
Laying period (days)	422	490	420	430	420
Eggs per hen	369	414	345	360	350
Egg weight (g)	62.5	60.0	63.5	63.0	56.0
Feed conversion	2.02	1.98	2.10	2.15	2.43

Table 4.2 *Costs of primary production (in eurocents per kilogram of eggs) in some non-EU countries in 2017*

	EU	USA	UKR	ARG	IND
Total costs inclusive labour	87.7	66.8	68.7	75.1	78.0
Total costs exclusive labour	83.7	64.6	66.5	72.1	75.9
Hen cost at 20 weeks	18.7	13.7	15.3	16.4	14.3
Feed	50.3	39.5	44.1	48.3	59.7
Other	5.7	3.1	4.2	3.5	5.2
Labour	4.0	2.2	2.2	3.1	2.1
Housing	9.0	8.0	6.8	5.5	1.7
General	0.9	0.8	0.5	0.5	0.6
Manure disposal	0.3	0.0	0.0	0.0	0.0
Revenue spent hen	-1.2	-0.5	-4.5	-2.1	-5.5

The feed price determines the total production costs to a significant extent. The feed price is considerably lower in Ukraine, the USA and Argentina than it is in the EU. The lower feed price in these countries can largely be explained by the domestic availability of sizeable quantities of feed ingredients such as maize and soy beans. European producers partly depend on South American and US imports for some of their feed ingredients. The costs of storage, transport and merchant's profit increases the price of feed ingredients in Europe. The price of a young hen is also lower because of the low feed price.

In addition to the aforementioned differences in the feed and young hen prices, some third countries also have the advantage of lower housing costs and labour costs. Wages are much lower in Ukraine, Argentina and India. The difference in labour costs between Europe and the USA is mainly attributable to the social security system, with higher employer charges being paid in Europe.

In all mentioned third countries, producers have lower costs because legislation on environment, food safety and animal welfare is less stringent than in the EU. See Chapter 1.

4.1.2 Production costs of egg powder

The cost of producing egg powder consists of the costs of eggs and the cost 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 3.1.2. Table 4.3 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 4.2 gives the same data in a graph.

Table 4.3 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of cage eggs in 2017 (enriched cage in the EU)*

	EU	USA	UKR	ARG	IND
Farm level costs	428	326	335	367	381
Processing costs	105	94	90	97	84
Total	533	420	424	464	465

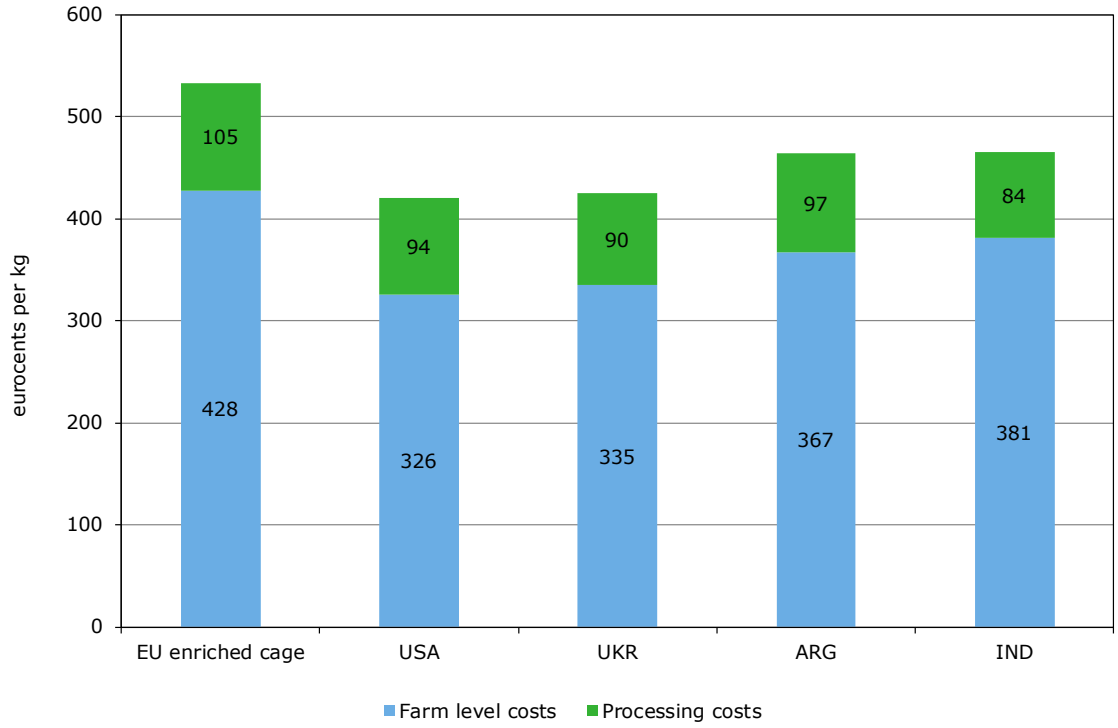

Figure 4.2 *Cost of production of whole egg powder in some non-EU countries (eurocents per kilogram of egg powder) in 2017*

Figure 4.2 shows that the USA and Ukraine are 19% and 22% cheaper than the average EU production costs of egg powder. The difference in production costs between the EU and India and Argentina is approximately 15%.

5 Results of different scenarios

In this chapter four scenarios were defined (Section 5.1), which were examined for shell eggs (Section 5.2) and for whole egg powder (Section 5.3). In all figures, the EU level is an average of the eight EU countries shown in Chapter 3.

5.1 Description of the scenarios

The EU has a set of rules on trade with third countries. Part of these rules can be import levies and tariff quotas. Within the GATT agreement of 1995 a reduction of import tariffs for a maximum quantity of eggs and egg products was agreed. Later bi-lateral agreements were made with Mexico, Ukraine, Canada and Japan. Appendix 4 gives an overview of the main import quota and import levies on eggs and egg products. The basic import levy for fresh eggs is 0.30 euro per kg and 1.37 euro per kg of whole egg powder.

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

1. 50% reduction of the EU import levies on egg and egg products, as a possible result of a new multilateral (WTO) agreement or bilateral agreement.
2. 10% lower exchange rates of the US dollar, Argentine peso, Ukrainian hryvnia and Indian rupee. The average exchange rate in 2017 was used to convert the production costs of all countries to euros. In Appendix 1 the development of the exchange rate of some non-EU countries is given. The graph in Appendix 1 illustrates that a 10% lower exchange rate is a realistic scenario.
3. A combination of 50% lower import levies and a 10% lower exchange rate of the third countries' currencies.
4. A combination of no import levies and a 10% lower exchange rate of the third countries' currencies. This is the 'worst-case' scenario.

5.2 Shell eggs

5.2.1 Basic situation

In order to form an idea of the transport costs from the major production area of a country to an EU market region, in this case Frankfurt am Main in Germany, the transport costs have been added to the production costs on the basis of a full truckload of shell eggs. For that purpose, an offer price in Frankfurt am Main has been calculated, which is the total of production costs (farm level and processing), transportation costs and import levies. The results clearly indicate that it was not possible for the egg producers in the selected non-EU countries to compete in the supply of shell eggs to Germany in 2017. The horizontal line indicates the EU level of total costs, including the 3 eurocents/kg cost of transport to Frankfurt. Ukraine could be a threat for EU egg producers, but the current 30 eurocents/kg levy on imports means that it is not cost effective to export shell eggs to the EU market. Figure 5.1 also shows that imports from Indian and Argentine producers will not be competitive in a situation if there were to be no import levies, because of the high transport costs.

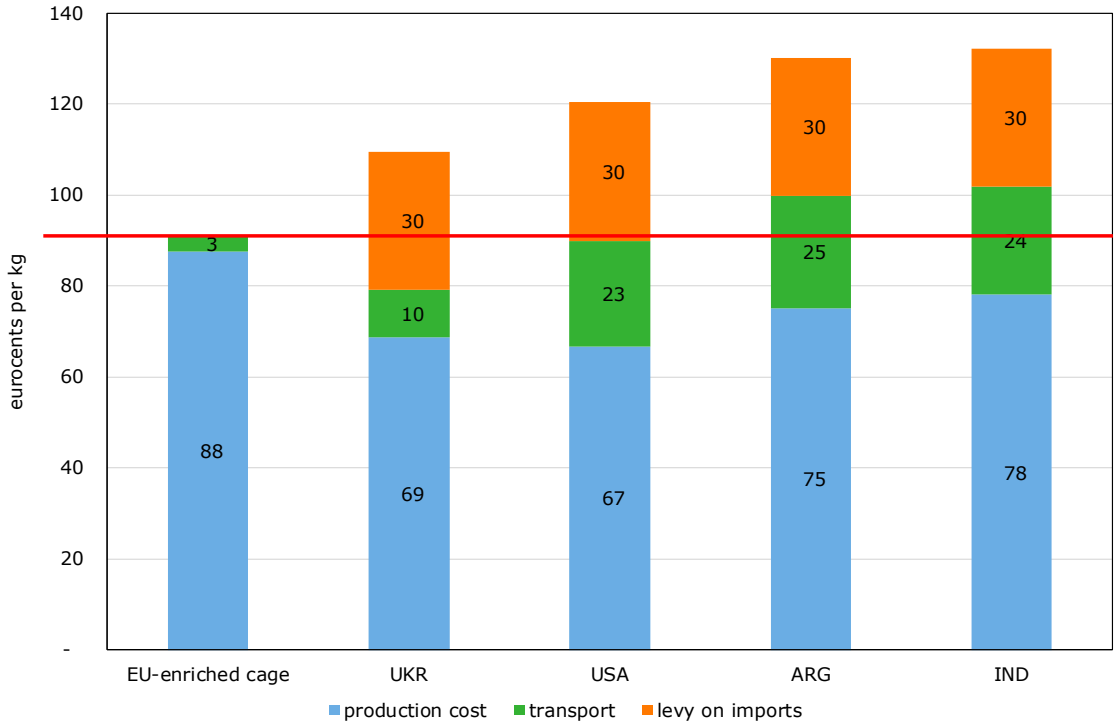

Figure 5.1 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (*enriched cages*; horizontal line) and non-EU countries in eurocents per kilogram of egg (basic situation)*

Figure 5.2 shows that if shell eggs from barn and free range systems produced in EU countries would have to compete on the world market, then the offer price of eggs from Ukrainian producers would be close to the EU offer price, even in a situation with import levies. However, this is not really the case, because barn eggs and free range eggs are sold on a specific market. Therefore, this is not included in the scenarios.

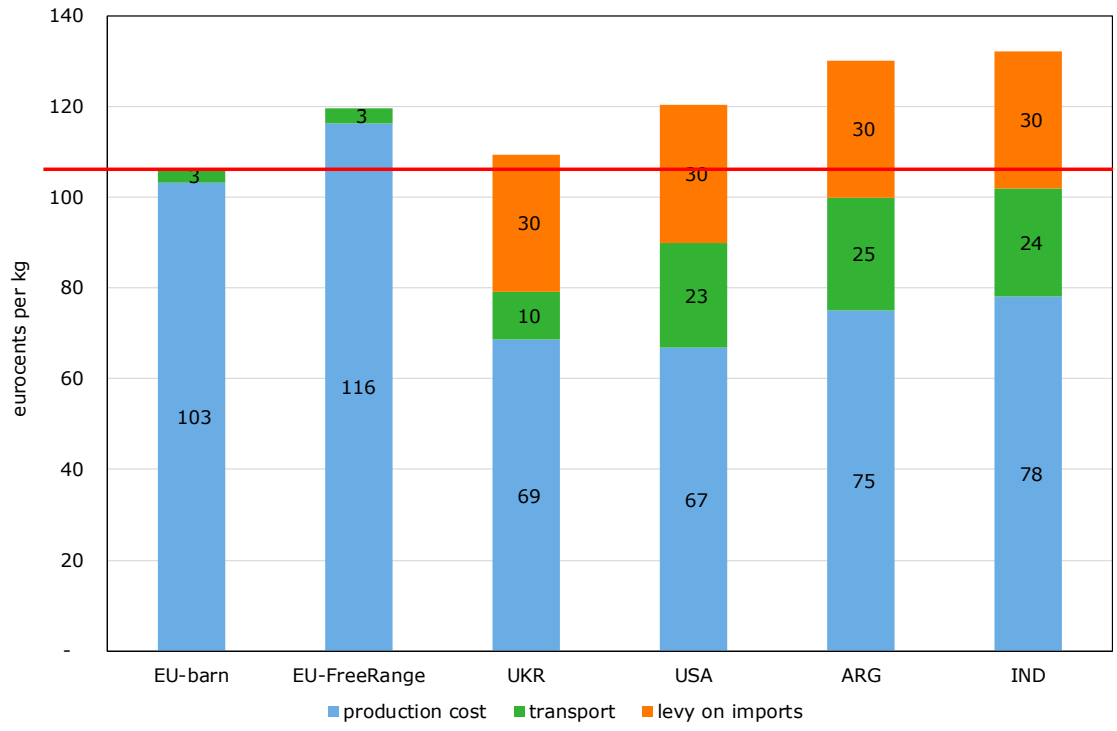

Figure 5.2 *Offer price of shell eggs in Germany from EU average (*barn eggs and free range eggs*) and non-EU countries (*cage eggs*) in eurocents per kilogram of egg (basic situation)*

5.2.2 Scenario 1 - Lower EU import levies

In the first scenario the impact of 50% lower levies on imports into the EU has been examined. As Figure 5.3 illustrates, in this scenario Ukraine would be the most competitive supplier of shell eggs to Frankfurt in 2017. The result of the lowering of the import levies is that Ukraine can almost compete on the EU market. In this scenario other non-EU countries would not be competitive on the EU market.

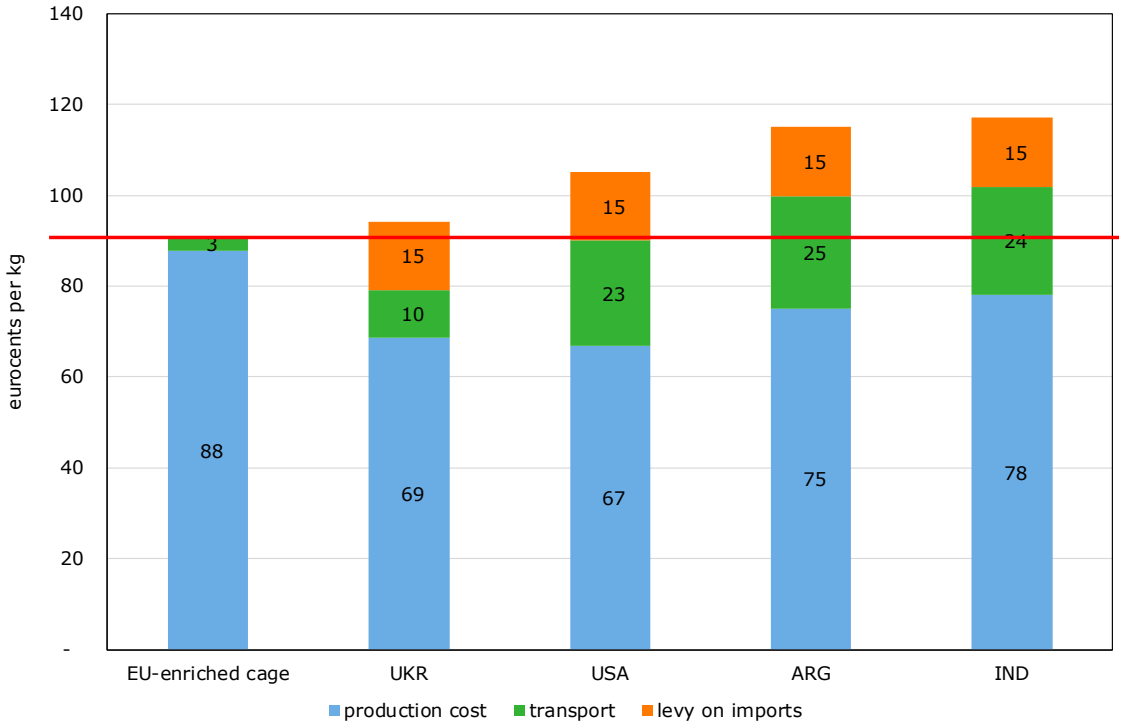

Figure 5.3 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 1: 50% lower import levies)*

5.2.3 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 5.4 shows that in the case of 10% lower exchange rates none of the non-EU countries would provide real competition to the EU market.

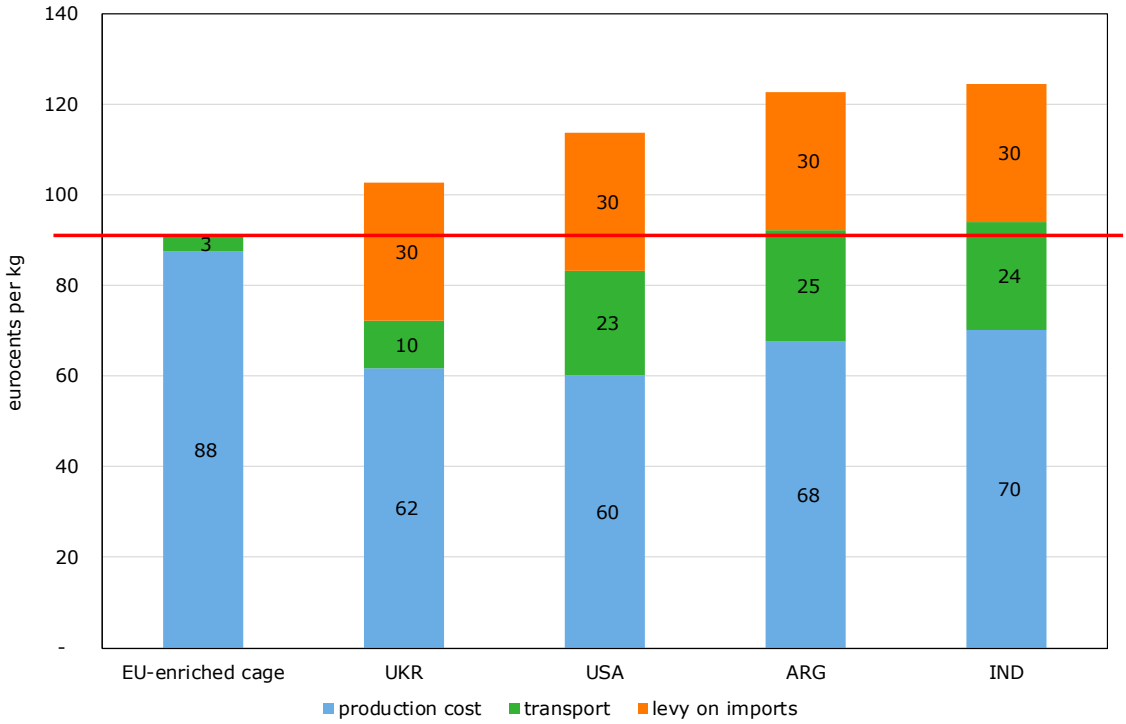

Figure 5.4 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 2: 10% lower exchange rates)*

5.2.4 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. The consequences of the combination of 50% lower levies on imports and 10% lower exchange rates are indicated in Figure 5.5. In this scenario, Ukraine obtains a very competitive position on the EU market for shell eggs. The other non-EU countries would not be competitive.

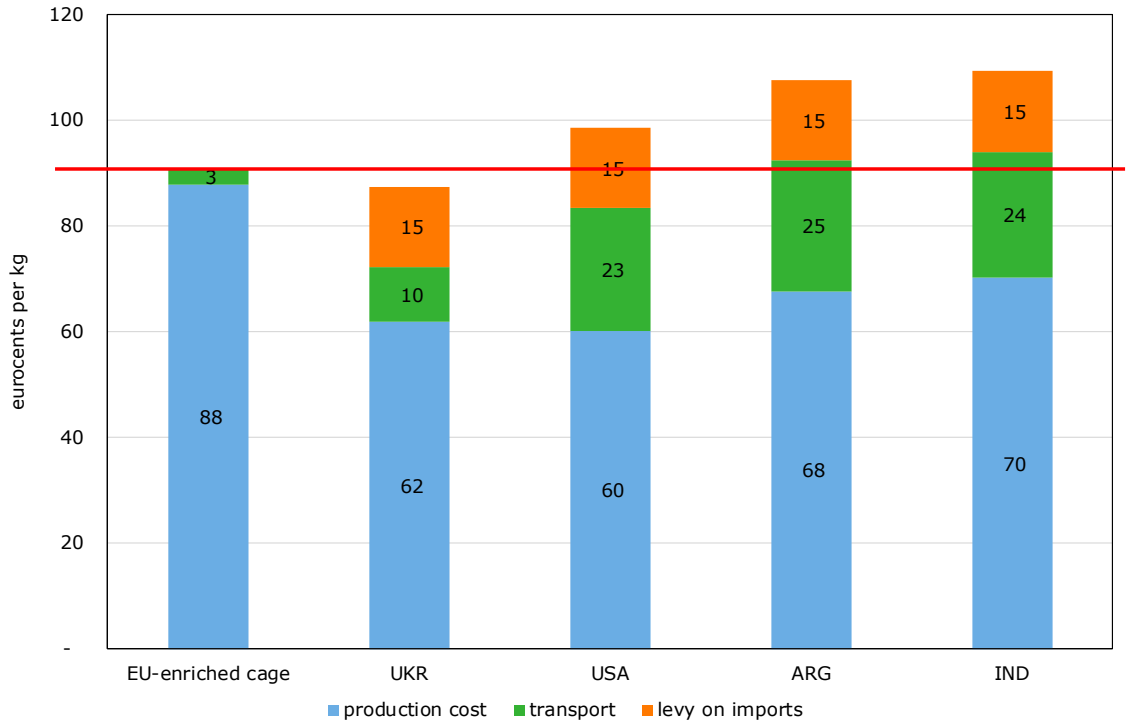

Figure 5.5 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 3: 50% lower import levies and 10% lower exchange rate)*

5.2.5 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. In fact, this is a 'worst-case' scenario. The consequences of the combination of no import levies and 10% lower exchange rates are indicated in Figure 5.6. In this scenario the Ukraine is very competitive on the EU market. Also, the USA has a lower offer price than the EU producers. The difference in offer price for Argentina and India compared to the EU producers is very small.

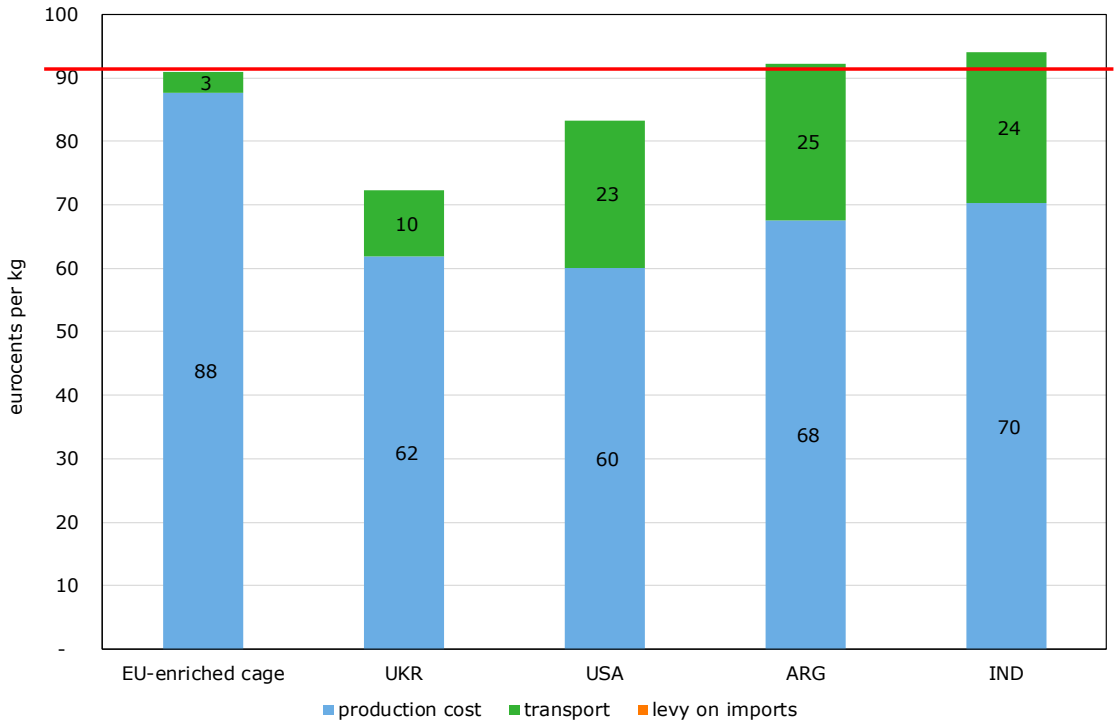

Figure 5.6 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 4: zero import levies and 10% lower exchange rates)*

5.3 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 is the relatively low cost of transport as the product is dried.

5.3.1 Basic situation

The assumed market location is Frankfurt am Main in Germany, for which an offer price has been calculated. The offer price is the total of production costs, processing costs, transportation costs and import levies. The results are shown in Figure 5.7. This figure shows that for whole egg powder the competition from non-EU countries is a real threat. However, the levies on imports still provide enough protection for whole egg powder entering the EU market. The full tariff for whole egg powder is 1.37 euro per kg. If there were to be no levies on imports, all suppliers of whole egg powder from the non-EU countries illustrated would have been very competitive on the EU market in 2017. It has to be recognised that, in contrast to shell eggs, the product quality of egg powder is not affected by long-distance transport.

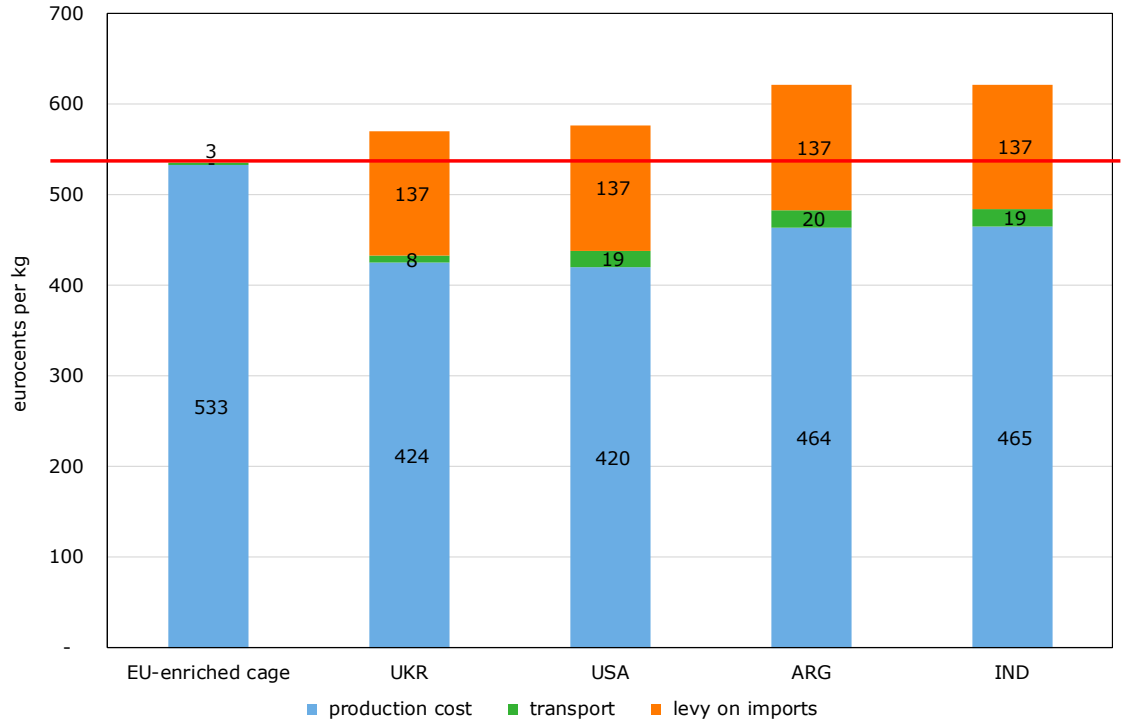

Figure 5.7 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (enriched cage; horizontal line) and non-EU countries in eurocents per kilogram (basic situation)*

Figure 5.8 shows that if egg powder in the EU would be produced from barn eggs and free range, then this product could not compete with egg powder from Ukraine and the USA, even in a situation with full import levies. However, in practice egg powder made from barn and free range eggs is sold to a specific market. Therefore, this is not included in the scenarios.

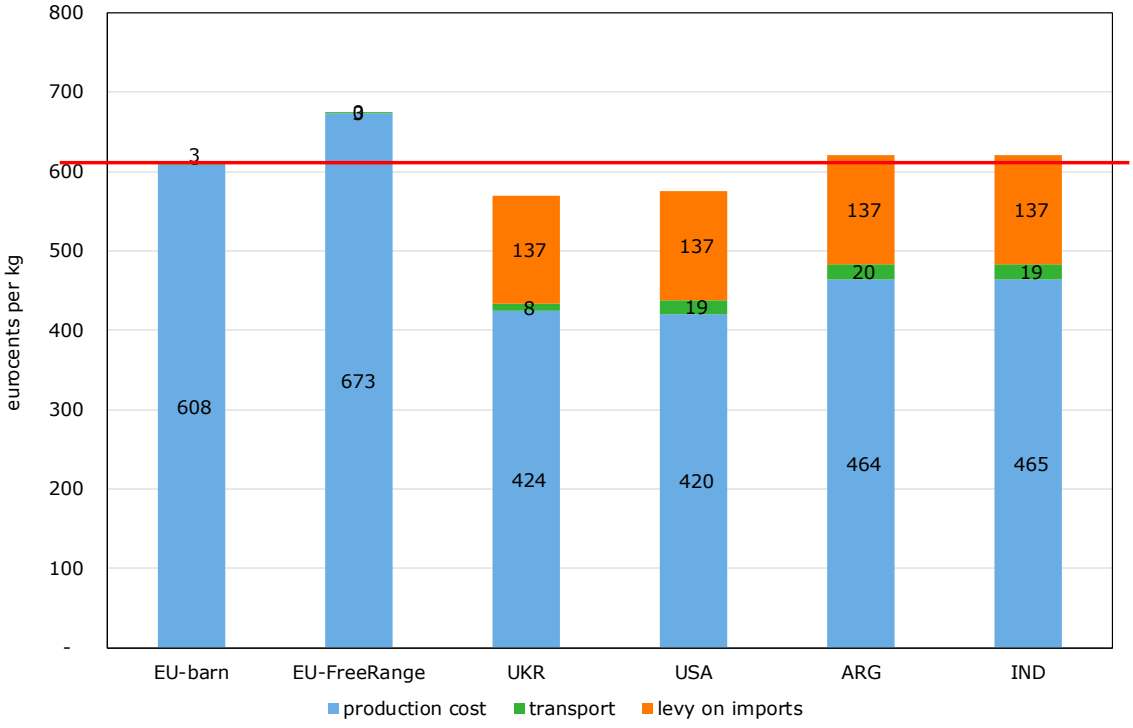

Figure 5.8 *Offer price of whole egg powder in Germany from EU average (*barn eggs and free range eggs*) and non-EU countries (*cage eggs*) in eurocents per kilogram (basic situation)*

5.3.2 Scenario 1 - Lower EU import levies

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

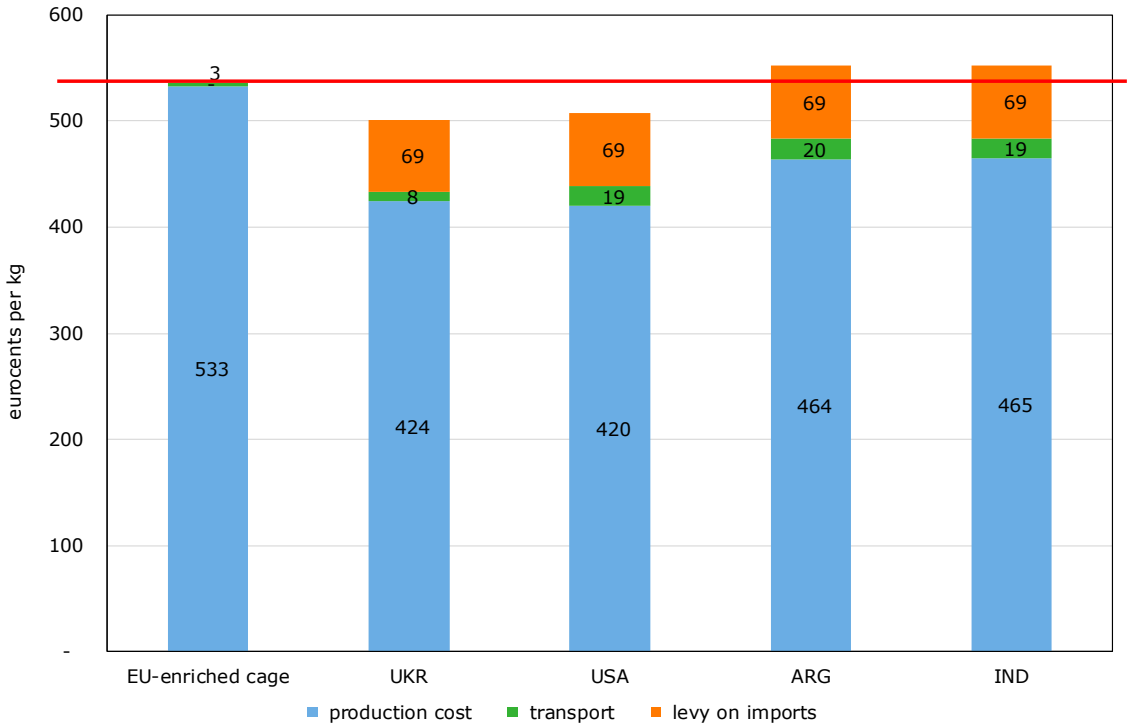

Figure 5.9 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 1: 50% lower import levies)*

5.3.3 Scenario 2 - Lower exchange rates

This second scenario evaluates the consequences of 10% lower exchange rates of all non-EU currencies. In Figure 5.10 the impact of lower exchange rates is shown. In this scenario the Ukraine and the USA can be relatively cheap suppliers of whole egg powder in Frankfurt. The total costs of production, transport and levies of Ukraine and USA would be below the average EU level. However, this scenario has less impact than the previous scenario with the lower import levies.

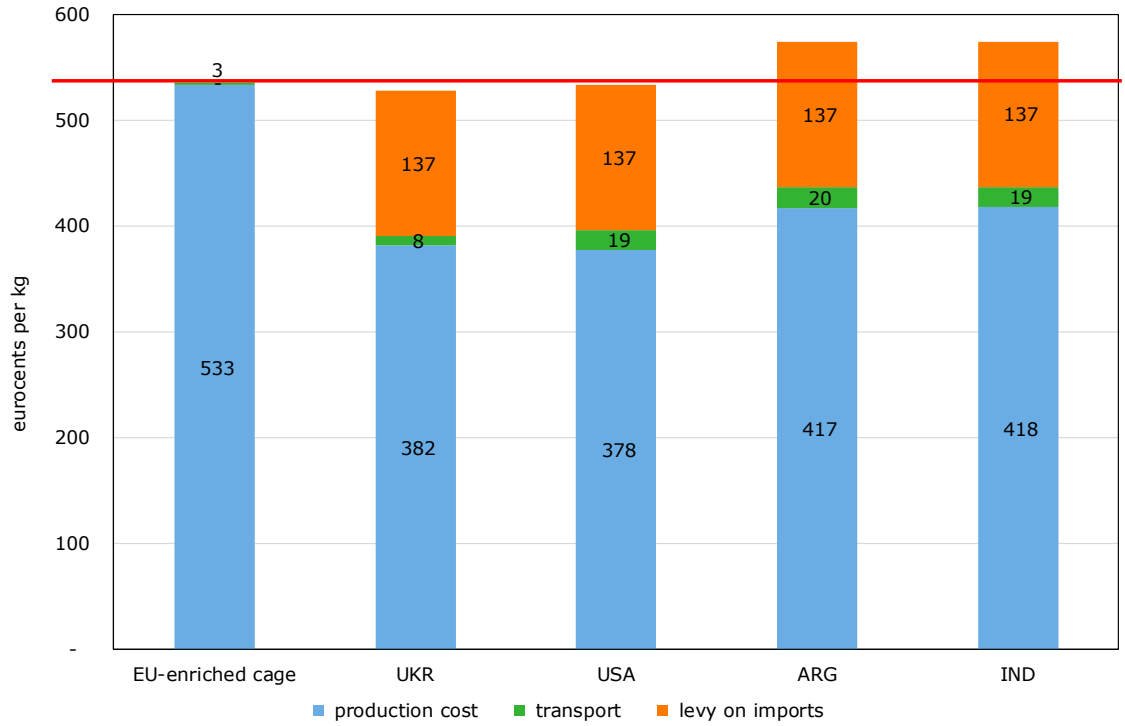

Figure 5.10 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 2: 10% lower exchange rate)*

5.3.4 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). The consequences of this combination are illustrated in Figure 5.11. In this scenario all non-EU countries would be very cheap suppliers of whole egg powder to the EU market. Offer prices in Frankfurt could be 6% (Argentina, India) to even 14% (Ukraine) below the average EU level.

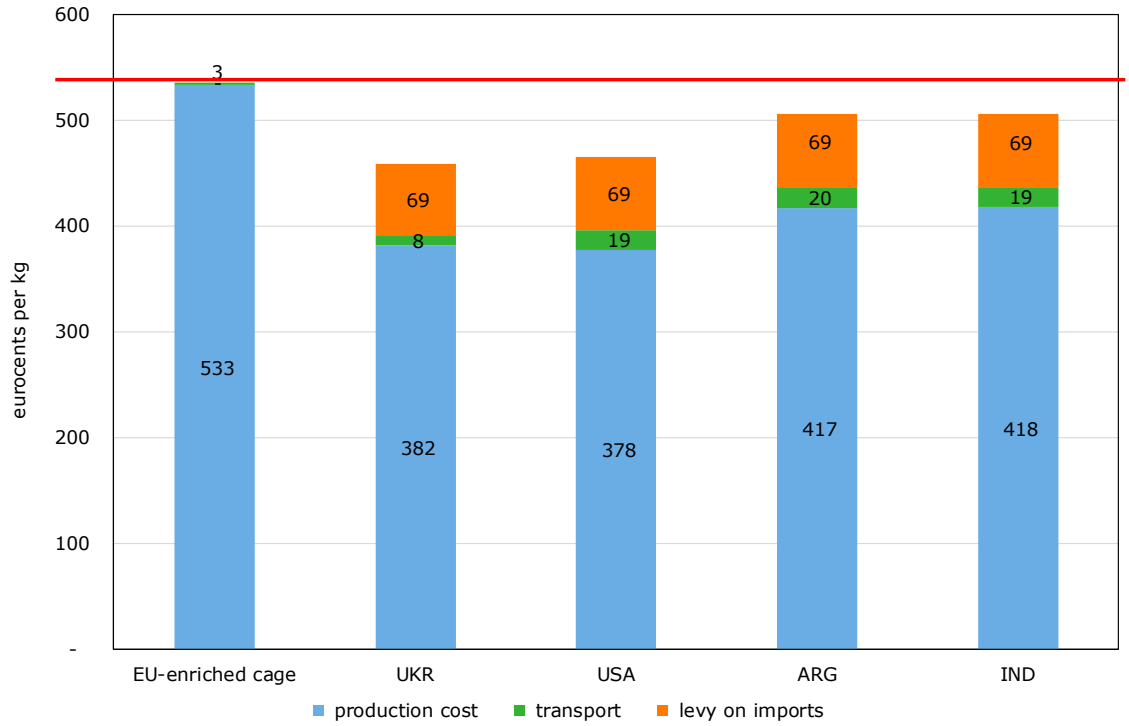

Figure 5.11 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 3: 50% lower import levies and 10% lower exchange rate)*

5.3.5 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. In fact, this is a 'worst-case' scenario. The consequences of this scenario are illustrated in Figure 5.12. In this worst-case scenario all non-EU countries would be very cheap suppliers of whole egg powder to the EU market. Offer prices in Frankfurt could be 18% (Argentina, India) to 27% (Ukraine) below the average EU level.

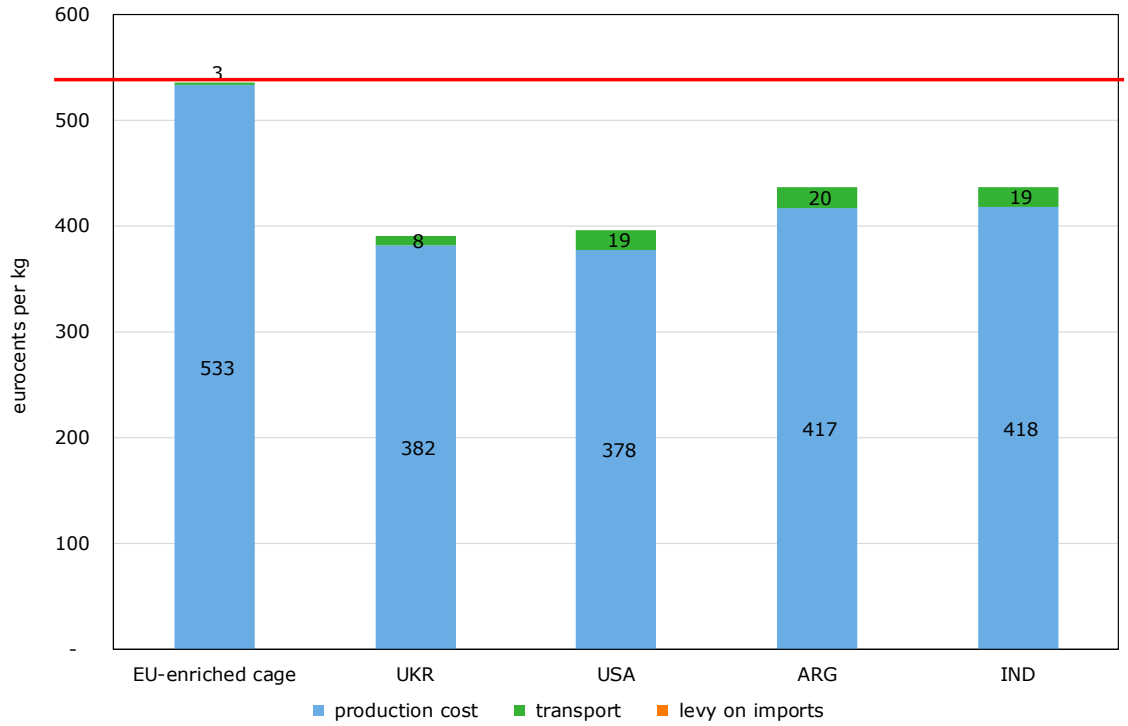

Figure 5.12 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 4: zero import levies and 10% lower exchange rate)*

6 Conclusions

Structure and employment
In 2017, the total egg production in the EU-28 was 6,757,000 tonnes. The total number of farms with laying hens in the EU is 3.9m. Of these farms, 11,740 have more than 3,000 hens and can be described as commercial. In the egg supply chain, different companies are involved in supplies (e.g hatcheries, feed mills), packing and processing. The total employment in the EU egg supply chain is estimated to be 186,000 full-time workers.

Economic importance of the egg sector
The total production value of the egg sector in the EU-28 in 2017 was 8,240m euros, at farm-level prices. The total production value at retail prices is 14,530m euros. The EU is an important player in the international trade of eggs and egg products. In 2017 the EU-28 exported eggs and egg products with a value of 221m euros. At the same time, the EU-28 imported eggs and egg products with a value of 31m euros.

EU legislation
In the EU, egg producers have to comply with European legislation. This legislation deals with environmental protection, animal welfare and food safety. In 2017 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*
  N 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', which was implemented in 2012 on EU egg laying farms. The move from conventional cages to enriched cages led to a 6% costs increase.

The legislation on environment, animal welfare and food safety is less stringent in non-EU countries than in the EU.

In the EU farmers are keeping hens in four different systems. In 2017, 53% of the laying hens were in enriched cage, 27% in barn systems, 15% in free range systems and 5% was organic. Production costs of barn eggs and free range eggs are 17 and 32% higher, respectively compared to enriched cages.

Welfare legislation in non-EU countries
In the countries outside the EU illustrated in this report only the USA has 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 at this time is the conventional cage system, which was banned in the EU from 1 January 2012. Argentina, India and Ukraine don't have 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 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).

Production costs in 2017 within the EU

The production costs of shell eggs produced in enriched cages have been calculated for eight EU countries: the Netherlands, Germany, France, UK, Spain, Italy, Denmark and Poland. Between these main egg-producing countries, the production costs of shell eggs in 2017 ranged from 96.3 eurocents per kg of eggs in Denmark and 94.0 eurocents in the UK to 82.9 in Poland and 82.3 eurocents per kg of eggs in Spain. The average for those eight countries is 88 eurocents per kg, based on production in enriched cages. The total production costs for whole egg powder also differ within the EU countries from 586 eurocents per kg of egg powder in Denmark to 495 eurocents per kg in Poland. The EU average for production costs of whole egg powder based on cage eggs was 533 eurocents per kg.

Production costs in 2017 in non-EU countries

Compared to the average level within the EU, the cost of production for shell eggs in 2017 was lower in USA (-24%), Ukraine (-22%), Argentina (-14%) and India (-11%). As a result of the costs of transportation, import levies and also the effects on product quality and food safety, there are barely any imports of shell eggs from those countries to the EU. In addition, in the 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. However, the Salmonella control programme in the Ukraine has been approved by the EU thereby allowing imports of shell eggs. For whole egg powder the non-EU countries are more competitive. Compared to the average level within the EU (enriched cages), the production costs of whole egg powder from traditional cages in 2017 were lower in USA (-21%), Ukraine (-20%), Argentina (-13%) and India (-13%). Because the costs of transportation of powder are low (8 to 20 eurocents per kg), the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the EU from large quantities of imports from the illustrated countries.

Comparison with earlier studies

This study is an update of two earlier reports with base years 2013 (van Horne and Bondt, 2014) and 2015 (van Horne and Bondt, 2017). Comparison of the production costs of eggs at farm level in this study with the results for 2015 shows that the costs in the EU and USA decreased. The production costs calculated in euros increased slightly in Ukraine, Argentina and India, mainly as a result of higher feed prices and a change in the exchange rate to the euro. Figure 6.1 gives the production costs of cage eggs at farm level in 2010, 2013, 2015 and 2017 in the EU, USA, Ukraine, Argentina and India. The graph illustrates the Ukraine had the lowest production costs in 2013 and 2015. In 2017, the USA had the lowest production costs. Due to the small decrease in production costs in the EU the difference with Ukraine, Argentina and India was slightly reduced between 2015 and 2017. The difference between EU and USA did increase between 2015 and 2017.

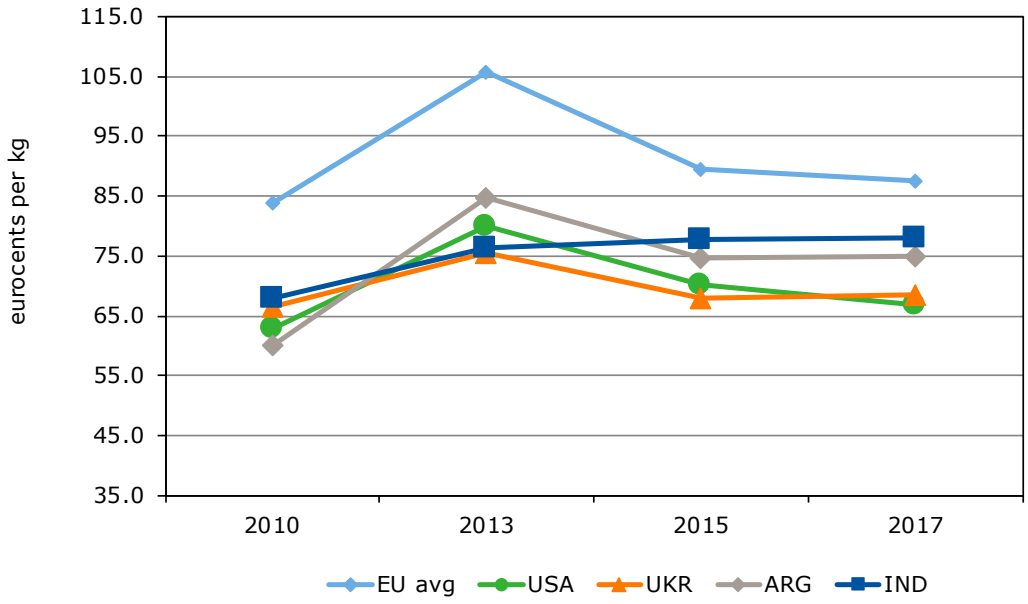

Figure 6.1 *Production costs of eggs at farm level (eurocents per kg eggs) in 2010, 2013, 2015 and 2017 in the EU, United States (USA), Ukraine (UKR), Argentina (ARG) and India (IND).*

Scenarios

To show the impact of a possible change in import levies and a change in exchange rate on the competitiveness of the EU egg sector, some scenarios were developed. In the first scenario, 50% lower import levies on eggs and egg products was taken as an example to illustrate the impact of any multi- or bilateral agreement with lower import levies. The results show that in this scenario Ukraine and the USA have a lower offer price of whole egg powder compared to the EU egg sector.

In the second scenario with a 10% lower exchange rate only the price of whole egg powder from the USA and Ukraine would be lower than the average EU level. In the third scenario with a combination of 50% lower import levies and a 10% lower exchange rate, all non-EU countries would be very cheap suppliers of whole egg powder to the EU market. This is also 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 / Cascina Italia – Gruppo Moretti
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 Development of the currency exchange rate

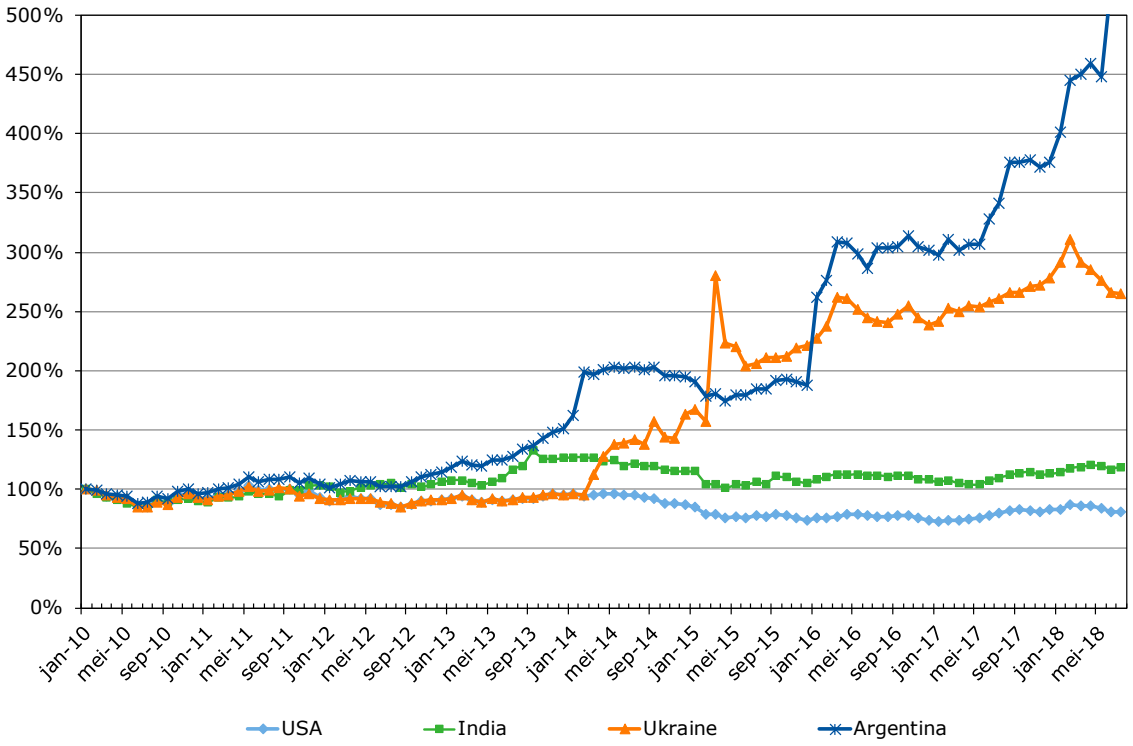

Figure A1.1 *Development of the exchange rate of the currencies of Ukraine, the USA, Argentina and India against the euro (January 2010 = 100%)*

Figure A1.1 shows that a change in exchange rate of 10% (scenario 2) or more can be a realistic scenario. Between 2017 (the base year of this study) and the first half of 2018, the exchange rates of all currencies increased against the euro. A higher exchange rate of the currency results in a lower offer price of egg products of these countries in Europe. The exchange rate development of Argentina increased the most. Although to a lesser extent than Argentina, also for Ukraine, USA and India the value development of the local currency to the euro between 2017 and 2018 was in a similar direction. Table A1.1 gives the average exchange rates to the euro which were used to calculate production costs for 2017 (local currency in euros). In the third and fourth column, the average exchange rates in the first half of 2018 and the difference between 2018 and 2017 are given.

Table A1.1 *Average exchange rate against the euro in 2017, first half of 2018 and the difference*

Country	2017	2018	2017/2018
Ukraine	0.0336	0.0308	92%
India	0.0136	0.0126	93%
USA	0.8905	0.8300	93%
Argentina	0.0540	0.0388	72%

Appendix 2 EU imports of eggs and egg products

The EU is an importer of eggs and egg products. In recent years these import mainly came from USA, Argentina, India and Ukraine. Table A2.1 gives the amount imported from 2013-2017 from the most important third countries. The total import of eggs and egg products in 2017 was 21,828 tonnes egg equivalent. The total value of the EU eggs and egg products imports in 2017 was €31.0m.

Table A2.1 *EU Imports of eggs and egg products (in tonnes egg equivalent) from third countries*

	2013	2014	2015	2016	2017
Ukraine	0	163	3,665	8,043	2,938
USA	6,857	4,156	2,745	3,450	11,558
Argentina	5,797	1,433	3,232	1,864	2,921
India	3,855	5,606	5,743	764	--
Other	4,268	2,269	3,484	3,019	4,411
Total	20,378	13,626	18,869	17,140	21,828

Source: European Commission, February 2018.

Figure A2.1 gives an overview of the import of eggs and egg products from the main competitors Argentina, USA and Ukraine. This figure shows that the amount of import from a specific country fluctuates between years. Imports from Ukraine decreased in 2017. Imports from USA increased in 2017 to almost 12,000 tonnes.

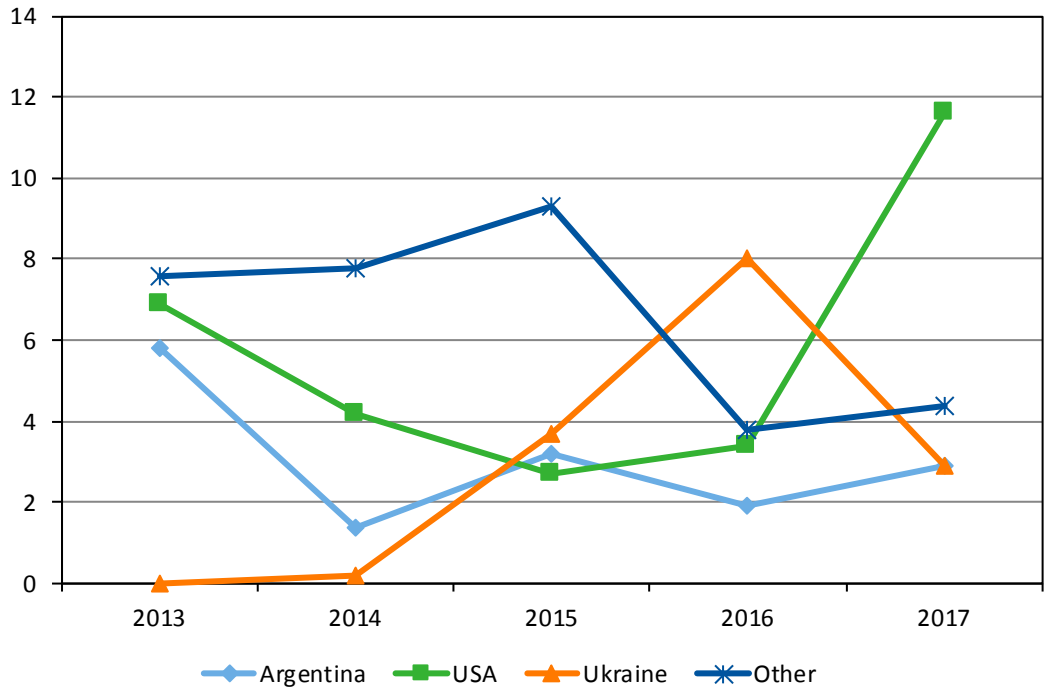

Figure A2.1 *Import into EU of eggs and egg products (in 1,000 tonnes of egg equivalent)*
Source: European Commission, adaptation Wageningen Economic Research.

Appendix 3 Main assumptions in different housing systems for layers

Table A3.1 *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 (euro per hen housed)	6.38	8.16	12.37
Inventory (euro per hen housed)	6.50	10.60	9.25
Other inventory (euro per hen housed)	2.70	2.89	4.70

Table A3.2 *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

Appendix 4 Overview of EU import levies (€/1,000) and quotas (1,000 kg) (2018)

Import quota and duties on eggs				01.12.2018				
					Reduction Tariff rate €/tonne		Initial duty amount €/tonne	
Third country	Code group	Reg /CN code 8-digit	poultry species	Quantity	lowest	highest	lowest	highest
Mexico	09.1831	0407 00 19	Poultry eggs not hatching	300		50%	35/1,000p	
Mexico	09.1832	0408 1180, 0408 1981/9, 0408 9180, 0408 9980	Egg yellow	1,000		50%	1,423, 620, 663, 1,374, 353 euro/tonne	
Mexico	09.1869	3502 1190 / 1990	Albumine	3,000		100%	1,235, 167 euro/tonne	
GATT	09.4015 E1	0407 0030	Egg fresh/preserved	135,000		152 euro/tonne		304 euro/tonne
GATT	09.4401	0408 1180, 0408 1981/89, 0408 9180/9980	Egg yolk, dried Egg yolk liquid Egg yolk, other Not in shell, dried Not in shell, cooked	7,000 (egg equiv in shell)		711 310 331 687 176 euro/tonne		1,423 620 663 1,374 353 euro/tonne
GATT	09.4402	3502 1190, 3502 1990	Albumin dried, other	15,500 (egg equiv in shell)		617 83 euro/tonne		1235 167 euro/tonne
Ukraine	09.4275	Reg 1308/2013 Reg 501/2014 Impl reg 2015/2077	Several codes 0407, 0408 and 3502	2100 in 2018 increasing to 3000 in 2021 (egg equiv)		100%		
Ukraine	09.4276		0407 2100, 0407 2910/9010	3,000 (net weight)		100%		
CANADA		CETA	Full Tariffs for a line of -0407 and 0408 codes					
JAPAN		pm						
EPA			All goods except those mentioned in one of the annexes			100%		
GSP (Developing countries)			All goods except those mentioned in one of the annexes			100%		

Check: European Commission Taxation and Customs Union - Taric Consultation website

http://ec.europa.eu/taxation_customs/dds2/taric/taric_consultation.jsp?Lang=en

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The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.