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Impact of EU Council Directive 99/74/EC 'welfare of laying hens' on the competitiveness of the EU egg industry

P.L.M. van Horne
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Final Report

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Because of animal welfare concerns in the EU, from 2012 only enriched cages will be allowed for the housing of laying hens (Council Directive 1999/74/EC). Production in enriched cages will increase the production cost of eggs. At the same time the World Trade Organisation (WTO) has launched a new round of negotiations to further liberalise trade in agricultural products. This report provides the results of a study on the impact of the EU Directive for EU egg processors. Within several scenarios, the increase in production costs (enriched cages) are combined with different levels of import levies and currency exchange rates. In general it can be concluded that in 2012 EU countries cannot compete on their home market for egg products with countries such as Ukraine, United States, Brazil and India.

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Preface

Within the European Union conventional cages will be banned by the year 2012. Because of animal welfare concerns, from 2012 only enriched cages will be allowed for the housing of laying hens (Council Directive 1999/74/EC). Production in enriched cages will increase the production cost of eggs. At the same time the World Trade Organisation (WTO) launched a new round of negotiations to further liberalise trade in agricultural products. A reduction in the basic level of EC import tariffs for eggs and egg products will be discussed in the next WTO round.

In this report the Agricultural Economics Research Institute (LEI), an independent research institute in the Netherlands, provides the results of a study on the impact of the EU Directive 1999/74/EC for the EU egg processors. The production costs for eggs and egg products are calculated for several EU and non-EU countries. Based on the data for 2001, a projection is made towards 2012 after implementation of enriched cages in the EU countries. Within several scenarios, the increase in production costs, as a result of the use of enriched cages in 2012, is combined with different levels of import levies. It should be stated that the specific German situation is not taken into account within this report. According to the German order for keeping laying hens (October 2001) conventional cages will be banned from 1 January 2007 and from 2012 enriched cages would be prohibited. This means much stricter rules for German poultry farmers compared to the rest of the EU.

The study is initiated by four organisations in which egg producers and egg processors participate. For the United Kingdom this is the British Egg Industry Council (BEIC), for Spain the Asociacion Espanola de Productores de Huevos (ASEPHRU), for Italy Unione Nazionale dell'Avicoltura (UNA) and for the Netherlands the Product Boards for Livestock, Meat and Eggs (PVE).

We believe that this report provides an accurate assessment of the consequences of the EU Directive 1999/74/EC on the European egg industry in general and especially for the European egg processors.

Prof. Dr. L.C. Zachariasse
Director General LEI B.V.



Summary

The European Union has introduced new animal welfare legislation in the form of Council Directive 1999/74/EC. This will prohibit the use of the conventional cage from 2012, but authorises the use of enriched cages. Production in enriched cages will increase the production cost of eggs. At the same time a new round of World Trade Organisation (WTO) negotiations are set to further liberalise trade in agricultural products, with a reduction in the basic level of EU import tariffs for eggs and egg products being discussed.

The worldwide production of eggs grew from 32.5 million tonnes in 1985 to 55 million tonnes in 2000. China is by far the largest producer of eggs and between 1985 and 2000 China's share of world production increased from 18 to 40%, compared with a decrease in the EU, the USA and the Russian Federation. During the same period total production and also the share of world production grew in Mexico, India and Brazil. Total production in the EU 15 was 5.5 million tonnes in 1985 and 5.3 million tonnes in 2000.

In this report LEI researched the production cost of table eggs and whole egg powder in the main EU egg producing countries: the Netherlands (NL), France (FR), Germany (DE), Spain (ES), Italy (IT) and the United Kingdom (UK) and the non-EU countries: Poland (PL), Ukraine (UKR), the United States of America (USA), Brazil (BR) and India (IN). In all countries data was 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 was collected on investment in buildings, equipment and labour cost. The base year for the data was 2001. The total costs were converted to euro's with the average exchange rate in the year 2001.

Based on the 2001 results, we extrapolated the situation towards 2012. For 2012, we took into account the following changes:

- the implementation of enriched cages, being the minimum standard for egg production within the EU in 2012. Based on extensive calculations, it was concluded that the production cost of eggs produced in enriched cages, compared to traditional cages with 450 cm² per hen, will increase by 13%;
- a lower feed price for layers as a result of further reform in the EU market and price policy for feed grains. Related to the situation in 2001 it can be expected that feed prices for layers within the EU will decrease by a further 5% compared to the non-EU countries (world market price for grains);
- a change in import levies for eggs and whole egg powder. We have assumed a reduction of 36% similar to the change in the Uruguay Round Agreement on agriculture (as per the December 2002 European Commission's WTO negotiating proposal);
- lower exchange rate for the currency of the non-EU countries. In the scenarios a 15% lower exchange rate was assumed. A comparison of the exchange rate in the summer of 2002 and the average for 2001 (used in the basic scenario) showed that the rate of the US dollar and the Brazilian real to the euro was respectively 9 and 22% lower.

The results for the situation in 2012 are presented in tables 1 and 2. Table 1 provides the production cost of whole egg powder in the EU after implementation of the EU welfare Directive 1999/74/EC compared to the USA, Ukraine, Brazil and India. The column 'total' gives (per country) the production cost including import levy and transport to Germany. This is the 'best case scenario' with the full import levy and no change in exchange rates for the non-EU currency.

Table 1 Offer price of whole egg powder (in euro cents per kg) in Germany in 2012 with full (2001) import levy and no change in exchange rate of currency

| | Production cost | Transport | Import levy | Total | Difference (% of EU total) |
|---------|-----------------|-----------|-------------|-------|----------------------------|
| EU 15 | 444 | 3 | - | 447 | - |
| USA | 366 | 17 | 137 | 520 | 116 |
| Ukraine | 323 | 9 | 137 | 469 | 105 |
| Brazil | 275 | 21 | 137 | 433 | 97 |
| India | 246 | 21 | 137 | 404 | 90 |

India and Brazil can offer whole egg powder at a lower price than the EU countries.

Table 2 gives the 'worst case scenario' with a 36% decrease in import levy and a 15% devaluation of the exchange rates for the non-EU currency.

Table 2 Offer price of whole egg powder (in euro cents per kg) in Germany in 2012 with lower import levy (-36%) and 15% devaluation of the currency exchange rate in non-EU countries

| | Production cost | Transport | Import levy | Total | Difference (% of EU total) |
|---------|-----------------|-----------|-------------|-------|----------------------------|
| EU 15 | 444 | 3 | - | 447 | - |
| USA | 311 | 17 | 88 | 416 | 93 |
| Ukraine | 275 | 9 | 88 | 372 | 83 |
| Brazil | 234 | 21 | 88 | 343 | 77 |
| India | 209 | 21 | 88 | 318 | 71 |

In this scenario all countries, including the USA, can offer whole egg powder at a lower price than the EU countries.

Competition is not only based on price. Other factors like quality of the product, good distribution/logistics and quick response to changes in the market can be crucial in marketing a product. To obtain an idea of the characteristics of the egg products market, a survey was conducted in order to quantify the most important purchasing factors. On the

basis of this qualitative study, in which 11 buyers of egg products and 4 manufacturers of egg products were questioned, it appears that price and microbiological composition are the most important purchasing factors. Both of these factors score 35%. The producer of egg products (traditional versus innovative) scores 20% and less important are the housing system (cage, barn or free range eggs) and country of origin (local, Europe or world) with 7 and 2% respectively. It can be concluded that, given a certain minimum quality level of the product, the market for egg products can be described as a price market. The country of origin of eggs plays no role at all in buying egg products. Non-cage eggs are only of interest to buyers if they can be incorporated in their end product. At the present time the demand for processed products using non-cage raw materials (such as barn and free-range eggs) is still negligible. While the market for organic processed products is growing, it is still typified as a niche market.

In general it can be concluded that:

- compared to the average level within the EU the production costs of whole egg powder in 2001 were lower in Poland (85%), USA (78%), Ukraine (88%), Brazil (66%) and India (60%). Although the transport cost of whole egg powder is relatively low, current import levies protect the EU from large volumes of imports from the mentioned countries;
- in the year 2012 the EU Directive 'welfare of laying hens' will be fully implemented on European poultry farms. Production of eggs in enriched cages will give the lowest production cost. Compared to the traditional cage the cost for housing, feed and labour will be increased. It can be expected that the design of enriched cages will be further improved to obtain good technical results. Even with good enriched cages the increase in cost will be at least 13%;
- in 2012 the production cost of shell eggs in the EU is on average, and including cost of transport, 80 eurocent per kilogram. The results of the scenario calculations show that in a competition on the German market for shell eggs Ukraine, USA, Brazil and India cannot compete on price. This is a result of high cost for transportation and import levies. However, in scenario 4, with a 36% lower import tariff and a 15% lower exchange rate, Ukraine and India could compete;
- in 2012 the production costs of whole egg powder in some non-EU countries are predicted to be lower in comparison to the EU. In a situation where import levies and currency exchange rates remain unchanged the Brazil and India will be competitive on the European market. Including transport and import levy the offer price from Brazil and India is respectively 3 and 10% below the EU price. In a scenario with a 36% lower import levy and a 15% devaluation of the dollar exchange rate, the USA can also offer lower prices for whole egg powder than the EU countries;
- the market for egg products can be described as a price market. Given a minimum level of quality, manufacturers compete on price. It can be assumed that the quality of American whole egg powder will be equal to European quality. In the year 2012 imports of large volumes of egg powder can be expected from the USA or, depending on the quality, from 'low cost' countries like India and Brazil;
- in the countries outside the EU 15 mentioned in this report there are no animal welfare regulations to protect laying hens. In the USA there is discussion on

increasing the space allowance per hen (towards 432 cm² in 2008) on a voluntary basis. However, it is unclear if those welfare guidelines will be accepted by egg processors. At this moment most hens in the USA are kept in six-bird colony cages with 342 cm² per bird. In Brazil, India and Ukraine layers are kept in cages with a space allowance of 300 to 400 cm² per hen. USA calculations show that, purely from an economic point of view, 350 to 400 cm² per bird gives the highest income for the poultry farmer.

1. Production and consumption of, and the trade in, eggs

This chapter provides a short overview of the most important production areas of laying-hens in the world. It also examines the development in the consumption of eggs. Furthermore, this chapter gives an impression of the scope and the direction of international trade flows between various regions in the world.

1.1 Developments in important production areas

The production of eggs (including hatching eggs) amounted to over 55 million tonnes in 2000 (FAO). This amount was 32.5 million tonnes in 1985. China is by far the largest producer of eggs. The production of eggs has increased dramatically since 1985. As a result, China's share in the world production has increased from 18% in 1985 to 40% in 2000 (see figure 1.1) and the share of other large producers has decreased. The production decreased somewhat in the EU 15 from 5.5 million tonnes in 1985 to 5.3 million tonnes in 2000. The

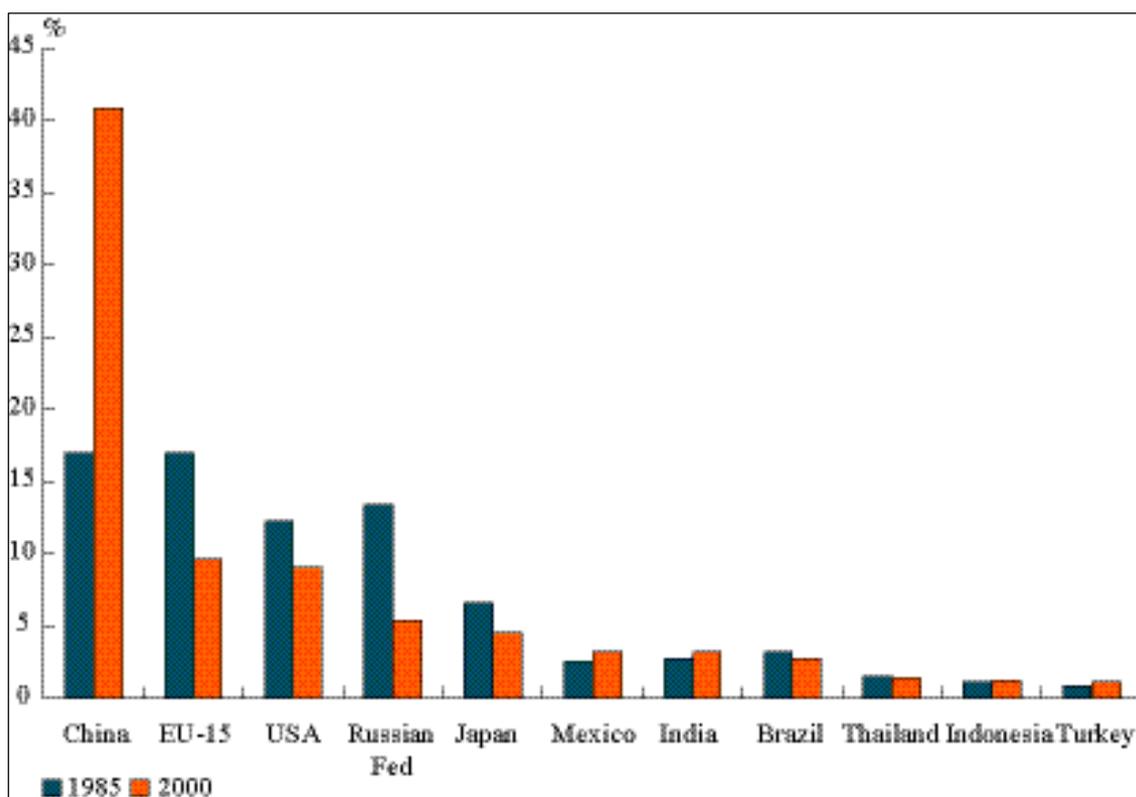


Figure 1.1 Share of the most important countries in the world production of eggs

share in the world production, however, dropped from 17 to 10%. The production in the USA increased by about one-fourth - from 4 million tonnes to 5 million tonnes - but the share in the world production declined to 9% in 2000. In the same period the total production and also the share in world production did grow in Mexico, India and Brazil.

1.2 Developments in consumption

Due to the differences in local, cultural customs and relative price ratios, among other factors, there are major differences between countries in terms of the consumption patterns and consumption preferences with respect to meat and eggs. There is also a growing partiality to convenience food in the developed countries (as a result of social trends, such as the growing number of single person households, women that work away from home, et-cetera). As a result, we can observe a shift from the consumption of table eggs to the consumption of egg products.

Figure 1.2 illustrates the consumption of eggs per head of the population of a number of selected countries. The very sharp increase in China strikes the eye; the consumption level is currently virtually the same as in some European countries.

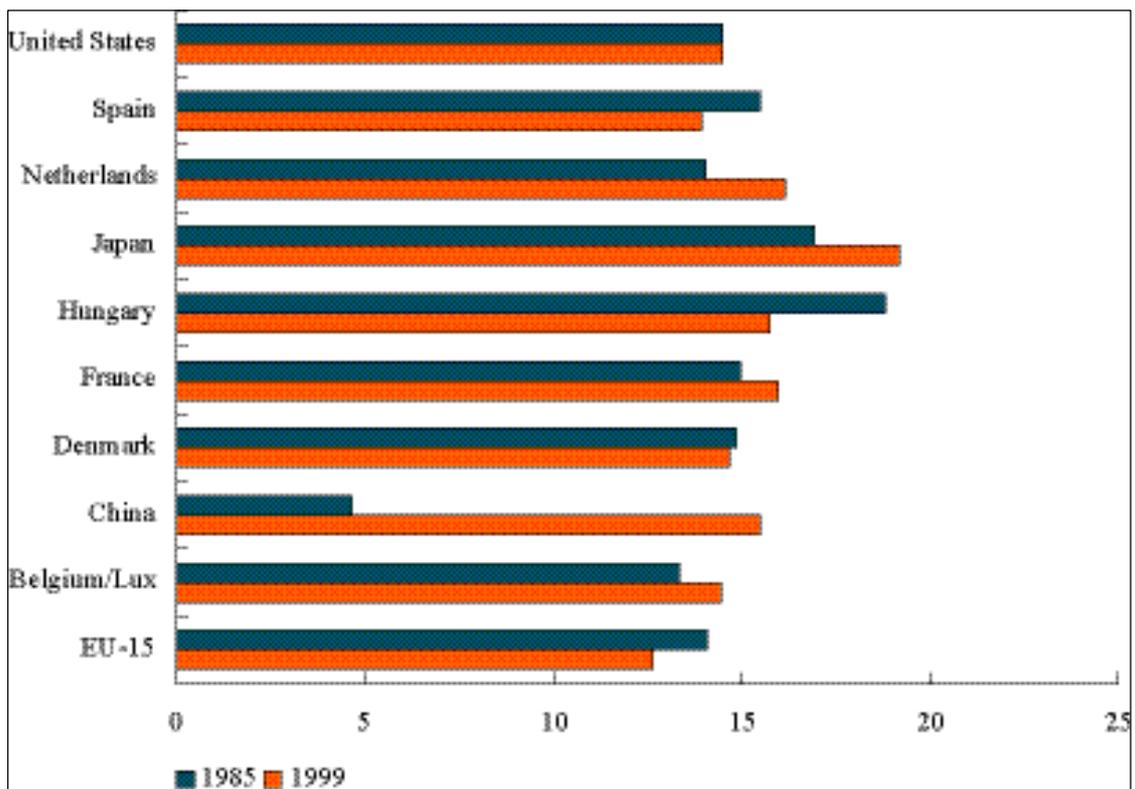


Figure 1.2 Consumption of eggs (in kg per capita per year) in a number of selected countries

1.3 International trade flows in eggs

Table 1.1 shows the trade flows between the regions in the world with respect to eggs. The first row of the table gives the total export value of each region. The member states of the EU, as a whole, are by far the largest exporter of eggs (in the amount of USD 820 million in 1999). Most of the eggs are exported to other EU countries. The second part of the table gives the total import per region and which share is coming from the various other regions. The EU 15 and Asian countries are the largest importers of eggs. The EU member states scarcely buy any eggs from outside the Union. Of the total EU imports (in the amount of USD 692 million) 95% is internal EU 15 trade. It can also be said of the NAFTA (USA, Canada and Mexico) that eggs are mainly (89%) imported from countries that are associated with the free trade treaty. The import of eggs in Asian countries is fairly evenly distributed across the regions of origin; EU 15 (31%), NAFTA-countries (32%) and other Asian countries (37%).

Table 1.1 Origin of world trade of eggs, total (millions USD) and shares (% in italics), 1999 a)

| | Total | EU 15 | Rest of Europe | Africa | NAFTA | Latin-America | Middle East | Asia | Oceania |
|----------------|-------|-----------|----------------|----------|-----------|---------------|-------------|-----------|----------|
| Total | 1,152 | 820 | 16 | 0,2 | 186 | 16 | 4 | 107 | 3 |
| EU 15 | 692 | <i>95</i> | <i>1</i> | <i>0</i> | <i>4</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>0</i> |
| Rest of Europe | 72 | <i>78</i> | <i>9</i> | <i>0</i> | <i>9</i> | <i>0</i> | <i>2</i> | <i>2</i> | <i>0</i> |
| Africa | 14 | <i>76</i> | <i>18</i> | <i>0</i> | <i>3</i> | <i>0</i> | <i>0</i> | <i>3</i> | <i>0</i> |
| NAFTA | 86 | <i>1</i> | <i>0</i> | <i>0</i> | <i>89</i> | <i>0</i> | <i>0</i> | <i>8</i> | <i>1</i> |
| Latin-America | 13 | <i>7</i> | <i>0</i> | <i>0</i> | <i>26</i> | <i>65</i> | <i>1</i> | <i>1</i> | <i>0</i> |
| Middle-East | 22 | <i>68</i> | <i>0</i> | <i>0</i> | <i>3</i> | <i>0</i> | <i>8</i> | <i>20</i> | <i>0</i> |
| Asia | 248 | <i>31</i> | <i>0</i> | <i>0</i> | <i>28</i> | <i>2</i> | <i>0</i> | <i>37</i> | <i>1</i> |
| Oceania | 4 | <i>49</i> | <i>0</i> | <i>0</i> | <i>32</i> | <i>0</i> | <i>0</i> | <i>12</i> | <i>8</i> |

a) The row 'Total' indicates the total export value of each region. The lower part of the table indicates per row how much a certain region imports (2nd column) and which share of that is from the various regions (column 3 through 10).

2. Production cost of eggs in 2001 in selected countries

2.1 Production cost of eggs in some EU countries

The production cost of shell eggs produced by hens housed in cages has been researched for the following countries: the Netherlands (NL), France (FR), Germany (DE), Spain (ES), Italy (IT) and the United Kingdom (UK). The results presented in figure 2.1 relate to the year 2001. The figure also provides an insight into the build up of primary production costs. All costs in this report are given in euro's.

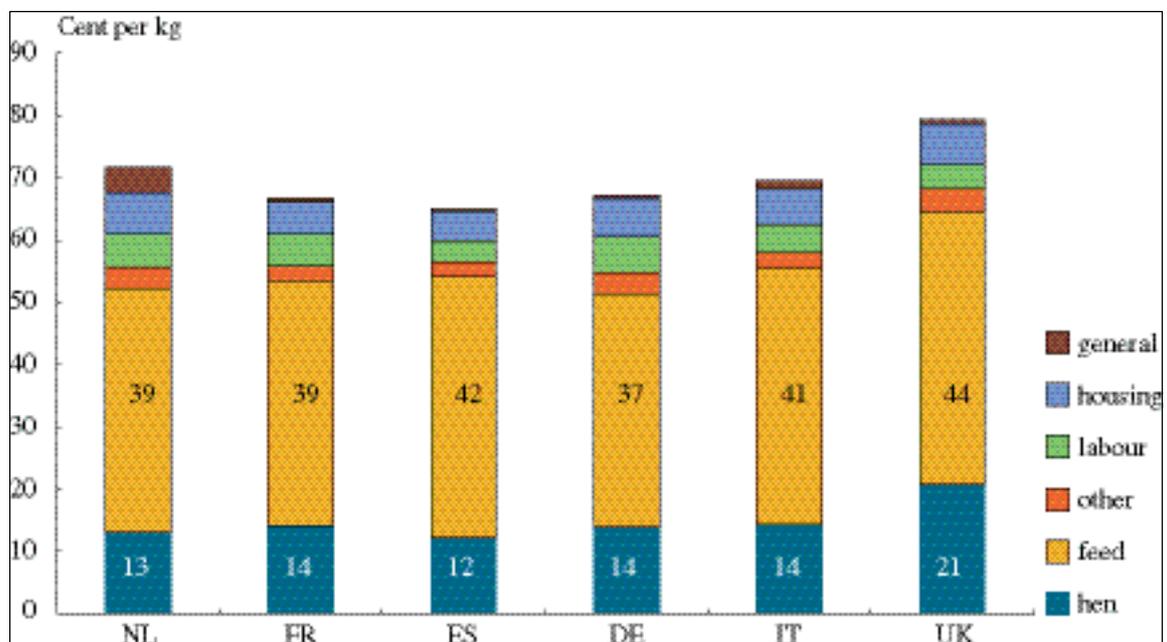


Figure 2.1 Cost of primary production in cages in EU countries (cents per kilogram egg)

The costs of primary production are the highest in the United Kingdom (79.4 cent). The cost in the Netherlands (71.6) and Italy (69.6) are approximately 10% lower. In Germany (67.2), France (66.8) and Spain (65.0) the cost of production are at the lowest level of the selected EU countries.

In table 2.1 the starting points are given which are used for the calculations. Table 2.2 indicates the results.

Table 2.1 Starting points for egg production in some EU countries

| | NL | FR | ES | DE | IT | UK |
|----------------------------------|------|------|------|------|------|------|
| Feed price (euro/100 kg) | 18.7 | 18.6 | 19.6 | 17.9 | 19.5 | 20.5 |
| Price per hen at 20 weeks (euro) | 3.01 | 3.12 | 2.84 | 3.00 | 3.08 | 4.13 |
| Laying period (days) | 395 | 395 | 395 | 395 | 385 | 392 |
| Eggs per hen housed | 323 | 323 | 321 | 323 | 305 | 318 |
| Egg weight (g) | 62.0 | 63.0 | 63.0 | 62.0 | 63.5 | 62.4 |
| Feed conversion | 2.09 | 2.11 | 2.14 | 2.09 | 2.10 | 2.14 |
| Mortality (%) | 7 | 6 | 7 | 8 | 9 | 6 |

Table 2.2 Costs of primary production (in cents per kilogram of egg) in some EU countries

| | NL | FR | ES | DE | IT | UK |
|------------------------------|------|------|------|------|------|------|
| Total costs inclusive labour | 71.6 | 66.8 | 65.0 | 67.2 | 69.6 | 79.4 |
| Total costs exclusive labour | 66.2 | 61.6 | 61.5 | 61.4 | 65.2 | 75.5 |
| Hen | 15.1 | 15.3 | 14.1 | 15.0 | 15.9 | 20.8 |
| Feed | 39.0 | 39.2 | 42.0 | 37.5 | 41.0 | 43.9 |
| Other | 3.5 | 2.4 | 2.3 | 3.4 | 2.6 | 3.5 |
| Labour | 5.3 | 5.2 | 3.5 | 5.8 | 4.4 | 3.8 |
| Housing | 6.6 | 5.2 | 4.7 | 6.0 | 5.8 | 6.7 |
| General | 0.8 | 0.8 | 0.6 | 0.8 | 0.6 | 0.6 |
| Manure disposal | 3.1 | -0.2 | -0.2 | -0.2 | 0.8 | - |
| Spent hen | -1.9 | -1.2 | -1.9 | -1.1 | -1.5 | - |

The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens, housing costs and manure disposal costs. Within the European countries the price of feed in Germany is the lowest and in the UK is the highest. Despite the relatively expensive feed young hens are the cheapest in Spain. While Dutch farms have good technical results, the production cost in a European context is relatively high. This is caused by higher housing costs, but also particularly by high manure disposal costs.

2.2 Production cost of eggs in some non-EU countries

The production cost of consumption eggs has been researched for the following non-EU countries: Poland (PL), Ukraine (UKR), the United States of America (USA), Brazil (BR) and India (IN). The results presented in figure 2.2 relate to the year 2001. The figure also provides an insight into the build up of primary production costs, and includes a comparison with the average EU level.

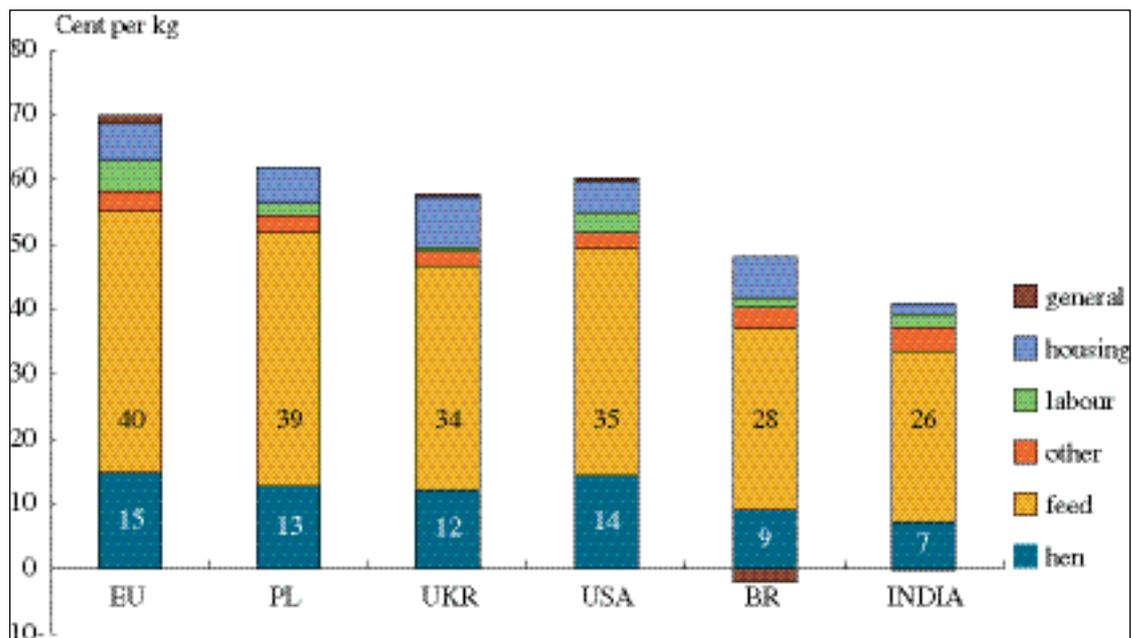


Figure 2.2 Cost of primary production in cages in EU and non-EU countries (cents per kilogram egg)

The costs of primary production in Poland, Ukraine and the USA are 11 to 18% lower than in the EU. The production cost are very low in Brazil and India. In fact the cost are respectively 34 and 42% lower than the average cost of primary production in the main EU countries.

Table 2.3 gives an overview of the starting points used for the calculation and table 2.4 indicates the results.

Table 2.3 Starting points for egg production in some non-EU countries

| | EU | PL | UKR | USA | BR | IN |
|----------------------------------|------|------|------|------|------|------|
| Feed price (euro/100 kg) | 19.1 | 17.7 | 15.0 | 16.4 | 13.1 | 11.9 |
| Price per hen at 20 weeks (euro) | 3.20 | 2.86 | 3.20 | 2.77 | 2.11 | 1.86 |
| Laying period (days) | 395 | 395 | 395 | 395 | 395 | 392 |
| Eggs per hen housed | 319 | 310 | 307 | 316 | 316 | 315 |
| Egg weight (g) | 62.6 | 62.5 | 62.0 | 61.3 | 62.0 | 56.0 |
| Feed conversion | 2.11 | 2.20 | 2.30 | 2.13 | 2.14 | 2.21 |
| Mortality (%) | 7% | 9% | 12% | 8% | 8% | 8% |

Table 2.4 Costs of primary production (in cents per kilogram of egg) in cages in some non-EU countries

| | EU | PL | UKR | USA | BR | IN |
|------------------------------|------|------|------|------|------|------|
| Total costs inclusive labour | 69.9 | 62.0 | 57.7 | 60.3 | 46.1 | 40.9 |
| Total costs exclusive labour | 65.3 | 60.1 | 57.0 | 57.2 | 44.7 | 39.0 |
| Hen | 16.0 | 14.8 | 16.8 | 14.3 | 10.8 | 10.5 |
| Feed | 40.4 | 39.0 | 34.5 | 35.0 | 28.0 | 26.3 |
| Other | 2.9 | 2.6 | 2.1 | 2.5 | 3.3 | 3.7 |
| Labour | 4.7 | 1.9 | 0.7 | 3.1 | 1.4 | 1.9 |
| Housing | 5.8 | 5.5 | 7.9 | 4.8 | 6.3 | 1.9 |
| General | 0.7 | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 |
| Manure disposal | 0.6 | -0.3 | - | - | -2.4 | -0.6 |
| Revenue spent hen | -1.3 | -2.0 | -4.6 | - | -1.7 | -3.3 |

The differences in costs for the primary production are mainly caused by differences in the costs of feed, young hens, labour and housing. For Brazil also the revenues for manure disposal are relevant. In the Ukraine the extra value of the spent hens means a more than 3 cents reduction of the net production costs.

2.3 Processing cost of whole egg powder in some EU countries

Besides the cost of primary production, the processing costs also play an important role in the international comparison of competitiveness. Figure 2.3 provides detailed information

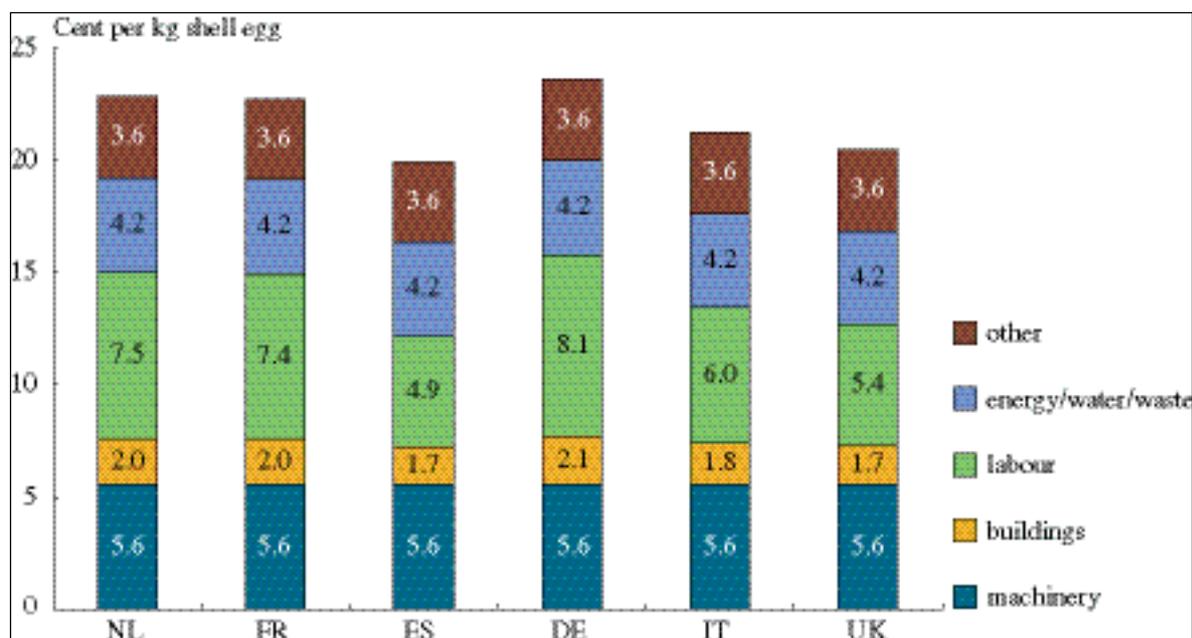


Figure 2.3 Cost of processing in EU countries in cents per kilogram of shell egg

about the cost of production of whole egg powder, in terms of cents per kg (in going) shell egg. The processing costs come to about 30% of the cost of primary production. It is clear that mainly the level of labour costs determines the differences in processing costs between the selected EU countries. The maximum difference is around 15% between the highest (Germany) and the lowest cost level (Spain).

2.4 Processing cost of whole egg powder in some non-EU countries

With regard to the processing costs in the non-EU countries figure 2.4 shows that Ukraine, Brazil and India are more than 30% cheaper than the average EU level, mainly because of very low wages. The total processing costs in the USA are more or less at the same level as in the EU.

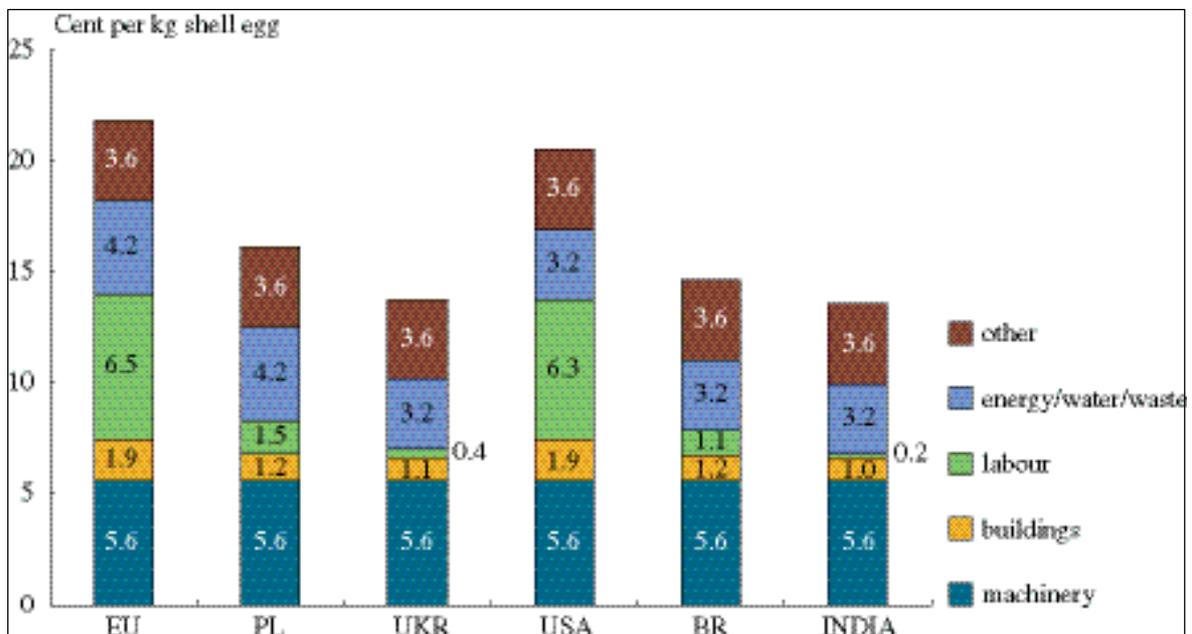


Figure 2.4 Cost of processing in EU (average) and non-EU countries in cents per kilogram shell egg

2.5 Total cost of production and transport of shell eggs

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 load of shell eggs. For that purpose an offer price in Frankfurt am Main has been calculated.

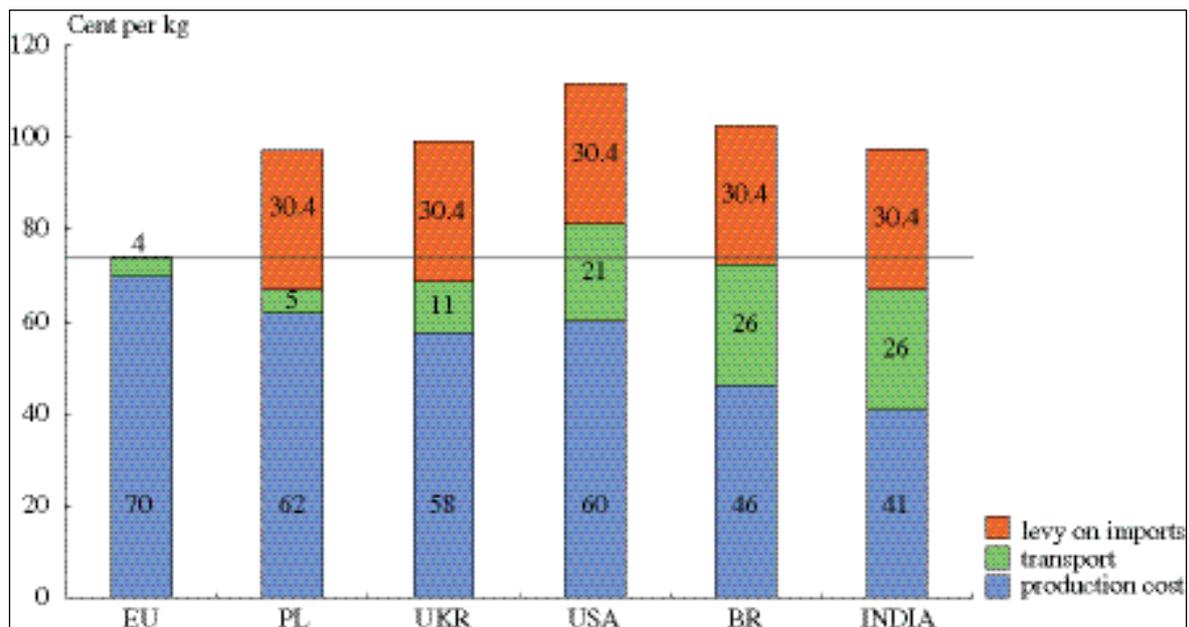


Figure 2.5 Offer price of shell eggs in Germany from EU (average) and non-EU countries in cents per kilogram shell egg

The results clearly indicate that it is not possible for the egg producers in the selected non-EU countries to compete in the supply of shell eggs in Germany in 2001. The horizontal line indicates the EU level of total costs, including the cost of transport to Frankfurt. Poland and the Ukraine could have been a threat for the EU egg producers, but the current 30.4 cents levy on imports is quite an adequate barrier to prevent non-EU countries to export their shell eggs to the EU market. Figure 2.5 shows that also imports from the Indian and Brazilian producers will be competitive in a situation without import levies. However, a serious problem will be the quality of the eggs after the long distance transport. In chapter 7 this is discussed.

2.6 Total cost of production and transport of whole egg powder

For whole egg powder the calculated offer price in Frankfurt am Main in 2001 is shown in figure 2.6.

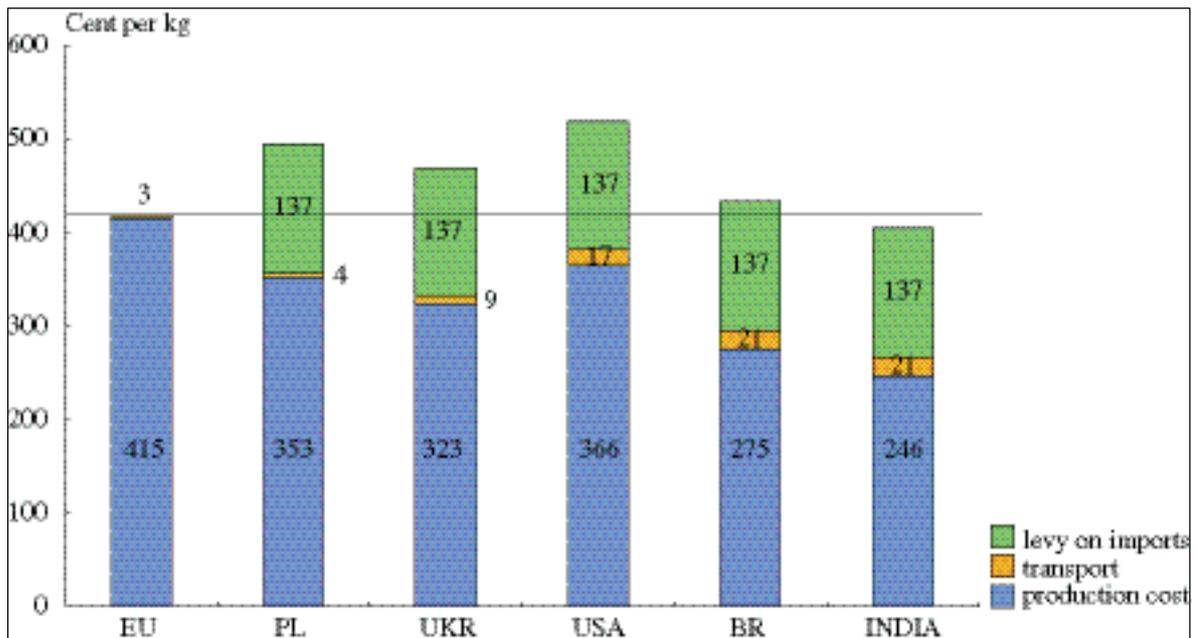


Figure 2.6 Offer price of whole egg powder in Germany from EU (average) and non-EU countries (cents per kilogram)

Figure 2.6 shows that for whole egg powder the competition of non-EU countries, especially from Brazil and India, is a real threat. The levy on imports is hardly high enough to prevent Indian and Brazilian producers of whole egg powder to export their products to the EU market. If there were to be no levies on imports, all suppliers of whole egg powder from the non-EU countries investigated would be very competitive on the EU market, already in 2001. It has to be recognised that, in contrast to shell eggs, there are no disadvantages on declining product quality after long distance transport of whole egg powder.

3. Production cost of eggs in 2012

3.1 Increase in production cost after implementation of EU Directive 99/74/EC

In June 1999 the European Agricultural Council decided after a transition period to house laying hens in the EU exclusively in so-called enriched cages or in alternative systems. The enriched cage gives each hen 750 cm² surface area, a perch, a nest box and litter. The alternative system described in the EU guidelines most resembles the aviary system, as has been known for many years in the Netherlands. Each hen has 1,100 cm² living space, (part of) the surface area of the pen is covered with litter and in the pen there are enough nest boxes and perches for the animals. In 2012 two different housing systems can be distinguished:

- *enriched cages*. In comparison to traditional battery cages the group size is enlarged. The cage is complete with a nest box, perch and litter according to EU standards;
- *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. According to the amended EU egg marketing regulations (1651\O1\EC) it is possible from 1 January 2002 to sell eggs from an aviary system as barn eggs.

3.1.1 Starting points

The production costs of eggs have been calculated for both systems mentioned. It is clear that with the enriched cages there is little practical experience. This means that the calculations are indicative. There are still uncertainties particularly in the field of technical results (egg production, quality of eggs, mortality of hens) and the labour requirements. The main assumptions for labour and investments for various housing systems are in table 3.1. Here

Table 3.1 Most important assumptions for labour and investments in the various housing systems for laying hens

| | Cage (450 cm ²) | Enriched cage | Aviary |
|--|--------------------------------|------------------|--------|
| <i>Labour</i> | | | |
| No. of hens/worker | 50,000 | 45,000 | 32,000 |
| <i>Buildings</i> | | | |
| Animal density (hens per m ² pen) | 30 | 17 | 18 |
| Surface area per pen (gross m ²) | 1,900 | 3,000 | 1,900 |
| <i>Investment</i> | | | |
| Inventory (euros per place per hen) | 7.49 | 10.44 | 10.44 |
| Other inventory (euros per place per hen) | 3.18 | 4.54 | 4.54 |

it seems that for all new systems the labour needs and investments for house and equipment per place per hen are increasing. The basic assumptions for the technical results are in table 3.2. The most important point of difference from the traditional cage is the higher feed consumption; this is caused by lower density on the one hand and higher level of movement of the hens on the other.

Table 3.2 Most important assumptions for the production results in the various housing systems for laying hens (laying period is 390 days)

| | Cage (450 cm ²) | Enriched cage | Aviary |
|--|--------------------------------|------------------|--------|
| No. of eggs per hen per place (units) | 319 | 319 | 314 |
| Feed consumption per hen per day (grammes) | 114 | 117 | 120 |
| Mortality (%) | 7 | 7 | 9 |

3.1.2 Production costs

On the basis of the accepted debit terms the costs for house and equipment are calculated for all housing systems. All variable costs are also calculated for each system (electricity, litter etcetera). The complete results are in figure 3.1 and table 3.2.

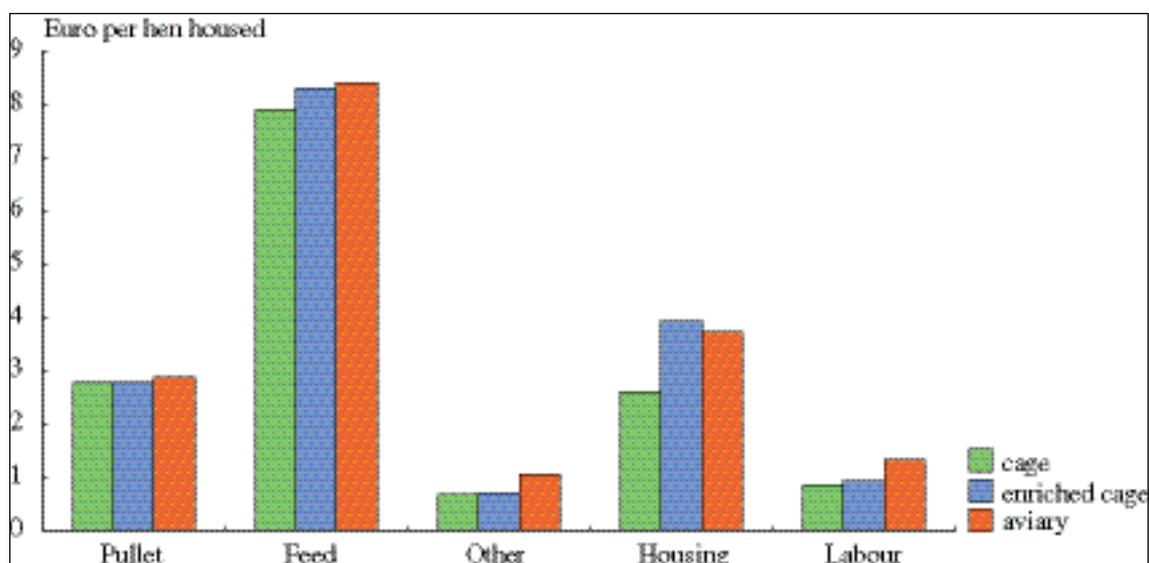


Figure 3.1 Build up of production cost for various housing systems

In the enriched cage the production costs in relation to the present cage accommodation (450 cm² per hen) are 13% higher. In the aviary system this is +21%. The conclusion is that after implementation of EU Directive 99/74/EC the housing system with enriched cages produces eggs at the lowest cost. The production costs in aviaries are 0.3 cent per egg higher compared to the enriched cages. This means that from the market a bonus must be achieved to keep the income for the poultry farmer at a constant level.

Table 3.3 Build up of production costs (in euros) for various housing systems for laying hens

| | Conventional cage (450 cm ²) | Enriched cage | Aviary |
|------------------------------------|--|---------------|--------|
| <i>Costs per hen housed (euro)</i> | | | |
| Purchase of hen | 2.77 | 2.77 | 2.88 |
| Feed costs | 7.91 | 8.30 | 8.41 |
| Variable costs | 0.69 | 0.71 | 1.06 |
| Housing | 2.60 | 3.92 | 3.74 |
| Labour | 0.85 | 0.94 | 1.33 |
| General costs | 0.15 | 0.16 | 0.22 |
| Revenue spent hen | -0.36 | -0.36 | -0.35 |
| Total costs per hen housed | 14.61 | 16.44 | 17.30 |
| Production cost per egg (cent) | 4.54 | 5.17 | 5.49 |
| Production cost per kg eggs (cent) | 0.73 | 0.83 | 0.88 |
| Increase (in %) | - | 13 | 21 |

3.2 Impact of EU reform on the feed price

The market and price policy of the EU is an important factor in the development of the layer sector due to the fact that the price of grain was kept at a significantly higher level than the world market. At the same moment grain substitutes could be imported without virtually any import restrictions. As a result, the areas nearby seaports in particular could obtain relatively cheap feed. The costs of animal feed largely determine the location of the intensive livestock farming. This section attempts to demonstrate the extent to which recent changes in the European grain policy have had an effect on the costs of feed for poultry in the EU countries in the present situation and with respect to the year 2012.

Figure 3.2 presents the prices of grains and various, for the most part, imported feed raw materials during the past 25 years. These are average EU prices on a wholesale level and that were established on the border of the Union. It is clear from figure 3.2 that the prices increased during the period between 1975 and 1982/83. The prices then begin to decrease across the board. And so this decrease occurs prior to the time when the intervention price for grains was reduced within the framework of the 'Mac Sharry' reforms. The decrease in the price of grains runs parallel to (trend-related) price decreases for all of the other feed raw materials. The range of prices between the various types of raw materials furthermore appears to be narrowing somewhat. In other words, the prices of the raw mate-

materials are closer together in the second half of the period compared to the first half. This indicates that the price of grains shows a stronger decrease when compared to other raw materials. The price of soybean meal - an extremely protein-rich raw material and therefore not a good alternative for grain - strongly fluctuates, yet one can also observe a decreasing trend here as well.

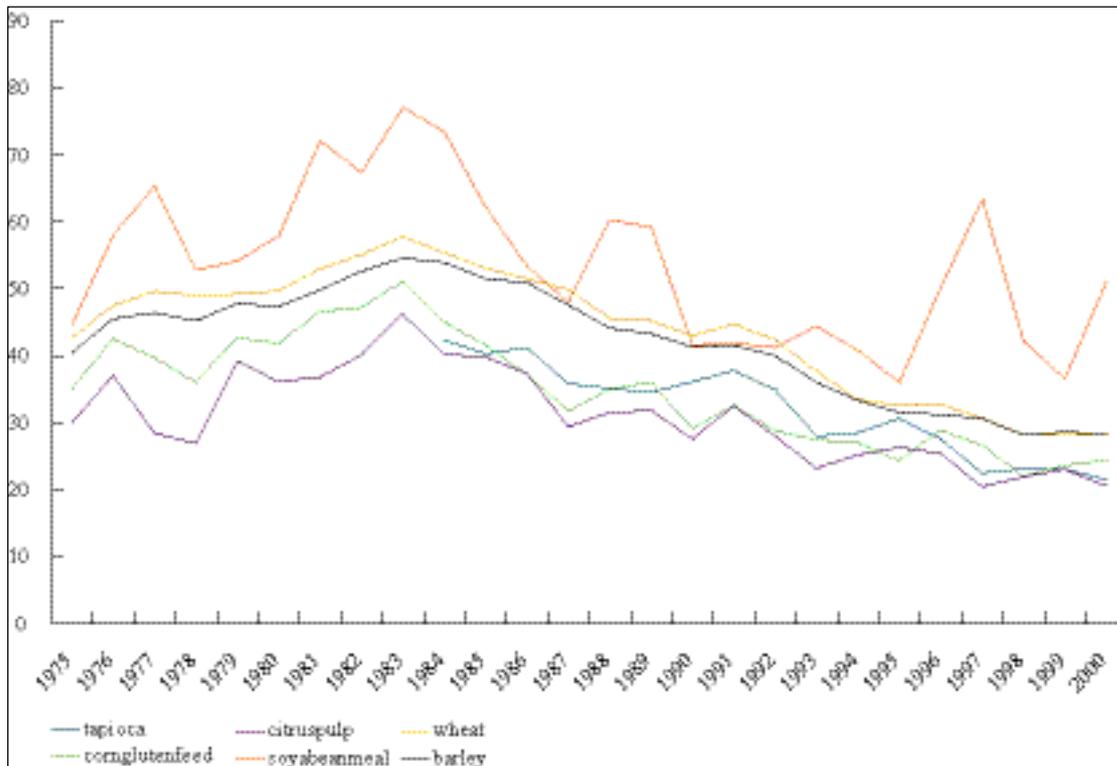


Figure 3.2 Market price of grains and alternative feed raw materials (in Dutch guilders per 100 kg; 2.2 guilder is 1.0 euro)

Source: LEI.

It is evident that the proposals of the European Commission to reduce the prices of grain - initially within the framework of the so-called 'Mac Sharry' reforms and later within the framework of Agenda 2000 - are effective. The effects of agenda 2000 are only partially visible in the price development shown in figure 3.2. It so happens that the intervention price for feed grain was reduced in the marketing year 2000/2001 by a total of 15% in two equal stages.

The calculations of the production costs of the various countries are based on the feed prices of laying mash in those countries during the calendar year 2001. What this means for the EU countries is that the effects of Agenda 2000 have already, to a large extent, been incorporated in the prices of feed. Expectations are that the last price correction for 2000/2001 is not as yet fully evident in the feed price. According to the current proposals, of the Mid Term Review, one may expect the European Council to reduce the

intervention price in the coming years by another 5%. However, no decision has been made in this respect as yet. In concrete terms, this means that the difference in price for feed grains between the EU and the rest of the world will continue to decrease. The calculations are based on a 10% reduction in the price of grains up to 2012. Based on a grain percentage of 50% in the laying mash, the decrease in the price of feed for laying-hens within the EU is then estimated to be 5%.

4. Results of different scenarios towards 2012

To show the possible impact of the EU welfare Directive 99/74/EC on the European egg producers and egg processors, several scenarios for the situation in the year 2012 have been developed. Besides the increase in cost due to the implementation of the EU welfare Directive, there are two other determining factors that are crucial:

1. the possible changes in the levy on egg (product) imports, according to new WTO-agreements;
2. changes in exchange rates of US Dollar, Brazilian Real, Ukraine Hryvnia and Indian Rupee.

Furthermore a decrease in the price of feed within the EU is expected as a result of further changes in the EU market and prices policy for grains.

In this chapter four different scenarios have been examined: at first a basic scenario, at second a scenario based on a 36% lower import tariff, at third a scenario assuming 15% lower exchange rates of three relevant currencies and finally a scenario with a combination of these factors: lower levies on imports and also lower exchange rates. The four scenarios have been examined for shell eggs (paragraph 4.1) and likewise for whole egg powder (paragraph 4.2).

The 36% reduction on import levy is based on the EU proposal of Commissioner Fischler (December 16, 2002). This reduction is similar to the reduction on import levies on egg and egg products from the WTO Uruguay Round.

In the scenarios a 15% lower exchange rate for the currency of the non-EU countries was assumed. This change relates to the average exchange rate to the euro in the year 2001. A comparison of the exchange rate in the summer of 2002 and the average for 2001 (used in the basic scenario) showed that the rate of the US dollar and the Brazilian real to the euro was respectively 9 and 22% lower. To give an indication of the impact of a change in exchange rate we took a 15% reduction for the currency of non-EU countries.

In the figures for the year 2012 the EU level is an average of the initial EU countries. This average is excluding Poland which will join the EU in May 2004.

4.1 Shell eggs

4.1.1 Scenario 1 - Basic situation

In this basic scenario the situation is comparable to the year 2001, with the exception of the lower feed price and an increase of the production costs in the EU as a result of the EU welfare Directive. In fact this first scenario is a 'best-case scenario'.

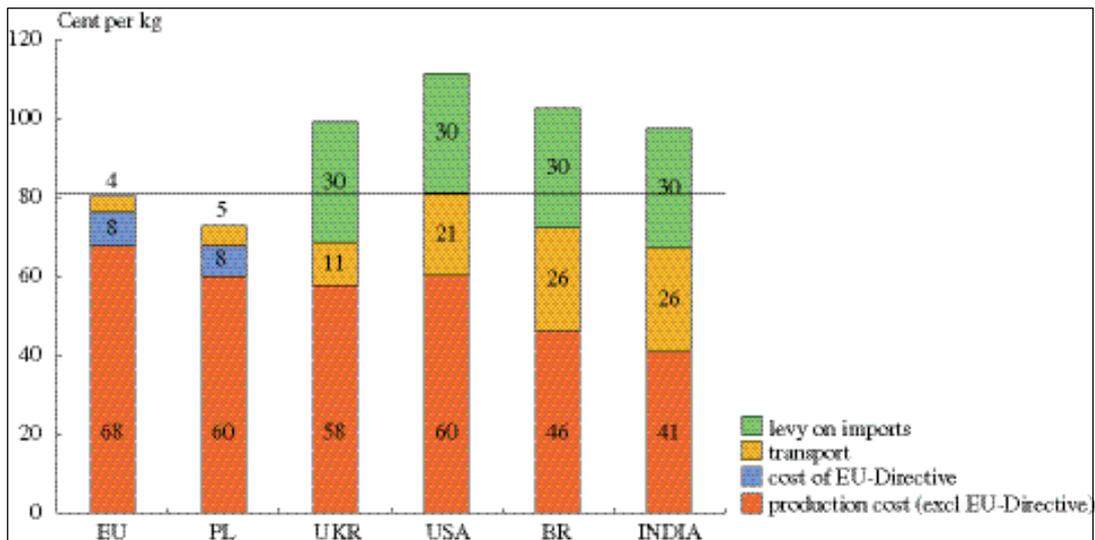


Figure 4.1 Offer price of shell eggs in Germany from EU average (horizontal line), Poland and non-EU countries in cents per kilogram egg (scenario 1)

Figure 4.1 shows that in 2012 Poland can be the cheapest supplier of shell eggs in Frankfurt. The total costs of production and transport are approximately 10% below the average EU level (the horizontal line). Due to the levy on imports the non-EU countries will be no real competitors on the EU market.

4.1.2 Scenario 2 - Lower EU import tariff

In the second scenario, on top of the basic scenario the impact of a 36% lower levy on imports into the EU has been examined.

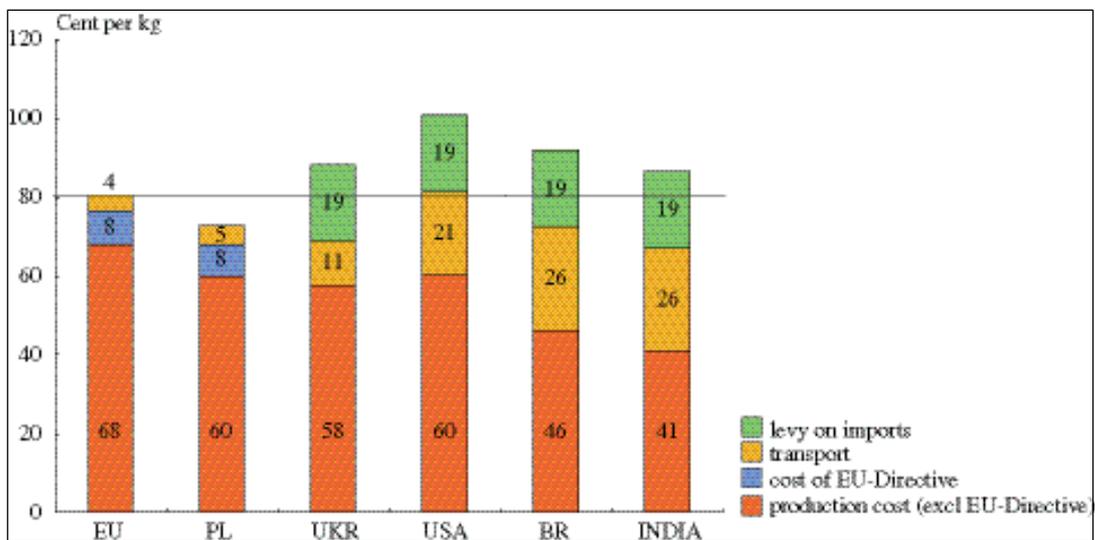


Figure 4.2 Offer price of shell eggs in Germany from EU average (horizontal line) and non-EU countries in cents per kilogram egg (scenario 2, 36% lower import tariff)

For shell eggs there is no real difference between scenario 1 and scenario 2. As figure 4.2 shows also in the second scenario Poland will be the most competitive supplier of shell eggs in Frankfurt in 2012. In spite of the lowering of the levy on imports the non-EU countries will not be competitive on the EU market.

4.1.3 Scenario 3 - Change in exchange rates

This third scenario evaluates the consequences of 15% lower exchange rates of the currencies of all non-EU countries.

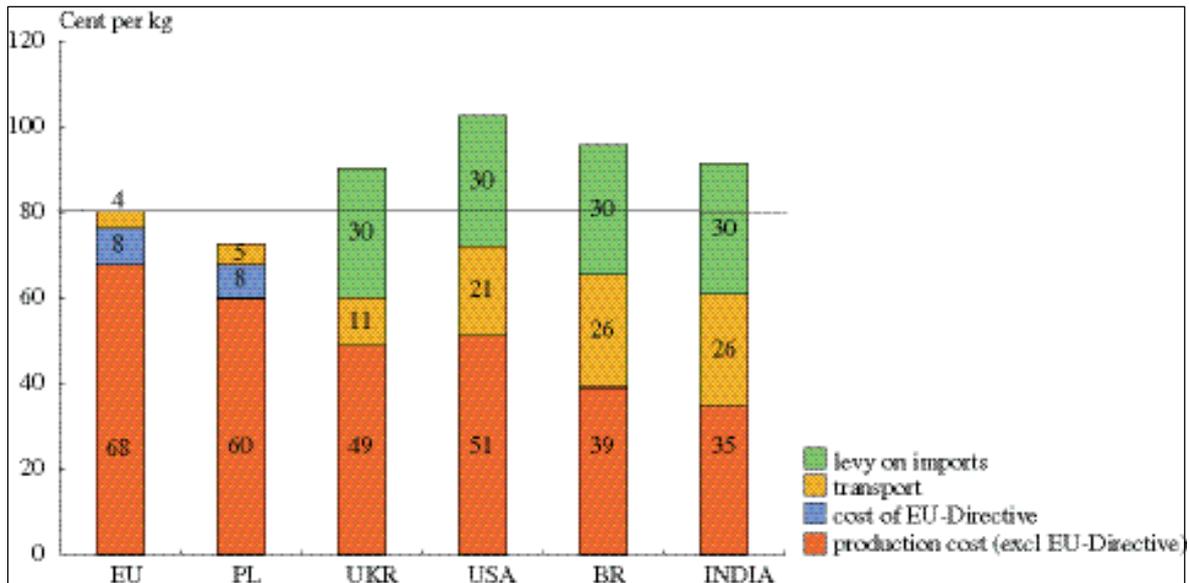


Figure 4.3 Offer price of shell eggs in Germany from EU average (horizontal line) and non-EU countries in cents per kilogram egg (scenario 3, 15% lower exchange rates)

Lower exchange rates in this third scenario have more or less the same impact as the lower import tariffs of scenario 2. Figure 4.3 shows again the competitive position of Poland in 2012. In the case of 15% lower exchange rates the non-EU countries will still be no real competition on the EU market.

4.1.4 Scenario 4 - Combination

The last scenario is a combination of the previous scenarios: lower feed price, cost increase due to EU Directive 99/74/EC (scenario 1 - 'basic'), 36% lower import tariffs (scenario 2) and also 15% lower exchange rates of all non-EU currencies (scenario 3). In fact this fourth scenario is a 'worst-case scenario'.

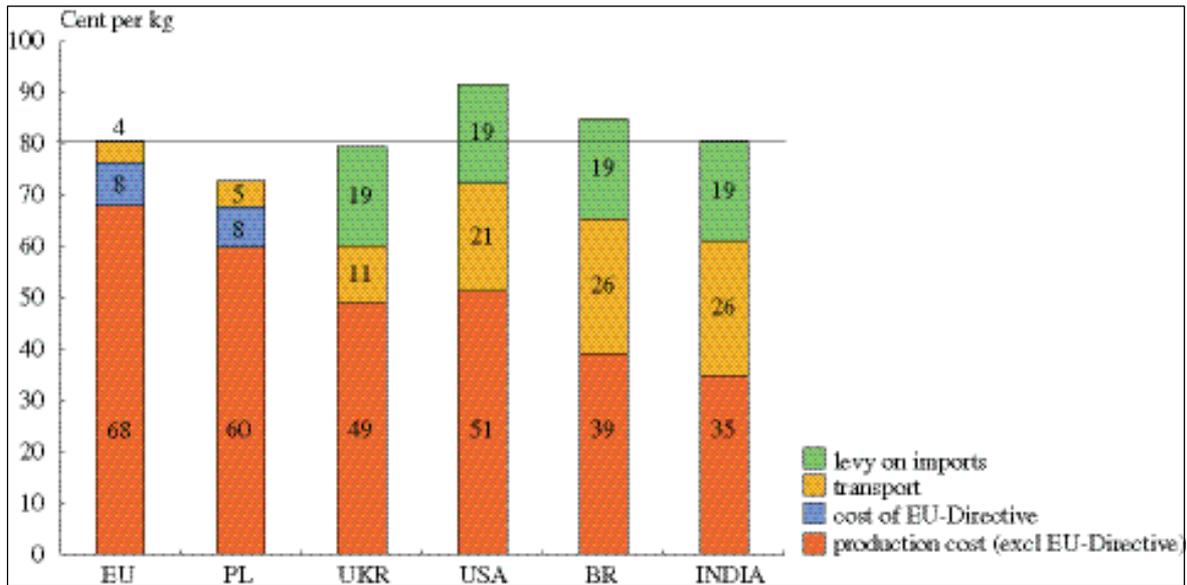


Figure 4.4 Offer price of shell eggs in Germany from EU average (horizontal line) and non-EU countries in cents per kilogram egg (scenario 4, 36% lower import tariff and 15% lower exchange rate)

The consequences of the combination of a 36% lower levy on imports and 15% lower exchange rates are indicated in figure 4.4. The position of Poland remains unchanged, but in this 'worst-case scenario' also the Ukraine and India obtain a quite competitive position on the EU market of shell eggs. The remaining levy on imports will make imports from the USA and Brazil unlikely.

4.2 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.

4.2.1 Scenario 1 - Basic situation

In this 'best-case scenario' the situation is comparable to the year 2001, apart from the lower feed price within the EU and an increase of the production costs caused by the EU Directive 99/74/EC.

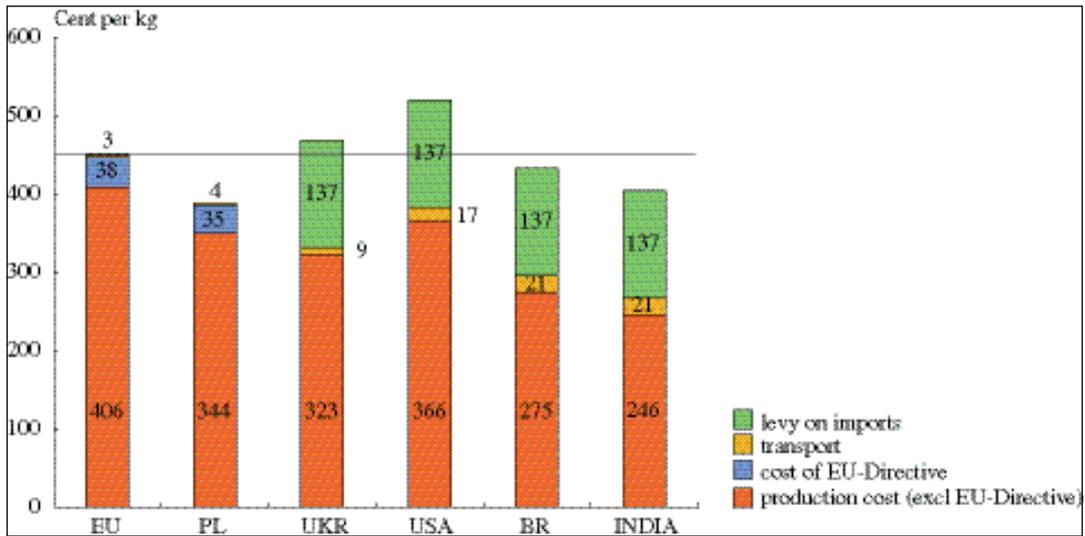


Figure 4.5 Offer price of whole egg powder in Germany from EU average (horizontal line) and non-EU countries in cents per kilogram (scenario 1)

Figure 4.5 shows that in 2012 Poland can be the cheapest supplier of whole egg powder in Frankfurt, directly followed by India and Brazil. The total costs of production, transport and levies for India are 10% below the average EU 15 level. In this 'best-case scenario' imports from the USA will be no real threat.

4.2.2 Scenario 2 - Lower EU import tariff

In the second scenario on top of the basic scenario the impact of a 36% lower import levy on imports into the EU has been examined.

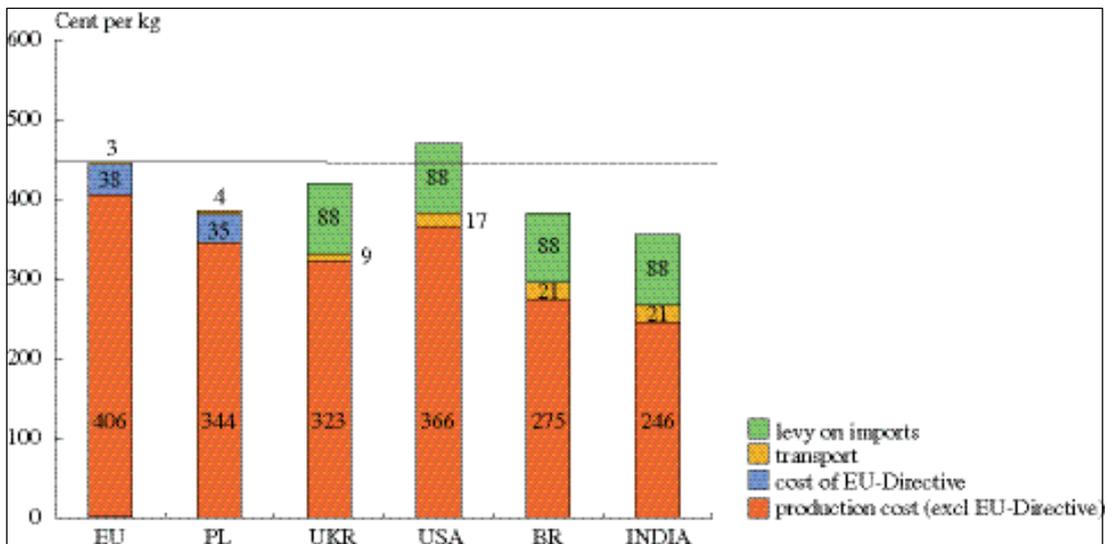


Figure 4.6 Offer price of whole egg powder in Germany from EU average (horizontal line) and non-EU countries in cents per kilogram (scenario 2, 36% lower import tariff)

Figure 4.6 shows that a 36% lower import tariff will mean that in 2012 India, Poland, Brazil and Ukraine can be relatively cheap suppliers of egg powder in Frankfurt. The total costs of production, transport and import levies will be 20% below the average EU level for India.

4.2.3 Scenario 3 - Change in exchange rates

This third scenario evaluates the consequences of 15% lower exchange rates of all non-EU currencies, on top of the basic scenario.

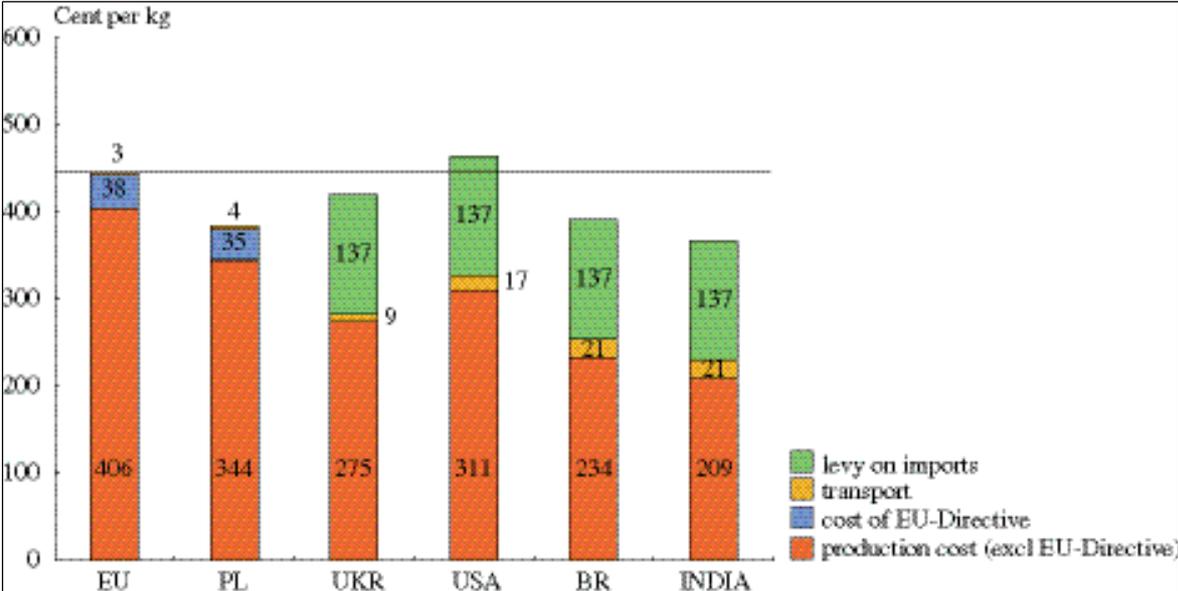


Figure 4.7 Offer price of whole egg powder in Germany from EU average (horizontal line) and non-EU countries in cents per kilogramme (scenario 3, 15% lower exchange rate)

In figure 4.7 the impact of lower exchange rates is shown. Also in this scenario in 2012 Poland and all non-EU countries, except for the USA, can be relatively cheap suppliers of whole egg powder in Frankfurt. The total costs of production, transport and levies will be up to 18% (India) below the average EU level, almost the same as in the previous scenario with the lower import tariff.

4.2.4 Scenario 4 - Combination

This 'worst-case scenario' is a combination of the previous scenarios: lower feed price, cost increase due to the welfare Directive (scenario 1 - 'basic'), 36% lower import tariffs (scenario 2) and also 15% lower exchange rates of all non-EU currencies (scenario 3).

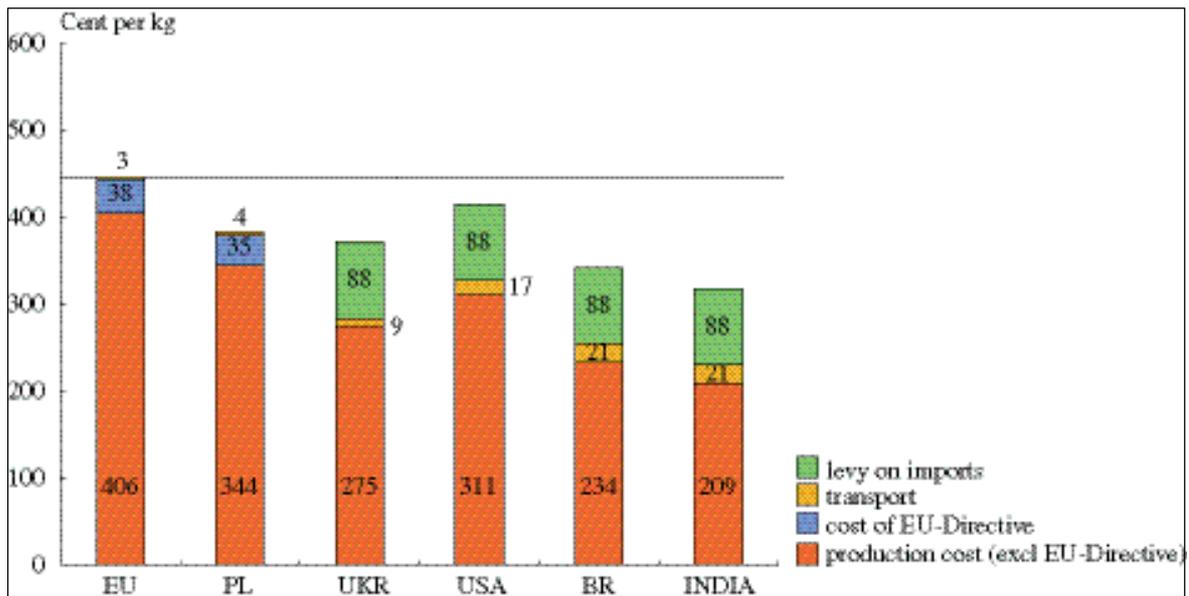


Figure 4.8 Offer price of whole egg powder in Germany from EU average ((horizontal line) and non-EU countries in cents per kilogramme (scenario 4, 36% lower import levy and 15% lower exchange rate)

The consequences of the combination of a 36% lower levy on imports and 15% lower exchange rates are illustrated in figure 4.8. In this 'worst-case scenario' all non-EU countries will be very cheap suppliers of whole egg powder to the EU market. Offer prices in Frankfurt could be 23% (Brazil) to even 29% (India) below the average EU level.

5. Purchasing factors for buyers of egg products

This chapter examines the competitiveness of the European egg products sector, as well as the consequences of tightening up the laws concerning layer poultry on the competitive position of the European egg production industry. A tightening of the laws has, in fact, the effect of raising the production cost. The object was to investigate what type of future perspective the egg products industry would have if stricter welfare legislation for layer poultry were called for in the EU. For more detailed information please refer to the full report written on this subject (Tacken et al., 2003).

5.1 Method

In the first place, desk research established the characteristics of the egg products market. During this process attention was directed at providing a general description of the structure of the sector, import and export statistics and the competitive position seen from the primary sector.

Qualitative interviews were then carried out, with quantitative elements. These interviews served to provide an insight into the field of influence in this chain and to consider how governmental policy can influence supply and demand. The object of the research was to go further than a classification of the competitive position and also to give a background to the field of influence in which the various chain parties operate.

It was impossible to take a statistically representative random sampling from the total clientele of the egg products industry, within the limits of this research. A rational random sampling was therefore taken, on the basis of the following characteristics:

- respondents from the major markets in the food industry;
- that can give a long-term image of the developments in the buying of egg products;
- and must be familiar with the segment of the food industry in which they operate.

The various replies within the segment divisions were studied and all respondents were asked to give an estimate of the representative quality of their contribution for the purchasers of the segment of the food industry in which they operate.

Of the 15 respondents who participated in the questionnaire, 8 respondents were buyers of egg products (of which 3 were in Germany), 3 were working at a food wholesaler's and 4 respondents were Dutch egg processors. Most respondents were buyers/sellers of liquid egg products and in some cases also of powdered egg. The choice of random sampling was based on the sale of egg products to various types of food industries. Some respondents bought in more product groups of egg products. The division of sectors within the food industry resulted in the following: bakery (6), sauces (3), soup (2), dessert and ice-cream (1), pastas (2), catering (1) and ready made (2).

5.2 Factors and values in testing

Buyers of egg products define various specifications for egg products prior to offering them to manufacturers of egg products. Within these specifications some factors seem to be more influential for the purchasing decision and the selection of an egg product manufacturer than others. For manufacturers of egg products decisive capacities regarding these factors in particular can result in a contract with a buyer and can thus be a competition-defining factor.

In order to establish which purchasing factors are decisive in egg products the buyers are first asked what the decisive purchasing factors are for them in the purchase of egg products. The top two are almost always the following: (1) fulfilment of the microbiological and chemical specifications and (2) price. Furthermore, items such as traceability, reliability and flexibility of the supplier are mentioned by almost everyone. For a number of buyers choice of colour, choice of scent, certification, innovation of the supplier and viscosity are also deciding factors. The country of origin of egg products appears to have almost no influence on purchase. The system of housing plays no role, as for processed products it is difficult if not impossible to establish. Even the buyers that have a range of products, in which free-range or organic egg products are processed, indicate that these are and will probably remain only niche markets.

In order to test the importance of various purchase factors, five critical purchasing factors have been established in co-operation with an expert from the egg products industry which can be tested quantitatively by the respondents by means of a conjoint measurement. From the answers to the open question previously described regarding the most important purchasing factors, it appears that the most important factors in the five quantitatively tested factors are processed. The factors included in this testing are: the price, microbiological properties of eggs, the extent of innovation on the part of the egg products manufacturer, the system of housing and the country of origin of the eggs. For each of the purchasing factors three different values have been defined, which are randomly combined with each other. The values that are tested are not randomly chosen.

5.3 Importance of various purchasing factors

From the grading attributed by the respondents to the various profiles, the relative importance of the various purchasing factors and the impact of the values which the factors can assume were deduced. A total picture was sketched of all respondents after which the results were itemised for the various participating groups. From the total overview (figure 5.1) it appeared that the microbiological properties and the price of egg products were the most important purchasing factors. If the total importance was set at 100%, both price and microbiological properties would have a 35% share of importance each. On an individual level too this result is recognisable, while some respondents clearly attached more importance to the price and others more for the microbiological properties. The level of innovation of the egg product manufacturer is, after price and microbiological properties, at 20% the most important factor, followed by the system in which animals are kept, 7%. For one of the respondents this was the most important purchasing factor. The country

from which the eggs originate was considered the least important purchasing factor at 3%. Individually there were widely different scores on these purchasing factors.

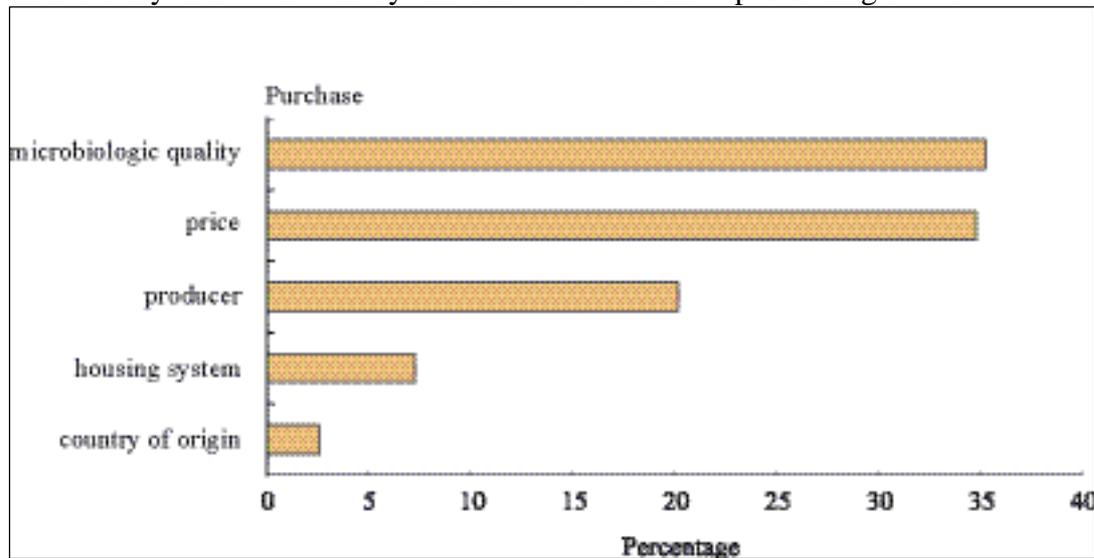


Figure 5.1 Relative importance of the various purchasing factors of egg products

5.4 Conclusions

In this paragraph we provide some conclusions from the report written by Tacken (2003). On the egg powder market European egg processors already face difficulty in competing with providers from the US. This can be attributed to the significantly lower production cost. As expected this difference in production cost will only increase in the future, despite the fact that in the US some attention is now being given to welfare-friendly housing.

The egg products market is a market in which the supply exceeds the demand and egg processors compete with each other at price level to the advantage of the client. The country of origin of eggs to be processed plays a minor role, but the professionalism of the egg products manufacturer is more important.

On the basis of this qualitative study, in which 11 buyers of egg products and 4 manufacturers of egg products were questioned, it appears that price and microbiological and chemical composition are the most important purchasing factors. In this respect it is relatively difficult to introduce an innovative product into the egg products market. The buyers expected the importance of traceability in the future to increase. This means also that egg processors could implement innovation policies for this purchasing factor.

Welfare-friendly eggs are only interesting for buyers if they can be incorporated in their end product. At the moment the demand for processed products with alternative raw materials (such as barn and free-range eggs) is still negligible. While the market for organic processed products is growing, it is still typified as a niche market.

6. Worldwide shifts in production following extra animal welfare requirements in the EU

6.1 Introduction

This chapter describes in broad outline a possible view of the future following a unilateral intervention in the EU in order to improve the welfare of laying-hens. This demand is obviously hypothetical, as world markets are subject to a great many policy measures. In addition, the location of the production through intensive livestock farming depends upon a great many social-economic factors from outside the sector. What is important in this respect is to identify a number of driving forces behind the possible developments in intensive livestock farming. In doing so, we can distinguish between demand factors, supply factors and policy factors.

- *Demand factors*

One should mainly consider the development of the demand for intensive livestock farming products outside the EU in this respect. A spectacular increase in the demand is not to be expected within the EU. This is not the case on other continents. An example is East Asia, where increasing incomes go hand in hand with an increasing demand for animal protein, particularly protein from pork meat and poultry meat. An increase in income and shifted preferences therefore play a role here.

- *Supply factors*

These concern issues such as improving productivity through scaling-up and by improving the feed conversion. Changes in the relative feed costs play a role here as well.

- *Policy factors*

The future expansion of the EU with East-European countries is the most significant policy factor that is to have an effect on the sector in the medium-long term. In this context, the expansion process of the Union is of influence on the competitive position of the producers in the EU compared to producers elsewhere. In addition, the competitive relationships within the expanded EU are to change as well. The EU expansion involves creating a larger customs-union that, in turn, involves the introduction of preferential trade conditions on the internal markets of the EU.

In addition to these factors, environmental requirements and animal welfare requirements play an increasingly important role in business decisions in the intensive livestock farming sector in Europe. Regulations that are expected to make Europe less attractive as a place of business have meanwhile become effective on an EU level. The effects of the policy factor will be explicitly discussed in this chapter.

6.2 Model and database

An economic model that describes trade and production on a worldwide scale is used here in order to be able to sketch a consistent scenario of the future. An important advantage of using a model is that this guarantees the mutual consistency between the assumptions and that, in turn, the results are consistent with the assumptions. As is the case with every model, the one that is used here is also an extreme abstraction of reality that is based on theoretical principles and the available data. The model that is used in this report concerns an adapted version of the Global Trade Analysis Project (GTAP) model. A comprehensive description of the model is provided in Hertel (1997), and Van Tongeren, Van Meijl and Surry (2001). The standard GTAP model is a so-called general equilibrium model. This approach is rooted in the micro-economic theory and describes the entire economy of a country in a consistent fashion. The GTAP model distinguishes between various sectors within the economy. Every sector in the standard GTAP model produces under constant scale-yields and the competition on product markets and on the markets for means of production is perfect as well. Producers combine raw materials and auxiliary materials and the production factors capital, labour (skilled and unskilled), land and natural resources. All of the products are composed of domestic and foreign components. The foreign component is furthermore differentiated according to the region of origin. This assumption enables one to model bilateral trade and intra-sectoral trade flows. The model also explicitly allows for international transport margins. The individual regions are linked by international capital flows, in addition to trade flows.

Data

The GTAP database divides the world into a number of regions. Some of these regions are individual national economies; other regions are compound groups of national economies. The most recent version includes 65 regions of this kind, including the 15 member states of the EU and a number of East-European countries. The 65 GTAP regions have been summarised in nine groups for the purpose of this study (see figure 6.1).

| Country code | Country description | Product code | Product description |
|--------------|-----------------------------|--------------|-----------------------------|
| EU27N | Northern member states EU27 | TARWE | Wheat |
| EU27Z | Southern member states EU27 | OVGRAAN | Other grains (excl. rice) |
| EU27O | Eastern member states EU27 | INTVEE | Intensive livestock farming |
| WEUR | Rest of West-Europe | OVVEE | Other forms of farming |
| USCDN | USA and Canada | OVAGR | Other agricultural products |
| ZAM | South-America | IND | Industry |
| OAZIE | East-Asia | DIENS | Services |
| ZAZIE | South-Asia | | |
| ROW | All other regions | | |

Figure 6.1 Regions and products included in the model and applied in this study

The GTAP database contains bilateral trade data, transport data and data regarding trade protection. This data is linked to regional input-output data that distinguishes between 57 sectors for each region. All of the flows are expressed in millions USD, and the basic year for version 5 of the database is 1997. The 57 GTAP sectors are summarised in seven groups (see figure 6.1).

Intensive livestock farming is one of the seven product groups. Unfortunately, it is not possible to further categorise intensive livestock farming into poultry and pigs with the GTAP database. Moreover, the primary production and the secondary processing have been combined in the aggregation. And so this concerns the 'complex' of intensive livestock farming.

6.3 Animal welfare scenario

In order to determine the influence of more stringent animal welfare requirements in the EU, the input for the model calculations concerns the effects on the production cost of the EU Directive for the animal welfare of laying-hens. This version allows insight into the consequences of unilaterally incorporating more stringent animal welfare requirements in the EU.

In accordance with the model, the more stringent regulations have been translated as a cost increase of the production factor 'capital'. After all, the current poultry houses will yield smaller profits with the incorporation of more stringent animal welfare requirements. Additional investments will be required in order to maintain the current level of production. The cost increase has been modelled as an increase in the costs of capital. The ultimate increase in the production cost as a result of the introduction of increased costs has been set at 13%. The increase in the costs of capital is uniform for all of the EU member states, yet the effects nevertheless differ per EU region, because the shares of the costs of capital differ. The costs of capital per unit of product are higher in Northern Europe compared to Southern Europe and Eastern Europe. And so the same price increase for the production factor 'capital' will therefore carry more weight in the production cost in Northern Europe than in the other EU regions.

The results for the production are shown in table 6.2. The columns 'high' and 'low' indicate the limits of 95% confidence intervals. According to the table, the production volume in Northern Europe can be expected to shrink by an average of 11.4%. The reduction will be somewhere between 8.7 and 14.1% in 95% of the cases. The effect is less major in Southern Europe due to the smaller share of the factor 'capital' in the production cost. The reduction there has been calculated at 4.2%. In this case, the 95% interval is between 0.9 and 7.5%. That which applies to Southern Europe applies even more to Eastern Europe. According to the model calculations, the production level may even increase in this region. The other regions in the world are expected to compensate for the production shrinkage in the EU. An increase in production is mainly observed in the USA and Canada (2.8%) and in south-America (3.2%). It can be concluded that the GTAP model gives an impression of the impact of increased production cost due to improvement of animal welfare. The introduction of enriched cages will especially increase the cost per kg product for housing and also for labour. As labour cost and housing cost are relatively high in Northern Europe the

decrease in production volume will be highest in that region. From the GTAP model we learn that the other regions will follow, first southern Europe and than Eastern Europe. The exact position of southern and eastern Europe to the rest of the world depends, among others, on the transport cost of the product to Europe.

Table 6.2 *Effects of more stringent EU requirements for animal welfare requirements on the production volume (in percentages)*

| | Production volume | | |
|-------------------|-------------------|---------|------|
| | high | average | low |
| EU27-North | -14.1 | -11.4 | -8.7 |
| EU27-South | -7.5 | -4.2 | -0.9 |
| EU27-East | 1.3 | 5.8 | 10.3 |
| USA and Canada | 2.4 | 2.8 | 3.2 |
| South-America | 2.8 | 3.2 | 3.6 |
| East-Asia | 0.9 | 1.1 | 1.3 |
| South-Asia | 0.8 | 0.8 | 0.8 |
| Rest of the World | 3.6 | 4.2 | 4.8 |

Source: Model calculations.

6.4 Discussion

It should be emphasised once again that the above concerns a scenario, and not predictions. Some of the results will change if the basic assumptions are changed. As mentioned in the introduction, many factors are of influence on the location of intensive livestock farming in the world.

The most significant differentiation concerns the fact that the intensive livestock-farming sector is a single, collective product group. The GTAP database does not, unfortunately, allow for a further categorisation of intensive livestock farming in poultry and pigs. What's more, the primary production and the secondary processing have been combined in the aggregation. And so the above concerns intensive livestock farming as a 'complex'. This means that the effects that apply to the laying-hens sector may be influenced by aggregation in the model.

7. Conclusions and discussion

Production and trade

The EU 15 is the second largest producer of eggs in the world. The share of the EU in the total world production has decreased during recent years as a result of a fast growing production in Asia and in North and South America. The self-sufficiency rate for eggs in the EU has been 102 to 103% in the period 1996 until 2000.

Production cost in 2001 within the EU

Between the six main egg producing countries the production cost of shell eggs in 2001 ranged from 79 in the UK to 65 eurocent per kg of eggs in Spain. The average for those six countries is 70 eurocent per kg. Processing cost for whole egg powder also differs within the EU countries from 23.6 in Germany to 20 eurocent per kg shell eggs (input) in Spain.

Production cost in 2001 in non-EU countries

Compared to the average level within the EU the production costs for shell eggs in 2001 were lower in Poland (88%), USA (86%), Ukraine (83%), Brazil (66%) and India (59%). As a result of cost of transportation and import levies there are barely no imports from those countries to the EU. For whole egg powder the mentioned non-EU countries are even more competitive. Compared to the average level within the EU the production costs of whole egg powder in 2001 were lower in Poland (85%), USA (88%), Ukraine (78%), Brazil (66%) and India (60%). Although cost of transportation of powder is relatively low, current import levies protect the EU from large amounts of imports from the mentioned countries. However, the offer price of whole egg powder from India is calculated to be below the EU 15 average.

EU Directive 99/74/EC

In the year 2012 the EU Directive 'welfare of laying hens' will be fully implemented on European poultry farms. Production of eggs in enriched cages will give the lowest production cost. Compared to the traditional cage the cost for housing, feed and labour will be increased. It can be expected that the design of enriched cages will be further improved to obtain good technical results. With good enriched cages the increase in cost will be at least 13%.

Impact of Agenda 2000

In the past the EU market and price policy had a great impact on the feed price of poultry. Grain prices were kept on a higher level than the world market price. As a result of the 'Mac Sharry' reforms and more recently Agenda 2000 intervention prices of grain are reduced. In the comparison for the different countries feed prices paid by farmers were collected for the year 2001. It is estimated that from 2001 towards 2012 the difference in feed prices for layers between the EU and the rest of world will be reduced by another 5%.

Scenarios 2012

In 2012 the production cost of shell eggs in the EU is on average, and including cost of transport, 80 eurocent per kilogram. The results of the scenario calculations show that in a competition on the German market for shell eggs Ukraine, USA, Brazil and India cannot compete on price. This is a result of high cost for transportation and import levies. In scenario 4, with a 36% lower import tariff and a 15% lower exchange rate, Ukraine and India could compete. For whole egg powder the results are different. In all scenarios, Brazil and especially India can compete on the German market. In the scenarios with lower import tariff and the scenario with lower exchange rates, also the Ukraine is competitive. For the USA especially scenario 3, where the exchange rate of the dollar is reduced by 15%, is relevant. In the basic scenario the exchange rate of the year 2001 was used. At the end of 2002 the exchange rate of the dollar to the euro was 10 to 15% lower. In other words: scenario 3 is close to the current situation.

Welfare legislation in non-EU countries

In the countries outside the EU 15 mentioned in this report there is no legislation on welfare to protect the laying hens. In the USA there is discussion on increasing the space allowance per hen (towards 432 cm² in 2008) on a voluntary basis (Babcock et al., 2002). However, it is also discussed whether those welfare guidelines will be accepted by breakers (production for the egg processing industry). At this moment most hens in the USA are kept in six-bird colony cages with 342 cm² per hen. In Brazil, India and Ukraine layers are kept in cages with a space allowance of 300 to 400 cm² 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 cm² per hen gives the highest income for the poultry farmer (Bell, 2000).

Cost of consumer demands

A recent Dutch study (Van Horne and Bondt, 2002) showed that from the year 2000 towards 2005 production costs will increase by 4% in Spain and up to 8% in the Netherlands due to the extra cost to implement legislation to improve animal welfare, food safety and for environmental protection. The cost increase towards 2005 was based on: an increase in

space allowance per hen (550 cm² in 2003), a ban on de-beaking of hens (Germany and the Netherlands), salmonella control, the ban on Meat and Bone meal (MBM), reduction of ammonia emissions (Germany and the Netherlands) and the introduction of a energy tax on electricity. In this report only the ban on MBM and the improved welfare (enriched cages) is taken into account. Apart from the food safety issues the mentioned themes are not discussed in the non-EU countries.

Purchasing factors of egg products

On the basis of a qualitative study, in which buyers of egg products were questioned, it appears that price and microbiological and chemical composition are the most important purchasing factors (Tacken, 2003). The egg products market is a market in which the supply exceeds the demand and manufacturers of egg products compete with each other at price levels to the advantage of the client. The country of origin of egg products and eggs plays a minor role, but the professionalism of the egg products manufacturer is more important. In this respect it is relatively difficult to introduce an innovative product into the egg products market. Non-cage eggs are only interesting for buyers if they can be incorporated in their end product. At the moment the demand for processed products with non cage eggs (such as barn and free-range) is still negligible. While the market for organic processed products is growing, it is still typified as a niche market.

Market for table eggs

In 2000 a study was conducted on the future position for Dutch table eggs. In combination with a desk study, interviews were held in the Netherlands and Germany at egg packing stations and retailers. The main conclusion in this report was that retailers strongly prefer locally produced table eggs. Particularly regarding aspects such as freshness, food safety and traceability EU eggs are far ahead of eggs produced in non-EU countries. In the same report (Tacken, 2002) it was concluded that non cage eggs have a future. However, it is questioned if the growth will continue. There are signals that growth has stabilised in the Netherlands and Germany.

Results of GTAP model

The impact of improved animal welfare calculations were made by using the GTAP model. GTAP stands for Global Trade Analysis Project and is used by several Universities in Europe and the USA in order to simulate the impact of legislation on world trade. The list of member institutions in the GTAP consortium includes, among others, the World Bank, the European Commission and the World Trade Organisation. In this project there were limited possibilities to make detailed calculations with the model. The LEI did run the model to provide an impression of the impact of a 13% increase in production cost after implementing the EU welfare Directive. The results show an 11.4 and 4.2% decrease in production volume in respectively North Europe and South Europe. This production capacity will move towards East Europe (+5.8%), USA (+2.8%), South America (+3.2%) and East Asia (+1.1%). It should be emphasised that in the current GTAP model, intensive

livestock farming is combined into one product group. This means that the effects that apply to the laying hens sector may be influenced by the aggregation in the model. It is recommended that the GTAP model is adapted by bringing in specific data for eggs and egg products. With this adapted model the impact on world trade as a result of lower import levies combined with increased production costs for improving animal welfare could be calculated.

Literature

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The basic data for calculating the production cost were obtained from several organisations, institutes, farms and companies in the countries. The main sources per country to be mentioned:

| | |
|-------------|---|
| Netherlands | Agricultural Economics Research Institute (LEI) |
| France | Institut Technique de l'Aviculture (ITAVI) |
| Spain | Visit to several companies |
| Germany | Agricultural Economics Research Institute (LEI) |
| Italy | Unione Nazionale dell'Avicoltura (UNA) |
| UK | National Farmers Union (NFU), British Egg Industry Council (BEIC) |
| Poland | Study tour 2002 |
| Ukraine | Sunside poultry consultancy |
| USA | University of California (Don Bell) and Economic Research Service (ERS) |
| Brazil | Centre for advanced studies on applied economics (CEPEA) |
| India | National Egg Co-ordination Committee (NECC) |