# The future of the Dutch egg processing industry

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This research examines the competitiveness of the Dutch egg products industry, as well as the consequences of tightening up the laws concerning layer poultry on the competitive position of the Dutch egg production industry. A tightening of the laws has, in fact, the effect of raising the production cost, and in this research the central question revolves around whether animal welfare-friendly egg products are perceived as products with added value by the buyers of egg products (mainly industrial buyers) and will thus also be offered for sale at a higher price. Furthermore, it will be investigated what the probable developmental directions are in the egg products industry if this higher price cannot be realised.

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# Contents

# Preface

In 1998 LEI, commissioned by the steering committee Reorientation of Poultry Farming (Alders Commission), conducted an initial exploratory chain analysis regarding the purchase and sales behaviour in the table eggs sector. In 2000 the Ministry of Agriculture, Nature Management and Fisheries formulated a follow-up assignment, which was completed at the end of 2001. In response to the results of that research, the Ministry of Agriculture, Nature Management and Fisheries decided on a chain analysis of the Dutch retail market for egg products.

The object of the research was to investigate what type of future perspective the Dutch egg products industry would have if stricter welfare regulations for layer poultry were called for in Europe than in the rest of the world and if stricter regulations were enforced in the Netherlands than in the rest of Europe.

In order to achieve more clarity in this respect, a desk study was first carried out with regard to the market position of the Dutch egg products industry in Europe and the world. More insight into the relationships between chains and the purchasing factors was subsequently gained through interviews with buyers of egg products in the Netherlands and Germany.

It is hoped that this study will provide better insight into the market for Dutch egg products, the position of the Dutch product in the international market, the position of Dutch traders on the international market and the future expectations for egg production on the basis of (improved) cage-produced eggs and egg products on the basis of barn eggs.

The research was principally financed by the Ministry of Agriculture, Nature Management and Fisheries, with additional contributions from the PVE (Product Boards for Livestock, Meat and Eggs) in money and time invested. The research was supervised by a supervisory committee, in which both the Ministry and representatives from the Dutch egg products industry were represented, as follows: E. Theune (Agriculture, Nature Management and Fisheries), A. Kuijpers (Agriculture, Nature Management and Fisheries), E. Bokkers (PPE), C. Hagen (PPE), T. van Dijk (Euroei), A. de Goede (de Goede), M. de Groot (Nive). LEI would like to sincerely thank the supervisory committee and all respondents who have helped with their research for their generous contribution.

Prof.Dr. L.C. Zachariasse
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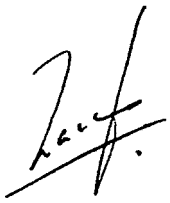

# Management summary

The future competitive position of the Dutch egg products industry is established to an important extent by the distinguishing characteristics of the Dutch product on the European market and on the world market.

Within the EU it has been agreed that from 2012 onwards only battery or caged poultry in enriched cages will be allowed. This study investigates the consequences for the European egg products industry and for the Dutch egg products industry in particular. The consequences for the Dutch egg products industry arising from stricter regulations regarding welfare policy in the Netherlands will also be investigated. These measures have, in fact, the effect of raising the cost price, but the question still remains whether the animal welfare-friendly egg products are perceived as a product with added value by the customers of the egg products industry and if they can also be sold for a higher price.

The Dutch egg products industry operates in a market with over capacity, in which purchasers buy egg products on the basis of price and microbiological characteristics. In the egg products market two main types of products are offered: liquid egg products and powdered eggs. Liquid egg products are sold within a radius of around 800 km and powdered eggs on the world market.

On the powdered egg market the Dutch egg products industry experiences competition from other European providers, but also from providers from the United States. Both on the European and Asian market the providers of powdered eggs from the US are the winners, because they can compete with a much lower cost price. The most important cost price determining factor for egg products is, in fact, the cost price of the egg itself. While in the US there is little promotion of welfare policy compared with Europe and the feed there is relatively cheap, the cost price of an egg from the US in 2000 was approximately 20% cheaper than the cost price of an egg in the Netherlands. The expectation is that the United States will introduce a welfare policy for layer poultry within the next 10 years, but the first examples are still under the present directives of the EU.

After 2012, if the traditional cages are no longer permitted in the EU and only the enriched cages are allowed, the US will have a cost price advantage of around 10% (including transport costs from the US to the EU) compared with the EU. If an even stricter welfare policy is enforced in the Netherlands than in the rest of Europe, this will likewise lead to a cost price difference of around 10% compared with the EU.

If a stricter welfare policy is enforced in the Netherlands than in the rest of Europe, it will be very difficult for the Dutch egg products industry to continue to compete with other providers within the EU on the European market. Competition outside the EU in powdered eggs would then be almost impossible. If a stricter welfare policy is enforced in Europe than in the rest of the world, it will probably be very difficult for the European providers to maintain a competitive position on the European market, if there is no entry protest raised to the availability of cheaper powdered eggs from the US. These potential disadvantages in the strongly competitive market can be avoided if retailers and consumers are convinced of

the added value of animal-friendly products, which would then become a purchasing condition.

# 1. Introduction

In 2001 almost three billion eggs for consumption were processed into egg products in order to be used as raw material for the food industry throughout the world. The fresh egg product that is processed in the Netherlands is mainly supplied to neighbouring countries, while the powdered egg is supplied to countries all over the world.

The future competitive position of the Dutch egg products industry is to an important extent established by the distinguishing characteristics of the Dutch product on the European and world markets. Particularly on the world market, competitive ability is influenced not only by product characteristics and the spirit of commerce of the company, but also by international economic policy (for example the WTO regulations). Due to international economic policy and its developments, a product with a lower price from countries with no environmental and animal welfare regulations can be sold on the European market and it is increasingly difficult outside the EU to compete at cost price level.

Particularly for the Dutch egg products industry, which is strongly oriented towards export, developments in the legislation seem to have very drastic repercussions, both within the EU as well as on the world market. The Dutch egg products industry sells more than 80% of its products outside the Netherlands, of which approximately 80% are sold within the EU and a little more than 20% in third party countries. Furthermore, the industry is dealing with a market that mainly competes on price, making it difficult to compete on the issue of added value and to translate this into higher pricing.

In this report the following types of eggs are distinguished:

- cage eggs: eggs from cage housing according to the present legislation;
- enriched cages eggs: eggs from cage housing in larger cages and with larger groups of layers;
- barn eggs: eggs from aviaries and ground floor system;
- outdoor free-range eggs: eggs from free-range system, whereby there is the possibility to roam freely out-of-doors;
- organic eggs: eggs from a free-range system with the possibility to roam freely out-of-doors, whereby the chickens receive exclusively organic vegetable feed.

If the previously mentioned welfare measures for poultry are implemented in Europe, the question remains as to the possible consequences for the European egg production industry and in particular the Dutch egg production industry. Within the EU it has been agreed that from 2012 only farming in enriched cages will be permitted. This study will investigate the consequences for the European egg production industry and the Dutch egg production industry in particular. It will also investigate the consequences of a stricter welfare policy in the Netherlands for the Dutch egg production industry. These measures will in fact have the effect of raising cost prices, but the question is whether animal

welfare-friendly egg products are perceived as a product with added value by customers of the egg products industry and if they can therefore be sold at a higher price.

A possible solution for maintaining the competitive position is no longer the processing of domestic eggs in the Dutch egg products industry but eggs from the rest of the world. This leads to the question as to whether it would not be economically more cost-effective to re-house the egg products industry. In this study the central question will be 'How does the future appear for the Dutch egg products industry?' and possible competition improvement strategies will be presented.

Specific attention will thereby be given to the following questions:

1. Can the Netherlands egg products industry interest its consumers in animal welfare-friendly eggs through innovative trading?
2. Can it hold its competitive position if stricter regulations are enforced in the Netherlands than in the rest of Europe?
3. Can it hold its competitive position in Europe if stricter regulations are enforced than elsewhere in the world?
4. If the Dutch egg products industry has no future here, where can it go? Why there in particular?
5. Does the possible re-location of the egg products industry or a significant rise in cost price of egg products have consequences for the business headquarters of the food industry?

The answers to these questions naturally have an effect on the rest of the layer poultry chain. The consequences for these parties will only indicatively be made known.

*Objective*

This project was aimed at establishing the long-term perspective for the Dutch egg products industry in general and furthermore to establish the consequences of policy changes for these chain links and the links in the layer poultry chains.

*Approach*

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 Dutch 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 Dutch 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. The random sampling appeared such that when people predicted variations which are also recognisable and if they did not predict any variations, the other respondents in the same market segment would give a similar response. Niche markets were not considered in principle, unless they were niche markets that are generally recognised as markets with growth potential.

In order to avoid measurement errors and socially acceptable answers, the qualitative approach was supplemented by a conjoint module (see appendix 3) in the interview. Due to the qualitative character of the questionnaire, the results of the research in this report have not been extrapolated to the entire population.

The length of each interview varied from 1 hour to 3 hours. Meetings with the egg products industry were longer than the meetings with the buyers of egg products from the food industry.

Based on the results of the questionnaire, propositions were then formulated and tested at the Spring Meeting of the International Egg Commission in London in an international framework. On the basis of the list of participants a categorisation was made for the country of origin of the participants and the extent to which animal welfare is considered to be important: outside EU, Northern Europe, Central Europe and Southern Europe. Then 8 mixed discussion groups were randomly chosen, in which a minimum of 1 participant from every 4 participating groups took part. Although Switzerland is not a member of the EU it was included in the EU group Central Europe, because Switzerland has a similar welfare policy to the one which will be implemented in the EU. Every discussion group was asked to appoint a chairperson and a secretary, who would report all findings with regard to the propositions to all participants. The reporters were explicitly asked to indicate all possible variations to the group in this report.

*Random sampling character*

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 products producers. Most respondents were buyers/sellers of liquid egg products and in some cases also of powdered egg. When determining the random sampling, knowledge of the Union of Dutch Egg Products Producers was used.

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:

*Table 1.1 Respondents categorised by product groups*

| | Number of respondents | | Number of respondents |
|---|---|---|---|
| Bakery | 6 | Pastas | 2 |
| Sauces | 3 | Meat (products) | - |
| Liqueurs | - | Fish | - |
| Confectionery | - | Non-food products | - |
| Liquid soup | 1 | Catering | 1 |
| Dried soup | 1 | Ready made | 2 |
| Desserts and ice-cream | 1 | | |

It was not possible to find respondents in all product groups who were available to speak to us in the fieldwork period. The participants at the Spring meeting of The International Egg Commission can be typified in table 1.2.

*Table 1.2 Origins of the participants of the IEC congress*

| | Number of participants |
|---|---|
| Outside the EU (except Switzerland) | 14 |
| Northern Europe (Norway, Sweden, Finland, Denmark) | 16 |
| Central Europe (United Kingdom, the Netherlands, Germany, Austria and Switzerland) | 48 |
| Southern Europe (France, Spain, and Italy) | 13 |

On the basis of this typology of participants, 8 discussion groups were made of 11 or 12 participants, in which a minimum of 1 participant from each participating group was represented. The participants in the Spring Meeting from within the EU were principally egg products producers or other concerned parties of the egg products industry. Only 4 participants from within the EU were researchers or employees of (international) governmental bodies. The participants from outside the EU often deal with the whole chain right up to the consumer himself (production of grain, production of eggs, egg wholesale and possibly the egg products industry) or are concerned parties of these businesses.

The next chapter presents the most important results of the desk research, while subsequent chapters present the results of the interviews, followed by the results of the testing in London and the conclusions of the research.

# 2. Profile of the Dutch egg products industry

## 2.1 Structure of the sector

*General*

In the egg products industry eggs are broken whereby the shell is separated from the contents. This produces whole eggs or egg yolks and egg whites that are sold both in liquid and in powder form. As well as the standard products, liquid egg products or powders of whole eggs, egg yolks or egg whites, special substances may be obtained from eggs such as lysosime. Both liquid and powder products are delivered to the food industry pasteurised. Pasteurised liquid egg products generally have a shorter shelf life than (pasteurised) powdered egg. Depending on the specifications of the buyer, additives (such as preservatives, or anti-oxidants), sugar or salt can be added.

The egg products industry supplies in small-scale packaging, large-scale packaging or bulk to the food industry and/or processors. The buyers of bulk products are mainly industrial bakeries and manufacturers of sauces and pastries, but bulk egg products are also used in the production of meat products, liqueurs and soups, as well as for some non-food applications. The small-scale packaging is mainly sold to institutional users, caterers, restaurateurs and small bakeries. The next chapter will deal in more detail with the most important products and the most important buyers of egg products.

*Structure*

In the spring of 2002 there were 23 manufacturers of egg products in the Netherlands. In total, these manufacturers jointly process 172,000 tons eggs annually. This is equivalent to 2.74 billion eggs. The total Dutch egg production in 2000 was 10 billion eggs. After correction of the amounts of purchased products it appears that 24% of the Dutch egg production is processed by the Dutch egg products industry.

In recent years the structure in the egg products industry has been in a state of constant flux with countless mergers and takeovers. At present, apart from three large market parties (Weko Group, Cebeco Egg Group B.V. and the Van Beek group), there are a number of smaller processors. The three largest companies have a 74% share in the Dutch processing capacity. The six largest companies have a 92% share. The three largest companies distinguish themselves from some of the others by having both an egg retail trade and an egg products plant (and primary companies on contract). The excellent mutual cooperation thus created results in the efficient processing of the eggs delivered. In the Dutch egg products industry unsorted class A eggs in particular[1] are processed and only some companies process eggs from classes B and C for specific sales markets. In the

[1] Class A eggs are eggs from the eggs for consumption quality, class B and C eggs are dirty or slightly damaged eggs.

specifications laid down for the companies in the food industry for egg products, often only class A eggs with supplementary product specifications are permitted.

## 2.2 International trade

Of the total Dutch production, around 24% is provided to the egg products industry. The majority is handled by the packing stations/egg traders. The Dutch egg products industry provides 16% of their production to the national food industry and 84% (20% of the total Dutch egg production) abroad. From this it appears that the market abroad is very important for the egg products industry.

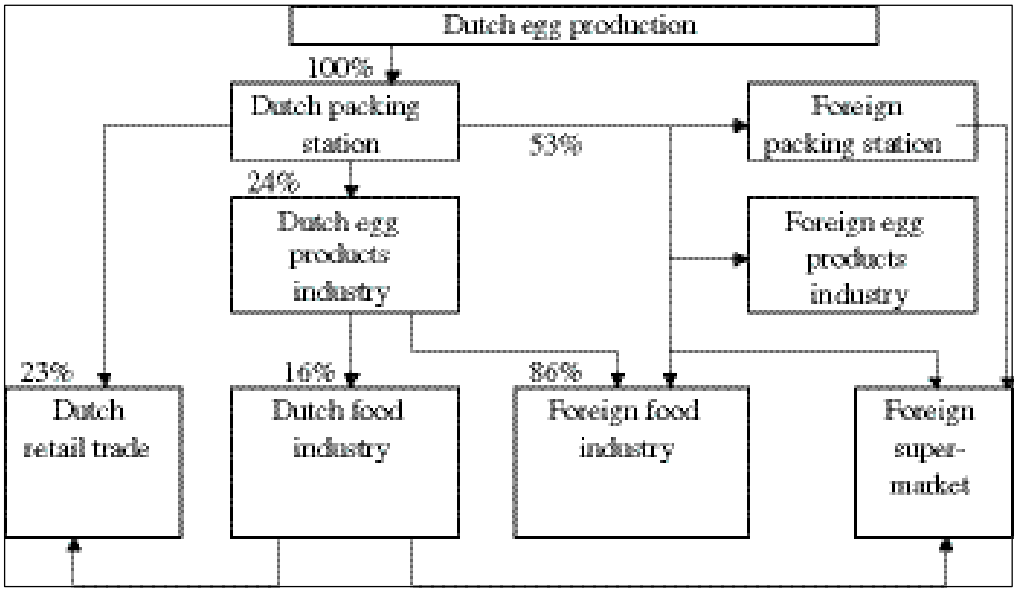


*Figure 2.1 Schematic overview of the Dutch egg chain (in numbers)*
Source: LEI/PVE.

Table 2.1 shows that the export of Dutch egg products mainly concerns exports to neighbouring countries within the EU: 71% of the exported amount and 58% of the value.

As appears from table 2.1, within the EU Germany, Belgium, Austria and the United Kingdom are the most important buyers of Dutch egg products. Outside the EU, Japan and Switzerland are of particular importance. What is noticeable in table 2.1 is that the Japanese 4% share in the amount is equivalent to 12% of the total value of the Dutch export; however the exports referred to here mainly relate to powdered egg white, for

which many more eggs per kilo are required in relation to the number required per kilo of fluid product[1] and therefore a relatively higher price is charged.

*Table 2.1 Export of egg products (total 61,200 tons) to destiny in the year 2000 in percentages*

| Destination | Volume | Value |
|---|---|---|
| *EU* | | |
| Germany | 51 | 37 |
| Belgium/Luxembourg | 12 | 9 |
| United Kingdom | 4 | 9 |
| Austria | 4 | 3 |
| *Outside of EU* | | |
| Switzerland | 9 | 9 |
| Japan | 4 | 12 |
| *Other countries* | 16 | 21 |

Source: PVE.

As indicated earlier the egg products can be divided into two main types: liquid egg products and powdered egg. In the statistics, frozen and cooked egg products are considered as fluid products, but for the Dutch egg products industry these are actually very small product groups. Table 2.2 provides an overview of the export per main type split up into divisions of products.

*Table 2.2 Export of egg products according to type (weight in tons and value * 1,000 euro) in 2000*

| | Weight (*1,000 kg) | Value (* 1,000 euro) |
|---|---|---|
| *Fluid/frozen/cooked* | 52,852 | 60,272 |
| Whole egg | 34,054 | 34,342 |
| Egg yolk | 13,461 | 22,577 |
| Egg white | 5,337 | 3,353 |
| *Dried* | 8,315 | 41,030 |
| Whole egg | 2,914 | 10,165 |
| Egg yolk | 914 | 3,298 |
| Egg white | 4,487 | 27,566 |
| Total | 61,167 | 101,301 |

Source: PVE.

[1] For 1 kg of fluid whole egg 1.18 kg eggs is necessary and for 1 kg dried whole egg product around 4.9 kg eggs are required. For 1 kg liquid egg yolk, 3 kg eggs are needed and for 1 kg dried egg yolk, 6.7 kg are needed. For 1 kg liquid egg white, 2 kg eggs are needed and for 1 kg dried egg white, 15.8 kg eggs.

Although the data in table 2.2 might seem to suggest that the powder market is not important for the Dutch egg sector, for the production of egg powder more eggs are required than for the production of fluid egg products. Furthermore, for the amount of powdered egg that is exported there are almost as many eggs needed as for the amount of liquid egg products that are exported.

Liquid egg products can only be sold competitively within Europe, within a radius of around 800 km from the production location, because the extra transport costs are otherwise too high. Cooked egg products also remain chiefly within Europe. Frozen egg products and powdered egg are sold throughout the world. If table 2.1 is combined with table 2.2, this is evident. The export of powdered egg is mostly destined for Asia, of which almost 30% goes to Japan. Dried egg white powder is particularly referred to here.

Within the EU the Netherlands is the largest exporter of egg products (in 1999 the Netherlands exported around 80% more egg products than Belgium and twice as much as France). As expected, the position of Belgium has only deteriorated since 1999. The position of France and Italy has improved in recent years and the export from Spain has also risen exponentially. With the current expansion of the layer poultry production capacity in Spain, it can be assumed that the competitive position of Spain will greatly improve in the near future. Thus, despite the current leading position of the Netherlands within the EU, this will soon be overtaken particularly by the southern countries.

Although the Netherlands is clearly a net exporter of egg products, it also imports egg products. Each year around 20 to 25% of the export amount of egg products (= around 15% of the Dutch production capacity) is imported in the Netherlands. Some of these imports are egg products which are sold on by the Dutch egg products industry, while some are foreign purchases by the Dutch food industry.

## 2.3 Indication of the cost price increase of Dutch egg products

On the basis of production of liquid whole eggs an indication can be given of the cost price increase of the processing of eggs into egg products in the Netherlands. The eggs supplied are broken, pasteurised and later stored as chilled liquid whole eggs. The total costs of this amount to an estimated 18 euro cent per kg of the end product. These costs relate to personnel, write-offs and maintenance of buildings and equipment, energy and water costs and other miscellaneous costs. The purchase price can be fixed at 0.73 euro cent per kg[1]. The cost price increase is given in table 2.3.

The purchase price of eggs is the most important cost allocation for egg products, with a share of 82.4% in the total costs (table 2.3). From this it appears that the competitive capacity of the Dutch egg products industry is largely based on the purchase price of eggs and that the egg products industry profits from a low purchase price for eggs. Given the hallmarks of the sales market (competing on price), an egg products manufacturer will try to achieve as low a cost price as is possible. In the table eggs market the rise in price, as a result of animal welfare improvements for example, can be better charged to the consumer on the market than the egg products market. For a packing station it is therefore much

[1] On average several years (= 73 euro cent)*85% advantage.

*Table 2.3 Cost price increase for the production of a kg of fluid whole egg (in euro cent)*

| | Absolute | Percentages |
|---|---|---|
| Egg purchase | 85.4 | 82.4 |
| Costs production process | | |
| - Personnel | 6.8 | 6.6 |
| - Building equipment | 5.9 | 5.7 |
| - Energy, water, waste | 2.3 | 2.2 |
| Other | 3.2 | 3.1 |
| - Total | 18.2 | |
| Cost price per kg fluid whole egg | 103.6 | 100 |

more economical to do business in the table eggs market, as potential extra costs can more rapidly be translated into higher prices.

In the egg production chains it is almost impossible to calculate added value as a result of animal welfare measures for three main reasons:

1. consumers do not immediately associate a processed product with animal husbandry and animal welfare;
2. food manufacturers often compete strongly with each other (on price issues) and must try to maintain shelf space as shelf space means visible prominence;
3. food manufacturers generally have (yearly) contracts with supermarkets and cannot be changed in the course of the year.

This shows that the cost price of eggs is very important to the egg products industry and that it is very profitable to purchase eggs which are cheaper than the cost price of the Dutch egg (inclusive of transport costs).

## 2.4 Production costs in the primary sector in the Netherlands in various scenarios

In this section the production cost of eggs is calculated in various scenarios. Firstly, the present cost level within the Netherlands and the US is compared. Thereafter the enriched cages, which the EU regulations stipulate in relation to animal welfare from 2012 onwards, will be compared with the cage system and the barn system. The Netherlands would like particularly, just as in Germany, to see the enriched cage forbidden and exclusively alternative holding systems allowed. For this reason the Netherlands is in the leading position regarding animal welfare. Both scenarios are comparable with the production costs in the cages to be used, such as those outside the EU that will still be used after 2012. The United States are an exponent of this. The following three welfare levels with the relevant cost price for eggs will be further discussed:

1. comparison with present cost level of NL and US;
2. basic level EU in 2012: cage, enriched cage and barn housing;
3. trendsetter Netherlands and Germany, floor level accommodation (free-range/aviary).

*Scenario I: Comparison of present cost level NL and US*

In 2000 production costs in the United States were almost 20% lower than in the Netherlands (see appendix 1). In this respect it is assumed for both countries that they adhere to the present cage accommodation. The difference in cost price can largely be explained by lower costs for feed and housing and the cost price of young hens. Contrary to this are slightly higher costs due to unfavourable technical result (less eggs per hen and more mortality). The United States have a structurally lower cost price in comparison to Europe. The lower transport price is mainly explained by the availability of large amounts of raw materials, such as corn and soy beans in the vicinity of poultry farms. In this respect the production takes place in efficient, large scale companies where the laying hens are kept in relatively simple, cheap poultry houses. Finally the Americans have advantages through the lack of environmental investments and welfare regulations. The present recommended standard for housing of hens in cages in the US is 350 $cm^2$ in contrast to 450 $cm^2$ (550 $m^2$ with effect from 1 January 2003) in Europe. At the moment there are indications that more attention will be paid to the welfare of layer poultry in the US, but any changes in the production guidelines will not bear any relationship to animal welfare guidelines in Europe. In short, the US will as expected have a cost price advantage in the long term in relation to Europe as a result of expected housing standards for poultry.

*Scenario II: Basic level EU in 2012: battery cage, enriched cages and barn housing*

In June 1999 the European Agricultural Council decided to exclusively implement the keeping of laying hens in the EU in so-called enriched cages or in alternative systems after a transition period. In the improved cage each hen has 750 $cm^2$ surface area, a perch, laying nest and litter according to its needs. The alternative system described in the EU guideline still most resembles the aviary system, such as we have been familiar with in the Netherlands for many years. In the aviary system every hen has 1,100 $cm^2$ surface living area, (part of) the surface area in the poultry house is strewn with litter and there are enough laying nests and perches for the animals. On the basis of the present practice two keeping methods can be outlined in 2012:

- enriched cages. Compared with the traditional cages the size of the groups has been enlarged, so that 8 to 10 hens can be kept per cage. The cage is equipped with a laying nest, perch and litter following EU standards.
- aviary/barn system. This system is based on floor level accommodation (comparable to free-range accommodation) whereby via different levels the hens can also utilize the vertical space in the poultry house. According to the new EU trade standards for eggs, from 1 January 2002 onwards, eggs produced in an aviary system may be sold as barn eggs.

For both systems mentioned above the following applies:

- the labour requirements and investment for house and equipment per hen rises in comparison to the present cage system;
- the technical results differ from the traditional battery cage mainly due to the greater feed consumption.

The costs of house and equiment for both holding systems are calculated on the basis of the current write off terms. The variable costs (electricity, litter, etc.) are also estimated for every system. Figure 3.1 gives the eventual increase in cost price per kg of eggs compared with the traditional battery cage accommodation in which the hens are kept according to the present EU standard of 450 $cm^2$ of space.

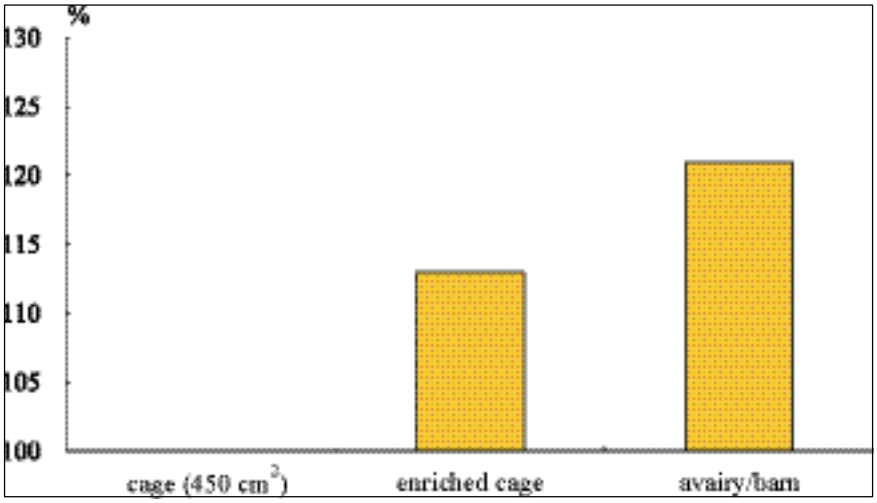


*Figure 2.2 Increase in percentage for improved cage and free-range accommodation in comparison with the traditional cage (=100%)*

Source: LEI.

In the improved cage the production costs in relation to the present battery cage accommodation (450 $cm^2$ per hen) are 13% higher and in the free-range system the production costs are 21% higher. This means that because of the market a bonus must be paid in order to compensate for the extra costs of the free-range system.

*Scenario III: Precursor position of the Netherlands and Germany*

From the results of the previous scenario it appears that if the Netherlands implements a precursor policy from 2012, the cost price of eggs in the Netherlands will be around 10% higher than the cost price in the rest of Europe. This is only attractive for the primary sector and the Dutch egg products industry if a higher price for these products can also be achieved on the market.

*Comparing production costs at three welfare levels*

On the basis of the preceding scenario results the following can be concluded in relation to the differences in cost prices on the European market. From 2012 the enriched cages are the basic level permitted in the EU, by which the minimum demands can be met in terms of the welfare of laying hens. If the Netherlands implements a welfare policy which goes

further than EU regulations and permits forms of exclusive alternatives for accommodation (free-range, outdoor free-range and organic) , then the cost price per egg in the Netherlands will be around 10% higher than in the rest of the EU. Outside the EU laying hens will still be kept in traditional cages in 2012. If the US cost price is taken as a starting point for this, the cost price per kg of eggs in the Netherlands will be 20% higher than in the US and in the EU 10% higher than in the US. The transport costs from the US to Europe are included here in the cost price of the US.[1]

## 2.5 Conclusion

Dutch manufacturers of egg products produce fluid egg products that are mainly sold within the EU and powdered egg that is mainly sold on the world market. Within the EU they mainly compete in the fluid egg products market with European suppliers, while on the world market, as well as European competitors, competitors from other parts of the world are also active. On the world market for powdered egg, the United States in particular is very active and competitive.

Dutch suppliers have difficulty in competing with US suppliers on the powdered egg market with regard to production costs. This can mainly be attributed to the lower cost price in the US:

- fewer environmental and animal welfare regulations;
- cheaper housing;
- cheaper poultry feed;
- large-scale operational management.

In the future this difference in cost price will only be even greater here in Europe when the improved cage becomes statutory. The expectation is that welfare regulations in the US will also be announced, but as yet these are below the present standards for cages in Europe. If a stricter welfare policy is enforced in the Netherlands, the cost price differences with the US will only increase.

Although the Netherlands is the largest exporter of egg products in Europe, other countries such as Spain, Italy and France have been gaining ground in recent years. If no battery cage system of accommodation is allowed in the Netherlands, the cheapest product variant of Dutch land will be 20% more expensive than the present cage accommodation and around 10% more expensive than the price on the European market. The next chapter will further study the force field in the egg products market and particular attention will be given to opportunities to achieve added value for alternative egg products.

[1] Lower cost price -20%, EU +15% and transport costs 25% = 20+15-25= 10% difference.

# 3. The market for Dutch egg products

Manufacturers of egg products, given the analysis and conclusions in chapter 2, must be able to compete with fluid egg products with other European producers and with powdered eggs with producers throughout the world. Egg products are principally sold in the food industry. Furthermore, a portion is also sold via the retail trade channel to bakeries, institutional users, caterers and the pharmaceutical industry. Only a small part of the total Dutch production is sold to the non-food industry. Within egg products two main groups of products can be defined: fluid egg products and powdered egg. Furthermore, fluid egg products are also frozen but this is rarely required in the EU.

## 3.1 Most important buyers

Each product group has a specific market. In the table below the most important buyers of various egg products and the products they purchase described.

*Table 3.1 The most important buyers of various types of egg products*

| Application | Liquid egg products | | | Powdered egg | | |
|---|---|---|---|---|---|---|
| | whole egg | egg yolk | egg white | whole egg | egg yolk | egg white |
| Bakeries | X | X | X | X | X | X |
| Cake mixes etc. | | | | X | X | X |
| Sauces | X | X | | X | X | |
| Liqueurs | X | X | | | | |
| Fluid soup | X | X | | | | |
| Dried soup | | | | X | X | |
| Desserts and ice creams | X | X | X | X | X | X |
| Sweets | X | X | | X | X | |
| Pastas | X | X | X | X | X | |
| Meat (products) | X | X | X | X | X | X |
| Fish | | | X | | | X |
| Non-food | | X | X | | | |
| Catering | X | X | X | | | |

On the basis of the table it seems that fluid egg products and powdered egg can be entirely substituted, but they are in fact separate markets. From table 3.1 it appears that for most applications both powdered eggs and fluid egg products can be used. The respondents indicate that fluid egg products are always preferable for fluid applications (such as sauces

and baker's dough). From the products list it seems also that egg products are particularly used as raw materials for product groups, in which multinationals are the leaders. This means that the egg products industry can count as its clients large companies or even multinationals, which sell on the world market or are at least oriented towards the world market. It still appears that multinationals buy regional egg products. Generally this applies to fluid egg products, which must of necessity be kept cool as they have a limited shelf life and must be kept refrigerated during transport and are relatively bulky to transport.

The possible preference for one of the two main types in the food industry is mostly determined by the price and performance of both types of products. Furthermore, the costs of changeovers in the automated production processes also play a role. These sometimes seem so high that there is a certain threshold value for the substitution of fluid egg products with powdered egg. The emulsifying properties of fluid egg yolk are better, for example, than the emulsifying properties of powdered egg. For this reason a lot of fluid egg yolk is applied in the sauce production industry. If the price of powders and sauces are going to vary so much that the changeover costs can be earned back by means of a lower purchase price, this can be the deciding factor for the other product type. In the pasta industry examples are known where this has already happened; where a European fluid product had been used, a cheaper American powder has now replaced it.

As well as supplying to the food industry, egg products are also supplied to large retail outlets for bakeries and (retail trade companies for) caterers. What is mainly referred to here is small packaging as opposed to the bulk supplies to the food industry. The strategy of the egg products industry on these 'business-to-business' markets is not distinguishable from the strategy on the bulk markets; on both markets a cost price minimisation strategy is implemented. In the wholesale trade segment for the bakery system this is mainly attributable to the extensive mutual competition, to the decline in the number of bakeries in the Netherlands, but also in the catering market in the food industry mutual competition has led to keen purchasing practices.

What is remarkable is that the Dutch egg products industry does not operate in the consumer market, whereas this is the case in the United States. This applies in particular to small packaging of pasteurised products viewed as a food safe product. Attempts to introduce consumer packages with pasteurised egg products to the consumer market within the EU, have failed up to the present time. In short, the Dutch egg products industry implements a cost price minimisation strategy on the business market.

## 3.2 The purchasing policy and sales strategy

The buyers indicate that the egg products purchase is distinguished from the purchase of other products in that the price fluctuates greatly throughout the year and from one year to another. This makes it necessary to have a purchasing policy, but this is not always easy. They refer to the cycles of high prices before Christmas and also before Easter, but some also indicate that they are monitoring the deposit figures in Europe. In general the buyers interviewed choose for contractual agreements with the egg products manufacturer. The duration of these contracts varies from three months to a year. In the contracts a minimum purchase amount is often established for the total duration or part of the duration. While

the buyers in general give preference to a fixed purchase price, they almost all worry about a competitive disadvantage resulting from changing over to long-term contracts while competitors will not do this and the egg prices will fall.

While in the eggs for consumption market there is little price elasticity, the question remains whether the fluid egg products will remain flexibly priced around the average market price. If a producer asks a significantly higher price than the average market price it can even lead to a break in an existing relationship, so that he will not be asked again in a further quotation round. The demand for powdered egg is even more flexible than the demand for fluid egg products as powdered egg can be purchased and traded at world market level partly due to their longer shelf life. This means that the Dutch powdered egg manufacturers must compete with suppliers from countries such as the United States, India and others, where the cost price of eggs and egg products is considerably lower than in the Netherlands. It is increasingly difficult to be competitive in this market, for one reason because the European export subsidies continue to be reduced. Through this price flexibility in their market, the manufacturers of egg products are forced to purchase price consciously. It is even now very difficult for European manufacturers of egg products to sell powdered egg on the European market, because large consignments of powdered egg from the US is being sold on the European market now that the WTO regulations are relaxed for egg products. In real terms this means that the import duties are lowered as a result of agreements in the trade agreement, while no conditions are stipulated regarding the production methods. If welfare regulations are then implemented within Europe that work in an even more cost-increasing manner, while products that do not fulfil the legal requirements may, in fact, be imported, the competitive position of the European producers on the European market will decrease.

As well as legal demands, buyers of egg products in general also often define specifications with which the desired egg product must comply. These specifications have changed considerably through the years. Whereas the first tendency was to put the emphasis on microbiological demands, as the years go by issues such as residue regulations, traceability demands and quality demands for the eggs used have been added. In short, buyers in the egg products industry want to be sure that they get good quality raw materials so that they can ensure a constant level of product quality and (even more important) in possible disasters they have the possibility to recover their mortality in the egg products industry.

A buyer lets a few manufacturers of egg products make a quotation and only egg product manufacturers who indicate that they fulfil the required specifications are audited. The buyers also indicate that they always make their choice from the same small group of potential suppliers. However this does not mean for an egg product manufacturer that he can supply all year round. A purchasing contract is agreed with the egg product manufacturer who makes the most attractive offer and can fulfil the required specifications. The contracts are mostly for a few months or for a year. It may be the case that some manufacturers of egg products can supply for one part of the year but not for the other. The competition between manufacturers of egg products to secure contracts with large suppliers is cutthroat because supply and demand in the egg products market is not in balance; in the case of over capacity some producers even make offers under the cost price.

The buyers on the other hand are kept informed of the supply and demand positions within the potential supply areas and use this information to their advantage.

In the fluid egg product market in Europe there is intense product competition among manufacturers of egg products [1]. There is little risk of generic competition[2] in the field of powdered egg or other substitutes due to high changeover costs in the production process of the food industry and the still relatively small price difference. The interviewed buyers rarely anticipate an increase in the generic competition for fluid egg products in the next 10 years as a result of high changeover costs. Experience has shown that if the price differences increase too much and a comparable quality can be achieved through technical innovations, substitution should certainly not be ruled out.

### 3.3 Other characteristics of the egg products market

The relationships between buyer and supplier of egg products have been cemented over the years. There is an indication that buyers from the food industry take advantage of the price competition between suppliers. There is very rarely any sense of a bond with or loyalty to a local supplier and co-makership is not an issue. Some manufacturers of egg products make a specific product on behalf of and in conjunction with a specific client, but the buyers indicate that these are products that can be made by anyone if requested. Real specialities are almost non-existent on the egg products market.

For Dutch buyers the country of origin of the egg products plays almost no role at all. In the case of disasters, such as the dioxin crisis in Belgium, they do not buy any Belgian product or only if it is guaranteed dioxin-free, but beyond this it has no influence. The buyers who buy in the Netherlands assume that the Dutch product is better and more profitable than the foreign product. A few Dutch buyers also buy abroad and are very satisfied. Dutch buyers often maintain that various producers have good and bad properties; it is therefore highly unlikely whether this is dependent on or determined by the country in which the supplier or producer operates but is principally dependent on or determined by the hallmarks of the supplier or producer themselves.

The German respondents see this differently; in Germany the country of origin plays a greater role. The German consumer recognises added value in a product if it is only or principally comprised of German raw materials (in this case egg products). As a result it is beneficial for a German food manufacturer to also buy German raw materials. The Dutch product is a good second choice according to the Germans. In this research Germans claim to find it easier to do business with the Dutch than with the French. They indicate, however, that each country has its good and bad producers and that they make a first selection of these.

The country of origin of the eggs (of which the egg products will be made) plays a minor role in both the Netherlands and Germany. The price of the egg (product) and the manufacturer that makes it is more important than the origins of the egg. Only in disasters

[1] Product competition = competition from producers who make the same product.
[2] Generic competition = competition from producers who make another product, but which can and will be used for the same application.

are such eggs important and included in the specifications. Once they appear in the specifications, they cannot just be dismissed.

What is interesting is that the country of origin of both egg products and eggs does appear to be of importance to the egg products industry. This is most probably due to the fact that it buys its eggs from all over the world and is able to define the differences in quality per country. If one were to ask the buyers about the country of origin of the eggs they buy, this is mostly unknown. They often have an indication in the specifications where the eggs may not come from. They expect that more attention will be given to this in the future, because traceability right back to the raw materials for livestock feed will be increasingly important, given the attention to food safety and zoonoses.

The buyers expect that traceability right back to the origins of the raw materials of the livestock feed will certainly take shape in the next 10 years. Country of origin will then play less of a role than the geographical origin of the egg products manufacturer and all that accompanies this. The buyers expect that the manufacturers of egg products in Western Europe will produce somewhere. It is therefore not at all important where they will produce, as long as the production is organised by someone who understands the business. The buyers of the German foodstuffs and those interviewed from the Dutch egg products industry place relatively more value on the country of origin and expect that this will play more of a role in 2012, than the Dutch buyers. For German buyers it is not only important where the product comes from, but it is even more important what kind of cultural background the egg products manufacturer has. If this is a well-known German or Dutch producer, this is valued more than if it concerns another nationality.

Another interesting point is that the German buyers indicate that they expect to purchase their products from Eastern Europe in the future, while the Dutch buyers expect to continue to buy in the Netherlands or in Southern Europe. Eastern Europe is rarely mentioned by Dutch buyers of egg products, but is referred to by the Dutch egg products industry. The US and Canada will also be seen as important suppliers in ten years from now by the egg products industry, while buyers of fluid egg products are not aware of this. The buyers of egg products interviewed are ambivalent in their views in relation to the US and Canada; is the product indeed comparable with what we are accustomed to here in Europe?

## 3.4 Conclusion

In short, the egg products market is a market with over capacity in which supply exceeds demand and manufacturers of egg products compete at price level for the benefit of the client. Within the egg products market there are two main types of egg products: the fluid egg products and powdered egg. The fluid egg products are mainly sold regionally (in other words within a radius of around 800 kilometres) while egg products are sold worldwide. In the fluid egg products market, a distinction can be made on the bulk market and in the market for pre-packaged small packaging. In both sections a cost minimalising strategy is implemented by the manufacturers of egg products, whereby the country of origin 'The Netherlands' has no added value. Only on the German market has the home product any added value, but only when there is no question of large price differences with

foreign products. In the next chapter further attention will be given to the purchasing factors for buyers of egg products.

# 4. The important purchasing factors for buyers of egg products

## 4.1 Introduction

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 in the Netherlands appears to have almost no influence on purchase, but it is mentioned in Germany (see also chapter 3). 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 (see appendix 3). 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. Three price levels have been defined in this manner: the world price (= the price of an egg from a normal battery cage), 10% higher than the world market price (= the price of improved cage eggs) and 20% higher than the world market price (= the price of barn eggs). In this way, per purchasing factor three (consciously chosen) different values can be distinguished, which have in principle a different priority and a different value for the respondents. Figure 4.1 shows the various critical factors and the accompanying values which can be assumed within the quantitative testing.

| Factors | Values |
|---|---|
| Price | World market price |
| | 10% higher than world market price |
| | 20% higher than world market price |
| Microbiological properties | Germ and residue-free |
| | Almost germ and residue-free |
| | No germ and residue information |
| Manufacturer | Traditional |
| | Innovative |
| | Neither traditional nor innovative |
| System in which hens are kept | Free-range system |
| | Battery cage system |
| | Outdoor free-range |
| Country of origin of the eggs | The Netherlands |
| | Southern Europe |
| | World |

*Figure 4.1 Factors and values as they vary in this research*

Based on the various values that the purchasing factors can assume, theoretical profiles of consignments of egg products can be composed. An example of a profile is as follows:

*A consignment of egg products from Dutch barn eggs from a traditional egg product manufacturer.*
*Almost germ and residue-free.*
*Price: 20% higher than the world market price.*

Furthermore 16 profiles have been developed and presented to 15 respondents. The respondents were asked to grade the 16 different consignments of egg products that were presented to them on the basis of the 16 profiles, on a scale from 0 to 10. In this respect, a value of 0 can be given to a totally unattractive consignment while a very attractive consignment can be graded with a 10. The buyers of egg products were asked to grade the consignments of egg products as if they were being offered them themselves. Those questioned from the egg products industry were asked to imagine that they were the clients and to indicate how their clients would grade the various consignments of egg products.

Based on the answers from those questioned the preferences for various purchasing factors can subsequently be traced back, making it possible to test the answers to the open question regarding purchasing factors against dependable and socially acceptable answers. By this means it was possible to analyse the purchasing behaviour of buyers, thereby acquiring better insight into the competitive position of the Dutch egg products industry. To trace the partial preferences from the estimated profiles, the conjoint analysis research method was used. In appendix 3 a further specification is worked out from the methodology employed (conjoint analysis). The results are described in the next section.

## 4.2 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. Firstly a total picture was sketched of all respondents after which the results were itemised for the various participating groups. A distinction was made between the Dutch egg products industry, the buyers of egg products in the Netherlands and the buyers in Germany.

From the total overview (figure 4.2) 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.

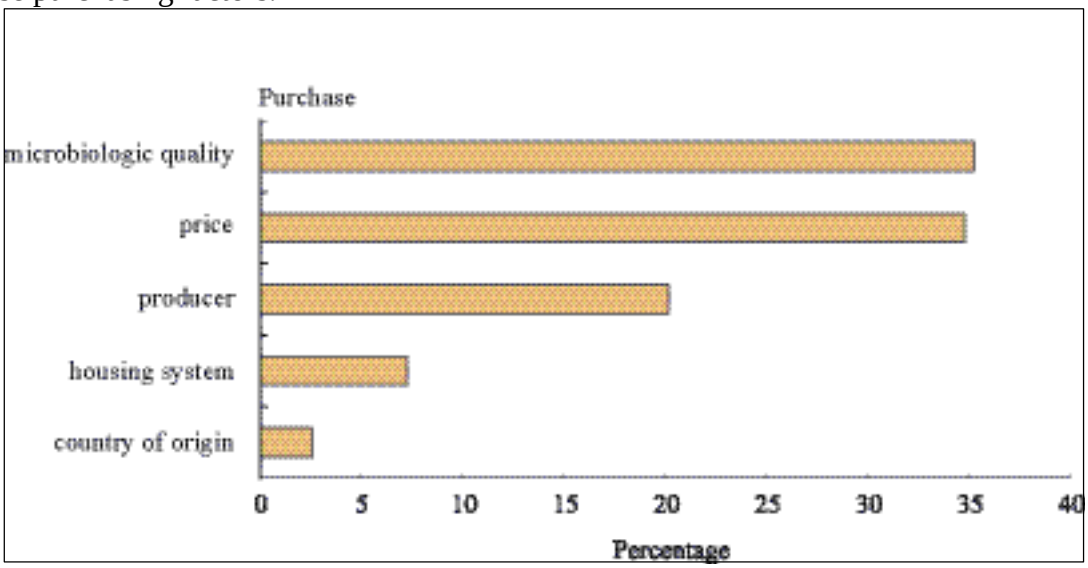


*Figure 4.2 The relative importance of the various purchasing factors*

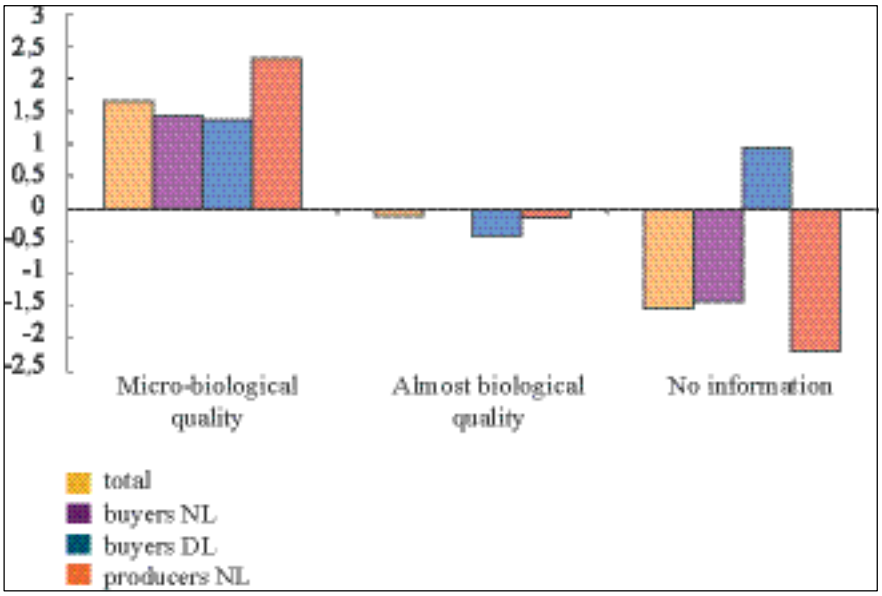


*Figure 4.3a The relative importance of the various values within the price factor*

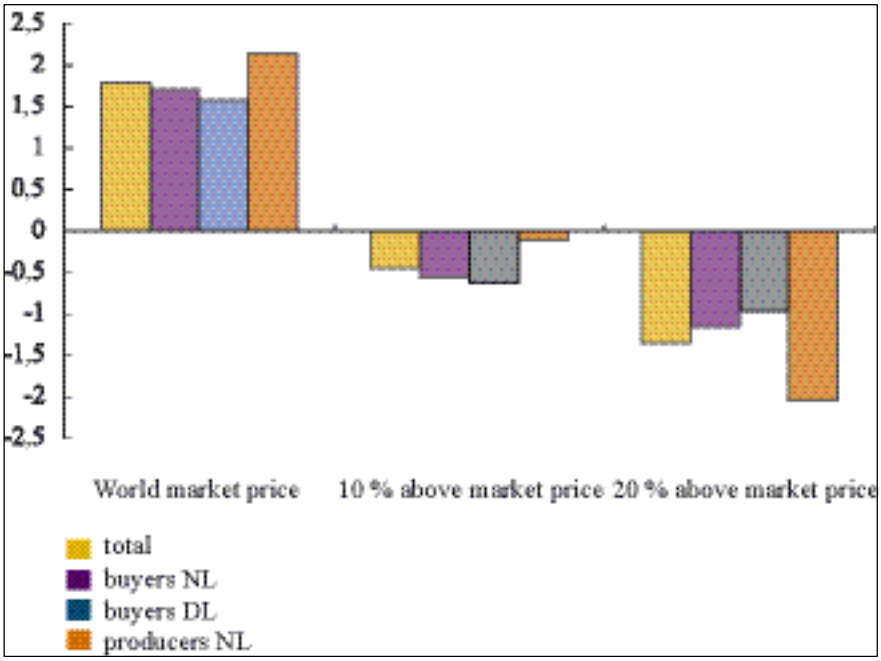


*Figure 4.3b The relative importance of the various values within the microbiological properties factor*

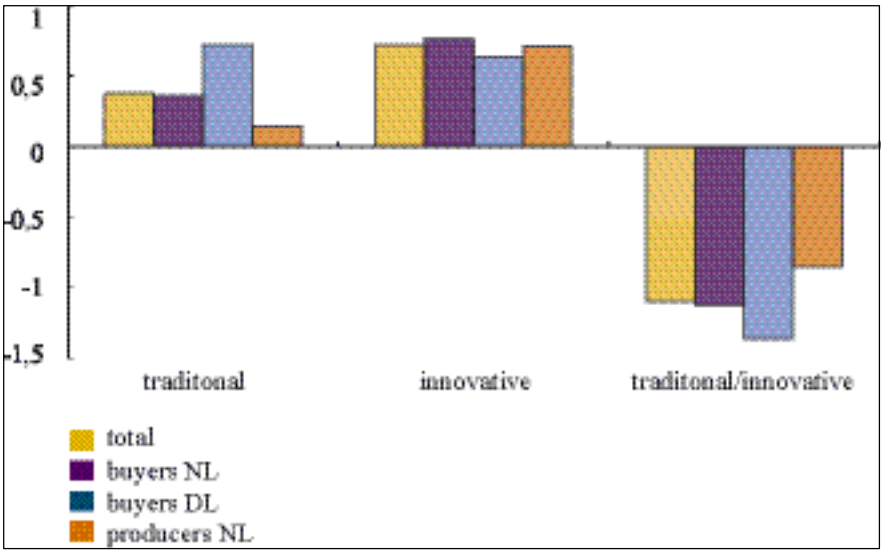


*Figure 4.3c The relative importance of the various values within the manufacturer factor*

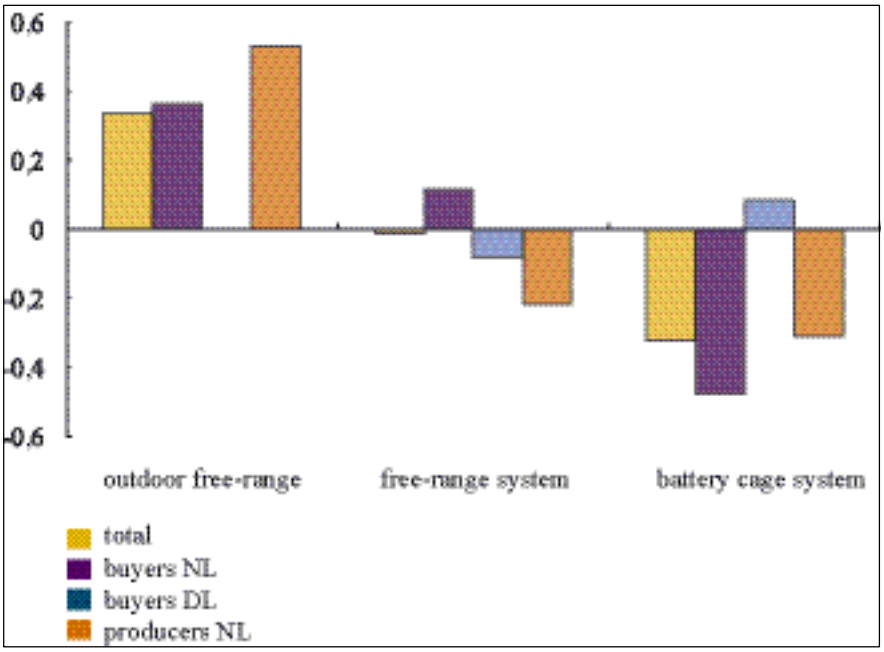


*Figure 4.3d The relative importance of the various values within the factor relating to the system in which hens are kept*

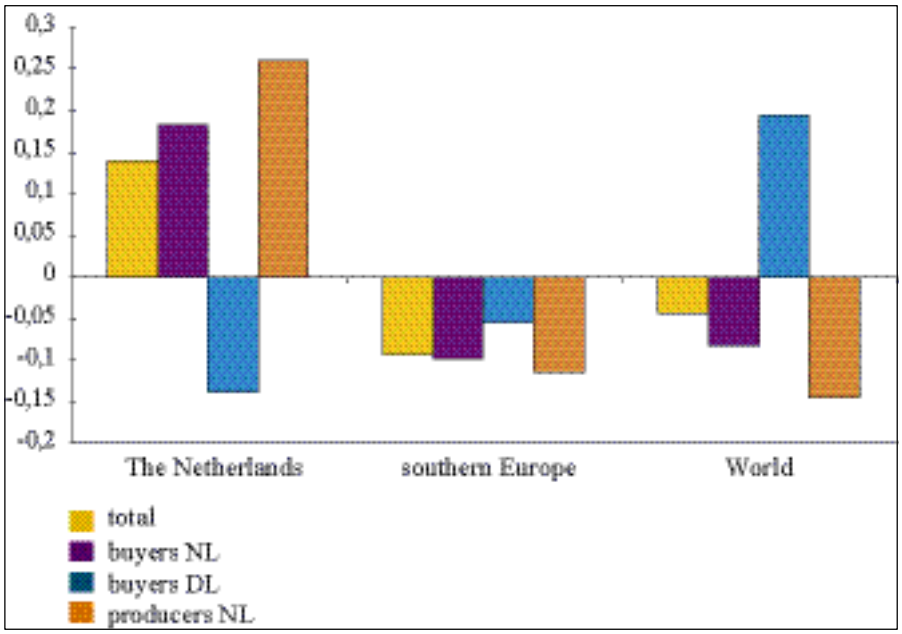


*Figure 4.3e The relative importance of the various values within the country of origin of eggs factor*

Besides the importance of the various purchasing factors, for each of the three values which can assume the factors, it was investigated whether they would be seen as attractive or indeed unattractive (see figure 4.3).

As expected from the three possible values at *microbiological level* the germ and residue-free consignment of egg products was generally found to be the most attractive, followed by the consignment that was almost germ and residue-free. The consignment in which germ and residue information is missing was the least attractive. However it was also strange that this did not apply to 4 of the 15 respondents. For these respondents it was evident that in their evaluation they probably found these relatively unimportant in relation to one or more other purchasing factors.

Regarding *the price*, likewise according to expectations, the lowest price was the most appreciated and the highest the least.

Regarding *innovation*, the individuality of manufacturers of egg products was found to be the most attractive. Egg products from innovative manufacturers were considered somewhat more attractive than traditional manufacturers. Products from neither innovative nor traditional manufacturers were not considered attractive.

Regarding the *housing system*, this was scored according to economic values; egg products from eggs from the outdoor free-range systems were more desirable than eggs originating from free-range systems, and these in turn were also found to be more desirable than eggs originating from the battery cage systems. At individual level opinions differed enormously regarding the various housing systems. The importance of this factor was also limited; therefore the question is whether respondents paid much attention to this factor.

In addition, *egg products from the Netherlands* were more highly valued than egg products originating from Southern Europe and the rest of the world. From the last two

categories the scores for egg products from Southern European countries were lower than egg products from the rest of the world. However, here too it must be noted that opinions were very divided. For this factor it also applies that the importance given to it by respondents appeared to be very limited.

If the buyers of egg products from the Netherlands were examined separately, it would appear that the general impression of this group corresponds with the total impression of all of the respondents. The percentages differed from the total impression by a few percent at the most. At individual level there was some variation in terms of accent. One was more outspoken and indicated that a certain factor was of great importance while others did not have any clear preference for one particular factor. In short, the total impression as reported in the previous section corresponded with the answers of the Dutch buyers of egg products.

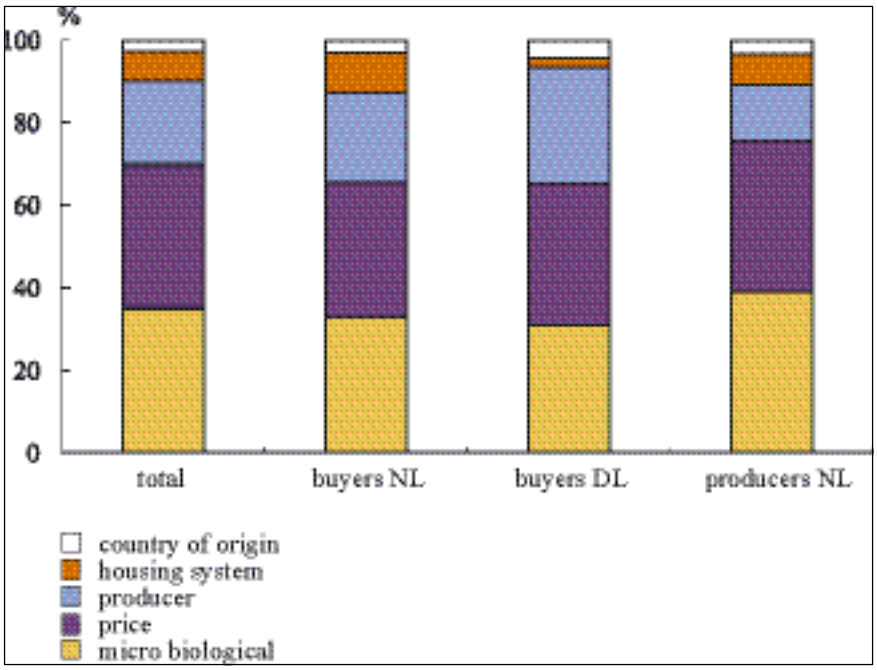


*Figure 4.4 The relative importance of the various purchasing factors reported per group*

The preferences of the German buyers of egg products corresponded reasonably to preferences in general. What was interesting is that egg products from eggs from battery cage housing were found to be more desirable to German buyers than egg products from eggs originating from the outdoor free-range system. The price of egg products from outdoor free-range eggs was more than 20% more expensive than the world market price. The free-range system was the least preferred system on the part of the Germans. It was also noticeable that German buyers placed less importance on the accommodation system than on the country of origin. This also corresponded with the answers to the open question regarding purchasing factors, as the German buyers had already indicated in this case that

they preferred German egg products to egg products from other countries. Another notable result was that they gave priority to eggs from outside the EU above eggs from Southern European and Dutch origin. This remarkable result can be explained by the fact that eggs from German origin are not included in the profiles and eggs from outside the EU have been interpreted as Eastern European eggs. In the explanation of their scores they indicated that they were already orienting towards the supply in these countries with an eye to the future and that they assumed that they were egg products from a Western egg products manufacturer. Because the group was relatively small, the score of even one of the respondents who attributed little importance to microbiological properties of egg products can considerably influence the average result of various values.

The scores of the Dutch egg products industry appeared to deviate from the total impression, but the order of merit showing the importance of the various purchasing factors is, however, comparable. Microbiological properties were found to be relatively more important by the Dutch egg products industry, with a percentage of around 39%, than by the buyers. What was notable was that two out of four egg products producers almost exactly conformed to the average preference of buyers of egg products in their answers. The other two concentrated in their answers on one particular purchasing factor; for one this was the price and for the other it was the microbiological properties that the egg products must fulfil. Furthermore, Dutch manufacturers of egg products seemed to find the supply from Southern Europe (after the Netherlands) more attractive than the supply from countries outside the EU, while this was judged to be quite the opposite in the total random sample.

## 4.3 Importance of the correct price-fixing

The price appeared to be one of the most important purchasing factors, if not the most important. From the open questions in the research it appeared that manufacturers of egg products must make an offer within a particular price range around the average market price in order to remain on the potential supplier list.

If one looks at the impact of the various price levels on the total assessment of the profiles in the conjoint measurement, it appears that a price rise of 10% in relation to the world market price brings with it a greater difference in the total assessment than the rise in the price from 10 to 20% above the world market price. This means that an extra price rise of 10% above the world market price to 20% above the world market price reduces the desirability of the product further, but relatively less than the first price rise. This can be explained in a number of ways:

1. a price rise of 10% is seen as a substantial increase by the respondents and consequently as establishing the competitors;
2. they assume that there is always a cheaper substitute available for the various profiles and therefore give preference to that cheaper substitute;
3. they calculate on the basis of the present market situation of a greater supply than demand in the egg products market, by which manufacturers are inclined to make an offer below the cost price in the case of over-capacity and by means of negotiation, can always reach a more satisfactory price than the enriched cages price.

From the answers it is clear that when an egg product is offered at the world market price and is seen as desirable, the same product is somewhat less attractive if the price is 10% higher. The importance of price as purchasing factor is here clearly emphasised.

Another noticeable aspect is that the buyers of egg products scored a greater decline in value within the first 10% price rise and the 10% rise on top of this than the respondents from the egg products industry. They saw less difference between the first 10% and the second 10% price increase. As price-fixer they naturally occupied a different position.

## 4.4 The purchasing factors of the future

As well as the present purchasing factors, those of 2012 were also discussed with the respondents. From the answers to the question it appeared that the buyers expected that traceability as far as livestock feed ingredients would become more important in the next 10 years, as well as the purchasing factors that already play a role. Respondents from the egg products industry in particular explicitly cited this purchasing factor. The buyers expected that this would be an important purchasing factor, but when asked indicated that this would occur much sooner. Some buyers expected that this purchasing factor would determine purchase in 2012. Food safety, country of origin, flexibility and innovation of the suppliers are also themes that will become more important in the future.

On the basis of these answers it is clear that the present purchasing demands will be further highlighted, but that no change in the purchasing policy of buyers of egg products is to be expected in the next 10 years. It is clear that the animal welfare purchasing factor will not be an important factor in the purchase of egg products. Therefore it can be expected that the relative importance of price and microbiological characteristics will remain and will only be further highlighted. This is also the experience from the egg products industry.

## 4.5 Conclusion

The results clearly showed that the buyers place much importance on the price and that a cost price minimisation strategy, only possible by means of better microbiological results, can be converted into a diversification strategy. In practice, highlighted requirements and product improvements, given the relationships between supply and demand, are converted by buyers into a 'licence to deliver' instead of a sustainable diversified product. This means that diversification alone can be profitable and sustainable if it can be patented or protected in another way. Experience shows that it is very difficult.

The buyers expected that traceability in the future would become increasingly important. For the egg products industry this is an opportunity to be grasped in the form of stricter welfare measures in Europe or in the Netherlands. If this is indeed achieved it can be established which egg products are purchased and preferred by which food companies. In fact better traceability in terms of separate laws can be applied as a moral control mechanism, by which it can be established which companies buy truly sustainable, animal-friendly and morally acceptable raw materials. The consumer must then be prepared to pay

more for these sustainable raw materials if retailers are prepared to only stock products processed from sustainable raw materials.

The fact remains that if the Netherlands wishes to implement a stricter welfare policy for poultry than in the rest of the EU, the cost price of Dutch eggs will then be around 20% higher than the cheapest alternative on the world market (eggs from the US), which are produced under less animal-friendly conditions. The food industry and the retail trade do not expect that these political developments will translate into a change in demand. For this reason a number of development scenarios were explicitly explained to the respondents. The results are presented in the next chapter.

# 5. The competitive power of Dutch egg products in various future scenarios

In the last section of the questionnaire the respondents were asked to respond to various future scenarios with various levels of animal welfare developments. In answering the questions it was clear that the Dutch buyers of egg products did not all have an impression of the reality content of the various scenarios, while the German buyers immediately associated the scenarios with the presently applicable laws. Furthermore, the German buyers had a much more outspoken opinion about the various scenarios and gave the impression that they had also investigated alternative suppliers and supplying countries, as a result of the German cabinet plans.

Per scenario the respondents were asked if they would still buy egg products in Netherlands (and in Germany for the German respondents), if it was important whether these egg products were made from Dutch (or German) eggs, what consequences this has for the egg products industry in the Netherlands (and Germany) and if this has repercussions for the company for which the respondent is working.

## 5.1 Scenario I: The Netherlands follows European law

The respondents were presented with the following scenario:

> The Netherlands will join the European legal system for keeping poultry within the next 10 years; the present battery system will be banned, but the enriched cages are allowed. In so far as an EU-plus policy is implemented in the Netherlands, this has no cost price increasing effect worth mentioning. In short, the cost price relationships within the EU will remain the same as they are at present.

This scenario has a cost price increasing effect of 10% in relation to the present poultry keeping system, but within Europe the cost price relationships remain the same. A small group of respondents realised this immediately and felt that this was a considerable price rise and expected to have to partly buy outside the EU. The vast majority immediately referred to the behaviour of the competition; if competitors are buying from a certain source, you must do the same.

However, the vast majority suspected that the European market relationships would remain as they are and that fluid egg products in the EU made from European eggs can continue to be bought and used. Almost all respondents indicated that they only competed with European competitors on their market and also mainly sold their products on the European market, whereby no economic inequalities should exist and the moral obligation to purchase European products can be maintained at a high level. If competitors begin to deviate from this it will have consequences for the whole European market.

Powdered egg is now bought outside the EU, therefore it is expected that in this scenario they will increasingly be imported only from outside the EU. A cost price increase of 10% for (the raw materials of) powdered egg is, according to respondents, impossible to

compensate elsewhere. The industry in particular dreads this scenario, but expects nevertheless that there is a future for the fluid products market with this scenario.

The respondents suspected that this scenario would have consequences for the European egg products industry. The egg products industry has in the past indicated during periods of high prices on the EU market that eggs can be imported from elsewhere and that these can then be sold cheaply. It is suspected in this scenario that Western European companies buy eggs in Eastern and Southern Europe.

For the food manufacturers and retail trade this scenario has absolutely no consequences. They can still buy egg products within the normal transport range.

## 5.2 Scenario II: Dutch and German stricter welfare policy

The following scenario was presented:

> The Dutch and German authorities have banned cage housing unilaterally. The other countries surrounding them do not follow their example; the enriched cages is permitted there. As a result the market price of eggs in the Netherlands is 5 to 10% higher than the EU market price and 20% higher than the world market price. The Dutch egg products industry buys eggs not only from the Netherlands, but also from other countries. You can therefore buy egg products both from (improved) battery cage housing as well as from alternative housing systems from Dutch manufacturers of egg products.

The percentages price increases cause people to think seriously. A fixed price of 20% higher than the world market price is indeed a lot and 10% more than the EU is also impossible. Most companies in our random sampling compete with competitors from other European countries in the European market (and some on the world market) and see their competitive position considerably reduced in this scenario.

The majority still buy Dutch egg products, but no longer from Dutch eggs, because they are presumed to be much too expensive. Many buyers have doubts as to whether the transporting of eggs to the Netherlands, breaking them here and then selling them, is the most cost price efficient approach. Would it not be much cheaper for an egg products manufacturing company to transfer to an area where the eggs are cheaper and consequently export the egg product to the Netherlands/Germany. Only if competitors process Dutch eggs or retailers specifically ask for them are they prepared to buy an end product with Dutch eggs. It is probable that this refers to niche markets and that the bulk is still made from cage eggs.

The German buyers in this scenario are particularly concerned about a shortage of eggs. The German market is now not self sufficient and, according to the German buyers in this scenario, will no longer be able to be self sufficient for the following reasons:

1. there seems to be no market for animal friendly processed products;
2. in this scenario more space is needed for poultry pens and outdoor free-range areas, which is probably not available in Germany.

The German respondents expected in this scenario an unequivocal transfer to Eastern Europe. The buyers thus predicted that this would have major consequences for the egg products industry in the Netherlands. They suspected that the present producers would

reduce production capacity on a massive scale and would transfer to Eastern or Southern Europe. The Dutch buyers expected more of a move towards the south, while the German buyers expected more a move towards the east. What is notable is that those interviewed from the Dutch egg products industry saw this scenario less pessimistically than the buyers of egg products; they expected to still be able to compete by buying eggs from outside the EU or Southern Europe and to process them here into fluid egg products and powdered egg. They indicated this was not the solution for everyone, but they expected in this scenario to continue to be able to supply competitively. They also indicated that Dutch producers would no longer be able to focus on the absolute bottom of the market. However for a Dutch manufacturer, this was not an interesting segment because the cost price here was always higher than in low-income countries for example.

Because the buyers expected that the egg products producers would transfer to countries where the eggs could be produced more cheaply, they did not expect this to have major consequences for their purchasing policy. They assumed that they would be able to do business with the same business partners with whom they are now doing business. It was not important to most buyers where the production plants were located or the origin of the eggs as long as they were processed with reliable technology, a reliable production system and under Western standards. Country of origin was also of no importance to the buyers; as long as there was a Dutchman, German, or Frenchman in charge everything would be fine. They know what they are doing, which would also be the case if they were in Spain or Poland.

## 5.3 Scenario III: Dutch and German manufacturers of egg products are summoned to monitor the Dutch and German housing policy

The following scenario is presented:

| |
|---|
| The Dutch and German authorities have banned unilateral battery cage housing. The other surrounding countries do not follow their example; the enriched cages is permitted there. For this reason the market price of egg products in the Netherlands is 5 to 10% higher than the EU market price and is 20% higher than the world market price. The Dutch egg products industry only buys Dutch eggs, thus meaning that only egg products from alternative housing systems are offered. |

The difference with the previous scenario is that the manufacturers of egg products on Dutch and German soil can no longer buy eggs from outside the Netherlands and Germany, as they do not comply with the housing regulations of the Netherlands and Germany.

This scenario is unrealistic according to almost all respondents, as well as being almost impossible to achieve. The buyers indicated in each case that they would no longer buy egg products from Dutch or German manufacturers of egg products. These would be too expensive to appreciate. They declared a scenario in which only the retail demands products in which alternative eggs were processed to be unrealistic; the consumer would never demand this of the retailer. According to the buyers there are substantial areas of their sales market in which animal welfare in terms of processed products still plays absolutely no role and probably never will. In this respect the German buyers were more

definite than the Dutch buyers. In Germany, discount stores win over the more expensive supermarkets, according to those interviewed, therefore demand remains for cheaper products with cheaper raw materials. Animal welfare is not of equal interest to all consumers and is certainly not an issue in terms of processed products. Consumers do not know if a cake or a pot of mayonnaise is largely composed of egg products, according to the buyers, and if they do know they place little importance on which type of hen produced the eggs. However with regard to table eggs this is seen very differently, with the housing system being an image that is very much a topic of conversation.

The buyers did not expect that the manufacturers of egg products in the Netherlands and Germany would be able to survive in this scenario. This would mean forced transfer to places where the eggs are available. The manufacturers of egg products themselves saw this as a gloomy scenario.

The buyers from the food industry did not expect this scenario to have consequences for their companies. The regional companies expected ordinary products from abroad to be included by the Western manufacturers of egg products.

The buyers for companies with branches in several countries and/or an international orientation were aware of the possibility of a change in production relationships in various countries when raw materials in other countries were needed and there was still production capacity there. Real transfers of production are only involved when multiple factors, as well as the cost price of egg products, turn out more favourable in a country other than the Netherlands or Germany; egg products are an important raw material, but the cost price is also not so important for the cost price of the end product. Transfer is also not unthinkable, as the incomes are higher here than in Southern Europe and Eastern Europe; environment is here a much more important item. In short, cost price increasing examples for the Netherlands and Germany can be mentioned. In Germany, on the other hand, the country of origin of processed products is important for the client, thus that is a factor which delays transfers. In the Netherlands this rarely matters.

## 5.4 Scenario IV: the whole of Europe dispenses with cage housing

The fourth scenario was presented as follows:

> The EU has unilaterally banned all cage housing. The countries outside the EU do not follow our example; there, cage housing is permitted as it is at present. In this way the market price of egg products in the EU is 20% higher than the World market price. The Dutch egg products industry only buys eggs from within the EU, thus this means that all egg products from alternative housing systems are offered.

This scenario was dismissed as unrealistic. Very few believed that the Southern European countries would agree with such a plan. A few respondents indicated that they had heard that presently the amount of poultry in Spain was to be increased with subsidies; it was therefore unthinkable that Spain would agree with such welfare policies and would go ahead and implement them. Some respondents wondered whether the present welfare guidelines in the Southern European countries were really so well followed and monitored as in the Netherlands. Thus if the Southern European countries were to agree with the welfare laws, the question then would be if and when these countries implemented them.

Furthermore, many respondents indicated that there was not enough room in Europe for a total changeover from cage housing to alternative housing. This scenario would result in a shortage of eggs. Alternative systems take much more space than cage housing. One possibility is that countries with space should house both the eggs and egg products industries.

In short, in this scenario the supply from countries in Eastern Europe, Southern Europe and outside the EU are of interest. In this scenario the transfer from fluid products to powdered egg is also of interest despite transfer costs.

## 5.5 Conclusion

From the egg products industry and its buyers, scenarios I and II were considered the most realistic scenarios. Scenario III and IV were seen as impossible.

Only scenario I has few consequences for the Dutch egg products industry. As far as consequences are concerned these will be the same all over Europe. Both in terms of buyers as well as manufacturers of egg products doubts exist as to whether welfare measures will be implemented in Southern European countries (now and in the future). The fact that in Spain expansion of production capacity with traditional cage housing is still permitted is also significant. Scenario I is seen as competitively disadvantageous by the egg products industry, despite the fact that buyers there have few disadvantages. They see disadvantages in the competitive disadvantages of powdered egg and the substitution of fluid egg products with powdered egg.

Scenario II has, given the sales shift of buyers, considerable repercussions for the Dutch and German egg products industry. Particularly the German buyers expect a transfer of the Dutch and German processors to Eastern Europe. The manufacturers of egg products themselves see this as less gloomy, because they expect to continue to be able to import eggs, but they recognise that they then have a cost price disadvantage in relation to the rest of Europe.

Scenario III and IV are seen as unrealistic by almost all respondents.

# 6. Test of the results of this research

On the basis of the results from the previous chapters four propositions were presented to the participants of the Spring Meeting of The International Egg Commission. Per proposition is indicated how participants reacted and if there was discord between the various countries of origin.

*'Eggs from animal-friendly housing systems score poorly on food safety'*

In relation to the first proposition it was stated that animal-friendly housing not only has advantages. The participants indicated that there was a difference between actual quality and the quality that a consumer attributes to a product. The experience is that in welfare-friendly housing systems more use of medication is necessary (thus more risk of residues in eggs). The perception of the consumer is that a welfare friendlier egg is also more food-safe.

*'Price is the most important purchasing factor for egg products''*

Price was considered an important purchasing factor by participants. It is also not the only one and not from a distance. The participants were of the opinion that the fulfilment of the specifications of buyers was just as important. This conforms to the outcome of the conjoint measurements in this research. There was no distinction between participants from different countries of origin.

*'If the European Union implements a stricter welfare policy than the rest of the world, will industrial buyers give preference to cheaper powdered egg from outside the EU '*

According to the participants at the Spring Meeting the Switzerland case teaches that if no WTO measures are taken, it is very difficult to eliminate the cheaper egg products. The participants felt that the consumer was less prepared to pay a higher price for an animal-friendly product in the case of processed products. The only possibility of avoiding this is to convince retailers and consumers of the added value of animal-friendly products, so that this becomes a condition of purchase. If this is not successful, the egg products industry in Europe will experience a difficult time, according to participants at the Spring Meeting, because it is not expected that welfare directives will be defined as entry directives for the EU.

The participants recognised that there some changeover costs would be involved in changing over from fluid egg products to powdered products, but if it depended on such cost price differences then there was a good chance that it would be implemented. The participants from outside the EU did not expect that it would go so far that the European market would only be supplied by those suppliers outside the EU. The EU was formed for

technical trade reasons, according to a spokesperson, and this did not tally. The original objective of the EU would always prevail.

*'Tracing & tracking right down to the raw materials for livestock feed will be a 'licence to deliver' in the next 10 years'*

The participants at the Spring Meeting did not expect that traceability down to the raw materials of livestock feed would be a prerequisite in the future. Traceability becomes more important, but some participants thought it was unlikely to be so important to trace very far back in the chain. Furthermore some expected that it would be almost impossible to achieve. This was in contrast to the answers of the buyers we interviewed.

*Furthermore, one group was asked to estimate in which area the most competitive egg products can be offered in 10 years from now*

The participants expected that the fluid egg products in 10 years from now would still come from the EU, but that Southern Europe and Eastern Europe would win ground from Western Europe. There were varying schools of thought regarding the opening up of Eastern Europe. Some had great confidence in this, others did not. The participants expected that outsiders such as Ukraine and Estonia could make fluid egg products for the European market and become successful in this.

Powdered eggs would certainly originate from outside the EU. The United States and Canada in particular were mentioned as being strong players on the market, but also Asia, South America and North Africa were considered outsiders that in 10 years from now could experience strong growth.

The buyers interviewed have close ties with the existing trade relations and therefore have no connections with these countries. Many buyers rarely even consider doing business outside their own country, certainly not outside Europe. Only one or two mentioned Estonia. The egg producers probably have a better global insight into the competition powers on the World market than the buyers who mainly buy regional fluid egg products.

# 7. Conclusions

The Dutch egg products industry produces liquid egg products which are sold within a radius of around 800 km in Europe and are also sold outside the EU on a very small scale in frozen form. The powdered eggs that are produced in the Netherlands are sold on the egg products market.

On the powdered eggs market Dutch manufacturers of egg products have difficulty competing with providers from the US. This can be attributed to the significantly lower cost price in that country. As expected this cost price difference will only increase in the future, despite the fact that in the US some attention is now being given to welfare-friendly housing. As yet this involves standards seen under present European law as minimum standards.

While the Netherlands is the largest exporter of egg products in Europe, countries such as Spain, Italy and France have been catching up in recent years. Particularly in Spain the production capacity in traditional battery cages has increased to such an extent that it can be assumed that Spain's market share in export will continue to grow.

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 level to the advantage of the client. Diversification strategies are rarely implemented. The country of origin of egg products and eggs plays a minor role, but the professionalism of the egg products manufacturer does. The Dutch and German manufacturers of egg products are seen as good and trustworthy business partners.

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 manufacturers of egg products could implement innovation policies for this purchasing factor.

The authority relationships of the chain stand in the way of introducing and protecting the innovative products; the supply exceeds the demand to the extent that buyers see new introductions immediately as regulations enforced on all other producers. Chain businesses are also inclined to fulfil these in order to retain sales.

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 outdoor free-range) is still negligible. While the market for biological processed products is growing, it is still typified as a niche market.

If stricter regulations are implemented in the Netherlands than in the rest of Europe, it will be difficult for the Dutch egg products industry to stay in business. They would then be forced to import eggs from other countries to be processed in their country. They were more optimistic about this themselves than the buyers; they expected that this would lead

to a higher cost price and a higher egg products price. The buyers see competition disadvantages in this.

If an unequivocal policy is implemented in Europe it will be easier for the Dutch egg products industry to remain in business. The market for fluid egg products has always been a regional market and will always remain so as long as the price differences with powdered eggs from outside the EU are not so great as to make the transfer costs in the production process outweigh the cost price advantage.

The respondents were divided throughout the region where the most potential is to be expected. The German respondents and the manufacturers of egg products saw more of a future in Eastern Europe, while the Dutch buyers expected that Southern Europe would show a growth spurt in the next 10 years. It is interesting to note that both lines of reasoning are connected to the suspected re-location movement of Western manufacturers of egg products.

It is unclear whether a stricter welfare policy in the Netherlands and Germany would have consequences for the change in the location of food industries. This does not seem relevant for local companies (with all premises in the Netherlands or Germany). However for multinationals this is a more realistic scenario, but the price of egg products will never be the only deciding factor in this. Re-location is chosen if multiple cost-related factors are more advantageous in other countries. In the Netherlands wages and environmental costs weigh against it, and if such stricter welfare policies for laying hens were to be implemented the cost price of egg products would also be a problem. But whether this will result in relocation of the food companies is still unclear.

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# Appendix 1 Comparison of production costs in the Netherlands and the US

The cost price of eggs for consumption has been researched for a few countries. Here only the results for the Netherlands and the United States are presented. The results refer to the year 2000.

Table B1.1 gives an insight into the build up of the primary production costs. Table B1.2 gives the results again.

*Costs of primary production (in Euro cents per kilogram of egg)*

*Table B1.1 Points of departure*

| | NL | US |
|---|---|---|
| Feed price (Euro /100 kg) | 17.8 | 15.0 |
| Hen price 20 week old (Euro) | 3.04 | 2.77 |
| Eggs per hen | 323 | 300 |
| Egg weight (g) | 62 | 61 |
| Feed conversion | 2.11 | 2.15 |
| Mortality (%) | 7 | 8 |

a) General costs are inclusive of manure sales costs.

*Table B1.2 Costs of primary production (in eurocents per kilogram of egg)*

| | NL | US |
|---|---|---|
| Hen | 15.3 | 15.1 |
| Feed | 37.5 | 32.3 |
| Other | 3.6 | 2.7 |
| Labour | 5.1 | 3.1 |
| Housing | 7.3 | 5.3 |
| General | 0.8 | 0.7 |
| Manure disposal cost | 2.8 | 0 |
| Slaughter | -1.5 | 0 |
| Total costs inclusive labour | 71.0 | 59.1 |
| Total costs exclusive labour | 65.8 | 56.0 |

a) General costs are inclusive of manure sales costs.

The difference in costs for the primary production is mainly caused by difference in feed prices, the price of young hens, housing costs and manure sales costs.

If the Dutch companies produce good technical results, the cost price of Dutch eggs comes out on top in a European perspective. This is caused by higher housing costs, but particularly higher manure disposal costs.

# Appendix 2 Points of departure and calculations of enriched cages and barn egg production

*Production costs of eggs from enriched cages and floor accommodation for laying hens*

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 improved cage gives each hen 750 $cm^2$ surface area, a perch, laying nest 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 $cm^2$ living space, (part of) the surface area of the pen is covered with litter and in the pen there are enough laying nests and perches for the animals. In the present practice around three different housing systems can be distinguished:

- *enriched cages*. In comparison to traditional battery cages the group size is enlarged, so that 8 to 10 hens per cage are kept. The cage is complete with a laying nest, 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 new EU trade regulations for eggs it is possible from 1 January 2002 to sell eggs from an aviary system as barn eggs.

*Intervention resolution*

In the Netherlands there is a supplementary regulation regarding welfare of the laying hens. The so-called intervention resolution bans beak treatment of hens in cages after a certain transition term. For hens kept in ground accommodation (barn and aviary systems) the EU rules apply that hens up to 10 days old can be treated. The present practice of treatment at 4 to 6 weeks old is therefore banned, with the required transition period.

*Points of departure*

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 . Also regarding the effect of the Dutch intervention resolution on the results little is known. The most important points of departure for labour and investments for various housing systems are in Table B2.1. Here it seems that for all new systems the labour needs and investments for house and equipment per place per hen are increasing. The points of departure for the technical results are in Table B2.2. 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. The Dutch

intervention resolution has the effect of extra mortality and extra feed consumption for all systems.

*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 Table B2.3.

In the improved cage the production costs in relation to the present cage accommodation (450 $cm^2$ per hen and beak treatment) +13% higher. In the aviary system this is the production costs +21%. The difference with the improved cage is 0.3 eurocent per egg. This means that from the market a bonus of minimum 0.3 eurocent must be achieved to keep the income for the poultry keeper at a constant level.

*Table B2.1 Most important points of departure for labour and investments in the various housing systems for laying hens*

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

*Table B2.2 Most important points of departure for the production results in the various housing systems for laying hens (laying period is 390 days) on the basis of the Dutch intervention resolution*

| | Cage | Improved Cage | Aviary |
|---|---|---|---|
| No. of eggs per hen per place (units) | 319 | 319 | 314 |
| Feed consumption per hen per day (gram) | 114 | 117 | 120 |
| Wastage (%) | 8 | 8 | 10 |

*Table B2.3 Build up of production costs in eurocents for various housing systems for laying hens*

| | | Battery cage | Improved battery cage | Aviary |
|---|---|---|---|---|
| *Costs per hen housed* | | | | |
| Purchase of hen | | 2.77 | 2.77 | 2.88 |
| Feed costs | | 8.09 | 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 |
| Spend hen | | -0.36 | -0.36 | -0.35 |
| Total costs per hen per place | | 14.79 | 16.44 | 17.30 |
| Cost price per egg (ct) | 4.54 a) | 4.63 | 5.17 | 5.49 |
| Cost price per kg eggs (ct) | 0.73 a) | 0.74 | 0.83 | 0.88 |
| Increase (in%) | | 0.54 | 13 | 21 |

a) Cost price in cage in which hen have their beaks treated according to EU guidelines (younger than 10 days).

# Appendix 3 Conjoint analysis

*Introduction*

Conjoint analysis is a method by which preferences for product can be modelled. Products are seen as a combination of properties (attributes) of which the consumer borrows the useful aspects. The weighing up process done by respondents in the valuation of a particular product can be identified and qualified on the basis of conjoint analysis. Products are defined by means of a limited number of relevant characteristics. These characteristics are called attributes. The attributes have various levels (Vriens, 1992).

*Data*

In this research 5 attributes have been chosen, each of which can reach 3 different levels. These are given in figure B3.1.

| Attributes a) | Levels b) |
|---|---|
| Price | World market price |
| | 10% above World market price |
| | 20% above World market price |
| Microbiological properties | Germ and residue-free |
| | Almost germ and residue-free |
| | No germ and residue information |
| Manufacturer | Traditional |
| | Innovative |
| | Neither traditional, nor innovative |
| System in which hens are kept | Free-range system |
| | Cage system |
| | Outdoor free-range system |
| Country of origin of the eggs | The Netherlands |
| | Southern Europe |
| | World |

*Figure B3.1 Attributes and levels as applied in the conjoint analysis*
a) Attributes are described in the chapter on factors; b) Attribute levels are described in the chapter on values of the factors.

A profile is a notional product composed of various attributes each with a certain level. An example of a profile is:

*A consignment of egg products from Dutch barn eggs from a traditional egg products manufacturer.*
*Almost Germ and residue-free.*
*Price: 20% above the World market price.*

In a conjoint analysis respondents are asked to evaluate a limited number of profiles (hypothetical choice-alternatives) from the total set of (3x3x3x3x3 =) 243 profiles. In the case that a respondent is presented with a lot of profiles, tiredness symptoms may show. The limitation of the number of attribute levels leads to less validity and to less valid and reliable results (Bont et. al., 1993). For these reasons a weighing up process must be done for a number of profiles presented to the respondents. In the present study 16 profiles in total are presented to the respondents.

Respondents are asked to grade each profile on a scale from 0 to 10. A value of 0 should be given to unattractive profiles and 10 to profiles that are seen as very attractive.

*Theory*

From the values attributed by the respondents the impact of various levels of the attributes on the total valuation can be derived. These are also called partial utilities. The relative importance of the various attributes can also be derived.

The assumption made here is that the valuation of a respondent for a particular product (profile) can also be actually attributed to the specified attributes and the accompanying attribute levels (Steenkamp, 1987). The model from which the partial utilities can be derived are as follows:

$$y = c + \sum_{i=1}^{n} \sum_{j=1}^{m_i} v_{ij} * x_{ij}$$

Hereby: y = value given by the respondent to a particular profile
c = constant
$v_{ij}$ = partial utilities (partial usefulness per attribute level)
$x_{ij}$ = dummy variable which takes on value 1 as the $j^{th}$ level of the $i^{th}$ attribute appears in the profile
i = 1,..,n (5 various attributes)
j = 1,..,$m_i$ (3 various attribute levels apply to attribute i).

An estimate of the partial utilities $v_{ij}$ is made as follows:

$$v_{ij} = \hat{a}_{ij} \quad for \; j = 1,.., m_i - 1$$

$$v_{ij} = -\sum_{i=1}^{m_i - 1} \hat{a}_{ij} \quad for \; j = m_i$$

The partial utilities are estimated with the help of the least squares method.

For estimating the relative importance of the various attributes the following model is used:

$$Belang_i = 100 * \frac{Range_i}{\sum_{i=1}^{n} Range_i}$$

In this: $Importance_i$ = Relatively important attribute I (in%)
$Range_i$ = Greatest value of a partial utility of a certain attribute – smallest value of partial utility of a particular attribute
i = 1,.. n, (5 various attributes)

*Results*

The average partial utilities, calculated on the basis of the theory described, are both per group as for all respondents reported to be the same. The different groups to be divided are the Dutch egg products industry, the Dutch buyers of egg products and the German buyers.

*Table B3.1 Average partial utilities ascribed to various items*

| Attributes | Egg products industry | Buyers from the egg products industry | | Total |
|---|---|---|---|---|
| | NL | NL | GER | |
| *Price* | | | | |
| World market Price | 2.15 | 1.71 | 1.58 | 1.80 |
| 10% above World market price | -0.10 | -0.56 | -0.63 | -0.45 |
| 20% above World market price | -2.04 | -1.15 | -0.96 | -1.35 |
| *Microbiological* | | | | |
| Germ and residue-free | 2.31 | 1.44 | 1.36 | 1.66 |
| Almost germ and residue-free | -0.13 | 0.00 | -0.43 | -0.12 |
| No information | -2.19 | -1.44 | 0.93 | -1.54 |
| *Manufacturer* | | | | |
| Traditional | 0.15 | 0.36 | 0.72 | 0.38 |
| Innovative | 0.71 | 0.77 | 0.64 | 0.73 |
| Traditional/innovative | -0.85 | -1.13 | -1.36 | -1.10 |
| *Housing system* | | | | |
| Outdoor free-range system | 0.53 | 0.36 | 0.00 | 0.34 |
| Free-range system | -0.22 | 0.11 | -0.08 | -0.01 |
| Battery cage system | -0.31 | -0.48 | 0.08 | -0.32 |
| *Country of origin* | | | | |
| The Netherlands | 0.26 | 0.18 | -0.14 | 0.14 |
| Southern Europe | -0.11 | -0.10 | -0.06 | -0.09 |
| World | -0.15 | -0.08 | 0.19 | -0.04 |
| *Constant* | 3.48 | 2.99 | 1.89 | 2.90 |

On the basis of the estimated partial utilities an estimate can be made of the value of a particular consignment of egg products. If the results of all respondents are looked at collectively, the following will be the consignment of egg products:

*A consignment of egg products from Southern European cage eggs from an innovative egg products manufacturer.*
*Germ and residue-free.*
*Price: 10% above the World market price.*

Valued as follows: 2.90 - 0.09 - 0.32 + 0.73 + 1.66 - 0.45 = 4.43. The constant (2.90) is the point of departure of the valuation. Thereby the partial utilities are calculated which belong to the attribute levels appearing in the to-be-evaluated profile.

The average relative importance is likewise both per group as well as for all respondents reported together.

*Table B3.2 Relative importance given to various attributes (in %)*

| Attributes | Egg products | Buyers from the egg products industry | | Total |
|---|---|---|---|---|
| | NL | NL | GER | |
| Microbiological | 39.13 | 32.86 | 30.90 | 35.23 |
| Price | 36.41 | 32.68 | 34.27 | 34.77 |
| Manufacturer | 13.59 | 21.61 | 28.09 | 20.15 |
| Housing system | 7.34 | 9.64 | 2.25 | 7.27 |
| Country of origin | 3.53 | 3.21 | 4.49 | 2.58 |

The fit of the estimated models, the extent to which the model explains the actual results, are given on the basis of two statistics: Pearson's R and Kendall's tau. From these statistics it appears that the fit of the models is good. For the results of the model preferred by all respondents together, Kendall' tau has a value of 0.886 and Pearson's R a value of 0.984. Both statistics indicate that the model is significant. The fit of the other models is also good.

*Comments*

A consequence of the choice of presenting 16 profiles to the respondents is that possible crossover between the attribute levels of various attributes is difficult to estimate, as the gradation of freedom is very low in a small number of profiles. In this research some major effects are estimated. These are the effects of an attribute level of the total preference without taking account of the levels of other attributes (Steenkamp, 1983).

For the number of attributes included in the profiles the same reasoning applies as for the number of profiles. When respondents were presented with a large number of attributes per profile, respondents lost concentration. They were consequently not in a position to weigh up all purchasing factors in the total valuation per profile. The respondent chose a number of attributes important for him or her, leaving the other attributes aside. As well as

the preference per respondent for one or more purchasing factors, they already have an idea regarding the relation between various attributes, resulting from practice. They are therefore unable to see the various attributes separately. An example is that egg products originating from outdoor free-range eggs are poorly valued, as these always appear more expensive. Even if it is indicated in the profile that the price is low the respondents value outdoor free-range eggs poorly, while the property of the egg product is valued highly. Both aspects influence the objectivity of respondents.

Due to the small number of respondents (15) no supplementary quantitative analysis could be carried out in which the results of the conjoint analysis are related to the open questions. On the basis of such analyses preferences for certain characteristics of egg products are related to certain individual characteristics of respondents. This could provide added value in the explanation of the preferences of the respondents.