

## THE DEVELOPMENT OF THE NETHERLANDS EGG INDUSTRY WITHIN THE EEC

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### SUMMARY

An analysis is made of the changes which have occurred in the Netherlands egg production industry during the last 15 years, and the relationships obtained have been used to forecast the likely future developments.

In common with the egg production industries of other countries, that of the Netherlands has undergone a radical change. Economic factors have dictated the decline of the small unit and the rise of the large unit. The Netherlands industry, however, has certain unusual factors affecting it. Traditionally Germany has imported large quantities of Dutch eggs, but now, while it still forms an important outlet for the Dutch industry, this market is declining.

Demand for eggs is divided into two sectors: home demand and West German export demand; the former is explained in terms of retail price and disposable income. The latter in terms of export price, West German production and disposable income in West Germany. However, it seems likely that these two sectors are not separate but interact upon each other and so consideration is given to this in the form of simultaneous equations. Attempts to relate these to a supply reaction were, however, less successful.

As most of the preceding work relates to retail prices a section is included which relates the price difference between retail and producer price for eggs to time. It is found that the margin increases with time over the last 20 years.

From these analyses the future demands upon the egg production industry in the Netherlands and the likely developments are predicted.

### INTRODUCTION

Production of eggs has been and still is an important sector of Dutch agriculture, especially in the southern and eastern part of the country.

Much has changed in the Dutch egg industry during the past 15 years. This paper attempts to analyse these changes in order to predict future developments in the market.

### SOME CHANGES IN THE MARKET STRUCTURE

Changes in market structure are to a large extent linked with developments in export markets, especially to West Germany. This changing market situation has accelerated the introduction of new production methods which is another important development in the Dutch poultry industry.

### *Changing export-opportunities*

Since the Common Market Policy with respect to eggs became effective, West Germany has increased her own egg production substantially. Self sufficiency for eggs in West Germany increased from 60% in 1962 to 87% in 1968. During the same period Dutch exports to West Germany decreased from 2·9 billion to 0·9 billion eggs per year. While some barriers to egg-trade in the Common Market existed in the period 1962 to 1967, it became fully liberalised in 1967. Since then Dutch exports of eggs have increased slightly, but have never reached the level of the beginning of the sixties.

### *Changes in farm size*

In the beginning of the sixties exports were stagnating and it became clear that there were too many small poultry farms with low productivity and product quality in the Netherlands. At the same time costs of distribution were high. Consequently many small farms left the poultry industry; according to the Central Bureau of Statistics the number of farms having laying hens decreased from 172,000 in 1961 to 62,599 in 1970 while the national flock fell from 42,575,000 to 25,958,000 hens. The number of poultry farms having 2000 or more hens increased substantially; while in 1966, according to the Agricultural Economics Institute, about 23% of laying hens were raised on these farms, this percentage increased to 69% in 1970. A further concentration of egg production on large farms is expected in the future. Some experts believe that in the future egg production in the Netherlands will be concentrated mainly on farms with 10,000 hens or more.

### *Marketing channels*

There are many different marketing channels for eggs. Reliable information on the relative importance of different channels is available at the farm level and at the retail level.

*Farm level.* According to a survey by the Agricultural Economics Institute, egg sales by poultry farmers in 1968 were distributed as follows among different outlets: 52·4% to wholesalers, 13·1% to collectors, 12·2% to consumers, 5·1% to retailers, 5·1% to food suppliers and 12·2% unknown (*De Nederlandse Pluimveehouderij, 1970*).

*Retail level.* The shares of different retail outlets in domestic egg sales, as determined from consumer panel data over a 12-week period ending in the middle of April 1971, were as follows: 31% poultry farms, 28% dairy men and cheese or egg middlemen, 18% grocery stores, 6% market-place, 5% vending car, 3% dairy shop and 9% others (*Cijfers en Feiten uit de Pluimveehouderij, 1971*).

*Wholesaling.* Concentration in wholesaling has been necessary in order to be able to serve large retail organisations adequately, to make profitable use of modern equipment and to participate in contract farming.

Cooperative wholesale companies are very important. There are four cooperative groups, which have joined one export organisation, the VECE. They suffered a serious decline in sales after 1962 but increased their sales from 423 million eggs in 1967 to 766 million eggs in 1971, which represented 12% of Dutch production in 1967 and 17% in 1971 (*Landbouwcijfers, 1971*).

*Markets.* Markets where poultry farmers sell eggs directly are of minor impor-

tance. A specialised market which is of some importance is the egg auction. In Barneveld two auctions are in operation and in 1971 the biggest cooperative wholesale organisation in the south also began selling eggs through auctions.

*Vertical integration.* Vertical integration is increasing in importance. Some experts estimate that a little less than 50% of production is currently produced on contract. Price-guaranteeing contracts are popular. Egg selling cooperatives developed contracts for a long period with a minimum and a maximum price. For instance the cooperative ROVECO has made contracts of the following type with members—poultry farmers who have at least 1000 hens per farm. When market prices drop below f.1·80 per kg, ROVECO absorbs 75% of the price deficiency; when prices are above f.1·95 per kg, ROVECO subtracts 25% of the excess price. These adjustments are limited to f.2 per hen per year (Coöperatie, 1972).

#### ANALYSIS OF DEMAND AND PRICE

##### *Domestic demand*

Domestic consumption as a percentage of total production increased from 51% in 1962 to 79% in 1967. After 1967 exports became more important again and while domestic consumption increased gradually, its share of total production fell to 71% by 1970.

Domestic demand for fresh eggs may be analysed on the basis of the following model:

$$y_t = \alpha_0 + \alpha_1 x_{1,t} + \alpha_2 x_{2,t} + u_t \quad (1)$$

$i = 1 \dots n$

$$E(u_t) = 0 \quad E(u_i u_j) = \begin{cases} \sigma^2 & \text{for } i = j \\ 0 & \text{for } i \neq j \end{cases}$$

where:

$y_t$  = *per capita* domestic consumption of eggs.

$x_{1,t}$  = retail price of eggs in cts./egg, deflated by the cost of living index  
(1963 = 100).

$x_{2,t}$  = *per capita* disposable income in guilders deflated by the cost of living index.

$u_t$  = error term.

Sources of data include: consumption, *Produktschap voor Pluimvee en Eieren*, Zeist; disposable income, *Nationale Rekeningen*, C.B.S. Den Haag; egg prices and cost of living index, Central Bureau of Statistics, Den Haag.

Price is treated as a predetermined variable, because it is assumed that export opportunities play a dominant role in price formation.

Estimation of this function, using annual data over the period 1950 to 1960, by the method of least squares, gave the following result:

$$y = 71.761 - 3.318x_1 + 0.076x_2 \quad (2)$$

$(\pm 2.222) \quad (\pm 0.018)$

$$R^2 = 0.94 \quad DW = 1.58 \quad n = 11$$

The influence of income was significant ( $P < 0.05$ ) with an income elasticity at the mid-point of 1.02. The influence of price was not significant ( $P < 0.05$ ).

Estimation of the same function using annual data for the period 1961 to 1970

showed the influence of neither price nor income to be statistically significant. It appears that domestic demand *per capita* did not increase during these 10 years, notwithstanding a substantial increase in *per capita* real income and an important drop of prices. This conclusion is in agreement with data from a consumer panel which found that purchases of eggs per family of 3·5 persons amounted to 39 eggs per four weeks in 1969 as compared with 38 eggs per four weeks in 1970 in spite of a drop in the retail price from 16·4 cts. in 1969 to 14·7 cts. per egg in 1970 (Produktschap voor Pluimvee en Eieren, 1970). Little difference was observed between consumption levels in different social classes.

It is intriguing why the consumption of eggs *per capita* is static in the Netherlands and at a level below that of many other west European countries. *Per capita* consumption of eggs in 1967-68 amounted to 11·8 kg in the Netherlands as compared with 13·5 kg in Belgium-Luxemburg in 1967-68, 12·7 kg in France in 1968, 15·2 kg in West Germany in 1968-69 and 14·8 kg in the United Kingdom in 1969 (Landbouwcijfers, 1971). One reason may be the low egg consumption at breakfast: a national consumer survey on consumption of bread in summer 1969 revealed that only 5% of households had eggs for breakfast on weekdays (N. V. Stichting voor de Statistiek, 1969).

The main change in the domestic purchases of eggs is the increasing share of packaged eggs at retail level: from 7% of consumer purchases in 1966 to 13% in 1970. It must therefore be concluded that an increase of *per capita* egg consumption in the Netherlands is very unlikely unless promotion and other marketing efforts can change the picture.

#### *Export demand*

*A single-equation approach.* Export demand has been analysed on the basis of the model:

$$y_t = \alpha_0 + \alpha_1 x_{1,t} + \alpha_2 x_{2,t} + \alpha_3 x_{3,t} + \alpha_4 x_{4,t} + u_t \quad (3)$$

$$E(u_t) = 0 \quad E(u_t u_j) = \begin{cases} \sigma^2 & \text{for } i = j \\ 0 & \text{for } i \neq j \end{cases}$$

Where:

$y_t$  = export to West Germany in 100 million eggs.

$x_{1,t}$  = export price of eggs, f.o.b. German border, deflated by cost of living index (1963 = 100), in cts. per egg.

$x_{2,t}$  = production of eggs in West Germany in 100 million eggs.

$x_{3,t}$  = *per capita* real disposable income in West Germany in 100 DM.

$x_{4,t}$  = production of eggs in Belgium in 100 million eggs.

Sources of data include: export to West Germany, export price of eggs f.o.b. German border, production of eggs in West Germany and in Belgium – Produktschap voor Pluimvee en Eieren, Zeist; *per capita* real disposable income in West Germany – Statistisches Bundesamt Wiesbaden.

Estimation of the model using annual data over the period 1955-70 by the method of least squares gave the following result:

$$\begin{aligned} y &= 42.398 - 1.416x_1 - 0.644x_2 + 1.297x_3 + 0.154x_4 \\ &\quad (\pm 0.447) \quad (\pm 0.076) \quad (\pm 0.355) \quad (\pm 0.208) \\ R^2 &= 0.97 \quad DW = 1.88 \quad n = 16 \end{aligned} \quad (4)$$

It appears that export price, production in West Germany and *per capita* real income have a statistically significant influence on exports. The price elasticity of exports on the basis of this equation was -0.88 at the midpoint which suggests that price has still a substantial influence on Dutch export opportunities.

*A simultaneous equation approach.* It may be argued that Dutch exports to West Germany and price in West German export market are interdependent, since increasing exports will stimulate prices in the Netherlands, while lower prices in the Netherlands will stimulate exports. Therefore a model is proposed which tries to explain simultaneously West German export demand and export price by the predetermined variable Dutch production, West German production and *per capita* disposable income in West Germany.

$$y_{1 \cdot t} = \alpha_0 + \alpha_1 x_{1 \cdot t} + \alpha_2 y_{2 \cdot t} + u_{1 \cdot t} \quad (5)$$

$$\text{and } y_{2 \cdot t} = \beta_0 + \beta_1 y_{1 \cdot t} + \beta_2 x_{2 \cdot t} + \beta_3 x_{3 \cdot t} + u_{2 \cdot t} \quad (6)$$

$$E(u_{1 \cdot i}) = 0, \quad E(u_{1 \cdot i} \cdot u_{1 \cdot j}) = \begin{cases} \sigma^2 & \text{for } i = j \\ 0 & \text{for } i \neq j \end{cases}$$

$$E(u_{2 \cdot i}) = 0, \quad E(u_{2 \cdot i} \cdot u_{2 \cdot j}) = \begin{cases} \sigma^2 & \text{for } i = j \\ 0 & \text{for } i \neq j \end{cases}$$

where:

$y_{1 \cdot t}$  = export price of eggs f.o.b. German border in cts. per egg deflated by the cost of living index,

$y_{2 \cdot t}$  = export to West Germany in 100 millions eggs,

$x_{1 \cdot t}$  = production of eggs in the Netherlands in 100 million eggs,

$x_{2 \cdot t}$  = production of eggs in West Germany in 100 million eggs,

$x_{3 \cdot t}$  = *per capita* real disposable income in West Germany in 100 DM.

Sources of data include: export to West Germany, export price of eggs, f.o.b. German border, production of eggs in West Germany and in the Netherlands – *Produktschap voor Pluimvee en Eieren*, Zeist; *per capita* real disposable income in West Germany – *Statistisches Bundesamt*, Wiesbaden.

Since equation (5) is over-identified according to our specification, the parameters of the equations will be estimated by the two-stage least squares method using annual data over the period 1955 to 1970:

$$y_1 = 22.468 - 0.352x_1 + 0.347y_3 \quad (7)$$

$$(\pm 0.075) (\pm 0.071)$$

$$n = 16 \quad R^2 = 0.70 \quad DW = 1.90$$

$$y_2 = 78.962 - 2.131y_1 - 0.321x_2 + 0.035x_3 \quad (8)$$

$$(\pm 0.904) (\pm 0.118) (\pm 0.544)$$

$$R^2 = 0.81 \quad DW = 1.82$$

It appears from equation (7) that exports have a significant positive influence on Dutch export prices ( $P < 0.05$ ) while equation (8) indicates that exports are stimulated by a decline in export price. The following elasticities at the midpoint could be derived from equations (7) and (8): (a) the flexibility coefficient of export price with respect to Dutch production is -1.19: an increase of Dutch production leads to a more than proportional decrease of export prices; (b) the flexibility

coefficient of Dutch export price with respect to export to West Germany is equal to +0.45: this implies that increasing exports stimulate prices but only to a limited extent; (c) the price elasticity of export to West Germany with respect to export price is -1.64. So it may be concluded that a price decline in the Netherlands stimulates export demand substantially, but this advantage has been overshadowed in the past by the negative influence of increasing West German production on Dutch export opportunities.

A modified version of model equations (5) and (6) was also estimated, replacing export price for eggs by Dutch producers' prices for eggs. The statistical results were about the same as in equations (7) and (8) and will not therefore be discussed. Another estimation of equations (5) and (6) has been made by introducing exports to West Germany and West German production on a *per capita* basis. The results were in line with foregoing estimates: flexibility coefficient of export price with respect to Dutch production -1.59; flexibility coefficient of Dutch export price with respect to export to West Germany +0.88, and price elasticity of export to West Germany with respect to Dutch export price -1.24.

It may be concluded that low egg prices are mainly the consequence of decreasing export opportunities, because of increasing egg production in West Germany. Domestic consumption will increase rather slowly but will not provide much room for increased production. Dutch poultry farmers will have to adapt production to export opportunities.

#### SUPPLY REACTIONS OF DUTCH POULTRY FARMERS

Egg production in the Netherlands decreased substantially in the depressed market situation from 1962 to 1967 because of decreasing export opportunities. Estimates were made of linear functions of the type: Production ( $t$ ) =  $f(\text{Price } (t-1), \text{Trend})$  and Production ( $t$ ) =  $f(\text{Production } (t-1), \text{Price } (t-1))$ .

These estimates indicated statistically significant influences of trend and lagged production, but not of the lagged price. An estimate was also made of a linear function of the type: Production ( $t$ ) =  $f(\text{Price } (t-1), \text{Average Price } (t-2, t-3, t-4))$ . The estimate of this function with data over the period 1955 to 1970, using the method of least squares, gave no statistically significant results. The reactions of poultry farmers to market prices of eggs thus do not appear to be systematic enough, to allow a conclusion about the price elasticity of supply.

#### ANALYSIS OF MARGINS

During the period 1950 to 1970 no statistically significant influence of changes in producer prices on margins could be established. However, it appears that the ratio "margin over producer price" gradually increased during this period. The margin between retail price and producer price for eggs as a percentage of producer price varied between 33 and 56% in the period 1950 to 1960 and between 55 and 91% in the period 1960 to 1970. This evolution has been estimated with the model:

$$y_t = \alpha_0 + \alpha_1 x_t + u_t \quad (9)$$

$$E(u_t) = 0, \quad E(u_t u_j) = \begin{cases} \sigma^2 & \text{for } i = j \\ 0 & \text{for } i \neq j \end{cases}$$

where:

$$i = 1 \dots n$$

$y_i$  = ratio of margin ( $\equiv$  retail price - producer price) to producer price, as a percentage.

$x_t$  = time:  $t(1950) = 1$ ,  $t(1951) = 2$ , etc.

Source of data was : Produktschap voor Pluimvee en Eieren, Zeist.

Estimation of the model by the method of least squares using annual data over the period 1950-70 gave the result:

(10)

$$y = 31.788 + 2.141x$$

$$(\pm 0.330)$$

$$R^2 = 0.69 \quad DW = 1.44 \quad n = 21$$

It must be concluded that in spite of increasing efficiency in egg-trading, relative margins have increased. This may perhaps be explained by the combination of low producer prices for eggs during the last ten years, with less flexible margins.

#### CONCLUSION

On the basis of foregoing research results it seems that the domestic market demand, which absorbed 71% of Dutch egg production in 1970, will increase only at a rate equal to population growth, which is a little more than 1% per year. Also it may be concluded that Dutch production of eggs may expand if export opportunities to West Germany were to improve.

These export opportunities depend not only on a gradual increase in German consumption, but especially on developments in West German production. It seems likely therefore, that Dutch egg poultry farmers in the next two or three years will not be concerned so much with increasing production, but will be more interested in improving efficiency by larger production units, by more vertical integrated production programmes and by improving marketing methods.

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