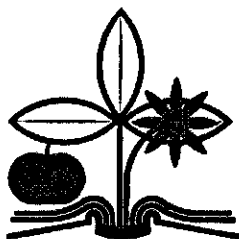


CONFERENZA NAZIONALE PER L'ORTOFLOROFRUTTICOLTURA

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e proiezione al 1970 e 1975 della domanda e della offerta
dei principali prodotti ortofrutticoli

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THE DEVELOPMENT IN PRODUCTION AND CONSUMPTION OF SOME HORTICULTURAL PRODUCTS IN THE NETHERLANDS FOR 1970 AND 1975



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by M. T. G. Meulenberg (*)

PREFACE

In this publication, the author tries to analyse the production and consumption of some vegetables and fruits in the Netherlands. Although in the Netherlands a substantial amount of statistical information is available on this subject, this showed to be insufficient for some products to establish reliable forecasts. Moreover, the importance of exports of several horticultural products leads to a greater unsteadiness of the market development.

Nevertheless we tried, although sometimes a little boldly, to make a quantitative forecast of production and consumption. The assumptions have been indicated as clearly as possible. This will make it possible to adjust these forecasts to developments different from the hypotheses made. Most of the information for this publication was taken from sources of the Produktschap voor Groenten en Fruit, for which we are most obliged. In addition the official statistics of the C.B.S. (Centraal Bureau voor de Statistiek), the « Landbouwtellingen » (Agricultural statistics) and the figures of the Landbouw Economisch Instituut (L.E.I.) were consulted. Without the close cooperation of Mr. M. A. Klumperbeek, in drafting of tables and statistics this publication would never have been achieved. For that we like to express our thanks.

CAULIFLOWER

1. Historical background and present situation

Cauliflower is a traditional product in Dutch horticulture. However, it is not a very important crop, and no distinct growth in production can be observed; in 1956 the cultivated area amounted to 4,616 hectares; in 1965, ten years later, the cultivated area was still about the same: 4,581 hectares. These figures show that the cultivation of cauliflower is rather stationary. (table 1)

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TABLE N. 1. - *Acreage of cauliflower in The Netherlands in hectares.*

	1954	1955	1956	1960	1961	1965
TOTAL	3,905	3,968	4,616	4,699	4,914	4,581
Glasshouse	—	132	157	175	160	134
Summer	1,552	1,880	1,705	1,959	2,131	2,288
Autumn	2,353	1,956	2,754	2,565	2,623	2,159

For a correct understanding of Dutch cauliflower production one should know how this vegetable is grown in Holland. We distinguish three types: (a) cultivation under glass; (b) cultivation in the open, which should be divided into (b1) summer cauliflower and (b2) autumn cauliflower.

Cultivation in glasshouses is especially located in Zuid Holland; the glasshouses are non-heated. In 1965, glasshouse-cultivation covered an area of 134 hectares, almost equal to that of 1955 (132 ha). This does not mean that the cultivation of cauliflower in glasshouses has not changed during the last ten years; on the contrary, in 1960 the area amounted to 175 hectares and since then it has been slightly diminishing. Cauliflower in glasshouses is harvested in May; mostly the supply is rather low during the first few weeks of May and it reaches its maximum in the last two weeks.

Summer cauliflower is grown in the open; it comes on the market in the course of June and July. The variation in supply depends highly on weather conditions. If the summer weather suddenly starts in the second part of June, large crops may be harvested in the end of June or the beginning of July. It is quite evident that under such circumstances the minimum-price scheme helps to prevent a total collapse of the market. Since 1950 the cultivated area of summer cauliflower in the open, which is much more important than cauliflower grown under glass, fluctuates from 1,500 to 2,000 ha. The main horticultural areas are in the western part of The Netherlands and, on a smaller scale, in the southern provinces. In these regions the danger of frost during spring is small.

Autumn cauliflower is harvested after 1st August. It is also grown on open ground. From 1960 till 1965 the production area varied from 2,000 to 2,500 ha. Since 1960 a fall in production has been observed, which is due to a reduction of the traditional growing areas in the province of Nord Holland. The market-gardeners in this region try to raise their income by replacing traditional products, which include cauliflower, by others, like bulbs. However, substitution possibilities are still very limited as numerous plots in this horticultural area can only be reached by boat. This is one of the reasons that these farms lack more profitable glass cultivation. This can only be changed by improving the communication facilities of these areas by re-allotment.

TABLE N. 2. - *Total production and yield per ha of cauliflower in The Netherlands.*

	1950	1955	1960	1965
TOTAL × 1 ton	63,400	67,800	56,400	48,800
Yield per ha	16.240	17.001	12.000	10.830

The yield per ha varies considerably from year to year (see table 2). In 1964 it was 13 tons/ha, in 1963 however, it was 11 tons/ha. This is due to climatic conditions.

The Dutch production of cauliflower is mostly sold in Holland itself. In 1964 the quantity auctioned (= production) was about 358,900 tons, of which 50,300 tons were for local sale and 8,600 tons for export. Moreover, in 1964 considerable quantities of cauliflower were imported, that is 20,100 tons.

Imports are concentrated in May, June and July. In May, imports from France are dominant, in June and July those from Belgium. In August and the following months, there is hardly any import. From 1950 till 1956 imports ranged from 1,900 to 8,300 tons. Since 1957 they are at a much higher level, over 15,000 tons. Imports in 1964 and 1965 amounted to 20,000 and 20,700 tons.

Especially from December till May imported products seem to have a good market, because during this time there is no supply of home products.

TABLE N. 3. - *Production, import, domestic consumption and export of cauliflower in The Netherlands.*

		Production	Import	Domestic consumption	Export	
					Total	To W. Germany
1950	× 1 ton	71,000	2,600	58,900	14,700	12,300
1955	id.	67,800	8,300	65,700	11,400	6,100
1960	id.	57,200	12,300	59,400	10,100	6,700
1965	id.	48,800	20,700	62,900	6,600	5,200

During the last fifteen years there has not been much rise in the consumption per head. Import increases as soon as home production starts to fail. The small Dutch export mainly goes to W. Germany.

2. Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

As already mentioned in section 1, cauliflower is an important product in some more static horticultural areas of the Netherlands. Although the average cultivated area shows strong fluctuations from year to year, it has remained around 4,500 hectares during the last ten years.

An effort has been made to explain the acreage for cauliflower in the year t as a function of the price of cauliflower in $(t-1)$. This analysis is based on the assumption that the growers of cauliflower trail behind the market. For that reason the following function was estimated:

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

y_t : acreage of cauliflower in hectares in the year t
 x_{t-1} : average wholesale price for cauliflower in gld/100 in the year $t-1$
 u_t : random term

Source: C.B.S., Landbouwtellingen; Produktschap voor Groenten en Fruit.

Least squares estimation of this function yielded unreliable results. Hence, for the total acreage « trailing behind the Market » could not be demonstrated.

However, applying equation (1) to summer and autumn cauliflower separately gives a different picture.

Application of the equation to summer cauliflower with data on the period 1951-1965 gave the following results:

$$(2) \quad y_t = 1887 + 20.679x_{t-1} \quad r^2 = 0.44 \\ (\pm 6.769)$$

y_t : acreage summer cauliflower in ha in the year t
 x_{t-1} : average wholesale price in gld/100 from April till July in the year $t-1$

Source: C.B.S., Landbouwtellingen; Produktschap voor Groenten en Fruit.

This shows that the price in the preceding year $t-1$ has a statistically reliable influence on the acreage in the year t . The price-elasticity of the supply was: $\Sigma_{yx} = 0.32$. The low value of r^2 shows on the other hand that the fluctuations of the acreage for an important part cannot be explained by price changes. For autumn cauliflower this phenomenon of trailing behind the market cannot be demonstrated. Estimation of function (1) using figures on cauliflower acreage and prices from records of the period August till December, yielded a statistically unreliable result. The difference between the supply of summer and autumn cauliflower might be a consequence of more alternative possibilities in using the acreage. The growing of autumn cauliflower is concentrated in Noord Holland, a region with a limited production programme. Moreover, autumn cauliflower is an after-crop, with few alternatives. Summer cauliflower on the contrary is spread over various production areas with more alternative possibilities. This also applies to the important production area in Noord Holland, which may go into early potatoes, for instance, at that time.

2.2. - PROJECTIONS FOR FUTURE SUPPLY

During the last ten years the pattern of cultivation has not changed — the acreage ranged from 4,000 to 4,500 ha. Neither have summer and autumn crops separately changed structurally. On the other hand the figures of the last five years show a slight drop in autumn and a small increase in the production of summer cauliflower.

On the basis of available times series for 1954-1965 an acreage on the

same level — around 4,500 hectares — seems the most probable for 1970 and also for 1975. This figure should be revised — in any case for 1975 — for possible structural changes in the important production area of Noord Holland. The structure of this horticultural area needs drastic improvement. Today, many market gardeners still depend on boats to transport their products. If re-allotment takes place in these production areas they may come within reach of trucks. Glasshouse cultivation might advance at the expense of cultivation in the open, which includes cauliflower.

Moreover, the competition for labour between the rather labour-intensive cultivation of cauliflower and the expanding industries in bordering areas will increase rapidly.

To what extent these factors will cause a decrease of the Dutch production of cauliflower depends as well on the development in other horticultural areas in Holland, of which some still have expansion possibilities. In this regard the future price-level and hence competition of imports are of great importance too.

Till 1970 the influence of the above mentioned factors probably will not be great. Therefore in 1970, the acreage will probably still be 4,500 hectares. The production will also be the same; the average production during the last six years amounted to 53,800 tons. It cannot yet be forecast how much the acreage in 1975 will differ from the present 4,500 hectares on the basis of the factors mentioned.

The production per ha shows a considerable variation from year to year (see table 2).

No trend is seen in this variation, however. Therefore change of the yield per ha is a negligible factor when considering structural changes in the supply.

3. Analysis and forecast of demand

3.1. - ANALYSIS

This analysis is limited to home consumption and is based on time series and budget data.

The following function was formulated for the consumption of cauliflower:

$$(3) \quad y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + u$$

y : yearly per capita consumption of cauliflower in kg

Source: Produktschap voor Groenten en Fruit

x_1 : the per capita disposable income in guilders deflated by the price-index of cost of living

x_2 : retail-price for cauliflower, quotation retail market Amsterdam in ct/kg, deflated by the price-index of cost of living

From: Produktschap voor Groenten en Fruit, C.B.S. Maandschrift (monthly review), C.B.S., Nationale Rekeningen

u : random term.

Estimation of this function by the method of least squares with data on the periods 1952-1964 and 1957-1964 gave the following result:

Period 1952-1964

$$(4) \quad y = 7.4008 + 0.001086x_1 - 0.07546x_2 \quad R^2 = 0.569 \\ (\pm 0.00082) \quad (\pm 0.02373)$$

The income elasticity, ϵ_{x_1} , and the price elasticity ϵ_{x_2} , derived from (4) are equal to:

$$\epsilon_{x_1} = 0.41 \text{ and } \epsilon_{x_2} = -0.92.$$

However, it should be mentioned that the influence of the income at the 5% level does not differ significantly from zero.

Period 1957-1964

$$(5) \quad y = 9.9957 - 0.0002377x_1 - 0.07273x_2 \quad R^2 = 0.72 \\ (+ 0.001487) \quad (+ 0.0323)$$

The influence of the income is not statistically significant, that of the price is significant and the average price elasticity during this period was $\epsilon_{x_2} = -0.92$. The average price elasticity from 1961 till 1964 was: $\epsilon_{x_2} = -1.15$.

Analysis based on budget data

$$(6) \quad y_i = \alpha_0 + \alpha_1 x_{1,i} + \alpha_2 x_2 + u_i$$

y_i : logarithm of the average cauliflower consumption in kg/consumer unit in class i

$x_{1,i}$: logarithm of the total expenditures per consumer unit in guilders in class i

x_2 : 0, 1 variable

Source: Statistical Office of the EEC, Sociale Statistiek, Speciale Serie no. 3; Budgetonderzoek 1963/1964 Nederland, Tabellen B1 till B 13 p. 90*-175*

The variables y_i and $x_{1,i}$ were weighted by the square root of the number of families in class i . An estimation of function (6) by means of the least squares method gave:

$$(7) \quad y = -7.3586 + 0.32355x_1 + 0.42843x_2 \quad R^2 = 0.95 \\ (\pm 0.03157) \quad (\pm 0.5264)$$

Thus budget analysis in contrast with time series 1957-1964 analysis, shows a statistically significant influence of the income; the income elasticity 0.32 does not deviate much from the value derived from the analysis based on time series on the period 1952-1964.

3.2. - FORECAST FOR CONSUMPTION IN 1970 AND 1975

Considering the similarity between the results from budget- and time series analysis for the period 1952-1964, a forecast was established for the per capita consumption in 1970 and in 1975 with equation (4). Assumptions were made about the increase in real income and the increase of the total population. The forecast was made assuming constant prices. The results have been summarized in table 4.

TABLE N. 4. - Forecast about consumption of cauliflower in The Netherlands in 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
1.	5,299	69,800	5,700	5,780	5,860	80,900	82,100	83,200
2. in % of 1964. . .	109.9	121.2	118.3	119.9	121.6	140.5	142.5	144.4
3. Assumptions: income per capita in 1970:			2,955 guilders					
income per capita in 1975 - low:			3,325 guilders					
- middle:			3,398 guilders					
- high:			3,472 guilders.					
rate of growth of income per capita (1965-'70) per year:						3.4%		
rate of growth of income per capita (1970-'75) per year:						low: 2.5%		
						middle: 3.0%		
						high: 3.5%.		
population in 1970: 13.17 million; 1975: 14.20 million.								

4. - Comparison of expected development of consumption and production in The Netherlands

An increase in consumption is expected up to approximately 69,800 tons in 1970 and 82,000 tons in 1975. Whether this increase in consumption will stimulate the Dutch production of cauliflower depends on the price-level. Probably the increasing demand will be met largely by means of imports. Imports may increase also because of the stimulating effect of the EEC on French and Italian imports. Imports of 30,000 tons by 1970 and of 37,000 tons in 1975 may very well be reached.

EARLY POTATOES

1. - Historical background and present situation

Production

For many years early potatoes have been grown on horticultural farms in Noord Holland (« De Streek » and « Langedijk » districts). In Friesland also early potatoes are of some importance and they are increasingly grown in the agricultural area of the Noord-Oost Polder. Table 1 shows the development of the production of early potatoes.

In 1938, early potatoes covered an acreage of 8,586 ha, which in 1949 had been expanded to 11,944 ha. The following years show a slight decrease in acreage. Since then it has been fluctuating between 8,000 ha and 10,000 ha. In the traditional production areas of Noord Holland this decrease is partly due to restrictions because of soil sickness and to the expansion of the more profitable growing of flower bulbs. The yearly fluctuation in production is due to differences in acreage and in yield. Yield is determined

TABLE N. 1. - *Acreage and production of early potatoes in The Netherlands.*

	1950	1955	1960	1965
Acreage × 1 ha	10,000	8,864	9,524	7,499
Production × 1 ton	175,000	176,000	199,000	156,600
Yield/ha × 1 ton	17.500	19.900	20.900	20.900

by climate and also by the time of lifting. If potatoes are lifted early, for example in early June, the yield per ha will be low. In the reverse, if the lifting is done at a late time, for example in early July, yields per ha are high.

Marketing

Early potatoes are sold for consumption or as seedpotatoes. Shifts from one outlet to the other depend to a certain extent on the price-level on the respective markets. The price-level in June and July is affected by the stocks from the preceding potato-crop. A considerable part of Dutch early potatoes is exported — especially as seed-potatoes —. Further, more strongly fluctuating imports contribute to an active market. Imports show an increasing trend (table 2).

TABLE N. 2. - *Outlets of early potatoes for human consumption in The Netherlands.*

	1950	1955	1960	1965
Home consumption × 1 ton	74,700	53,400	87,600	86,300
Export id.	20,000	26,800	3,400	17,200
Import id.	900	10,000	32,600	52,900

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

Short term

Short term fluctuations in the acreage under potatoes cannot be explained from price-changes in the preceding year. On the other hand, a positive correlation $r = 0,66$ was ascertained for the period 1949-1964, between the acreage under early potatoes in the year t and the cash yield/ha in the year $t - 1$. Although the correlation is statistically significant, its value is too small to explain fully short term changes in the acreage from the price in the preceding year.

Long term

Although from 1963 to 1965 the acreage was decreasing fast, the period is rather too short to determine a trend. The decrease in production of early potatoes in the main production area of Noord Holland is more evident:

TABLE N. 3. - *Important early-potato areas in The Netherlands (Noord Holland, Noord-Oost Polder). Total production, seed and human consumption respectively.*

	Acreage × 1 ha		NOP in % of Nd.-Holl.	Sales × 1 ton		Human consumption in % of seed-potatoes
	Noord-Holland	NOP		seed	human consumption	
1950	—	—	—	—	—	—
1955	—	—	—	74,000	102,000	137.8
1960	5,028	694	13.80	89,000	79,000	88.8
1965	3,464	675	19.49	106,000	50,600	48.2

in 1955: 5,797 ha in 1965: 3,464 ha. The main reasons are high production costs and the possibility of growing other, more profitable crops. In Noord Holland, production costs of early potatoes are high because of the rather small plots, which often can only be reached by boats, and cultivation cannot be mechanized easily. More profitable bulb-growing is expanding at the expense of potato-growing.

The decrease in Noord Holland is only in part compensated by expansion on the arable farms in the NOP, which have better possibilities for mechanisation. This change in the location of the production areas is accompanied by a change towards selling more of the crop as seed-potatoes. Imports of early potatoes for consumption are growing. Finally it should be emphasized that by improved storage methods, more potatoes of better quality from the preceding year are being supplied during the early-potato harvesting season yet.

2.2. - PROJECTION OF FUTURE SUPPLY

How big an influence the factors mentioned under 2.1. will have on the supply in 1970 and 1975, cannot be estimated. Most probably the acreage under early potatoes will continue to decrease. To make a rough estimate: to between 6,000 and 6,500 ha in 1970 and between 5,500 and 6,000 ha in 1975. It also seems likely that the sale as seed-potatoes will become more and more important compared to human consumption. As already stated, fluctuation in the yield/ha is not only due to climatic influences but also due to the time of lifting. From 1953 to 1965 the average yield/ha varied from 15 to 25 tons, which brought about considerable fluctuations in the total production. It is therefore impossible to give a reliable forecast for the production, on the basis of a probable acreage in 1970 and 1975.

3. - Analysis and forecast of the demand

3.1. - ANALYSIS

The per capita consumption of early potatoes does not show any specific trend, fluctuating between 4.5 and 7.5 kg per year since 1955. As stated above, consumption is increasingly being satisfied from imports (table 4).

TABLE N. 4. - *Per capita consumption of potatoes.*

	Per capita consumption of potatoes				
	1955	1960	1962	1963	1965
1. Total potatoes . . . × 1 kg	105.000	98.000	100.000	97.000	90.000
2. Early potatoes . . . × 1 kg	4.968	7.629	6.745	4.977	7.021
3. of which imported . × 1 kg	0.930	2.839	2.610	1.078	4.304
4. imported in % of early potatoes	18.72	37.21	38.70	21.66	61.30

No reliable results were obtained from a statistical analysis of the relation between the consumption and the price of early potatoes and the income available for consumption respectively. An analysis comprising more explanatory variables, like price of potatoes from stocks of the preceding crop, was not possible, because of lack of data. Instead, only a statistical analysis of the total yearly consumption of potatoes was made. On the basis of the estimates obtained from this analysis, the development in the consumption of early potatoes will be examined in more detail.

Analysis based on time-series

The relation between the consumption of potatoes and the income and the price is expressed in the following function:

$$(1) \quad y = a_0 + x_1x_1 + x_2x_2 + u$$

y : per capita consumption of potatoes in kg

Source: Produktschap voor Groenten en Fruit

x_1 : per capita disposable income in gld, deflated by the price-index of cost of living

Source: C.B.S., Jaarrekeningen; C.B.S., Maandschrift (Monthly Review)

x_2 : retail price of potatoes in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit

Estimation of this function on the basis of time series 1952-1964, by the method of least squares gave the following result:

Data period 1952-1964

$$(2) \quad y = 122.1499 - 0.01021x_1 - 0.1751x_2 \quad R^2 = 0.87 \\ (\pm 0.00255) (\pm 0.0731)$$

The value of the income elasticity and the price elasticity was:

$$\epsilon_{x_1} = -0.19 \text{ and } \epsilon_{x_2} = -0.0342 \text{ respectively.}$$

Data period 1957-1964

$$(3) \quad y = 108.456 - 0.01059x_1 + 0.5501x_2 \quad R^2 = 0.909 \\ (\pm 0.00168) (\pm 0.1695)$$

The average income elasticity is $\epsilon_{x_1} = -0.22$. The negative income elasticity of potatoes shows the decline in the per capita consumption. This decline however is rather small at present, as there is increasing consumption of potato crisps and other potato products. Whereas in equation (2) a slightly positive influence of price-reduction on the consumption was observed, one may notice an unlikely positive correlation between price and consumption in (3). Therefore influence of prices will not be considered here after.

Analysis based on budget data

On the basis of budget survey 1963/64 of the EEC, the following equation was estimated for industrial and office workers separately:

$$(4) \quad y_{1, i} = \alpha_0 + \alpha_1 x_{1, i} + u_i$$

$y_{1, i}$: logarithm of consumption of potatoes in kg per consumer unit in income class i

$x_{1, i}$: logarithm of total expenditures per consumer unit in class i

u_i : random term

Source: C.B.S., National Budgetonderzoek 1963/64.

Estimation of this equation by means of least squares gave for office workers an income elasticity of -0.4 , whereas the elasticity for industrial workers did not differ significantly from zero.

3.2. - FORECAST FOR HOME CONSUMPTION IN 1970 AND 1975

Potatoes as a whole

Using equation (3), the consumption of potatoes was estimated for 1970 and 1975, assuming constant prices. Official forecasts were used in respect of population and income. The results are summarized in table 5.

Some special points on the consumption of early potatoes

The consumption of early potatoes seems to be affected by the same influences as the total potato consumption.

TABLE N. 5. - Forecast of the domestic consumption of potatoes in 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 \times 1 kg			Total consumption 1975 \times 1 ton		
	per capita \times 1 kg	total \times 1 ton	low	middle	high	low	middle	high
1.	88.115	1,160,500	84.197	83.424	82.641	1,195,600	1,184,600	1,173,500
2. in % of 1964	95.8	104.0	91.5	90.7	89.8	107.2	106.2	105.2
3.	For assumptions about income per capita and growth of population in 1970 and 1975 the reader is referred to table 4 in the section on cauliflower.							

However, in our opinion there are some arguments which make decline in the consumption of early potatoes unlikely. A total potato consumption of 83.4 kg per head in 1975 means an average per capita consumption of 6.95 kg per month. Even in case of a rather high consumption of 6 kg of early potatoes yearly, this still means at maximum a per capita consumption of approximately 3 kg per month for June and July. Considering the fact that the consumer regards early potatoes to be of higher quality than « old » ones from storage, it seems possible to maintain the consumption level of early potatoes by substitution of « old » potatoes.

Of course, such substitution will be affected by the difference in price between the two categories. The opportunities for substitution in June and July may be over-estimated a little as the average monthly consumption of 6.95 kg in 1975 also includes products like potato flakes and crisps and it is not likely that these will be made from early potatoes. Assuming a yearly per capita consumption of 5.0 kg, like in 1965, domestic consumption of early potatoes will amount to 65,850 tons in 1970 and 71,000 tons in 1975.

4. - Confrontation of the prospective consumption and production in The Netherlands

The Dutch production of early potatoes will decline, but the extent cannot be forecast exactly. It is estimated that the decrease in acreage will amount to approximately 1,500 to 2,000 ha during the period 1965-1975. Moreover, an increasing part of the early potato-crop will be sold as seed-potatoes.

Whereas the total per capita consumption of potatoes continues to diminish, as yet this is hardly noticeable with regard to early potatoes, because early potatoes are of a special quality having only a small share in the total potato consumption. Hence, the decreasing domestic supply for consumption of early potatoes will lead to wider openings for imports from June till August.

It is impossible to make an exact forecast on imports. If the projected decrease in acreage is realistic an increase of imports to about 40,000 tons in 1970 and about 60,000 by 1975 may certainly be reached. Whether this can be achieved depends on the price as well as the quality of imported potatoes.

ONIONS

1. - Historical background and present situation

Production

The cultivation of onions in The Netherlands comprises seed-onions and silverskin-onions. The cultivation of seed-onions is the most important and only this will be considered in this analysis. In The Netherlands seed-onions are grown on farms in the south western part of the country. Of the approximately 5,000 ha of seed-onions in 1964 and approximately 5,600 ha in 1965, about 70 % were concentrated in the province Zeeland and on the islands of the province Zuid Holland. Apart from these areas onion production only is increasing in the Noord-Oost Polder.

TABLE N. 1. - *Acreage and production of seed-onions in The Netherlands.*

	1950	1955	1960	1965
Acreage × 1 ha	6,240	4,094	5,159	5,317
Production × 1 ton	207,000	98,900	155,100	173,300
Yield/ha × 1 ton	33.175	24.285	30.065	32.593

Dutch production of onions varies considerably from year to year. This is not only due to fluctuations in the acreage, but also to varying yields per ha.

Depending on the financial returns farmers seem to shift arable land from onions to other crops and vice versa. From 1955 to 1965 the yield per ha varied from 23 to 37 tons per ha. High production and high quality are obtained in warm and dry weather in summer and autumn. Rain and cold during these seasons have an adverse effect on the yield per ha.

Marketing

For many years, The Netherlands has been a very important exporter of onions. In 1939, 76.5 % of the total production was exported; in 1965, exports amounted to 84.7 %. Previously the most important importer of Dutch onions was the United Kingdom; nowadays it is Western Germany, whereas England and France are still regular importers of smaller quantities.

Exports vary from year to year due to international competition. Sales to the processing industry are increasing.

TABLE N. 2. - *Production and outlets of Dutch onions.*

	Production × 1 ton	Export × 1 ton	of which to		Inland	
			West Germany	United Kingdom	total	of which industry
1950	207,000	162,000	58,700	80,700	45,000	4,600
1955	119,000	98,800	31,000	52,100	40,600	10,500
1960	208,500	178,800	72,100	65,100	50,400	15,400
1964	217,900	182,600	73,200	37,800	57,500	20,000

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

Short term

An effort has been made to explain the fluctuation in the acreage of seed-onions by the price of the preceding year. During the years 1952-1965 an increase in prices in the year t in comparison to the year $(t-1)$, which occurs in 6 years, is always followed by an expansion of the acreage in the year $(t+1)$. Of the eight years with a price-reduction in year t as compared to $t-1$, six showed a reduction in acreage in $t+1$.

Consequently, we may conclude a statistically significant positive correlation between price and acreage. However, a linear regression of the acreage in the year t on the price in $t - 1$ proved to be statistically unreliable because of extreme irregularity in quantitative effects of price-increases. The average price elasticity of the supply over the period 1952-1965 was 0.26. Of the fourteen yearly measurements of elasticities, two appeared to be negative, four were not more than 0.25, one was very high, at 2.0, and the majority, seven ranged between 0.5 and 1.0. A better understanding of the fluctuations in the acreage under onions was obtained by taking into account the acreage of gladioli as an explanatory variable in addition to the price of onions in the preceding year:

$$(1) \quad y = 2963 + 42.297x_1 - 0.883x_2 \quad R^2 = 0.27 \\ (\pm 41.526) (\pm 0.54)$$

y : acreage seed-onions in ha

Source: C.B.S., Landbouwtelling

x_1 : price seed-onions in gld/100 kg

Source: Produktschap voor Groenten en Fruit

x_2 : acreage gladioli in ha

Source: C.B.S., Landbouwtelling

Production of gladioli is concentrated in the South western part of Holland and competes with onions for the available acreage. The fit however is so low that the result of equation (1) can not be considered seriously.

Long term

The acreage under seed-onions shows no clear-cut trend for the period 1950-1965. From 1958 till 1965 the acreage ranged mainly from 5,000 to 6,000 ha per year. There must have been no real reason for a structural reduction or expansion of this crop. Only in the Noord-Oost Polder was a slight increase in the production area observed.

2.2. - PROJECTIONS OF THE FUTURE SUPPLY

The future acreage will be determined on the one hand by the price movement of onions relative to alternative crops. In addition, production costs are equally important.

In view of the dominating importance of the export trade, it is most probable that the price of Dutch onions will be determined by the opportunities for exports. Therefore, first of all the consumption on the main export markets of West Germany and the United Kingdom should be explored. Moreover, the competitive position of the Dutch onions, compared to that of the other exporters, especially Egypt, Poland and Spain, is of greatest importance. However it is very difficult to estimate the export potential of those countries. Some of the countries appear to be gaining an increasing share of the market in West Germany and the United Kingdom. Thus supplies to the German market from East European countries, Poland and Hungary, seem to be on the increase. Up till now this has not affected

Dutch exports to West Germany. Export to England however has declined slightly while especially Poland and Canada exported large quantities to this country during the last few years. Presumably exports will not be much of a stimulus for increase in the acreage under onions in Holland. However, there is no indication either that the Dutch export position is about to decline.

Regarding the influence of cost factors on the expansion of onion production it should be mentioned that the cultivation of onions is rather labour intensive in comparison to some other field crops in South-West Holland. The opening of this area to industrialisation and tourism by the so called Delta-plan will certainly enhance the absorption of rural manpower into industry and services.

Moreover, the price guarantees for wheat and sugarbeets within the framework of the EEC agricultural policy, will surely not encourage more risky cultivation of onions. In accordance with these facts a decrease in the onion production in South West Holland seems probable. On the other hand some expansion may be expected in the new polder Oost-Flevoland, because here farmers from South West Holland settle who are familiar with growing onions.

Analogous to the development in the Noord-Oost Polder an expansion of approximately 550 ha might be reached in Oost-Flevoland. However, the soil in Oost-Flevoland seems less suited to the growing of onions than in the Noord-Oost Polder, so that an expansion of approximately 330 ha will be more realistic. For 1970 this will not have much influence.

The acreage in 1970 and — 75 will probably be lower than in 1965, but it is difficult to make any forecast. A decrease to an acreage between 4,500 to 5,000 ha in 1970 and between 4,000 and 4,500 ha in 1975 seems possible.

Besides of domestic supply yearly imports of onions varied between 11,000 tons and 27,000 tons in the period 1961-1966.

3. - Analysis and forecast of the demand

3.1. - ANALYSIS

As mentioned in the introduction this analysis will be limited to home consumption of seed-onions only. From 1950 till 1960 consumption of seed-onions was slightly increasing; in 1950 it amounted to 2.53 kg per capita per year and in 1960 to 3.05 kg per capita per year. Since 1960, no systematic increase has been observed. Note that consumption remains much lower than before the war; in 1939, the consumption amounted to 4.51 kg per capita.

Analysis based on time series

The relation of the consumption of seed-onions to price and income is represented by the following equation:

$$(1) \quad y = x_0 + x_1x_1 + x_2x_2 + x_3x_3 + u$$

y: consumption of seed-onions per capita in The Netherlands, in kg

Source: Produktschap voor Groenten en Fruit

x_1 : real per capita disposable income, in guilders

Source: C.B.S., Nationale Rekeningen; deflator, price-index of cost of living

Source: C.B.S., Maandschrift, (Monthly Review)

x_2 : retail-price of onions on the Amsterdam retail market in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit

x_3 : trend variable 1952 = 1; 1953 = 2, etc.

u : random term

Estimation by means of the method of least squares on the basis of time series 1952-1964 gave the following result:

$$(2) \quad y = 3.8424 - 0.0006552x_1 - 0.005759x_2 + 0.06946x_3 \quad R^2 = 0,62 \\ (\pm 0.0003277) (\pm 0.00429) (\pm 0.002426)$$

The influence of income and price on the consumption did not differ significantly from zero. On the other hand the positive trend in consumption differs significantly from zero.

Analysis on the basis of shorter time series (1957-1964) did not yield any reliable information.

Analysis based on budget data

From budget survey data the relation between consumption and income was estimated, assuming that this relation may be expressed in the function:

$$(3) \quad y_i = \alpha_0 + \alpha_1 x_{1,i} + \alpha_2 x_2 + u_i$$

y_i : logarithm of the consumption of onions in kg per consumer unit in class i

$x_{1,i}$: logarithm of the total expenditures per consumer unit in class i

x_2 : dummy variable (0,1)

office workers $x_2 = 1$

industrial workers $x_2 = 0$

Source: Statistical Office of the EEC, Sociale Statistiek

Speciale Serie no 3 Nederland 1963/1964. Tables B1 to B13, page 90* to 175*

Estimation of this equation by the method of least squares weighting observations in class i by the square root of the number of families in class i , gave the following results:

$$(4) \quad y = -8.599 + 0.24035x_1 + 1.80763x_2 \quad R^2 = 0.65 \\ (\pm 0.0718) (\pm 1.20017)$$

This shows a positive income elasticity. There were not sufficient data available to analyse the consumption of industrial and office workers separately.

A separation of these groups would have been interesting. According to experts in nutrition, onions were daily food for several groups of manual workers some years ago; today, they are reducing their onion intake because

TABLE N. 3. - Forecast of home consumption of onions in 1970 and 1975 in The Netherlands.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
A. 1.	3.012	39,700	3.121	3,072	3.024	44,300	43.600	42,900
2. in % of 1964	97.6	105.9	101.0	99.4	97.9	118.1	116.3	114.4
B. 1.	3.283	43,200	3.394	3,415	3.437	48,200	48.500	48,800
2. in % of 1964	106.2	112.5	109.8	110.5	111.2	120.5	129.3	130.1

A: estimate on the basis of time series analysis; B: estimate on the basis of budget-analysis.
For assumptions about income per capita and growth of population in 1970 and 1975 the reader is referred to table 4 in the section on cauliflower.

of the increasing standard of living. In contrast, among other consumer-groups the consumption of onions is now stimulated by increasing variety in food.

4. - Forecast of the home consumption in 1970 and 1975

On the basis of the analysis of time series for 1952-1964 and the budget data 1963/1964, a forecast was made of the consumption, under the assumption of a certain rate of growth in income and constant prices. The results have been summarized in table 3.

From table 3 it appears clearly that the increase of the consumption of onions will be small. The growth in population is the decisive factor for increase in the total consumption.

5. - Comparison of the expected consumption and production in The Netherlands

A slight increase in home consumption and a fall in domestic production will probably characterize the Dutch onion market till 1970 and 1975. Assuming that the yield per ha will not change substantially, a slight fall in exports may be expected. On the basis of a yield of 32 tons/ha yearly production may decrease with 12,800 tons from 1966-1970 and with 16,000 tons from 1970-1975. In view of the slight increase in domestic consumption it may be concluded, that Dutch production yearly available for exports may decrease slightly with 15,000 tons during 1966-1970 and 19,000 tons from 1970-1975.

It should be mentioned that this structural change may be overshadowed from year to year by tremendous fluctuations in acreage, as a consequence of variation in prices, and in yield per ha. Imports mainly in the months May-September vary from year to year, but show a tendency to increase. This development is too weak in order to allow any conclusion.

PEAS

Peas are grown on horticultural holdings and on farms. Yearly Dutch production of peas varied between 55,400 and 87,300 tons during the period 1960 to 1965. There exists a great variety in peas harvested. Production is mainly processed by the canning industry and the quick freezing industry. For instance of the 66,224 tons peas processed in 1964 about 54,200 tons were canned and about 11,500 tons were quick frozen.

A forecast of future production of peas in The Netherlands is in our opinion impossible because of the variations in acreage and yield. Since contract farming is substantial, forecasting of acreage seems even more risky.

Average consumption of fresh peas, is according to the Budget survey 1963/64 of the EEC equal to 1,225 kg per head. Lack of adequate data prevent an analysis of consumption on the basis of time-series. Estimation of consumption of fresh peas as a function of income for office-workers and labourers provided the following result:

$$(1) \quad y = 24.17309 + 0.58430x_1 - 9.02236x_2 \quad R^2 = 0.884 \\ \quad \quad \quad (+ 0.16081) \quad (+ 2.68765)$$

y_i : logarithm of consumption of fresh peas per consumer unit in class i in grams

$x_{1, i}$: logarithm of total expenditures per consumer unit in class i in guilders

x_2 : dummy variable

Office workers: $x_2 = 1$

Labourers : $x_2 = 0$

Source: Statistical Office of the EEC, Sociale Statistiek, Speciale Serie no. 3, Budgetonderzoek 1963/64, Nederland, Tabellen B1 - B13, pp. 90*-175*

The income elasticity of 0.584 implies that consumption of fresh peas will increase in the future. On the basis of a yearly increase in income of 3.4 % per capita, consumption of fresh peas will increase with about 9.4 % from 1965 to 1970. In the period 1970 to 1975 per capita consumption will increase with about 8.5 % under the assumption of an yearly increase in income of 3 %.

So per capita consumption of fresh peas might amount to 1.35 kg in 1970 and 1.45 in 1975. On the basis of the forecasts on population — 13.17 million in 1970 and 14.20 million in 1975 — domestic consumption of fresh peas may amount to 17,780 tons in 1970 and 20,590 tons in 1975.

TOMATOES

1. - Historical background and present situation

Production

By 1930 tomato cultivation was already important in Holland. There was a noticeable fall in production during the depression of the thirties, though even during 1933-1938 production still ranged from 60,000 to 70,000 tons.

The fall in production during those years was due to the economic depression, though political conditions in Western Europe also tended to reduce export possibilities. From 80,000 tons in 1929, exports had fallen to 38,746 tons in 1938. After 1945, the tomato soon regained its position in the programme and the years 1950 to 1965 show prodigious development. The cultivation of tomatoes is concentrated in some important horticultural areas, the « Westland » and the « Kring » in the province of Zuid Holland — the area in the triangle 's-Gravenhage, Delft, Rotterdam, Hoek van Holland — and around Venlo in the province of Limburg. There are some smaller centers like Huissen near Arnhem.

Dutch horticulture is characterized by the growing of horticultural products under glass. Climatological circumstances exclude cultivation in the open of various products, like cucumbers, grapes, tomatoes, etc. An important aspect of glasshouse cultivation is the considerably higher yield per ha that can be obtained, and this is most attractive for numerous small market-gardeners. Tomatoes then are invariably grown under glass. In Holland, the number of sunny days generally does not suffice to allow tomatoes grown in the open to ripen. In the years 1963-1965 one had between 1347 and 1686 hours of bright sunshine per year. The very high number of rainy days — in the same period 191 to 252 per year — also implies that cultivation in the open offers few possibilities to produce a high quality product.

Tomatoes do not occupy the glasshouses throughout the whole year. Therefore they are often preceded and/or succeeded by some other crop, in many cases lettuce. Other crops used for this purpose are endive and spinach. The development of the acreage of tomatoes under glass reflects the considerable expansion of tomato growing during the last 15 years (table 1).

Table 1 shows that the expansion of the acreage strongly contributed to the growing of tomatoes in heated glasshouses. Heating requires investments, which cause an increase in the cost of tomatoes. However, by heating the glasshouses, production can be accelerated so that the product can be put on the market at a commercially more favourable time.

TABLE N. 1. — *Cultivated area, production, yield per ha of tomatoes under glass in The Netherlands.*

	Acreage in ha		Production × 1 ton	
	heated	non-heated	total	yield/ha
1950	355	756	75,100	67.600
1955	713	1,108	125,000	68.600
1960	1,311	1,278	201,400	77.800
1965	2,253	1,211	297,900	85.900

TABLE N. 2. - *Monthly supply of tomatoes as a percentage of total yearly production in The Netherlands.*

	Total production	April and may	June	July	August	Rest of the year
1950	100	4.75	13.90	28.23	34.08	19.04
1955	100	7.01	17.09	28.67	32.38	14.85
1960	100	16.96	21.46	22.80	21.50	17.28
1965	100	21.76	21.37	17.86	21.31	17.70

Table 2 shows that during the last 15 years the increase in production is closely connected with early cropping. Though in 1950 there was still a maximum supply in July and August, in 1965 there is little difference in supply during the months of May, June, July and August. Naturally, early cropping was only possible after having dealt with numerous technical problems.

The overall increase in tomato production is due largely to the expansion in acreage. In addition, sizeable extra output comes from an increase in production per ha. In 1950 the average yield per ha amounted to 67.6 tons, in 1965 this had been raised to 85.9 tons.

Marketing

Dutch tomatoes are for the larger part exported, although considerable quantities are for domestic sale. Sales for industrial processing are negligible.

TABLE N. 3. - *Proportional distribution of Dutch tomatoes to the most important destinations.*

	Total production	Export			Inland	Industry	Destruction
		West Germany	U. K.	Other countries			
1950	100	27.16	20.24	7.59	22.91	11.85	10.25
1955	100	46.16	16.72	8.32	21.60	2.64	4.56
1960	100	56.21	16.78	8.29	15.59	0.70	2.43
1965	100	55.93	16.91	8.90	12.43	0.48	5.35

Export

Already in 1929 exports of Dutch tomatoes amounted to 80,182 tons, followed by a fall from 1930 till 1940. Since 1950 however, exports recovered rapidly and there was an unprecedented increase in the last 10 years. The Dutch production areas are well situated with regard to the English and German consumption centers, which is most important for the sale of perishable products like tomatoes. Other factors stimulating exports are the quality of the product and efficient methods used by the market gardeners. This, together with the growth of population and increasing prosperity on the export markets contributed to the fact that in 1965 export was about

6.2 times higher than in 1950. Of the total export in 1965, about 68.6 % went to West-Germany and 20.7 % to the United Kingdom, while smaller quantities were sold to Sweden, Switzerland and Belgium-Luxemburg.

Home consumption

Although the domestic market absorbs a relatively diminishing part of the Dutch production, there is an evident increase in consumption (table 4).

TABLE N. 4. - *Yearly home consumption of tomatoes in kg per head of the population.*

1930	1938	1950	1955	1960	1965
1.020	2.130	1.676	2.522	2.734	3.156

The increase in local consumption is seen especially from April till June and is less evident in July and August.

Canning industry

Almost all Dutch tomatoes are sold to the consumer as fresh produce. The production costs are too high when compared to those of South-European countries to sell them to the canning industry. The industry may occasionally buy part of the «unsaleable» production.

Sale through auctions and the minimum-price system

In Holland the market-gardeners sell tomatoes via auctions. Until January 1st, 1966 this was a legal obligation. Today many producers are bound by a co-operative auction rule which requires that market-gardeners who are a member of a cooperative auction sell their products through this auction. This is one of the reasons that most of the production is still sold via auctions. For the sale via auctions a minimum price is fixed; tomatoes that cannot be sold at this minimum price are taken off the market. They are either destroyed or in some cases, sold on non-competitive markets. This means that sometimes a part of tomatoes earmarked for destruction are sold to the canning industry. The supplier of unsaleable products gets a compensation, which is financed by a levy on all tomatoes sold. This minimum-price scheme therefore is not a monopolistic practice, but a method to prevent disastrous market disruption. Changes in the marketing system are under way.

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

The production of tomatoes has been increasing constantly since 1950. Although the expansion fluctuates from year to year, the trend in the production has continued to rise. The acreage of tomatoes under glass during the period 1954-1965 can be represented as a function of time and price in the preceding season.

$$(1) \quad y = 1425 + 157.013x_1 + 0.669x_2 \quad R^2 = 0.991$$

$$\quad \quad \quad (\pm 8.426) \quad (\pm 2.257)$$

y : acreage of tomatoes under glass in ha

x_1 : trend; 1954 = 1, 1955 = 2 etc.

x_2 : average auction price in ct/kg in the preceding year

Increase in production finds its most important cause in an attractive cost-return relationship. This especially applies to tomatoes from heated glasshouses, supplied from April till June. The relationship between the average price to the producer in the year t and the acreage of tomatoes under glass in the year $t + 1$ is positive, but statistically unreliable. Thus deviations from the trend in production cannot be explained by prices in the preceding year.

Besides direct profitability due to growing export markets and efficient production, other factors had a stimulating effect on the expansion, such as better possibilities for complementary crops, especially lettuce. Also production of grapes under glass was being substituted by tomatoes. Because of these developments, many of the market-gardeners have expanded their production capacity under glass, often using considerable amounts of borrowed capital.

2.2. - PROJECTION OF THE FUTURE SUPPLY

To what level the supply may have increased in 1970 or 1975 cannot be deduced from the development during the period 1950-1965. In our opinion an extrapolation of the existing trend would overestimate future production. However, several factors can be mentioned which are of considerable importance for the future supply.

Qualitative approach

a) In the first place it should be noted that the development of the Dutch production highly depends on future export opportunities. The future sales on the traditional export markets like West-Germany and the United Kingdom are of decisive importance. Liberalisation of trade within the EEC will enhance marketing possibilities of Dutch produce; England's entry into the EEC is a doubtful factor in this respect.

Not only the increase in the total export demand is important; competitive supply from other countries will affect the situation as well. The Dutch product has gained a good reputation on foreign markets and certainly therefore is competitive. However big expansion of the supply from other countries may cause a slump in prices making the Dutch tomato grower reluctant to expand.

b) The specialised Dutch horticulture is characterized by small farms; in 1960, 93.2 % of glasshouse farms had an acreage of less than 5 ha. These farms can only realize a reasonable income by intensive glasshouse cropping, and this often means growing tomatoes.

Certainly tomatoes can be substituted by other products, like cucumbers. However, this possibility should not be regarded lightly. It is complicated

by technical requirements. Often the markets for substitution products do not have a growing consumption capacity either. Thus, low prices for tomatoes from heated glasshouses in 1965 led to expansion of the production of cucumbers in 1966; the prices of cucumbers however were extremely low from May till September 1966.

c) One aspect of tomato growing that cannot be forecast is the lifting of the law, limiting acreage under flowers in The Netherlands.

It is expected that abrogation of this law will lead to an increase in flower cultivation, and this may be at the expense of tomato production. Of course this will only happen if the prices on the tomato market yield considerably lower profits. Disappointing prices for early tomatoes from heated glasshouses (April-June) in 1965, and non-heated tomatoes in 1966 (July-September) certainly stimulated the interest of the gardeners in flower cultivation.

d) The development of Dutch horticulture is not determined by government policy or financial assistance. For glasshouse gardening neither public subventions nor cheap credit are offered. The influence of the government on horticultural development is limited to an efficient assistance to market-gardeners through extension advisory services, education and research. Therefore, the production of tomatoes is not at all affected by any autonomous policy of the authorities.

An effort to « quantification »

It is extremely difficult to give a quantitative forecast on the supply in 1970 and 1975 because of some incalculable factors, which will affect the production of tomatoes. Nevertheless, it is tried to make a rough quantitative estimate. Assuming that the competitive pattern on the export markets will not change, that a possible entry of England into the EEC will not have any influence on exports and that the market for flowers will steadily grow, a continuing increase in the Dutch tomato production is expected. This increase will be less spectacular than it was during the last 15 years because Dutch tomatoes have now reached a high degree of penetration on export markets. The lower financial results in spring '65 and summer '66 made the market-gardeners, who worked with high loans, more cautious. For 1970 a production of approximately 360.000 tons and for 1975 of approximately 400,000 tons lies within possibilities. This projection needs to be revised in case of a change in the assumptions.

3. - Analysis and forecast of the demand

As already shown in table 3, Dutch tomatoes are mainly exported, which implies that the tomato production in Holland depends decisively on a possible increase in the external demand. This however, is not within the scope of this analysis; we shall only analyse the domestic demand, which in 1965 covered 12.4 % of the total production.

Table 4 shows that from 1930 till 1940 the per capita home consumption increased considerably, and has been growing during the last 15 years. The highest yearly consumption per head amounted before 1940 to about 2 kg;

during the last few years it has been increasing steadily and in 1965 reached 3.16 kg per head. The increase in the per capita consumption is highest from April till June, it is less evident from July till September.

3.1. - FACTORS AFFECTING CONSUMPTION

The analysis of per capita consumption is based on time series for 1950-1965 and on budget data from the budget survey 1963-64 of the EEC.

Analysis based on time series

The local demand for tomatoes per head of the population was regarded as a linear function of the tomato price and the per capita disposable income.

$$(2) \quad y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + u$$

y : yearly per capita consumption in kg [(production-export-destruction-processing) / population]

Source: Produktschap voor Groenten en Fruit

x_1 : real per capita disposable income in guilders

Source: C.B.S., Nationale Rekeningen

Deflator: price-index of cost of living

Source: C.B.S., Maandschrift, (Monthly Review)

x_2 : retail price of tomatoes at the Amsterdam retail market in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift, (Monthly Review)

u : random term

No competitive vegetable has been included in the function as an explanatory variable, as it is impossible to select any one vegetable as the substitution product.

The function was estimated by means of the least squares method on the basis of data on the periods 1952-1964 and 1957-1964. Estimates were made separately for these periods, because changes in consumption and buying habits can also affect the magnitude of the parameters α_0 , α_1 and α_2 . In that case a reliable estimate on the basis of recent data is more suitable for forecast purposes. The result of these estimations reads as follows:

Data period 1952-1964:

$$(3) \quad y = 1.4596 + 0.001954x_1 - 0.03351x_2 \quad R^2 = 0.856 \\ (\pm 0.000262) \quad (\pm 0.01003)$$

The income elasticity ϵ_{x_1} and price elasticity ϵ_{x_2} , based on the results in equation (3) were:

$$\epsilon_{x_1} = 1.479; \quad \epsilon_{x_2} = -1.078$$

Data period 1957-1964:

$$(4) \quad y = 2.2368 + 0.0009791x_1 - 0.01789x_2 \quad R^2 = 0.622 \\ (\pm 0.0003557) \quad (\pm 0.01173)$$

The average income elasticity ϵ_{x_1} , and price elasticity ϵ_{x_2} , based on the results in equation (4) were:

$$\epsilon_{x_1} = 0.71 \quad \epsilon_{x_2} = -0.52$$

and for the period 1961-1964:

$$\epsilon_{x_1} = 0.74 \quad \epsilon_{x_2} = -0.13$$

This shows that the demand for tomatoes in The Netherlands was elastic for income and price. It is also seen that demand elasticity is decreasing.

An alternative specification, taking into account time in addition to income as explanatory variable yielded little result because of the correlation of the explanatory variables time and income.

Analysis based on budget data

The consumption of tomatoes per consumer unit was considered as a linear function of the income available for consumption and a dummy variable for the difference in the consumption level between industrial and office workers.

$$(5) \quad y_i = \alpha_0 + \alpha_1 x_{1,i} + \alpha_2 x_2 + u_i$$

y_i : logarithm of the average tomato consumption in kg per consumer unit in class i

$x_{1,i}$: logarithm of total expenditures per consumer unit in class i in guilders

x_2 : dummy variable $x_2 = 1$ for office workers
 $x_2 = 0$ for industrial workers

u_i : random term

From: Statistical Office of the EEC (Bruxelles) Sociale Statistiek; speciale serie; no. 3 Netherlands - Tabellen B. 1 till B/13, pp. 90*-175*

This function was estimated by means of the least squares method; y_i and x_i were weighted by the square root of the number of families in class i . Results:

$$(6) \quad y = -1.04137 + 0.15682x_1 + 3.07206x_2 \quad R^2 = 0.745$$

$$(\pm 0.04797) \quad (\pm 0.80167)$$

The income elasticity, derived from budget data is considerably lower than that from time series. The consumption level for office workers is evidently much higher than for labourers as indicated by the value of the coefficient of x_2 . This suggests that with changing working conditions for industrial workers (less physical effort) considerable expansion of the consumption may be possible.

3.2. - FORECAST OF HOME CONSUMPTION IN 1970 AND 1975

On the basis of equation (4), the estimate of the demand function from time series 1957-1964, a forecast was made of the consumption for 1970 and 1975, assuming constant prices. For the expected growth in income and population already available forecasts are used. Results are summarized in table 5.

TABLE N. 5. - Forecast on the consumption of tomatoes in The Netherlands for 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
1.	3.616	47,600	3.978	4.050	4.122	56,500	57,500	58,500
2. in % of 1964	117.0	127.3	128.7	131.1	133.4	151.1	153.7	156.4
3. For assumptions about income per capita and growth of population in 1970 and 1975 the reader is referred to table 4 in the section on cauliflower.								

These forecasts may have to be revised, with changing working conditions, less physical effort, stimulating the consumption of vegetables, especially among industrial workers. However it is impossible to measure to what extent these factors will influence the future consumption.

Comparison of production and consumption in 1970 and 1975

The expectations for 1970 and 1975 are subject to a number of uncertainties with respect to supply, as well as to demand. Notwithstanding these uncertainties it is expected that the available quantity for export will increase. We expect the export to amount to 310,000 tons in 1970 and 340,000 tons in 1975. Whether such exports are possible at profitable prices will depend on the growth of demand abroad. It may be concluded that exports will continue to grow in importance for the Dutch tomato industry.

APPLES

1. - Historical background and present situation

Production

In The Netherlands apples are grown on mixed farms and on specialized farms. Important areas are: De Betuwe, Southwest Holland and some

TABLE N. 1. - Acreage and production of apples in The Netherlands.

	Acreage × 1 ha	Production × 1 ton	
		total	yield/ha
1950	40,612	251,300	6.262
1955	37,201	218,200	5.865
1960	35,599	383,700	10.778
1965	33,353	358,300	10.743

sections of the province Utrecht. Specialized farms provide an ever increasing part of the total fruit production. This expansion of specialized fruit growing does not mean an expansion of acreage. The increase in acreage from 1945 till 1952 has been followed by an evident decrease. In 1952, the acreage reached a maximum of 43,138 ha, but by 1965 it had shrunk to 33,353 ha (table 1).

Production is not reduced due to the increased yield/ha; a very important fact in the development of apple production is the shift in varieties. Whereas in 1955 the variety Goudreinette dominated, with 30 % of the supply (= auction sales) and the variety Jonathan occupied second place, with 10 % of the supply, it appears especially from newly-planted orchards that the future acreage will mainly be planted with Golden Delicious, Cox Orange Pippin and James Grieve (table 2).

TABLE N. 2. - *Percentage distribution of the acreage under apples in The Netherlands according to variety and age, based on *Landbouwtellingen 1963*. Relative importance of some varieties in the total sale of trees certified by the N.A.K.B.*

Varieties	Age in 1963			Tree-sales certified by N.A.K.B.		
	< 7 yrs	7-21 yrs	> 21 yrs	1963	1964	1965
Golden Delicious	8.4	5.5	0.4	43.7	40.6	34.5
Cox's Orange Pippin	5.6	6.1	1.2	19.9	18.3	24.7
James Grieve	3.7	3.0	0.4	7.7	14.6	9.0
Other varieties	9.3	23.4	33.0	28.7	26.5	31.8
TOTAL in %	27.0	38.0	35.0	100	100	100

A striking example for the change in varieties is that of the decreasing importance of the « Brabantse Bellefleur », which in 1940 represented 20 %, and in 1955 only 1 % of the total supply (= auction sales).

Marketing

The total per capita consumption of apples is rather stable and has been around 19.0 kg since 1950. This stability in the average total consumption hides a far more lively consumption pattern of particular varieties. In particular it is likely that Golden Delicious, Cox Orange Pippin and James Grieve are taking an important place in consumption. Also, the increasing storage capacity has contributed to the spread of consumption of apples over a larger part of the year.

For detailed analysis, each variety would require separate attention. Where supply is concerned, this will be done as far as is necessary; for the analysis of the demand for each variety, available data remain insufficient.

Although main part of the Dutch apple-production is for inland consumption, also considerable quantities are exported every year. During the last few years the export has been fluctuating strongly; no clear trend in exports can be observed.

TABLE N. 3. - *Percentage distribution of the sale of Dutch apples according to destination.*

	Production	Inland	Export		Processing industry	Destruction
			total	W. Germany		
1950	100	72.6	17.2	8.9	10.0	0.3
1955	100	62.7	22.5	12.5	14.7	0.1
1960	100	61.3	20.4	16.5	16.1	2.2
1965	100	65.0	16.4	11.3	17.7	0.9

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

During the period 1956-1965 the acreage under apples showed a yearly decrease of 200 to 800 ha. The net decrease in acreage during 1956-1965 amounted to approximately 3,900 ha, notwithstanding the fact that 12,411 ha were newly planted.

The reason for this decrease in acreage may be the low profitability of old orchards, often standard trees. The price per kg apples of these traditional varieties is not very attractive. Also the old standard tree orchards are more difficult to maintain (disease control!) than orchards with modern plant systems. Because of the lack of data it is impossible to measure the impact of the low cost/return relationship on the clearing of the older orchards.

The clearing of numerous unprofitable orchards — especially those with standard trees — will continue to shrink the acreage under apples in the future. Since at 1st May 1963 out of a total of 33,844 ha of apples, 11,868 ha were 22 years old or over, considerable acreage remains available for clearing. In general it may be said that in view of market requirements only fruit from specialized fruit-farms will continue to have a good market. Probably on new, modern fruit-farms sizeable acreage will be newly planted. The substantial planting during the last ten years suggests that modern fruit growers are still confident of the future.

2.2. - PROJECTIONS OF THE FUTURE SUPPLY

Expected acreage in 1970 and 1975

Total acreage

Apple acreage at 1st May 1963 distributed according to age and variety is shown in table 2. Table 2 shows the share of different varieties in planted acreage during the period 1963-1965 too.

From 1960 to 1964 the yearly acreage cleared averaged 1,934 ha, with newly planted acreage averaging yearly 1,616 ha. In order to forecast the acreage in 1968 and 1970 the following assumptions have been made:

a) The yearly acreage to be cleared from 1965 to 1970 will be equivalent to the average in the period 1961-1964, approximately 2,000 ha. This figure

TABLE N. 4. - *Apple acreage cleared and newly planted.*

Changes in acreage	1950	1955	1960	1961	1962	1963	1964
Cleared × 1 ha	824	1,032	1,447	1,475	1,822	2,628	2,297
Newly planted . . . × 1 ha	—	463	943	1,259	1,689	2,064	2,187

is rather high because of large clearings in 1963 and 1964. A slight decrease during the period 1965-1970 is possible, because of better kept old orchards, especially those planted with standard Goudreinette trees. For that reason an alternative hypothesis of 1,700 ha cleared per year has been made.

b) The yearly planting in the period 1965-1970 will be equivalent to the average yearly planting in the period 1961-1965.

c) It is also assumed that no trees of the modern varieties Golden Delicious, Cox Orange Pippin and James Grieve will be cleared.

Based on these assumptions the acreage in 1968 and 1970 has been estimated (table 5).

Productive acreage

In order to determine the productive acreage under apples in 1970 it was assumed that all trees of 7 years of age or more are fully productive. This means that the entire acreage for 1963, minus acreage cleared 1963 to 1970, will contribute to the production in 1970. The contribution of the 6 years old trees will differ according to the variety. It is assumed that Golden Delicious in its sixth year produces 80 % of the normal yearly production, whereas other varieties realize only 50 %. This means that the 1964 planting will contribute to the harvest in 1970 in these percentages.

Furthermore it is assumed that the 1965 plantings, which will be five years old in the production year 1970, will yield 30 % of their normal yearly production. The productive acreage calculated in this way is presented in table 6.

TABLE N. 5. - *Forecast of acreage under apples in 1968 and 1970 according to variety.*

	1968		1970	
	I	II	I	II
Golden Delicious	8,091	8,319	9,241	8,621
Cox's Orange Pippin	6,221	6,350	6,869	7,084
James Grieve	3,392	3,455	3,708	3,813
Other varieties	15,049	14,329	12,535	11,035

I: annual clearance 1700 ha, trees planted 1500 ha.

II: annual clearance 2000 ha, trees planted 1700 ha.

Only *other varieties* are cleared.

TABLE N. 6. - Estimation of the Dutch apple production in 1970.

	Acreage 1963 × 1 ha	Cleared acreage × 1 ha	1964 and '65 plant- ing in product ive ha	Produc- tive acreage in 1970 ⁽¹⁾	Production 1970		
					yield per ha × 1 ton ⁽¹⁾	total × 1 ton	in % of yearly a- verage production in 1960-'65
I. Golden Delicious	4,943	—	978	5,921	18,711	110,800	292.3
Cox's Orange							
Pippin	4,466	—	375	4,841	13,338	64,600	206.4
James Grieve . .	2,459	—	202	2,661	18,250	48,600	233.7
Other varieties .	22,871	13,625	435	9,604	11,843	114,700	37.7
Total	34,739	13,625	1,993	23,107	14,658	338,700	86.0
II. Golden Delicious	4,943	—	978	5,921	18,711	110,800	292.3
Cox's Orange							
Pippin	4,466	—	375	4,841	13,338	64,600	206.4
James Grieve . .	2,459	—	202	2,661	18,250	48,600	233.7
Other varieties .	22,871	15,125	438	8,184	11,843	96,900	31.9
Total	34,739	15,125	1,993	21,607	14,852	320,900	81.4

Yearly norm: I - cleared 1700 ha and planted 1500 ha.

II - cleared 2000 ha and planted 1700 ha.

only * other varieties * are cleared.

(¹) For calculation * productive acreage * and * yield/ha * see text.

Expected production in 1970

The expected yield/ha in 1970 has been calculated separately for the important modern varieties and together for the other varieties as follows:

$$\begin{array}{r}
 \begin{array}{r}
 1962 \\
 \Sigma \text{ production }_i \\
 i = 1960
 \end{array}
 + 2 \begin{array}{r}
 1965 \\
 \Sigma \text{ production }_i \\
 i = 1963
 \end{array} \\
 \hline
 \begin{array}{r}
 1962 \\
 \Sigma \text{ acreage }_i \\
 i = 1960
 \end{array}
 + 2 \begin{array}{r}
 1965 \\
 \Sigma \text{ acreage }_i \\
 i = 1963
 \end{array}
 \end{array}
 \cdot 1.05 = \text{estimated yield/ha 1970}$$

The average over 6 years was taken in order to diminish the effect of biennial bearing. By weighting the last three years more the increase in productivity during the period 1961-1965 is to some extent taken into account. The increase in productivity because of better production methods has been estimated yearly at 1% for the period 1965-1975. The results of this calculation are presented in table 6. The production in 1970 has been forecast on the basis of the expected acreage and the yield/ha in 1970.

TABLE N. 7. - Estimate of Dutch apple-production in 1975.

	Acreage 1963 × 1 ha	Cleared acreage × 1 ha	1964-'70 planting in pro- ductive ha	Produc- tive acreage in 1975 ⁽¹⁾	Production 1975		
					yield per ha × 1 ton ⁽¹⁾	total × 1 ton	in % of yearly a- verage produc- tion in 1960-'65
I. Golden Delicious	4,943	—	3,781	8,724	19,602	171,000	451.2
Cox's Orange							
Pippin	4,466	—	2,014	6,480	13,973	90,500	289.1
James Grieve . .	2,459	—	1,059	3,518	19,119	67,300	323.6
Other varieties .	22,871	21,031	1,664	3,504	12,407	43,500	14.3
Total . . .	34,739	21,031	8,518	22,226	16,750	372,300	94.5
II. Golden Delicious	4,943	—	4,092	9,035	19,602	177,100	467.3
Cox's Orange							
Pippin	4,466	—	2,178	6,644	13,973	92,800	296.5
James Grieve . .	2,459	—	1,140	3,599	19,119	68,800	330.9
Other varieties .	22,871	22,871	1,912	1,912	12,407	23,700	7.8
Total . . .	34,739	22,871	9,322	21,190	17,102	362,400	92.0

Yearly norm: I - cleared 1700 ha and planted 1500 ha.

II - cleared 2000 ha and planted 1700 ha.

only «other varieties» are cleared.

(¹) For calculation «productive acreage» and «yield/ha» see text.

Expected production in 1975

The productive acreage and the yield/ha in 1975 was forecast in the same way as for 1970. Plantings up to 1968 will be fully productive in 1975.

Assumptions on yearly plantings and clearings in this period are a tricky affair. For lack of better information the same assumptions are made for clearing and plantings and for a possible increase in productivity as for the period 1963-1970.

Since the yield/ha, quoted to-day for well-kept fruit farms is considerably higher than our forecast of average yield for 1975, it seems that the hypothesized increase in productivity of 5% during the period 1970-1975 will be realized easily.

The probable production in 1975 has been calculated on the basis of the estimated yield/ha and on the estimated productive acreage (table 7).

3. - Analysis and forecast of the demand

The consumption of apples will be explained from the level of income, the price of apples and the price of oranges. The analysis is based on time series and budget data.

3.1. - ANALYSIS

The relation between consumption, disposable income and the prices of apples and oranges is expressed in the following model:

$$(1) \quad y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + u$$

y : per capita consumption of apples in kg

x_1 : disposable income in gld/per head deflated by the price-index of cost of living

Source: C.B.S., Nationale Rekeningen; C.B.S., Maandschrift (Monthly Review)

x_2 : retail-price of apples in ct/kg, quotation Amsterdam, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift (Monthly Review)

x_3 : retail-price of oranges in ct/kg, quotation Amsterdam, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift (Monthly Review)

u : random term

Estimation of this equation by means of the least squares method with data for the period 1957-1964 gave the following result:

$$(2) \quad y = 10.4529 + 0.006268x_1 - 0.2238x_2 + 0.1143x_3 \quad R^2 = 0.98$$

$$(\pm 0.00174) \quad (\pm 0.01799) \quad (\pm 0.1032)$$

This shows that with increasing income some increase in consumption may be expected and that the demand for apples is also influenced by price changes. For the period 1961-1964 an income elasticity of 0.71 and a price elasticity of -0.81 was calculated. Although the coefficient of x_3 , the price of oranges, has the expected sign, it still does not differ significantly from zero.

Analysis based on budget data

The relation between consumption of apples and income, for office and industrial workers, is expressed in the following model:

$$(3) \quad y_i = \alpha_0 + \alpha_1 x_{1,i} + \alpha_2 x_2 + u_i$$

y_i : logarithm of the average consumption of apples per consumer unit in class i , in kg

$x_{1,i}$: logarithm of total expenditures per consumer unit in class i , in guilders

x_2 : dummy variable

office workers : $x_2 = 1$

industrial workers: $x_2 = 0$

u_i : random term

Source: Statistical Office of the EEC, Sociale Statistiek, Speciale Serie, Budgetonderzoek 1963-1964, Nederland, Tables B 1 till B 13, p. 90*-180*

Estimation of (3) by least squares weighting the observations of y_i and $x_{i,1}$ in class i with the square root of the number of families in class i , gave the following result:

$$(4) \quad y = 1.89107 + 0.38711x_1 - 0.79915x_2 \quad R^2 = 0.98$$

$$\quad \quad \quad (+ 0.02658) \quad (+ 0.44426)$$

The income elasticity of the consumption of apples is positive (0.387) and differs significantly from zero. The income elasticity determined from budget data is much smaller than that arrived at from the analysis on the basis of time series.

3.2. - FORECAST OF HOME CONSUMPTION IN 1970 AND 1975

On the basis of the estimates in 3.1. the consumption in 1970 and 1975 can be forecast if the increase in population and in the disposable income is known. The calculation was made on the assumption that the price level will remain constant. The results of this analysis are presented in table 8.

TABLE N. 8. - Forecast of the Dutch consumption of apples in 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
1.	24.467	322,200	26.786	27.244	27.707	380,400	386,900	393,400
2. in % of 1964	101.9	110.7	111.6	113.5	115.4	130.7	132.9	135.1
3. For assumptions about income per capita and growth of population in 1970 and 1975 the reader is referred to table 4 in the section on cauliflower.								

4. - Comparison of the expected consumption and supply of apples in The Netherlands

The results obtained in section 3 show that the export of apples will decrease. They even seem to indicate that by 1975 the export will cease altogether. It should however be noted that the increase in consumption, especially from April till July, will be satisfied from imports greatly. In the production years 1964-1965 and 1965-1966 imports during that period already amounted to 20.9 thousand and 22.3 thousand tons respectively. It is difficult to estimate the further growth of imports. But in 1975, Dutch growers will certainly still be exporting apples. To forecast the size of exports is very difficult.

Finally it should be emphasized that the forecasts for 1975 are influenced to a high extent by assumptions on cleared, planted acreage, and yields.

GRAPES

1. - Historical background and present situation

Production

Production of grapes in Holland was introduced in 1647 and started in the « Westland », main horticultural area of the province Zuid Holland. Today, this region is still the main production area. The grapes are grown in glasshouses, because the Dutch climate makes growing in the open practically impossible. The harvest is in autumn (September, October). From 1930 to 1940 there was a great expansion of the cultivation; in 1930, the supply sold through auctions was approximately, 11,500 tons; in 1935, it had already risen to 24,100 tons, and in 1939 a further, though small increase to 25,100 tons was realized.

After 1945, this 1939 record has not been broken. The acreage has been declining rapidly, especially during the last ten years. In 1965, there were only 244 ha, of which 42 ha were heated glasshouses and 202 ha non-heated glasshouses. The production figures show a similar trend; whereas in 1939, the supply sold through auctions was approximately 22,800 tons, in 1965 it had dropped to 5,900 tons.

Marketing

Dutch grapes are mainly for home consumption. In 1930, the average consumption of grapes amounted to approximately 0.73 kg per head and with reduced prices it increased up to 1.90 kg per head in 1939. In the period after 1945, the consumption started at a very low level. From 1955 to 1962 it was around 0.6 kg per head. From 1963 on there has been a rapid increase in the per capita consumption. However, in 1965 the average per capita consumption (1.2 kg) was still far below the 1939 level. Before the war the export of grapes was rather important: in 1935 the export amounted to 8,277 tons, 36.7 % of the total production. In 1939 the export was still at about the same level, 8,253 tons, 36.2 % of the total production.

There has also been a considerable drop in the export. Export is mainly to West Germany.

TABLE N. 1. - *Acreage, production and sale of Dutch grapes.*

	Acreage × 1 ha	Production × 1 ton	Home consumption	Export	Import
1935	—	24,100	15,800	8,300	—
1939	—	25,100	16,800	8,300	—
1950	608	15,600	7,700	7,400	—
1955	464	11,200	6,800	4,000	—
1960	383	9,700	7,400	2,400	400
1965	244	5,900	14,800	1,400	10,900

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

The yearly fluctuations in supply are of little importance in the light of structural changes in grape production. Therefore this analysis will deal with the factors that affect the long term production. The decrease in the Dutch production of grapes is due to structural changes. The Dutch grape growers can hardly compete with producers in South European countries. The main reasons are:

a) Dutch grapes do not easily become as sweet as the Mediterranean product, because of the shortage of sunny days in the Dutch climate. This should be compensated by the attractive appearance of glasshouse grapes. Attempts have been made to reduce this handicap.

b) The production costs of grapes in glasshouses, especially in heated glasshouses, are much higher than those in Mediterranean countries.

c) Attractive profits obtained from vegetables grown under glass (tomatoes and lettuce) stimulated the substitution of grapes by other crops, especially by tomatoes.

Notwithstanding this structurally difficult competitive position the Dutch grape-culture was able to survive the first 10 to 15 years after the second world war by rationing imports. In 1959 an import quota of 335 tons from EEC-countries was allowed. This quota was increased during the following years, and on 1st July 1961 the limitations on import of grapes into The Netherlands were lifted. The resulting increase in imports caused a massive decrease in domestic production. The acreage under grapes dropped from 375 ha in 1961 to 244 ha in 1965. Imports come from Italy — in 1965 approximately 4,000 tons —, while France has been taking an equivalent position with approximately 3,400 tons in 1965.

2.2. - FUTURE SITUATION

Undoubtedly, the acreage under grapes will continue to decline because of structural difficulties. If this trend continues at the same rate, the area of grapes in 1970 will only cover approximately 100 ha and by 1975 grape-culture will be a thing of the past. The latter assumption is in our opinion too extreme. It is still possible that an acreage of a little less than 100 ha will also prevail in 1975 for the following reasons:

a) Dutch grapes from glasshouses have an attractive appearance; therefore they will continue to be sold as a special product, especially if the sweetness can be improved. However this will depend to a great extent upon the promotion for Dutch grapes.

b) The profitability of alternative crops under glass — especially tomatoes — is being compressed.

These arguments suggest a slow decrease in the acreage. However, in our opinion they are not strong enough to stimulate new plantings.

3. - Analysis and forecast of the demand

3.1. - ANALYSIS

The increase in consumption of grapes from 1930 to 1940 was mainly due to the fall in price. In post war years because of the quota system on imports the consumption could only slightly rise until 1961.

From 1961, this limitation was lifted and the consumption increased rapidly.

In addition to lower prices the increasing standard of living contributed favourably to the consumption. This will be analysed more closely on the basis of time series and budget data.

Analysis based on time series

On the basis of time series for 1952-1964 and 1957-1964, the relation between consumption of grapes and the income and price of grapes was estimated as follows:

Period 1952-1964

$$(1) \quad y = 0.2273 + 0.0002815x_1 - 0.0001825x_2 \quad R^2 = 0.36$$

$$(\pm 0.0001186) \quad (\pm 0.0005223)$$

Period 1957-1964

$$(2) \quad y = 0.9426 + 0.0003420x_1 - 0.00505x_2 \quad R^2 = 0.916$$

$$(\pm 0.000146) \quad (\pm 0.00164)$$

y : per capita consumption of grapes in kg

Source: Produktschap voor Groenten en Fruit

x_1 : per capita real disposable income in guilders

Source: C.B.S. Nationale Rekeningen

Deflator: price-index of cost of living

Source: C.B.S., Maandschrift, (Monthly Review)

x_2 : retail price of grapes in ct/kg, quotation Amsterdam, deflated by the price-index of cost of living

The fit (R^2) shows that our attention can be limited to equation (2). During the period 1957-1964 a free market became into existence after the quota system had been abolished. A statistically significant influence of the price, price elasticity — 0.965, was established for the period 1961-1964. A statistically significant influence of income, income elasticity 0.864, was established for the period 1961-1964.

Analysis based on budget data

The relation between consumption and income is represented in the following equation:

$$(3) \quad y_i = \alpha_0 + \alpha_{1,i} + \alpha_2 x_{2,i} + u_i$$

y : logarithm of the consumption of grapes in kg per consumer unit in class i

$x_{1,i}$: logarithm of total expenditures per consumer unit in class i

x_2 : dummy variable (0,1)
 office workers: $x_2 = 1$
 industrial workers: $x_2 = 0$

u_1 : random term

Source: Statistical Office of the EEC, Sociale Statistiek; Speciale Serie, Bud-
 detonderzoek 1963-1964, no. 3, Nederland, Tables B 1-B 13 p. 90*-175*.

Estimation of this equation by the method of least squares, weighting data class i by the square root of the number of families, gave the following result:

$$(4) \quad y = -14.9102 + 1.02231x_1 + 4.53759x_2 \quad R^2 = 0.93 \\
 (+ 0.11492) (\pm 1.92062)$$

The income elasticity here is 1.02 and is slightly higher than that derived from equation (2). The coefficient of x_2 , the dummy variable, shows that the consumption level of office workers is much higher than that of industrial workers.

Forecast of home consumption in 1970 and 1975

On the basis of the results in 3.1. a forecast was made of the consumption of grapes, assuming constant prices and using projections on income and population in 1970 and 1975.

These forecasts are clearly underestimations. A consumption of 1.123 kg per head was forecast for 1970 and a consumption of 1.249 to 1.3 kg per head for 1975, depending on the assumptions used. However, in 1965 the per capita consumption amounted to 1.2 kg already. This is considerably higher than the amount forecast for 1970. The analysis from 3.1. provides an incomplete picture of the structural changes in consumption. In our opinion a per capita consumption of 1.5 kg in 1970 and 2.0 kg in 1975 can be easily achieved if an efficient sales-promotion is carried through. For this, an important factor will be the cooperation of retail chains and supermarkets. The level mentioned seems within reach, considering that the per capita consumption in 1939 amounted to approximately 1.9 kg. Under the assumption of a population of 13.17 million in 1970 and 14.2 million in 1975, a consumption of 19,700 tons in 1970 and of 28,400 tons in 1975 seems very well possible.

4. - Comparison of the expected consumption and production in The Netherlands

During the last five years The Netherlands became an importer of grapes. In the season 1961-1962, the imported quantity amounted to approximately 7,700 tons, and in 1965-1966 this had almost doubled to 14,800 tons. A further increase in consumption will be met completely by imports. Similarly the decrease in domestic production by approximately 90 ha, equivalent to a production of approximately 2,100 tons will be compensated by imports too.

If these forecast on production and consumption will be realized, imports will increase to approximately 17,000 tons in 1970 and will continue to rise to approximately 26,000 tons in 1975.

LEMONS

The consumption of lemons in The Netherlands is limited. Per capita consumption remained consistently at 0.7 kg from 1957 until 1964. In 1965 consumption increased to 0.8 kg. Any forecast about the future is speculative. Disregarding structural changes in consumption and assuming a very smooth increase in consumption a per capita consumption between 0.9 to 1.0 kg in 1970 and of about 1.1 to 1.2 kg in 1975 seems possible. In that case domestic consumption of lemons will amount to about 12-13 thousand tons in 1970 and 16.000 tons in 1975. — Population estimates: 1970: 13.17 million, 1975: 14.2 million —.

ORANGES

1. - Historical background and present situation

By 1929, the per capita consumption of citrus fruits already amounted to 6.4 kg in The Netherlands. In spite of the decline in the income the consumption of citrus fruits increased during the thirties and reached a level of 9.7 kg per head in 1938. After 1945, the consumption remained at a rather low level for some years because of the economic situation. Since 1950 however, there has been a spectacular increase. By 1953 the pre-war maximum was surpassed, with a consumption of 10.0 kg per head; in 1960 it was 16.3 kg, and in 1965 it had advanced to 19.7 kg per head. Parallel with these figures for citrus fruits one may observe a similar growth for oranges. Although in 1950/1951 only 5.9 kg was consumed per head, this amount had increased to 18.2 kg per head in 1964/1965. Beside the growing demand for fresh citrus fruits the market for canned products also expanded. For the latter however, no exact data are available.

The consumption of oranges in The Netherlands is completely covered by imports. The main suppliers are Spain, Israel and the United States. From June till November substantial quantities are imported from the Union of South Africa (table 1).

TABLE N. 1. - *Total Dutch imports of oranges by countries of origin.*

	Imports × 1 ton	of which from				Consumption per head × 1 kg
		Spain	Israel	U.S.A.	South Africa	
1950	59,100	—	—	—	—	5,846
1955	116,800	51,400	15,700	33,400	8,000	10,866
1960	179,900	77,900	31,000	9,000	17,400	15,667
1965	213,000	73,400	27,600	16,300	11,600	17,328

2. - Analysis and forecast of the demand

2.1. - ANALYSIS

The main causes for the increase in the consumption of oranges are:

- a) The growing per capita income.
- b) Lower prices of oranges.
- c) The higher sale efforts of retail trade, especially of the chains.

The higher need for vitamin C in the winter is often regarded an important factor for the consumption of oranges. This however will not be examined here.

Analysis based on time-series

The relation of consumption to income, and price is expressed in the following function:

$$(1) \quad y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + u$$

y : per capita consumption of fresh oranges in kg

Source: Produktschap voor Groenten en Fruit

x_1 : the per capita disposable income, deflated by the price-index of cost of living

Source: C.B.S., Nationale Rekeningen; C.B.S., Maandschrift (Monthly Review)

x_2 : retail price of oranges in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift (Monthly Review)

x_3 : retail price of apples, quotation Amsterdam in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift (Monthly Review)

u : random term

Estimation of this equation by means of the method of least squares on the basis of time-series for 1957-1964 gave the following result:

$$(2) \quad y = 17.2199 + 0.004120x_1 - 0.1364x_2 + 0.04825x_3 \quad R^2 = 0.81$$

$$(\pm 0.002293) (\pm 0.06874) (\pm 0.02396)$$

Changes in the disposable income and in the retail price of oranges and apples offer a good explanation for the changes in the consumption. The income- and price-elasticity for the period 1961-1964 was 0.54 and -0.80 . The cross-elasticity with regard to the price of apples was 0.202. Because of multi-collinearity the standard deviations of regression coefficients are rather high and the latter are not statistically significant at the 5% level.

The competition between oranges and apples becomes more evident when the ratio of the consumption of oranges to the consumption of apples is related to their price-ratio. For the years 1950 to 1963 a statistically significant substitution elasticity of -0.65 was measured on the basis of time series. Function (1) was also estimated on the basis of time series for the period 1952-1964, adding trend x_4 as fourth explanatory variable.

$$(3) \quad y = 6.2932 + 1.1998x_3 - 0.00644x_1 - 0.02193x_2 + 0.03417x_3 \quad R^2 = 0.97$$

$$(\pm 0.3029) (\pm 0.00400) (\pm 0.0124) (\pm 0.01361)$$

The trend in consumption is evident; multicollinearity between x_1 and x_3 enlarges the standard deviation of the income coefficient, so that its influence does not differ significantly from zero.

Analysis based on budget data

For the analysis of the consumption on the basis of budget data it was assumed that the consumption is related to the disposable income as follows:

$$(4) \quad y_i = \alpha_0 + \alpha_1 x_{1,i} + \alpha_2 x_2 + u$$

y_i : consumption of fresh oranges per consumer unit in class i , in kg, in logarithms

$x_{1,i}$: total expenditures per consumer unit in class i , in guilders; in logarithms

x_2 : dummy variable (0,1)
Office workers: $x_2 = 1$
Industrial workers: $x_2 = 0$

u_i : random term

Source: Statistical Office of the EEC, Sociale Statistiek. Speciale Serie no. 3. Budgetonderzoek 1963-1964 Nederland, Tabellen B 1 - 13, p. 90*-175*

This function was estimated by the least squares method weighting the observations in class i by the square root of the number of families in class i . The result reads as follows:

$$(5) \quad y = -11.5943 + 0.50357x_1 + 0.95299x_2 \quad R^2 = 0.96$$

$$(\pm 0.04681) (\pm 0.78228)$$

The income elasticity of 0.50 is of same order as the value derived from the time series. The coefficient of x_2 suggests a higher consumption-level for office workers. The standard deviation however is too large to attach much importance to the coefficient of x_2 in (5).

The influence of the distribution system on the sale of oranges

There are two developments in the retail trade that are of utmost importance for the sale of oranges:

- a) Sale in self-service stores and in supermarkets, and
- b) Concentration in the food-retail business.

With the establishment of self-service stores and supermarkets many groceries widened their assortment. They also included fresh fruits in their assortment. This is especially true for oranges, as they are more suitable for sale in self-service than apples and pears. Accordingly the number of points of sale for oranges has increased considerably, which certainly has stimulated the consumption to a high extent.

Concentration in the food-sector stimulates central purchase of large quantities. The trade in citrus fruits in The Netherlands fits this kind of sale better than the selling methods used for Dutch fruits like pears and

TABLE N. 2. - Forecast of Dutch consumption of oranges in 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
1a. on the basis of (2) in 2.1	19.585	257,900	21.109	21.409	21.715	299,700	304,100	308,400
1b. on the basis of (3) in 2.1	20.578	271,000	24.193	23.723	23.246	343,500	336,900	330,100
2a. on the basis of (2) in 2.1 in % of 1964	107.4	117.4	115.8	117.4	119.1	136.5	138.5	140.4
2b. on the basis of (3) in 2.1 in % of 1964	112.9	123.4	132.7	130.1	127.5	156.4	153.4	150.3
3. Assumptions: income per capita in 1970: 2,955 guilders								
income per capita in 1975 - low: 3,325 guilders								
1975 - middle: 3,398 guilders								
1975 - high: 3,472 guilders								
Assumptions: rate of growth of income (1965-'70) per year:						3.4%		
rate of growth of income (1970-'75) per year - low:						2.5%		
						- middle: 3.0%		
						- high: 3.5%		
population in: 1970 = 13.17 million; 1975 = 14.20 million.								

apples. Concentration of Dutch auctions will lead to a reduction of this relative advantage of oranges.

However it is rather difficult to measure the influence of these factors. But it seems that these developments have been an important stimulus on the sale of oranges.

2.2. - FORECAST OF CONSUMPTION IN 1970 AND 1975

The consumption in 1970 and 1975 has been forecast on the basis of the results in 2.1., assuming that prices are constant and using available forecasts of yearly increase in real income and in population.

The forecast on the basis of equation (2) suggests that the future consumption of oranges will advance less rapidly, which was also seen when period 1950-1956 was compared to period 1957-1964. The results arrived at from equation (3) suggest that the increase in consumption, as a consequence of the rising standard of living and different buying habits, will continue in the next 10 years, hence a more optimistic view.

According to our calculations the total consumption and hence the import of fresh oranges will probably range between 260,000 tons to 270,000 tons in 1970 and between 300,000 tons to 336,000 tons in 1975. For this forecast, neither price increase due to changes in the EEC external tariff nor price-changes due to changing market conditions have been taken into account.

PEACHES

Peaches are of minor importance both in the production and in the consumption of fruits and vegetables in The Netherlands.

Dutch climate does not fit very well to growing of peaches. This is in fact the main reason for the negligible domestic production which decreased systematically from 1,000 tons in 1963 to 700 tons in 1966. The decrease of domestic production is also enhanced by increasing imports especially from Italy.

Consumption of peaches is increasing, which may be observed in the development of imports; in 1961 imports amounted to 2400 tons; but imports had increased to 5,100 tons in 1965. This increase of consumption is to a large extent the consequence of the high income elasticity.

Consumption of peaches was assumed to be a linear function of disposable income. The function was estimated on the basis of budget data by the method of least squares; observations on consumption and income in class i were weighted by the square root of the number of families in class i . The result was:

$$y = -19.679 + 0.980x_1 + 0.939x_2 \quad R^2 = 0.95$$

$$(\pm 0.098) (\pm 1.637)$$

y_i : logarithm of the average consumption of peaches per consumer unit in class i in grams

$x_{1,i}$: logarithm of total expenditures per consumer unit in class i in guilders

x_2 : dummy variable

Office workers : $x_2 = 1$

Industrial workers: $x_2 = 0$

Source: Statistical Office of the EEC, Sociale Statistiek; Speciale Serie, Budgetonderzoek 1963-64 no. 3, Nederland, Tables B 1-B 13, p. 90*-175*

The positive income elasticity of 0.98 however cannot explain completely a per capita increase of consumption of peaches. Lower prices and structural changes in consumption are responsible for this development too. Unfortunately analysis on the basis of time-series fails to measure these influences.

A forecast of the consumption of peaches depends on whether the increasing trend in consumption will continue or not. In case of a continuous trend a consumption of 8,000 to 10,000 tons may be expected in 1970 and of about 11,000 to 13,000 tons in 1975. Many experts in the trade of fruits and vegetables take this view and we join their opinion on this matter. However this conclusion cannot be tested.

PEARS

1. - Historical background and present situation

Production

Pears in The Netherlands are grown on specialized farms and on mixed farms. On the latter, production is less intensive and the quality of the crop

TABLE N. 1. - *Acreage and production of pears in The Netherlands.*

	Acreage × 1 ha	Production × 1 ton	
		total	yield/ha
1950	14,531	111,200	7.653
1955	11,650	95,200	8.172
1960	10,833	134,300	12.397
1965	10,244	79,100	7.722

is on the average lower. The share of the mixed farms in the total supply is diminishing.

During the last fifteen years the acreage under pears has been showing a strong decrease. In 1950, the acreage still amounted to 14,531 ha; in 1965 it was 10,244 ha. This decrease in acreage has not lead to a decrease in production (table 1); by using better production techniques the yield/ha could be raised. Total production of pears therefore does not show a trend during the last fifteen years. On the other hand, there are evident shifts in the varieties planted; especially the varieties Conference and Doyenné du Comice are becoming more important.

Marketing

The yearly fluctuations in production due to biennial bearing are reflected in the domestic consumption of pears. From 1955 to 1965 the per capita consumption of pears ranged between 5.55 and 9.09 kg, except in 1957, in which year per capita consumption was equal to 2.41 kg. A trend in per capita consumption of pears cannot be observed.

The export of pears varies considerably from year to year but does not show a definite trend. The sale for industrial processing also remains at the same level and has not surpassed 9,000 tons since 1955. Finally, with regard to imports a slight increase can be observed. For the time being, imports are however of minor importance. From 1962 to 1965 they amounted to about 4,500 tons per year.

TABLE N. 2. - *Outlets of Dutch pears in percent of total production.*

	Production	Domestic consumption	Export		Processing industry	Destruction
			total	W. Germany		
1950	100	68.3	27.8	6.0	3.7	0.2
1955	100	62.9	27.6	11.2	9.3	0.2
1960	100	59.9	33.3	20.6	5.7	1.1
1965	100	65.5	28.3	15.8	5.9	0.3

2. - Analysis and forecast of the supply

2.1. - FACTORS AFFECTING SUPPLY

In spite of plantings of about 3,000 ha from 1956 to 1965 the total acreage under pears decreased during that period from 12,805 ha to 10,244 ha. It must be concluded that during those years about 5,560 ha were cleared. Mainly unprofitable orchards on mixed farms are cleared. From 1950 to 1958 the yearly-planted acreage of pears amounted to about 100 ha; from 1953 to 1956 there was an evident decrease in planting. Since 1959, planting has been increasing. The varieties Conference, Beurré Hardy and Doyenné du Comice represent since 1962 more than 50 % of the new plantings (table 3).

TABLE N. 3. - *New plantings of pears in The Netherlands in ha.*

	1955	1960	1961	1962	1963	1964	1965
New plantings	70	250	353	439	456	445	399
of which: Conference	—	—	—	94	98	112	89
Beurré Hardy	—	—	—	88	107	76	56
Bonne Luise d'A.	—	—	—	23	30	41	54
Doyenné du Com.	—	—	—	71	59	75	83
Triomphe de Vienne	—	—	—	32	23	17	12
Other varieties	—	—	—	131	139	124	105

There are some reasons which make the growing of pears less dynamic and less important than that of apples in The Netherlands. First of all the climate is less suitable for growing pears. Pear-trees blossom earlier than apple-trees and are therefore more vulnerable to nightfrost. In areas having less risk of nightfrost, pear-growing is more important, i.a. the area Zuid Beveland.

The preference given to apple growing is not only due to the variation of yields/ha for pears. Another problem in growing of pears especially among young fruit-growers is the high investment/ha. This investment is higher for pears than for apples because pear-trees come into bearing about 2 to 3 years later. The level of prices in the domestic market and abroad only justify the expansion of the acreage with varieties of high quality. The yearly fluctuations in acreage during the last fifteen years cannot be explained by price-changes. There is a decreasing trend in total acreage.

2.2. - PROJECTIONS OF THE FUTURE SUPPLY

Expected acreage in 1968 and 1970

Pear-acreage at 1st May 1963, according to age and variety, is summarized in table 4.

TABLE N. 4. - *Distribution of the acreage under pears in The Netherlands, according to age and variety, based on * Landbouwtellingen 1963 * (in percentages).*

Variety	Total %	According to age		
		< 9 year	9- < 25 year	> 25 year
Conference	16.2	5.2	7.6	3.4
Beurré Hardy	6.4	3.9	1.5	1.0
Bonne Louise d'Avranches	4.8	1.2	2.7	0.9
Doyenné du Comice	6.3	4.1	1.5	0.7
Triomphe de Vienne	4.2	1.8	1.3	1.1
Other varieties	62.1	6.8	19.3	36.0

The newly planted acreage during the period 1960-1965 according to variety is summarized in table 3.

In 1965, the acreage under pears was 10,244 ha; this means that from autumn 1963 till spring 1965 an acreage of 1,417 ha was cleared. The acreage in 1968 and 1970, and the share of each variety, can be determined from the 1965 acreage and the estimate of acreage to be cleared and newly planted since 1965. Neither government policy nor the present market situation provide any indication about the acreage that will be cleared in the future. It will be assumed that the yearly acreage cleared from 1965 to 1970 is equal to the average acreage cleared per year in the period 1961-1965. The future planting per year is assumed to be the same as the average yearly planting during the period 1960-1965. Considering that in 1963 the acreage under pears of 33 years of age or more amounted to 2,366 ha and the acreage of 25 to 32 years of age to 2,144 ha, this assumption of the cleared acreage seems feasible. Alternative assumptions have been made.

The estimate of the acreage under pears in 1968, based on the above assumptions, has been presented in table 5.

Expected production in 1970

The production in 1970 is equal to the productive acreage in 1970 multiplied by the yield/ha. The productive acreage in 1970 is equal to the acreage in 1963 minus the acreage cleared in the period 1963-1970. It is assumed that pear-trees of 9 years of age or more will be in full bearing and that 8 and 7 years old trees will contribute to total production at reduced yields.

8 years old trees: Conference 80 % productive,
 Other varieties 50 % »

7 years old trees: 30 % productive.

Projections of yield/ha, for modern varieties separately and for the other varieties together, were determined as follows:

TABLE N. 5. - *Projection of the acreage under pears in 1968.*

	1968	
	I	II
Conference	2,151	2,238
Beurré Hardy	937	988
Bonne Louise d'Avranches	718	760
Doyenné du Comice	1,013	1,088
Triomphe de Vienne	512	524
Other varieties	4,703	4,346
TOTAL	10,034	9,944

$$\frac{\sum_{i=1960}^{1962} \text{production}_i + 2 \sum_{i=1963}^{1965} \text{production}_i}{\sum_{i=1960}^{1962} \text{acreage}_i + 2 \sum_{i=1963}^{1965} \text{acreage}_i} = 1.05 \text{ yield/ha 1970}$$

TABLE N. 6. - *Projection of the production of pears in The Netherlands in 1970.*

Variety	Acreage 1961 × 1 ha	Cleared acreage × 1 ha	Planting in 1962 and 1963 in pro- ductive ha (1)	Produc- tive acreage in 1970 (1)	Production 1970		
					yield/ha (1) × 1 ton	total × 1 ton	in % of yearly a- verage production in 1962-'65
I. Conference	1,557	—	104	1,661	14.654	24,300	142.3
Beurré Hardy	493	—	76	569	10.080	5,700	211.1
Bonne Louise d'Avranches	468	—	21	489	18.479	9,000	128.6
Doyenné du C.	548	—	54	602	10.852	6,500	151.4
Triomphe de V.	404	—	23	427	9.797	4,200	164.1
Other varieties	7,309	4,024	108	3,393	12.359	41,900	61.0
Total	10,779	4,024	386	7,141	12.827	91,600	90.9
II. Conference	1,557	—	104	1,661	14.654	24,300	142.3
Beurré Hardy	493	—	76	569	10.080	5,700	211.1
Bonne Louise d'Avranches	468	—	21	489	18.479	9,000	128.6
Doyenné du C.	548	—	54	602	10.852	6,500	151.4
Triomphe de V.	404	—	23	427	9.797	4,200	164.1
Other varieties	7,309	4,774	108	2,643	12.359	32,700	47.6
Total	10,779	4,774	386	6,391	12.893	82,400	81.8

Assumptions: I - cleared 350 ha and planted 280 ha per year.

II - cleared 500 ha and planted 400 ha per year.

Only *other varieties* to be cleared.

(1) For calculation acreage and yield/ha: see text.

The number of years used seems sufficient for a reasonable balance of biennial bearing. By this weighted average a possible influence of technical advance on the yield/ha within the period 1960-1965 has been considered. A further increase in yield/ha by improving production methods is probable, but it will take place gradually. It is estimated to be 1% per year. The production in 1970 has been forecast on the basis of these assumptions about the productive acreage and the yield/ha (table 6).

Expected production in 1975

The production in 1975 is determined by productive acreage in 1975 and the yield/ha. The productive acreage is equal to the acreage in 1968 minus hectares cleared in the period 1968-1975. Of this acreage the trees of 9 years of age or more are in full bearing, 8 years old trees only partly, and those of 7 years of age will contribute at modest yields. The amount of hectares cleared per year is assumed to be equal to the assumption made in projecting the productive acreage for 1970. The yield/ha is equal to that projected for 1970 plus an increment of 1% per year due to the increase in productivity. The forecast of the production in 1975 is presented in table 7.

TABLE N. 7. - *Projection of the production of pears in The Netherlands in 1975.*

Variety	Acreage 1966 × 1 ha	Cleared acreage × 1 ha	Planting in 1967 and 1968 in produc- tive ha	Produc- tive acreage in 1975 (¹)	Production 1975		
					yield/ha (¹) × 1 ton	total × 1 ton	in % of yearly average produc- tion in 1962-'65
I. Conference . . .	2,017	—	74	2,091	15.352	32,100	188.0
Beurré Hardy . .	859	—	32	891	10.560	9,400	348.1
Bonne Louise							
d'Avranches . .	650	—	27	677	19.359	13,100	187.1
Doyenné du C. .	895	—	48	943	11.369	10,700	385.6
Triomphe de V.	496	—	6	502	10.263	5,200	203.1
Other varieties .	5,257	3,150	59	2,166	12.947	28,000	40.8
Total . . .	10,174	3,150	246	7,270	13.549	98,500	97.7
II. Conference . . .	2,046	—	106	2,152	15.352	33,000	193.3
Beurré Hardy . .	876	—	45	921	10.560	9,700	359.3
Bonne Louise							
d'Avranches . .	664	—	30	702	19.359	13,600	194.3
Doyenné du C. .	920	—	67	987	11.369	11,200	403.6
Triomphe de V.	500	—	10	510	10.263	5,200	203.1
Other varieties .	5,138	4,500	83	721	12.947	9,300	13.5
Total . . .	10,144	4,500	349	5,993	13.683	82,000	81.4

Assumptions: I - cleared 350 ha and planted 280 ha per year.

II - cleared 500 ha and planted 400 ha per year.

Only *other varieties* to be cleared.

(¹) For calculation *productive acreage* and *yield/ha*: see text.

3. - Analysis and forecast of the demand

3.1. - ANALYSIS

An effort will be made to determine as to what extent the consumption of pears can be explained by the disposable income and the price of pears. This analysis is made on the basis of time series and budget data.

Analysis based on time series

The relation between consumption, the disposable income and the price of pears is expressed by the following model:

$$(1) \quad y = x_0 + x_1x_1 + x_2x_2 + u$$

y : yearly per capita consumption of pears in kg; data concern production years (July to June)

Source: Produktschap voor Groenten en Fruit

x_1 : per capita disposable income in guilders, deflated by the price-index of cost of living

Source: C.B.S., Nationale Rekeningen; C.B.S., Maandschrift (Monthly Review)

x_2 : retail-price of pears, quotation Amsterdam in ct/kg, deflated by the price-index of cost of living

Source: Produktschap voor Groenten en Fruit; C.B.S., Maandschrift (Monthly Review)

u : random term

Estimation of this function by the method of least squares on the basis of data over the period 1957-1964, gave the following result:

$$(2) \quad y = 13.5615 - 0.0002710x_1 - 0.09702x_2 \quad R^2 = 0.96 \\ (\pm 0.0008009) (\pm 0.008339)$$

It appears that the influence of the income does not differ significantly from zero. The variation in consumption is almost entirely explained by the price. From equation (2) a price elasticity of -0.98 can be derived for the period 1961-1964. This proves that the demand for pears is rather price-elastic. Almost the same price elasticity, -0.92 , was measured from annual data over the period 1950-1963.

Analysis based on budget data

The relation between consumption and income was expressed in the following function:

$$(3) \quad y_i = x_0 + x_1x_{1,i} + x_2x_2 + u_i$$

y_i : logarithm of the average consumption of pears per consumer unit in class i in kg

- x_{1i} : logarithm of total expenditures per consumer unit in class i in guilders
- x_2 : dummy variable
Office workers : $x_2 = 1$
Industrial workers: $x_2 = 0$
- u_1 : random term

Source: Statistical Office of the EEC, Sociale Statistiek, Speciale Serie, no. 3, Budgetonderzoek 1963-1964 Nederland, Tables B1-B13, p. 90*-175*

Estimation of this equation by the least squares method, weighting observations of y and x_1 in class i by the square root of the number of families gave the following result:

$$(4) \quad y = -4.34825 + 0.31711x_1 - 0.33198x_2 \quad R^2 = 0.72$$

$$(+ 0.0937) \quad (+ 1.20683)$$

The income elasticity derived from budget data is positive (0.317) and differs statistically significant from zero. It appears that the difference in consumption level for office and industrial workers is not statistically significant. Contrary to the results from analyses based on time series, the estimates derived from budget data suggest that the increase in income will bring about a further increase in consumption.

3.2. - FORECAST OF HOME CONSUMPTION IN 1970 AND 1975

On the basis of the results under 3.1. the consumption in 1970 and 1975 can be forecast using estimates of the increase in population and in the income. The results have been summarized in table 8.

TABLE N. 8. - Forecast of the consumption of pears in 1970 and 1975.

	Consumption 1970		Per capita consumption 1975 × 1 kg			Total consumption 1975 × 1 ton		
	per capita × 1 kg	total × 1 ton	low	middle	high	low	middle	high
1.	6.691	88,100	6.956	7.009	7.062	98,800	99,500	100,300
2. in % of '61-'65	107.8	118.6	112.0	112.9	113.7	133.0	133.9	135.0
3. For assumptions about income per capita and growth of population in 1970 and 1975 the reader is referred to table 4 in the section on cauliflower.								

Considering the high price elasticity it is emphasized that this forecast was made on the assumption of constant prices. A fall in prices might lead to a considerable increase in consumption.

4. - Comparison of the projected consumption and production in The Netherlands in 1970 and 1975

On the basis of the projections made about consumption and production it seems that the export of pears will remain at the same level till 1970. In view of the forecast made production and consumption will balance in 1970 and 1975. Because of imports of pears in shortage periods, especially June-August, The Netherlands will remain an exporter of pears in autumn. However it is impossible to forecast the size of these gross-exports.

APPENDIX

TABLE N. 1. - *Cauliflower* ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3-2)
1955	67,800	8,300	11,400	54,500	8,600	2,600	+ 3,100
56	61,700	3,500	8,400	46,700	9,200	1,000	+ 4,900
57	77,900	15,900	7,400	66,900	7,800	11,600	- 8,500
58	71,000	16,500	8,800	68,500	4,700	5,400	- 7,700
59	68,700	18,900	16,100	62,900	6,500	2,200	- 2,800
1960	57,200	12,300	10,100	47,700	8,100	3,600	- 2,200
61	57,100	19,200	8,300	55,300	8,800	3,800	- 10,900
62	57,500	16,900	8,500	54,900	8,400	2,500	- 8,400
63	47,400	7,800	4,000	41,600	8,400	1,200	- 3,800
64	58,900	20,100	8,600	59,300	7,200	4,000	- 11,500
65	48,800	20,700	4,900	58,600	4,400	1,700	- 15,800

⁽¹⁾ Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 2. - Peas⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) (import—)
	1	2	3	4	5	6	7 (3—2)
1955	38,100	—	800	4,000	33,400	—	+ 800
56	37,200	100	300	4,000	32,900	—	+ 200
57	42,600	—	300	4,000	38,300	—	+ 300
58	33,500	—	100	3,000	30,400	—	+ 100
59	42,300	100	100	3,000	39,200	—	—
1960	61,400	—	300	3,000	58,200	—	+ 300
61	69,100	100	200	3,000	65,900	—	+ 100
62	87,300	100	500	3,000	83,900	—	+ 400
63	81,400	—	1,200	3,000	77,300	—	+ 1,200
64	70,100	300	1,200	3,000	66,200	—	+ 900
65	55,400	200	3,000	3,000	49,700	—	+ 2,800

(1) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 3. - Tomatoes⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) (import—)
	1	2	3	4	5	6	7 (3—2)
1955	125,000	800	89,000	25,000	6,700	5,100	+ 88,200
56	124,200	300	97,400	22,300	3,500	1,400	+ 97,100
57	160,100	400	125,100	28,800	3,500	3,150	+ 124,700
58	172,900	500	132,900	28,800	3,400	8,200	+ 132,400
59	195,700	700	153,200	32,300	2,900	8,000	+ 152,500
1960	201,400	900	162,500	31,400	3,300	5,100	+ 161,600
61	225,200	1,500	185,600	34,300	3,000	3,800	+ 184,100
62	229,200	1,700	183,100	32,300	3,200	7,300	+ 186,400
63	226,400	1,700	188,400	32,200	2,700	4,800	+ 186,700
64	291,800	2,300	228,200	37,400	2,900	25,200	+ 225,900
65	297,900	2,300	242,100	37,500	5,300	15,300	+ 239,800

(1) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 4. - Onions ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3 - 2)
1955/56	119,000	20,500	98,800	30,000	10,500	100	+ 78,300
56/57	173,600	9,300	139,800	30,000	13,100	—	+ 130,500
57/58	172,800	7,600	134,800	30,000	15,500	—	+ 127,200
58/59	235,100	5,200	191,700	30,000	18,600	—	+ 186,500
59/60	147,600	17,400	122,900	35,000	7,000	—	+ 105,500
1960/61	208,500	20,700	178,800	35,000	15,400	—	+ 158,100
61/62	215,400	13,100	179,500	35,000	14,000	—	+ 166,400
62/63	209,500	11,100	165,700	35,000	19,900	—	+ 154,600
63/64	193,300	12,300	155,000	35,000	15,600	—	+ 142,700
64/65	217,900	22,200	182,600	37,500	20,000	—	+ 160,400
65/66	190,600	27,400	161,000	37,500	19,500	—	+ 133,600

⁽¹⁾ Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 5. - Potatoes ⁽¹⁾ × 1000 tons.

Year	Production	Import	Export	Domestic		Industry	Waste	Net export (+) import (-)
				con-	seedlings			
				sump-	cattle-			
1	2	3	4	5	6	7	8 (3 - 2)	
1955/56	4,233	10	841	972	1,410	1,020	—	+ 831
56/57	3,532	62	398	970	1,256	970	—	+ 336
57/58	4,026	6	496	960	1,416	1,100	60	+ 490
58/59	3,909	11	759	1,020	1,101	970	70	+ 748
59/60	3,385	50	427	1,070	793	1,055	90	+ 377
1960/61	4,253	21	466	1,160	1,133	1,335	80	+ 445
61/62	3,790	30	530	1,115	832	1,266	77	+ 500
62/63	4,023	14	676	1,100	787	1,327	147	+ 662
63/64	3,924	12	476	1,100	960	1,335	65	+ 464
64/65	4,281	52	744	1,035	899	1,580	75	+ 692
65/66	3,300	110	550	840	675	1,290	55	+ 440

⁽¹⁾ Fresh.

Source: Hoofdproduktschap voor Akkerbouwprodukten and Centraal Bureau voor de Statistiek.

TABLE N. 6. - Apples⁽¹⁾ × 1 ton.

Year	Production 1	Import 2	Export 3	Domestic consumption 4	Indus- try 5	Waste 6	Net export (+) import (-) 7 (3-2)
1955/56	218,200	8,900	49,100	145,800	32,000	200	+ 40,200
56/57	298,400	7,300	57,500	204,400	43,500	200	+ 50,200
57/58	141,400	23,300	41,400	98,300	25,000	—	+ 18,100
58/59	394,800	15,200	83,200	269,700	55,600	1,200	+ 68,000
59/60	321,300	15,100	116,600	170,400	49,200	200	+ 101,500
1960/61	383,700	9,800	78,500	244,900	61,800	8,300	+ 68,700
61/62	240,600	32,400	61,600	169,100	42,000	200	+ 29,200
62/63	225,200	68,600	23,600	210,500	58,900	800	— 45,000
63/64	281,600	34,000	31,800	220,700	62,000	1,000	— 2,200
64/65	514,800	13,700	155,200	293,100	61,500	18,600	+ 141,500
65/66	358,300	24,700	58,800	257,400	63,500	3,200	+ 34,100

(¹) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 7. - Grapes⁽¹⁾ × 1 ton.

Year	Production 1	Import 2	Export 3	Domestic consumption 4	Indus- try 5	Waste 6	Net export (+) import (-) 7 (3-2)
1955/56	11,700	100	3,900	7,400	400	—	+ 3,800
56/57	10,400	—	2,800	7,200	400	—	+ 2,800
57/58	8,700	100	2,600	5,900	—	—	+ 2,500
58/59	10,500	100	2,100	7,900	500	—	+ 2,000
59/60	9,000	300	2,500	5,700	200	—	+ 2,200
1960/61	10,100	400	2,300	7,900	300	—	+ 1,900
61/62	9,000	1,000	1,700	8,000	300	—	+ 700
62/63	8,300	5,600	1,800	11,600	500	—	— 3,800
63/64	6,700	4,700	1,300	9,600	500	—	— 3,400
64/65	6,200	7,600	1,300	12,200	300	—	— 6,300
65/66	6,200	10,900	1,400	15,100	600	—	— 9,500

(¹) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 8. - *Pears* ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3 - 2)
1955/56	95,200	1,300	26,200	61,300	8,900	200	+ 24,900
56/57	98,800	1,000	20,300	71,900	7,000	700	+ 19,300
57/58	33,400	2,300	10,000	24,100	1,400	—	+ 7,700
58/59	145,700	1,300	40,000	97,300	7,100	2,500	+ 38,700
59/60	127,700	2,100	54,900	69,300	5,200	300	+ 52,800
1960/61	134,300	1,200	44,700	81,500	7,700	1,500	+ 43,500
61/62	120,200	1,900	51,000	66,200	4,800	100	+ 49,100
62/63	91,900	5,300	18,700	70,700	7,300	500	+ 13,400
63/64	107,600	4,600	37,000	66,800	7,000	400	+ 32,400
64/65	146,100	4,300	48,000	93,900	7,400	1,100	+ 43,500
65/66	79,100	5,700	22,400	57,500	4,700	200	+ 16,700

(1) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 9. - *Peaches* ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3 - 2)
1955	1,500	200	—	1,700	—	—	— 200
56	1,000	—	—	1,000	—	—	—
57	800	100	—	900	—	—	— 100
58	1,000	100	—	1,100	—	—	— 100
59	900	1,000	—	1,000	—	—	— 1,000
1960	1,100	1,700	—	2,800	—	—	— 1,700
61	900	2,400	—	3,300	—	—	— 2,400
62	1,200	2,800	—	3,900	—	—	— 2,800
63	1,000	4,200	—	5,100	—	—	— 4,200
64	800	5,100	—	5,900	—	—	— 5,100
65	700	5,100	—	5,800	—	—	— 5,100

(1) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 10. - Oranges ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3 - 2)
1955/56	—	106,900	300 ⁽²⁾	106,600	—	—	— 106,600
56/57	—	114,500	1,000 ⁽²⁾	113,500	—	—	— 113,500
57/58	—	147,700	1,200 ⁽²⁾	146,500	—	—	— 146,500
58/59	—	139,600	2,000 ⁽²⁾	137,600	—	—	— 137,600
59/60	—	165,100	1,400 ⁽²⁾	163,700	—	—	— 163,700
1960/61	—	175,100	1,200	173,900	—	—	— 173,900
61/62	—	193,900	1,800	192,100	—	—	— 192,100
62/63	—	188,900	3,400	185,500	—	—	— 185,500
63/64	—	214,000	4,200	209,700	—	—	— 209,700
64/65	—	189,500	5,800	183,700	—	—	— 183,700
65/66	—	218,100	4,100	214,000	—	—	— 214,000

(1) Fresh, incl. bitter oranges; (2) incl. mandarines.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 11. - Mandarines ⁽¹⁾ × 1 ton.

Year	Production	Import	Export	Domestic consumption	Industry	Waste	Net export (+) import (-)
	1	2	3	4	5	6	7 (3 - 2)
1955/56	—	5,100	—	5,100	—	—	— 5,100
56/57	—	5,300	—	5,300	—	—	— 5,300
57/58	—	4,500	—	4,500	—	—	— 4,500
58/59	—	5,600	—	5,600	—	—	— 5,600
59/60	—	6,200	—	6,200	—	—	— 6,200
1960/61	—	6,000	—	5,900	—	—	— 5,900
61/62	—	10,800	—	10,800	—	—	— 10,800
62/63	—	9,100	—	9,100	—	—	— 9,100
63/64	—	10,300	—	10,300	—	—	— 10,300
64/65	—	10,700	—	10,600	—	—	— 10,600
65/66	—	13,000	—	12,900	—	—	— 12,900

(1) Fresh.

Source: Produktschap voor Groenten en Fruit.

TABLE N. 12. - Summary of forecast on the production and consumption (1000 tons) of some fresh fruits and

	Average 1961 - 1963				production
	production	domestic consumption	import	export	
Cauliflower	54.0	50.6	14.6	6.9	54.0
Indices	100	100	100	100	100.0
Peas	79.3	14.6 ⁽¹⁾	0.1	0.6	—
Indices	100	100	100	100	—
Tomates	227.6	32.9	1.6	187.4	360.0
Indices	100	100	100	100	158.2
Onions	206.1	35.0	12.2	166.7	152.0
Indices	100	100	100	100	73.8
Early potatoes	185.2	66.6	21.2	5.2	141.8*
Indices	100	100	100	100	76.6*
Potatoes	3,912.0	1,105.0	19.0	561.0	—
Indices	100	100	100	100	—
Apples	249.1	200.1	45.0	39.0	321.0-339.0
Indices	100	100	100	100	128.9-136.1
Grapes	8.0	9.7	3.8	1.6	2.0
Indices	100	100	100	100	25.0
Pears	106.3	67.9	3.9	35.6	82.0-91.6
Indices	100	100	100	100	77.1-86.2
Peaches	1.0	4.1	3.1	—	—
Indices	100	100	100	—	—
Oranges	—	198.9	198.9	—	—
Indices	—	100	100	—	—
Lemons	—	8.3	8.3	—	—
Indices	—	100	100	—	—

* Figures with asteriks are tentative.

(1) Yearly domestic consumption 1963/64 on the basis of the E.E.C. Budget survey 1963/64; fresh peas

(2) This estimate is too low imports in 1966 amounted to 20.600 tons. Therefore it is concluded that

(3) There will be substantial imports of tomato-products, which cannot be forecast.

(4) Seed potatoes.

Appendix 1 Statistical Data.

vegetables for The Netherlands in 1970 and 1975 (*).

Forecast 1970			Forecast 1975			
domestic consumption	import	export	production	domestic consumption	import	export
69.8	18.8 ⁽²⁾	3.0	48.0*	82.0	37.0	3.0*
137.9	128.8	43.5	96.3	162.1	253.4	43.5*
17.8 ⁽¹⁾	—	—	—	20.6 ⁽¹⁾	—	—
121.9	—	—	—	141.1	—	—
48.0	— ⁽²⁾	312.0	400.0	58.0	— ⁽³⁾	342.0
145.9	—	166.5	175.7	176.3	—	182.5
39.7 43.2	15.0*	123.8-127.3	136.0	43.6 - 48.5	17.0	104.5 - 109.4
113.4-123.4	123.0*	74.3 - 76.4	66.0	124.6 - 138.6	139.3	62.7 - 65.6
65.9*	40.0*	— ⁽⁴⁾	126.0*	71.0*	60.0*	— ⁽⁴⁾
98.9*	188.7*	—	68.0*	106.6*	283.0*	—*
1,160.0	—	—	—	1,184.0	—	—
105.9	—	—	—	107.2	—	—
320.0	30.0*	31.0 - 49.0	360.0 - 372.0	385.0	35.0*	10.0 - 22.0
159.9	64.7*	79.5 - 125.6	144.5 - 149.3	192.4	77.8*	25.6 - 56.4
19.7	17.7	—	1.5*	28.4	26.9	—
203.1	465.8	—	18.8*	292.8	707.9	—
88.1	7.0*	0.9 - 10.5	82.0 - 99.0	99.0	10.0*	7.0 - 10.0
129.7	179.5*	—	77.1 - 93.1	145.8	256.4*	—
8.0 - 10.0	8.0 - 10.0	—	—	11.0 - 13.0	11.0 - 13.0	—
258.1 - 243.9	195.1 - 322.6	—	—	268.3 - 317.1	354.8 - 419.4	—
260.0 - 270.0	260.0 - 270.0	—	—	300.0 - 336.0	300.0 - 336.0	—
130.7 - 135.7	130.7 - 135.7	—	—	150.8 - 168.9	150.8 - 160.9	—
12.0 - 13.0	12.0 - 13.0	—	—	16.0* - 17.0*	16.0* - 17.0*	—
144.6 - 156.6	144.6 - 156.0	—	—	192.8* - 204.8*	192.8* - 204.8*	—

only.
Imports will amount at least to 30,000 tons.