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Internal information on AGRICULTURE

Projection of production and consumption of agricultural products - 1977

I United Kingdom

COMMISSION OF THE EUROPEAN COMMUNITIES
DIRECTORATE GENERAL FOR AGRICULTURE
DIRECTORATE FOR "AGRICULTURAL ECONOMICS AND STRUCTURES" - DIVISION FOR "BALANCE-SHEETS, STUDIES - INFORMATION"

APERÇU DES PRINCIPAUX ÉLÉMENTS DE L'ÉTUDE

PROJECTIONS DE LA PRODUCTION ET DE LA CONSOMMATION DE PRODUITS AGRICOLES - "1977"

I. ROYAUME-UNI

II. DANEMARK, IRLANDE

Série : "Informations Internes sur l'Agriculture" N°s 108 et 109

Cette étude vient de paraître en langue allemande.
Les versions française et anglaise sont en préparation.

Dans le cadre de son programme d'études, la Direction Générale de l'Agriculture a confié à des experts indépendants l'élaboration de projections des différents éléments constitutifs de la production et de la consommation des principaux produits agricoles dans chacun des Etats membres et cela suivant différentes hypothèses de base et compte tenu, dans la mesure du possible, des évolutions structurelles.

Le volume n° 108 contient les résultats des travaux pour le Royaume-Uni et le n° 109 ceux pour le Danemark et l'Irlande.

Les travaux, pour lesquels l'horizon 1977/78 a été retenu, portent sur les principaux produits agricoles, y compris les consommations intermédiaires, les bilans globaux de consommation alimentaire humaine et animale et sur les éléments des comptes globaux de l'agriculture.

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COMMISSION DES COMMUNAUTÉS EUROPÉENNES
DIRECTION GÉNÉRALE DE L'AGRICULTURE
DIRECTION : ÉCONOMIE ET STRUCTURE AGRICOLES – DIVISION : BILANS, ÉTUDES, INFORMATION
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Pour les nouveaux Etats membres, vu que leur adhésion entraînait, notamment pour leur agriculture, des changements très importants dont toutes les incidences ne sont pas toujours faciles à évaluer, certaines hypothèses de travail particulières ont dû être retenues.

Les volumes contiennent l'analyse de la demande intérieure ainsi que de l'offre des principaux produits agricoles tels que céréales, betteraves sucrières et sucre, pommes de terre, graines oléagineuses, lait et produits laitiers, oeufs, viandes ainsi que pommes, pêches et tomates.

Les différentes méthodes utilisées dans l'analyse de la demande et de l'offre, les prévisions en matières de consommation alimentaire globale et par tête, de production, de revenus et de prix, sont également exposées dans ces volumes.

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Foreword

This study, the purpose of which is to make possible a forecast of the production and consumption of agricultural products in the United Kingdom, Ireland and Denmark, was produced as part of the programme of studies of the Directorate-General for Agriculture of the European Communities by the

Kiel Institute of World Economics

Coordination of all the contributions was carried out by Dr Martin Hoffmeyer.

The work was carried out:

- for the United Kingdom and Ireland, by Dr. Rainer Schmidt;
- for Denmark, by Dr Torsten Tewes.

Two divisions of the Directorate-General for Agriculture also took part; these were: "Statistics, Balance sheets; General Studies" and "Agricultural Prices and Incomes Policy and General Economic Questions affecting Agriculture". This volume contains the report relating to the United Kingdom. The reports for Denmark and Ireland constitute Number 109 in this same series.

* * *

This work does not necessarily reflect the opinion of the Commission of the European Communities and does not anticipate its future attitude in this field.

Introduction

The aim of these studies is a projection of the production and consumption of agricultural products in the three new Member States, the United Kingdom, Denmark and Ireland, in the 1977/78 farm year, assuming that these States adopt the present Community agricultural system and prices immediately upon accession or during a 5-year transitional period. This implies drastic changes, in some cases, in the former national market support systems, in the position of the producers' organizations and, above all, in agricultural prices, which will rise extremely sharply in these countries. There will also probably be considerable changes in some parts of the agricultural price structures of the new Member States. The main problem involved in making a forecast is therefore to predict what will happen if there is a structural revolution in the most important frameworks of the agricultural system (market support arrangements, etc.) and in the time series for prices. Under these circumstances there is a danger that prediction of demand, and more especially of supply, using simple trend extrapolations would produce no meaningful results. Attempts have therefore been made to obtain as much information as possible, in particular regarding the sensitivity of production and consumption to price changes, by using detailed econometric models. These estimated equations applicable to the framework conditions prevailing in the past were then adapted to the new conditions in the light of considerations pertinent to the subject. In addition, appropriate modifications were made to price elasticities in cases of abnormally large price jumps.

In order to be able to predict production and consumption, hypotheses must be made concerning agricultural prices in the enlarged Community in the 1977/78 farm year (see Table 1). In view of the continued high rates of inflation to be expected in the Member States, these price hypotheses imply only a fairly small increase in producer prices. These hypotheses are based on the fact that,

even in the enlarged Community, there is still a danger that structural surpluses will continue to increase on the markets for some key agricultural products, above all those for milk and wheat, unless a relatively restrictive prices policy is introduced. Quite a large increase in producer prices in comparison with other products was forecast only for beef and veal, and mutton and lamb, as even the enlarged European Community is likely to continue to be a deficit area for these products.

A special explanation is necessary concerning the hypothesis on the prices of mutton and lamb. We have assumed that, after the accession of the United Kingdom, Ireland and Denmark, a start will have been made on the common organization of the market in mutton and lamb, whereby account should be taken in particular of the great importance of sheepfarming to the agriculture of United Kingdom and Ireland compared to the other States of the European Community. If it is further assumed that a common market in mutton and lamb would be set up on the same basis as that in beef and veal, the only question still to be answered is how high the price could be in relation to the prices of beef and veal. In our opinion, the most important price for mutton and lamb within the Community of the Six is the one at which the French Government permits imports. This price, which corresponds to the wholesale price for mutton and lamb on the Paris market, stood at approximately £ 353 per 1 000 kg live weight in mid-1972. The average prices for top quality mutton on the Paris market in 1968/70 were approximately 120 % of the beef and veal prices (hind quarters, top quality)[1]. However, even compared to world market prices for mutton and for beef, this ratio seems to us to be rather an exception than the rule. The average producer price ratio in France in 1968/70 was (lamb : veal) 0.91

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[1] See "Agricultural Statistics", Brussels 1970, No 4, p. 100, issued by the Statistical Office of the European Communities.

Table 1 - Hypothetical prices of important agricultural products in the enlarged European Communities in the 1977/78 farm year

Product	Type of price	Unit	1972/73	1977/78	Change in 1977/78 compared with 1972/73 in %	Average annual change from 1972/73 to 1977/78 in %
Common Wheat	- Basic intervention price (Federal Republic of Germany)	u.a./metric ton	104.75[b]	116.00	+ 10.7	+ 2.1
Barley	- Basic intervention price (Federal Republic of Germany)	u.a./metric ton	95.70[b]	107.00	+ 11.8	+ 2.3
Maize	- Intervention price (France)	u.a./metric ton	(83.25)[b]	107.00	.	.
Oats	- Market price	u.a./metric ton	(80.60)[c]	100100	.	.
Sugar beet	- Minimum price[a]	u.a./metric ton	17.68	19.00	+ 7.5	+ 1.5
White sugar	- Intervention price	u.a./metric ton	233.40	247.00	+ 5.8	+ 1.1
Ware potatoes	- Market price[d]	u.a./metric ton	.	45.00	.	.
Rape, rape seed	- Basic intervention price	u.a./metric ton	202.50	223.00	+ 10.1	+ 1.9
Milk	- Target price ex-dairy (3.7 % fat)	u.a./metric ton	117.70	135.00	+ 14.7	+ 2.8
Butter	- Intervention price	u.a./metric ton	1860.0 [e]	2000.0	+ 7.5	+ 1.5
	- Threshold price	u.a./metric ton	2011.5	2200.0	+ 9.4	+ 1.8
Skimmed milk powder	- Intervention price	u.a./metric ton	540.0	700.0	+ 29.6	+ 5.3
	- Threshold price	u.a./metric ton	670.0	840.0	+ 25.4	+ 4.6
Whole milk powder	- Threshold price (26 % fat)	u.a./metric ton	1167.0	1308.0	+ 12.1	+ 2.3
Condensed whole milk, unsweetened	- Threshold price	u.a./metric ton	494.5	555.0	+ 12.2	+ 2.3
Condensed whole milk, sweetened	- Threshold price	u.a./metric ton	661.0	744.0	+ 12.6	+ 2.4
Cheddar cheese	- Threshold price	u.a./metric ton	1560.5	1783.0	+ 14.3	+ 2.7
Beef and veal	- Guide price	u.a./metric ton live weight	780.0 [e]	945.0	+ 21.2	+ 3.9
Mutton and lamb	- Guide price	u.a./metric ton live weight	710.0 [f]	860.0[f]	+ 21.2	+ 3.9
Pigmeat	- Basic price	u.a./metric ton carcase weight	825.0	908.0	+ 10.1	+ 1.9
Poultrymeat	- Sluice-gate price[g]	u.a./kg carcase weight[h]	0.6913	0.7960	+ 15.1	+ 2.9
Eggs	- Sluice-gate price[i]	u.a./10 units[h]	0.2706	0.3150	+ 16.4	+ 3.1

[a] Beet within the basis quota (region: Aisne, Somme, Oise - France). [b] August 1972. [c] Market price in the Federal Republic of Germany (Hanover) in August 1972. [d] Average producer price for ware potatoes from the main harvest in the Federal Republic of Germany. [e] Applicable from 15 September 1972. [f] Fictitious price (= 91 % of the guide price for beef). [g] "Fowls 70 %" (plucked and drawn, without heads and feet but with hearts, livers and gizzards). [h] Applicable from 1 August 1972 to 31 october 1972. [i] Eggs (in shells) of poultry, fresh and made conservable (Class A4 = 55 - 60 g per egg).

Source: Directorate-General for Agriculture, Agricultural Economics and Structure Directorate, EEC Information: Agricultural Markets - Prices (livestock and vegetable products), Brussels, 1973 - Own calculations and estimates.

("agneaux gris"/fattened calves[1]). In the enlarged Community the United Kingdom will be by far the largest producer of mutton and lamb. The average guaranteed price for fat sheep in the United Kingdom in 1968/69 - 1970/71 was fixed at 0.91 of the guaranteed prices for clean fat cattle. This coincides exactly with the price ratio at the producer level in France, which is why we fixed the fictitious guide price in a hypothetical common market in mutton and lamb at 91 % of the guide price for beef and veal.

A relatively large increase in the price of skimmed milk powder was also suggested, in response to the desire to give greater value to milk protein than to milk fat. However, in view of the Decision of the European Council of Ministers on prices for 1973/74 (reduction of the butter intervention price by 5.4 % and increase in the intervention price for dried skimmed milk y 18.5 % compared with 1972/73), our milk fat / milk protein ratio for 1977/78 seems rather "conservative".

The floating of the UK and Irish pound which began at the end of June 1972 leads to some difficulties in converting the hypothetical prices, expressed in European Communities' units of account, into pounds as the fluctuations which have since occurred in the rate of exchange of the pound will mean a considerable devaluation of the pound in relation to the European Communities' unit of account if the parity of the pound should be fixed again. The related problems are discussed in detail in the individual studies on the "United Kingdom" and "Ireland".

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[1] Statistical Office of the European Communities, loc. cit., p. 98.

In the studies on the United Kingdom, Denmark and Ireland it was unnecessary to give a detailed description of agriculture and agricultural policy in these countries, as adequate details have already been provided in previous studies[1].

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[1] J. Schüler Landwirtschaft und Agrarpolitik in einigen westeuropäischen Ländern. II. Dänemark, Commission of the European Communities, Internal Information on Agriculture, No 57, Brussels, April 1970.

R. Schmidt Landwirtschaft und Agrarpolitik in einigen westeuropäischen Ländern. V. Vereinigtes Königreich, loc. cit., No 66, Brussels, December 1970.

R. Schmidt Landwirtschaft und Agrarpolitik in einigen westeuropäischen Ländern. VIII. Irland, loc. cit., No 73, Brussels, May 1971.

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U N I T E D K I N G D O M

I. Analysis of demand for foodstuffs

1. General remarks

In the following report we are going to try, by way of econometric methods, to identify the most important factors determining the demand for foodstuffs in the United Kingdom. The principal aim of this analysis is to estimate income and price elasticities, which will serve as a basis for a forecast of the demand for foodstuffs. This forecast is to be prepared in view of the fact that after entry into the EEC at the beginning of 1973 the United Kingdom is to adopt the common agricultural policy of the Community, and British agricultural prices will be raised in stages over a period of five years (up to 1977) to the level of agricultural prices in the Community. In the course of this adaptation process some serious changes in prices and relationships between prices of foodstuffs in the United Kingdom will take place which will in all probability cause considerable shifts in the structure of British food consumption. On the one hand it would probably be asking rather too much of the demand functions and/or elasticities calculated by us for the period under review to try to forecast the effect of British entry into the EEC on food consumption (referred to hereafter as EEC effect for short) using these functions alone. On the other hand, the fact that only the sum of experiences collected in the past can be expressed in any forecast, is also valid for this one. In order not to be dependent at the outset upon subjective speculations alone in preparing the forecast, initially we will calculate the EEC effect exclusively on the basis of the demand functions estimated by us for the reference period - i.e. on the limiting assumption that there is no significant change in consumer behaviour. At a later stage, we will try to correct the results obtained on the first forecast with the help of special economic considerations.

2. Development of the model; forecasting methods

In accordance with the microeconomic theory of demand, we would like to start from the basic assumption that demand in an individual household

for a given foodstuff is primarily determined by the income of that household, the number and age of the members of the household, the preference system of the household, the price of the foodstuff concerned, the price of competing foodstuffs, and the prices of all other goods purchased by the household. If the individual demand functions are aggregated to produce the macroeconomic demand function, total domestic consumption of the product concerned provides the independent variable. Total domestic consumption of a product could be explained by a variable reflecting consumer incomes in national accounts (e.g. the private disposable income), by the population and its age structure, by food consumption habits, by the national average price of the product concerned and of close substitutes and/or complementary goods and by the general level of prices. In order to save degrees of freedom and at the same time to reduce multicollinearity, which often proves to be troublesome in demand analysis, it is usually advantageous to use per capita data (food consumption) and deflated income and prices (the latter implies that the majority of households is free from money illusion). Under these hypotheses we first obtain the following model:

(1) $Q = f\ (Y_{prv};\ P_1;\ P_2;\ P_3;\ \ldots\ldots\ ;\ t);$

where:

Q : per capita consumption of the product concerned

Y_{prv} : private disposable income per head of population, divided by the weighted index of all retail prices

$P_1;\ P_2;\ P_3;\ \ldots\ :$ average national retail price of the products concerned and of competing products, divided by the weighted index of all retail prices

t : time variable ($t = 1 - T$, in which T is equal to the number of years included in the investigation).

The main function of the t-variables in the equation is to take account of slowly and steadily developing influences on per capita consumption

are independent of income and prices (for example, changes in the age structure of the population or certain gradual shifts in the preference system).

In addition to the private disposable income, personal disposable income or total private consumption expenditure may be considered as appropriate income variables. We have chosen private consumption expenditure because today usually long term contract saving methods are preferred, with contributions being fixed mainly in advance, so that there is much to be said for the theory that consumer decisions are largely made on the basis of the available income minus savings (this should moreover be considerably truer of foodstuffs than of certain consumer durables which account for a relatively high proportion of the total disposable income of those earning average incomes).

In choosing the type of function to be used in (1) it should be remembered that as a rule the income elasticity of demand decreases as income increases[1] - except in the case of a few notable luxury foodstuffs with "snob appeal". There are many types of functions which express this phenomenon; of these only the two relatively simplest are mentioned here:

1. The semi-logarithmic function

$$Q = a + b \log C_{pr}$$

with the elasticity

$$\eta \; Q/C_{pr} = 0.4343 \cdot \frac{b}{Q}$$

$$= 0.4343 \cdot \frac{b}{a + b \log C_{pr}}$$

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[1] See inter alia L.M. Goreux, Income and food consumption. FAO, "Monthly Bulleting of Agricultural Economics and Statistics", Vol. 9 (1960), No. 10, p.1et seq.

2. The inverse function

$$Q = a - b\left(\frac{1}{C_{pr}}\right)$$

with the elasticity

$$\eta\, Q/C_{pr} = \frac{b}{Q \cdot C_{pr}}$$

$$= \frac{b}{a\, C_{pr} - b}$$

where:

C_{pr} : Real private consumption expenditure per head of population.

As can be seen quite clearly from the above formulae, both types of function always show income elasticity falling as income increases, if the correlation between Q and C_{pr} is positive - i.e. in the case of products reacting normally to changes in income. In the case of inferior goods, for which demand falls as C_{pr} rises (e.g. bread and potatoes), the semi-logarithmic type of function would show an increasing income elasticity in absolute terms as income rises. This seems feasible from an economic point of view in so far as one can accept that readiness to substitute high-grade products for simple basic foodstuffs increases as income rises, at least within a certain income range. When the inverse function is used, the absolute value of the income elasticity for inferior goods falls (rises) as income rises, if the constant a is positive (negative). If the value of the constant a is zero, the absolute value of the income elasticity remains unchanged as income rises[1]. The difference between the two types of function lies mainly in the fact that the inverse function approaches asymptotically a "saturation point" as income increases, whilst Q moves towards infinity as C_{pr} increases when the semi-logarithmic

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[1] Cf.: Commission of the European Communities, Directorate-General for Agriculture, Landwirtschaftliche Vorausschätzungen - II. Möglichkeiten der Anwendung bestimmter Modelle, Methoden und Techniken in der Gemeinschaft. Hausmitteilungen über Landwirtschaft, Brussels, October 1970, No 63, p. 100.

function is used. This difference is, however, only of theoretical importance for the range of income covered by this analysis. The fact that, all other things being equal, the inverse function shows a somewhat smaller increase in per capita consumption as income increases than the semi-logarithmic function is of practical importance - especially for forecasting. In the cas of inferior goods, the exact reverse is true: here the inverse function implies a sharper decline in the level of consumption as income increases than the semi-logarithmic function.

We would in any case like to represent the relationship between demand for a product and the price of the product by the semi-logarithmic type of function. Normally there is a negative correlation between the demand for and the price of the product, so that all other things being equal, the absolute value of direct price elasticity increases as the price rises. This means that in the case of extreme price increases the reaction of the consumer is relatively greater than with smaller price increases. This could be of particular use in forecasting, as the EEC effect will bring about a very sharp increase in the prices of many British foodstuffs.

Very little knowledge of the form of the relationship between demand and cross price can be obtained from the theory of demand. We are also going to use the semi-logarithmic type of function here because of its simplicity. When, as is normal, there is a positive correlation between demand and cross price, the adoption of this method would imply, all other things being equal, an increasing (decreasing) cross price elasticity as the cross price falls (rises).

In accordance with these considerations we obtain the following two equations for the determination of demand:

$$(2)\quad Q = \alpha_0 + \alpha_1 \log C_{pr} + \alpha_2 \log P_1 + \alpha_3 \log P_2 + \ldots\ldots (+\alpha_k t) + u_1$$

$$(3)\quad Q = \beta_0 + \beta_1 \left(\frac{1}{C_{pr}}\right) + \beta_2 \log P_1 + \beta_3 \log P_2 + \ldots\ldots (+\beta_k t) + u_2$$

where:

C_{pr} : private consumption expenditure at 1963 prices per head of population (£)

P_1, P_2 : real retail prices (nominal retail prices divided by the weighted index of all retail prices; 16th January 1962 = 1.00)

u_1, u_2 : unexplained residuals in the equations concerned.

The parameters of equations (2) and (3) shall to be estimated with the help of the ordinary least squares method (OLS method). If the OLS method is to provide unbiased and efficient parameter estimates, the following conditions, among others, must be fulfilled:

1. The residuals (u_i) follow a random distribution with zero mean and constant variance.
2. The distribution of the residuals must be independent of the distribution of the explanatory variables.
3. The residuals must not be autocorrelated.

We have no a priori knowledge of the distribution which may underly the variables used by us in demand analysis. Condition (2) is mainly broken in our experience when endogenous variables are used as explanatory variables. In our case this danger can, in reality, only exist in respect of prices - i.e. not only do prices influence demand, but demand too has a clearly noticeable influence on prices. Where simultaneous relationships of this kind occur, the OLS method may produce parameter estimates which are subject to a bias. Apart from seasonal variations, which play no role when annual averages are used, the assumption that demand for most agricultural products develops relatively steadily should be justified. The big changes in prices, the effect of which is mainly measured in demand analysis, are as a rule the result of factors relating to the supply side of the market (for example, the cyclical movements in the case of livestock products or the influences of weather conditions in the case of arable products). Under these circumstances there is much to be said for the opinion that the OLS method yields satisfactory parameter estimates.

If there is autocorrelation in the residuals, the estimates are unbiased but not efficient[1]. However, there are only asymptotic properties which cannot help us very much in our very small samples (covering only a short period). To that extent we must always remember that, in the case of a significant degree of positive or negative autocorrelation, the estimated regression coefficients are also subject to a considerable bias. This is particularly true when the autocorrelation is due to specification errors in the model[2]. For this reason it is necessary in such a case to improve the equation by the inclusion of additional variables and by suitable transformations of variables already included until the autocorrelation of the residuals is reduced to an acceptable level. We are going to use the Durbin Watson statistic (D.W.) as a test value for the autocorrelation of the residuals.

In equations (2) and (3) the time variable is only included in brackets. The reason for this is as follows: demand equations are estimated at first in any case both with and without a time variable. Later on in the presentation of results a time variable is included only in those equations in which time actually has a significant influence.

If systematic shifts and other trend influences are taken into account by the introduction of linear time variables, it should be noted that this is just the same as correlating deviations from a linear trend in the case of the other variables in the equation (consumption, income and prices)[3]; i.e., only the short-term reactions are expressed in the regression coefficients for income and prices, while the differences between long and short term effects are added together or - in the case of divergent trend developments in the explanatory variables - balanced against each other in the regression coefficients of the t-variables. This should be pointed out in view of the following example[4]:

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[1] See J. Johnston, Econometric Methods, New York 1963, p. 179.

[2] See E. Malinvaud, Statistical Methods of Econometrics, Amsterdam 1966, p. 420.

[3] Consumption (Q) - arithmetical: absolute deviations from the trend; income (C_{pr}) and prices (P): logarithmic (percentage) deviations from the trend.

[4] See H. Gollnick, Einführung in die Ökonometrie, Stuttgart 1968, p. 123 et seq.

The following simple regression equation may have been estimated.

$$(4)\quad Q = \hat{\alpha}_0 + \hat{\alpha}_1 \log C_{pr} + \hat{\alpha}_2 \log P + \hat{\alpha}_3 t$$

For the trends in income and price the equations

$$(5)\quad \log C_{pr} = \hat{a}_0 + \hat{a}_1 t \qquad \text{and}$$

$$(6)\quad \log P = \hat{b}_0 + \hat{b}_1 t$$

are assumed to be valid. Then the composition of the regression coefficient of the time variable - in the case of an sufficiently well specified equation - would be as follows:

$$(7)\quad \hat{\alpha}_3 = (\hat{\alpha}^{\ell}_1 - \hat{\alpha}_1) \cdot a_1 + (\hat{\alpha}^{\ell}_2 - \hat{\alpha}_2) \cdot b_1$$

where:

$\hat{\alpha}^{\ell}_1$ and $\hat{\alpha}^{\ell}_2$: regression coefficient, which represents the long term relationship between demand and income and/or price.

If the regression equation is incomplete, the coefficient of the t-variable can additionally include the influence of all not explicitly included, systematically changing factors. If there is more than one explanatory variable, the long term reactions of consumers ($\hat{\alpha}^{\ell}_i$) cannot unfortunately be estimated separately, with the result that we have to resort to guess work in the interpretation of the regression coefficient of the time variable. This is of particular hindrance when preparing forecasts based on the assumption of an important change in the trend in explanatory variables (a problem which is posed in particular in the assessment of consumer reaction to major changes in prices resulting from the EEC effect). If, for example, in equation (7) there would be a b_1 of -0.2 for the assessment period and a b_1 of +0.3 for the forecasting period, equation (4) would yield a marked overestimate or underestimate of Q - according to which value $\hat{\alpha}_3$ and

the other parameters in equation (7) would assume. This shows that the explanatory power of regression equations when using time variables is very closely linked to the assessment period. Their use for the purpose of forecasting in the case of changes in price trends is therefore only possible after appropriate corrections to the regression coefficients of the t-variables have been made. As has still to be shown after discussion of the results obtained in the parameter estimates of the demand equations, an estimation of the regression equations without t-variables can be decidedly helpful in many cases for such corrections. This is connected with the fact that in the regression coefficients of an equation estimated without t-variable the long and short-term influences combine, whereby however in the majority of cases the long-term influence seem to make themselves more felt than the short-term influences. In other words: The actual regression coefficients in the equation without time variable are very close to the long-term coefficients ($\hat{\alpha}_1^{\ell}$).

3. The results of the estimate of the demand functions

Generally the assessment period covers the years 1958 to 1969 for data relating to calendar years, and 1958/59 - 1968/69 for seasons. Only variations from these periods will be noted for the individual equations. The retail prices are, without exception, those quoted in the annual reports of the "National Food Survey Committee"[1] and are based on extensive household surveys carried out in all regions of the United Kingdom. In the analysis of demand we were able to evaluate only the National Food Survey Committee's annual reports up to 1970 inclusive, in which the prices were still given in old pennies (d); to cut down our work we did not convert them in new pennies (p). In order to facilitate understanding of the following it should be pointed out that in the case of the inverse type of function a negative (positive) regression coefficient for the income variable implies that demand rises (falls) as income increases.

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[1] Ministry of Agriculture, Fisheries and Food, Household Food Consumption and Expenditure, Annual Report of the National Food Survey Committee. London, H.M.S.O., various issues.

a. Wheat flour

According to the results of our estimate wheat flour consumption is, in practical terms, determined exclusively by the development of income:

$$(8)\quad Q = +\,30.178 + \underset{(10.1)}{16064.0}\left(\frac{1}{C}\right)_{pr}$$

$$r^2 = 0.919 \qquad D.W. = 1.76 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.4\ \%$$

where:

Q : total per capita consumption of wheat flour (kg product weight) in the farm year July - June.

The figure in brackets underneath the regression coefficient $\left(\frac{1}{C}\right)_{pr}$ is the t-test value, which gives the ratio of the regression coefficient to its standard deviation. D.W. is the Durbin-Watson statistic and $\hat{\sigma}$ the standard error of the estimate

$\left(\hat{\sigma} = \sqrt{\frac{\sum_i u_i^2}{N-m-1}}\right)$, where N is the number of observations and m the number of explanatory variables. Hence $\hat{\sigma}/\bar{Q}$ is the standard error of the estimate in relation to the arithmetic mean of the dependent variable. The dominant factor influencing UK wheat flour consumption is the consumption of white bread. White bread is an inferior product which is replaced mainly by higher grade products of animal origin. The extent of this "substitution" is largely determined by the growth of income. With the help of function (8) an income elasticity of the demand for wheat flour of -0.6[1] can be calculated.

b. Rolled oats and corn flakes

$$(9)\quad Q = 4.9403 + \underset{(5.3)}{587.25}\left(\frac{1}{C}\right)_{pr} + \underset{(2.0)}{2.7024}\log P_1$$

$$R^2 = 0.934 \qquad D.W. = 1.59 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 3.3\ \%$$

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[1] Measured in the arithmetical mean - this is also true of all following price and income elasticities.

where:

Q : per capita consumption of rolled oats (kg product weight; farm year July - June)

P_1 : real retail price for corn flakes (d/kg)

$$(10)\quad Q = +\,3.1629 - \underset{(3.8)}{2359.8}\left(\frac{1}{C_{pr}}\right) + \underset{(1.3)}{4.5284}\log P_1 - \underset{(0.1)}{0.65612}\log P_2$$

$$R^2 = 0.867 \qquad D.W. = 3.13 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 6.9\ \%$$

where:

Q : per capita consumption of corn flakes (kg product weight; farm year July - June)

P_1 and P_2 : real retail price for rolled oats and corn flakes respectively (d/kg).

Demand for rolled oats must be looked at in the light of the consumption of corn flakes. There is a very close substitution relationship between these two products in the United Kingdom, in which rolled oats are clearly the inferior product (estimated income elasticity of rolled oats consumption: -1.1; income elasticity of corn flakes consumption: +0.3). The degree to which rolled oats are substituted for corn flakes is, however, determined only by income but also by price. Thus, the regression equations for both rolled oats and corn flakes show the price of the competing product to be the most important factor influencing substitution after income. It can hardly be a coincidence that equation (9) gives the same cross price elasticity for demand (rolled oats compared with corn flakes) as equation (10) (corn flakes compared with rolled oats) - namely +0.8. On the other hand, at -0.1[1] the direct price elasticity of demand for corn flakes is very small; the price of rolled oats was seen to have no impact whatsoever on demand for this product.

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[1] The very low t-value of the regression coefficient of P_2 in equation (10) is partly the result of the high intercorrelation between C_{pr}, P_1 and P_2, which probably had a negative effect on the t-value of the coefficient of P_2, above all.

c. Potatoes

Income can be considered as the main factor determining the demand for maincrop ware potatoes:

$$(11)\quad Q = +106.71 - \underset{(4.0)}{11271.0}\left(\frac{1}{C_{pr}}\right)$$

$R^2 = 0.639$ D.W. = 1.72 $\frac{\hat{\sigma}}{\bar{Q}} = 2.5\ \%$

where:

Q : per capita consumption of maincrop ware potatoes (kg; farm year July - June)

In contrast with most other countries in north-west Europe there is a significant positive correlation between ware potato consumption and income in the United Kingdom; the income elasticity is surprisingly high at +0.4 (equation (11)). The reason for this is that a long-term downward trend in direct consumption of ware potatoes by private households is greatly overcompensated for by a rapidly expanding consumption of ware potatoes in processed form (chips, crisps, etc.) (negative income elasticity in demand for ware potatoes for household consumption; strongly positive income elasticity in demand for potatoes to be processed into chips, crisps, etc.). The inclusion of the price of potato chips in the regression equation brings only slight improvement, as the consumption of chips, crisps, etc. is probably primarily determined by income:

$$(12)\quad Q = +131.52 - \underset{(2.1)}{9680.7}\left(\frac{1}{C_{pr}}\right) - \underset{(0.5)}{18.267}\log P_1$$

$R^2 = 0.648$ D.W. = 1.79 $\frac{\hat{\sigma}}{\bar{Q}} = 2.6\ \%$

where:

P_1 : real retai price of potato chips (d/kg)

The small t-value of the price variable is also due in part to a high intercorrelation between income and price. Equation (12) gives an income elasticity for ware potato demand of +0.3; the absolute value of the elasticity of total ware potato consumption in relation to the price of chips only is in any case expected to be rather low (estimate from equation (12): -0.1).

Income and price of the product permit only an inadequate explanation of the demand for early potatoes.

$$(13)\quad Q = +4.4040 + \underset{(2.4)}{7457.3}\left(\frac{1}{C_{pr}}\right) - \underset{(0.8)}{6.2718}\log P_1$$

$$R^2 = 0.382 \qquad D.W. = 1.44 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 11.0\ \%$$

where:

Q : per capita consumption of early potatoes (kg; calendar years)

P_1 : real retail price of early potatoes (d/kg)

The income elasticity of early potato consumption according to equation (13) is -1.1 and the direct price elasticity -0.2. This result does not entirely correspond to our a priori expectations. We had supposed that early potatoes - as well as maincrop ware potatoes - are an inferior product, but that consumers nevertheless react considerably more sharply to changes in the price of earlies, which are available for only a short period period, than the calculated price elasticity of -0.2 per cent suggests. (due to the fact that when supplies of nwe potatoes are at their peak[1] ware potatoes from the previous year's main crop are also still available, generally at considerably lower prices, so that consumers can revert to a cheaper substitute if the price of early potatoes increases sharply.) It must, nonetheless, be admitted that in contrast to the almost complete price inelasticity of demand for maincrop ware potatoes for household consumption the elasticity of demand for earlies (which are also used almost exclusively for household consumption) can be regarded as being fairly high (absolute value: 0.2). The large relative standard error in

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[1] If both domestic and imported new potatoes are included, this period stretches from April to July.

equation (13) points to the fact that some care must be taken in using equation (13) for forecasting despite the possible theoretical justification of the assumed relationship.

d. Sugar

$$(14)\quad Q = +\,46.725 + 4209.5\,\left(\frac{1}{C_{pr}}\right) - 2.9165 \log P_1$$

$$(1.4) \qquad (0.2)$$

$$R^2 = 0.295 \qquad D.W. = 2.05 \qquad \frac{\hat{\delta}}{\bar{Q}} = 2.5\ \%$$

where:

Q : per capita consumption of refined sugar (including products containing sugar) (kg of white sugar; farm year July - June)

P_1 : real retail price of white sugar for direct consumption in private households (d/kg).

In principle equation (14) shows that the demand for sugar in the United Kingdom is essentially determined by traditional food consumption habits and only marginally by economic factors (income, prices) (income elasticity: -0.2; direct price elasticity: -0.02 - i.e. practically zero). The marginal influence of the price of sugar should also be looked at in the light of the fact that direct consumption of sugar in households accounts for only about 50 per cent of total sugar consumption. For all industries using sugar as a raw material, sugar prices are likely to affect stockbuilding only in the short term, whereas sales prospects for the main output items (sugar and chocolate confectionery) are believed to be the decisive factor for sugar consumption in this sector in the long term. Consumption of sugar products in the United Kingdom was already relatively high at the end of the 1950's and increased only marginally thereafter. The direct consumption of sugar fell slightly after 1958; accordingly, total per capita consumption of sugar changed little during the period 1958/59 - 1968/69. The low coefficient of determination in equation (14) should also be looked at against this background. As may be concluded from the D.W. statistic, we have introduced in equation (14) at least all the important economic factors influencing the demand for sugar.

e. Beef

$$(15)\quad Q = +105.84 - \underset{(0.1)}{163.18}\left(\frac{1}{C_{pr}}\right) - \underset{(1.9)}{48.360}\log P_1 + \underset{(0.4)}{9.7249}\log P_2$$

$$R^2 = 0.656 \qquad D.W. = 1.53 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 4.2\ \%$$

$$(16)\quad Q = +88.002 + \underset{(2.4)}{16425.0}\left(\frac{1}{C_{pr}}\right) - \underset{(3.6)}{91.154}\log P_1 + \underset{(1.6)}{36.371}\log P_2 + \underset{(2.6)}{1.2042}\,t$$

$$R^2 = 0.824 \qquad D.W. = 2.81 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 3.2\ \%$$

where:

Q : per capita consumption of beef and veal (kg slaughter weight)

P_1 : real retail price of beef (d/kg)

P_2 : real retail price of pork (d/kg)

t : time trend ($T = 1, 2, 3 \ldots\ldots, T$)

According to equation (15), the main factor influencing beef consumption would be the price of beef (direct price elasticity calculated from (15): -0.8). Pork would be of some importance as a substitute (cross price elasticity: +0.2). However, income does not appear to have any significant influence (income elasticity: +0.02 - i.e. practically zero). The introduction of a linear time variable, however, brings substantial improvements; the coefficient of determination, adjusted for degrees of freedom, increases by 19.7 per cent[1], and the partial regression coefficients are all now well established (see equation (16)). This could mean that in the case of the demand for beef there are considerable differences between long and short-term reactions for which adequate allowance can be made only by the introduction of a time variable. As has already been outlined in (I, 2), the regression coefficients for prices and income show only the short-term reactions when a time variable is used, whilst the regression coefficients

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[1] The coefficient of determination ($R^2(a)$) adjusted by the number of degrees of freedom is calculated as follows:

$$R^2(a) = R^2 - \frac{m}{N-m-1} \cdot (1 - R^2);$$ where

N is the number of observations and m the number of explanatory variables (see also H. Gollnick, op. cit., p. 99). In (15) and (16) $R^2(a)$ equals 0.527 and 0.724 respectively.

mainly reflect the long-term reactions in estimates without time variables (strictly speaking, a mixture with an a priori unknown weighting of long and short-term reactions). Equation (16) gives the following elasticities relating to the demand for beef: income: -1.8; own price: -1.6; cross price (pork): +0.6. This would suggest that the demand for beef always reacts more sharply in the short term than in the long term. However, the very high, short-term negative income elasticity seems to raise problems. It is difficult to find reasons why of all products beef should be an inferior product in the United Kingdom, which is not the case with the other types of meat, as will be shown later. One possible explanation is that the regression coefficients in equations (15) and (16) are influenced not only by the behaviour of consumers but also in part by supply restrictions. Total supplies of beef on the British market were heavily dependent on imports during the period 1958 - 1969 and still are. In the years after 1958, and in particular 1959/60 and 1964/65, there were repeated, relatively lengthy supply shortages on the world beef market when British importers often seem to have been unable to obtain the desired quantities on the world market. Importers in the EEC and the USA in particular, where the prices of beef and of other types of meat were substantially higher than those in the United Kingdom, were prepared to pay correspondingly higher prices than the British import trade. Traditionally important suppliers of beef to the British market such as Australia and Argentina reacted to this price difference by preferring after 1958 and 1963 to supply chiefly the US and EEC markets respectively, whilst exports to the United Kingdom were forced increasingly into the role of a stop-gap measure. British importers could, of course, have obtained greater quantities from the world market by raising their offer prices to the level of those paid by US, Italian and Federal German importers. This, however, was clearly not possible in view of the marketing situation and profit margins (rather pessimistic assessment of the chances of passing on the higher cost prices to the retail trade and consumers). This would then have had the

result that - at the given price - supplies on the UK beef market could not for a time meet demand, so that consumers would have been forced indirectly to change to other types of meat (not price-conditioned, but supply-conditioned substitution). It might be possible that during the period 1958 - 1969 there was to a certain extent a purely random negative correlation between the cyclical fluctuations of C_{pr} and the supply-conditioned substitution. If, for this reason, C_{pr} is eliminated from equation (16), the following is obtained:

$$(17)\quad Q = +118.20 - \underset{(2.4)}{70.126}\log P_1 + \underset{(0.9)}{24.983}\log P_2 + \underset{(0.9)}{0.18835}\,t$$

$$R^2 = 0.684 \qquad D.W. = 1.61 \qquad \frac{\hat{\delta}}{\bar{Q}} = 4.0\ \%.$$

Equation (17) yields a direct price elasticity of -1.2 and a cross price elasticity (pork) of +0.4. As in equation (15), the own price is dominant factor influencing the demand for beef in (17). Equation (17) hardly represents a considerable step forward compared with equation (15). If the hypothesis of a random correlation between C_{pr} and the supply-conditioned substitution were accepted, equation (16) should be discarded and the original equation (15) used for forecasting purposes.

f. Mutton and Lamb

Income, the own price and the prices of pork and poultrymeat provide a good explanation of mutton and lamb consumption:

$$(18)\quad Q = +12.970 - \underset{(1.2)}{2739.1}\left(\frac{1}{C_{pr}}\right) - \underset{(3.9)}{30.795}\log P_1 + \underset{(3.6)}{23.640}\log P_2 + \underset{(1.8)}{9.2180}\log P_3$$

$$R^2 = 0.858 \qquad D.W. = 2.01 \qquad \frac{\hat{\delta}}{\bar{Q}} = 2.7\ \%$$

where:

Q : per capita consumption of mutton and lamb (kg slaughter weight; calendar years)

P_1, P_2, P_3 : real retail prices for mutton and lamb, pork and poultrymeat (d/kg)

The elasticities calculated from equation (18) all lie in a range covered by the a priori expectations. The income elasticity is +0.7, the own price elasticity -1.2, the cross price elasticities +0.9 (pork) and +0.4 (poultrymeat). The price of beef was not seen to have significant influence on the demand for mutton and lamb, which is surprising in view of the great similarity in taste properties of both types of meat. As the price of lamb likewise plays no part in the equations determining beef consumption, we must assume that in the consumer's view beef and lamb are both close substitutes for pork, whereby - easures in terms of the ratio of the cross price elasticities in equations (15) and (18) - the degree of substitution between lamb and pork is considerably greater than that between beef and pork.

g. Pork

From the above results we can assume that demand for pork is influenced not only by income and the own price but also by the price of lamb and possibly that of beef:

$$(19)\quad Q = -34.278 + \underset{(7.7)}{30.041} \log C_{pr} - \underset{(3.6)}{29.508} \log P_1 + \underset{(1.6)}{14.471} \log P_2$$

$$R^2 = 0.928 \qquad D.W. = 1.63 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 3.4\ \%$$

where:

Q : per capita consumption of pork (kg slaughter weight; calendar years)

P_1 and P_2 : real retail prices of pork, and of mutton and lamb (d/kg).

The additional inclusion of the price of beef in the analysis brings hardly any improvement[1]:

$$(20)\quad Q = -52.477 + \underset{(2.9)}{35.482}\ \log C_{pr} - \underset{(2.0)}{25.293}\ \log P_1 + \underset{(1.3)}{19.858}\ \log P_2 - \underset{(0.5)}{7.2375}\ \log P_3$$

$$R^2 = 0.931 \qquad \text{D.W.} = 1.76 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 3.6\ \%$$

where:

P_3 : real retail price of beef (d/kg).

The negative sign of the regression coefficient of P_3 is not what was theoretically expected (beef as a substitute for pork). The sharp drop in the t-test value for the regression coefficient of C_{pr} in equation (20) compared with equation (19) and the low t-value for the regression coefficient of P_3 should be considered in relation to the high inter-correlation between $\log C_{pr}$ and $\log P_3$ (correlation coefficient: +0.83). For this reason equation (20) does not provide satisfactory proof that demand for pork is not influenced by the price of beef. The elasticities estimated using equation (19) show not only that demand for pork is highly sensitive to price (which has already been established for the consumption of beef and lamb), but that growth in income also is a significant factor in promoting the consumption of pork: income elasticity: +1.2; own price elasticity: -1.1; cross price elasticity (lamb): +0.6.

h. Bacon

The consumption of bacon in the United Kingdom seems to be strongly influenced by traditional habits. This could primarily be seen from the fact that the per capita consumption of bacon in the years 1958 - 1969 only fluctuated between around 14.3 and 15.6 kg. This is a relatively small range of fluctuations when compared with that of other types of meat. In view of this small range of variation in the demand for bacon

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[1] R^2(a) in (19): 0.901; R^2(a) in (20): 0.892.

during the assessment period, we are not expect satisfactory results from the regression analysis:

$$(21)\quad Q = +65.469 - \underset{(0.9)}{3.6450}\ \log C_{pr} - \underset{(2.4)}{20.280}\ \log P_1$$

$$R^2 = 0.433 \qquad D.W. = 1.45 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 2.2\ \%$$

Measured in terms of the coefficient of determination adjusted for degreees of freedom and of the other statistical test values, the introduction of a time variable is a considerable improvement:

$$(22)\quad Q = -22.798 + \underset{(2.0)}{31.735}\ \log C_{pr} - \underset{(3.0)}{20.652}\ \log P_1 - \underset{(2.3)}{0.31191}\ t$$

$$R^2 = 0.660 \qquad D.W. = 1.99 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.8\ \%$$

Eggs are an important complementary good for bacon; therefore the egg price should also be included in the regression equation for the demand for bacon:

$$(23)\quad Q = +71.011 + \underset{(2.1)}{4742.3}\ \left(\frac{1}{C_{pr}}\right) - \underset{(2.8)}{19.848}\ \log P_1 - \underset{(0.5)}{1.8199}\ \log P_2 - \underset{(2.4)}{0.31547}\ t$$

$$R^2 = 0.688 \qquad D.W. = 1.77 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.9\ \%$$

where:

Q : per capita consumption of bacon (in kg fresh meat equivalent; calendar years)

P_1 and P_2 : real retail price for bacon and shell eggs respectively (d/kg product weight and d/egg).

All three equations yield an own price elasticity of the demand for bacon of -0.6. There are significant differences between short and long-term reactions as regards income. The short-term income elasticity according to equations (22) and (23) ranges from +0.8 to +0.9. This is

in contrast with a very low, but negative income elasticity of -0.1 in equation (21), which probably represents in the main the long-term reaction. Accordingly, in the long-term demand for bacon would, in fact, be determined primarily by traditional food consumption habits which are moving away from bacon, albeit very slowly. The egg price exerts only a small influence on bacon consumption - equation (23) gives the elasticity in relation to the egg price as -0.1. (As eggs are a complementary product, the negative elasticity and regression coefficient of P_2 correspond to the theory). The low t-test value for the regression coefficient of P_2 is due mainly to the high intercorrelation between the egg price C_{pr} and the time variable (correlation coefficient < -0.9 in each case).

i. Poultrymeat

The explanation of the extraordinarily rapid expansion in demand for poultrymeat is hampered considerably by problems of multicollinearity. Thus the influence of income on the consumption of poultrymeat, which is no doubt present, and the effect of the sharply falling deflated retail price of poultrymeat (P_1) cannot be satisfactorily distinguished from one another (correlation coefficient $\log C_{pr}/\log P_1$: -0.98). However, given the poultry price and the price of two important substitutes (pork and lamb) the consumption of poultrymeat can be very clearly determined:

$$(24)\quad Q = 12.017 - \underset{(25.3)}{20.516 \log P_1} + \underset{(3.0)}{15.889 \log P_2} + \underset{(3.0)}{13.820 \log P_3}$$

$$R^2 = 0.988 \qquad \text{D.W.} = 2.14 \qquad \frac{\hat{b}}{\bar{Q}} = 3.0\ \%$$

where:

Q : per capita consumption of poultrymeat (kg; calendar years)

P_2 and P_3 : real retail price of lamb and pork respectively (d/kg).

Equation (24) clearly shows that the sharp increase in demand for poultrymeat in the period 1958 - 1969 could be ascribed on the whole

to the drop in the (real) price of the product (direct price elasticity according to (24): -1.2). However, the cross price elasticities for the demand for poultrymeat are also surprisingly high: +1.0 (lamb) and +0.8 (pork).

j. Edible offals (liver, heart, kidneys etc.)

Liver consumption has by far the greatest importance in the consumption of offals. We have therefore tried to explain the demand for offals in terms of income and the price of liver:

$$(25)\quad Q = -3.2395 + \underset{(2.1)}{6.3348} \log C_{pr} - \underset{(0.9)}{4.2068} \log P_1$$

$$R^2 = 0.860 \qquad D.W. = 0.76 \qquad \frac{\hat{\delta}}{\bar{Q}} = 2.8\ \%$$

where:

Q : per capita consumption of offals (kg product weight; calendar years)

P_1 : real retail price for liver of all kinds (d/kg).

The high coefficient of determination of equation (25) reflects primarily the trend relationship between Q and C_{pr}. As can be seen from the very low Durbin-Watson statistic, this does not, however, provide a satisfactory explanation of annual fluctuations in demand for edible offals. The additional use of a time variable produces considerably better results:

$$(26)\quad Q = -28.098 + \underset{(4.4)}{21.595} \log C_{pr} - \underset{(3.0}{10.710} \log P_1 - \underset{(3.4)}{0.16934}\ t$$

$$R^2 = 0.943 \qquad D.W. = 1.26 \qquad \frac{\hat{\delta}}{\bar{Q}} = 1.9\ \%$$

Equation (26) gives a (short-term) income elasticity of +2.1 and a short-term own price elasticity of -0.1. If these values are compared with the elasticity coefficients calculated from equation (25) (+0.6 and -0.4), this shows that in the case of the demand for edible offals, as in the case of the demand for beef and bacon, consumer reaction in the short term is much sharper than in the long term.

k. Liquid whole milk

Demand for liquid milk ought to be mainly determined by the own price and by income. Condensed milk can be considered as a possible substitute but it should be remembered that the total consumption of condensed milk compared with that of liquid milk is only marginal:

$$(27)\quad Q = +\,223.93 - \underset{(0.3)}{885.50}\,\left(\frac{1}{C_{pr}}\right) - \underset{(1.2)}{91.224}\,\log P_1$$

$$R^2 = 0.410 \qquad D.W. = 0.83 \qquad \frac{\hat{\delta}}{\bar{Q}} = 0.9\ \%$$

where:

Q : per capita consumption for liquid whole milk in kg, natural fat content (only deliveries to dairies[1], excluding consumption by producers; calendar years)

P_1 : real retail price of liquid whole milk (weighted average for sales at the normal price and at Government subsidised prices (welfare and school milk); d/pint).

The additional introduction of the condensed milk price brings no improvement in the still unsatisfactory results of equation (27); only the inclusion of a time variable achieves this:

$$(28)\quad Q = +\,282.48 - \underset{(5.0)}{27689.0}\,\left(\frac{1}{C_{pr}}\right) - \underset{(1.6)}{66.094}\,\log P_1 - \underset{(5.1)}{1.4238}\,t$$

$$R^2 = 0.859 \qquad D.W. = 2.05 \qquad \frac{\hat{\delta}}{\bar{Q}} = 0.5\ \%$$

The coefficient of determination adjusted for degrees of freedom is almost trebled[2] by this procedure and the D.W. test no longer shows any significant autocorrelation between the residuals as in equation (27).

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[1] Including direct sales of liquid whole milk by the producer to the consumer

[2] R^2(a) in (27): 0.279; R^2(a) in (28): 0.806.

Consequently, the representation of the year-to-year variations in liquid milk consumption by (28) is rather good. As with a number of other products, the short-term income elasticity (+0.5) calculated from equation (28) is considerably higher than the mixed and thus the long-term income elasticity also (+0.02 from equation (27)). Both equations yield a similar estimate for the own price elasticity of demand: -0.3 (27) and -0.2 (28). The very inealstic reaction of liquid milk demand to price changes should primarily be seen in the light of the fact that there is no perfect substitute for liquid milk (unlike margarine for butter or pork for beef, for example) and that liquid milk is one of the important daily necessities in most households.

1. Fresh cream

In constructing the equation for the determination of fresh cream consumption it should be remembered that nearly 50 per cent of total fresh cream sales go to bakeries (for the production of pastries and cream cakes). The demand of the bakeries for fresh cream is almost exclusively derived from the sales prospects for the end products, pastries and cream cakes, which in turn can best be explained in our analysis by reference to income. The direct demand from private households for fresh cream (mainly for use as whipped cream) may similarly be dependent on income and - in contrast to the sales to bakeries - also partly on the price of cream. After the end of food rationing in 1954, which had already affected cream production to a certain extent, there was a manifold increase in cream consumption as a result of the considerable pent-up demand. In order to take this special circumstance into consideration in the type of function, we are going to give the equation for fresh cream consumption a double logarithmic form (here it is supposed that rising income elasticity remains constant):

$$(29)\quad \log Q = -7.8319 + \underset{(13.8)}{4.7292} \log C_{pr} - \underset{(3.6)}{0.87787} \log P_1$$

$$R^2 = 0.997 \qquad \text{D.W.} = 1.82 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 0.4\ \%$$

where:

Q : per capita consumption of fresh cream in product weight (g; calendar years)

P_1 : real retail price for cream (d/pint whole milk equivalent).

A further improvement in equation (29) is hardly possible and, what is more, unnecessary. The elasticity coefficients are given directly by the regression coefficients in the double logarithmic type of function. The income elasticity of +4.7, which seems extremely high at first sight, is, as explained earlier, mainly due to the fact that at the time of food rationing the production and sale of fresh cream came almost entirely to a halt as emphasis was laid on securing adequate supplies of liquid milk and other essential dairy products.

m. Tinned sterilised cream

To a certain extent the situation of tinned sterilised cream is similar to that of fresh cream (suspension of production and imports until 1954, followed by a rapid increase in consumption, which levelled off after 1963 - this in contrast to fresh cream for which the boom in consumption is still continuing). In some sectors condensed milk is an important substitute for tinned cream:

$$(30)\quad Q = -2.9341 + \underset{(1.5)}{1.7575} \log C_{pr} - \underset{(1.2)}{0.91507} \log P_1 + \underset{(0.5)}{0.46067} \log P_2$$

$$R^2 = 0.885 \qquad D.W. = 0.85 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 7.9\ \%$$

where:

Q : per capita consumption of sterilised tinned cream in product weight (kg; calendar years)

P_1 : real retail price for cream (d/pint whole milk equivalent)

P_2 : real retail price for condensed milk (d/pint whole milk equivalent - average price for sweetened and unsweetened products).

The low D.W. statistic and the large relative standard error already suggest that in spite of the rather high coefficient of determination of equation (30) an unsatisfactory explanation of the yearly fluctuations in the demand for tinned cream is still given. The reason for this may inter alia be the merging of widely differing short and long-term influences in the regression coefficients of equation (30). This hypothesis is confirmed by the inclusion of a time variable:

$$(31)\quad Q = -10.658 + \underset{(5.7)}{5.3608}\ \log C_{pr} - \underset{(3.9)}{1.6623}\ \log P_1 + \underset{(1.2)}{0.52279}\ \log P_2 - \underset{(4.9)}{0.03943}\ t$$

$$R^2 = 0.974 \qquad D.\,W. = 2.32 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 4.0\ \%$$

The influences of income and prices on the demand for tinned cream are now well established and the significant positive autocorrelation of the disturbance term in (30) has become an insignificant negative autocorrelation in (31). The representation of the yearly fluctuations in demand for tinned cream in (31) can be described as rather good. A comparison of the elasticity coefficients in (30) and (31) gives the usual picture. The short-term elasticities in equation (31) (income: +6.5; own price: -2.0) are much higher than the mixed elasticities in equation (30) (income: +2.1; own price: -1.1). Only the cross price elasticity (condensed milk) is about the same in both functions (+0.6). The almost "exotic", short-term income elasticity of +6.5 and also the very high mixed income elasticity are, as with fresh cream, related to the "rationing effect" (see above).

n. Condensed milk

Problems of multicollinearity among explanatory variables and the small range of variation of condensed milk consumption offer little hope of an acceptable explanation of the demand for condensed milk of all kinds being given. In addition to income and own price, demand for condensed

milk is mainly influenced by the price of liquid milk, but here it should be remembered that on the consumer preference scale liquid milk rates above condensed milk (condensed milk as a cheap substitute for liquid milk):

$$(32)\quad Q = +0.88494 + \underset{(0.2)}{170.86}\left(\frac{1}{C_{pr}}\right) - \underset{(0.7)}{3.2729}\log P_1 + \underset{(0.5)}{5.3584}\log P_2$$

$$R^2 = 0.344 \qquad D.W. = 1.48 \qquad \frac{\hat{\delta}}{\bar{Q}} = 6.4\ \%$$

where:

Q : per capita consumption of condensed milk of all kinds in product weight (kg; calendar years)

P_1 : real retail price for sweetened and unsweetened condensed milk (d/pint whole milk equivalent)

P_2 : real retail price for liquid milk (weighted average for sales at the normal price and Government subsidised prices (welfare and school milk); d/pint).

The coefficient of determination in equation (32) and the t-value of the partial regression coefficients are all very low. It should, however, be remembered that the intercorrelation between the explanatory variables is very high (the correlation coefficients between the explanatory variables vary from +0.83 to +0.97). The D.W. statistic shows that at least we have not ommitted any important factors influencing the demand for condensed milk from equation (32). The elasticity coefficients obtained from (32) are also plausible (income elasticity: -0.2; own price elasticity: -0.5; cross price elasticity: +0.8) - this is especially so because the high estimate for the cross price elasticity demonstrates the outstanding importance of liquid milk as a substitute for condensed milk. In spite of the poor results of the statistical tests (R^2, t-value) equation (32) seems, therefore, not unsuitable for forecasting purposes.

o. Whole and skimmed milk powder

By far the greatest customers for milk powder are the chocolate and confectionery industries, bakeries (dried skimmed milk used in the

production of white bread) and some branches of the canning industry (particularly the producers of preserved meat and fish). For these buyers the marketing prospects for their end products, but hardly ever the milk powder price, have bearing on their buying arrangements. The marketing prospects for the end products can be reflected here only by reference to income. Direct consumption of whole milk powder is concentrated in the baby food sector (branded whole milk powder at market prices and dried whole milk at reduced prices under the Government welfare milk programme), that of skimmed milk powder taking the form of the production of instant dried milk as a drink. We have no adequate information about retail prices of instant skimmed milk powder. The retail prices of branded whole milk powder and "welfare" dried milk are known; however, their inclusion in the regression analysis in addition to income brought no significant improvement:

$$(33)\quad Q = +\,4.7836 - \underset{(2.7)}{1305.3}\left(\frac{1}{C_{pr}}\right) - \underset{(3.2)}{0.08314}\,t$$

$$R^2 = 0.630 \qquad D.W. = 1.79 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 7.9\ \%$$

where:

Q : per capita consumption of whole milk powder (kg; calendar years).

$$(34)\quad Q = -\,15.563 + \underset{(1.1)}{6.5891}\log C_{pr} - \underset{(0.8)}{0.04045}\,t$$

$$R^2 = 0.316 \qquad D.W. = 2.12 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 9.6\ \%$$

where:

Q : per capita consumption of skimmed milk powder (kg; calendar years).

p. Butter

With reference to a study by J.A.C. Brown[1] we are going to explain the demand for butter in terms of income and the price of butter, but not in terms of the price of margarine. This decision is based on the

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[1] J.A.C. Brown, Seasonality and Elasticity of the Demand for Food in Great Britain since Derationing. (University of Cambridge, Department of Applied Economics, Reprint Series, No. 148) London 1959, p. 8 et seq.

assumption that the effect of the considerably cheaper substitute for butter (margarine) is only a substantial increase in the absolute value of the own price elasticity of the demand for butter. This is because butter ranks higher than margarine on the preference scale of the British consumer. With a given income a household's demand for butter is as high as its subjective judgement of the butter price allows. The proportion of total demand for spreading fats (excluding lard) not covered by purchases of butter is made up by margarine, the price of which is here irrelevant. (One condition must however be fulfilled, namely that the price of margarine remains substantially below that of butter). It follows from this that in principle the sale of and demand for butter and margarine are conditional on the butter price alone and not on the price of margarine.

$$(35)\quad Q = +\,14.701 + \underset{(1.3)}{351.81}\left(\frac{1}{C_{pr}}\right) - \underset{(3.9)}{3.5887}\log P_1$$

$$R^2 = 0.632 \qquad D.W. = 1.39 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.8\ \%$$

where:

Q : per capita consumption of butter in product weight (kg; calendar years)

P_1 : real retail price of butter (d/lb).

At first sight the negative income elasticity for butter demand (-0.1) obtained from equation (35) seems rather surprising. It should, however, be remembered that, as in the United States in the fifties, there is now a growing trend in the United Kingdom towards limiting consumption of fats on health grounds, the so-called visible fats, predominantly butter, being affected first. The estimated value of the own price elasticity of the demand for butter is also unexpectedly low: -0.2 (equation (35)).

During 1971 there were extraordinarily sharp increases in the prices of dairy products on the world market as a result of the (random) interaction of a number of factors on the supply side (to name only the most important: drought in New Zealand; slaughter premiums for dairy cows and drought too

in the EEC). During the short period from December 1970 to January 1972 alone these events caused the prices of New Zealand butter on the London commodity exchange to rise by nearly 70 per cent and those of Danish butter (ex quay) by nearly 50 per cent to a level closely approaching butter prices inside the Six. This period offers an excellent opportunity to investigate the effects on demand of extreme increases in the price of butter (which were also to be expected in a slightly more acute manner after the adoption of EEC agricultural prices by the United Kingdom). In order to make this possible, we have correlated the average weekly consumption of butter per quarter with the changes in the real wholesale price of New Zealand butter in the United Kingdom and with real private consumption expenditure during the period from the 1st quarter of 1970 to the 1st quarter of 1972[1]. An adjustment for population growth was omitted because of the short assessment period. For the same reason a double logarithmic function was chosen in contrast to (35):

$$(36)\quad \log Q' = +0.94362 + \underset{(2.3)}{0.27268} \log C'_{pr} - \underset{(11.7)}{0.39348} \log P'_1$$

$$R^2 = 0.960 \qquad D.W. = 3.45 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 0.7\ \%$$

where:

Q' : average domestic weekly consumption of butter per quarter (1 000 t; moving two-quarter averages)

C'_{pr} : private consumption expenditure per quarter at 1963 prices (£ 100 million; not seasonally adjusted)

P'_1 : unweighted, average wholesale price per quarter of New Zealand butter ("in bulk; finest") on the London commodity exchange, divided by the index of all retail prices (16.1.1962 = 1.00) (£/112 lb; moving two-quarter averages).

With a value of -0.4 a direct price elasticity of butter demand twice as high as that resulting from equation (35) (in absolute terms) results

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[1] Assuming relatively constant retail margins (retail price (RP) $\approx$ 1.33 wholesale price (WP), the reaction of demand at the retail stage can be measured by this process (Δ WP : WP = Δ RP : RP).

from equation (36). This shows very clearly that with unusually sharp price rises consumers can react considerably more acutely than with price rises within a range which is still felt to be "normal". It is remarkable that for the quarterly estimate a significantly positive income elasticity (+0.3) is obtained from (36), compared with a small negative income elasticity resulting from the application of annual data, not comprising a time variable (-0.1 from (36)). A short-term positive income elasticity is also produced by equation (35) after the introduction of a time variable:

$$(37)\quad Q = +\,24.602 - \underset{(1.3)}{2046.1}\left(\frac{1}{C_{pr}}\right) - \underset{(4.0)}{4.9307}\log P_1 - \underset{(1.5)}{0.13977}\,t$$

$$R^2 = 0.714 \qquad \text{D.W.} = 1.76 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.7\ \%$$

The own price elasticity (-0.2) resulting from (37) is consistent with that obtained from (35); according to (37) the income elasticity is +0.6.

The results of the analysis of the demand for butter can be summarised as follows:

1. Using the own price elasticities derived from equations (35) and (37), we would probably seriously underestimate the price effect on the demand for butter under EEC conditions; the price elasticity obtained from equation (36) should, however, provide fairly realistic estimates of the price effect.

2. Equations (35) - (37) give no clear information about the sort of income elasticity which should be used for forecasting. In the short term, i.e. when income is rising, the demand for butter obviously reacts positively (negatively when income falls). In the long term, however, the influence of income is expected to become obscured by the trend - independent of income - towards the contraction of overall fat consumption, which has a negative effect on the demand for butter. Equation (37) yields a reliable differentiation between long and short-term effects. A correction of the regression coefficient of P_1 in equation (37) in line with the information gained from equation (36), combined with a correction to be explained later of the regression coefficient of (t) in (37), would make equation (37), in our opinion, the most suitable equation on which to base a forecast.

q. Cheese

The demand for cheese in the United Kingdom can be adequately explained by reference to income and the price for "natural cheese" - this includes, above all, Cheddar, Cheshire and related cheeses which have not been processed any further (processed cheese is, therefore, not included in the calculations):

$$(38)\quad Q = 4.9754 + \underset{(6.8)}{6.1162} \log C_{pr} - \underset{(4.0)}{3.1452} \log P_1$$

$$R^2 = 0.891 \qquad D.W. = 1.41 \qquad \frac{\hat{\delta}}{\bar{Q}} = 1.9\ \%$$

where:

Q : per capita consumption of all cheeses in product weight (kg; calendar years)

P_1 : real retail price for "natural cheese" (d/kg).

The additional inclusion of the processed cheese price did not bring about any significant improvement in equation (38); this may be primarily connected with the fact that cheese still accounts for only a very small proportion of total cheese consumption. An income elasticity of +0.6 can be calculated from (38), together with an own price elasticity of -0.3. The low own price elasticity is probably due to the fact that there is no perfect substitute for cheese.

r. Eggs and egg products

According to the results of our analysis, the demand for fresh eggs is dependent on income, own price and the price of bacon, which is an important complementary product:

$$(39)\quad Q = + 397.50 - \underset{(1.7)}{21133.0} \left(\frac{1}{C_{pr}}\right) - \underset{(0.9)}{35.261} \log P_1 - \underset{(0.5)}{38.445} \log P_2$$

$$R^2 = 0.846 \qquad D.W. = 2.23 \qquad \frac{\hat{\delta}}{\bar{Q}} = 1.3\ \%$$

where:

Q : per capita consumption of fresh shell eggs (eggs; calendar years)

P_1 : real retail price for fresh eggs (d/egg)

P_2 : real retail price for bacon in product weight (d/kg).

From (39) an estimate of +0.2 for the income elasticity is obtained (own price elasticity: -0.07). This shows that price will influence on demand for fresh eggs only within very narrow limits. The situation as regards eggs seems to be similar to that of bacon: the decisive factor for the long-term trends in egg consumption is ultimately traditional consumption habit. The low t-test values in equation (39) are predominantly a result of the close intercorrelation between $(\frac{1}{C_{pr}})$ on the one hand, and log P_1 and log P_2 on the other (correlation coefficients: +0.9 and +0.7 respectively).

If we attempt to explain the demand for egg products, we are confronted with the same problems as when we determine the demand for milk powder. The demand for egg products comes almost exclusively from a variety of enterprises in the food industry which need egg products for the manufacture of quite different products. It would be hopeless to attempt to incorporate the prices of all end products in the regression equation for the consumption of egg products. The only solution is to explain the demand for egg products by reference to income alone:

$$(40)\quad Q = +\,40.066 - \underset{(2.1)}{6780.0}\,(\frac{1}{C_{pr}})$$

$$R^2 = 0.305 \qquad \text{D.W.} = 2.27 \qquad \frac{\hat{\delta}}{\bar{Q}} = 9.5\,\%$$

where:

Q : per capita consumption of egg products in shell egg equivalent (eggs; calendar years).

Equation (40) gives an income elasticity of +0.8 - four times the income elasticity for fresh eggs. It is clear from this that egg products are used in the United Kingdom mainly for the manufacture of foodstuffs which

are also characterised by a high, positive income elasticity of demand and that for many end products the share (by weight) of egg products in the total product weight has increased substantially (there is much to be said for the fact that the greatest importance is attached to the last factor).

s. Fruit and vegetables

The demand for apples (cooking and dessert) reflects above all the sharp fluctuations in apple prices raised by supply conditions. The changes in the total supply of apples on the British market follow fairly closely the changes in domestic supply, i.e. the extent of the British apple harvest, which is extremely dependent on climatic conditions. Compensation of these fluctuations in domestic supply by imports was substantially hindered by a fairly inflexible handling of existing import quotas and by seasonal tariffs for apples from North America and the continental Europe. Imports of apples from New Zealand, Australia and South Africa were completely liberalised. As their arrival do not, however, coincide with the availability of British supplies, supplies from these countries could perform only a very limited "buffer function" for the British apple harvest. The apple price alone, therefore, provides a very good explanation of apple consumption:

$$(41)\quad Q = +\,40.458 - \underset{(4.3)}{19.617}\ \log P_1$$

$$R^2 = 0.674 \qquad D.W. = 2.05 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 7.3\ \%$$

where:

Q : per capita consumption of apples (kg; farm years)

P_1 : real retail price for apples (cooking and dessert) (d/kg).

The direct price elasticity of the demand for apples is -0.8, according to equation (41). In the long term income seems to have practically no influence on the consumption of apples, but in the short term the influence may be considerable:

(42) $Q = + 41.564 - \underset{(0.1)}{0.51023} \log C_{pr} - \underset{(3.6)}{19.479} \log P_1$

$R^2 = 0.675$ D.W. = 2.02 $\frac{\hat{\sigma}}{\bar{Q}} = 7.7\ \%$

(43) $Q = - 127.39 + \underset{(1.5)}{64.266} \log C_{pr} - \underset{(2.6)}{14.971} \log P_1 - \underset{(1.5)}{0.70281}\ t$

$R^2 = 0.754$ D.W. = 2.24 $\frac{\hat{\sigma}}{\bar{Q}} = 7.2\ \%$

Equation (42) gives an income elasticity of -0.02 ("mixed elasticity" of long and short-term reactions) and equation (43) a short-term income elasticity of +2.5 (own price elasticity from (42): -0.8; from (43): -0.6). Equation (43) would indicate an extraordinarily strong and positive cyclical influence of income on the demand for apples which could be theoretically proven only with difficulty (in contrast to the long-term, almost completely inelastic reaction especially). The limitations on the supply side mentioned initially (import restrictions) possibly played an important part in the formation of the regression coefficient of C_{pr} in equation (43), so that in reality it does not measure consumer behaviour at all. If one also considers that the quotas for imports of apples were be lifted after entry into the EEC, there is a great deal of support for the notion that equation (41), which gives, above all, the reaction of demand to supply-induced price changes, are better suited for forecasting than equations (42) and (43).

Consumption of pears (dessert and cooking) contracted sharply in the 1958/59 - 1968/69 period. According to the results of the regression analysis, income - in contrast to the situation as regards to apples - was primarily responsible:

(44) $Q = 25.276 - \underset{(3.8)}{6.4852} \log C_{pr} - \underset{(2.7)}{4.2097} \log P_1$

$R^2 = 0.690$ D.W. = 1.99 $\frac{\hat{\sigma}}{\bar{Q}} = 7.9\ \%$

where:

Q : per capita consumption of pears (dessert and cooking) (kg; seasons)

P_1 : real retail price for pears of all types (d/kg).

Equation (44) gives an income elasticity of -1.3 and an own price elasticity of -0.8. The market for pears in the United Kingdom is regulated in principle in the same way as that for apples (see above); in this respect, the regression coefficient of C_{pr} could in equation (44) at least partly reflect the influence of supply restrictions. However, unlike with apples, an explanation of the demand for pears in terms of their price only does not lead to useful results and so we must first limit ourselves entirely to equation (44) with regard to the forecast.

The consumption of fresh tomatoes can be adequately explained in terms of income and the price:

$$(45)\quad Q = +\,50.204 - \underset{(3.0)}{7.0939}\ \log C_{pr} - \underset{(2.4)}{14.744}\ \log P_1$$

$$R^2 = 0.732 \qquad D.W. = 2.79 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 3.5\ \%$$

where:

Q : per capita consumption of fresh and chilled tomatoes (kg; calendar years)

P_1 : real retail price for fresh tomatoes (d/kg).

According to equation (45), the demand for fresh tomatoes reacts sharply to price changes (own price elasticity: -1.0) and negatively to income growth (-0.5). The negative income elasticity of the demand for fresh tomatoes is to be seen in the light of the consumption of the most important substitute for fresh tomatoes, namely whole peeled tomatoes, whether tinned or bottled. Unfortunately, it is not possible for statistical reasons to analyse the demand for tinned tomatoes separately from the demand for other tomato preserves and concentrates and to compare the results with equation (45).

$$(46)\quad Q = -\,44.183 + \underset{(3.5)}{23.898}\ \log C_{pr} - \underset{(0.9)}{6.4848}\ \log P_1$$

$$R^2 = 0.725 \qquad D.W. = 1.72 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 8.0\ \%$$

where:

Q : per capita consumption of tomato preserves and concentrates of all types (including whole peeled tomatoes whether tinned or bottled) (kg fresh weight; calendar years)

P_1 : real retail price for bottled, whole peeled tomatoes (d/kg).

Unlike the demand for fresh tomatoes, the consumption of tomato preserves and concentrates is characterised by a high positive income elasticity (+1.4) and a low (in absolute terms) own price elasticity (-0.4) (both elasticity coefficients are calculated according to equation (46)). These results may have been induced by the fact that relatively low-price tinned tomatoes increasingly displacing fresh tomatoes in many fields (for instance, in the preparation of bacon, eggs and tomatoes for breakfast), and that more and more households are adding tomato ketchup to certain special meat dishes (a process probably connected primarily with the rise in the standard of living and the resulting growth in income.

4. Problems of compiling forecasts by means of demand equations incorporating a time variable

As already explained in (2) [equations (4) to (7)] the differences between the long and short-term influences of income and prices on demand are summed up in the regression coefficient of the time variable, whereby the trend in the respective explanatory variable acts as a sort of weighting in respect of these differences. The short-term reactions are represented in the demand equations with a time variable by the regression coefficients of the price and income variables. A direct calculation of the long-term reactions using equation (7) is not possible in cases of more than one explanatory variable, since with only one equation two, three or more variables would have to be determined (for example $\hat{\alpha}_1$ and $\hat{\alpha}_2$ are given in equation (7), a_1 and b_1 can be calculated; $\hat{\alpha}_1^{\ell}$ and $\hat{\alpha}_2^{\ell}$ both remain unknown). When the results of the statistical analysis of the demand for food are, however, examined, will be noticed that the short-term reactions, which have been estimated with the

Table 1 - Estimate income and price elasticities of demand for foddstuffs in the United Kingdom

Product	Income elasticity[a]	Direct price elasticity[a]	Cross price elasticity (elasticities)[a]	With respect to:	Calculated in equation No:	Mixed[b] elasticity - Equation without time variable: (g); short term elasticity - Equation with time variable: (k)	Regression coefficient of time variable
Wheat flour	- 0.59				(8)	(g)	
Rolled oats	- 1.09		+ 0.81	Corn flakes	(9)	(g)	
Corn flakes	+ 0.26	- 0.12	+ 0.81	Rolled oats	(10)	(g)	
Maincrop ware potatoes	+ 0.34	- 0.10[c]			(12)	(g)	
Early potatoes	- 1.14	- 0.16			(13)	(g)	
Refined sugar	- 0.21	- 0.02			(14)	(g)	
Beef I	+ 0.02	- 0.84	+ 0.17	Pork	(15)	(g)	
Beef II	- 1.75	- 1.58	+ 0.63	Pork	(16)	(k)	+ 1.2042
Mutton and lamb	+ 0.65	- 1.19	+ 0.91	Pork	(18)	(g)	
			+ 0.36	poultrymeat			
Pork	+ 1.15	- 1.13	+ 0.55	mutton and lamb	(19)	(g)	
Bacon I	- 0.11	- 0.59			(21)	(g)	
Bacon II	+ 0.92	- 0.60			(22)	(k)	- 0.31191
Bacon III	+ 0.84	- 0.58	- 0.05	Eggs	(23)	(k)	- 1.8199
Poultrymeat		- 1.23	+ 0.95	mutton and lamb	(24)	(g)	
			+ 0.83	mutton and lamb			
Edible offals I	+ 0.62	- 0.41[d]			(25)	(g)	
Edible offals II	+ 2.11	- 1.04[d]			(26)	(k)	- 0.16934
Total meat	+ 0.20	- 0.51[e]	+ 0.12	fish	(64)	(g)	
Liquid whole milk I	+ 0.02	- 0.28			(27)	(g)	
Liquid whole milk II	+ 0.53	- 0.20			(28)	(k)	- 1.4238
Fresh cream	+ 4.73	- 0.88			(29)	(g)	
Tinned cream I	+ 2.12	- 1.10	+ 0.56	condensed milk	(30)	(g)	
Tinned cream II	+ 6.47	- 2.01	+ 0.63	condensed milk	(31)	(k)	- 0.03943
Condensed milk	- 0.15	- 0.46	+ 0.75	liquid whole milk	(32)	(g)	
Whole milk powder	+ 4.64				(33)	(k)	- 0.08314
Skimmed milk powder	+ 2.53				(34)	(k)	- 0.04045
Butter I	- 0.11	- 0.18			(35)	(g)	
Butter II	+ 0.27	- 0.39			(36)	predominately short-term reaction - without time variable - 1st quarter 1970 to 1st quarter 1972	
Butter III	+ 0.62	- 0.24			(37)	(k)	- 0.13977
Cheese	+ 0.56	- 0.29			(38)	(g)	
Shell eggs	+ 0.23	- 0.06	- 0.07	bacon	(39)	(g)	
Egg products	+ 0.82				(40)	(g)	
Apples I (cooking+dessert)		- 0.76			(41)	(g)	
Apples II (" + ")	- 0.02	- 0.75			(42)	(g)	
Apples III (" + ")	+ 2.48	- 0.58			(43)	(k)	- 0.70281
Pears (" + ")	- 1.28	- 0.83			(44)	(g)	
Fresh tomatoes	- 0.48	- 1.01			(45)	(g)	
Tinned tomatoes and tomato concentrates	+ 1.41	- 0.38[f]			(46)	(g)	

[a] Measured in the arithmetical mean. [b] Mixed elasticity coefficient of long and short-term influences (for details see text).
[c] Potato crisps. [d] Liver. [e] Average weighted retail price for all meat. [f] Tinned tomatoes.

Source: Own calculations and estimates.

equations incorporating a time variable, are, with a few minor exceptions, appreciably stronger (in absolute terms) than the mixed reactions derived from demand equations without time variables. From this we have hypothetically deduced that:

$$(47)\quad |\, r(\ell)\,| < |\, r(m)\,| \ll |\, r(k)\,|$$

would have to be valid, where $r(\ell)$ denotes the long-term, r (m) the mixed and r (k) the short term reaction. The relation (47) means that (in absolute terms) the long-term reaction is only slightly below the mixed reaction, while the short-term reaction sonsiderably exceeds the long-term and the mixed reactions. If the relation (47) were correct, it would then have to be possible to replace the unknown $r(\ell)$ by the known r (m) in the decomposition of the regression coefficient of the time variable based upon the generalised form of equation (7), i.e. instead of $\hat{\alpha}_i^{\ell}$, to use the regression coefficients $\hat{\alpha}_i^{m}$, which were obtained from the relationship:

$$(48)\quad Q = \hat{\alpha}_0^{m} + \hat{\alpha}_1^{m} \log C_{pr} + \hat{\alpha}_2^{m} \log P_1 + \hat{\alpha}_3^{m} \log P_2 + \ldots\ldots\ldots$$

Equation (7) would then change into:

$$(49)\quad \hat{\alpha}_t' = (\hat{\alpha}_1^{m} - \hat{\alpha}_1) \cdot \hat{a}_1 + (\hat{\alpha}_2^{m} - \hat{\alpha}_2) \cdot \hat{b}_1 + (\hat{\alpha}_3^{m} - \hat{\alpha}_3) \cdot \hat{c}_1 + \ldots\ldots\ldots$$

If our hypothesis (47) were correct, we would have to obtain an estimated value for $\hat{\alpha}_t'$ from (49), which as a rule is only marginally below $\hat{\alpha}$, i.e. the actual regression coefficient of the time variable. Using (49) we would indeed have no exact, but at least an approximate description of the structure of the regression coefficients of the t-variables, the knowledge of which is indispensable if corrections are to be made for the purposes of forecasting.

In order to test hypothesis (47), we have compared in Table 2 the actual regression coefficients of the time variables and the coefficients estimated by means of equation (49). We have included all demand equations where

Table 2 - Consistency test relating to the decomposition of the regression coefficient of the time variable in the analysis of the demand for foodstuffs in the United Kingdom

Product	Estimated regression coefficient of the time variable (equation (49))	Actual regression coefficient of the time variable	Estimated regression coefficient as a percentage of the actual regression coefficient
Beef	+ 1.101	+ 1.204	91.4
Pork	- 0.203	- 0.215	94.4
Bacon	- 0.294	- 0.312	94.2
Edible offals	- 0.162	- 0.169	95.9
Liquid whole milk	- 1.415	- 1.424	99.4
Sterilised tinned cream	- 0.016	- 0.039	41.0
Whole milk powder	- 0.077	- 0.083	92.8
Skimmed milk powder	- 0.038	- 0.040	95.0
Butter	- 0.134	- 0.140	95.7
Fresh eggs - I[a]	- 1.014	- 1.080	93.9
Fresh eggs - II[b]	- 1.021	- 1.087	93.9
Apples (dessert and cooking)	- 0.599	- 0.703	85.2
Pears (dessert and cooking)	- 0.227	- 0.264	86.0

[a] Excluding the bacon price . - [b] Including the bacon price.

Source: Own calculations and estimates.

the version with a t-variable has yielded sufficiently acceptable results. This contrasts with the comment on the results in (3), in which the version with an explicit t-variable was used only with those equations in which this version, judging by the statistical tests, was clearly a substantial improvement on the equation without a time variable). The clarity of the results summarised in Table 2 leaves hardly anything to be desired.
With only one exception, the regression coefficient of the time variable estimated with (49) comes to 85 - 99 per cent (in 10 out of 13 cases more than 90 per cent) of the actual regression coefficient of the t-variable. As this could hardly be ascribed to chance, we should like to regard this result as confirmation of our hypothesis (47).

By using an empirical example, it will be shown how the approximate knowledge of the structure of the regression coefficient of the time variable can be used for the compilation of forecasts. In the demand analysis we had estimated inter alia the two regression equations

(25) $Q = - 3.2395 + 6.3348 \log C_{pr} - 4.2068 \log P_1$ and

(26) $Q = - 28.098 + 21.595 \log C_{pr} - 10.710 \log P_1 - 0.16934\ t$

(the statistical parameters were not given as they are unimportant for the following explanations), where Q denotes the level of consumption of edible offals and P_1 the real retail price of liver. In order to apply (49) to (25) and (26), we also need the two trend equations (calculation period: 1958 - 1969)

(50) $\log C_{pr} = + 2.519120 + 0.0082791\ t$ and

(51) $\log P_1 = + 2.082479 - 0.0054728\ t$

According to (25) (26), (49), (50) and (51), we obtain the following as an estimate of the regression coefficient of the time variable:

$$(52)\ \hat{\alpha}'_t = \left[(6.335 - 21.595)\ .\ 0.0082791\right] + \left[(-4.207 - (-10.710).(-0.0054728)\right]$$

$$\hat{\alpha}'_t = -\ 0.16189$$

As $\hat{\alpha}'_t$ approaches very closely the actual regression coefficient of the time variable $\hat{\alpha}_t$ (-0.16934; see equation (26)), the long-term reaction can be only marginally below the mixed reaction (equation (25)), so that (52) gives a sufficient insight into the structure of the regression coefficient of the t-variable.

The problem is now to estimate the demand for edible offals using equation (26) on the condition that the real retail price for liver does not fall as it did in the estimation period 1958 - 1969, but that, as UK agricultural prices are aligned on prices level in the Community, the liver price will in real terms rise so sharply that the following new trend equation could, for example, result for the estimation and forecasting period as a whole (1958 - 1977) (the values here are purely notional):

$$(53)\ \log P_1 = +\ 2.00 + 0.005\ t$$

If the demand for edible offals were forecast under these conditions with equation (26) without changing the regression coefficient of t, a systematic error would be made in estimating the demand for edible offals - however "correct" equation (26) may otherwise be. If one's reasoning is at first based on the estimated regression coefficient of the time variable ($\hat{\alpha}'_t$), which differs only slightly from the actual coefficient, by using (26) unchanged

the trend coefficient of the price variable would appear in the regression coefficient of the time variable with a value of about - 0.0055 (see equation (52)), although a value of + 0.005 (equation (53)) would be actually required for forecasting purposes. If the value -0.0054728 is replaced in equation (52) by +0.005, a corrected $\hat{\alpha}'_t$ of only -0.09378 is obtained for the period 1958-77 in place of a value of -0.16189 for the period 1958-69. It is easy to imagine using the resulting relationship between the two estimated regression coefficients of the t-variable, which we shall denote with z, to correct the actual regression coefficient of the time variable in equation (26):

$$(54)\quad z = \frac{\hat{\alpha}'_t \text{ (corrected; 1958 - 1977)}}{\hat{\alpha}'_t \text{ (1958-1969)}}$$

$$z = \frac{(-0.09378)}{(-0.16189)}$$

$$z = 0.579$$

After introducing z into equation (26) the following corrected forecasting equation is obtained:

$$(55)\quad Q = - 28.098 + 21.595 \log C_{pr} - 10.710 \log P_1 - (0.579) \cdot (0.16934)\ t$$

$$Q = - 28.098 + 21.595 \log C_{pr} - 10.710 \log P_1 - 0.09805\ t$$

A comparison of (55) and (26) shows immediately that, other things being equal, (55) gives higher estimates for per capita consumption of edible offals than (26). At first glance, this result is somewhat surprising since one would be inclined to assume simply by intuition that in view of equation (26), which in fact implies a downward trend in real prices, the level of consumption of edible offals at rising prices was overestimated in comparison with equation (55), in which rising real prices are expressly assumed. One should, however, bear in mind that it is possible to take the different price trends (1958 to 1969) and (1958 to 1977) into consideration only as far as their special influence on the regression coefficients of the t-variables is concerned and that in this the short-term and long-term elasticities must be assumed to be unchanged. From equation (52) it can be easily deduced that in the case of the own price elasticities resulting from (25) and (26) the partial influence of the price components on the regression coefficients is negative in the case of a downward trend in prices. Accordingly, in the case of an upward trend in prices this partial influence is positive so that the absolute value of the regression

coefficient of the t-variable in (55) must be lower than in (26). (In theory, it is also conceivable that with very sharply rising prices the positive price components would outweigh the negative income components, thereby resulting in a positive corrected regression coefficient of the t-variable). It is another matter whether consumers would perhaps have reacted to a rise in prices in a manner other that suggested by the regression coefficients of log C_{pr} and log P_2 in (25) and (26). If one had good reasons for assuming this, not only the trend coefficients but also possibly the differentials between short-term and long-term (or mixed) reactions would have to be changed in (52) and this could also require further corrections to the regression coefficient of the t-variable. We can however make only subjective speculations about the direction or indeed the extent of such changes in consumer behaviour vis-à-vis different price tendencies. Consequently, we cannot expect any further results from econometric analysis in this field and we therefore have to limit ourselves, whether we like it or not, to correcting the trend influences in (52), i.e. purely formal correction which must not be expected simply to overcome the difficulties facing demand forecasting in the event of large price increases.

A generalisation of this example is readily possible. Assume the following two demand equations:

$$(56)\quad Q(58\text{–}69) = \hat{\alpha}^{m}_{0} + \hat{\alpha}^{m}_{1} \log C_{pr} + \hat{\alpha}^{m}_{2} \log P_1 + \hat{\alpha}^{m}_{3} \log P_2 + \ldots\ldots \text{ and}$$

$$(57)\quad Q(58\text{–}69) = \hat{\alpha}_0 + \hat{\alpha}_1 \log C_{pr} + \hat{\alpha}_2 \log P_1 + \hat{\alpha}_3 \log P_2 + \ldots\ldots + \hat{\alpha}_t\, t$$

Both equations are supposed to refer to the assessment period 1958 - 1969; $\hat{\alpha}^{m}_{i}$ denotes the mixed and $\hat{\alpha}_i$ the short-term reactions. For the estimated regression coefficient of the t-variable in the assessment period

$$(58)\quad \hat{\alpha}'_t\,(58\text{–}69) = (\hat{\alpha}^{m}_{1} - \hat{\alpha}_1) \cdot \hat{a}_1(58\text{–}69) + (\hat{\alpha}^{m}_{2} - \hat{\alpha}_2) \cdot \hat{b}_1(58\text{–}69) + (\hat{\alpha}^{m}_{3} - \hat{\alpha}_3) \cdot \hat{c}_1(58\text{–}69) + \ldots\ldots\ldots$$

period would then be valid, as would the following equation for the estimated regression coefficient of t during the entire period (assessment and forecasting period):

$$(59)\quad \hat{\alpha}'_t\ (58\text{–}77) = (\hat{\alpha}^{m}_1 - \hat{\alpha}_1)\cdot \hat{a}_1\ (58\text{–}77) + (\hat{\alpha}^{m}_2 - \alpha_2)\cdot b_1\ (58\text{–}77) + (\hat{\alpha}^{m}_3 - \hat{\alpha}_3)\cdot c_1\ (58\text{–}77) + \ldots\ldots$$

The correction factor z is given by the relationship between the estimated regression coefficient of the time variable:

$$(60)\quad z = \frac{\hat{\alpha}'_t\ (58\text{–}77)}{\hat{\alpha}'_t\ (58\text{–}69)}$$

By introducing z into (57) we obtain as a forecasting equation for 1977:

$$(61)\quad Q\ (58\text{–}77) = \hat{\alpha}_0 + \hat{\alpha}_1 \log C_{pr} + \hat{\alpha}_2 \log P_1 + \hat{\alpha}_3 \log P_2 + \ldots\ldots\ldots + (z)\ (\hat{\alpha}_t)\ t$$

The calculation of z makes sens only when $\hat{\alpha}'_t\ (58\text{–}69)$ and $\hat{\alpha}'_t\ (58\text{–}77)$ have the same sign. If this is not so, the simple difference between the two values may be chosen as a substitute:

$$(62)\quad Q'\ (58\text{–}77) = \hat{\alpha}_0 + \hat{\alpha}_1 \log C_{pr} + \hat{\alpha}_2 \log P_1 + \hat{\alpha}_3 \log P_2 + \ldots\ldots\ldots + \left[(\hat{\alpha}_t) - (\hat{\alpha}'_t\ (58\text{–}69) - \hat{\alpha}'_t\ (58\text{–}77)\right]\ t$$

II. Forecasting the demand for foodstuffs

1. Hypotheses relating to the development of income, population and the level of consumer prices up to 1977

As can be seen from Table 3, we have assumed that the growth of real private consumption expenditure in the period 1971 - 1977 (average annual growth rate assumed: 2.4 per cent) will continue only marginally weaker than in the period 1958 - 1971 (2.7 per cent). However, compared with the growth rates achieved during recent years (1965 - 1971: 2.1 per cent), pour hypothesis for 1971 - 1977 means a considerable acceleration in the growth of real private consumption expenditure. The basis of this mildly optimistic assumption is the belief that during the first years of United Kingdom membership of the EEC the British economy will to a certain extent receive additional stimuli to growth. Special mention must be made of the phased dismantling of tariffs for industrial products between the Six and the United Kingdom as of 1973, since this will considerably facilitate the access of British industry to the market of the Six. This could lead to a strong boost in British exports which, via the export multiplier and the consumption function, would, in turn, be reflected in an again somewhat faster growth in real private consumption expenditure in the United Kingdom.

From 1955 to 1962 the growth rate of the UK population moved in a clearly upward direction (average 1955/57: 0.44 per cent; average 1960/62: 0.83 per cent). The reasons for this were an almost continuous increase in the birth rate (from 15.4 per 1 000 inhabitants in 1955 to 18.3 per 1 000 inhabitants in 1962) and considerable net immigration from a number of Commonwealth countries and Ireland. Since 1963 the growth rate of the population slowed down appreciably (average annual growth rate from 1962 to 1972: 0.46 per cent). Apart from a fall in the birth rate (1970: 16.2 per 1 000 inhabitants), a sharp decline in net immigration due to economic reasons (rising domestic unemployment, which also means reduced employment opportunities for foreign workers) was also thought to have been a contributory factor. In forecasting the size of the resident population we have assumed that the birth rate will

Table 3 - Compilation of hypotheses on income and population growth and on price levels in the United Kingdom in 1977 and the 1977/78 farm year

Calendar year	Total private consumption expenditure at 1963 prices (£ million)		Annual growth rate of private consumption expenditure at 1963 prices (%) (values in brackets: growth rates calculated on the basis of revised figures	Index of retail prices (16 January, 1962 = 1.00)[b]	Annual rate of increase in the retail price level (%)	Population (mid-year estimates; millions)		Private consumption expenditure at 1963 prices per head of population (£)	
	figures used in the demand analysis[a]	up-dated and/or forecast figures[b]				figures used for the calculation of per capita consumption and private consumption expenditure[d]	figures up-dated on the basis of the[b] 1971 census	figures used in the demand analysis	up-dated and/or forecast figures
1958	17019		2.5 (.)	0.928	0.3	51.652	.	329.5	.
1959	17747		4.3 (.)	0.933	0.5	51.956	.	341.6	.
1960	18445		3.9 (.)	0.942	1.0	52.372	.	352.2	.
1961	18871		2.3 (.)	0.974	3.4	52.807	.	357.4	.
1962	19269		2.1 (.)	1.016	4.3	53.314	53.266	361.4	361.8
1963	20087		4.2 (.)	1.036	2.0	53.637	53.535	374.5	375.2
1964	20783		3.5 (.)	1.070	3.3	54.008	53.849	384.8	385.9
1965	21183	21243	1.9 (.)	1.121	4.8	54.361	54.175	389.7	392.1
1966	21619	21628	2.1 (1.8)	1.165	3.9	54.654	54.450	395.6	397.2
1967	22074	22118	2.0 (2.3)	1.194	2.5	54.578	54.746	401.5	404.0
1968	22570	22667	2.3 (2.6)	1.250	4.7	55.283	55.045	408.3	412.2
1969	22629	22800	0.3 (0.5)	1.318	5.4	55.534	55.272	407.5	412.5
1970		23413	. (2.7)	1.402	6.4	55.711	55.411		422.5
1971		24032	. (2.6)	1.534	9.4	55.950	55.566		432.5
1972		24609	2.4	1.643	7.1		55.788		441.1
1973		25200	2.4	1.728	5.2		56.067		449.5
1974		25805	2.4	1.818	5.2		56.347		458.0
1975		26424	2.4	1.913	5.2		56.629		466.6
1976		27058	2.4	2.012	5.2		56.912		475.4
1977	27768		2.4	2.115	5.2	57260		484.9	

Table 3 (continued)

Farm year	Total private consumption expenditure at 1963 prices; (only figures actually used; £ million)[c], [e]	Index of retail prices (only figures actually used; 16 January 1962 = 1.00)[c], [f]	Population at the turn of the year (only figures actually used; millions)[d], [h]	Private consumption expenditure at 1963 prices per head of population (only figures actually used; £)
1958/59	16947	0.931	51.804	327.1
1959/60	17791	0.934	52.164	341.1
1960/61	18128	0.954	52.590	344.7
1961/62	18597	0.999	53.061	350.5
1962/63	19365	1.027	53.476	362.1
1963/64	20423	1.047	53.823	379.4
1964/65	20993	1.096	54.185	387.4
1965/66	21562	1.144	54.508	395.6
1966/67	21551	1.183	54.816	393.2
1967/68	22476	1.216	55.131	407.7
1968/69	22552	1.286	55.409	407.0
1969/70				
1970/71				
1971/72				
1972/73				
1973/74				
1974/75				
1975/76				
1976/77				
1977/78	28115	2.173	57.365	490.1

[a] Central Statistical Office, Annual Abstract of Statistics, No. 107, H.M.S.O., London 1970. - [b] Central Statistical Office, "Monthly Digest of Statistics", No 317, H.M.S.O., London, January 1973. - [c] Central Statistical Office "Monthly Digest of Statistics", H.M.S.O., London, various issues. - [d] Central Statistical Office "Monthly Digest of Statistics, no 304, H.M.S.O., London, April 1971. - [e] Addition of quarterly figures not seasonally adjusted (3rd and 4th quarter in the calendar year t and 1st and 2nd quarter in the calendar year t + 1). - [f] Estimated on the basis of monthly figures for the period July-June. - [g] Own estimate : population in the middle of year (t) plus mid-year population in (t + 1) divided by 2.

Source: See notes.

not fall below its current level but that net immigration will drop slightly for the next few years. (The employment of British labour in some EEC countries, Germany mainly, a development which had already been observed for some time and which will presumably have made itself more sharply felt since, is one of the points for consideration here.) The estimated growth rate in the UK population for 1972 - 1977 will be about 0.5 per cent according to these considerations.

The average annual increase in consumer prices in the United Kingdom was 4.2 per cent in the period 1958 - 1972, which can be broken down into two clearly distinguishable phases:

1. 1958 - 1968, when retail prices rose by less than 5 per cent each year;
2. after 1969, when the rate of retail price increases rose abruptly (1969: 5.4 per cent; 1970: 6.4 per cent; 1971: 9.4 per cent). The highest "inflation rate" for consumer prices was recorded in August 1971: 10.3 per cent (compared with August 1970). Rates of price increases have slowed down considerably since then, but compared with 1968 they are still very high. The lowest rate recorded since August 1971 was 5.8 per cent in July 1972 (compared with July 1971). After this the upward movement in prices accelerated again to between 7.0 and 7.9 per cent from September 1972 to January 1973 (compared with the corresponding period the previous year) in spite of the wage and price freeze introduced at the beginning of November.

The reasons for this development (since 1969) are firstly to be found in a change in attitude on the part of British trade unions which are for appearances' sake pushing strongly for the highest possible increases in nominal earnings, partly by fairly extensive use of the right to strike, whereby job preservation seems in many cases to be of only secondary importance (wage - price spiral). Trade unions' growing preoccupation with a fair distribution of income can be observed in varying degrees in other Western industrial countries also and is likely to be of a long-term than a short-term nature. The annual rate of increase in retail prices of 5.2 per cent assumed for the period between 1972 and 1977, would, under these circumstances, still appear to be a fairly

"optimistic" hypothesis ("optimistic" in the sense that this supposes that the UK Government conducts a considerably mor successful anti-inflation policy in the future). Nevertheless, we maintain this "optimistic" hypothesis for a very specific reason. As can be seen from Table 4, when converting the EEC agricultural prices imputed for 1977/78 from units of account into pounds sterling, we based our calculations on the exchange rate of the £ before it was floated on 23 June 1972. As the fluctuations in the exchange rate of the pound have since shown, a considerable devaluation of the pound seems to be fairly certain when a new parity for the pound is fixed at some future date. Accordingly, the producer prices for 1977/78 in Table 4, which are expressed in old pounds, would prove to be too low by an amount corresponding to the anticipated rate of devaluation of the pound against the old US dollar (= 1 unit of account); this would also have a considerable effect on the level of the hypotheses relating to real retail prices. In order to balance to some extent this "negative effect" on real retail prices, a rate of price increase may be assumed which is too low compared with the recent increases ("positive effect") - so low, in fact, that from the purely theoretical point of view, given this rate of inflation the old exchange rate of the pound could have been maintained. By doing so no definite relation between the rate of inflation and the exchange rate is to be postulated - along the lines, for instance, of the "naive purchasing power parity theory"; it is merely to be made clear which direction the argument is taking.

2. Hypotheses relating to retail prices

a. Hypotheses relating to producer prices

In order to be able to construct hypotheses relating to retail prices, assumptions must first of all be made about producer prices as these represent the raw material costs or the cost prices to the processors or the wholesale trade respectively. The hypotheses relating to the possible level of the producer prices of important agricultural products in the enlarged EEC in the 1977/78 farm year are summarised in Table 4, which is largely based on the table in the Introduction, so that nor further explanation is required here. In addition to the hypotheses relating to the threshold prices of milk and milk products formulated in Table 4, further

Table 4 - Hypotheses on prices[a] of important agricultural products in the enlarged EEC in the 1977/78 farm year

Product	Type of price	Unit	1972/73	1977/78	Percentage change 1977/78 compared with 1972/73	Average annual rate of increase between 1972/73 and 1977/78 (%)
Common wheat	- Basic intervention price	£/1000 kg	43.6	48.3	+ 10.8	+ 2.1
Barley	- Basic intervention price	£/1000 kg	39.9	44.6	+ 11.8	+ 2.3
Maize	- Intervention price (France)	£/1000 kg	(34.7)[c]	44.6	.	.
Oats	- Market price	£/1000 kg	(33.6)[l]	41.7	.	.
Sugar beet	- Minimum price[b]	£/1000 kg	7.4	7.9	+ 6.8	+ 1.3
White sugar	- Intervention price	£/1000 kg	97.3	103.0	+ 5.9	+ 1.2
Ware potatoes	- Market price[d]	£/1000 kg	.	18.8	.	.
Rape, rape seed	- Basic intervention price	£/1000 kg	84.4	92.9	+ 10.1	+ 1.9
Milk	- Target price ex-dairy (3.7 % fat)	£/1000 kg	49.04	56.3	+ 14.8	+ 2.8
Butter	- Intervention price	£/1000 kg	775.0[e]	833.0	+ 7.5	+ 1.5
	- Threshold price	£/1000 kg	838.1[f]	917.0	+ 9.4	+ 1.8
Skimmed milk powder	- Intervention price	£/1000 kg	225.0	292.0	+ 29.8	+ 5.4
	- Threshold price	£/1000 kg	279.2[f]	350.0	+ 25.4	+ 4.6
Whole milk powder	- Threshold price (26 per cent fat)	£/1000 kg	486.3[f]	545.0	+ 12.1	+ 2.3
Condensed milk, unsweetened	- Threshold price	£/1000 kg	206.0[f]	231.0	+ 12.1	+ 2.3
Condensed milk, sweetened	- Threshold price	£/1000 kg	275.4[f]	310.0	+ 12.6	+ 2.4
Cheddar cheese	- Threshold price	£/1000 kg	650.2[f]	743.0	+ 14.3	+ 2.7
Beef and veal	- Guide price	£/1000 kg live weight	325.0[e]	394.0	+ 21.2	+ 3.9
Mutton and lamb	- Guide price	£/1000 kg live weight	295.8[g]	358.0	+ 21.0	+ 3.9
Pigmeat	- Basic price	£/1000 kg slaughter weight	343.8	378.0	+ 9.9	+ 1.9
Poultrymeat	- Sluice-gate price[h]	£/kg slaughter weight	0.2880[k]	0.3320	+ 15.3	+ 2.9
Eggs	- Sluice-gate price[j]	£/10 eggs	0.11276[k]	0.1310	+ 16.2	+ 3.0

[a] Prices given in £ on the basis of 1 unit of account = £/0.416667 (valid until 23.6.1972 - i.e. until the floating of sterling). [b] For beet within the basic quota; area: Aisne, Somme, Oise (France). [c] August 1972. [d] Average producer price for ware potatoes from the West German main crop. [e] Valid from 15.9.1972. [f] Threshold price fixed for milk products on 1.4.1972. [g] 91 per cent of the guide price for beef (explanation see text). [h] "Fowls 70 per cent" (plucked, drawn, without head and legs, with heart, liver and gizzard). [i] Valid from 17.5.1972 - 31.7.1972. [j] Poultry eggs in shell, fresh or preserved (class A4 = 55-60 grammes per egg). [k] Valid from 1.8.1972 - 31.10.1972. [l] Market price in the Federal Republic of Germany in August 1972 (Hanover).

Source: Directorate-General for Agriculture, Directorate for Economy and Agricultural Structure, EEC Information: Agricultural markets prices (livestock and vegetable products), Brussels, various issues. Own calculations and estimates.

hypothetical threshold prices had to be deduced for projecting the demand for fresh and tinned cream respectively:

1. Sterilised tinned cream is produced in principle according to the same methods as unsweetened condensed whole milk. This has led us to the simplified assumption that the price difference between unsweetened condensed whole milk and tinned cream can mainly be traced back to the differences in milk fat and milk protein content. In the United Kingdom tinned cream generally has a fat content of 23 per cent and unsweetened condensed whole milk an estimate average (comprising all marketed types) content of 8 per cent, giving a ratio of 2.88 : 1 (tinned cream : condensed milk in terms of fat content). If this ratio alone were applied to prices, this would result in a considerable over-valuation of tinned cream as the milk protein content of tinned cream comes to only a fraction of the milk protein content of condensed milk. As we do not possess any reliable information on the milk protein content of tinned cream, however, we are also unable to estimate a corresponding price reduction to account for the low milk protein content of tinned cream (quite apart from the fact that an evaluation of milk protein could be only fairly arbitrary). In order to obtain some idea of the price relationship between tinned cream and condensed milk, we compared the average import prices in the British overseas trade accounts for "tinned cream" from Denmark (most important foreign supplier of tinned cream to the United Kingdom market) with the import prices of unsweetened condensed whole milk from the Netherlands. The comparison gave a price relationship between tinned cream and condensed milk of about 2.0 : 1 for the years 1967/69. If this figure is applied to the EEC threshold price, it gives a hypothetical threshold price for tinned cream of £ 462/1 000 kg for 1977/78.

2. Fresh cream has a fat content of 48 per cent (double cream) in the United Kingdom. The price of fresh cream can be derived directly from that of tinned cream since, in termes of production methods and packaging, both products differ in respect of milk fat content only (48 : 23 $\approx$ 2). Accordingly, a hypothetical threshold price for fresh cream of £ 924/ 1000 kg was arrived at for 1977/78.

b. Hypotheses relating to nominal and real retail prices

The hypotheses relating to the nominal retail prices for food in the United Kingdom in 1977 and their decomposition in particular, can be taken directly from Tables 5 and 6 so that a detailed discussion of the separate price hypotheses is hardly necessary at this point. The method we applied in forecasting the cost of raw materials and/or cost prices and the processing and sales margins per product unit shall be demonstrated by using only two examples:

1. Rolled oats: The producer price for 1.7 lb of oats in the form of grain, i.e. the producer price of the average quantity of oats estimated to be necessary for the production of 1 lb of rolled oats was subtracted from the retail price per lb product weight of rolled oats. In so doing, the deficiency payments had to be eliminated from the producer price beforehand since they enter neither into the market price nor into the cost price for the milling industry. The difference between these two amounts, retail price per lb product weight and producer market price obtained from 1.7 lb of oats, corresponds in substance to the processing margin and also to the wholesale and retail margin including VAT (henceforth referred to as total margin for short). The producer market price obtained from 1.7 lb of oats assumed for the 1977/78 farm year can be equated with the market price of the same quantity of oats assumed for the 1977/78 farm year in the enlarged Community (see Table 4). The total margin for 1977/78 was forecast with reference to the hypothesis relating to the trend in the general price level until 1977/78. From 1958/59 to 1968/69 the level of retail prices in the United Kingdom registered an average annual growth rate of 3.3 per cent. The average annual growth rate of the total margin came, however, to only 1.8 per cent for the same period.

Table 5 - Hypotheses on the nominal retail prices and their most important components, for vegetable products in the United Kingdom in the 1977/78 farm year or

Product	Price and price components	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69		1977/78
Rolled oats	Average producer market price obtained for oats (d/1.7 lb grain value)	4.05	3.88	3.48	3.57	3.70	3.62	3.72	3.87	3.90	3.57	3.72		7.72
	Processing and trading margins (d/lb product weight)	10.93	11.65	11.25	11.18	10.93	11.56	11.66	11.03	11.20	12.96	13.13		7.60
	Retail price (d/lb product weight)	14.98	15.53	14.73	14.75	14.63	15.18	15.38	14.90	15.10	16.53	16.85		15.32
Corn flakes	Average import price of Argentinian maize (d/lb grain value)	2.27	2.29	2.29	2.24	2.37	2.53	2.65	2.75	2.66	2.67	2.88		4.86
	Processing and trading margins (d/lb product weight)	24.20	24.36	24.24	25.01	25.86	26.82	27.95	28.13	28.89	28.93	29.22		41.60
	Retail price (d/lb product weight)	26.47	26.65	26.53	27.25	28.23	29.35	30.60	30.88	31.55	31.60	32.10		46.46
Maincrop ware potatoes	Producer market price (d/lb)	2.45	1.38	1.25	1.96	1.93	1.61	1.51	1.52	2.08	1.57	1.66		2.05
	Processing and trading margins (d/lb)	1.70	1.67	1.55	1.99	1.97	1.79	1.79	1.88	2.07	2.08	2.04		3.20
	Retail price (d/lb)	4.15	3.05	2.80	3.95	3.90	3.40	3.30	3.40	4.15	3.65	3.70		5.25
Early potatoes	Retail price (d/lb)	5.90	5.40	5.30	5.70	8.80	5.80	4.80	5.70	7.40	7.40	5.80		8.93
	Price relationship (early potatoes : maincrop ware potatoes)	1.42	1.77	1.89	1.44	2.26	1.71	1.45	1.68	1.78	2.03	1.57		1.70
Apples (dessert + cooking)	Producer market price (d/lb)	3.5	4.5	3.4	9.7	5.3	4.8	4.3	5.0	6.4	8.9	7.9		5.5
	Processing and trading margins (d/lb)	7.3	7.7	8.4	8.1	8.7	9.2	9.7	10.3	10.4	10.9	13.0		22.0
	Retail price (d/lb)	10.8	12.2	11.8	17.8	14.0	14.0	14.0	15.3	16.8	19.8	20.9		27.5
Pears (dessert + cooking)	Producer market price (d/lb)	4.5	6.6	4.8	9.3	6.5	5.1	6.3	5.6	7.8	8.9	5.4		6.0
	Processing and trading margins (d/lb)	8.6	9.1	9.2	8.0	9.5	10.2	10.6	9.8	10.7	10.7	11.7		19.8
	Retail price	13.1	15.7	14.0	17.3	16.0	15.3	16.9	15.4	18.5	19.6	17.1		25.8
Fresh tomatoes[a]	Producer market price (d/lb)	14.1	11.7	13.2	14.2	13.5	16.9	15.2	15.8	15.5	15.5	18.2		15.0
	Processing and trading margins (d/lb)	8.8	10.3	9.0	10.0	11.1	9.7	11.8	12.5	14.0	13.2	12.8		29.3
	Retail price (d/lb)	22.9	22.0	22.2	24.2	24.6	26.6	27.0	28.3	29.5	28.7	31.0		44.3
Tinned tomatoes[a]	Retail price (d/lb)	15.6	14.9	16.0	15.5	14.7	15.0	17.2	19.1	18.0	17.9	17.5		26.6
	Price relationship (tinned tomatoes : fresh tomatoes)	0.68	0.68	0.72	0.64	0.60	0.56	0.64	0.68	0.61	0.62	0.57		0.60

Table 5 (continued)

Product	Price and price components	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969	1970		1977/78
White sugar[b]	Retail price in the United Kingdom (d/lb)	7.65	7.80	8.05	7.85	8.00	10.75	9.65	8.45	8.35	8.55	8.50	8.85	9.00		17.20
	Intervention price for refined sugar in the EEC (d/lb)	.	.	.	.	.	.	.	.	.	.	9.63	9.63	9.63		11.20
	Retail price in West Germany (d/lb)	13.38	13.38	13.38	13.83	13.97	13.97	13.97	13.97	14.20	14.20	13.83	14.06	14.52		17.20
	Difference between the retail price in West Germany and the EEC intervention price (d/lb)	.	.	.	.	.	.	.	.	.	.	4.20	4.43	4.89		6.00
	[a] Calendar years 1958-1968 and 1977.	[b] Calendar years 1958-1970; 1977/78 farm year.														

Source: Ministry of Agriculture, Fisheries and Food, Household Food Consumption and Expenditure (Annual Report of the National Food Survey Committee), H.M.S.O., London, current edition. Secretary of State for the Home Department, Secretary of State for Scotland, Secretary of State for Wales and the Minister of Agriculture, Fisheries and Food, Annual Review and Determination of Guarantees, London, H.M.S.O., various issues. F.A.O., Production Yearbook, Rome, various issues. - Own calculations and estimates.

Table 6 - Hypotheses on the nominal retail prices, and their most important components, for livestock products in the United Kingdom in 1977

Product	Price and price components	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969		1977/78
Beef	Producer market price obtained (d/lb slaughter weight)	29.1	30.5	28.4	25.0	27.2	27.4	33.7	34.9	32.1	32.1	37.7	38.6		83.5
	Processing and trading margins (d/lb)	16.8	18.2	21.6	25.3	24.4	24.5	23.9	25.1	34.1	34.3	35.7	39.7		99.7
	Retail price (d/lb)	45.9	48.7	50.0	50.3	51.6	51.9	57.6	60.0	66.2	66.4	73.4	78.3		183.2
Mutton	Producer market price obtained (d/lb slaughter weight)	32.3	26.3	30.8	24.8	28.8	31.5	36.0	36.0	34.1	34.1	39.4	42.5		86.8
	Processing and trading margins (d/lb)	8.3	12.7	9.9	15.1	12.2	10.3	9.5	12.4	15.8	15.3	14.0	15.0		30.3
	Retail price (d/lb)	40.6	39.0	40.7	39.9	41.0	41.8	45.5	48.4	49.9	49.4	53.4	57.5		117.1
Pork	Producer market price obtained (d/lb slaughter weight)	24.0	23.4	23.4	21.0	19.8	22.2	22.2	21.6	27.0	26.9	26.6	28.0		41.1
	Processing and trading margins (d/lb)	21.2	24.4	26.4	29.5	29.8	27.1	30.2	31.5	29.2	33.5	35.8	36.9		74.6
	Retail price (d/lb)	45.2	47.8	49.8	50.5	49.6	49.3	52.4	53.1	56.2	60.4	62.4	64.9		115.7
Bacon	Wholesale price for British bacon (d/lb product weight)	30.4	29.9	29.6	27.1	26.3	28.7	30.4	29.0	34.2	33.0	32.6	34.5		51.4
	Simple price difference (bacon - pigmeat) (d/lb)	6.4	6.5	6.2	6.1	6.5	6.5	8.2	7.4	7.2	6.1	6.0	6.5		10.3
	Average wholesale price for British and Danish bacon (d/lb product weight)	31.0	30.3	30.0	28.1	27.0	29.3	31.2	29.7	34.4	33.8	33.4	35.9		52.4
	Price difference (British bacon - ø British and Danish bacon) (d/lb product weight)	0.6	0.4	0.4	1.0	0.7	0.6	0.8	0.7	0.2	0.8	0.8	1.4		1.0
	Processing and trading margins (d/lb product weight)	16.8	18.2	21.6	25.3	24.4	24.5	23.9	25.1	34.1	34.3	35.7	39.7		99.7
	Retail price (d/lb product weight)	45.9	48.7	50.0	50.3	51.6	51.9	57.6	60.0	66.2	66.4	73.4	78.3		183.2
Poultry-meat	Wholesale price (d/lb slaughter weight)[b]	.	.	28.8	25.0	26.5	25.0	27.0	24.0	26.0	23.0	23.0	24.0		30.1
	Processing and trading margins (d/lb slaughter weight)	.	.	18.9	19.0	17.4	16.9	17.8	18.5	17.0	18.0	17.9	17.2		22.0
	Retail price (d/lb slaughter weight)	54.6	49.2	47.7	44.0	43.9	41.9	44.8	42.5	43.0	41.0	40.9	41.2		52.1
Liver	Retail price (d/lb)[c]	49.1	51.0	51.2	50.6	51.6	52.1	53.0	55.2	57.8	58.6	59.2	62.2		124.4
Butter	Wholesale price for New Zealand butter in London (d/lb)	25.4	37.0	33.1	27.4	31.9	34.5	36.2	35.7	32.4	32.1	32.1	32.1		94.7
	Processing and trading margins (d/lb)	7.0	7.3	7.7	7.8	7.0	8.2	8.5	8.8	9.6	9.5	8.5	8.7		12.8
	Retail price (d/lb)	32.4	44.3	40.8	35.2	38.9	43.1	44.7	44.5	42.0	41.6	40.6	40.8		107.5

Table 6 (continued)

Product	Price and price components	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969		1977/78
Cheese	Wholesale price - average for British and New Zealand produce (d/lb)	20.7	31.4	25.8	25.4	25.5	26.1	28.0	28.7	29.5	29.7	28.6	28.2		81.0
	Processing and trading margins (d/lb)	9.4	10.8	13.4	12.8	13.2	13.8	13.8	15.0	15.4	15.9	17.2	17.7		40.5
	Retail price (d/lb)	30.1	42.2	39.2	38.2	38.7	39.9	41.8	43.7	44.9	45.6	45.8	45.9		121.5
Cream	Retail price (d/pint product weight)[d]	69.4	68.7	69.0	66.9	63.8	64.1	66.2	68.1	70.1	71.9	72.7	72.0		167.0
Condensed whole milk	Retail price (d/pint whole milk equivalent)[e]	9.5	9.4	9.3	8.7	8.6	8.5	8.5	8.8	8.4	8.9	8.9	9.3		17.6
Liquid milk	Retail price (d/pint)[f]	7.5	7.5	7.5	7.7	7.9	8.0	8.4	8.6	8.9	9.2	9.7	10.2		16.5
Fresh eggs	Average producer price of the Egg Marketing Board (d/egg)	3.8	3.4	3.6	3.2	3.2	3.1	2.8	3.1	2.8	2.6	2.9	2.9		3.1
	Processing and trading margins (d/egg)	0.4	0.5	0.6	1.0	0.6	1.3	0.9	0.9	1.2	1.3	1.2	1.5		3.5
	Retail price (d/egg)	4.2	3.9	4.2	4.2	3.8	4.4	3.7	4.0	4.0	3.9	4.1	4.4		6.6

[a] Difference between the retail price for bacon and the average wholesale price for British and Danish produce. [b] Broilers from domestic production, plucked, with giblets, not drawn (corresponds approximately to "fowls 83 per cent" in the calculation of the EEC sluice-gate price). [c] Assuming that the price of liver of all types will rise to about the same extent as the average retail price for beef, mutton and pork - each separate type of meat having a weight of 0.3333 (equal distribution). [d] Assuming that the average retail price refers to 20 per cent tinned cream and 80 per cent fresh cream and that the wholesale price in 1977 will be about 70 per cent of the retail price (the wholesale prices for fresh and tinned cream in 1977 are represented by the fictitious EEC threshold prices for these products). [e] Assuming that the average retail price for condensed milk referes to 25 per cent sweetened and 75 per cent unsweetened produce and that wholesale prices in 1977 will be about 75 per cent of the retail price (wholesale prices for sweetened and unsweetened condensed whole milk in 1977 are represented by the estimated EEC threshold prices for these two types of condensed milk). [f] Direct estimate on the basis of a price comparison at the retail stage for the United Kingdom and the EEC countries.

Source: See Table 4 - Vegetable products.

If one considers that the cost factors influencing the total margin are to be found primarily in labour costs and only secondarily in capital costs (this is particularly true of the wholesale and retail trade, but not so or only conditionally so of the milling industry) and that wages have risen considerably faster than prices, the fairly low growth rate of the total margin in relation to the general inflation rate indicates that both for the production and for the marketing of rolled oats appreciable productivity gains must have been achieved and that, moreover, following a relatively sharp increase in competition - accompanied by a rapidly growing degreee of concentration in marketing and, above all, in the milling industry - profit margins have fallen considerably (there are, of course, close links between the concentration in processing and marketing, on the one hand, and in productivity gains, on the other). If it is now assumed that this development will also continue in the future in a similar form, one can also assume that the relationship of 0.55 to be observed in the reference period between the growth rate of the total margin and that of the price level will also persist until 1977/78. From 1968/69 to 1977/78 we had estimated an average annual increase in prices of 6 per cent (see Table 3); if this figure is multiplied by the factor 0.55, we obtain an average annual growth rate of the total margin of 3.3 per cent for 1968/69 - 1977/78. (In this estimate it is implicitly assumed inter alia that the relationship between nominal wage increase and the rise in prices - or, in other words, the growth rate of real wages - will not change substantially during the forecasting period compared with the reference period.)

2. Beef: The total margin (see above) for beef in the reference period was estimated by subtracting, on a slaughter weight basis, the average domestic producer market price obtained for 1 lb of meat from clean fat cattle (excluding deficiency payments) from the retail price of 1 lb of beef. The total margin for beef consequently represents in the main the processing and trading margins (including the VAT) of the butchers operating at wholesale and at retail. The producer price of beef assumed for 1977/78

in Great Britain cannot be automatically equated with the EEC guide price for cattle assumed for 1977/78, since both prices are defined in a different way. While the EEC guide price includes cattle of all classes and categories (for instance, cows and bulls for slaughter), the average producer market price calculated from the deficiency payments systems in the United Kingdom applies only to meat from clean fat cattle[1] of good quality (hence, fat cows in particular are not included). In order to account for this, we have, for the special purpose of this price comparison, raised the estimated EEC guide price for 1977/78 by 5 per cent. This is a purely arbitrarily determined percentage, since no adequate information was available to us as to how differences in quality between separate types of beef are valued from on country to another and how, above all, the differences in valuation which would very probably result would compare. In addition, the question arises whether the actual market price in the EEC in the 1977/78 farm year will correspond to the guide price or whether, depending on the market situation, it will settle considerably above or below it. As it is difficult for us to say at the present time what the market situation of beef will be in the enlarged Community in 1977/78, we must satisfy ourselves with the assumption that there will be a fairly "normal" market situation in 1977/78 and that prices on the reference markets of the Member States will at least approach the guide price. From 1958 to 1969 the total margin increased at an average annual rate of 8.1 per cent, i.e. almost two and a half times the increase in the general price level (3.3 per cent). The total margin for beef has, therefore, increased at a slower pace than the average weekly earnings of a male employee in the food, drink and tobacco industry as a whole (average annual growth rate of weekly earnings from October 1958 to October 1969: 9.2 per cent). This shows very clearly that the productivity gains achieved in the processing and marketing of beef were only marginal during the reference period. The likely reason for this was primarily that until now most beef is sold through retail abattoirs, which have only a relatively low turnover and which, accordingly, have little opportunity to undertake effective

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[1] Fat steers, fat heifers, young fat bulls.

rationalisation measures. The traditional retail abattoir is, therefore, usually forced to pass on wage increases almost in their entirety to the consumer. For some years supermarkets have been accounting for a fast growing, if still small proportion (in terms of volume) of total beef sales. This process is likely to become still more marked in the future and this could bring about a certain decelartion of the rate of increase of the total beef margin (increased competition on butcher's shops as a result of supermarkets' more rationalised marketing methods). For this reason we have assumed that the ratio (rate of increase of total margin : rate of price increase) of 2.45 in the reference period will fall to 2.00 in the forecasting period. Under these conditions, the average annual increase in the total margin for beef will be about 12 per cent (2.0 - 6.1) during the period from 1969 to 1977.

We cannot proceed in the same way described in (1) and (2) for all products. For example, no representative time series of wholesale and dairy selling prices were available for condensed milk and cream respectively. In both cases we resorted to assuming that the threshold prices of condensed milk and cream estimated for 1977 in the enlarged Community were the wholesale and dairy selling price respectively in the United Kingdom. In order to arrive at the hypothesis on the retail price in 1977 in the United Kingdom, we further assumed that the wholesale price and dairy selling price as a proportion of the retail price for condensed milk and cream in 1977 will be of approximately the same order of magnitude as the average for butter and cheese. The retail price of liver had to be forecast similarly. We simply assumed that the increase in the retail price of liver from 1969 to 1977 will roughly correspond to the average price rise for beef, mutton and pork (cattle, sheep and pigs are by far the largest source of liver intended for human consumption). The wholesale price for bacon in 1977 was calculated taking into consideration the average producer market price obtained for pigmeat as compared with the wholesale price for British bacon (simple price difference) and also the average wholesale price of British and Danish bacon and the retail margin on bacon.

The price hypotheses on fruit and vegetables need special explanation. The producer price for apples and pears in the United Kingdom is a calculated average price (total of prices obtained divided by the quantity sold) which refers to all marketable varieties and qualities of both apples and pears. We could not find a corresponding representative producer price for apples and pears for the Six. Price comparisons are possible, however, for the individual EEC countries[1]. For example, the average producer price of class A apples and pears in the EEC "high price country" for fruit - i.e. Germany - for the 1967/68 to 1969/70 farm years was 5.2 and 4.8 d/lb respectively compared with 7.7 and 7.4 d/lb in the United Kingdom (average of 1966/67 to 1968/69 farm years). In the other EEC countries, particularly France and Italy, which have the best climates for apple and pear production, producer prices for apples and pears were in part far below those in the United Kingdom A similar situation obtains if we compare retail prices. In 1968/69 retail prices of apples and pears in Paris were only 63 per cent and 83 per cent respectively of those in the United Kingdom (national average for 200 towns)[2]. In Germany in 1967/68 the retail prices of top quality apples (dessert and cooking) stood at 78 per cent of the average retail price in the United Kingdom[3]. The UK "Economic Development Committee for Agriculture" estimated in a study published only recently that after the complete dismantling of tariffs and quotas for fruit from EEC countries British producer prices for apples will probably drop by about 20 per cent while producer prices for pears are likely to fall only slightly[4]. This has led us to assume that British producer prices for apples (dessert and cooking) in the 1977/78 farm year will be about 15 per cent lower than the average price obtained in the 1964/65 - 1968/69 farm years (pears: 12 per cent lower).

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[1] Statistical Office of the European Communities, "Agricultural Statistics", Luxembourg, various issues.

[2] See Federal Statistical Office, Prices, Wages, Economic calculations, Series 9: Prices abroad - II. Retail prices, 3rd quarter 1970, Wiesbaden, page 45 et seq.

[3] See Federal Statistical Office, Statistical Yearbook for the Federal Republic of Germany 1968, Wiesbaden, p. 446.

[4] Quoted in the Financial Times, London, of 8th March 1972.

The producer prices for tomatoes in the various EEC countries differ in part to an extraordinary degree. In 1968/69 the price of tomatoes for fresh consumption in Belgium, for example, was 5.2 d/lb compared with 11.5 d/lb in the Netherlands. The lowest producer market price for fresh tomatoes was recorded in Italy, namely 4.5 d/lb (1968/69). This compared with an average producer price of hothouse tomatoes for fresh consumption of 16.9 d/lb in the United Kingdom (average for the 1967/68 - 1968/69 farm years). In view of these price relationships we have assumed that the average producer price for hothouse tomatoes in the United Kingdom in 1977 will reach 15.0 d/lb at least.

The hypotheses on the real retail prices for foodstuffs in the year 1977 or the 1977/78 farm year were obtained quite simply by dividing the nominal retail prices by the index of all retail prices in 1977 or 1977/78 (cf. Table 3). The resulting real retail prices are summarised in Table 7. These forecasts indicated that there would be significant increases in real retail prices by 1977, especially for beef, mutton and edible offals as well as for cream, butter and cheese. Appreciable price reductions are to be expected primarily for potatoes, fruit and vegetables (tomatoes). The downward trend in the prices of poultrymeat and eggs recorded during the base period (1968 - 1969) could persist until 1977, although at a decidedly slower rate. According to our estimates, there would be little change in the real prices of pork and bacon, along with a modest fall in real retail prices during the base period offset by a slight increase during the forecasting period.

3. Results of forecasting per capita consumption of foodstuffs in the 1977/78 farm year or in 1977

Results of forecasting per capita consumption by means of the demand functions developed under (I, 3), which are summarised in Table 8, will now be briefly discussed. This has already involved a certain preselection

Table 7 - Summary of hypotheses on the real retail prices of important foodstuffs in the United Kingdom after alignment on EEC agricultural prices in 1977

Product	ø 1958/60	ø 1967/69	1977	Increase (+) or decrease (-) from ø1958/60-ø 1967/68	Increase (+) or decrease (-) from ø1967/69-1977 (%)	Average annual rates of change ø 1967/69 to 1977 (%)
Rolled oats[a]	16.05	13.15	11.65	- 18.1	- 11.4	- 1.3
Corn flakes[a]	28.26	25.87	21.38	- 8.5	- 17.4	- 2.1
Refined sugar[a]	8.72	7.11	7.92	- 18.5	+ 11.4	+ 1.2
Maincrop ware potatoes[a]	3.56	3.13	2.42	- 12.1	- 22.7	- 2.8
Early potatoes	5.89	5.38	4.22	- 8.7	- 21.6	- 2.7
Apples (dessert + cooking)[a]	12.34	15.58	12.70	+ 26.3	- 18.5	- 2.3
Pears (dessert + cooking)[a]	15.19	15.02	11.90	- 1.1	- 20.8	- 2.6
Fresh tomatoes	24.0	24.6	20.9	+ 2.1	- 14.7	- 1.8
Bottled and tinned tomatoes	16.6	14.5	12.6	- 12.7	- 13.1	- 1.5
Beef	51.6	57.9	86.6	+ 12.2	+ 49.6	+ 4.6
Mutton and lamb	42.9	42.6	55.4	- 0.7	+ 30.0	+ 3.0
Pork	50.9	49.9	54.7	- 2.0	+ 9.6	- 1.0
Bacon	50.9	47.6	49.4	- 6.5	+ 3.8	- 0.4
Poultrymeat	54.0	32.8	24.6	- 39.3	- 25.0	- 3.1
Edible offals (liver)	54.0	47.9	58.8	- 11.3	+ 22.8	+ 2.3
Liquid whole milk[b]	8.0	7.7	7.8	- 3.7	+ 1.3	+ 0.1
Cream (fresh and tinned)[c]	73.9	57.7	79.0	- 21.9	+ 36.9	+ 3.5
Condensed milk (sweetened and unsweetened)[d]	10.1	7.2	8.3	- 28.7	+ 15.3	+ 1.6
Butter	41.9	32.8	50.8	- 21.7	+ 55.0	+ 5.0
Cheese (Cheddar)	39.7	36.5	57.4	- 8.1	+ 57.3	+ 5.2
Fresh eggs[e]	4.4	3.3	3.1	- 25.0	- 6.1	- 0.7
All types of meat	50.5	49.1	61.3	- 2.8	+ 24.8	+ 2.5
Fish (white)	36.0	38.9	41.0	+ 8.1	+ 5.4	+ 0.6

[a] Farm years: July-June (ø 1958/59-1960/61; ø 1966/67-1968/69; 1977/78). [b] d/pint (= 0.5851 kg). [c] d/pint product weight. [d] d/pint whole milk equivalent. [e] d/egg.

Source: Own calculations and estimates.

of results but does not take into account the possible consequences of a later nutritional test. In this first appraisal of results of forecasting it also seems opportune to discuss those products for which no demand functions could be formulated.

a. Cereal products

As can be seen from Table 9, the fall in the per capita consumption of cereal products should, according to our estimates, continue during the forecasting period. It is likely that decisive factor in this development will be a further contraction in the consumption of wheat flour due to a marked income-dependent fall in demand for white bread, while demand for wheat flour in the form of cakes, biscuits, grits, wheat germs and similar products will stagnate. However, the consumption of so-called breakfast cereals - rolled oats and corn flakes - could still expand somewhat by 1977/78. At the same time, rolled oats could be increasingly replaced by corn flakes - according to our estimates, the proportion of rolled oats in the total consumption of breakfast cereals would decline from 32 % (average 1966/67 - 1968/69) to only 18 % in the 1977/78 farm year. The main reason for this would be the income-dependent substitution of rolled oats by corn flakes for taste reasons. The fact that, according to our price hypotheses, the retail price relationship (corn flakes : rolled oats) would shift somewhat during the forecasting period in favour of corn falkes will also play a part. (Here is should be remembered that in the demand functions for rolled oats and corn flakes the prices of competing products seem in each case to be the most important explanatory variables after income). During the reference period the per capita consumption of rice was subject to marked fluctuations in which no definite long-term trend is recognizable. These fluctuations in rice consumption could not be explained either by the real retail price of rice or by income, which leaves two main possible explanations:

Table 8 - Summary of results of forecasting per capita consumption of important foodstuffs in the United Kingdom in 1977 by means of the demand functions (kg)

Product	ø 1958/60	ø 1967/69	1977	By applying equation No.	Regression coefficient of time variables	
					unadjusted	adjusted to
Wheat flour (product weight)[a]	77.9	69.1	63.0	(8)		
Rolled oats (product weight)[a]	1.65	1.26	0.78	(9)		
Corn flakes (product weight)[a]	2.03	3.80	3.63	(10)		
Refined sugar (white value)[a]	55.1	53.3	51.7	(14)		
Maincrop ware potatoes[a]	73.2	79.7	83.7	(11)		
Early potatoes	19.0	15.0	13.7	(13)		
Apples (dessert + cooking)[a]	12.1	9.7	12.1	(41)		
			12.0	(42)		
Pears (dessert + cooking)[a]	2.5	1.9	1.9	(44)		
Fresh tomatoes	6.8	6.1	6.6	(45)		
Tinned tomatoes and tomato concentrates (fresh weight)	6.4	8.5	10.6	(46)		
Beef	25.8	24.0	15.9	(15)		
			14.6	(16)	+ 1.2042	
			20,8	(16)		+ 1.5104
Mutton and lamb	11.6	10.7	8.3	(18)		
Pork	9.9	12.2	15.2	(19)		
Bacon (fresh weight)	14.6	14.8	14.0	(22)	- 0.31191	
			14.2	(22)		- 0.30876
			13.6	(23)	- 0.31547	
			13.7	(23)		- 0.31228
Poultrymeat	5.1	9.5	14.3	(24)		
Edible offals	4.3	4.7	3.9	(26)	- 0.16934	
			4.6	(26)		- 0.13305
Liquid whole milk	138.2	139.8	138.0	(28)	- 1.4238	
			138.5	(28)		- 1.3973
Fresh cream (product weight)	0.32	0.91	1.60	(29)		
Sterilised tinned cream (product weight)	0.26	0.41	0.28	(31)	- 0.03943	
			0,88	(31)		- 0.00990
Condensed milk (product weight)	3.02	3.37	3.00	(32)		
Whole milk powder (product weight)	0.77	0.64	0.43	(33)	- 0.08314	
			0.44	(33)		- 0.08260
Skimmed milk powder (product weight)	1.06	1.16	1.38	(34)	- 0.04045	
			1.33	(34)		- 0.04024
All types of cheese	4.41	5.02	4.80	(38)		
Butter (fresh weight)	8.60	8.80	8.10	(35)		
			7.50	(37)	- 0.13977	
			8.50	(37)		- 0.0889
			7.30	(36)[b]		
Shell eggs (No.)	233	249	258	(39)		
Egg products (No.)	21	24	26	(40)		

[a] Farm years July/June (ø 1958/59-1960/61; ø 1966/67-1968/69; 1977/78). - [b] Indirect estimate on the basis of average weekly consumption per quarter.

Source: Cf. Supply situation statements - Own calculations and estimates.

Table 9 - Results of forecasting per capita consumption of cereal products in the United Kingdom in 1977/78

Product	Per capita consumption in	ø 1958/59-1960/61	ø 1966/67-1968/69	1977/78	No. of equation used or freehand estimate (F)
Wheat flour	kg flour	77.9	69.1	63.0	(8)
Pearl and roasted barley	kg flour	0.8	0.5	0.5	F
Rolled oats and corn flakes	kg product weight	3.7	4.1	4.4	
Rolled oats	kg product weight	1.7	1.3	0.8	(9)
Corn flakes	kg product weight	2.0	2.8	3.6	(10)
Rice - total	kg flour	1.7	1.9	2.0	
Direct consumption	kg flour	1.4	1.6	1.7	F
Processed	kg flour	0.3	0.3	0.3	F
Rye flour	kg flour	0.2	0.2	0.2	F
Cereal products - total	kg flour and/or product weight	84.3	75.8	70.1	

Source: Cf. annexed supply situation statements - Own calculations and estimates.

1. The supply situation statement for rice contains gross statistical errors.

2. Rice is regularly consumed in large quantities by only a relatively small proportion of private households. The quantities of rice required by these families would tend to remain constant over a period of time, i.e. they depend neither on the income of the families in question nor on the price of rice. The remaining households eat rice only occasionally and then in varying quantities. A sizeable proportion of rice consumption is accounted for by Chinese restaurants and the like. Although the number of these restaurants has risen in the reference period, this does not necessarily mean that there has been corresponding increase in demand for rice in this sector.

In view of the special structure of demand for rice it is clear that any determination of demand by means of the customary factors (income, prices) will prove unrewarding. Consequently, there is no need to try to prove that the rice balance sheet contains serious errors. In forecasting per capita consumption of rice we therefore had to confine ourselves to the assumption that no appreciable changes were likely in rice consumption before 1977/78. For pearl and roasted barley and for rye flour, in respect of which information is also lacking, we have assumed that consumption will stagnate. The estimate of total per capita consumption of cereal products is hardly affected by this asumption as pearl and roasted barley as well as rye flour are of only secondary importance in the total consumption of cereal products.

b. Sugar

During the period under review the real retail price of refined sugar fell by almost 20 %, although a price rise of around 11 % is indicated for the forecasting period. However, this will not mean any appreciable acceleration in the fall already noted in per capita consumption of sugar since the overall demand for sugar is almost completely inelastic to price changes. The fall of 3 % in sugar consumption forecast for the period (average 1966/67 -

1968/69) up to 1977/78 is even to be attributed primarily to the effect of income (negative income elasticity) and only secondarily to the effect of price.

c. Potatoes

For per capita consumption of all kinds of potatoes in the 1977/78 farm year we obtained an estimate of 97.4 kg - compared with the 1966/67 - 1968/69 average this represents a slight increase of 3 per cent. This presupposes that future demand for potato chips, crisps and similar products will increase so sharply that the decline in demand for main-crop ware potatoes and for new potatoes will not only be offset but even overcompensated - a process, which as in the past, would be determined mainly by the growth in incomes. The same will also be true of the per capita consumption of early potatoes, for which a decline of almost 9 % is forecast by 1977/78 (basis: average 1966/67 - 1968/69), although in real terms it is expected that early potatoes will be much cheaper at the retail stage (fall in the real price in the period under review: -9 %; figure assumed for the forecasting period: -22 %). The decisive factor in this forecast of demand for early potatoes is, however, the high negative income elasticity, the absolute value of which is many times the absolute value of the own price elasticity.

d. Meat and meat products

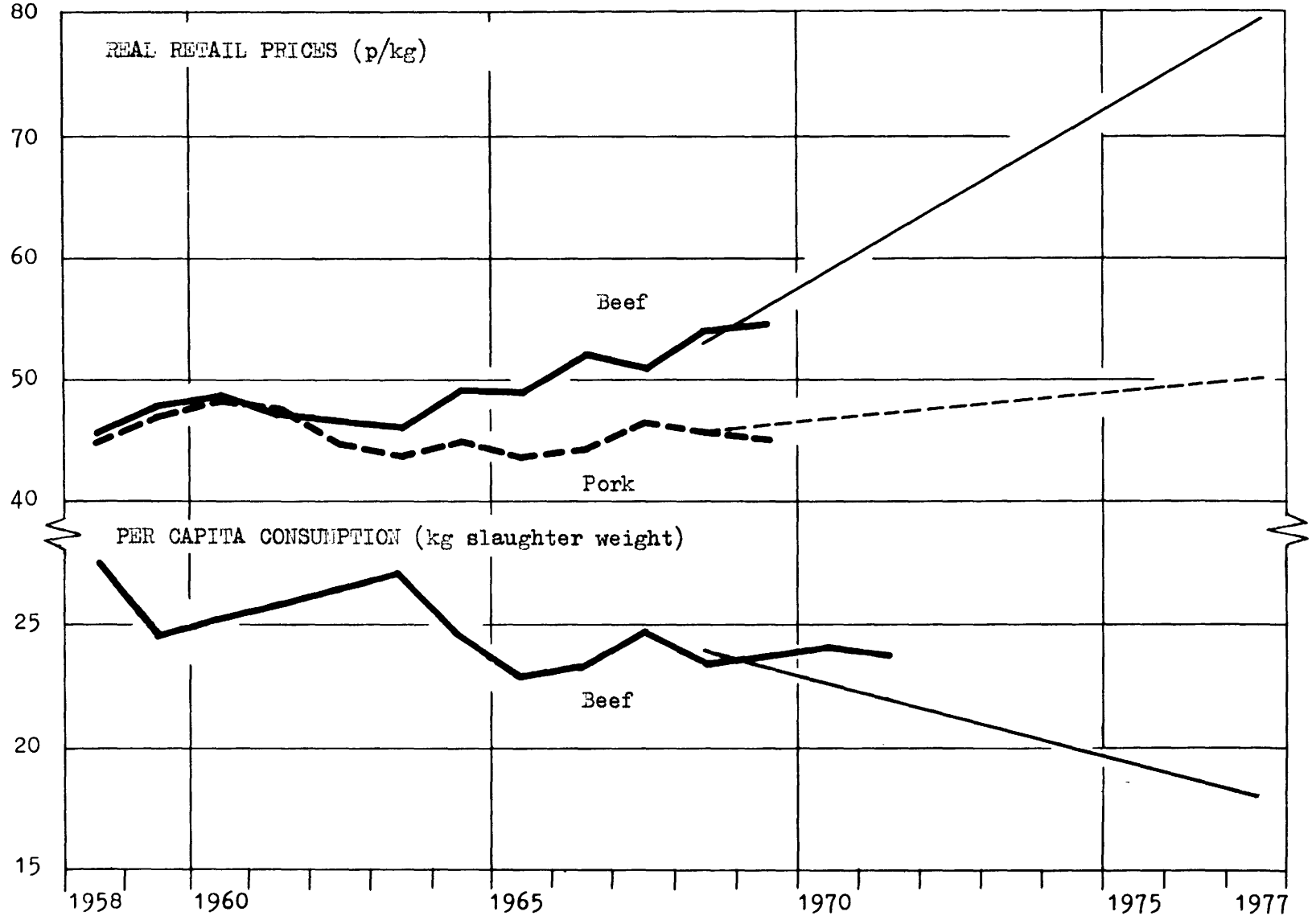
If per capita consumption of beef is to be forecast by equation (16), i.e. the equation in which, along with income and the price of both beef and pork, time also appears as an explanatory variable, the question arises whether the regression coefficient of the time variable should be used for forecasting with or without adjustment (cf. explanation under I,4). As the trend in beef and pork prices during the period under review will not persist in the forecasting period for neither (in both cases we are faced with a structural break in the price time series), an adjustment of the regression coefficient of the t-variable appears necessary. With

Table 10 - Results of forecast of per capita consumption of meat in the United Kingdom in 1977/78

Product	Per capita consumption in	ø 1958/61	ø 1968/71	1977	No. of equation used for estimate
Beef and mutton	kg slaughter weight	37.56	34.17	26.30	
Beef	kg slaughter weight	25.79	23.82	18.00	
Mutton	kg slaughter weight	11.77	10.35	8.30	(16)
Pork and bacon	kg slaughter weight	24.69	27.82	26.90	
Pork	kg slaughter weight	9.92	12.73	15.20	(19)
Bacon	kg slaughter weight	14.77	15.09	13.70	(23)
Poultrymeat	kg slaughter weight	5.55	10.21	14.30	(24)
Pork and poultrymeat	kg slaughter weight	15.47	22.94	29.50	
Edible offals	kg slaughter weight	4.09	4.58	4.60	(26)
All types of meat	kg slaughter	71.89	76.78	74.60	

Source: Cf. annexed supply situation statements - Own calculations and estimates.

Diagram 1 - Per capita consumption of beef and real retail prices for beef and pork in the United Kingdom 1958/69(71) and results of forecasts for 1977



such equation (16) gives an estimated per capita consumption of beef of 20.8 kg slaughter weight. Compared with the average for the years 1968/71 this represents a decline of 13 %. In view of the hypothesis of a 50 % rise in the real retail price of beef by 1977 and a marked shift in the retail price ratio (beef : pork) in favour of pork[1] a decline in consumption of only 13 % by 1977 seems to us rather unrealistic. Equation (15), in which no time variable is included and whose coefficients primarily reflect long-term consumer reactions, gives an estimated per capita consumption of beef in 1977 of 15.9 kg, which would represent a decrease of 33 % compared with 1968/71. However, this estimate appears too pessimistic in the light of recent developments; as a subjective compromise solution we shall, therefore, assume a per capita consumption of beef in 1977 of 18.0 kg (-24 % compared with 1968/71).

According to equation (18), consumption of mutton and lamb would decline from by 20 % to 8.3 kg slaughter weight in the period 1968/71 - 77. This would be due wholly to the own price effect (rise of 30 % in the real retail price of mutton and lamb by 1977) and the cross price effect in respect of poultrymeat (the price ratio mutton and lamb : poultrymeat would increase from 1.30 in the years 1967/69 to 2.25 in 1977!).

As a result of a highly positive income and cross price effect (mutton and lamb), which are counterbalanced only fractionally by a relatively weak, contractive own price effect, we obtain an increase of 19 % in the per capita consumption of pork from 1968/71 to 1977 (equation (19)). For forecasting the demand for bacon equation (23) seems to us to be the most suitable equation, as apart from income and its own price, the price of its principal complementary food (eggs) and the factor time have been introduced as explanatory variables. Divergent trends in the price of bacon and eggs in the reference and forecasting periods necessitated an adjustment to the regression coefficient of the time variable. Given these conditions, we obtain a per capita consumption of bacon in 1977 of 13.7 kg slaughter weight, which is equal to 91 % of the consumption level

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[1] Favourable: from the consumer's point of view.

Diagram 2 - Per capita consumption of mutton and lamb and real retail prices for mutton and lamb, pork and poultrymeat in the United Kingdom 1958/69(71) and results of forecasts for 1977

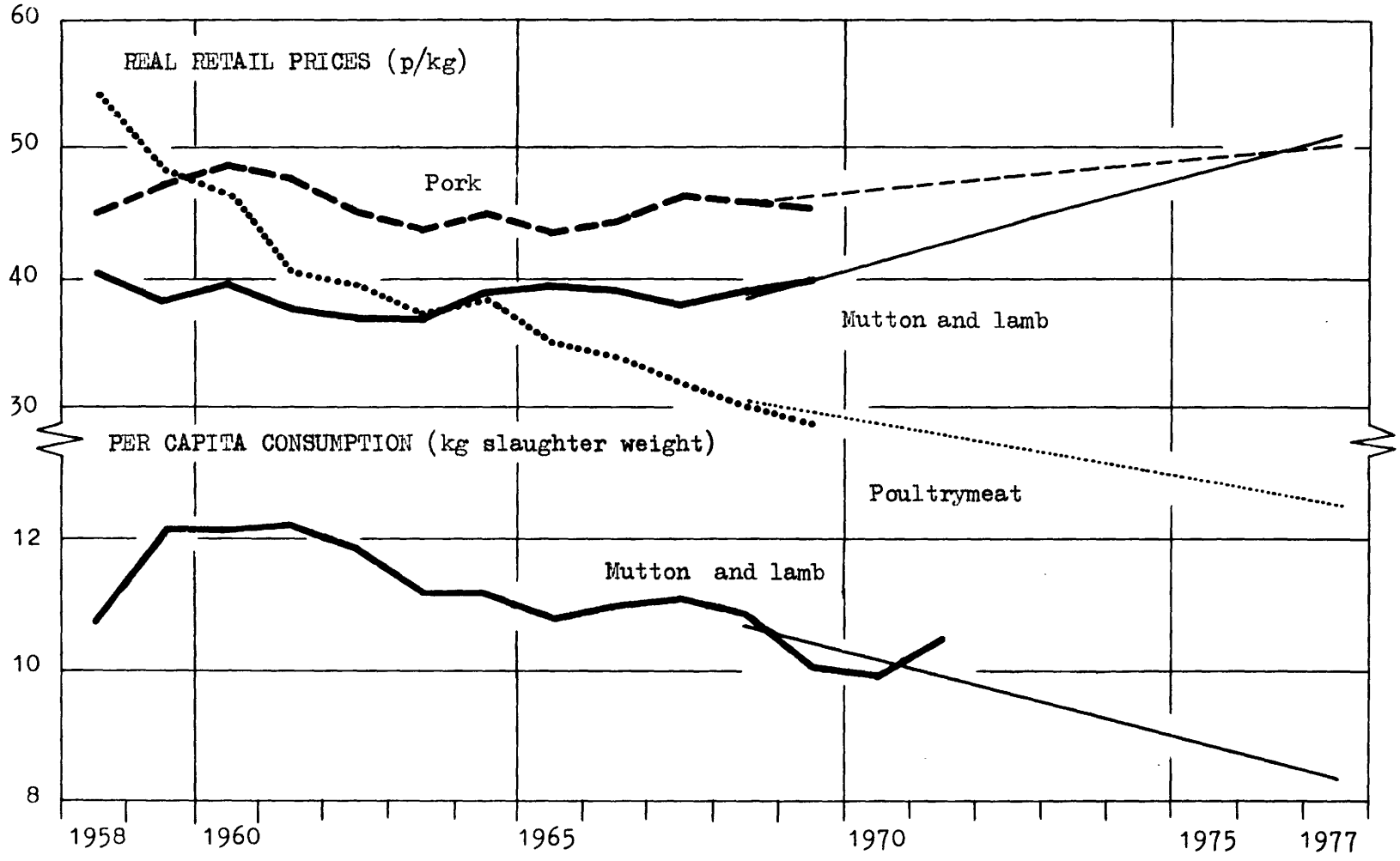
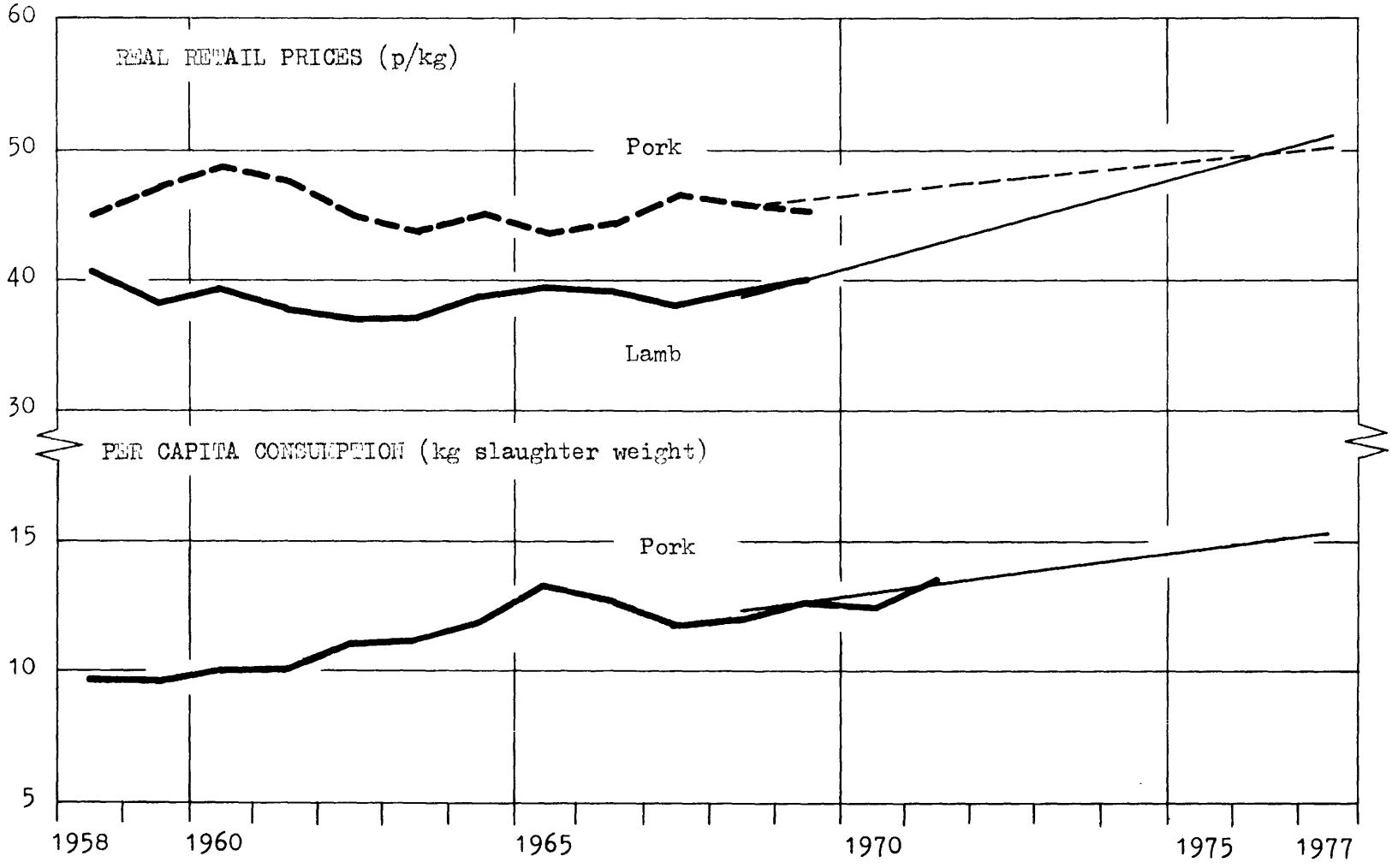


Diagram 3 - Per capita consumption of pork and real retail prices for pork and lamb in the United Kingdom 1958/69(71) and results of forecasts for 1977

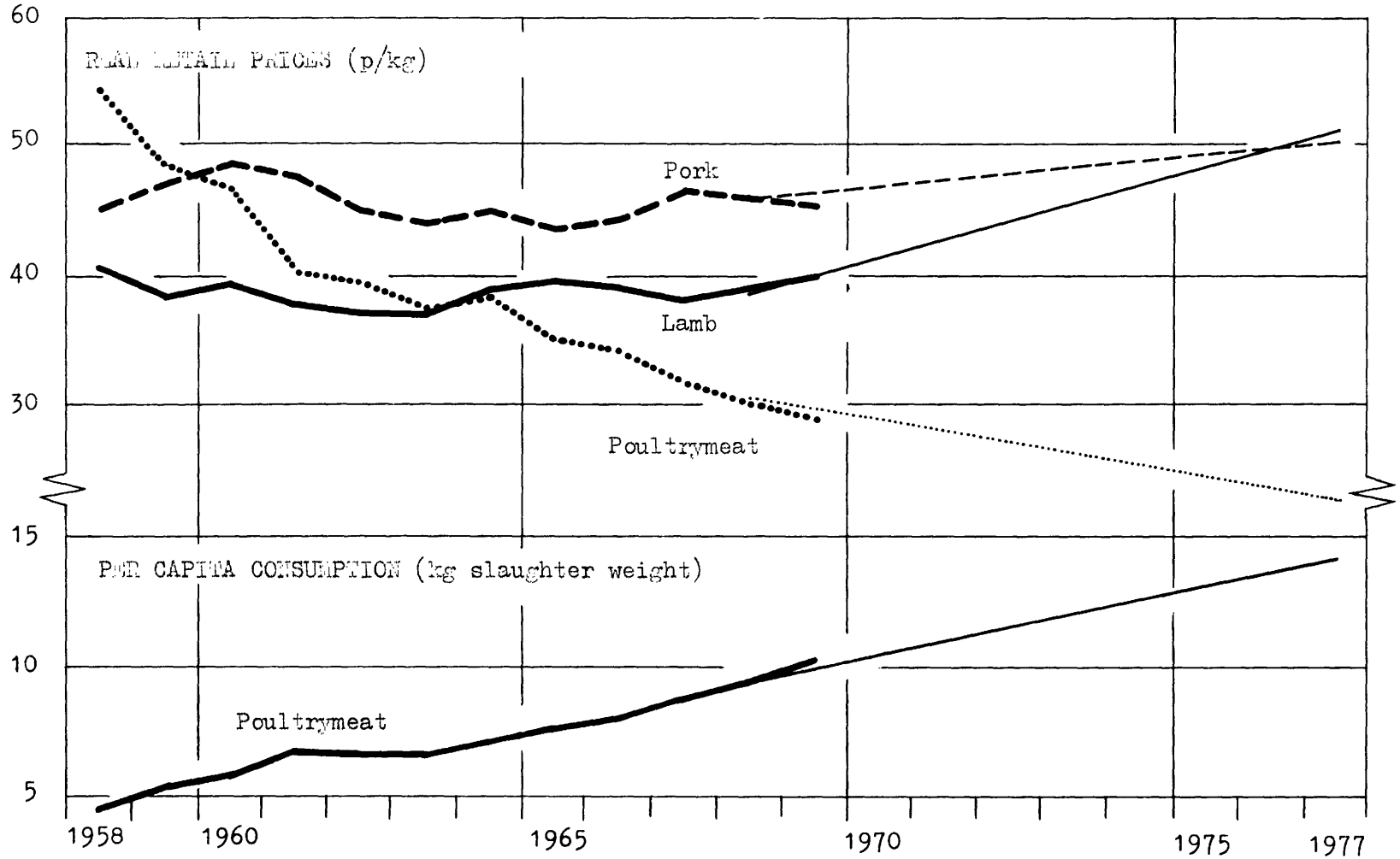


in 1968/71. The reasons for this forecast decrease in demand for bacon are the own price effect and especially the influence of the time factor (it should be remembered that the differences between long-term and short-term reactions are expressed in the regression coefficients of the t-variables and that in the long term the demand for bacon obviously reacts negatively to the growth in income, but positively in the short term) (see equations (21) and (22)).

Demand for poultrymeat could rise very sharply. Both the influence of its own price and the influence of both the cross price contained in equation (24) (lamb and pork) would have a decidedly expansive effect on the consumption of poultrymeat. Under these circumstances the forecast increase of 40 % in the per capita consumption of poultrymeat from 1968/71 to 1977 seems thoroughly realistic.

According to our price hypotheses, the adoption of the EEC agricultural prices by the United Kingdom would cause a very sharp rise in real retail prices for beef, and mutton and lamb in particular (50 % from 1967/69 to 1977 for beef and 30 % for mutton and lamb). During the same period, pork and bacon would, however, be only 10 and 4 % dearer respectively in real terms at the retail stage. The real retail price of poultrymeat could fall even further during the forecasting period (1967/69 to 1977: -25 %). As the demand analysis has shown, British consumers react quite decisively to changes in meat prices when purchasing meat and meat products, i.e. the demand for individual types of meat is characterised by a relatively high own price elasticity (in absolute terms) and by a high cross price elasticity. So it seems probable that by 1977 those types of meat whose prices increase at a relatively faster rate than other meats will account for a smaller proportion of total per capita meat consumption, while the proportion accounted for by types of meat which become relatively cheaper will show a corresponding increase. As can be seen from Table 10, this is exactly the result obtained. The proportion of beef, mutton and lamb in total per capita consumption of meat would fall from 44.5 % (1968/71) to 35.3 % in 1977 and this would be accompanied by an increase in the proportion of pork and poultrymeat during the same period from 29.9 % to 40 %.

Diagram 4 - Per capita consumption of poultrymeat and real retail prices for poultrymeat, pork and lamb in the United Kingdom 1958/69 and results of forecasts for 1977



The proportion of bacon in the per capita consumption of meat would remain almost unchanged (1968/71 : 19.7 %; 1977 : 19 %), although bacon will become considerably cheaper compared with beef, mutton and lamb. However, as the demand analysis has clearly shown, consumer habits as regards bacon are rather rigid. In contrast with pork and poultrymeat, bacon has only limited possibilities as a substitute for beef, mutton and lamb. It is probable that carcase meat will be primarily affected by the expected substitution process resulting from the marked shift in retail price ratios.

According to our estimates total per capita consumption of meat would decline by 3 % from 76.8 kg in 1968/71 to 74.6 kg in 1977. Consumption would thus return to its 1960/62 level. The level of meat consumption is expected to correlate positively with the growth in income.Assuming this, the forecast decrease in the per capita consumption of meat by 1977 is only plausible if overall demand for meat is clearly sensitive to price changes[1] (it is easy to deduce from Table 7 that in whatever way it is construed the average real retail price of meat would rise sharply by 1977).

In order to test the price sensitivity of the demand for meat we have, in addition, estimated a demand function for all types of meat:

$$(63)\quad Q = \underset{}{122.10} + \underset{(4.5)}{43.124} \log C_{pr} - \underset{(3.5)}{94.006} \log P_1$$

$$R^2 = 0.840 \qquad D.W. = 1.27 \qquad \frac{\hat{\sigma}}{\bar{Q}} = 1.3\ \%$$

Assessment period 1958–69

where:

Q : total per capita consumption of meat (kg slaughter weight)

P_1 : average weighted real retail price of all types of meat (d/lb)[2].

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[1] A high degree of price sensitivity for individual kinds of meat does not necessarily imply a price sensitivity for the overall demand for meat since calculation of overall demand is a weighted average of own price elasticities and cross price elasticities of the demand for individual meats.

[2] The weighting system used in calculating the average retail price for all types of meat on the basis of nominal retail prices was as follows: beef (0.324); mutton and lamb (0.149); pork (0.162); bacon (0.203); poultrymeat (0.101); edible offals (0.061).

Equation (63) provides a rather good explanation of the overall per capita consumption of meat. The income elasticity of demand for meat would, according to equation (63), be +0.3 and the own price elasticity -0.6 (the elasticity coeffivients were measures in the arithmetical mean). In addition to the price of meat itself the price of fish (fish being a possible substitute for meat) could also influence demand for meat:

$$(64)\quad Q = +102.23 + \underset{(2.2)}{34.293}\ \log C_{pr} - \underset{(3.4)}{87.902}\ \log P_1 + \underset{(0.6)}{20.409}\ \log P_2$$

$R^2 = 0.850$ D.W. = 1.23 $\frac{\hat{\delta}}{\bar{Q}} = 1.3\ \%$ Assessment period 1958-69

where:

P_2 : real retail price of fish - white, filleted and unfilleted, fresh (d/lb).

Compared with equation (63), the low t-test value for the regression coefficients of income and the equally low t-test value for the regression coefficient of the fish price in equation (64) result mainly from the close (random) correlation between $\log C_{pr}$ and $\log P_2$ ($r = +0.80$). Consequently, it cannot be concluded from equation (64) that the price of fish exerts no significant influence on the demand for meat. Equation (64) yields an income elasticity of +0.2 for meat demand, an own price elasticity of -0.5 and a cross price elasticity (fish) of +0.1. One reason for this relatively low cross price elasticity is that during the reference period per capita consumption of fish amounted to only a fraction of per capita consumption of meat. The most important result for us is, however, the surprisingly high sensitivity of the overall demand for meat to price, which is clearly shown in equations (63) and (64). It is particulary interesting to note that, in

absolute terms, the own price elasticity of the demand for meat is about twice as high as income elasticity.

For control purposes it is, therefore, advisable to forecast the per capita consumption of meat directly by means of equations (63) and (64). The hypothesis on the real retail price of all types of meat can be derived directly from the hypotheses on the nominal retail prices for the individual types of meat, from the weighting scheme for the average meat price and from the hypothesis on the general price level. This would give an increase of around 25 % (cf. Table 7) in the real retail price of meat from 1967/69 to 1977. In the absence of any other information it was assumed that the upward trend in the real retail price of fish noted during the reference period will continue until 1977 (see Table 7). Assuming this, equation (63) would give an estimate of 70.0 kg (equation (64) = 70.1 kg) for total per capita consumption of meat in 1977. Aggregating the estimates of per capita consumption for the individual types of meat in 1977 we had obtained a figure of 74.6 kg. Both estimates are so close to one another that a revision of our first estimate (aggregate method) on the basis of the results of the second estimate (using the demand function for all types of meat) hardly seems necessary.

e. Milk products

For liquid whole milk we expect only marginal changes in the real retail price by 1977. Along with the low own price elasticity of demand for liquid milk this means that consumption will not be appreciably influenced by its own price between now and 1977. The short-term income elasticity of demand for liquid milk of +0.5 is certainly high; meanwhile, in the long term the demand for liquid milk is almost completely inelastic to changes in income. Not only the short-term but also, via the regression coefficient of the t-variable, the long-term reactions are taken into consideration when forecasting the per capita consumption of liquid milk by means of equation (28), with the result that the net effect of income is kept within relatively narrow limits. This would explain why the per capita consumption of liquid milk of 138.5 kg in 1977 obtained by using equation (28) the regression coefficient is only slightly different from the level of consumption in the years 1967/69 (139.8 kg).

For cream, according to our calculations, an increase of around 37 per cent in the average real retail price is to be expected from 1967/69 to 1977. If the rather high own price elasticity of the demand for fresh cream is also taken into consideration, consumption of fresh cream should, other things being equal, fall considerably. However, incontrast to this there is an extraordinarily marked expansive income effect such that on balance the per capita consumption of fresh cream is expected to expand appreciably in the forecasting period too (by 76 % from 1967/69 to 1977). As can be seen from Table 8, in no event does equation (31) give an acceptable forecast of the demand for tinned sterilised cream. If no adjustment is made to the regression coefficient of the t-variable in equation (31), a step, which is in fact not acceptable (in view of the serious structural break both in the price series for cream as well as in that for condensed milk due to the EEC effect) that equation produces a 32 % fall in the consumption of tinned cream for the period 1967/69 to 1977. However, in view of the very high income elasticity of tinned cream consumption this is not plausible. (It is rather to be expected that, as in the case of fresh cream, the expansive influence of income will outweigh the contractive influence of its own price). If the regression coefficient of the t-variable in equation (31) were adjusted, the equation would show that the per capita consumption of tinned cream would more than double by 1977. However, a much sharper increase in tinned cream consumption than in that for fresh cream would, however, be completely inconsistent with past experience, which points to a marked preference for the fresh as opposed to the tinned product. The reason for this poor forecasting performance of equation (31) could be the fact that the method proposed under (I, 4) for segregating regression coefficients of the time variables on which the adjustment of the coefficients for forecasting purposes is based is only conditionally applicable to tinned cream (cf. Table 2, column 3). For this reason, the per capita consumption of tinned

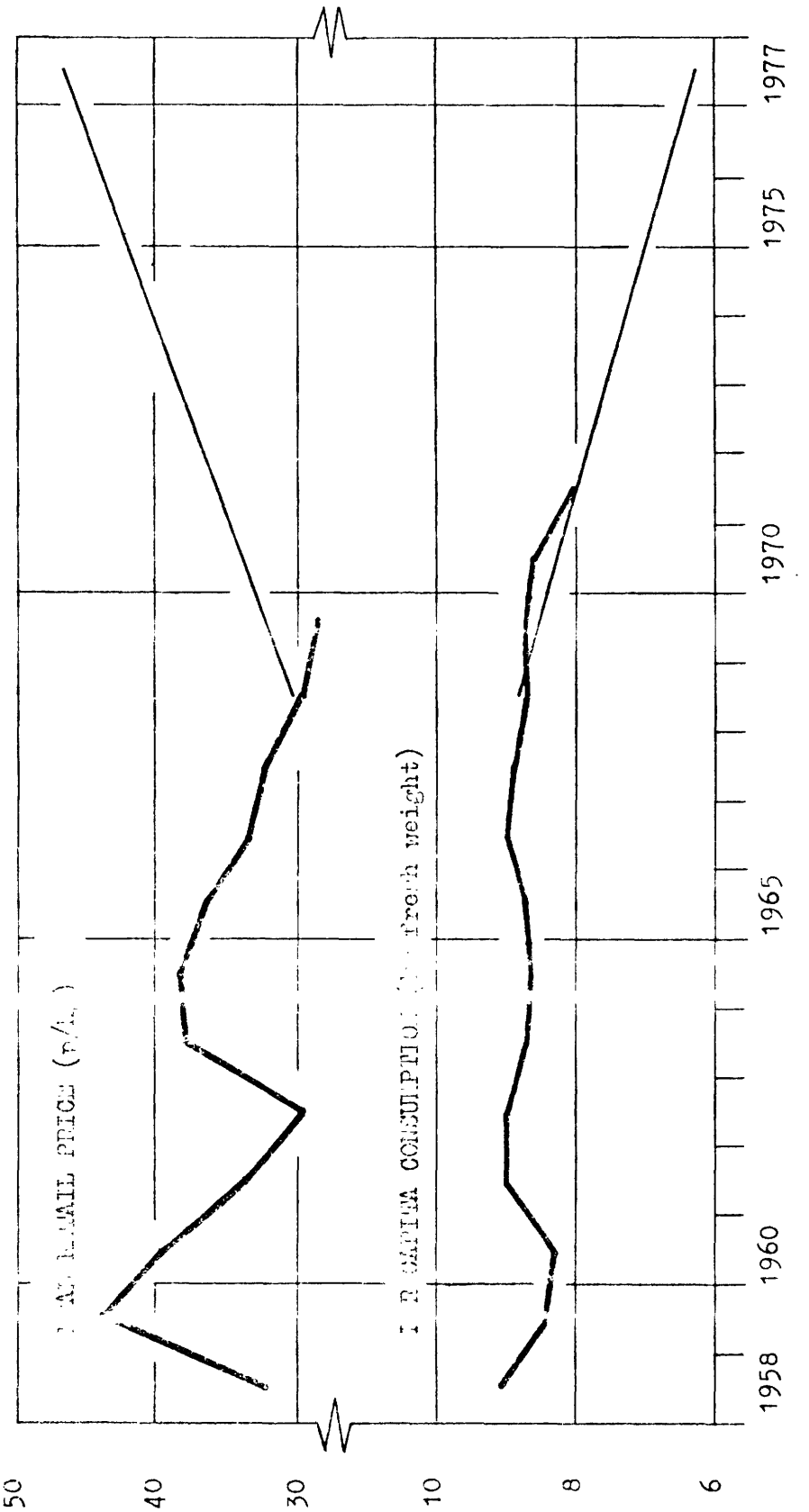
cream should be forecast by means of equation (30), in which the price of condensed milk appears along with income and the price of cream but not with time as explanatory variables. Equation (30) gives an estimate of 0.47 kg product weight for the per capita consumption of tinned cream in 1977, which would represent an increase of 15 % over 1967/69. This result seems at least more realistic than that obtained with equation (31). Total per capita consumption of cream would therefore rise from 1.32 kg product weight in the years 1967/69 to 2.07 kg product weight in 1977, representing an increase of 57 per cent.

The principal factor determining demand for condensed milk is the price of liquid milk. Since, according to our hypotheses, the real retail price of liquid milk will scarcely alter by 1977, only the increase in its own price (15 % in real terms by 1977) and the negative income elasticity will have any effect on the forecast of condensed milk consumption by means of equation (32). Their joint effect will result in a decline of 11 % in the per capita consumption of condensed milk from 1967/69 to 1977, with condensed milk consumption falling back to its approximate level at the beginning of the reference period.

The slight downward trend in total per capita consumption of milk powder, which was already perceptible in the reference period, is expected according to our estimates, persist (1958/60: 1.83 kg; 1967/69: 1.80 kg; forecast for 1977: 1.77 kg). The proportion of whole milk powder will probably fall even more sharply (1958/60: 42.1; 1967/69: 35.6; estimate for 1977: 25 %). The substitution process between skimmed milk powder and whole milk powder would still be determined by income (cf. equations (33) and (34)) and be limited primarily to the use of milk powder in the food industry.

With the adoption of EEC agricultural prices by the United Kingdom the retail price for butter will also increase very sharply in real terms (+ 55 % between 1967/69 and 1977). Bearing in mind also that the price of butter is the most important factor in determining demand, the estimates derived from equations (35) and (37), which show a decline in butter consumption of only about 5–15 %

Diagram 5 - Per capita consumption and real retail price of butter in the United Kingdom 1958/69(71) and results of forecasts for 1977

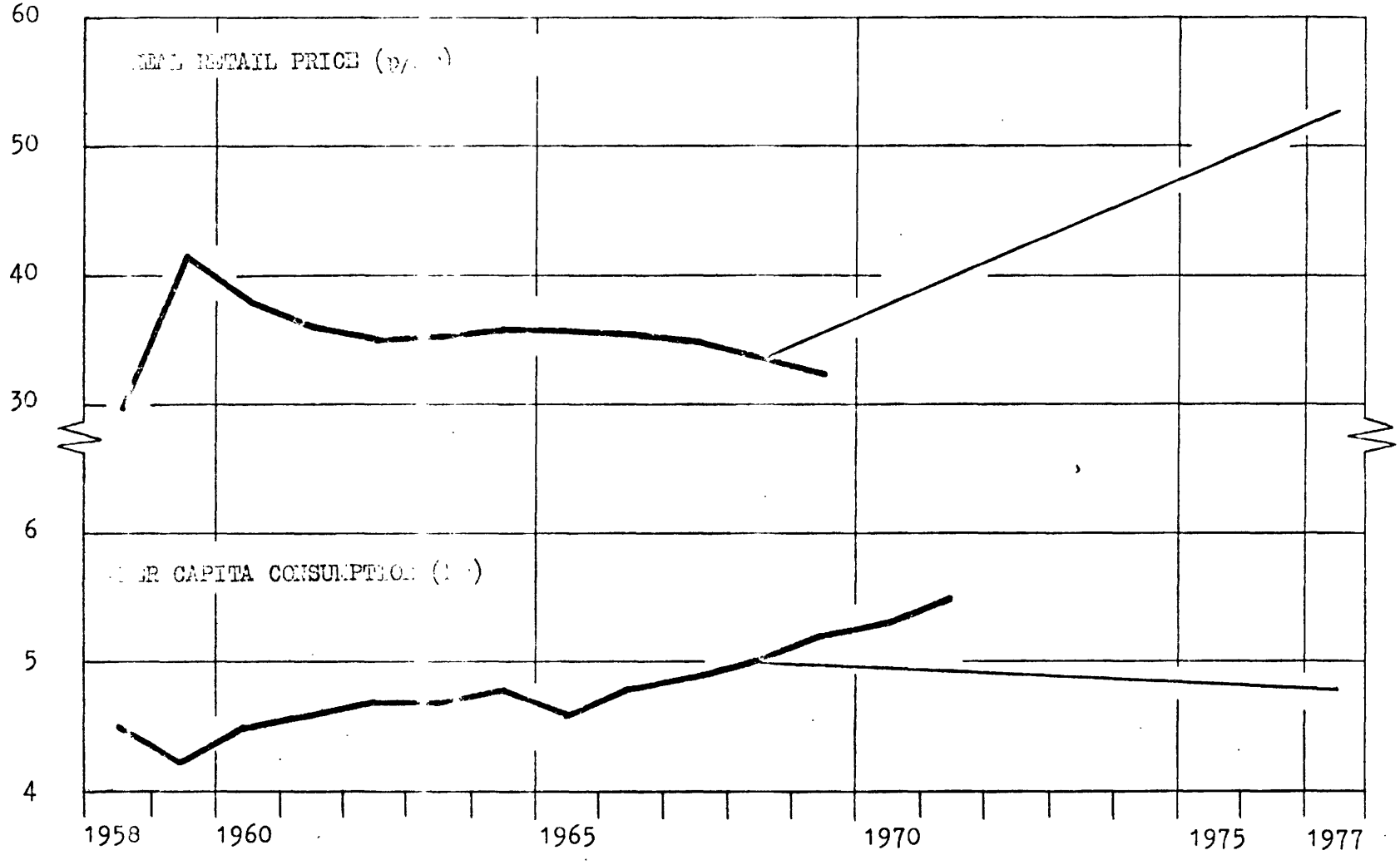


from 1967/69 to 1977 are not very plausible. According to our expectations, demand for butter ought to react much more sharply to such price rises. Therefore, it seems advisable to use directly for forecasting equation (36), which measures, in particular, the effect of extreme increases in the price of butter on the demand for butter. Average weekly consumption on a quarterly basis estimated by means of equation (36) results in a per capita consumption of 6.9 kg in 1977 (fall of 21.4 per cent compared with 1967/69). In view of the recent developments on butter market in the United Kingdom and since equation (36) too considerably overestimates the average weekly consumption of butter in the first, second and third quarters of 1972, we consider that even the forecast obtained by using equation (36) is too optimistic; after making the corresponding correction we still obtain an estimate of 6.2 kg for the per capita consumption of butter in 1977, representing a fall of 29.4 % compared with 1967/69.

According to our price hypotheses, the price of cheese will rise even more strongly in real terms than that of butter (57 % between 1967/69 and 1977). However, because of the very low own price elasticity (in absolute terms) and the high positive income elasticity of the demand for cheese, this would not lead to any significant reduction in the per capita consumption of cheese (estimated decrease from 1967/69 to 1977: 4 %).

Owing to the lack of suitable statistical data we were unable to estimate demand functions for ice cream, yoghourt and milk drinks (milk shakes etc.). We possess only a time series of the quantity of whole milk used by the dairies for the manufacture of these products, which is, however, believed to be rather unreliable as it has been estimated as a residual value. Calculated on a per capita basis the quantity of whole milk used for the manufacture of ice cream, yoghourt and milk drinks increased during the reference period from 0.87 kg (1958/60) to 2.05 kg in 1969/71. A high positive income elasticity of demand for the end products was thought to be primarily responsible for this development. The adoption of EEC agricultural prices could mean considerable increases in the real retail prices of these products and as a result demand

Diagram 6 - Per capita consumption and real retail price of cheese in the United Kingdom 1958/69(71) and results of forecasts for 1977



could increase at a somewhat slower rate than in the reference period (figure assumed for 1977: 2.50 kg whole milk equivalent).

Demand for chocolate crumb is entirely dependent on the volume and especially the composition of the domestic production of chocolate confectionery (chocolate crumb is an important raw material in the chocolate confectionery industry). Therefore one could not justify explaining the whole milk equivalent of the volume of per capita chocolate crumb consumption in terms of income and in terms of an average retail price for chocolate confectionery. During the period 1958-71 the whole milk equivalent of the per capita consumption of chocolate crumb fluctuated between 4.4 and 6.5 kg, with no clear long-term trend appearing. This could inter alia be due to the fact that the per capita consumption of chocolate confectionery remained practically unchanged during the same period. The per capita consumption of sweets and confectionery of all kinds in the United Kingdom was already at an internationally very high level towards the end of the fifties and has not risen since. The per capita consumption of sweets and confectionery is more likely to decline slightly in the future; this is also indicated in the forecast of a fall in total sugar consumption between now and 1977. In line with this, we assume that the whole milk equivalent of the per capita consumption of chocolate crumb in 1977 will at best amount to 5.0 kg, which almost corresponds to the average figure for the years 1968/71 (5.13 kg).

f. Eggs and egg products

Demand for eggs reacts only weakly to changes in income and prices (own price and that of bacon). According to our estimates, the real retail price of eggs will fall by 6 % between 1967/69 and 1977, while that of bacon could rise by around 4 %. In view of the small degree of both price and income elasticity and the assumed changes in the real price, the per capita consumption of eggs in 1977 is expected to differ little from its level in the base period (estimated increase from 1967/69 to 1977: 4 %). The consumption of egg products is expected to expand somewhat more sharply since it is assumed that the positive correlation between income and the demand for egg products discernible in the refe-

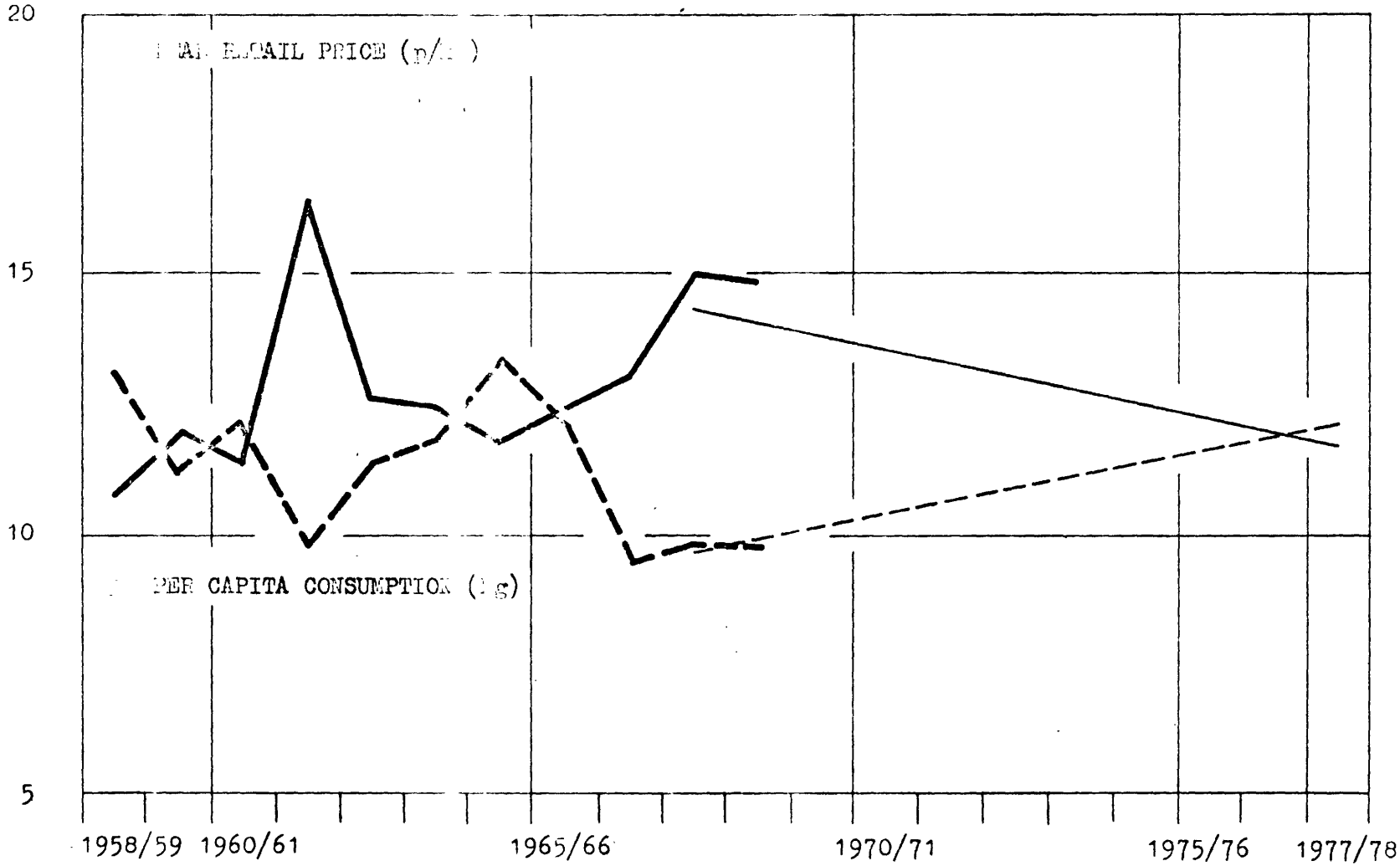
rence period will continue in the future. Forecasting the consumption of egg products contains an element of uncertainty in so far as it is conceivable that, as a result of appreciable changes in the amount of egg products used in the manufacture of various foodstuffs, the overall demand for egg products can change considerably within a relatively short time. Apart from such considerations, the per capita consumption of egg products could increase by 8 per cent between 1967/69 and 1977.

g. Fruit and vegetables

The real retail price for apples (dessert and cooking) rose sharply in the reference period (by 26 % from its average of 1958/69 - 1960/61 to its average of 1966/67 - 1968/69). With demand almost wholly inelastic changes in income but highly dependent on price this led to a decline of 20 % in the per capita consumption of apples (dessert and cooking). Following the gradual abolition of duties and (seasonal) quotas for imports of apples (dessert and cooking) from the EEC countries the supply of relatively cheaper apples, especially from France and Italy, to the UK market could result in an appreciable reduction in the real retail price of apples in the United Kingdom by 1977/78 (according to our expectations, -19 % from its average for 1966/67 - 1968/69 to its average for 1977/78). According to equation (41), in which demand for apples is explained solely by their price, this would mean that the per capita consumption of apples (dessert and cooking) would return by 1977/78 to its level at the beginning of the reference period. A decline is also forecast in the retail price of pears (dessert and cooking) by 1977/78 (-21 %) for the same reasons as given above for apples. Things being equal, this will give a considerable boost to the demand for pears. However, there will also be a marked contractive income effect (high negative income elasticity of the demand for pears) with the net result that the per capita consumption of pears (dessert and cooking) will remain unchanged until 1977/78 (equation (44)).

It was not possible to estimate the income and price elasticities of the demand for preserved apples and pears by means of the multiple regression analysis as no representative retail prices were available for these products. An explanation of the per capita consumption of preserved apples and pears by income alone led to no meaningful results, as the consumption

Diagram 7 - Per capita consumption and real retail price of apples (dessert and cooking) in the United Kingdom 1958/59 - 1968/69 and results of forecasts for 1977/78



of both products changed only slightly in the reference period and showed no recognisable trend. Average per capita consumption for the 1966/67 - 1968/69 farm years was 1.20 kg for pear preserves and to 1.23 kg for apple preserves. For 1977/78 we must, therefore, content ourselves with the simple assumption that the level of consumption will remain constant for both products (1.20 kg).

Because of the lack of adequate information on their retail price we were unable to estimate the demand functions for fresh peaches and preserved peaches. This is particularly unfortunate as it means that the probable substitution between preserved peaches and other preserved fruit (for example, tinned pears and pineapples) cannot be studies. By far the greater proportion of the consumption of peaches in the United Kingdom consists of tinned peaches, of which good quality imports are supplied at very low prices by certain Commonwealth countries (led by Australia) and by South Africa. Consumption of fresh peaches is still, however, quite uncommon in many regions of the United Kingdom. During the years 1967/69 total per capita consumption of peaches averaged 2.23 kg, of which preserved peaches accounted for 79 % (or 1.77 kg) and fresh peaches for only 21 % (or 0.46 kg). Nevertheless, a strong upward movement was noted in the per capita consumption of fresh peaches in the reference period (in 1958/60 only 0.17 kg was sold per capita each year). From this we would like to draw the conclusion that the sale of fresh peaches on the British market is capable of being developed much further. With free entry to this market France and Italy especially should be able, by means of intensive sales promotion campaigns and the maintenance of high quality standards, to increase their exports[1] of fresh peaches to the United Kingdom quite considerably. Under these circumstances, the per capita consumption of fresh peaches will reach 1.0 kg by 1977. In the first half of the reference period the level of consumption of preserved peaches first showed a marked upward trend (1958/60: 1.70 kg; 1962/64: 2.00 kg) which later settled between 1.7 and 1.9 kg. After the accession of the United

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[1] During the reference period the Six were already supplying nearly 90 % of all fresh peaches coming on to the British market.

Kingdom to the EEC the low-prices imports of preserved peaches from Australia and South Africa are expected to be partially displaces by higher-prices products from France and Italy, as the previous customs preferences for imports from South Africa and Australia would have to be abolished (treatment as imports from non-member countries). This could have a negative effect on the overall demand for preserved peaches. Moreover it should be remembered that the assumption of a very rapid expansion in demand for fresh peaches can possibly be justified only if at the same time one assumes certain cuts in the estimate for preserved produce. For these reasons we sill assume that the per capita consumption of preserved peaches in 1977 will correspond to the average for the years 1966/69 (1.8 kg). On this basis the total per capita consumption of peaches (fresh and preserved) would rise from 2.23 kg (1966/69) to 2.80 kg in 1977.

In spite of an expected decline of 15 % in the real retail prices for fresh and chilled tomatoes between 1967/69 and 1977, the demand for this product is expected to increase only slightly in future as income exerts a contractive influence on the consumption of fresh tomatoes (negative income elasticity). By applying equation (45) we arrive at a per capita consumption of fresh tomatoes of 6.6 kg for 1977 (increase compared with 1967/69: 8 %). In contrast with fresh tomatoes, the demand for preserved tomatoes and tomato concentrates could rise sharply in the fugure as both price (hypothesis on the real retail price of preserved tomatoes: -13 % by 1977) and especially income will exert a positive effect on consumption (forecast of the per capita consumption of tomatoes and tomato concentrates in 1977 according to equation (46): 10.6 kg fresh tomato equivalent: increase compared with 1967/69: 25 %). Consumption of tomato juice also showed an upward movement during the reference period (1958/60: 0.14 kg fresh tomato equivalent; 1967/69: 0.20 kg), which, it is supposed, was activated by the growth in income. We were unable to verfy this supposition by means of the regression analysis because of the lack of data

on the retail prices of tomato juice. A graphical trend extrapolation of the per capita consumption of tomato juice during the period 1958-1970 gave an estimate of 0.25 kg for 1977. Aggregating these individual forecasts, the consumption of tomatoes and processed tomato products in 1977 - converted to fresh tomato equivalent - would amount to 17.45 kg, which represents an increase of 18 % over 1967/68 (14.80 kg).

h. Oils and fats

The multiple regression analysis showed no significant influence of income of of the retail prices of the principal fats (butter, margarine, manufactured edible fat and lard) on the total per capita consumption of oils and fats during the reference period. From this we draw the conclusion with a high individual level of income, the consumption of fats and oils is determined only by consumer habits (inter alia the type of meals eaten and their preparation) and to an increasing degree by health considerations. In the first half of the reference period total consumption of oils and fats in the United Kingdom was still growing (21.87 kg in 1958; 23.12 kg in 1964)[1] to be followed by a temporary fall to 22.4 kg in the years 1965/67 and then a slight recovery which did not exceed the 1964 level. A further continuing decline in the per capita consumption of fats and oils is considered more likely. Under these circumstances our assumption that there will be a reduction of only 4.7 % from 1968/70 to 1977 seems rather optimistic (see Table 11).

Understandably the tendency to reduce fat consumption for health reasons affects primarily the consumption of the so called "visible fats", of which butter and margarine are by far the most important. Total per capita

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[1] These and all following data are given in pure fat or raw oil equivalent.

Table 11 - Results of forecasting per capita consumption of oils and fats in the United Kingdom in 1977 (kg pure fat or raw oil equivalent)

Product	ø 1958/60	ø 1968/70	1977	Change ø 1958/60-1968/70 (%)	Change ø 1968/70-1977 (%)
Spreadable fats - Total	12.29	11.35	10.50	- 7.6	- 7.5
- Butter	7.06	7.13	5.10	+ 1.0	- 28.5
- Margarine	5.23	4.22	5.40	- 19.3	+ 28.0
Lard (direct consumption)	2.80	3.16	3.30	+ 12.9	+ 4.4
Manufactured edible fat	2.60	2.38	2.00	- 8.5	- 16.0
Other edible oils and fats	4.38	6.21	6.70	+ 41.8	+ 7.9
Fats and oils - Total -	22.07	23.10	22.50	+ 4.7	- 2.6

Source: Central Statistical Office, Annual Abstract of Statistics, various issues. Own calculations and estimates (cf. also sources given in the oil and fat balances).

consumption of butter and margarine accordingly fell almost continously during the reference period from 12.43 kg (1958) to 11.21 kg in 1971. Very probably this trend will continue during the forecasting period so that it should be possible to forecast the per capita consumption of spreadable fats in 1977 by means of a graphical trend extrapolation. This would still mean a per capita consumption of butter and margarine of 10.5 kg in 1977.

As has already been shown in the demand analysis for butter, demand for margarine can also be determined on the basis of given income and a given price of butter as well as a given level of consumption of spreadable fats. For the per capita consumption of butter in 1977 we obtained an estimate of 6.20 kg fresh weight; in terms of pure fat content this is around 5.10 kg. The resulting difference of 5.40 kg in pure fat content between the per capita consumption of spreadable fats and that of butter in 1977 would, under the above conditions, be entirely accounted for by margarine. This means that as a result of the expected sharp rise in the price of butter the level of consumption of margarine would increase by 28 % between 1968/70 and 1977.

In the period 1958-65 the per capita consumption of lard (only direct consumption and not the quantities used in the manufacture of margarine and edible fats) showed a clear negative correlation with the per capita consumption of butter and a positive correlation with the per capita consumption of margarine. This indicates that in the United Kingdom initially lard was still to a certain extent a cheap substitute for butter as regards spreading on bread. After 1966 the situation changed with lard no longer playing this substitution role except in a very few cases and this has led us to assume that only margarine and not lard will profit from the sharp decline forecast in the demand for butter by 1977. This explains why only a marginal increase (4 %) is forecast in the per capita consumption of lard between 1968/70 and 1977. Demand for manufactured edible fats showed a downward trend during the reference period which was primarily due to the increasing use of specific edible vegetable oils for

baking and frying. Demand for vegetable oils ought also to have receive a boost from their growing use in the preparation of salad dressings and mayonnaise. The substitution of vegetable oils for manufactured edible fats should continue so that a further decline in the consumption of manufactured edible fats is to be expected. Accordingly, the per capita consumption of vegetable oils during the reference period will probably not be repeated since, according to our expectations, the trend towards a lower fat content diet will also affect somewhat the consumption of vegetable oils.

Below we will briefly discuss the importance of those types of oil which are of special interest for the EEC agricultural policy - e.g. rape-seed, sunflower-seed and olive oil - in terms of the total consumption of fats and oils in the United Kingdom (cf. Table 27*). Until 1964 imports of rape-seed oil (direct imports of oil plus the oil equivalent of rape-seed imports) played only a very minor role in total UK imports of vegetable oils (less than 10 000 t per annum). After 1964 a sharp rise in rape-seed oil imports took place (average annual imports for the years 1967/69: 31 000 t). The principal suppliers during this period were Pland, the German Democratic Republic, Sweden and the Six (chiefly the Federal Republic of Germany, the Netherlands and France). By far the greatest proportion of total imports of rape-seed oil took the form of seeds which were processed in oilmills in the United Kingdom. Rape was not grown on any appreciably scale in the United Kingdom before 1970. One reason for this could be that rapeseed was not covered by the deficiency payments systems so that UK producers of rape seed had to compete directly at world market prices. Consequently, the commercial cultivation of rape for oil seed was at a marked disadvantage compared with the cultivation of sugar beet, wheat and barley in particular. In recent years the total area devoted to the cultivation of rape in the United Kingdom has stood at about 45 000 ha, which represented only 1 % of the total area given over to the cultivation of grain. Statistical data relating to rape-seed crops and their utilization are not available to us. However, as far as can be deduced from the statistics on land utilization, rape is cultivated predominantly for feed purposes (as an intermediate crop); in the years 1968/71 only

5 000 ha were used for the cultivation of oil seed. Assuming a yield of 2.5 metric tons per hectare then the annual crop would amount to 18 500 t or, with an average oil extraction rate of 42 %, 5 300 t of raw oil. Consequently, the domestic production of rape-seed oil would be of quite minor importance compared with the volume of rape-seed oil and other vegetable oil imports. Of the total available domestic supplies of rape-seed oil, which we estimate at about 35 000 t for the period 1967/69, 43 % (15 000 t) was used for the manufacture of margarine and edible fats (margarine: 10 000 t; edible fats: 5000 t). In 1967/69 rape-seed oil represented 9 % of the total quantity of vegetable oils (animal oils are not taken into account) used for the production of margarine and 11 % of the total quantity of vegetable oils used for the manufacture of edible fats). We possess no reliable information on the use to which the remaining quantity of rape-seed oil was put.

As in the case of rape-seed oil, UK imports of sunflower-seed oil were for a long time practically non-existent (until 1966 5 000 t or less annually). Subsequently there was a dramatic rise to 68 000 t in the years 1967/69. Imports were restricted entirely to raw oil; the principal suppliers were the USSR, Romania, Bulgaria, Yugoslavia and the Netherlands. Imports from the Netherlands were limited exclusively to transit trade (for example, from Argentina). In 1967/69 38 % (26 000 t) of the oil imported was used in the manufacture of margarine and edible fats; during the same period sunflower-seed oil accounted for 20 % of the total quantity of raw vegetable oil used in the manufacture of margarine (22 000 t); as regards the manufacture of edible fats during the same period the corresponding figure was 9 % (4 000 t). The remaining 42 000 metric tons are believed to have been used mainly as edible oil for frying, salad dressings etc. (direct consumption).

Annual imports of olive oil during the reference period amounted to between only 2 000 and 3 000 metric tons and came mainly from Spain. The use of olive oil as edible oil in the United Kingdom is still limited; at present the main customers of olive oil for use as edible oil are presumably certain restaurants run by non-UK nationals.

If the United Kingdom's liberal import policy for oils and fats were continued, the consumption of sunflower-seed and rape-seed oil in 1977 would

depend primarily on the relationship between the world price for both these types of oil and those for the other vegetable and animal oils. Adoption of the EEC agricultural policy by the United Kingdom could, however, bring about considerable changes. Above all, it is expected that, compared with grain, rape seed as an oil seed will be substantially better placed (from the producer's point of view) in the agricultural price system than at present. This could be a strong incentive for farmers to expand the cultivated area devoted to rape grown for the production of oil seed, particularly since, from an economic point of view, it could offer a better solution to the problem of crop rotation, particularly for holdings concentrating on the cultivation of grain. If there is a sharp rise in the UK production of rape-seed oil, this may result, for supply reasons, in the substitution of rape-seed oil for other imported vegetable oils given the existing EEC rape-seed marketing regulations. No pronouncement as to what extent this would be the case is possible until an estimate of the domestic production of rape-seed oil has been made. For this reason we will not estimate the consumption of rape-seed and sunflower-seed oil (the estimated demand for sunflower-seed oil should again be viewed in terms of that for rape-seed oil) until the forecast of supply is available.

As stated earlier, UK imports of olive oil are used mainly to meet special requirements. Since no spectacular change can be expected in consumer habits as regards the use of edible oils for cooking, frying and as salad oil in the next few years we will assume that not more than 3 000 metric tons of olive oil will be consumed in the United Kingdom in 1977.

4. Summary of the results of the forecast

The results of the forecast of total consumption of important foodstuffs in the United Kingdom in 1977 are given in Table 12. In interpreting these results we will differentiate principally between the "EEC effect" and the "normal effect". The "EEC effect" should be understood essentially as a price effect which might affect all those

Table 12 - Forecast of total consumption of important foodstuffs in the United Kingdom in 1977 ('000 metric tons)

Product		ø1968/60	ø1967/69	1977	Increase (+) or decrease (-) ø 1967/69-1977 (%)	Average annual rate of change ø 1967/69-1977 (%)
Products containing grain - total	(in flour weight or product weight)[a]	4 381	4 159	4 022	- 3.3	- 0.4
Wheat flour	(in flour weight)[a]	4 064	3 811	3 614	- 5.2	- 0.6
Rye flour	(in flour weight)[a]	12	9	11	+ 22.2	+ 2.3
Corn flakes	(in product weight)[a]	106	154	208	+ 35.1	+ 3.4
Rolled oats	(in product weight)[a]	86	69	45	- 34.8	- 4.6
Rice including processed products	(in flour weight)[a]	73	87	115	+ 32.2	+ 3.4
Pearl and pot barley	(product weight)[a]	40	29	29	± 0	± 0
Sugar - total	(white value)[a]	2 875	2 937	2 966	+ 1.0	+ 0.1
Potatoes - total	(fresh weight)[a]	4 814	5 292	5 587	+ 5.6	+ 0.6
Maincrop ware potatoes	(fresh weight)[a,b]	3 823	4 394	4 801	+ 9.3	+ 1.0
Early potatoes	(fresh weight)[a]	991	898	786	- 12.5	- 1.5
Meat - total	(slaughter weight)	3 692	4 196	4 272	+ 1.8	+ 0.2
Beef	(slaughter weight)	1 340	1 329	1 031	- 22.4	- 2.8
Mutton and lamb	(slaughter weight)	605	592	475	- 19.8	- 2.4
Pork	(slaughter weight)	512	672	870	+ 29.5	+ 2.9
Bacon	(slaughter weight)	760	819	784	- 4.3	- 0.5
Poultrymeat	(slaughter weight)	267	524	819	+ 56.3	+ 5.1
Edible offals	(slaughter weight)	208	260	263	+ 1.2	+ 0.1
Dairy products - total						
Liquid whole milk[c]	(fresh weight)	7 187	7 728	7 931	+ 2.6	+ 0.3
Fresh cream	(product weight)	17	51	92	+ 80.4	+ 9.3
Tinned cream	(product weight)	13	23	27	+ 17.4	+ 1.8
Condensed milk	(product weight)[d]	157	186	172	- 7.5	- 0.9
Whole milk powder	(product weight)	40	35	25	- 28.6	- 3.7
Skimmed milk powder	(product weight)	55	64	76	+ 18.8	+ 1.9
Butter	(fresh weight)	448	485	355	- 26.8	- 3.4
Cheese	(product weight)	229	278	275	- 1.0	- 0.1
Chocolate crumb	(whole milk equivalent)	284	321	286	- 10.9	- 1.3
Ice cream, yoghurt, milk drinks (milk shakes etc.)	(whole milk equivalent)	45	109	143	+ 31.2	+ 3.1
Eggs and egg products - total	(million dozen)	1 101	1 259	1 355	+ 7.6	+ 0.8
Fresh eggs	(million dozen)	1 011	1 148	1 231	+ 7.2	+ 0.8
Egg products	(million dozen)	90	111	124	+ 11.7	+ 1.2
Fats and oils - total	(pure fat content or raw oil equivalent)	1 148	1 263	1 288	+ 2.0	+ 0.2
Butter	(pure fat content)	367	398	292	- 26.6	- 3.4
Margarine	(pure fat content)	272	333	304	+ 32.2	+ 3.2
Lard	(pure fat content)	146	176	189	+ 7.4	+ 0.8
Manufactured edible fats	(raw oil equivalent)	135	134	115	- 14.2	- 1.7
Other edible fats	(raw oil equivalent)	228	322	384	+ 19.3	+ 2.0
Fruit and vegetables						
Apples (cooking + dessert)	(fresh)	631	536	694	+ 29.5	+ 2.9
Pears (cooking + dessert)	(fresh)	128	103	109	+ 5.8	+ 0.6
Preserved apples	(product weight)	84	67	69	+ 3.0	+ 0.3
Preserved pears	(product weight)	57	65	69	+ 6.2	+ 0.7
Peaches	(fresh)	8	25	57	+128.0	+ 9.6
Preserved peaches	(product weight)	90	98	103	+ 5.1	+ 0.6
Tomatoes	(fresh)	355	339	379	+ 11.8	+ 1.2
Preserved tomatoes and tomato concentrate	(fresh tomato equivalent)	335	471	608	+ 29.1	+ 2.9
Tomato juice	(fresh tomato equivalent)	7	11	14	+ 27.3	+ 2.7

[a] Farm year July-June (average 1958/59-1960/61; average 1966/67-1968/69; 1977/78). [b] Including processed products for human consumption (chips, crisps, etc.). [c] Excluding farm consumption. [d] Sweetened and unsweetened condensed whole milk as well as sweetened condensed skimmed milk.

Source: Cf. annexed supply situation statements. Own calculations and estimates.

products which will either increase sharply in price (high price effect) or decrease sharply in price (low price effect) as a result of the repercussions of the EEC market regulations on UK agricultural prices. By "normal effect" we mean the situation whereby for a number of products the results of the forecast were influenced either primarily by factors which would have come to beat even without UK entry (income growth; long-term shifts in consumer habits) or by factors which even under EEC conditions would probably affect prices to only a relatively small extent. The "normal effect" applies principally to the projections for the most important basic foodstuffs - e.g. wheat flour (although considerable increases in wheat prices are to be expected under EEC conditions; as equation (8) shows, however, the price of wheat or wheat flour and/or bread does not affect the demand for wheat flour), sugar, potatoes, liquid milk and eggs. It is above all the forecasts for beef, mutton, lamb, butter and cheese which reflect a "high-price EEC effect". For the period 1967/69 to 1977 a 25 % fall in the consumption of beef was forecast (mutton and lamb: 20 %; butter: 27 %). As regards cheese, domestic demand is expected to fall by only 1 % in the same period (as the result of a comparatively high positive income elasticity and a low own price elasticity, expressed in absolute terms, of the demand for cheese); in comparison with the sharp increase in the consumption of cheese during the reference period, however, the forecast implies a complete break with past trends. The estimates for pork and poultrymeat as well as for margarine are strongly influenced by the high price effect via the cross-price elasticities. Mainly as a result of the large increases in beef and lamb prices compared with pork and poultrymeat a 30 % increase in the consumption of pork was forecast for the period 1967/69 to 1977 (poultrymeat: +56 %). The expected price-induced contraction in the consumption of butter by 1977 should favour the sale of margarine considerably (+32 % from 1967/69 to 1977).

Important low price effects resulting from the United Kingdom's adoption of the EEC agricultural policy are to be found only in the forecast of the demand for fruit and vegetables. For the period 1967/69 to 1977 a

largely price-conditioned increase of 30 % in the consumption of apples and pears (dessert and cooking), and fresh peaches and of 22 % in the consumption of tomatoes of all kinds (including processed tomato products in fresh tomato equivalent) was forecast.

5. Nutritional test

The results of the nutritional test are given in Tables 13, 14 and 15. In particular, it should be pointed out that in view of the forecast this test had, of course, to be limited to only those products for which a forecast of demand had already been made under II, 3 (underlined headings). For all other products (with the one exception of fish) we assumed that the level of consumption attained in 1968 would remain unchanged until 1977. Due to this much simplified assumption the per capita calorie, protein and fat consumption in 1977 has been systematically underestimated (this is particularly true of a number of different kinds of fruit and vegetables and of glucose). The forecast of the per capita consumption of fish was based on the following considerations: as equation (64) suggests, the demand for fish is considerably influenced by the price ratio (meat : fish); furthermore, the demand for fish will probably show a significantly positive income elasticity. Between 1958/60 and 1967/69 the price ratio (meat : fish) fell from 1.40 : 1 to 1.26 : 1. The resu lting negative effect on the demand for fish was clearly offset by the positive effect of income growth with the result that the long-term trend in the consumption of fish remained approximately constant. We expect a rise in the price ratio (meat : fish) from 1.26 : 1 to 1.50 : 1 or of around 20 % (see Table 7) between 1967/69 and 1977. Moreover, during the forecast period both the relative prices and the assumed income growth would have a positive effect on the demand for fish. Accordingly, we have estimated that the per capita consumption of fish in 1977 (fresh fish, smoked fish, preserved fish etc.) will be 11.00 kg; this is 26.6 % higher than in 1967/69 (8.69 kg). As regards the headings "tinned vegetables", "other fresh fruit", "tinned and bottled fruit" it

Table 13 - Per capita calorie consumption of selected agricultural products and foodstuffs in the United Kingdom (1958-1968 and 1977)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1977
Wheat flour	278675	274770	276190	266960	264830	260215	255955	258440	248855	244240	243175	223650
Pearl and roasted barley	2976	2976	2976	2604	2604	2976	2604	2232	1860	1860	1860	1860
Rolled oats	6696	6324	5580	5580	5580	5580	5208	5208	4836	4836	4836	2976
Corn flakes	6696	6184	7812	7440	8184	10416	8928	9672	10044	10416	10788	13392
Rice	4615	4615	5680	7100	6745	4970	6035	6035	4970	5325	6390	6035
Puffed rice	1065	1065	1065	1420	1065	1065	710	1065	1065	1520	1065	1065
Rye flour	1116	744	744	744	744	1116	1116	1116	744	744	744	744
Starch	4836	4836	4464	4836	5208	5580	5580	5580	5208	5580	7068	7068
Sugar	212076	207432	219816	216720	217881	202401	210915	211302	208593	205884	204336	200079
Glucose	11396	11088	11704	11704	12320	13244	13860	15092	15092	15708	16940	16940
Beef and veal	76972	68936	70588	72380	74480	75852	69020	63868	65184	69524	65800	50401
Mutton and lamb	32337	36603	36572	36845	35907	33729	33941	32731	33154	33517	32973	25108
Pork	30163	30194	31310	31372	34503	34813	36549	41199	39432	36487	37510	47120
Bacon and ham	54150	55252	57266	57836	59242	56924	57722	59128	56202	55632	57038	52060
Poultrymeat	4380	5250	5750	6806	6710	6680	7200	7580	8110	8800	9450	14300
Edible offals	5474	5488	5796	6118	6328	6370	6538	6454	6482	6594	6734	6440
Liquid whole milk	89245	89895	90415	91065	91520	91845	92300	91780	91715	91715	90870	90020
Fresh cream	1013	1200	1425	1650	1875	2138	2400	2700	2925	3225	3413	6000
Sterilised tinned cream	825	938	1125	1275	1275	1500	1575	1613	1463	1463	1575	1760
Condensed milk (whole, unsweetened)	3413	3204	3059	3188	3413	3172	3317	3623	3381	3703	3703	3784
Condensed milk (whole, sweetened)	1781	1814	1747	1613	1646	1613	1680	1747	2285	1848	1714	1176
Condensed milk (skimmed, sweetened)	676	662	676	676	635	621	580	580	552	593	511	414
Whole milk powder	3690	3936	3788	3838	4084	3690	3838	3985	3985	3788	2952	2165
Skimmed milk powder	3276	3924	4248	3600	4068	4392	4752	3744	4248	3744	4248	4752
Ice cream, yoghourt, milk drinks (milk shakes etc.)	481	598	618	774	865	995	1157	1086	1216	1216	1326	1625
Chocolate crumb	3647	3471	3543	3575	3419	3439	3608	3439	4251	3972	3783	3250
Cheese	17441	16247	17287	17633	18172	18057	18480	17710	18288	18788	19404	18480
Shell eggs	19440	20592	20736	20880	20304	20448	21024	20448	20880	21024	21312	21312
Egg products	1224	1836	1224	1224	1224	1836	1836	1224	1836	1836	1836	1836
Butter	65946	60996	60377	64886	65239	63118	62234	63383	64886	64267	63383	45136
Margarine	43935	47471	47206	42609	41990	42609	42609	38454	38808	37570	36244	47736
Manufactured edible fats	23426	22807	22807	23426	23338	25371	27050	22454	22888	21835	21039	17680
Lard	20686	26520	27139	25459	25194	25724	28023	24840	27492	27846	28818	29172
Other edible oils and fats	39338	38454	38454	43670	44112	44907	44465	46145	48090	45703	54896	59228
Fish - total	15220	14533	12932	12597	13832	12520	13908	13771	12871	13069	13771	16775
Potatoes	62720	64610	66290	65170	67550	64050	65660	67760	67130	66710	67760	68180
Fresh tomatoes	1625	1800	1700	1700	1575	1500	1600	1475	1500	1550	1525	1650
Other fresh vegetables	10675	10475	11275	10775	10800	10550	11425	11500	11450	11475	11450	11450
Tinned vegetables	1225	1175	1225	1325	1450	1550	1475	1525	1825	1750	1700	1700
Citrus fruits	2536	2790	2914	2790	2821	2542	2883	2697	2821	2790	2852	2852
Other fruit (fresh)	12255	14022	13737	12882	13452	13794	13737	13965	14022	12426	13395	13395
Tinned or bottled fruit	4161	4503	4389	4617	4845	4845	5016	4845	4845	4902	4902	4902
Pulses	12420	12075	12765	9315	12075	12765	10350	11730	11040	11385	10695	10695
Dried fruit	7250	7250	6750	6250	7750	7000	6250	6250	6000	6000	6000	6000
Cocoa powder	2100	1750	2100	1750	1750	2100	1750	2100	2100	1750	1750	1750
Total	1205113	1203305	1225264	1216671	1232604	1210622	1216863	1213275	1203924	1194510	1203526	1164113
Daily consumption (g)	3302	3297	3357	3333	3377	3317	3334	3324	3298	3273	3297	3189

Table 14 - Per capita protein consumption of selected agricultural products and foodstuffs in the United Kingdom (1958-1968 and 1977) (g.)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1977
Wheat flour	8 949	8 824	8 869	8 573	8 504	8 356	8 219	8 299	7 991	7 843	7 809	7 182
Pearl and roasted barley	65	65	65	57	57	65	57	49	41	41	41	41
Rolled oats	146	138	122	122	122	122	113	113	105	105	105	65
Corn flakes	146	178	170	162	178	227	194	211	219	227	235	292
Rice	85	85	104	130	124	91	111	111	91	98	117	111
Puffed rice	20	20	20	26	20	20	13	20	20	26	20	20
Rye flour	24	16	16	16	16	24	24	24	24	16	16	16
Starch	105	105	97	105	113	122	122	122	113	122	154	154
Sugar	-	-	-	-	-	-	-	-	-	-	-	-
Glucose	-	-	-	-	-	-	-	-	-	-	-	-
Beef and veal	3 849	3 447	3 529	3 619	3 724	3 793	3 451	3 193	3 259	3 476	3 290	2 520
Mutton and lamb	1 256	1 422	1 421	1 431	1 395	1 310	1 318	1 271	1 288	1 302	1 281	975
Pork	924	925	960	961	1 057	1 067	1 120	1 263	1 208	1 118	1 150	1 444
Bacon and ham	1 454	1 483	1 537	1 552	1 590	1 528	1 549	1 587	1 509	1 493	1 531	1 397
Poultrymeat	574	688	753	891	879	875	943	993	1 062	1 153	1 238	1 873
Edible offals	547	549	580	612	633	637	654	645	648	659	673	644
Liquid whole milk	4 806	4 841	4 869	4 904	4 928	4 946	4 970	4 942	4 939	4 939	4 893	4 848
Fresh cream	11	13	15	18	20	23	26	29	31	34	36	64
Sterilised tinned cream	9	10	12	14	14	16	17	17	16	16	17	19
Condensed milk (whole, unsweetened)	176	165	158	164	180	164	171	187	174	191	191	195
Condensed milk (whole, sweetened)	43	44	43	39	40	39	41	43	56	45	42	29
Condensed milk (skimmed, sweetened)	42	41	42	42	40	39	36	36	34	37	32	26
Whole milk powder	195	208	200	203	216	195	203	211	211	200	156	114
Skimmed milk powder	328	392	425	360	407	439	475	374	425	374	425	475
Ice cream, yoghourt, milk drinks (milk shakes etc.)	26	32	33	42	47	54	62	58	65	65	71	88
Chocolate crumb	196	187	191	193	184	185	194	185	229	214	204	175
Cheese	1 133	1 055	1 123	1 145	1 180	1 173	1 200	1 150	1 188	1 220	1 260	1 200
Shell eggs	1 485	1 573	1 584	1 595	1 551	1 562	1 606	1 562	1 595	1 606	1 628	1 628
Egg products	102	153	102	102	102	153	153	102	153	153	153	153
Butter	37	35	34	37	37	36	35	36	37	36	36	26
Margarine	-	-	-	-	-	-	-	-	-	-	-	-
Manufactured edible fats	-	-	-	-	-	-	-	-	-	-	-	-
Lard	-	-	-	-	-	-	-	-	-	-	-	-
Other edible oils and fats	-	-	-	-	-	-	-	-	-	-	-	-
Fish - total	1 637	1 563	1 391	1 355	1 487	1 346	1 496	1 481	1 384	1 405	1 481	1 803
Potatoes	1 523	1 569	1 610	1 583	1 641	1 556	1 595	1 646	1 630	1 620	1 646	1 656
Fresh tomatoes	94	104	99	99	91	87	93	86	87	90	88	96
Other fresh vegetables	619	608	654	625	626	612	663	667	664	666	664	664
Tinned vegetables	71	68	71	77	84	90	86	88	106	102	99	99
Citrus fruits	-	-	-	-	-	-	-	-	-	-	-	-
Other fruit (fresh)	108	123	121	113	118	121	121	123	123	109	118	118
Tinned and bottled fruit	37	40	39	41	43	43	44	43	43	43	43	43
Pulses	799	777	821	599	777	821	666	755	710	733	688	688
Dried fruit	73	73	68	63	78	70	63	63	60	60	60	60
Cocoa powder	48	40	48	40	40	48	40	48	48	40	40	40
Total	31 742	31 659	31 996	31 710	32 343	32 055	31 944	31 833	31 586	31 677	31 731	31 041
Daily consumption (g)	87.0	86.7	87.7	86.9	88.6	87.8	87.5	87.2	86.5	86.8	86.9	85.0

Table 15 - Per capita consumption of selected agricultural products and foodstuffs in the United Kingdom (1958-1968 and 1977) (g.)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1977
Wheat flour	864	851	856	827	821	806	793	801	771	757	754	693
Pearl and roasted barley	24	24	24	21	21	24	21	18	15	15	15	15
Rolled oats	54	51	45	45	45	45	42	42	39	39	39	24
Corn flakes	54	66	63	60	66	84	72	78	81	84	87	108
Rice	9	9	11	14	13	10	12	12	10	11	13	12
Puffed rice	2	2	2	3	2	2	1	2	2	3	2	2
Rye flour	9	6	6	6	6	9	9	9	6	6	6	6
Starch	39	39	36	39	42	45	45	45	42	45	57	57
Sugar	-	-	-	-	-	-	-	-	-	-	-	-
Glucose	-	-	-	-	-	-	-	-	-	-	-	-
Beef and veal	6 680	5 983	6 126	6 282	6 464	6 583	5 990	5 543	5 657	6 034	5 711	4 374
Mutton and lamb	2 940	3 328	3 325	3 350	3 264	3 066	3 086	2 976	3 014	3 047	2 998	2 283
Pork	3 211	3 214	3 333	3 340	3 673	3 706	3 891	4 386	4 198	3 884	3 993	5 016
Bacon and ham	5 273	5 380	5 576	5 631	5 768	5 543	5 620	5 757	5 472	5 417	5 554	5 069
Poultrymeat	210	252	276	326	322	321	346	364	389	422	454	686
Edible offals	332	333	352	371	384	387	397	392	394	400	409	391
Liquid whole milk	4 806	4 841	4 869	4 904	4 926	4 946	4 970	4 942	4 939	4 939	4 893	4 848
Fresh cream	108	128	152	176	200	228	256	288	312	344	364	640
Sterilized tinned cream	88	100	120	136	136	160	168	172	156	156	168	188
Condensed milk (whole, unsweetened)	191	179	171	178	191	177	185	203	189	207	207	212
Condensed milk (whole, sweetened)	53	54	52	48	49	48	50	52	68	55	51	35
Condensed milk (skimmed, sweetened)	-	-	-	-	-	-	-	-	-	-	-	-
Whole milk powder	203	216	208	211	224	203	211	219	219	208	162	119
Skimmed milk powder	9	11	12	10	11	12	13	10	12	10	12	13
Ice cream, yoghourt, milk drinks (milk shakes etc.)	26	32	33	42	47	54	62	58	65	65	71	88
Chocolate crumb	196	187	191	193	184	185	194	185	229	214	204	175
Cheese	1 395	1 308	1 383	1 411	1 454	1 445	1 478	1 417	1 463	1 503	1 552	1 478
Shell eggs	1 404	1 467	1 496	1 508	1 466	1 477	1 518	1 477	1 508	1 518	1 539	1 539
Egg products	80	120	80	80	80	120	120	80	120	120	120	120
Butter	7 460	6 900	6 830	7 340	7 380	7 140	7 040	7 170	7 340	7 270	7 170	5 100
Margarine	4 970	5 370	5 340	4 820	4 750	4 820	4 820	4 350	4 390	4 250	4 100	5 400
Manufactured edible fats	2 650	2 580	2 580	2 650	2 640	2 870	3 060	2 540	2 510	2 470	2 380	2 000
Lard	2 340	3 000	3 070	2 880	2 850	2 910	3 170	2 810	3 110	3 150	3 260	3 300
Other edible oils and fats	4 450	4 350	4 350	4 940	4 990	5 080	5 030	5 220	5 440	5 170	6 210	6 700
Fish - total	686	846	754	735	807	731	812	804	751	763	804	980
Potatoes	90	92	95	93	97	92	94	97	96	95	97	97
Fresh tomatoes	20	22	20	20	19	18	19	18	18	19	18	20
Other fresh vegetables	128	126	135	129	130	127	137	138	137	138	137	137
Tinned vegetables	15	14	15	16	17	19	18	18	22	21	20	20
Citrus fruits	-	-	-	-	-	-	-	-	-	-	-	-
Other fruit (fresh)	43	49	48	45	47	48	48	49	49	44	47	47
Tinned and bottled fruit	15	16	15	16	17	17	18	17	17	17	17	17
Pulses	76	74	78	57	74	78	63	71	67	69	65	65
Dried fruit	38	38	35	33	40	36	33	33	31	31	31	31
Cocoa powder	150	125	150	125	125	150	125	150	150	125	125	125
Total	51 593	51 797	52 315	53 111	53 844	53 822	54 037	53 013	53 498	53 135	53 916	52 230
Daily consumption (g)	141.4	141.9	143.3	145.5	147.5	147.5	148.0	145.2	146.6	145.6	147.7	143.1

should be added that although forecast have been worked out for individual sub-headings in II, 3, the estimates for these cannot be considered representative of all the other products of the group in question. Therefore, we have to assume instead that the consumption of the products under these three headings will remain constant between 1968 and 1977.

In interpreting the estimates of the calorie and fat content of food one should bear in mind that, although in the first half of the reference period the daily calorie and fat consumption per head of population moved steadily upwards (1958/60 to 1962/64: + 0.7 % (calories) and +3.9 % (fat), subsequently the average daily calorie (fat) intake per head of population fell significantly (between 1962/64 and 1966/68 by 1.6 % (calories) and by 0.7 % (fat)). This tendency towards a lower-calorie and lower-fat for health reasons is likely to spread in future. To that extent, the estimates resulting from the forecasts of demand show that a fall in the daily per capita consumption of calories and fat of 3.0 % and 2.4 % respectively between 1966/68 and 1977 is nothing more than a slightly intensified continuation of the trend which has been noticeable since the middle of the sixties. They can be considered wholly realistic forecasts, particularly if one bears in mind that the assumption of a constant level of consumption as regards those groups of products not covered by the demand forecasts results in a slight systematic underestimation of the daily calorie and fat consumption per head of population (see above for details). The average daily per capita consumption of protein reached its highest point in the years 1961/63; up to 1966/68 it fell again by 1.3 %. The reason for this was a considerable decrease in the consumption of protein, above all in the form of cereal products, accompanied by a practically stationary consumption of animal protein. On the basis of the demand forecasts there will be a further 2 % decrease in the daily per capita consumption of protein between 1966/68 and 1977. As was already established for the reference period, it is to be assumed that with a growing income level there will be a long-term tendency as regards total protein consumption towards the substitution of high-grade animal protein for vegetable protein. Precisely this result emerges from Table 14 as regards the

forecast period also. The proportion of animal protein in the total consumption of protein would increase accordingly from 62.2 % (1966/68) to 63.5 % in 1977.

In conclusion, the nutritional test can be said by and large to have produced fairly plausible results; a revision of the demand projections in line with results of the nutritional test does not, therefore, seem necessary.

III. Analysis of the supply of agricultural products

1. General introduction

If here we take the considerable trouble to construct econometric models in order to explain the supply of agricultural products in the United Kingdom, we do so for three reasons:

- to gather information about how UK farmers have responded in the past to price changes;
- to analyse the degreee of competition existing between the most important sectors of agriculture in the United Kingdom;
- to differentiate between the influences of economic factors (prices, costs, subsidies not dependent on sales, etc.) and the effects of non-economic factors (weather, soil characteristics etc).

The results obtained from the models constructed below are naturally dependent in many respects on the conditions obtaining during the reference period, primarily the validity of the deficiency payments system. Use of these models for forecasting purposes must, therefore, in every case be preceded by a critical appraisal criticism of each individual equation of behaviour, having regard to whether and to what extent the relevant equation could be applicable even after adoption by the United Kingdom of the Community's agricultural policy and also to what extent it must be modified to meet the new conditions. In our opinion, this is most likely to permit as rational a forecast of supply as possible to be made (i.e. an economico-causal and feasible forecast). The alternative would be trend extrapolations and related procedures along with speculative considerations, and, given the hypothesis of a change in the agricultural system, this would, in our view, greatly increase the danger of more or less inconsistent estimates.

2. Construction of the models and general formulation of the equations of behaviour featuring in the models

a. Cereals

In the case of crops the farmers react to price changes and to other economic factors almost exclusively by varying the area under cultivation. In contrast to this the long-term trend in yields per unit area is determined primarily by technical progress, which, with a more or less considerable time-lag, permeates agriculture in an extremely autonomous fashion. In the short term, i.e. from one year to the next, yields per unit area are determined by weather conditions. In forecasting yields per unit area we can accordingly limit ourselves to trend extrapolations or simple assumptions whereby normal weather conditions are presumed to obtain.

By far the bulk of land in the United Kingdom given over to the cultivation of cereals is devoted to wheat and barley. Whereas, for climatic reasons and because of soil fertility, the opportunities for growing wheat in the United Kingdom are rather limited, barley growing is economically viable in almost all regions of the British Isles (if one discounts some areas in Wales and in the West and North of Scotland). Following the abolition of food rationing, when the British Government was concentrating on improving domestic supplies of feed grains, it was necessary firstly to promote the growing of barley. In order to obtain a rapid extension of barley growing the guaranteed price for barley was at first set higher than that for wheat. Furthermore, farmers could claim deficiency payments for feed barley grown and used on their own farms, something which was not possible in the case of wheat. The farmers reacted to this by doubling the area under barley in the relatively short period from 1957 to 1965; the cultivation of wheat followed a declining trend until 1964. To the extent that the "barley boom" consolidated, the wheat price again was raised to the level of the barley price. The domestic production of barley rose so much in the meantime that in the years 1965–67 considerable surpluses appeared. Consequently, the Government again set the wheat price considerably higher than the barley price and this promptly put an end to the barley boom and led to an increase in the area under wheat.

We have here dwelt on the past trend only because it gives a clear indication that the price ratio (wheat : barley) exerts great influence on the size of the areas under wheat and barley. As for production costs, it can be assumed that wheat differs only marginally from barley; this is related inter alia to the use of almost identical techniques of sowing, harvesting and storage and of similar amounts of fertilizers as well as almost the same labour input for both types of grain. To that extent a simple comparison of actual producer prices (market price obtained plus guaranteed payments) to show the "relative competitiveness" of wheat as against barley should (from the farmer's point of view) suffice. In the United Kingdom wheat is sown almost exclusively as winter wheat, whereas in the case of spring barley predominates. When spring barley is sown, the farmer has as a rule marketed all or at least the greater part of the grain from the previous year's harvest and he knows the prices he received for it from the dealer. He should by this time also have a reasonably accurate idea of the size of the deficiency payments he can expect. Accordinly it could be supposed that the decision on the size of the area sown with spring barley, irrespective of the weather conditions obtaining at the time of sowing, is, to a considerable extent, dependent on the market prices obtained and the expected deficiency payments for wheat and barley from the previous havest. The prices expected for the coming harvest can, in our opinion, be best represented by the average producer price subsequently calculated by the Home-Grown Cereals Authority or, as the case may be, by the Ministry of Agriculture on the basis of the data given in the farmers' claims according to the Cereals Deficiency Payments Scheme and by the guarantee payments actually made; this price is shown in the statistical appendix of the Annual Review[1].

In the case of winter wheat not only the prices for harvest (t-1) but also those for harvest (t-2) should play an important part when deciding on the size of the area to be cultivated because when winter wheat is sown the previous

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[1] Secretary of State for the Home Department, Secretary of State for Scotland, Secretary of State for Wales and the Minister of Agriculture, Fisheries and Food, Annual Review and Determination of Guarantees, London, H.M.S.O., various issues.

harvest of wheat and barley has been completed only a month (wheat) or a month and a half (barley) previously, and because the volume of this harvest (t-1) sold by then often make up only a small part of the total grain from that harvest intended for marketing.

Price expectations for the coming harvest could in the case of barley be influenced also by the announcement of the guaranteed prices for the next crop year in the Annual Review immediately before the sowing of spring barley. This would imply that the area to be devoted to the cultivation of spring barley in period (t), could, to some extent, also be dependent on the guaranteed prices for wheat and barley in the same period. Against this, if the individual farmer knows what the guaranteed prices will be, this means merely that any suppositions he may wish to make regarding his own producer price for the coming harvest will still be subject to a considerably wide margin of error. The reason for this is that the level of the guarantee payment does not reflect the difference between the guaranteed price and the market price obtained by the individual farmer, but merely the difference between the average market price received by all farmers for all sales and the guaranteed price (i.e. in spite of different market prices all farmers receive, for example, the same deficiency payment per unit of weight for barley of the same quality with the same delivery date). Thus the individual farmer can reckon on a total producer price that is considerably higher (lower) than the guaranteed price should the market price received by him be above (below) the average market price. Apart from that, the simultaneous introduction of the guaranteed price in period (t) and of the average total producer price in period (t-1) into the equation for the determination of the area to be devoted to the cultivation of barley would, for statistical reasons, cause serious problems as regards the preparation of estimates because both prices are, as a rule, closely correlated with each other. Moreover, in determining the area to be given over to wheat such a procedure would not be justified, since when winter wheat is sown the guaranteed prices for the coming harvest are not yet known. When analysing cultivated areas we shall, therefore, limit ourselves from the start to the average total producer prices in periods t-1, t-2, t-3 etc.

By the introduction of a time variable in the equation for determining the area under wheat and also in that for barley account is to be taken of the fact that, with regard to soil characteristics and climate, the opportunities of increasing wheat growing are much more limited than those for barley. Moreover, the time variables should also pick up the effects on the long-term trend in barley and wheat cultivation of the continuing preferential position of barley over wheat as regards the deficiency payments (the fact that deficiency payments may be claimed in respect of barley used on the farm of origin can be regarded, as far as the time element is concerned, as a permanent stimulus to extend the barley acreage at the expense of wheat).

Consideration of the influence of weather on the areas under wheat and barley is based on a British study[1] which set itself the target of forecasting the supply of agricultural products in 1975 on the assumption, however, which facilitated its task, that the United Kingdom did not adopt the EEC agricultural policy. The authors of this study assume that given continual wet weather the acrual area sown with winter wheat may be less than the sowing area planned in the light of price expectations and of considerations relating to crop rotation. In such a case many farmers would the following spring devote the area reluctantly not sown with winter wheat to spring barley[2]. This would involve introducing a dummy variable giving the degree of moisture in the soil when winter wheat is sown into both the equation for determining the area to be devoted to wheat and that for determining the area to be devoted to barley. In the above report it was possible when constructing these weather variables to refer back directly to regional reports on sowing conditions. As such information is not at our disposal, we shall make do with the quotient (amount of precipitation: average hours of sunshine per day), which, in principle, corresponds to the so-called coefficient of evaporation of Lang and

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1 A.M.M. McFarquhar, S. Mitter, G.B. Aneuryn Evans, A Computable Model for Projecting U.K. Food and Agriculture, in: Europe's Future Food and Agriculture, ASEPELT, North-Holland Publishing Company, Amsterdam, London, 1971, p. 392 et seq.

2 Idem, p. 431 et seq.

De Martonne - with the sole difference that Lang and De Martonne use the degree of temperature instead of the hours of sunshine[1].

According to the above considerations, we obtain (assuming a double-logarithmic type of equation in which the respective elasticities are given directly by the partial regression coefficients) the two following equations for determining the areas under wheat and barley:

$$(65)\quad \log A^{w} = a_0 + a_1 \log \left[\tfrac{1}{2} \sum_{j=1}^{2} \left(\frac{P(w)}{P(b)} \cdot 10 \right)_{-j} \right] + a_2 Q_1 \left(\frac{R}{S} \right) + a_3 t + u_1$$

where:

A^{w} : area under wheat in June ('000 ha)

$P(w)$ or $P(b)$: average total producer price (market price plus guaranteed payments for wheat or barley respectively (£/100 kg)

$Q_1\left(\frac{R}{S}\right)$: quotient [amount of precipitation (mm)/sunshine (hours per day)] in England and Wales in October of the preceding year.

$$(66)\quad \log A^{b} = b_0 + b_1 \log \left(\frac{P(w)}{P(b)} \cdot 10 \right)_{-1} + b_2 Q_1 \left(\frac{R}{S} \right) + b_3 + u_2$$

where:

A^{b} : area under barley in June ('000 ha).

The area under oats contracted considerably until 1966; since then it has stabilized at about 380 000 ha. The areas released in this way were devoted almost exclusively to the cultivation of barley. This development cannot be explained by the price ratio (oats : barley). The decline in oat cultivation is due above all to a considerable reduction in the stock of horses, the

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[1] A.M.M. McFarquhar, S. Mitter, G.B. Aneuryn Evans, op. cit., p. 422 et seq.

substantially longer ripening period compared with barley and the fact that, owing to the high percentage of spelt in the grain, oats are not quite so suitable as barley or wheat as a raw material for the compound feedingstuffs industry. The fact that the area under oats has remained almost constant in recent years could have been caused by the circumstance that the cultivation of oats has been largely restricted to those regions of the United Kingdom in which poor soil quality and very high precipitation make the cultivation of other types of cereals seem uneconomic (in particular, some hill and mountainous regions of Wales, the West and North of Scotland and Northern Ireland should here be mentioned). As it is to be expected that the area under wheat and barley will be extended under EEC conditions, one may assume that the area under oats will still decrease marginally in the future too.

b. Sugar beet

In order to carry out their obligations under the Commonwealth Sugar Agreement, the UK Government set acreage quotas for sugar beet, whereby a fixed area for cultivation is allocated to each farmer. The British Sugar Corporation, which is responsible for marketing the domestic beet crop, is obliged to take all the beet harvested from this area from the farmer at the guaranteed price. The contract area offered by the British Sugar Corporation has, as a rule, used up by the farmers. The contract area has, particularly in recent years, been exceeded but always to a small degree. This is because the British Sugar Corporation can at any time refuse to buy beet not harvested in the contract area. Under these circumstances it would make no sense to try to measure the effect of the guaranteed price for sugar beet on the area under sugar beet. Moreover, this appears unnecessary because during the negotiations on the entry of the United Kingdom into the EEC a sugar beet production equivalent to 900 000 t of white sugar was accorded to UK farmers (sugar production quota). The problem is thus reduced to a forecast of the beet crop per hectare and the amount of sugar extracted. If these are known, then, given the production of sugar, the area under cultivation can be fixed.

c. Potatoes

The most important aim of the regulation of the British potato market is to reconcile, as far as possible, supply of maincrop ware potatoes with demand. For this purpose, restrictions which are not as stringent as in the case of sugar beet were also applied to the area under potatoes. Each year, at the beginning of the planting season, the British Potato Marketing Board fixes the so-called "target acreage" by means of which it is believed that, given normal yield per unit area, the quantity of potatoes harvested from this area (less the demand for early, seed and feed potatoes) will roughly correspond to the domestic consumption of maincrop ware potatoes. As the domestic consumption of maincrop ware potatoes grew only slightly in the review period with the yield per unit area tending, however, to increase rapidly, the "target acreage" had to be reduced considerably.

Each farmer engaging in the commercial cultivation of potatoes is allocated by the Potato Marketing Board what is known as a "basic acreage" which depends essentially on the area under potatoes cultivated by this farmer in the long term. Once this basic acreage has been allocated, it may remain unchanged for years. In order to ensure adaptation to the "target acreage" at national level the Potato Marketing Board merely adjusts from year to year the maximum percentage of the "basic acreage" which may be put under potatoes by the farmer in question. The farmer is, however, not in every case bound by the resulting individual acreage quota. He may even exceed it and thereby pay an agreed fine the amount of which increases in proportion to the amount by which he exceeds his acreage quota.

Yields per unit area, which fluctuate widely from one year to the next due to the influence of the weather, caused considerable variations in producer prices owing to a fairly price-inealstic demand for ware potatoes at the wholesale and retail stages prices. All further efforts by the Potatoe Marketing Board - mainly support buying - to stabilize the market affected the situation only slightly. Potato producers reacted to these price changes in such a fashion that in many years the "target acreage" was considerably exceeded but in others largely underutilized. If account is taken of the

long-term downward trend in the "target acreage" by means of a time variable, and of the weather conditions during the planting season by means of a special dummy variable, then in the light of the potato price a short-term elasticity of the actual area under potatoes at least ought to be able to be estimated:

$$(67)\quad \log A^{mp} = c_0 + c_1 \log (P(mp))_{-1} + c_2 Q_2 \left(\frac{Q}{S}\right) + c_3 MAT + c_4 t + u_3$$

where:

A^{mp} : area under maincrop potatoes in June ('000 ha)

P(mp) : average producer price of Potato Marketing Board for maincrop ware potatoes (£/100 kg)

$Q_2 \left(\frac{R}{S}\right)$: quotient [precipitation (mm) : sunshine (hours per day)] in the United Kingdom in April (weighting: England and Wales 0.75, Scotland 0.15, Northern Ireland 0.10)

MAT : average daily air temperature at sea level in the United Kingdom in April (weighting: see above).

d. Cattle

An econometric model which at the same time will enable milk and beef production to be determined will be constructed below. Some basic factors for this model come from the British study[1] mentioned above, which set itself a similar task. For a number of reasons, of which only the three most important are to be given here, it does not seem appropriate for us to adopt the British authors' model:

1. No distinction between beef and dairy cows is made. The net inflow into the total cow population, which results from the utilization of the supply of female calves fit for rearing, is regarded as a function of the milk price only; this may be true as far as dairy farmers are concerned, but,

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[1] See A.M.M. McFarquhar, S. Mitter, G.B. Aneuryn Evans, op. cit., p. 440 et seq.

as regards the corresponding decisions made by the owner of beef cows the milk price is of no importance. This is to be seen in the light of the fact that the expansion of the total cow population in the years after 1962 was accounted for almost exclusively by beef cows.

2. The prices of beef and milk are the only exogenous variables in the British model. The interrelationship, for example, between cattle and sheep raisong or pig production are not taken into consideration.

3. The main aim of the British model is to ascertain the short-term, i.e. cyclical, changes in beef and milk production and their causes. Therefore, the annual inflow into and the outflow from the breeding herd, for example, or the rearing of male and female calves for a given level of the breeding herd, are explained. Our main concern, however, is to draw up a long-term forecast of beef and milk production and to to this we may limit ourselves to a direct explanation of dairy and beef cow numbers and of calf slaughterings since these are by far the most important factors determining beef and milk supply in the long term, whereas with the other factors (size of the calf crop for a given cow population, turnover rate of the cow population). We may confine ourselves to simple assumptions. Therefore, in interpreting the individual steps in the construction of our model it should always be borne in mind that our aim is not a complex short-term model for the cattle economy but merely a long-term model of beef and milk production.

Determination of the stock of dairy and beef cows is the starting point for our model. Dairy cow numbers could first be considerably influenced by the price ratio (beef : milk). Here one must differentiate between two matters:

1. In the short term, i.e. from one year to the next, the price ratio (beef : milk) should be of decisive importance for the utilization of the available supply of female calves. If beef prices develop favourably (unfavourably) compared with the milk price, then more (fewer) female calves will be diverted to fattening and thus undermine (assist) the inflow into the stock of dairy cows.

2. In the long term a favourable and long-lasting increase in the price of beef compared with that of milk may cause many farmers to cease dairy farming altogether and to revert to keeping beef cattle. In addition, the available labour forece at the farm will presumably often influence such a decision (lavour input per dairy cow is on average considerably higher than that per beef cow).

Particularly in Wales, Scotland and Northern Ireland, but also in many parts of England there ought often, in view of the two production factors "pasture land" and "labour force", be very close competition between dairying and sheep-raising (principally breeding ewes). Account could be taken of this by the introduction of the price ratio (milk : lamb) in the equation for dairy cows. The price ratio (milk : wool) ought, however, to be of only little minor importance in this connection, because after the Second World War the significance of the returns from wool sales compared with the returns from sales of store lambs and cull ewes was much reduced for the sheep breeder. Dairying might also in part be in competition with pig production (predominantly litter production). In Eastern England some competition is conceivable with cereal growing (wheat and barley as "cash crops"). A simple comparison of producer prices could produce no meaningful results in all cases in which in the long term there are significant differences in productivity gains between two products. This should be true principally in the case of milk, beef and lamb on the one hand and cereals on the other. One must assume that in the long term (1950-71) average productivity in cereal growing rose considerably faster than in pasture farming in general. Given sufficiently long periods of observation, the productivity differences may ideally be seen as the difference between two exponential time trends, so that, within the framework of a double-logarithmic function they can be represented simply by a linear time variable. In this way we arrive at the following equation for the dairy cow population:

$$(68)\quad \log DC = d_0 + d_1 \log \left(\frac{P(bf)}{P(m)} \cdot 10\right)_{-j} + d_2 \log \left(\frac{P(s)}{P(m)} \cdot 10\right)_{-j}$$
$$+ d_3 \log \left(\frac{P(p)}{P(m)} \cdot 10\right)_{-j} + d_4 \log \left(\frac{P(m)}{P(w)} \cdot 10\right)_{-j} + d_5\, t + u_4$$

where:

P(bf) and P(s): average total producer price (market price obtained plus guarantee payments) for fat cattle and for fat hoggets and lambs respectively (£/100 kg live weight)

P(m) : average pool price of all milk sales for liquid consumption and for manufacture effected through the Milk Marketing Boards (£/kg, natural fat content, free to dairy)

P(p) : average total producer price (market price obtained including guarantee payments) for pigs (bacon and pork pigs, but excluding sows and boars) (£/100 kg live weight)

DC : number of dairy cows in June ('000).

Unlike in the case of vegetable products, we can make only some conjectures on the lag j in equation (68). Thus, for example, the decision whether a female calf born in the spring 1968 should be used as a replacement in the dairy cow stock or sold for fattening (or put to fattening by its first owner) ought to depend essentially on the milk and beef prices recorded in the 1967/68 farm year (april-march) just running out, and also on the prices recorded in the 1966/67 farm year. If it is decided to use as a replacement in the stock of dairy cows, the heifer will presumably be serviced by a bull in the late summer or in the autumn of 1969 and appear for the first time in June 1970 as a dairy cow in stock statistics. If the farmer himself rears the female calves destined for fattening to the store heifer stage or if he fattens the animal until it reaches a marketable condition, then it is theoretically possible, in the event of a favourable development in milk prices compared with beef prices, to use heifers actually intended for fattening as replacements in the dairy cow herd. Fairly rapid adaptation to changes in the price ratio (milk : beef)

would thus be possible (in this case, j could have the value (-1) or (-2)). As the majority of farms keeping dairy cows sell their surplus female calves immediately after birth this possibility is open to only a minority of milk producers. This limitation does not, however, apply should the reverse situation obtain: when beef prices are more attractive than milk prices, heifers originally intended as dairy cow replacements may at any time be sold as store heifers or put to fattening by their owners.

A large part of the calves made available for fattening by dairy farms, however, does not originate from pure dairy breeds, as has been implicitly assumed in the preceding discussion, but from crossing a dairy cow with a beef bull. Female calves resulting from such a cross are suitable as dairy cow replacements only on certain conditions. In this case the period between the decision on the number of future replacements for the dairy cow stock and the actual inflow is lengthened by the period of pregnancy (about nine months) of dairy cows (the decision on future dairy cow replacements must be made before the dairy cows are serviced not after the birth of the calves), so that j must be reckoned to have a value of at least (-4).

In so far as the price ratio (milk : beef) influences not only the exploitation of the supply of female calves but also the decision as to whether dairying should be given up in favour of beef cows, quite high values for j ought similarly to be expected, since the planning and implementation of a decision having such wide implications will certainly take up a considerable amount of time.

Accordingly, the value of lag j in equation (68) would lie between (-2) and (-4).

Presumably the most important factor determining beef cow numers is the price ratio (beef : lamb). Hill farms in Wales and Scotland, in particular, frequently have only two production possibilities: breeding ewes for the production of store lambs and wool, or rearing resistant breeds of beef cattle in order to obtain store cattle for selling. The fact that beef and lamb prices play a central role

in the decisions of these farms requires no special explanation. The price ratio (beef : milk) is of relevance for beef cow numbers only in so far as it has probably served many farmers as an important criterion for deciding whether they should give up dairying altogether and revert to keeping beef cattle (the opposite may happen only in exceptional cases). The price ratio (beef : milk) is, however, irrelevant as regards exploitation of the supply of female calves on a beef cattle holding. The UK Government has attempted from time to time to influence beef cow numbers by increasing the "hill cow subsidy". In addition, a strong incentive to raise the number of beef cattle was introduced in 1966 in the shape of the "beef cow subsidy" as a result of which not only hill farmers but practically all beef-cattle farmers became entitled to production subsidies. To take this into account a special dummy variable was constructed in which the "hill cow subsidy" and the "beef cow subsidy" are expressed as a single sum per cow. In doing so it was assumed that the two subsidies would affect beef-cattle raising not permanently but merely according to the "echo principle": as long as the total amount of both subsidies granted in respect of each cow remains constant a nil value is given the dummy variable. If that amount rises in a given farm year by say 40 %, the dummy variable is given a value of +0.4 for that year, +0.2 for the following year, and +0.1 for the year after that; thereafter the value of the dummy variable is nil until the subsidies are again increased. This mechanism has inter alia the advantage that, if these subsidies are abolished, which under the EEC regulations is highly likely, the dummy variable can be given a negative value (-1.0 according to the above example).

The equation for the determination of beef cow numbers would thus be the following:

$$(69)\quad \log BC = e_0 + e_1 \log \left(\frac{P(bf)}{P(m)} \cdot 10\right)_{-k} + e_2 \log \left(\frac{P(bf)}{P(s)} \cdot 10\right)_{-k} + e_3 D^{bc}_{-k} + u_5$$

where:

D^{bc} : Dummy variable for the "hill and beef cow subsidies" (cf. text for details)

BC : beef cow numbers in June ('000).

In principle, the same considerations as those already set out for j in equation (68) apply to lag k in equation (69). As a rule, in the beef-cow sector the final decision on the use of female calves suitable for rearing ought to be taken immediately after birth. This would give k a value of (-3). In exceptional cases the decision can be taken at a later stage, up to the time of them being sold as store heifers (k: -2). It must, however, be borne in mind that experience has shown that often a fairly long period of time elapses before higher total producer prices for fat cattle or fat sheep and lambs are observed on the markets for store animals (suppliers of store animals participate only indirectly in the guarantee payments granted for the end product)[1]. This could result in k having a vlue of (-4) or even (-5).

The total number of cows is given as the total number of dairy and beef cows:

(70) TC = DC + BC

where:
TC : total cow numbers in June ('000).

The total number of calves available in a given cow population is determined by the calving rate. Table 17 gives details of the method used for estimating the calving rate during the period under review. Calving rate depends on numerous factors (e.g. the age and breed structure of the cow stock, the quality of feed and maintenance, veterinary attention) among which economic factors, however, hardly appear at all. As regards the calving rate, each farmer seems rather to strive for a "conditioned maximum" adapted to the particular situation on his farm. Under these circumstances, a simple assumption on the level of the calving rate is adequate for the forecast. As Table 17 shows, the calving rate varied in the United Kingdom during the reference pe

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[1] Cf. inter alia J. Cherrington, Farmers confident about EEC entry, in the "Financial Times", London, of 8th November 1971.

Table 16 - Cattle numbers ('000 000)[a] and slaughterings of cattle and calves ('000) in the United Kingdom (1958-71)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total cattle	10 961	11 305	11 779	11 944	11 869	11 728	11 635	11 948	12 211	12 343	12 156	12 377	12 580	12 835
Total dairy cows	3 676	3 676	3 790	3 899	3 950	3 867	3 809	3 808	3 768	3 900	3 920	3 940	3 939	3 898
Cows and heifers in milk	2 599	2 559	2 671	2 756	2 813	2 787	2 690	2 755	2 739	2 790	2 816	2 855	2 835	2 858
Cows in calf, but not in milk	430	430	434	446	452	445	436	432	423	425	411	419	408	375
Heifers in calf with first calf	647	687	685	697	685	635	683	621	606	685	693	666	696	665
Total beef cows	979	1 006	1 055	1 092	1 130	1 147	1 123	1 162	1 254	1 274	1 291	1 371	1 471	1 551
Cows and heifers in milk	727	743	780	821	874	894	859	885	963	986	1 001	1 039	1 111	1 187
Cows in calf, but not in milk	134	132	138	141	139	146	149	138	148	158	156	176	193	199
Heifers in calf with first calf	118	131	137	130	117	107	115	139	143	130	134	156	167	165
Bulls and bull calves	110	110	109	108	103	98	91	93	93	91	90	90	91	94
Other cattle, 2 years and over	1 351	1 317	1 314	1 329	1 196	1 095	1 048	978	957	1 003	923	879	860	871
Other cattle, 1 year and under 2	2 289	2 461	2 675	2 744	2 621	2 598	2 526	2 524	2 692	2 714	2 581	2 623	2 656	2 749
Other cattle, under 1 year	2 556	2 735	2 836	2 772	2 869	2 923	3 038	3 383	3 447	3 361	3 351	3 474	3 563	3 672
Slaughterings of														
Steers and heifers	2 196	2 006	2 314	2 712	2 627	2 764	2 677	2 599	2 706	2 937	2 808	2 628	2 895	2 888
Cows and bulls	756	636	696	624	768	780	684	588	648	648	720	756	792	813
Calves	712	629	860	921	869	703	491	387	508	614	477	420	356	257

[a] June of the year in question.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues. Central Statistical Office, Monthly Digest of Statistics, London, various issues. Ministry of Agriculture, Fisheries and Food, Department of Agriculture and Fisheries for Scotland, Ministry of Agriculture, Northern Ireland, Agricultural Statistics, London, various issues. Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues. Own calculations and estimates.

Table 17 - Analysis of the structure of the cattle stock in the United Kingdom (1958-71) ('000)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
I. Estimate of the calving rate:														
1. Slaughterings of steers and heifers, cows and bulls - ø of periods (t+1) and (t+2)	2 826	3 173	3 366	3 470	3 453	3 274	3 271	3 470	3 557	3 456	3 536	3 694		
2. Calf slaughterings - period (t)	712	629	860	921	869	703	491	387	508	614	477	420	356	257
3. Change in total cattle stock - ø of periods (t+1) and (t+2)	409	320	45	- 108	- 117	110	288	198	- 28	17	212	229		
4. Total exports of live cattle - ø of periods (t+1) and (t+2)	126	81	124	155	146	238	315	248	226	220	182	178		
5. Total imports of live cattle - period (t)	642	474	508	691	567	639	706	511	567	649	620	554	525	620
6. Total cow population - period (t)	4 655	4 682	4 845	4 991	5 080	5 014	4 932	4 970	5 022	5 174	5 211	5 311	5 410	5 449
7. Estimated calving rate (%) - [(1.+2.+3.+4.-5.) : (6.)] . 100	73.7	79.6	80.2	75.1	74.5	73.5	74.2	76.3	73.6	70.7	72.7	74.7		
8. Estimated calf crop (1.+2.+3.+4.-5.)	3 431	3 729	3 887	3 747	3 784	3 686	3 659	3 792	3 696	3 658	3 787	3 967		
II. Comparison of the calf crop with the stock of calves:														
9. Estimated calf crop minus slaughterings and exports of calves (= number of calves retained for rearing)	2 679	3 068	3 005	2 795	2 884	2 951	3 123	3 348	3 164	2 987	3 267	3 228		
10. Number of cattle under 1 year (in June)	2 556	2 735	2 836	2 772	2 869	2 923	3 038	3 383	3 447	3 361	3 351	3 474	3 563	3 672
11. Difference (9.-10.)	123	333	169	23	15	28	85	- 35	- 283	- 374	- 84	- 246		
III. Inflow into and outflow from the total cow population:														
12. Total change in cow numbers (net inflow or net outflow)	- 70	27	163	146	89	- 66	- 82	38	52	152	37	100	99	39
13. Heifers in calf with first calf (gross inflow)	765	818	822	827	802	742	798	760	749	815	827	822	863	830
14. Outflow from cow stock due to cow slaughterings[a]	745	625	685	613	758	770	675	579	639	639	711	747	783	804
15. Difference (13.-14.) (exports of slaughter cows)	90	166	- 26	68	- 45	38	205	143	58	24	79	- 25	- 19	- 13
16. Export of slaughter cows: 1969-71, actual values; 1958-1968, average exports estimated on bais of 15.	54	54	54	54	54	54	54	54	54	54	54	59	63	28
17. Export of slaughter cows: 1969-71, actual values; 1958-1968, exports estimated on basis of 14. and 16.	51	36	16	31	31	36	96	116	76	81	24	59	63	28
18. Total outflow from cow stock (14.+17.)	796	661	701	644	789	806	771	695	715	720	735	806	846	832
19. Turnover rate of the total cow population (%)(18.:6.).100	17.1	14.1	14.5	12.9	15.5	16.1	15.6	14.0	14.2	13.9	14.1	15.2	15.6	15.3
IV. Inflow into and outflow from the population of bulls for service														
20. Changes in stock of bulls for service[b]	- 4	0	- 1	- 1	- 5	- 5	- 7	2	0	- 1	- 2	0	1	3
21. Estimated slaughterings of bulls for service[b]	11	11	11	11	10	10	9	9	9	9	9	9	9	9
22. Estimated gross inflow (20.+21.)	7	11	10	10	5	5	2	11	9	7	8	9	10	12
V. Consistency test for calf utilization														
23. Domestic slaughterings of fat cattle, minus imports of live cattle[c], plus exports of store and fat cattle (= number of indigenous fat cattle of all kinds actually sold for the home market and for export[d])	1 614	1 565	1 827	2 146	2 116	2 221	2 130	2 240	2 212	2 426	2 282	2 169	2 509	2 347

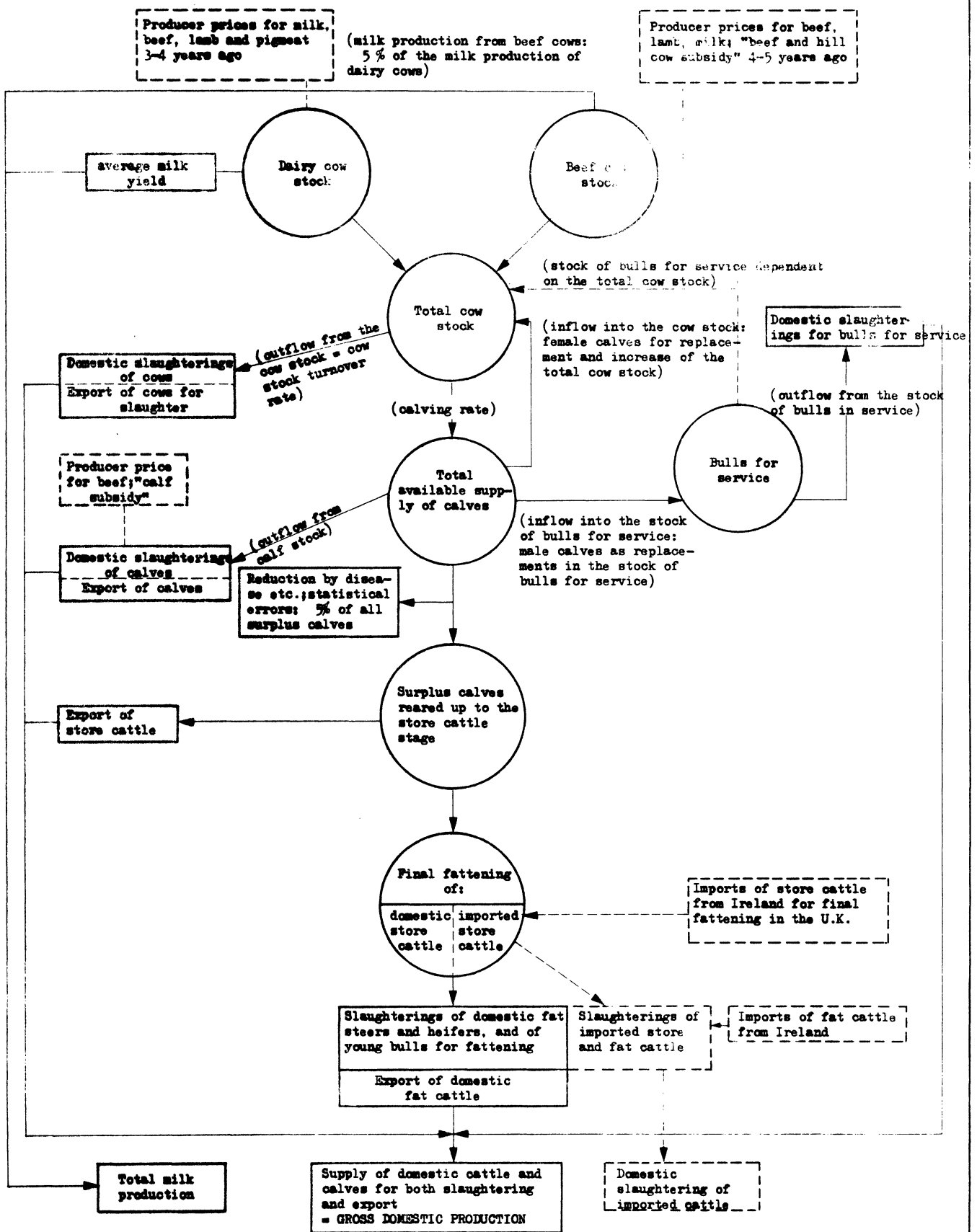
Table 17 (continued)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
24. Calves retained at home for rearing (9.), less gross inflow into cow stock (13.) and into bull stock of bulls for service (22.) (= number of indigenous fat cattle of all kinds[d] available for the domestic market and for export)	1 907	2 239	2 173	1 958	2 077	2 204	2 323	2 577	2 406	2 165	2 432	2 397		
25. Supply of fat cattle from internal sources actually marketed as a % of the domestic supply of fat cattle originally available (23.:24.) . 100	84.6	69.9	84.1	109.6	101.9	100.8	91.7	86.9	91.9	112.1	93.8	90.5		

[a] Slaughterings of cows and bulls less 10 % of the stock of bulls for service. [b] 10 % of stock of bulls for service. [c] Almost exclusively store and fat cattle; imports of cows and bulls for slaughter may be ignored. [d] Fat steers and heifers, and young bulls for fattening.

Sources: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Board of Trade, "Overseas Trade Accounts of the United Kingdom", London various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.

Diagram 8 - Model for determining the gross domestic production of beef and of milk production in the United Kingdom



between 70 and 80 % with a clear downward tendency predominant in the long term (average for the years 1958/63: 76.1 %; average for the years 1964/69: 73.7 %; fall = - 3.2 %). The reason for this is, undoubtedly, the continuing increase in the proportion of beef cows in the total cow stock, since one can assume that the beef cows in the hill and mountain areas in the northern and western parts of Britain, which are at a disadvantage climatically and as regards soil conditions, have a considerably lower calving rate than dairy cows. We expect that the proportion of beef cows in the total cow population will continue to increase considerably and that this will probably have a negative effect on the calving rate in the forecasting period as well (assumption for forecasting purposes: 71.5 %; -3.0 % compared with the average figure for the years 1964-69). Accordingly, the total calf crop (TCC) is given as follows:

(71) $TCC = 0.715\ TC.$

In order to find the number of calves retained for rearing on the basis of the total available supply of calves, domestic calf slaughterings and the export of calves must be calculated (≡ total outflow from the calf population)[1]. Disregarding the proportion of calves suitable for rearing in the total number of those born viable, slaughterings of calves[2] ought to be influenced mainly by the trend in beef prices and by the "calf subsidy", which was introduced by the UK Government in an attempt to reduce in the early post-war period the still very extensive slaughterings of calves fit for rearing, which could not, therefore, be devoted to beef production. As with the "beef and hill subsidy", the effects of the calf subsidy will be expressed by means of a dummy variable constructed according to the "echo principle":

(72) $\log SLCV = f_0 + f_1 \log P(bf) + f_2 D^c + u_6$

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[1] Imports of calves are of minor importance and can therefore be disregarded.
[2] Principally slaughterings of new-born ("bobby") calves but also of fat calves.

where:

SLCV : domestic calf slaughterings ('000)

D^c : dummy variable for the calf subsidy (cf. text for details).

The sizeable exports of calves were subject to wide fluctuations which after 1960 show a clear negative correlation with the cyclical changes in beef production in the Six (the largest market for British calf exports). This would imply that from 1958 to 1971 calf exports were primarily determined by factors which were, to a large extent, independent of events on the UK market. Accordingly, calf exports should be treated as an exogenous variable in the analysis and, therefore, nolens volens in the forecast as well:

(73) EXCV = exogenous

where:

EXCV : export of live calves ('000).

The total number of calves (TCCR) retained for replacement purposed or and fattening (or for export as store or fat cattle) can now be defined as:

(74) TCCR = TCC - (SLCV + EXCV).

The number of calves required as replacements in the total cow population (CWR) is equal to the total ooutflow from the cow stock (this is composed of either domestic slaughterings or live exports for slaughter plus (minus) the increase (decrease) in the total cow population[1]):

(75) $CWR = SLCW + EXCW + (TC - TC_{-1})$

---

[1] Due to their small numbers imports of cows, like imports of calves, can be disregarded.

where:
SLCW : domestic cow slaughterings ('000)
EXCW : export of live cows for slaughter ('000).

The proportion of cows slaughtered or exported (total outflow) in the total cow stock is defined as the turnover rate of the cow population. Table 17 gives details of the turnover rate of the British cow population during the reference period. Considerable cyclical fluctuations appear which result from the inclination of farmers in periods of intensive expansion in cow numbers to use cows longer on average than in periods of stagnation or even of stock reduction. In theory, it is possible to explain the fluctuations in the turnover rate around its long-term average value by the means of economic factors, but this would hardly be a step forward because the model is intended for the preparation of long-term forecasts (cf. p. 105 on this subject). We shall, therefore, merely assume, as with the calving rate, an average turnover rate of 15 % for purposes of forecasting. The proportion of the total outflow of cows from stock which is exported live is, exactly as with calf exports, primarily dependent on factors which have littel to do with the situation on British cattle markets. (The remarks concerning exports similarly hold good for British exports of slaughter cows). We now have:

(76) EXCW = exogenous

(77) SLCW = 0.15 TC - EXCW.

Using (76) and (77) equation (75) can now be simplified to:

$$(78)\quad CWR = 0.15\ TC + (TC - TC_{-1})$$
$$= 1.15\ TC - TC_{-1}.$$

The size of the stock of bulls for service (cf. Table 16) was mainly influenced in the period under review by progress in the production field. The extraordinarily rapid expansion in the use of artificial insemination resulted in a continous fall in the number of bulls for service which were necessary in relation

to the size of the cow stock. The stock of bulls for service was equal to 2.3 % of the cow stock in the years 1958-60 and to only 1.7 % in the years 1969-71. As artificial insemination has meanwhile been widely adopted, it can be assumed that this proportion will not alter appreciably in future. Merely for reasons of caution (so as not to run the risk of underestimating the number of bull calves needed as replacements in the stock of bulls for service) we shall, for forecasting purposes, fix the ratio of the stock bulls for service to that of cows at 1.75 %. Inflow into the bull population can, moreover, be determined by the same method as that used for the inflow into the stock of cows (assumption of the turnover rate of the stock of bulls for service: 10 %)[1]:

(79) $BS = 0.0175\ TC$

(80) $SLBS = 0.10\ BS$

(81) $BSR = SLBS + (BS - BS_{-1})$

where:
BS : stock of bulls for service in June ('000)
SLBS : domestic slaughterings of bulls for service ('000)
BSR : inflow into the population of bulls for service.

Equation (81) can be reconstructed as:

$$\begin{aligned}(82)\ BSR &= 0.10\ BS + (BS - BS_{-1}) \\ &= 1.10\ BS - BS_{-1} \\ &= 1.10\ (0.0175)\ TC - 0.0175\ TC_{-1} \\ &= 0.01925\ TC - 0.0175\ TC_{-1}.\end{aligned}$$

Both the calculation of CWR and that of BSR require not only the estimate of the cow population in the target year of the forecast.

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[1] Foreign trade in bulls for service is negligible and can be disregarded.

In addition, the cow stock in the preceding period (TC_{-1}) must be estimated. Strictly speaking, this should be done with the help of equations (68) - (70), but this would require making a hypothesis on the prices and price ratios during the year prior to the end of the period of price adjustment, a somewhat complex procedure. A more pragmatic approach would simply be to spread equally over all the years of the forecasting period the total increase in the stock of cows as previously estimated from the starting year to the target year of the forecast. The final year of the reference period (= starting year of the forecast) is 1971 with 1980 being assumed to be the target year of the forecast. If the cow stock in 1971 is given as TC(71) and that in 1980 as TC(80), the cow stock in 1979 (TC(79)) would be calculated as follows:

$$(83)\quad TC(79) = TC(80) - 0.111\,[TC(80) - TC(71)].$$

Knowing the inflow into the breeding herd (cows and bulls), the total calf potential (CF) theoretically available for domestic fattening and for the export of fat and/or store cattle can be defined by:

$$\begin{aligned}(84)\quad CF &= TCCR - CWR - BSR\\ &= [TCC - (SLCV + EXCV)] - CWR - BSR\\ &= [0.715\,TC - (SLCV + EXCV)] - (1.15\,TC - TC_{-1}) - (0.01925\,TC - 0.017\,TC_{-1})\\ &= 1.0175\,TC_{-1} - 0.45425\,TC - (SLCV + EXCV).\end{aligned}$$

As the consistency test for the utilization of the calf supply in Table 17 shows, actual domestic slaughterings of fat cattle (plus exports of live fat and store cattle) do not quite correspond even in the long term to the supply of calves originally available for that purpose. This is due <u>inter alia</u> to stock diseases, animals culled after inspection at slaughterhouses and, probably most important, the changes in the stock of fat cattle not explicitly recorded and statistical errors. In order to preserve continuity with the

past trends when forecasting, a statistical corrective factor must be introduced into the model:

(85) (SLFC + EXSF) = 0.95 CF

(86) EXSF = exogenous

(87) SLFC = 0.95 CF - EXSF

where:
SLFC : domestic slaughterings of home-bred fat cattle ('000)
EXSF : exports of home-bred fat and store cattle.

The number of home-bred cows, sterrs/heifers and calves available for domestic slaughter or for export is now obtainable so that the total gross domestic production of beef and veal ('000 metric tons) can be estimated after assumptions on the respective average slaughter weights (in metric tons) have been made for the forecasting period:

(88) BEZB = (0.230) (SLCW) + (0.270) (SLBS) + (0.023) (SLCV)
+ (0.250) (SLFC) + (0.230) (EXCW) + (0.030) (EXCV)
+ (0.200) (EXSF)

where:
BEZB : gross domestic production of beef and veal ('000 t).

Milk production is obtained by multiplying the number of dairy cows forecast by equation (68) by the average milk yield per cow (the latter may be simply estimated by a graphic trend extrapolation), plus an additional amount allowing for milk occasionally sold beef-cattle farmers (about 5 % of the milk production from dairy cows, according to official estimates):

(89) MP = 1.05 (DC · AMY)

where:

MP : total milk production ('000 t)

AMY : average milk yield per dairy cow (t).

e. Sheep

The aim of the following model is to compile a consistent long-term forecast of the gross domestic production of mutton and lamb; i.e. no short-term model of the sheep economy should be set up to explain the cyclical fluctuations in sheep-raising. The basis of this model too is an evaluation of the stock of breeding ewes. Factors possibly influencing the ewe population were thoroughly discussed in the section dealing with the stock of dairy and beef cows: namely, the price ratios (lamb : milk, and beef : lamb), which over all the important output items of pasture farming. Furthermore, we must consider the "hill sheep subsidy" too, the effects of which on the stock of ewes could also be taken into account by constructing a dummy variable according to the echo principle:

$$(90)\quad \log EW = g_0 + g_1 \log \left(\frac{P(bf)}{P(s)} \cdot 10\right)_{-\ell} + g_2 \log \left(\frac{P(s)}{P(m)} \cdot 10\right)_{-\ell} + g_3 D^{hs}_{-\ell} + u_7$$

where:

EW : stock of ewes in June ('000)

D^{hs} : dummy variable for the "hill sheep subsidy" (cf. text).

We expect estimates in the range (-3) to (-4) for lag 1 in equation (90). Normally, lambs are born in the spring in the United Kingdom. It is then that the decision is, therefore, taken as to how the available supply of female lambs fit for rearing is to be divided into replacement (ewe) and fattening stock. The prices obtained in the farming year just ending (April - March), but also frequently the prices of the previous farm year are important for this decision. This is particularly true for hill farmers

producing store lambs because, as a rule, higher (lower) prices for fat almbs appear with a considerable time-lag in the form of price movements on the store lamb market. Female lambs born in the spring are usually tupped in the autumn of the following year (as ewe hoggets). This means that they do not appear in stock statistics as ewes until Une of the next year but one. The tupping of one-year old lambs is carried out only in exceptional cases because it generally results in a great reduction of the "lambing rate"[1].

A reliable estimate for the lamb crop is obtained most easily by comparing the number of sheep under one year of age in June with the number of ewes in June (cf. Table 19: method B). This gives a national average of about 110 - 117 % for the lambing rate in the reference period. This figure comprises figures of about 150 % for lowland sheep farming with good conditions of soil and dlimate, and often also of less than 100 % for hill farms much disadvantaged by weather and by soil quality. For forecasting purposes we have assumed an average figure of 115 %. The number of lambs born alive and reared (TLC) is given by the following equation:

(91) $TLC = 1.15\ EW.$

If the not very extensive external trade in ewes is disregarded, the inflow into the ewe population corresponds to domestic slaughterings of ewes plus (minus) the increase (decrease) in the ewe stock. The turnover rate of the ewe stock in the United Kingdom is surprisingly small. As Table 19 shows, only about 7-13 % of the stock of ewes was slaughtered in each year of the reference period; this corresponds to an average ewe age of 10-15 years! We wahll assume in the forecast an average turnover rate in the ewe population of 10 %:

(93) $EWR = SLEW + (EW - EW_{-1})$

$= 1.10\ EW - EW_{-1}$

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[1] Cf. J. Cherrington, Hill-farms gain from "extreme" prices; in the "Financial Times", London, of 15 October 1971.

Table 18 - Sheep numbers (in '000 000)[a] and sheep and lambs slaughtered (in '000) in the United Kingdom (1958-71)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Total stock of sheep	26 105	27 612	27 871	28 967	29 498	29 344	29 657	29 911	29 957	28 885	28 004	26 604	26 080	25 998
Ewes	10 322	10 735	11 232	11 505	11 829	11 832	11 918	11 946	12 019	11 760	11 415	10 946	10 544	10 436
Rams for service	317	320	322	332	344	345	334	336	344	332	327	313	302	304
Other sheep - one year and over	3 635	4 020	3 800	3 645	3 689	3 663	3 530	3 738	3 737	3 583	3 475	3 323	3 292	3 200
Other sheep - under one year	11 831	12 537	12 517	13 485	13 637	13 504	13 875	13 891	13 857	13 211	12 787	12 022	11 943	12 059
Animals slaughtered:														
Ewes[a]	736	916	1 096	987	1 094	1 213	1 275	1 190	1 598	1 407	1 395	1 325	1 278	1 193
Rams for service[b]	32	32	32	33	34	35	33	34	34	33	33	31	30	30
Wethers, hoggets and lambs	8 640	11 666	10 311	12 192	11 595	10 887	11 353	10 952	11 924	11 731	10 961	9 074	10 140	10 270

[a] Total number of ewes and rams for service slaughtered, less 10 % of the ram population of rams for service. [b] 10 % of the stock of rams for service.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

Table 19 - Analysis of the structure of the stock of sheep in the United Kingdom (1958-71) (in '000)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
I. Estimate of the lambing rate:														
1. Fat wethers, hoggets and lambs slaughtered - Ø periods (t) and (t+1)	10 153	10 989	11 252	11 894	11 241	11 120	11 153	11 438	11 828	11 346	10 018	9 607	10 205	
2. Rams and ewes slaughtered - period (t+1)	948	1 128	1 020	1 128	1 248	1 308	1 224	1 632	1 440	1 428	1 356	1 308	1 223	
3. Change in total stock of sheep - Ø of period (t) and (t+1)	1 408	883	678	814	189	80	284	150	- 513	- 977	-1 141	- 962	- 303	
4. Net external trade in live sheep - period (t)	- 98	3	- 66	6	27	174	34	198	- 33	54	126	303	197	93
5. Stock of ewes - period (t)	10 322	10 735	11 232	11 505	11 829	11 832	11 918	11 946	12 019	11 760	11 415	10 946	10 544	10 436
6. Estimated lamb crop (1.+2.+3.+4.)	12 411	13 003	12 884	13 842	12 705	12 682	12 695	13 418	12 722	11 851	10 359	10 256	11 322	
7. Estimated lambing rate (%) - Method A: (6.:5.) . 100	120.2	121.1	114.7	120.3	107.4	107.2	106.5	112.3	105.8	100.8	90.7	93.7	107.4	
8. Number of lambs under one year (in June)	11 831	12 537	12 517	13 485	13 637	13 504	13 875	13 891	13 857	13 211	12 787	12 022	11 943	12 059
9. Estimated lambing rate (%) - Method B:(8.:5.) . 100	114.6	116.8	111.4	117.2	115.3	114.1	116.4	116.3	115.3	112.3	112.0	109.8	113.3	115.6
II. Inflow into and outflow from the stock of ewes:														
10. Change in stock of ewes (net inflow or outflow)	482	413	497	273	324	3	86	28	73	- 259	- 345	- 469	- 402	- 108
11. Outflow from the ewe population (= domestic slaughterings of ewes [a, b])	736	916	1 096	987	1 094	1 213	1 275	1 190	1 598	1 407	1 395	1 325	1 278	1 193
12. Estimated gross inflow into the ewes population(10.+11.)	1 218	1 329	1 593	1 260	1 418	1 216	1 361	1 218	1 671	1 148	1 050	856	876	1 085
13. Turnover rate in the stock of ewes (%): (11.:5.) . 100	7.13	8.53	9.76	8.58	9.25	10.25	10.70	9.96	13.30	11.96	12.22	12.10	12.12	11.43
III. Inflow into and outflow from the stock of rams:														
14. Change in stock of rams (net inflow or outflow)	22	3	2	10	12	1	- 11	2	8	- 12	- 5	- 14	- 11	2
15. Rams slaughtered[c] (= outflow from the stock of rams)	32	32	32	33	34	35	33	34	34	33	33	31	30	30
16. Estimated gross inflow into the ram population (14.+15.)	54	35	34	43	46	36	22	36	42	21	28	17	19	32
IV. Consistency test for lamb crop utilization														
17. Number of lambs under one year (June) less estimated gross inflow into the stock of ewes, and rams [8. - (12.+16.)] (= number of fat wethers, hoggets and lambs, home-bred, available for the domestic market and for export)	10 559	11 173	10 890	12 182	12 173	12 252	12 492	12 637	12 144	12 042	11 709	11 149	11 048	10 942
18. Fat wethers, hoggets and lambs slaughtered domestically, corrected by the net external trade in live sheep (= number of fat wethers, hoggets and lambs, home-bred, marketed for the domestic market and for export)	8 542	11 669	10 245	12 198	11 622	11 061	11 387	11 150	11 891	11 785	11 087	9 377	10 337	10 363

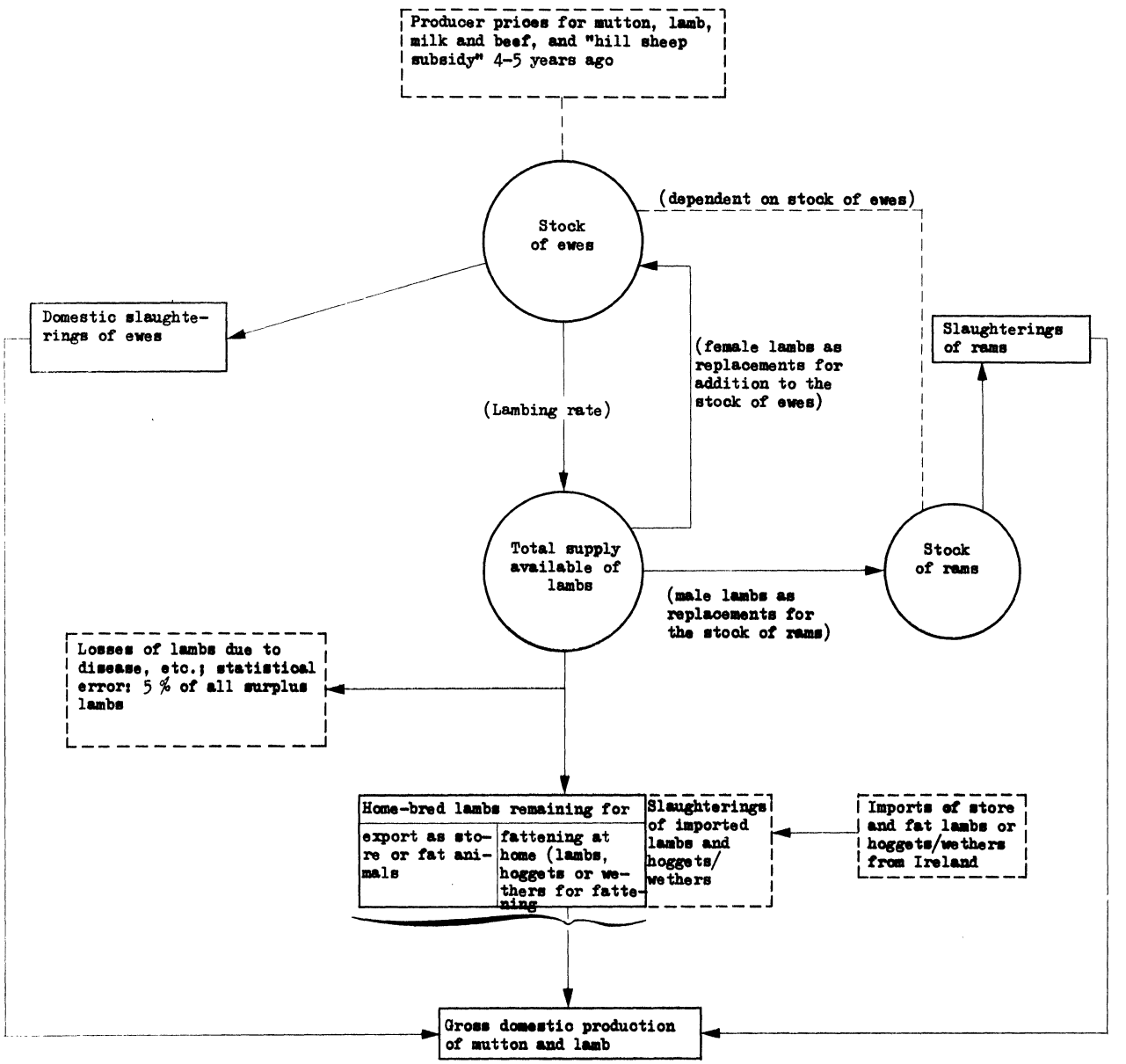
Table 19 (continued)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
19. Number of indigenous fat wethers, hoggets and lambs marketed, expressed as a % of the domestic supply originally available (18.:17.) . 100	80.9	104.4	94.1	100.1	95.5	90.3	91.2	88.2	97.9	97.9	94.7	84.1	93.6	94.7

[a] External trade in live ewes can be disregarded. [b] Total number of ewes and rams slaughtered, less 10 % of the stock of rams. [c] Assumption: 10 % of the stock of rams.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Board of Trade, Overseas Trade Accounts of the United Kingdom, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

Diagram 9 - Model used for determining the gross domestic production of mutton and lamb in the United Kingdom



(93) $SLEW = 0.10\ EW$

where:

EWR : inflow into the ewe stock ('000)

SLEW : domestic slaughterings of ewes ('000)

For the inflow into the stock of rams for service the following applies similarly:

(94) $RE = SLR + (R - R_{-1})$

$= 1.10\ R - R_{-1}$

(95) $SLR = 0.10\ R$

where:

R : stock of rams in June ('000)

SLR : domestic slaughterings of rams for service ('000)

RR : inflow into the stock of fams for service ('000)

The ratio (rams for service : ewes) fell in the reference period from 2.97 % (1958/60) to 2.88 % in 1969/71. The main reason for this was the increase in stocks of rams for service. For forecasting purposes we have assumed a ratio (rams for service : ewes) of 2.9 %.

(96) $R = 0.029\ EW.$

The total number of lambs remaining for domestic fattening at home and for export as store or fat lambs or hoggets/wethers (MLF) is obtained from the following:

(97) $MLF = TLC - (EWR + RR)$

$= 1.15\ EW - (1.10\ EW - EW_{-1} + 1.10\ R - R_{-1})$

$= 1.15\ EW - (1.10\ EW - EW_{-1} + 0.0319\ EW - 0.029\ EW_{-1})$

$= 0.0181\ EW + 1.029\ EW_{-1}.$

The consistency test for lamb utilization (cf. Table 19) showes that in the long term the average actual domestic slaughterings of home-bred wethers, hoggets and lambs and the live exports of store and fat lambs, and wethers/hoggets did not quite reach the quantity MLF, which as with the utilization of calves, may well be connected with losses due to disease, animals going astray in the hills, the unrecorded changes in the stock of fat animals, but also with inadequate statistical recording of slaughterings and foreign trade. It is, therefore, necessary to introduce into the model a statistical corrective factor for lamb utilization too:

(98) (SLML + EXML) = 0.95 MLF

(99) EXML = exogenous

(100) SLML = 0.95 MLF - EXML

where:

SLML : domestic slaughterings of indigenous fat lambs and wethers/hoggets ('000)

EXML : export of indigenous store and fat lambs, and wethers/hoggets ('000)

Once the average slaughter weight (in metric tons) has been calculated for the forecast period, the gross domestic production of mutton and lamb (BEZS; '000 t) can be calculated as follows:

(101) BEZS = (0.025) (SLEW) + (0.025) (SLR) + (0.019) (SLML) + (0.020) (EXML)

f. Pigs

The main objective of the pig model is to forecast the total number of slaughter pigs available for the production of pork and bacon. The equation determining the stock of sows is of central importance to this model. As regards the inputs labour, capital and feed crops for use on the farm of origin, pig-breeding in

Table 20 Stock, slaughterings, and slaughter and rearing rates of pigs in the United Kingdom (1958-71) ('000)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
I. Stock:														
1. Pigs - total	6 485	5 984	5 724	6 043	6 722	6 859	7 379	7 979	7 333	7 107	7 387	7 783	8 088	8 742
2. Sows	802	705	725	774	857	876	903	945	822	824	887	915	953	984
3. Boars for service	47	41	40	43	46	47	47	49	43	41	44	44	45	46
4. Pigs aged 5 months and over	1 160	1 109	1 108	1 042	1 124	1 132	1 221	1 251	1 179	1 146	1 149	1 188	1 249	1 270
5. Pigs between 2 and not more than 5 months	2 791	2 657	2 449	2 591	2 902	3 050	3 271	3 594	3 392	3 218	3 309	3 526	3 672	4 065
6. Pigs under 2 months	1 686	1 471	1 491	1 594	1 793	1 754	1 937	2 140	1 897	1 878	1 998	2 111	2 169	2 378
II. Slaughterings:														
7. Domestic slaughterings of pigs, total	11 012	10 830	10 298	10 727	12 082	12 202	12 805	14 330	13 485	12 336	12 976	14 027	14 393	15 993
8. Slaughterings of bacon pigs, total	4 328	4 312	3 874	4 470	4 963	5 019	5 038	5 444	5 489	5 289	5 718	6 202	6 619	7 955
a. Slaughterings of bacon pigs	.	.	3 079	3 307	3 533	3 371	3 276	3 549	2 903	2 542	2 684	2 896	3 077	3 525
b. Slaughterings of bacon pigs used only in part for bacon	.	.	768	1 163	1 430	1 648	1 762	1 895	2 586	2 747	3 034	3 306	3 542	4 430
9. Slaughterings of other fat pigs (for pork, sausages, and the like)	6 312	6 151	6 093	5 959	6 786	6 828	7 410	8 519	7 601	6 730	6 940	7 439	7 449	7 676
10. Slaughterings of sows and boars	372	367	331	298	333	355	357	367	395	317	318	386	325	362
a. Slaughterings of sows[a]	363	359	323	289	324	346	348	357	386	309	309	377	316	353
b. Slaughterings of boars[b]	9	8	8	9	9	9	9	10	9	8	9	9	9	9
III. Slaughter and rearing rates:														
11. Sow slaughterings in % of sow stock (10.a : 2.) . 100	45.3	50.9	44.6	37.3	37.8	39.5	38.5	37.8	47.0	37.5	34.8	41.2	33.2	35.9
12. Average total slaughterings per sow (7. : 2.)	13.73	15.36	14.20	13.86	14.10	13.93	14.18	15.16	16.41	14.97	14.63	15.33	15.10	16.25

[a] Slaughterings of sows and boars, less 20 % of stock of boars for service. [b] 20 % of stock of boars for service.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

the United Kingdom could compete particularly with dairying and, at regional level, could perhaps do so with beef-cattle raising and arable farming (particularly wheat and barley as "cash crops"). The production of eggs and poultry in Great Britain has meanwhile been industrialized to such an extent that it appears that these two branches of production can have a tangible effect on pig-keeping only as regards fattening on a large scale, but hardly ever as regards breeding. If one takes account of the long-term differences which certainly exist between the productivity gains of the above products once more by means of a linear time trend, the equation for determining the sow stock can be constructed as follows:

$$(102)\quad \log SW = h_0 + h_1 \log \left(\frac{P(p)}{P(m)} \cdot 10\right)_{-m} + h_2 \log \left(\frac{P(bf)}{P(p)} \cdot 10\right)_{-m} + h_3 \log \left(\frac{P(p)}{P(e)} \cdot 10\right)_{-m} + h_4 \log \left(\frac{P(p)}{P(w)vel\ P(b)} \cdot 10\right)_{-m} + h_5\, t + u_8$$

where:

SW : stock of sows in June ('000)

P(e) : average producer price of the Egg Marketing Board for top-quality hens' eggs (£/100 kg; including the guarantee payments by the Government to the Egg Marketing Board).

We expect an estimate of between (-1) and (-2) only for lag m in equation (102), since, in the case of sows the age at which they are first serviced is always considerably lower, and the period of pregnancy and the time until weaning considerably shorter than in the case of cattle.

In order to estimate directly the number of slaughter pigs in a given stock of sows we need information on the average number of slaughter pigs available per sow per year. (This figure is not to be confused with the average number of piglets reared per sow per year, which must always be marginally greater than the number of slaughter pigs produced per sow per year in the normal event of a pig stock expanding on a long-term basis). Theoretically, an estimate of the number of slaughter pigs produced per sow per year may be obtained by dividing the number of pork and bacon pigs slaughtered plus (minus) the exports (imports)

of live pigs during one year by the stock of sows in June of the same year. As export of live pigs is of only marginal importance in the United Kingdom, it can be disregarded. As estimated in the above manner, the average numver of slaughter prigs produced per cow increased in the reference period from 14.3 (1958/61) to 15.3 in 1968/71 (see Table 20). We shall asume a value of 16 for forecasting purposes. We now obtain the following for the total available supply of slaughter pigs (TSSP):

(103) $TSSP = 16.0 \cdot SW.$

The demand forcasts already made for pork and bacon alon can assist us somewhat in estimating the utilization of the total available supply of slaughter pigs. In general, the domestic demand for fresh pigmeat for direct consumption in private households and for the processing industry (mainly sausage manufacturers) is almost entirely covered by domestic production. In 1969/71 the degree of self-sufficiency in pigmeat as a whole was 88.4 % while some 99 % of fresh pigmeat was accounted for by domestic production. The much lower degree of self-sufficiency in pigmeat as a whole is due to the large volume of imports of all kinds of preserved pigmeat (1969/71: equivalent to 80 000 metric tons fresh meat equivalent). Under these circumstances, it seems justifiable to make an assumption as to the future degree of self-sufficiency for total pork on the basis of economic considerations whereby the TSSP quantities and the forecast of the domestic consumption of pork (expressed in terms of slaughter weight) should serve as guidelines (the average slaughterweight of both bacon and pork pigs can be assumed to be 0.065 metric tons). The use of the domestic supply of slaughter pigs for the production of pork could then be calculated as follows:

(104) $TSPP = \alpha \left(\frac{CP}{0.065}\right) \qquad 0 < \alpha < 1$

where:

TSPP : slaughter pigs used for the production of pork ('000)

CP : forecast of domestic consumption of pork (1 000 t slaughter weight)

α : assumed degree of self-sufficiency in pork.

Theoretically speaking, it would naturally be desirable if α could be explained directly by means of the model. Even if that were possible for past developments, hardly anything would be gained as regards the forecast. In determining α the strong protective measures inter alia which the UK Government applied until February 1973 to assist the bacon industry would naturally play an important role. They took the form mainly of quotas introduced in respect of bacon imports under the "Bacon Market Sharing Understanding" and of extensive subsidies received by the bacon industry from the Government. Both measures had to be suspended after the accession of the United Kingdom to the EEC, since they do not comply with EEC regulations. Any equations laboriously constructed in order to determine α in the reference period would, therefore, hardly provide any meaningful estimates of α under EEC conditions. Thus we have no choice but to fix a priori values for α and to present the slaughter pigs used for bacon production as the residue from the total utilization of slaughter pigs:

(105) TSBP = TSSP - (TSPP + EXLP)

(106) EXLP = exogenous

where:

TSBP : slaughter pigs used for bacon production ('000)

EXLP : exports of live pigs ('000).

For the gross domestic production of pork and abacon as a whole and for the net domestic production of pork and bacon respectively we now obtain the following:

(107) BEZP = (0.065) · TSSP

(108) NEP = α (CP) - (0.065) EXLP

(109) NEB = BEZP - NEP

where:

BEZP : gross domestic production of pork and bacon as a whole expressed in terms of the slaughter weight ('000 t)

NEP : Net domestic production of pork expressed in terms of the slaughter weight ('000 t)

NEB : net domestic production of bacon expressed in terms of the slaughter weight ('000 t).

g. Poultry

The attempt to construct an equation determining the number of laying hens failed for two reasons:

1. Only annual figures are available for evaluating the stock of laying hens. The very short production period in the egg-laying sector would require, however, the use of quarterly figures at least and monthly figures, if possible.

2. Of the egg prices which are important for the egg-laying sector we possess only those which the Egg Marketing Board, which was only recently abolished, paid on average (after taking into account the guarantee payments received from the Government) to its members. The number of eggs sold through the Egg Marketing Board as a proportion of the total number of eggs marketed tended, however, to fall sharply during the reference period because the large, capital-intensive egg producers in particular preferred to deliver directly to large users at prices freely negotiated. We have no information on these "free" egg prices. We would, however, need to have details of these prices since it is the large enterprise which reacts strongly to price changes and thus probably exerts a decisive influence on the laying hen cycle.

A further difficulty is that productivity has risen sharply in both egg and poultry production sectors. Consequently, prices for the ultimate buyer are in themselves of little significance. We do not, however, possess suitable indicators of the trend in average productivity in egg and poultry production. Under these circumstances, the only remaining possibility is to forecast egg and poultrymeat production on the basis of the demand forecasts for the products in question.

3. Statistical examination of the equations of behaviour incorporated in the models for determining supply

a. Cereals

The statistical examination of the equations for determining the areas under wheat and barley by means of the method of ordinary least squares produced the following results:

Period for which estimate made: 1955-70

$$(110)\quad \log A^{w} = \underset{}{+\ 2.4829} + \underset{(1.4)}{0.43364}\ \log\left[\tfrac{1}{2}\sum_{j=1}^{2}\left(\frac{P(w)}{P(b)}\cdot 10\right)_{-j}\right] - \underset{(1.4)}{0.00063}\ Q_1\left(\frac{R}{S}\right) + \underset{(2.5)}{0.0474}\ t$$

$R^2 = 0.471$ D.W. = 2.87 $\dfrac{\hat{\sigma}}{\log A^{w}} = 1.2\ \%$

Period for which estimate made: 1955-70

$$(111)\quad \log A^{b} = \underset{}{+\ 3.6463} - \underset{(2.3)}{0.68450}\ \log\left(\frac{P(w)}{P(b)}\cdot 10\right)_{-1} + \underset{(14.8)}{0.03112}\ t$$

$R^2 = 0.948$ D.W. = 0.62 $\dfrac{\hat{\sigma}}{\log A^{b}} = 1.2\ \%$

The signs of the regression coefficients in equation (110) correspond to theoretical expectations: If, for instance, the price ratio (wheat : barley) changes by 1 % in favour of wheat, this would ceteris paribus result in an

extension of the area under wheat by about 0.4 %. A rise in the weather variable $Q_1(\frac{R}{S})$ indicates increased soil moisture when winter wheat is sown. Above-average soil moisture can seriously impair the sowing of wheat with the result that only a negative sign can be meaningful for the regression coefficient of the weather variable in equation (110). As the t-test values (in brackets under the regression coefficients) show, the short-term (annual) changes in the area under wheat can be explained almost equally by the influence of price and weather. The differences between these short-term and long-term reactions of wheat producers are expressed in the regression coefficient of the time variable. The time variable should first take account of the fact that in the United Kingdom, owing to climatic and soil conditions, the cultivation of wheat is subject to much greater limitations than the cultivation of barley. From this point of view, the regression coefficient of the time variable in the equation for determining the wheat acreage ought either to be negative, or - if the sign is positive - be substantially lower than the corresponding coefficient in the equation for determining the area under barley. As equations (110) and (111) show, the latter holds: The regression coefficients of the time variables have indeed a positive sign in both equations, but at the same time the coefficient in the equation for the area under barley comes to almost seven times greater than the coefficient in the equation for the area under wheat.

At 0.7 the absolute value of the short-term elasticity of the area under barley compared with the price ratio (wheat : barley) is much higher than the corresponding elasticity of the area under wheat (0.4). It mus not to be deduced from this that the parameter estimates in equations (110) and (111) are inconsistent. Rather, the relationship between these two elasticity coefficients ought first to bring to light the fact that even in the short term farmers in the United Kingdom have much more scope for changing the area sown with barley than for varying the area under wheat. The influence of the weather dummy in the equation for barley was insignificant. This

could be due to the fact that a weather-induced limitation of the area sown with winter wheat will be of only minor importance compared with the area under spring barley. (It is to be remembered here that in recent years the area under barley has amounted to two and a half times that under wheat).

The coefficient of determination which is twice as great in equation (111) as in equation (110), is to be attributed predominantly to the level correlation which is very marked in equation (111) but virtually non-existent in equation (110). Relying exclusively on the explanation of the short-term influence of price and weather, equation (110) comes out much better than equation (111), which is also evident from the D.W. statistic in particular. While, for instance, the expansion of the barley acreage in the years after 1966 almost totally ceased, only a small fall in the growth rate of the area under barley appears in the values estimated by equation (111). Under these circumstances, one should be rather cautious in the use of equation (111) for forecasting purposes.

b. Potatoes

We obtained the following parameter estimates for the equation for determining the area under maincrop ware potatoes:

$$(112)\quad \log A^{mp} = \underset{}{+\ 2.4820} + \underset{(1.3)}{0.07996}\ \log (P(mp))_{-1} - \underset{(1.6)}{0.00123}\ Q_2 \left(\frac{R}{S}\right) - \underset{(6.6)}{0.00723}\ 6$$

$$R^2 = 0.830 \qquad \text{D.W.} = 2.25 \qquad \frac{\hat{\sigma}}{\log A^{mp}} = 0.8\ \%$$

The dominant element in equation (112) is the negative time trend which corresponds to the markedly downward trend in the "target acreage" (cf. III, 2 c). At + 0.08 the elasticity of the short-term changes in the area actually cultivated in relation to the price of ware potatoes, which in the main reflects the extent of the fluctuations above or below the "target

acreage" in relation to the preceding variations in the price of ware potatoes, is very small. This appears, however, quite understandable if one considers that, in the event of a farmer exceeding the acreage quota allocated to him, the agreed fines payable to the Potato Marketing Board increase in line with the size of the excess area. Of the two weather variables "soil moisture" and "temperature" only the first appeared as an important factor influencing the planting of maincrop potatoes. Excessively wet soil can seriously impair the swelling of potatoes, as is shown in the negative sign of the regression coefficient of the variable Q_2 $(\frac{R}{S})$. The temperature probably plays an important part only in the cultivation of early potatoes.

c. Cattle

In the statistical examination of the equation determining the dairy cow herd we had to confine ourselves to the period 1961-71 because until 1960 factors other than those covered by equation (68) also clearly influenced to a considerable degree dairy cow numbers (in this connection, the eradiction of tuberculosis in the dairy herd in the late fifties, for instance, is a factor to be borne in mind). For reasons of multicollinearity it was not possible to differentiate the various influences of the price ratios introduced into equation (68). Instead of a simultaneous estimate in one equation several alternatives were tested, three of which gave a rather good explanation of the dairy cow herd:

$$(113)\quad \log DC = +4.4396 - \underset{(3.2)}{0.24421} \log\left[\tfrac{1}{2}\sum_{j=3}^{4}\left(\frac{P(bf)}{P(m)}\cdot 10\right)_{-j}\right] - \underset{(4.1)}{0.25236} \log\left[\tfrac{1}{2}\sum_{j=3}^{4}\left(\frac{P(s)}{P(m)}\cdot 10\right)_{-j}\right]$$

$R^2 = 0.738$ D.W. = 2.07 $\frac{\hat{\sigma}}{\log DC} = 0.1\ \%$.

$$(114)\quad \log DC = +4.3329 - \underset{(3.1)}{0.22582} \log \left[\tfrac{1}{2} \sum_{j=3}^{4} \left(\frac{P(bf)}{P(m)} \cdot 10 \right)_{-j} \right] - \underset{(4.3)}{0.21038} \log \left[\tfrac{1}{2} \sum_{j=3}^{4} \left(\frac{P(p)}{P(m)} \cdot 10 \right)_{-j} \right]$$

$R^2 = 0.759$ D.W. = 1.85 $\frac{\hat{\sigma}}{\log DC} = 0.1\ \%$.

$$(115)\quad \log DC = +3.8746 - \underset{(3.7)}{0.25471} \log \left[\tfrac{1}{2} \sum_{j=3}^{4} \left(\frac{P(bf)}{P(m)} \cdot 10 \right)_{-j} \right] + \underset{(4.7)}{0.13723} \log \left[\tfrac{1}{2} \sum_{j=3}^{4} \left(\frac{P(m)}{P(w)} \cdot 10 \right)_{-j} \right]$$

$R^2 = 0.789$ D.W. = 2.30 $\frac{\hat{\sigma}}{\log DC} = 0.1\ \%$.

The conclusion to be drawn from equations (113) - (115) is, in our opinion, that not only the price ratio (beef : milk) but also the price ratios (lamb : milk), (pigmeat : milk) and (milk : wheat) are important for the stock decisions of milk producers. We obtain three different, albeit close (-0.23 to -0.25) estimates for the elasticity of dairy cow numbers compared with the price ratio (beef : milk). The estimated values for the elasticities of the dairy cow population in relation to the price ratios (lamb : milk) and (pigmeat : milk) are also of a surprisingly similar magnitude (-0.25 and -0.21). Milk producers seem to react much more weakly only to changes in the price ratio (milk : wheat) (elasticity: +0.14).

The price expectations of milk producers, which at present influence the size of the dairy cow stock, are best shown by taking the average of prices lagged by three and four periods. In this way we obtain an estimated value for lag j in equation (68) which falls entirely within the a priori expected range (-2) to (-4).

A time variable which was intended to take account of the productivity trends in the production of wheat and of slaughter pigs, on the one hand, and in pasture farming, on the other, was also added to the price ratios in equation (68) in order to assess the stock of dairy cows. In the estimate, however, the time variable in both (114) and (115) had to be eliminated owing to its mediocre explanatory power. The reason for this could be that given the relatively short estimation period long-term productivity differences show up only weakly. Judged on the basis of statistical tests only equations (113) - (115) seem to be of almost equal value. It would also hardly be sensible to recommend on economic grounds only one of the equations for use in the forecasts. It would be better if one were to work with all three equations for the forecast. A point estimate detached from the individual equations and based on a combination of all the coefficients of elasticity derived from equations (113) - (115) would also be conceivable.

Estimation of the equation determining the beef cow population is largely free of problems:

Period for which estimate made: 1955-71

$$(116)\quad \log BC = +\,1.2952 + \underset{(4.4)}{0.25859}\log\left[\tfrac{1}{2}\sum_{j=4}^{5}\left(\frac{P(bf)}{P(m)}\cdot 10\right)_{-j}\right] + \underset{(10.0)}{1.3637}\log\left[\tfrac{1}{2}\sum_{j=4}^{5}\left(\frac{P(bf)}{P(s)}\cdot 10\right)_{-j}\right] + \underset{(3.6)}{0.06800}\,D^{bc}_{-4}$$

$R^2 = 0.985$ D.W. = 1.89 $\frac{\hat{\sigma}}{\log BC} = 0.3\ \%$.

The price ratios (beef : milk) and (beef : lamb) and also the dummy variable for the "beef and hill cow subsidy" give a good explanation of the cyclical movements in the stock of beef cows also. Equation (116) shows clearly that the price ratio (beef : lamb) is far and away the most important factor influencing beef cow numbers - a result entirely in

line with our theoretical expectations. The elasticity of the stock of beef cows in relation to the price ratio (beef : lamb) is astonishingly high at +1.4. The price ratio (beef : milk), however, exerts a much smaller influence on beef cow numbers (elasticity coefficient: +0.26). The positive influence of the "beef and hill cow subsidy" on the stock of beef cows is well established by equation (116). In short, it can be said that the continuous change in the price ratio (beef : lamb) which until recently worked in favour of beef, and the subsidies to beef and hill cows have provided the decisive stimuli for the extraordinarily rapid growth of the UK beef cow population. We obtain an estimate of (-4) or (-5) for lag k in equation (69). This implies a very slow adaptation of the stock of beef cows to changes in the guaranteed or, where appropriate, total producer prices for beef and lamb, which is to be taken to indicate (as already supposed) only that market price movements for store cattle often move in line with those for fat cattle only after a considerable delay.

The number of new born claves slaughtered can be satisfactorily explained by the beef price and the calf subsidy:

Period for which estimate made: 1953-71

$$(117)\quad \log SLCV = +\,5.6892 \underset{(8.0)}{-\,2.3357} \log (P(bf)) \underset{(0.5)}{-\,0.07375}\, D^c$$

$$R^2 = 0.805 \qquad D.W. = 1.03 \qquad \frac{\hat{\sigma}}{\log SLCV} = 3.2\ \%.$$

According to equation (117), a 1% rise in the price of beef would ceteris paribus bring about a 2.3% reduction in the number of calves slaughtered. Against this, the calf subsidy, which is considered to be very important for calf utilization in the United Kingdom, seems to be of only secondary importance. Compared with the subsidy for beef and hill cows the calf subsidy's contribution to the increase in beef production would thus seem to have been rather insignificant.

d. Sheep

The equation for determining the stock of ewes produced the following estimate:

Period for which estimate made: 1955-71

$$(118)\quad \log EW = +\,2.711 + \underset{(13.9)}{0.87782} \log \left[\tfrac{1}{2} \sum_{j=4}^{5} \left(\frac{P(s)}{P(m)} \cdot 10 \right)_{-j} \right] - \underset{(1.9)}{0.15784} \log \left[\tfrac{1}{2} \sum_{j=4}^{5} \left(\frac{P(bf)}{P(s)} \cdot 10 \right)_{-j} \right]$$

$R^2 = 0.937$ D.W. = 1.42 $\frac{\hat{\sigma}}{\log EW} = 0.2\ \%$.

The major factor influencing ewe numbers, as equation (118) makes abundantly clear, is the price ratio (lamb : milk), an not, as might have first been supposed from the results obtained in equation (116), the price ratio (beef : lamb). To interpret this result correctly it must be borne in mind that in 1970, for instance, there were 10 544 000 ewes compared with 3 939 000 dairy cows but only 1 471 000 beef cows. In general, the rearing of ewes competes with dairying for the production factors "pasture land" and "labour force". Even when account is taken of the fact that owing to regional peculiarities the competition between beef cattle raising and the rearing of ewes is in general closer than that between dairying and the rearing of ewes, it may be concluded from the respective shares of dairy and beef cows in the total cow population that the influence of dairying on the stock of ewes is greater than that of beef-cattle raising. That is not contradicted by the fact that sheep raising as a whole exerts a dominant influence on only a part (25 %) of the total stock of cows, i.e. on the beef cow population. Thus it is also quite consistent if the price ratio (lamb : milk) plays an important, but not the most important role as regards dairy cow numbers (see equations (113) to (115)).

It was not possible to detect a significant influence on the part of the dummy variable "hill sheep subsidy" for which however, problems of multi-collinearity were in part responsible with the result that a certain impact of the "hill sheep subsidy" on the stock of ewes cannot be ruled out de facto. Lag 1 in equation (90) would, according to our estimates be -4 or -5 i.e. it would assume exactly the same value for the breeding of ewes as for the raising of beef cows and this fits in with the theoretical expectations. (The reasons for the slow adaptation to price changes are probably the same as those already established for beef cows).

e. Pigs

The stock of sows in the period 1961-71 can be well explained by the two price ratios (beef : pigmeat) and (pigmeat : milk) and by a linear time trend. Between 1955 and 1960, however, the correlation between these variables was only weak. The incorporation of other price ratios yielded no worthwhile improvement in the results for this period with the result that we had to confine ourselves entirely to the years 1961-71 without, however, being able to give any plausible reason for this limitation:

$$(119)\quad \log SW = +\,2.0006 \underset{(1.7)}{-\,0.81754} \log \left[\tfrac{1}{2} \sum_{j=2}^{3} \left(\frac{P(bf)}{P(p)} \cdot 10 \right)_{-j} \right] \underset{(4.2)}{+\,0.98602} \log \left[\tfrac{1}{2} \sum_{j=2}^{3} \left(\frac{P(p)}{P(m)} \cdot 10 \right)_{-j} \right] \underset{(4.3)}{+\,0.01830\ t}$$

$R^2 = 0.910 \qquad$ D.W. = 3.01 $\qquad \frac{\hat{\sigma}}{\log SW} = 0.4\ \%$.

Even the cyclical movements in the stock of sows are reflected almost accurately by equation (119); this is true for both the flex points and, more particularly the amplitude of fluctuation in the cycle. The stock of sows reacts, according to our estimates, rather more strongly (coefficient

of elasticity: +1.0) to changes in the price ratio (pigmeat : milk) than to changes in the price ratio (beef : pigmeat) (coefficient of elasticity: -0.8). It must also be noted that in the period 1961-71 the contribution of the price ratio (pigmeat : milk) to the explanation of the stock of sows is considerably greater than that of the price ratio (beef : pigmeat) (this can be seen indirectly from the t-test values). The regression coefficient of the time variable has a positive sign, well above zero. This would mean that in the long term the greater productivity gains in pig production than in cattle production had a positive influence on growth of the stock of sows. Such a result is indeed quite plausible in itself, but it must now be asked why in equation (114), in which the stock of dairy cows is explained inter alia by the price ratio (pigmeat : milk), the time variable plays no part despite the fact that the length of the estimation period is the same in both cases i.e. (114) and (119).

IV. Forecast of the supply of agricultural products

1. Remarks on the hypotheses relating to producer prices and feed grain prices in the 1977/78 farm year

In Table 21 we have endeavoured to apply the hypotheses on producer prices for 1977/78 as formulated for the enlarged Community in Table 4 to the UK prices and qualities effective until 1972, since only in this way does the use in our econometric models for forecasting purposes of the price hypotheses formulated an enlarged EEC appear meaningful. As our starting point we have had recourse to the guaranteed prices for 1972/3 and to the average producer prices (including guarantee payments) in the preceding years. The following major modifications have been made compared with Table 4:

- Whole milk: The UK pool price is related to the natural fat content, which was assumed to be 3.9 % in 1977/78. However, the EEC guide price for milk applies to milk with a fat content of 3.7 %. This was taken into account by introducing an approximate corrective factor (UK pool price 1977/78 = 1.0541 EEC guide price 1977/78).

- Beef: The UK guaranteed price for beef is valid only for fat cattle of certain minimum qualities, while the EEC guide price for beef also applies to lower qualities of beef such as cow beef. To balance these differences in quality at least to a certain extent, the EEC guide price for cattle was multiplied by the factor 1.05, which is, of course, a purely arbitrary value.

- Mutton and lamb: The UK guaranteed price for mutton and lamb likewise applies only to fat animals (hoggets/lambs) of certain minimum qualities. In Table 4 the 1977/78 mutton and lamb price was taken to be equal to 91 % of the 1977/78 guide price for cattle. In order to comply with UK quality standards the mutton and lamb price for 1977/78 was, therefore, estimated in Table 21 at 91 % of the adjusted beef price (see above).

Table 21 - Hypotheses on the producer prices of important agricultural products in the United Kingdom in the 1977/78 farm year (£/1000 kg)

Product	Average producer price (market price plus guarantee payments) Ø 1968/69-1970/71	Guaranteed price for 1972/73 farm year	Assumed average producer price in 1977/78 farm year	1977/78 producer price as % of 1972/73 guaranteed price	Average annual rate of change 1972/73 to 1977/78 %	1977/78 producer price as % of average producer price 1968/69 - 1970/71	Average annual rate of change Ø 1968/69-1970/71 to 1977/78 %
Common wheat	28.7	33.9	48.3	142.5	+ 7.3	168.3	+ 6.7
Barley	26.2	30.7	44.6	145.3	+ 7.8	170.2	+ 6.9
Oats	27.4	29.7	41.7	140.4	+ 7.0	152.2	+ 5.4
Sugar beet	6.7[a]	7.9	7.9	100.0	± 0	117.9	+ 2.1
Potatoes (main crop)	17.1[b]	16.3	18.8	115.3	+ 2.9	109.9	+ 1.2
Rape (as oil seed)	.	49.9[c]	92.9	186.2	+13.2	.	.
Whole milk	36.5[d]	41.7[d,e]	59.3	142.2	+ 7.3	162.5	+ 6.3
Beef - live weight	214.8	259.8	413.7	159.2	+ 9.7	192.6	+ 8.5
Mutton and lamb - live weight	195.8	252.7	376.5	149.0	+ 8.3	192.3	+ 8.5
Pigmeat - slaughter weight	278.5	309.8	378.0	122.0	+ 4.1	135.7	+ 3.9
Eggs (hen) (pence per dozen)	14.5	16.0	15.7	98.1	- 0.4	108.3	+ 1.0

[a] Guaranteed prices. [b] Average market price for maincrop ware potatoes. [c] Average price paid by the Wessex Agricultural Producers Ltd. to producers for winter rape from the 1972 crop. [d] Pool price from sales by the Milk Marketing Boards of liquid milk and milk for manufacturing; free at dairy with natural fat content. [e] 1971/72 farm year.

Source: Cf. Tables 4, 5, 6.

Table 22 - Hypotheses on feed grain prices in UK agriculture in the 1977/78 farm year (£/1000 kg)

Cereal	∅ 1968/69-1970/71	Remarks	1977/78	Remarks	1977/78 price as % of the price in the base period	Average annual growth rate ∅ 1968/69-1970/71 to 1977/78
Barley	(23.7)	Average market price obtained by producers for malting and feed barley under the Cereals Deficiency Payments Scheme (CDPS) - Price markdown for feed barley: 5 %				
	22.5		44.6	Basic intervention price	198.2	+ 8.9
Oats	(21.5)	Average market price obtained by producers for oats for milling and for feed purposes under the CDPS; Price markdown for feed oats: 2 %				
	21.1		41.7	Market price	197.6	+ 8.9
Maize	25.2[a,b]	Average import price (cif) for US-maize (almost exclusively feed qualities)	46.9	Threshold price (assumption: 97 % of target price)	186.1	+ 8.1
			44.6	Intervention price	177.0	+ 7.4
Wheat	(24.3) 23.8	Average market price obtained by producers for wheat for milling under the CDPS; price markdown for feed wheat: 2 %	44.6	Basic intervention price for barley[c]	187.4	+ 8.2
	22.6[a,b]	Average import price (cif) for denatured wheat	46.9	Threshold price (assumption: 97 % of target price for barley)	207.5	+ 9.6

[a] ∅ 1968/70. [b] Imports into the United Kingdom of maize and wheat as grain are duty-free. [c] In view of the denaturing premium the price of barley was regarded as relevant for feed wheat.

Source: Commonwealth Secretariat, Grain Bulleting, London; various issues; Department of Trade and Industry, Overseas Trade Statistics of the United Kingdom, London, H.M.S.O., various issues; Directorate-General for Agriculture, Directorate for Agricultural Economics and Structure, EEC Information, Agricultural markets - Prices (vegetable products), Brussels, No. 2 of 14.3.1972, p. 9 et seq.; Own calculations and estimates.

As can be easily seen from Table 21, producers of cereals and rape (as oil seed) but above all also producers of beef, milk, mutton and lamb would obtain appreciably higher average prices for their products if the United Kingdom were to adopt the EEC agricultural system. At the same time it must be remembered, however, that the continued application of production grants for cattle and sheep (e.g. beef cow subsidy, hill sheep subsidy) in their present form can hardly be reconciled with current EEC rules, and that it is still uncertain at the moment to what extent any other form of compensation is possible. Unlike the prices of the above products, those of root crops (sugar beet and potatoes) and those obtained by the intensive branches of the animal products industry (pigs, eggs and poultry) are expected to experience only relatively small increases or to remain mainly unchanged.

The price hypotheses for pigmeat and eggs in particular but also to some extent those for beef and milk are in themselves of little significance. Still more information is required on the possible future development of feed-grain prices as input prices, i.e. as a cost factor. Information is obtained by means of Table 22, in which the market or import prices for feed-grain (excluding guarantee payments for home-grown cereals, since the compound feedingstuffs industry in the United Kingdom only has to pay the market price) in recent years are compared with the 1977/78 feed-grain prices resulting from the producer price hypotheses for cereals in the enlarged EEC. From this it can be seen that between 1968/70 and 1977 input prices for feed grain are expected to rise on average by around 80 - 100 %. This would result for UK producers in an unfavourable development in the price ratio (pigmeat : feed grain) or (eggs : feed grain), as the case may be.

2. Forecast of the areas under cultivation and of livestock numbers in 1977

The areas under cultivation and the livestock numbers in 1977 were forecast first solely by means of the econometric model equations constructed in Part III. The result of this forecast are shown in Table 23; they will be critically examined below and, where necessary, revised.

Table 23 - Results of the estimate of the areas under cultivation and of livestock numbers in the United Kingdom in 1977[a] by means of the model equations and revised projections

Cultivated areas ('000 ha) or type of animal ('000 000)	ø 1969/71	Forecast for 1977 calculated by means of the model equations	No. of equation used; other remarks	Change ø 1969/71 to 1977 (%)	Average annual rate of change ø 1969/71 to 1977 (%)	Forecast for 1977 revised according to economic considerations (see text)	Change ø 1969/71 to 1977 (%)	Average annual rate of change ø 1969/71 to 1977 (%)
Wheat	980	1 055	110[b]	+ 7.7	+ 1.1	1 400	+ 42.9	+ 5.2
Barley	2 315	4 507	111	+ 94.7	+ 10.0	2 400	+ 3.7	+ 0.5
Potatoes (maincrop)	228	209	112[b]	- 8.3	- 1.2	160	- 29.8	- 4.9
Dairy cows		3.422	113	- 12.8	- 1.9			
	3.926	3.770	114	- 4.0	- 0.6	4.300	+ 9.5	+ 1.3
		3.585	115	- 8.7	- 1.3			
		3.356	Combined estimate[c]	- 14.5	- 2.2			
Beef cows	1.464	1.483	116[d]	+ 1.3	+ 0.2	2.400	+ 63.9	+ 7.3
Ewes	10.642	13.470	118	+ 26.6	+ 3.4	-	-	-
Sows	0.951	0.800	119	- 15.9	- 2.4	-	-	-

[a] It must here be borne in mind that owing to the lags in the respective equations, especially those for determining the number of cows and ewes, the results shown do not strictly speaking apply to the 1977/78 farm year but really to later years (e.g., for 1979/80 in the case of a two-year lag). This at least would be the case if British farmers begin to make adjustments at just this point of time to the prices valid for the 1977/78 farm year, i.e. the year envisaged as the final year in the adjustment period. It must be said against that, however, that British farmers may anticipate the 1977/78 prices within a certain range of uncertainty and that possibly, therefore, they will take these prices into account before 1977/78 in their production planning. [b] It was assumed with the weather dummy that the 1977/78 climatic conditions would correspond to the average conditions recorded in the reference period. [c] Estimate by combination of all coefficients of elasticity derived from equations (113) - (115). [d] With this equation the dummy for the "beef and hill cow subsidy" obtains the value -0.3, with a certain reduction but not complete suspension (-1.0) of this subsidy being assumed (see text for details).

Source: Own calculations and estimates.

a. Cereals

Assuming "normal" sowing conditions for winter wheat in the autumn of 1976 (1977 in actual fact), equation (110) shows that the area under wheat in 1977 would be about the same size as in 1969/71. The main reason for this is that, according to our hypotheses on producer prices, the price ratio (wheat : barley) would change only marginally by 1977, compared with 1969/71. Of necessity the "level effect", i.e. the assumed increase of about 70 % in wheat and barley prices between 1968/70 and 1977, is disregarded meanwhile in this forecast. In our opinion, however, this effect should stimulate the cultivation of wheat and barley. This ought also to be true when it is taken into account that the abolition of the fertilizer subsidies, which is necessary under EEC regulations, implies ceteris paribus a substantial increase in the input prices for a number of the most important trade fertilizers. According to a study[1] published by the Agricultural Economic Development Committee of the National Economic Development Office the net margins per acre in grain growing could almost double in spite of the suspension of the fertilizer subsidies following the upward adjustment of UK grain prices to the EEC level. This compels us to up considerably the estimate for the area under wheat obtained from equation (110) (1977: 1 400 000 ha; increase over 1969/71: 43 %).

If forecast by means of equation (111), the area under barley is seen to double almost by 1977 (see Table 23). This is due almost exclusively to the effects of the time trend, and that amounts in practice to an extrapolation of the trend in the barley acreage in 1955-70. This in turn means that the barley boom which took place between the end of the fifties and the middle of the sixties is carried forward to the forecasting period with only minor downward adjustments. Such a result, however, seems hardly meaningful, although in themselves the economic incentives to expand further barley cultivation under EEC conditions ought to be much greater than in the past.

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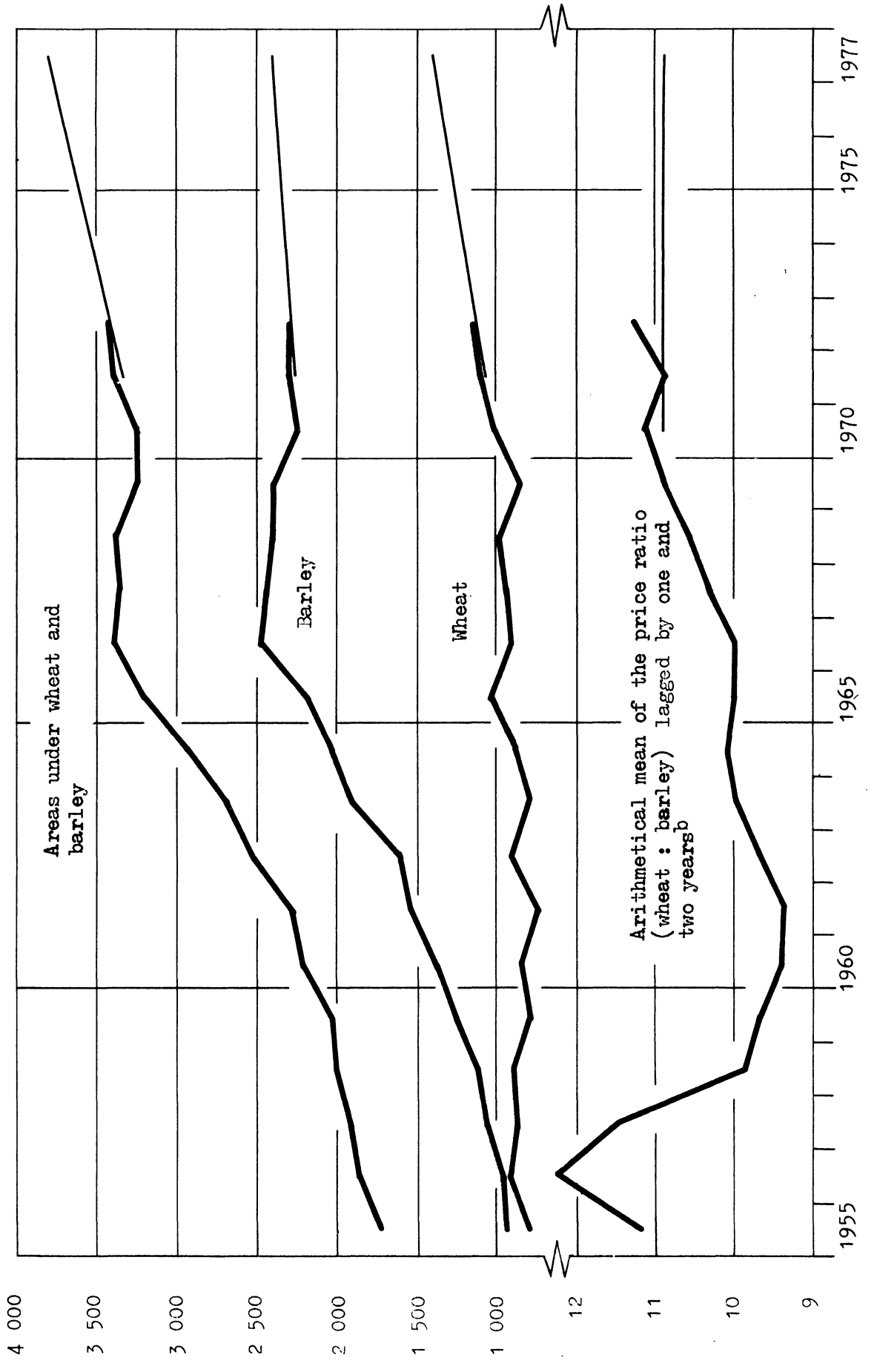
[1] Mentioned in The Financial Times, London, of 23.6.1972.

Diagram 10 - Areas under wheat and barley and the price ratio between both cereals in the United Kingdom (1955-72, 1977[a])



[a] Corrected forecast values (cf. text).

[b] Multiplied by 10.

It must be noted, above all, that, in view of the soil fertility, weather conditions, considerations of crop rotation and crops competing with barley, a further large increase in the barley acreage in many regions would be possible only by taking into account a considerable decline in the "net margins per acre". Besides, in the traditional arable regions - and this ought after all to be of greatest significance, wheat would probably be preferred as a "cash crop" to barley (cf. also the forecast for wheat). Under these circumstances, it seems appropriate to reduce considerably the estimate resulting from equation (111) for the barley area in 1977 (2 400 000 ha; increase over 1969/71: 4 %).

In the case of oats, we reckon on an only slightly changed acreage compared with the latest position (1972: 314 000 ha) (assumption for 1977: 300 000 ha); the reasons for this were given in detail on page 101 et seq. In the case of rye and meslin there should likewise be only marginal deviations from the area cultivated hitherto, since the market for these two cereals in the United Kingdom is, by tradition, very limited.

b. Sugar beet

In forecasting the area under sugar beet we assume that in 1977 a white sugar production quota of 900 000 tons will be allocated to the United Kingdom (see page 102 for details)[1]. The beet crop per hectare amounted in 1967-71 to 36.2 tons. Only a small increase (up to 37.5 tons) is considered probable by 1977, since the input of fertilizers, insecticides and herbicides per hectare of beet area has already reached a very high

[1] For the time being we are not taking into consideration the matter of whether the United Kingdom Government will succeed in obtaining a substantial share of Australia's sugar quota (340 000 t) which is to be abolished entirely, whent the Commonwealth Sugar Agreement expires in February 1975 for its domestic beet industry. The British Sugar Corporation has already shown a lively interest in a subsequent partial transfer of this quota to the United Kingdom (see The Financial Times, London, 17 November 1972).

level. This, along with the rather high degree of mechanization of beet cultivation (above all, the use of monogerm varieties of seed) resulted in only a small increase in the beet crop after 1960. The average yield of sugar per beet (in % of the beet weight) rose, however, somewhat more extensively, whereby, in addition to improved methods of extraction, further increases in the sugar content of beet owing to genetic improvements could well have played a part (in recent years the use of monogerm varieties of seed has, in many cases, been accompanied by some loss in sugar content; efforts are being made to overcoming the negative correlation between the use of monogerm seed and sugar content) (assumption for 1977 sugar yield: 14.5 % of beet weight; 1967/71: 13.6 % of beet weight). Given the two assumptions on beet crop and sugar yield a white sugar yield per hectare of 5.44 tons in 1977 (1967/71: 4.91 tons; increase: 10.8 %) and thus an area of about 165 000 ha under beet for sugar production in 1977 are obtained. If an area of about 1 000 ha for seed production is taken into account, the entire area under sugar beet in 1977 would be equal to 166 000 ha (1969/71: 187 000 ha; contraction: 11.8 %)[1].

c. Potatoes

Assuming "normal" planting conditions in April 1977 (in actual fact 1978), equation (112) shows a slight reduction in the maincrop ware potato acreage from 228 000 ha (1969/71) to 209 000 ha in 1977 whereby the small positive effect of a slight rise in the average producer price for ware potatoes by 1977 was more than compensated for by the negative time trend (adjustment of the target acreage to the still slowly growing home demand for ware potatoes, in view of the rapidly rising yields per unit area). It can be deduced from Table 21 that in future potato cultivation will lose much of its attraction, compared, in particular, with grain and rape cultivation, but also with pasture farming. This is especially true if one assumes that even in 1977 there will still be no EEC regulations governing the market in po-

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[1] The "British Sugar Corporation" estimated that the area of sugar beet corresponding to a white sugar quota of 900 000 metric tons would rise by 3.6 % to about 172 000 ha. The difference may be attributed mainly to the fact that their estimate was based more on current production possibilities and present sugar yield (Financial Times, London 17 November 1972).

tatoes. Under these circumstances the forecast that the maincrop ware potato acreage would fall by only 8 % by 1977 could hardly be upheld (assumption for 1977: 160 000 ha; contraction compared with 1969/71: 30 %).

The competitive position of UK producers of early potatoes vis-à-vis producers in the other EEC countries ought to be influenced less by prices than by delivery dates. As regards delivery dates UK producers are at a great disadvantage, especially when compared with producers in France and Italy. The seasonally adjusted protective duties in force hitherto for imports of early potatoes from both the above countries have to be completely abolished by the end of the transitional period. For these reasons we consider a large reduction in the area under early potatoes also to be highly probably (assumption for 1977: 20 000 ha; 1969/71: 30 000 ha).

d. Rape

In the past the commercial cultivation of rape for oil seed has played a quite insignificant role in UK agriculture (area under rape : 5 000 ha and less). The reason for this was that UK producers received no guarantee payments or other aids and were thus obliged to compete directly with supplies at world market prices. The majority of producers in the south of England have in recent years formed the Wessex Agricultural Producers Ltd., a non-profit-making farmers' organization the basis aim of which is to strengthen as much as possible the market position of the domestic producer by common marketing policies. This organization expects an "explosive" increase in rape cultivation in the future[1]. In this connection, the following points should be considered:

- After complete adjustment to the EEC price the producer price for oil-seed rape should increase by about 80-90 % compared with its present level.
- Until now farming in the United Kingdom has lacked a suitable "break crop" for grain growing. Efforts made towards the end of the sixties to create a suitable substitute by subsidising the cultivation of field beans should

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[1] See The Financial Times, London, 21 January 1972.

now be seen to have failed. In future, however, oil-seed rape could prove to be a very attractive "break crop" because, under EEC conditions, its production would be very remunerative, since inter alia the cultivation and harvesting of rape can be highly mechanized.(This is particularly true for the large arable farms in eastern and south-eastern areas of England, which combine a large capital input with a low input of labour per hectare). The extraordinarily favourable prospects for the commercial growing of oil-seed rape under EEC conditions led in the 1972/73 farm year - as a sort of anticipation of future price trands - to a 31 % increase in the area under rape compared with the previous year. Contracts covering some 12 000 ha for winter and spring rape for the 1973/74 farm year were reported by the Wessex Agricultural Producers Ltd. alone, and that is more than three times the area cultivated by this society in previous years[1].

In line with these tendencies, which already apparent, we assume that in 1977 the area under rape for oil seed will total 50 000 ha.

e. Cattle

Equations (113) - (115) for predicting dairy cow numbers show a decrease of between 4 and 13 % for 1977. If the coefficients of elasticity derived from equations (113) - (115) are combined to carry out a "point estimate", this results in even a decline of 15 % in the dairy cow stock compared with 1969/71 (see Table 23). In view of the expected rise of 60 % in the milk producer price between 1968/70 and 1977 the forecast of a significant reduction in dairy cow numbers seems surprising at first. It must, however, be borne in mind that the above estimates are based on price ratios:

- The price ratio (beef : milk) would, according to our hypotheses, clearly develop to the detriment of milk in the forecasting period.

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[1] See The Financial Times, London, 8 August 1972 and 24 November 1972.

- The price ratio (lamb : milk), which from the end of the fifties to the and of the sixties developed in favour of milk, would increase considerably by 1977, thereby favouring rearing to the detriment of dairying.
- The milk price rose more steeply than the wheat price in the reference period; according to our price hypotheses the opposite trend would set in during the forecasting period, and this should likewise ceteris paribus have a negative influence on dairying.
- Only the price ratio (pigmeat : milk) could in future develop much more strongly in favour of milk than in the past.

If the forecast is based only on the effects of the price ratios included in equations (113) - (115) is is easy to understand that the negative effect on dairy cow numbers resulting from the price ratios (beef : milk), (lamb : milk) and (milk : wheat) outweighs by far the positive effect of the price ratio (pigmeat : milk) so that on balance the stock of dairy cows will contract.

Some important factors which, after adoption by the United Kingdom of the Common Agricultural Policy (CAP), will be of importance could not be taken into account when preparing the above forecasts:

- The price ratio (milk : feed grain ["input price"; cf. Table 27), which by and large remained unchanged in the reference period, would by 1977 develop very much to the detriment of milk producers. This could be offset to a certain extent by replacing feed grains with other protein-bearing feeding stuffs which, under EEC regulations, can be imported free of levies (oil cake, cassava, tapioca, citrus fruit pulp inter alia). In this connection, mention must be made of the Netherlands, where the feedingstuffs industry drastically reduced, under EEC conditions, the share of feed grain in fodder concentrates within a few years. It must also be pointed out that in dairying the use of oil cake is anyhow more important than feed grain. As the consumption of oil cake per cow in the United Kingdom is already at

a very high level[1], it is to be assumed that UK milk producers will be inclined to avoid the high feed grain prices by producing more "summer milk" (larger proportion of grass in total feed requirements) and less "winter milk" (less grass, more feed grain). This possible alternative falls down at the point where the milk supply in the winter months could suffer[2] (not only from the point of view of supply policy but also for economic reasons, since the prices of liquid milk are very high). That would mean that the production of manufacturing milk would much more heavily concentrated on the grazing months April to September and this would create a number of problems as regards the utilization of capacity in the dairy industry.

- The price for cull cows would rise very much. In the past slaughter guarantee payments could not be received in respect of the EEC guide price, however, also applies to cow beef.

- The assumed sharp rise in the price of beef would also mean considerably higher prices for surplus calves which are an important by-product on dairy farms.

- During the reference period dairying contracted slightly in the eastern areas of the United Kingdom and was practised more in western areas particularly Wales. Owing to the substantially improved position under EEC conditions of wheat, barley and rape cultivation, which is concentrated in eastern areas, this trend is expected to become more marked in future. Sheep and beef-cattle raising in particular compete with dairying in western areas. However, the price ratio (lamb/beef : milk) would, according to our hypotheses, clearly favour sheep and beef-cattle raising until 1977, and this might impede a future expansion in dairy farming even in

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[1] Cf. R. Schmidt, Analyse und Prognose der Importe von Milcherzeugnissen ausgewählter Länder mit Hilfe ökonometrischer Modelle (Analysis and forecast of imports of milk products of selected countries with the help of econometric models), Kieler Studien Nr. 117, Tübingen 1971, p. 252.

[2] It should be remembered here that liquid milk production in the United Kingdom accounts for more than half of the total annual supply of milk.

western areas too. It should, however, be remembered that it is precisely in western and south-western areas that there are a large number of small holdings for whose profitability dairying is of crucial importance (higher value of production per unit area)[1].

The contraction in the stock of dairy cows forecast by means of the model equations appears too pessimistic in view of the expected substantial price increases for slaughter cows and surplus calves - on the assumption that there will be a considerable reduction in the input of feed grain in dairying, as a result of more intensive use of pasture land and/or the use of more protein-bearing feedingstuffs (other than oil cakes) which are allowed to enter free of levies. The "regional effect" mentioned above (stronger competition particularly sheep-raising in western areas) and limitations resulting from a scarce labour force on farms could, however, impede any spectacular long-term expansion in the dairy herd. This is why we assume an increase of about 10 % in the stock of dairy cows for 1977 as against 1969/71 (4 300 000).

The major factor determining beef cow numbers is the price ratio (beef : lamb), which in the reference period strongly developed in favour of beef. For the forecasting period, however, we have assumed a constant price ratio so that, other things being equal, this ought to result in a constant beef-cow stock. The trend in the price ratio (beef : milk) would, according to our hypotheses, continue to favour beef until 1977. Under EEC conditions, the continued stimulation of the growth of the beef cow population in the reference period afforded by the "beef and hill cow subsidy" ought presumably to be terminated in its present form. On the basis of recent trends, however. it may be supposed that another premium for beef cattle will be introduced in its place in the enlarged Community, and this will at least compensate somewhat for the "beef and hill cow subsidy". The positive effect of the steep rise in the beef price in the United Kingdom compared with the

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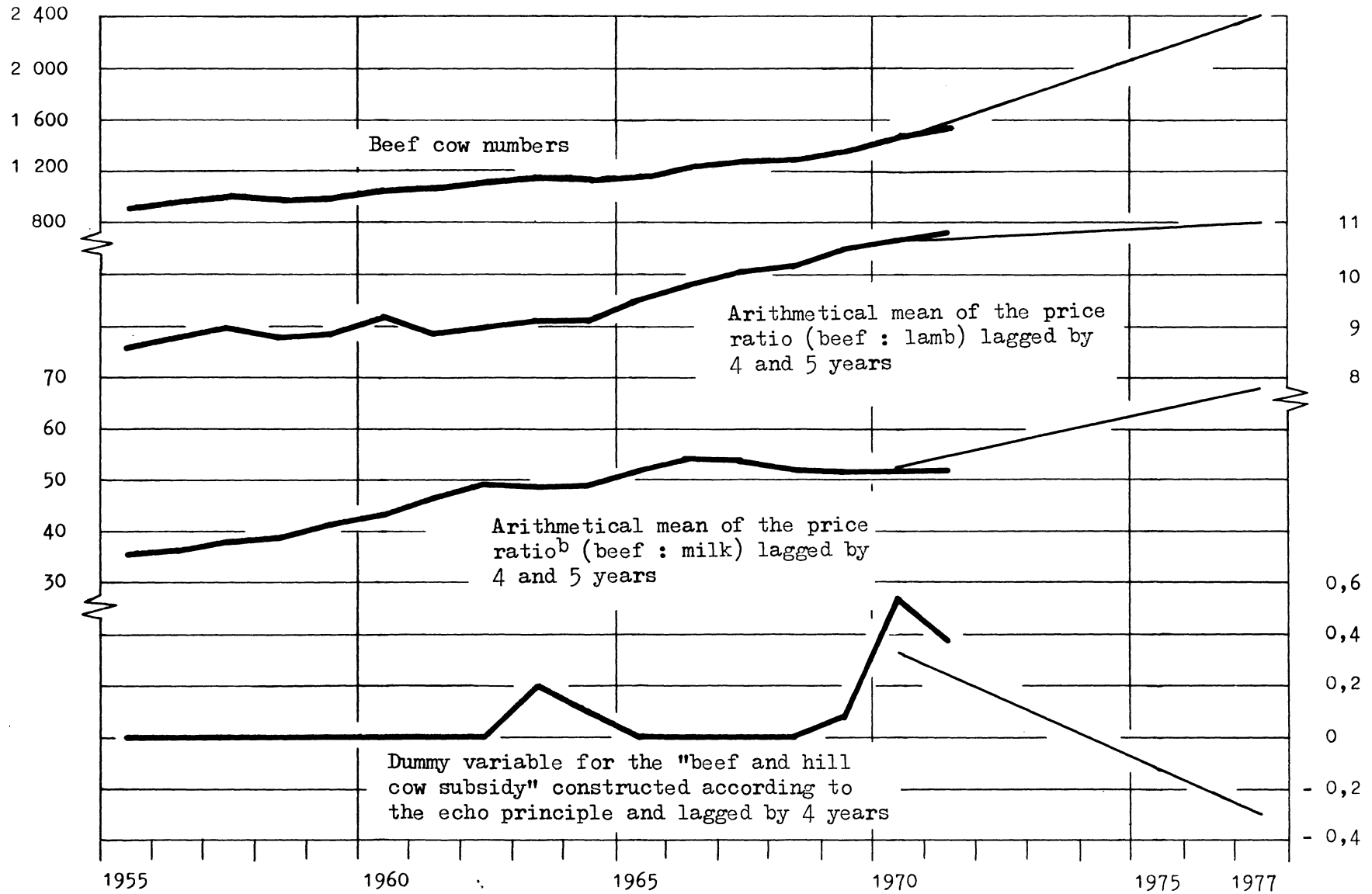
[1] Cf. J. Cherrington, "Farmers now less despondent - the South West" in The Financial Times, London, 7 November 1972.

milk price is, when forecasting the stock of beef cows by means of equation (116), almost balanced by the negative effect of an assumed partial reduction in beef cattle premiums. In view of the constant price ratio (beef : lamb) this has resulted in the forecast of an essentially unchanged stock of beef cows until 1977.

The forcast drawn up with equation (116) could not take into account the fact that the selling prices of cull cows, which account for a considerable proportion of the total earnings of beef-cattle farmers, will probably rise at a greater rate than that suggested in Table 21 in respect of the price of beef, since, under the UK agricultural system, slaughter cows were not covered by the deficiency payments arrangements. The price ratio (beef : feed grain [input price]), which in the reference period developed very much in favour of beef, would in future, according to our hypotheses, develop to the slight detriment of beef cattle producers. That could be countered, to a yet greater extent than in the case of dairying by reverting more to fattening on pasture. More intensive use of grass land ought to replace, to a considerable degree, the production of "barley baby beef" and other systems of intensive grain-based indoor feeding of young cattle. The profitability of such systems has, given the need to buy in store cattle, proved to be rather low in recent years; under EEC conditions, these systems, apart from some minor exceptions, are not expected to produce any satisfactory results.

In short, it may be said that the future growth of the beef cow population will neither be promoted, as in the past, nor hindered by the greater relative competitiveness of beef-cow rearing over sheep-raising (assuming a constant price ratio (beef : lamb) until 1977). The assumed development of the price ratio (beef : milk) would further favour the rearing of beef cattle in the forecasting period. Under EEC conditions, the premiums for beef cows would indeed be reduced but not entirely abolished. But a countervailing factor would be the extraordinarily steep rise in the prices for slaughter cows. With reference to this in particular and in view of the very favourable long-term sales prospects for beef in the enlarged Community too we should like to revise considerably upwards the projected size of the stock

Diagram 11 - Beef cow numbers in the United Kingdom and the most important determining factors involved (1955-71, 1977[a])



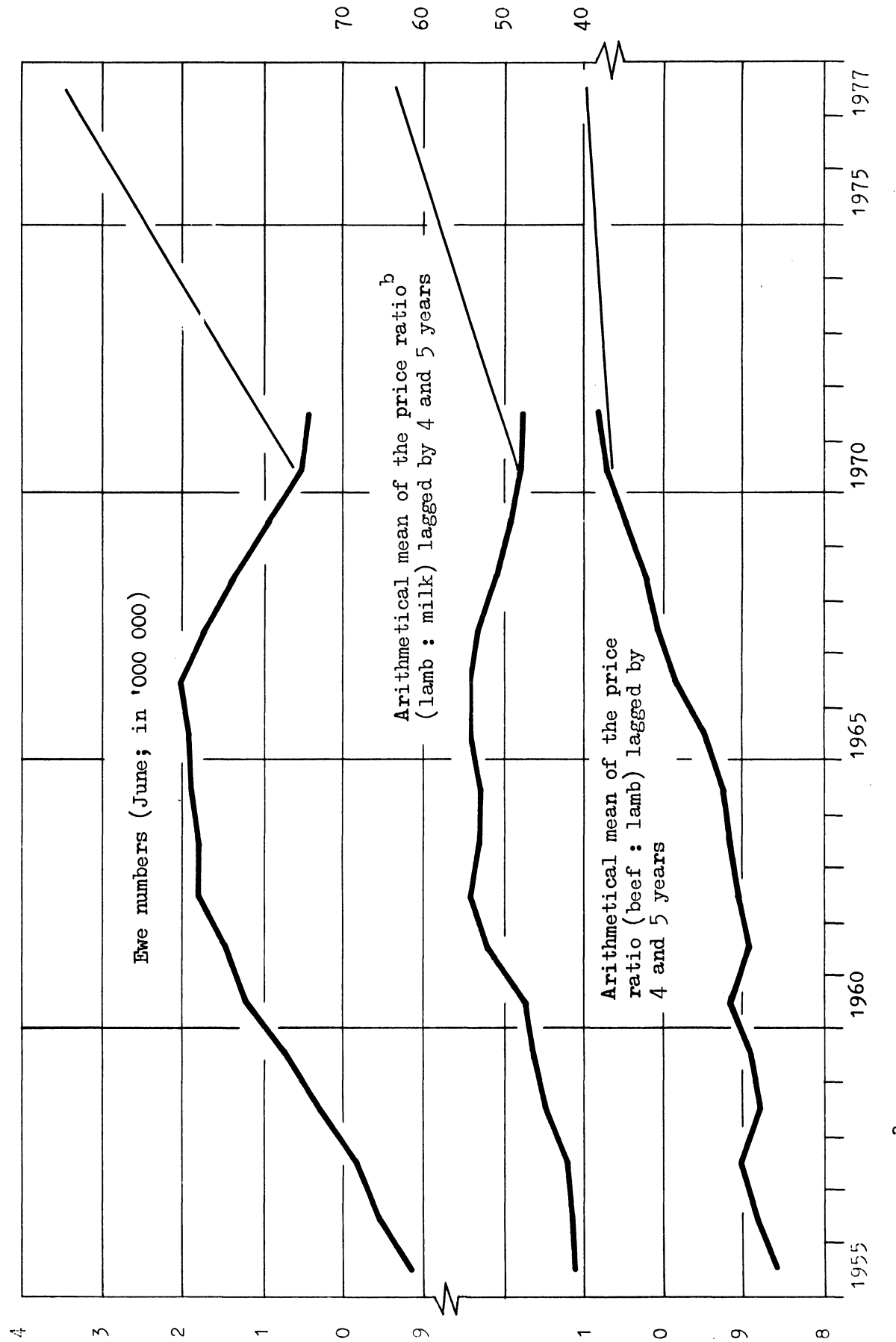
[a] Revised forecast value (cf. text). [b] Multiplied by 10.

of beef cows obtained from equation (116): namely, 2 400 000 for 1977, a 64 % increase compared with 1969/71. These estimates of the future growth of the UK beef and dairy cow population, which perhaps seems somewhat optimistic, must first be viewed in the light of recent developments. In 1972 UK farmers expanded considerably their stock of cows principally as a result of the sharply rising prices on the markets in milk products between the beginning of 1971 and the beginning of 1972 and the boom in prices on the beef market, although at the same time the market prices for feed grain also increased sharply in reaction to the acute supply shortage on the world market. The cattle census in September 1972 in England and Wales showed that there had been an increase of 4.3 % in the stock of dairy cows and of 18.2 % in the stock of beef cows (!) compared with September 1971. What is striking here is that from 1971 to 1972 the production of grass silage of all kinds rose by almost 25 % - this was possibly an attempt to reduce the input of feedgrain, which had risen considerably in price, by a more intensive use of grassland. In our opinion, these recent developments are a very good test of what is to be expected as regards UK cattle raising under EEC conditions, and the result of this test is on the whole in accordance with the considerations we have set out above. Compared with 1972, increases of only 5.8 % and of 30.9 % are forecast in the stock of dairy cows and that of beef cows respectively in 1977.

f. Sheep

If equation (118) is used for projecting the ewe stock, a steep rise of 27 % between 1969/71 and 1977 is obtained. The major factor determining ewe numbers is, according to equation (118), the price ratio (lamb : milk). While the trend in this price ratio tended to favour sheep farmers in the sixties, the price ratio itself (lamb : milk) would, according to our hypotheses, increase by at least 17 % by 1977 (in comparison with 1969/71), and this should provide a significant stimulus to sheepfarming. The price ratio (beef : lamb), which during the reference period had not favoured sheep farmers, would remain constant until 1977 so that beef-cow raising would be expected to have little contractive effect on the ewe stock.

Diagram 12 - Ewe numbers in the United Kingdom and the most important important determining factors involved 1966-71, 1977[a]



[a] Forecast value calculated with equation (118). [b] Multiplied by 10.

Account must also be taken of the fact that, unlike all other branches of animal production, sheep-keeping would be only marginally affected by the rise in feed grain prices (the use of concentrates for fattening lambs and hoggets in the United Kingdom is not very common; stable feeding of lambs with grain, as is to be found, for instance, in France, is almost unknown in the United Kingdom)[1]. On the assumption that future EEC arrangements governing the market in mutton and lamb similar to those for beef will be introduced and will also apply to meat from cull ewes and rams, the prices for rams and ewes for slaughter will rise very sharply (price guarantees are not granted in respect of these types of animals under the UK system). The hill sheep subsidy, which must be regarded as not complying with EEC regulations, would indeed have to be abolished in its present form. It is, however, thought probable that some compensation under the structural aid arrangements for hill farmers is possible. Protection of the wool market (price guarantees for wool) would presumably be discontinued, but the British Wool Marketing Board would probably continue to function as the central marketing body for home-produced wool (on a voluntary basis). The suspension of wool price guarantees would cause problems for hill farmers especially; however, it is precisely the hill and mountain farmers who will receive considerably higher prices for slaughter ewes. Since the disadvantage resulting from the assumed abolition of the wool price[2] guarantee ought to be at least balanced by the higher prices for cull ewes and rams, we do not consider a revision of the forecast obtained from equation (118) necessary.

g. Pigs

By means of equation (119) a reduction of 16 % (800 000) in the stock of sows was forecast from 1969/71 to 1977. The reason for this is that, according to our hypotheses, the price ratios (beef : pigmeat) and (pigmeat : milk) will in

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[1] Cf. The Financial Times, London, 18 August 1972.

[2] In view of the developments in demand and supply on the international wool markets since 1971/72 it is even conceivable that UK producer prices will be higher in future than during the reference period (approximately until 1970) in spite of the possible abolition of wool price guarantees.

future develop substantially more strongly to the disadvantage of the producers of slaughter prigs than in the past. The price ratio (pigmeat : feed grain) is of crucial significance for the profitability of pig fattening. This price ratio was not shown to have a significant influence on the pig cycle in the reference period; this is probably due to the fact that under the price guarantee arrangements automatic compensation for feed costs (by means of "feed formula") was granted to UK producers. Such far-reaching protection for pig fatteners against fluctuations in feed grain prices is not included in the EEC system. And so in future in the United Kingdom too farmers will be expected to base their decisions concerning the sow stock more on the price ratio (pigmeat : feed grain) than has hitherto been the practice. Under EEC conditions this price ratio will deteriorate considerably for UK producers of slaughter pigs. From 1958/60 to 1968/70, for instance, the price ratio (pigmeat : feed maize) fell in the United Kingdom by only 10 %, but from 1968/70 to 1977 a reduction of 27 % is to be expected. It must also be added that protection of the bacon industry in the United Kingdom by the 1964 Bacon Market Sharing Understanding and by the subsidies granted by the Government must be discontinued. Under these circumstances, the forecast obtained from equation (119) looks rather too optimistic. We shall, however, retain this forecast (800 000 for 1977) in view of the large increase in the demand for pork estimated in Part (II), which, at least as far as fresh carcase meat is concerned, should be mainly covered by domestic production.

h. Poultry

The construction of an econometric model for the number of laying hens and for the production of market poultry proved impossible; thus only a projection based on logical considerations can be undertaken here. In doing so it is to be first noted that the efficiency of UK egg and poultry production (particularly in view of farm size, the technical infrastructure

and the standard of organization is, in general, considerably higher than that of producers in the other countries of the Community (the Netherlands may be the exception). The price ratios (eggs : feed grain) and (poultrymeat : feed grain) would fall by about 40 % from 1968/70 to 1977, but this would represent nothing more than a slightly more marked continuance of the trend observed in the reference period. In our opinion, it is important as regards future possible trends that UK poultry farming now competes with other EEC countries on the basis of approximately the same prices for feed grain, with the advantage of efficiency mentioned above being able to make itself fully felt as a competitive advantage. These considerations have led us to assume that the production of eggs and poultrymeat in the United Kingdom will increase somewhat more rapidly until 1977 than the demand for those products. Assuming that the egg yield per laying hen continues to rise in the forecast period, the number of laying hens would, under these conditions, remain practically unchanged (61 400 000 in 1977 compared with 61 600 000 in 1969/71). Poultrymeat production had to be forecast directly (1967/69: 509 000 tons; 1977: 849 000 tons; increase: 67 %).

3. Test of the areas under cultivation

An estimate of the total agricultural area constitutes the basis of the test of the areas under cultivation. It can be assumed here that the decline in the total agricultural land, a trend already apparent in the reference period, will remain unchanged in the future, irrespective of any profitability considerations for agriculture resulting from the accession of the United Kingdom to the EEC. This development is mainly due to the increasing demand for land for house and road construction, for industrial purposes and for leisure facilities, a demand generally met at the expense of the agricultural area. A graphical trend extrapolation gave, for 1977, a total agricultural area of about 18 500 000 ha (1970/72: 18 804 000 ha; reduction: 1.6 %, cf. Table 24)[1].

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[1] The data on the total agricultural area for the years up to 1969 are no longer fully comparable with the data for the years since 1970, on account of the new definition of rough grazings in 1970 as a result of which some 400 000 ha were no longer counted as rough grazing land.

Table 24 - "Test of the areas under cultivation": United Kingdom (in '000 ha)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1977
Arable land: total	7084	7184	7304	7262	7323	7366	7435	7495	7481	7419	7381	7262	7199	7228	7222	7950
Cereals: total	3030	2942	3106	3057	3200	3259	3424	3656	3788	3822	3810	3695	3712	3811	3798	4160
wheat	894	781	851	739	913	780	893	1026	906	933	978	833	1010	1097	1127	1400
barley	1115	1238	1365	1549	1614	1907	2036	2183	2481	2439	2401	2413	2243	2288	2288	2400
oats	897	822	799	701	615	524	455	410	367	410	382	382	376	363	314	300
rye	9	6	8	8	7	8	8	7	4	4	4	4	4	6	6	5
maslin	115	95	83	60	51	40	32	30	30	36	45	63	79	57	63	55
Sugar beet	178	176	176	173	172	171	179	184	180	185	188	185	187	191	189	166
Potatoes	332	330	335	284	298	311	315	300	271	287	280	248	271	257	236	180
Fodder crops: total	525	488	491	456	435	388	361	341	314	314	333	323	293	276	262	130
Hops	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7
Mustard	14	13	11	11	10	10	6	8	7	8	9	9	6	6	6	6
Fruit: total	120	118	116	112	110	108	101	99	96	92	89	84	83	80	78	50
Vegetables: total	172	162	168	147	155	160	153	150	149	166	178	191	206	184	180	120
Flowers: total	12	12	13	13	13	14	14	14	14	14	14	15	15	15	15	16
Other	20	16	23	11	8	8	7	7	7	14	15	15	14	13	13	65[a]
bare fallow	103	148	78	123	72	91	81	68	106	93	81	168	98	74	80	50
Temporary grassland: total (incl. lucerne)	2570	2771	2779	2867	2842	2838	2786	2660	2541	2416	2377	2322	2307	2314	2358	3000
Permanent grassland: total	5457	5307	5184	5133	5081	5031	4980	4912	4937	4989	4935	4997	4944	4926	4910	4350
Rough grazings[b]: total	7420	7413	7405	7358	7334	7307	7255	7215	7170	7138	7097	7109	6692	6678	6614	6200
Total area[b]	19961	19904	19893	19753	19738	19704	19670	19622	19588	19546	19413	19368	18835	18830	18746	18500

[a] Including 50 000 ha for oil seed rape. [b] From 1970 onwards approximately 400 000 ha are no longer recorded as rough grazings.

Source: Central Statistical Office, Monthly Digest of Statistics, London, H.M.S.O., various issues; own calculations and estimates.

Table 25 - Trend in stocking rates of pasture land and in use of compound feeding stuffs in UK cattle and sheep farming (1958 - 1972 and forecast for 1977)

Year	A	B	C	D	E	F	G	H	I
1958	10.961	26.105	9.865	2.611	12.476	8.027	1.554	2.557	205.0
1959	11.305	27.612	10.175	2.761	12.936	8.078	1.601	3.043	235.2
1960	11.779	27.871	10.601	2.787	13.388	7.963	1.681	3.168	236.6
1961	11.944	28.967	10.750	2.897	13.647	8.000	1.706	3.099	230.1
1962	11.869	29.498	10.682	2.950	13.632	7.923	1.721	3.267	239.7
1963	11.728	29.344	10.555	2.934	13.489	7.869	1.714	3.158	234.1
1964	11.635	29.657	10.472	2.966	13.438	7.766	1.730	3.133	233.1
1965	11.948	29.911	10.753	2.991	13.744	7.572	1.815	3.378	245.8
1966	12.211	29.957	10.990	2.996	13.986	7.478	1.870	3.348	239.4
1967	12.343	28.885	11.109	2.889	13.998	7.364	1.901	3.538	252.8
1968	12.156	28.004	10.940	2.800	13.740	7.312	1.879	3.616	263.2
1969	12.377	26.604	11.139	2.660	13.799	7.319	1.885	3.961	287.0
1970	12.580	26.080	11.322	2.608	13.930	7.251	1.921	4.090	293.6
1971	12.804	25.981	11.554	2.598	14.152	7.240	1.955	3.837	271.1
1972	13.483	26.877	12.135	2.688	14.823	7.268	2.039	4.106	277.0
1977	15.581[a]	33.675[b]	14.023	3.368	17.391	7.350	2.366	.	

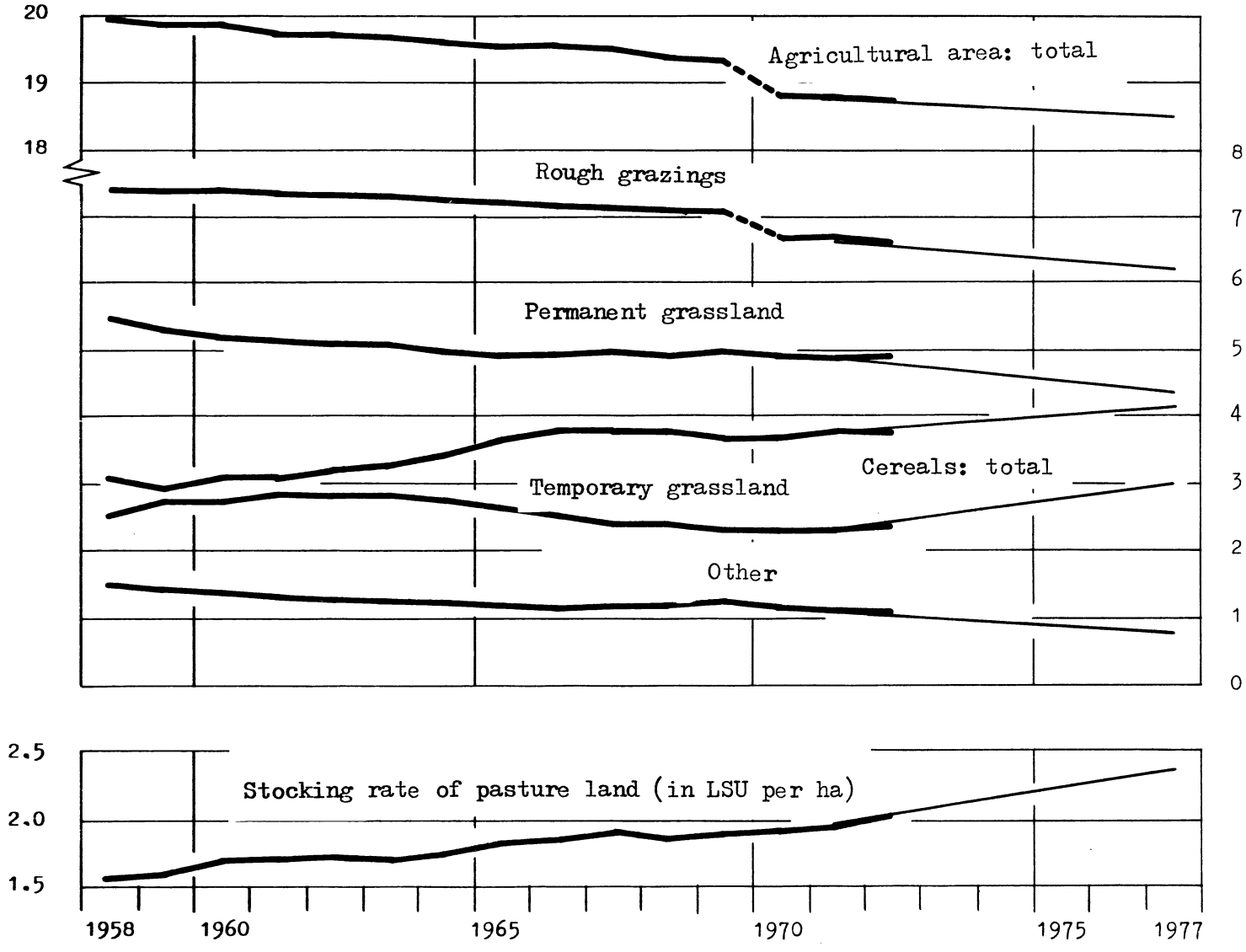
A. Cattle stock ('000 000). B. Sheep stock ('000 000). C. Cattle stock ('000 000 livestock units (LSU))[c]. D. Sheep stock ('000 000 LSU[d]). E. Stock of cattle and sheep ('000 000 LSU). F. Total pasture land (temporary and permanent grassland; '000 000 LSU ha). G. LSU per ha of pasture land. H. Production of compound feeding stuffs for cattle, calves and sheep ('000 000 tons). I. Production of compound feeding stuffs per LSU (kg).

[a] $(\frac{1}{0.43})$ · total cow population 1977. [b] $(\frac{1}{0.40})$ · stock of ewes 1977. [c] One head of cattle $\approx$ 0.9 LSU.

[d] One sheep $\approx$ 0.1 LSU.

Source: Central Statistical Office, Monthly Digest of Statistics, London, H.M.S.O., various issues. Own calculations and estimates.

Diagram 13 - "Test of the areas under cultivation": United Kingdom ('000 000 ha) 1958-71, 1977



[a] Total cattle and sheep population (converted into livestock units) per ha of temporary and permanent grassland

A slight increase in the arable land as such (excluding temporary grassland) from 4 890 000 ha in 1970/72 to 4 950 000 ha in 1977 was estimated (+ 1.2 %). The main reason for this is that the sharp increase forecast in the areas under wheat and rape - with the area under barley remaining fairly constant - is being accompnied by a drastic reduction in the areas under toot crops. If arable land as such is deducted from the total agricultural area, a total figure of 13 550 000 ha of temporary and permanent grassland and of rough grazings is obtained for 1977. Only a slight increase in permanent grassland at the expense of rough grazings is conceivable given natural conditions obtaining in the United Kingdom. Rough grazings are to be found mostly on hill slopes where only a thin layer of earth covers the subsoil rock. They are often very boggy owing to the infiltration water from the hills especially, and the feed value of the grass varieties thriving in these places is correspondingly small. In principle, it is either impossible to convert the majority of rough grazings into more profitable permanent grassland, or possible only with great difficulty and with a relatively heavy outlay of capital and labour. It can, however, be assumed that there is a certain reservoir of rough grazings which it would be economically worthwhile to make improvements in view of the sharp price increases expected under EEC conditions for the most important outputs of pasture farming. In the case of rough grazings too a projection may, therefore, be made by a simple graphical trend extrapolation in which, however, the downward trend in the area of rough grazings continues somewhat more intensely during the forecast period (conversion of rough grazings into permanent grassland in certain regions assumed to be carried out to a greater extent in the period 1970/72-77 than in the period 1958/60-1970/72). Under theses conditions we obtain a forecast of 6 200 000 ha of rough grazings, which represents a fall of 7.2 % compared with 1970/72.

Thus, temporary and permanent grassland could still cover 7 350 000 ha in 1977 (1970/7: 7 253 000 ha; increase: 1.3 %). According to our forecasts, the stock of cattle and sheep would, converted into livestock units (LSU), increase by 21.6 % from 1970/72 to 1977 (see Table 25 for details). At first glance, such a result fits badly into the forecast of an area of temporary and permanent grassland growing only marginally in the future. This is true particularly because in

the projection of the total cow population we had assumed that, in order to avoid the high feed grain prices, feed grain will be replaced by grass to a great extent both in the milk and beef production sectors. Our forecast of cattle and sheep numbers may be retained, therefore, only if the stocking rates can be considerably increased in the future. In the reference period the stocking rate was raised by 22.3 % from 1 612 LSU/ha in 1958/60 to 1 972 LSU/ha in 1970/72. This could well have been made possible both by a greater use of concentrates (approximately represented by the domestic production of compound feedingstuffs for cattle and sheep), from 225.6 kg/LSU (1958/60 to 280.6 kg/LSU in 1970/72, i.e. an increase of 24.4 % and also by a more intense use of grassland (cf. Table 25). A stocking rate of 2.366 LSU/ha is calculated for 1977, which corresponds to a rise of 16 % compared with 1972. Even such a stocking rate could be easily maintained by more widespread concentrate feeding alone. A further increase in the utilization of concentrates (which are mainly grain-based) for cattle feeding (sheep can be disregarded here since they are rarely given concentrated rations in the United Kingdom) would conflict with our forecasting hypothesis of a production of milk and beef relying on the intensified use of grassland. The higher stocking rate would, therefore, in future have to be attained only by a more intensive use of grassland - principally by improved conservation methods for grass (more silage, less hay), by increased utilization of fertilizers by the use of higher-quality seed and, last but not least, by a substantial increase in the share of high-yield temporary grassland (the so-called "leys") in the total pasture land (excluding rough grazings) at the expense of permanent grassland. (As Table 24 shows, we have for this reason assumed a 27 % increase in temporary grassland between 1972 and 1977 and, accordingly, an 11 % reduction in permanent grassland.) Since this is, in principle, possible (see the remarks on the developments in UK cattle farming in 1972! - p. 156) it is thought unnecessary to revise the forecast of the stocks of dairy cows, beef cows and ewes.

4. Forecast of the yields per unit area and per livestock unit

Both the yields per unit area and the yields per livestock unit were forecast with the aid of graphical trend extrapolations and of special technical considerations. The results of these estimates are shown in Table 26 (for sugar beet cf. IV, 2, b).

In interpreting the assumed growth of cereal yields it must be borne in mind that poor weather resulted in an extremely unfavourable harvest in 1968 and a bad one in 1969 and this had a negative effect on overall average for 1968-71. Compared with 1971-72, two years with extremely good harvest, the yield of wheat estimated, for 1977, for example, represents only a quite modest increase of 4.2 % (barley: 5.1 %; oats: 4.2 %). Looked at in this way, the yields of cereals estimated by us for 1977 could be judged as being somewhat too low. Nevertheless, we have retained this assumption for the following reason: In the past, the rise in grain yields was achieved mainly by increased inputs of fertilizers, insecticides, herbicides and fungicides. Insecticides and herbicides in particular include to a greater or lesser extent poisonous compounds which, for the most part, break down in the soil only after a very long time. The harmful effects are now acknowledged, and, as a first step, attempts are being made to keep future increases in pollution within certain limits at least. (Mention must here be made inter alia of the ban on the use of DDT in some countries of north-western Europe.) This would also mean, however, that further inconsiderate use of insecticides and herbicides per unit area by farmers would no longer be tolerated - this is particularly true for the United Kingdom, where the Government and public opinion do take the problem of environmental pollution extremely seriously. In the case of fertilizers a certain cutback could be achieved by economic means alone (abolition of the large fertilizer subsidies). Furthermore, the problem of environmental pollution arises here too, even if the situation has, for a long time now, been not so serious as with pesticides (e.g. fertilizer saturation in lakes and rivers due to the excessive inflow of fertilizer residues from the surrounding meadows and fields).

Table 26 - Projections of the yields per unit area in crop production, and the average milk yield per cow and the average yield of eggs per laying hen in the United Kingdom for 1977

	Ø 1958-61	Ø 1968-71	1977	Increase from Ø 1958-61 to Ø 1968-71 (in %)	Average annual rate of change Ø 1958-61 to Ø 1968-71 (in %)	Increase from Ø 1968-71 to 1977 (in %)	Average annual rate of change Ø 1968-71 to 1977 (in %)
Crop yields (100 kg/ha)							
Wheat	34.6	40.5	45.0	+ 17.1	+ 1.6	+ 11.1	+ 1.3
Barley	31.5	35.3	41.0	+ 12.1	+ 1.1	+ 16.1	+ 1.9
Oats	26.0	34.1	40.0	+ 31.2	+ 2.8	+ 17.3	+ 2.0
Potatoes							
- Maincrop	216	259[a]	310	+ 19.9	+ 1.8	+ 19.7	+ 2.3
- Earlies	151	169[a]	190	+ 11.9	+ 1.1	+ 12.4	+ 1.5
Milk yield per cow (kg)	2982	3338	3600	+ 12.0	+ 1.1	+ 7.8	+ 0.9
Eggs per hen	237	266[a]	290	+ 12.2	+ 1.2	+ 9.0	+ 1.1

[a] Average of years 1968-69

Source: Cf. the corresponding supply situation statements; own calculations and estimates

Similar considerations are also valid for the projection of the yield of potatoes, although there it is, however, to be borne in mind that there is still ample scope for achieving higher yields by improving harvesting techniques and subsequent storage methods.

It is to be noted that in the forecast of milk yields it has been assumed that there will be a considerable weakening of the growth trend during the reference period. This is to be explained by the fact that the estimated cow population in 1977 is based on the hypothesis "more grass, less concentrates", which could permit a slowing down in the future growth rate of milk yields.

5. Forecast of the domestic production of agricultural product and comparison of the results of the projections of production and consumption

a. General preliminary remarks

In sections 2 and 4 above the forecasts for animal stocks, the areas under cultivation and yields per unit area and per livestock unit were drawn up. The crop production for 1977 is obtained by multiplying the relevant area under cultivation by the yield per unit area. Milk production in 1977 is also obtained by multiplying the number of cows forecast for 1977 by the average milk yield in 1977, and egg production in 1977 by multiplying the number of laying hens by the average egg yield. Projections of meat production are rather more difficult because, though they are based upon the forecasts of the stock of cows, ewes and sows the attached comprehensive econometric models must first be applied in order to be able to calculate the gross domestic production. But before this can be done it is necessary to make assumptions as regards the exogenous variables entering into these models in so far as this has not yet been done in connection with the construction of the models.

We will first represent the results of the forecasts by an "extension" of the supply situation statements until 1977. This, in our opinion, has the

advantage that the past trend can be compared in one table at any time with the projected values for 1977 (without loss of information as a result of using averages omitting some balance sheet items which are not explicitely stated in the projections but which are still important none the less). Since the supply situation statements are often fairly complex and, therefore, difficult to "read", in this text "rapid information" is provided by summarizing the most important forecasts for 1977, compared with the average for the last few years of the reference period, in small tables.

b. Cereals

According to our estimates, UK cereal production would by 1977 have risen sharply to 17 550 000 tons (1969-71: 13 936 000 tons; increase: 26 %). Of this total for 1977 common wheat would account for 35.9 % (6 300 000 tons), and barley for 56.1 % (9 840 000 tons) (for details cf. Tables 1* - 8*).

b_1 Remarks on some important balance items in so far as they concern human consumption and industrial use

In the case of wheat, it is expected that in 1977, as a result of the expected greater supply of wheat from domestic sources, the UK milling industry will no longer meet only one third less (as in the last years of the reference period), but 50 % ot its requirements of milling wheat by purchases of home-grown grain. Owing to the composition of white bread favoured by British consumers we consider a marked increase in the share of home-grown wheat in the national grist improbable. We further assume that exports of UK quality biscuits to other countries of the Community (among them Germany in particular) will expand sharply in the future. Likewise, as a result of more extensive domestic supplies and in view of the changed price ratios brought about by the EEC levy system (often in the past UK products were probably far too expensive in relation to imports), the demand for wheat for malting and brewing should

Table 27 - The supply of cereals for human consumption and for industrial use in the United Kingdom Ø 1966/67 - 1968/69 and forecasts for 1977/78
('000 t grain weight)

	Ø 1966/67 - 1968/69	1977/78	Percentage change Ø 1966/67-1968/69 to 1977/78	Average annual percentage change Ø 1966/67-1968/69 to 1977/78
Human consumption				
Supplies from domestic sources for the domestic market	1760	2561	+ 45.5	+ 3.8
Supplies from foreign sources for the domestic market	3729	2786	- 25.3	- 2.9
Total supplies for the domestic market	5489	5347	- 2.6	- 0.3
Foreign trade balance for products containing grain	- 114	- 65	-	-
Net domestic consumption	5603	5412	- 3.4	- 0.3
Proportion of home grown cereals in net domestic consumption (%)	30.6	46.2	-	-
Industrial use				
Supplies from domestic sources for the domestic market	1294	1738	+ 34.3	+ 3.0
Supplies from foreign sources for the domestic market	1113	1325	+ 19.0	+ 1.8
Total supplies for the domestic market	2407	3063	+ 27.3	+ 2.4
Proportion of home-grown cereals in total industrial consumption (%)	53.8	56.7	-	-

Source: See annexed Tables 1* and 3*.

in 1977 be met to a greater extent by domestic production and not, as hitherto, almost exclusively by imports. The consumption of barley for malting and brewing will also presumably rise only slowly in the future because the per capita consumption of beer is by and large constant and because the export prospects for beer are not exactly favourable. Only exports of malt could increase appreciably under EEC conditions (an export surplus of 130 000 tons (grain equivalent) was estimated for 1977). As compared with the past, a large increase in the use of home-grown barley for distilling is estimated given the expectation of a continued rapid growth in the demand for some UK alcoholic drinks (whisky) on international markets and the assumption that in future domestic distilleries will, for price and supply reasons, replace to a large extent imported maize by home-grown barley. It is, therefore, reckoned that the use of imported maize by UK distilleries and maltsters will, for some years to come, diminish appreciably. In contrast, it is expected that maize might have to be used for the production of starch and glucose in almost all cases in the forecast period with the result that the considerable increase in imports of maize for this purpose that was observed in the reference period will remain unaffected.

b_2 Estimate of the domestic supply of feed grain and its utilization

If the demand for seed, the wastage by producers and processors and the demand for cereals for food and industry presumably met from domestic sources are deducted from total domestic production, an estimate is obtained for the total available supply of home-grown feed grain (for domestic use and for export). By reference to Tables 4* and 8* and according to the method just described a value of about 12 250 000 tons is obtained for 1977. The total feed grain consumption in UK agriculture (including imported feed grain) averaged 12 850 000 tons in the 1966/67 - 1968/69 farm years. As was frequently mentioned, the higher feed grain prices in the Community ought to prompt UK farmers to replace, where possible, feed grain by other feedingstuffs which could be imported free of levies under EEC arrangements. In cattle production, however, they ought to greater recourse to grass, in particular, as a substitute, Consequently in spite of growing stocks there whould be no significant

rise in the use of feed grain in cattle production. The projected fall in the pig stock should have a contractive effect on the consumption of feed grain, although, according to our forecasts, the available supply of potatoes for feed purposes will fall drastically. This is to be seen in connection with the fact that potatoes were only of rather minor importance as regards total feed requirements for pigs in the United Kingdom in the reference period. Furthermore, one should bear in mind that in pig production, as a result of the relevant price ratios, an extensive substitution of feedingstuffs which can be imported free of levies (e.g. tapioca flour) for feed grain is to be expected. It is only in egg and poultrymeat production that one may reckon on a continuing and clearly expanding feed grain demand in future (few substitution possibilities; forecast indicates a particularly rapidly growing production of poultrymeat). Accordingly, it is likely that up to 1977 the total feed grain requirements of UK agriculture will increase only slightly above its level of the years 1966/67 to 1968/69 (estimate: ± 10 %). This in turn would mean that from a purely theoretical point of view 85-90 % of total feed grain requirements in 1977 would come from domestic sources. If one considers that for numerous reasons a greater amount of maize will probably be used in pit and poultry production under EEC conditions than in the past, an export surplus of home-grown feed grain might appear on the UK market. According to our overall estimates, this would occur if imports of maize rose in 1977 to more than $\left[1.10 \cdot (12.85) - 12.25\right] = 1\ 890\ 000$ tons[1].

c. Sugar

If the white sugar production of 900 000 tons allocated to the United Kingdom is subtracted from the consumption of white sugar forecast for 1977 (after allowing for statistical errors), we obtain a net import demand of 2 100 000 tons, which is virtually the same as that recorded in 1966/67 - 1968/69: 2 119 000 t (see also Table 9*).

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[1] Although it provides no figures, a report presented by the Agricultural Economic Development Committee speaks of a "surplus of supplies" of home-grown feed grain (quoted in The Financial Times, London, 23 June 1972).

Table 28 - The supply of sugar and potatoes in the United Kingdom Ø 1966/67 - 1968/69 and forecasts for 1977/78

	Ø 1966/67 - 1968/69	1977/78	Percentage change Ø 1966/67-1968/69 to 1977/78	Average annual percentage change Ø 1966/68-1968/69 to 1977/78
Sugar ('000 t white sugar equivalent)				
Production	882	900	+ 2.0	+ 0.2
Total net imports (including products containing sugar)	2119	2100	- 0.9	- 0.0
Total disposable quantity	3001	3000	- 0.0	- 0.0
Statistical errors	+ 32	+ 34	-	-
Domestic consumption	2937	2966	+ 1.0	- 0.1
Degree of self-sufficiency (%)	30.0	30.3	-	-
Potatoes ('000 t fresh weight)				
Total production	6884	5340	- 22.4	- 2.5
- Maincrop	6273	4960	- 20.9	- 2.3
- Early potatoes	611	380	- 37.8	- 4.6
Total utilization by farmers	1744	608	- 65.1	- 10.0
- Feed	1053	160	- 84.8	- 17.2
Total sales by farmers	5140	4732	- 7.9	- 0.8
Total exports	75	70	-	-
- Seed potatoes	57	70	-	-
- Maincrop ware potatoes	18	0	-	-
Total imports	307	995	-	-
- Seed potatoes	10	20	-	-
- Maincrop ware potatoes	9	569	-	-
- Earlies	288	406	-	-
Total net imports	232	925	-	-
Total disposable quantity	7140	6265	- 12.3	- 1.3
Total domestic consumption as food	5292	5587	+ 5.6	+ 0.5
- Maincrop	4394	4801	+ 9.3	+ 0.9
- Earlies	898	786	- 12.5	- 1.3

Source: See annexed Tables 9* and 10*.

d. Potatoes

According to our forecasts, the domestic production of maincrop ware potatoes would fall from 1967/69 to 1977 by 20.3 %, to 4 960 000 tons, and that of early potatoes by 29.9 %, to 380 000 tons (cf. Table 10*). The quantity of ware potatoes (maincrop) remaining after deduction of the domestick demand for seed potatoes and of wastage would not be sufficient to met total domestic requirements of ware potatoes. Under these circumstances, it is to be expected that maincrop potatoes will be used for feed purposes to only a small extent in future and that ware potatoes will cease to be exported. Only exports of seed potatoes, of which the United Kingdom is one of the most important suppliers of the world market, might perhaps be maintained in the forecast period. On these assumptions, the gross import demand for maincrop ware potatoes would be around 570 000 tons in 1977. This seems a realistic figure whent it is considered that under EEC conditions quotas for imports of ware potatoes (maincrop) from Member States would have to be discontinued. The poor quality of the ware potatoes supplied by British producers have often been the butt of much criticism from the representatives of consumer interests in the United Kingdom. It should not, therefore, be very difficult for Dutch suppliers, in particular, who offer top-quality potatoes, to win a larger share of the UK market in maincrop ware potatoes in future.

e. Rape-seed and sunflower oil

Assuming a net yield (minus seed requirements) of 2 700 kg/ha (no information on past trends is available to us with the result that this assumption has had to be based on the yields per unit area in other EEC countries; peak yields in the United Kingdom are thought at present to stand at 23 cwt/acre, i.e. about 2 900 kg/ha[1]) and an oil extraction rate of 42 %, UK rape-seed oil production in 1977 would total 57 000 tons (seed production: 135 000 tons).

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[1] The Financial Times, London, 8 August 1972.

As regards utilization, we assume that the projected domestic production of rape-seed oil will go primarily to meeting the growing demand for vegetable oil in the margarine industry, which, according to our estimates, will increase by about 25 000 tons from 1969/71 to 1977. This assumption can be justified only if one presupposes that in 1977 the type of rape cultivated in the United Kingdom will be almost exclusively that from which oil with only marginal acidity ($\leq$ 1 %) is obtained and which, therefore, in terms of taste, can be used unhesitatingly in the manufactue of margarine. The tendency towards growing rape with very low acidity is already evident in some of the main producer countries (for example France, but principally in Canada). Altogether about 50 000 tons of rape-seed oil could be processed in the margarine industry in 1977 (1969/71: 9 000 tons - predominantly imported rape-seed oil). And so in 1977 some 16 % of the estimated oil and fat requirements of the margarine industry (total: 308 000 tons) would be met by rape-seed oil, and this would presumably be at the expense of imports of sunflower oil (assumption for 1977: 10 000 tons; 1969-71: 21 000 tons). The remaining 7 000 tons of rape-seed oil could be immediately used in the manufacture of edible fats (1969-71: 6 000 tons) or exported in the form of seed. In this connection it should be noted that the Wessex Agricultural Producers Ltd. have, in anticipation of future developments, already been able to negotiate the first "trial deliveries" of British rape seed to some continental European countries[1]. Imports of rape seed and rape-seed oil, which still amounted to the equivalent of 34 000 tons of oil in 1969-71, should fall appreciably owing to expanded domestic production (assumption for 1977: 10 000 tons oil equivalent). According to hypothesis 1 (7 000 tons of domestic rape-seed oil for the manufacture of edible fats, and 50 000 tons for the margarine industry) the total consumption in 1977 of rape-seed oil would amount to 67 000 tons (hypothesis 2: with 7 000 tons of domestic rape-seed oil for export and 50 000 tons for the margarine industry, total consumption would be 60 000 tons).

f. Beef

In order to forecast the gross domestic production of beef and veal with the aid of the econometric model constructed for the cattle stock, a further hypothesis

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[1] The Financial Times, London, 21 January 1972.

on the export of calves and projection of calf slaughterings in 1977 is needed. Calf slaughterings in 1977 were estimated by means of equation (117), in which the dummy variable "calf subsidy" was given a value of -0.5 (this implies a considerable reduction in this subsidy under EEC conditions). On this assumption equation (117) produces the result that calf slaughterings (owing to the assumed very sharp rise in producer prices for beef) would drop to just 100 000 by 1977 - that means that in the main only calves not fit or only conditionally fit for rearing would be slaughtered (calf slaughterings 1969-71: 314 000). As regards calf exports, it is to be noted that the demand for UK calves in other EEC countries (mainly Belgium and Holland) is more likely to increase in future. Nevertheless, in view of the very favourable price and marketing prospects for store and fat cattle, UK farmers will be striving more than ever to rear as many calves as possible themselves. If these two factors are weighed against each other, it may still be considered optimistic if we assume that UK calf exports will again reach the peak levels (50 000 calves) recorded during the reference period (1964/65).

With a total cow stock (dairy and beef) of 5 700 0000 (since, on average, the stock of cows reacts to price changes with a four-year lag, this level will, strictly speaking, not be reached until 1981), with a calf outflow of 150 000 due to slaughter and export, and assuming exports of 300 000 store and fat cattle, we obtain for 1977 a gross domestic production of beef and veal of 1 058 000 tons (1969/71: 852 000 tons; increase: 24 %)[1]. Since, as a result of the expected steep rise in real retail prices for beef, a decrease in consumption from 1 336 000 tons (1969/71) to 1 031 000 tons in 1977 (23 %) was forecast, the domestic production in 1977 would not only suffice to meet domestic demand but would also result in a small export surplus of 27 000 tons. This does not mean, however, that the United Kingdom will import hardly any live cattle and/or beef in 1977. Much more likely is that the import of "Irish

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[1] Cf. Table 11*.

Table 29 - The supply of beef, sheepmeat and pigmeat in the United Kingdom Ø 1969/71 and forecasts for 1977 ('000 tons slaughter weight)

	Ø 1969/71	1977	Percentage change Ø 1969/71 to 1977	Average annual percentage change Ø 1969/71 to 1977
BEEF AND VEAL				
Gross domestic production	851.8	1058.4	+ 24.3	+ 3.2
Total net imports (live cattle and meat)	479.0	- 27.4	-	-
Domestic consumption	1332.6	1031.0	- 22.6	- 3.6
Degree of self-sufficiency (%)	63.9	102.7	-	-
MUTTON AND LAMB				
Gross domestic production	225.0	284.0	+ 26.2	+ 3.4
Total net imports (live sheep and meat)	343.5	191.0	-	-
Domestic consumption	566.2	475.0	- 16.1	- 2.5
Degree of self-sufficiency (%)	39.7	59.8	-	-
PIGMEAT				
Total gross dom. prod.	962.1	832.0	- 13.5	- 2.1
- Pork	637.2	609.0	- 4.4	- 0.6
- Bacon	324.9	223.0	- 31.4	- 5.2
Total net imports	604.0	822.0	-	-
- Pork[a]	87.1	261.0	-	-
- Bacon[b]	516.9	561.0	-	-
Total domestic consumption	1562.0	1654.0	+ 5.9	+ 0.8
- Pork	720.3	784.0	+ 8.8	+ 1.2
- Bacon	841.7	870.0	+ 3.4	+ 0.5
Degree of self-sufficiency (%)	61.6	50.3	-	-

[a] Including tinned pork. [b] Including tinned bacon and ham.

Source: See annexed Tables 11*, 12* and 13*.

stores", in particular, will not cease entirely (assumption for 1977: 35 000 tons meat equivalent; this corresponds to about 180 000 store cattle). Furthermore, chilled meat will presumably be imported from Ireland ("table-beef" qualities) as well as meat for the processing industry from New Zealand, Australia and the Argentine will presumably still be imported in large quantities (assumption for 1977: nearly 185 000 tons, probably in the form of beef for the most part (1977: 100 000 tons). Thus the United Kingdom would in future be one of the leading suppliers of cattle and beef to international markets - a development which, in somewhat narrower limits has already been observed since the middel of the sixties (British exports of cattle, in meat equivalent, and beef totalled 75 000 tons in 1964/65 and almost 95 000 tons in 1972).

g. Mutton and lamb

With a ewe stock of 13 470 000 (since the ewe stock reacts to price changes with a four-year lag, this figure would, strictly speaking, not be reached until 1981) and assumping a slaughter weight of 25 kg for ewes and rams (fat hoggets and lambs: 19 kg; sheep exported live: 20 kg on average), the model for the sheep stupply produces a gross domstic production of 284 000 tons for 1977 (1969/71: 225 000 tons; increase: 26 %). For mutton and lamb we forecast a price-induced fall in consumption from 1969/71 to 1977 of 16 % (1977 level: 475 000 tons). This convergent trend in production and consumption results in a sharp reduction in the calculated net import requirements of mutton and lamb from 344 000 tons in 1969/71 to only 191 000 tons in 1977, i.e. a fall of 45 %. The gross import demand ought, however, to be considerably higher, for it must be reckoned that UK producers of fat lambs will devote themselves much more intensively than hitherto to supplying the French market, which is capable of absorbing a great deal of English lamb and which, in terms of prices obtainable, is an attractive market. Considerable quantities could, however, also be exported to Belgium, Germany and Italy. (These remarks are, of course, valid only if UK producers enjoy free access to the markets just mentioned following the establishment of a common organi-

zation of the market in sheepmeat). In detail, exports of 50 000 tons of mutton and lamb and 300 000 head of live sheep (equivalent to 6 000 tons of meat) are assumed for 1977, compared with a gross import demand of 247 000 tons of mutton and lamb in toto. Since, with the exception of Ireland, there are no important exporters of mutton and lamb in the enlarged European Community, at least 200 000 tons of mutton and lamb would still have to be imported from non-member countries in 1977 (New Zealand and Australia) (see also Table 12*).

h. Pork and bacon

With a sow population of 800 000 and an average "yield" of 16 slaughter pigs per sow per year, a total of 12 800 000 slaughter pigs would be available in 1977. A domestic pork consumption of 870 000 tons slaughter weight was forecast for 1977. If it is assumed that in 1977 70 % domestic consumption will be met from domestic sources (1969/71: 88.4 %), the gross domestic production of pork in 1977 should total 609 000 tons slaughter weight. Assuming an average slaughter weight of 65 kg for pork and bacon pigs, this would require a total of 9 369 000 slaughter pigs. Furthermore, if it is assumed that in 1977 too foreign trade in live pigs will be relatively insignificant (assumption: export = import = 10 000 animals, or 700 tons meat equivalent), and that, therefore, gross domestic production can be equated with net production, 3 431 000 slaughter pigs still remain for bacon production, equal to a bacon output of some 223 000 tons (1969/71: 325 000 tons; decrease: 31.4 %)[1]. Given a slight fall in bacon consumption by 1977, this would result in a reduction in the market share of the UK bacon industry from 38.6 % (1969/71) to 28.4 % in 1977, from which Danish exporters, above all, could benefit.

i. Edible offals

The "projection" of the domestic production of offals is based on the forecast net production of beef, veal, mutton, lamb and pigmeat. It was assumed that, on average, edible offals account for 9 % of the slaughter weight of

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[1] See Table 13*.

cattle, 20 % of that of calves, 14 % of that of sheep and 4 % of that of pigs (here edible offals are not included in the slaughter weight, which only serves as a reference quantity). This results in a possible domestic production of edible offals of about 164 000 tons in 1977 (1969/71: 153 000 tons; increase: 7.2 %; see Table 14*). As the demand for edible offals will, according to our estimates, probably rise at a somewhat slower rate (+4.8 % from 1969/71 to 1977), net imports could remain almost unchanged (1969/71: 98 000 tons; 1977: 99 000 tons).

j. Milk and milk products

Given the forecast rate of growth in the stock of dairy cows and given the average milk yield the total milk production in 1977 will amount to 16 254 000 tons (1969/71: 13 883 000 tons; increase 17.1 %). Producer consumption of liquid milk and fresh cream should continue to fall appreciably until 1977, since on the one hand, it is to be expected that the number of farms keeping dairy cows will also decrease rapidly and since, on the other, the level of (per capita) consumption in farm households is extremely high, so that it seems hardly possible that the negative effect of the fall in the number of individuals can be offset to any extent by an increase in the level of per capita consumption. In addition, for reasons of labour saving alone, the production of farmhouse butter will continue to fall sharply. The only exception could be the production of farm cheese, which until now has been by the Milk Marketing Boards and which is a fairly attractive line for some specialized milk producers. It will be difficult to maintain the legally based monopoly position of the Milk Marketing Boards as purchaser of liquid and manufacturing milk under EEC conditions; on a voluntary basis, the Milk Marketing Boards could, in future, presumably still grant certain "marketing aids", organize quality control, and much else, from which producers of farm cheese would also benefit. Feeding with whole milk could still expand slightly until 1977 because under the EEC common agricultural policy the feeding of whole milk to stock must be encouraged in a more permanent manner than hitherto. Given the above assumptions we obtain for 1977 a total consumption of whole milk in farm households of 1 612 000 tons, which, compared with 1969/71 (1 597 000 tons), represents an increase of 0.9 % (cf. Table 15*). Consequently, there will be available in 1977 14 642 000 tons of whole milk (at present, 12 286 000 tons; + 19.2 %) for farm sales to dairies and other milk-processing establishments.

Table 30 - The production and utilization of whole milk in the United Kingdom Ø 1969/71 and forecasts for 1977 ('000 t)

	Ø 1969/71	1977	Percentage change Ø 1969/71 to 1977	Average annual percentage change Ø 1969/71 to 1977
Total production	13883	16254	+ 17.1	+ 2.3
Quantity used on producers' farms	1597	1612	+ 0.9	+ 0.1
Total farm sales	12286	14642	+ 19.2	+ 2.6
Farm sales as a percentage of total production	88.5	90.1	-	-
Utilization by dairies and by other milk processors for:				
- Total fresh consumption[a]	8518	9362	+ 9.9	+ 1.4
- Preserved milk products[b]	752	838	+ 11.4	+ 1.6
- Butter	1478	2193	+ 48.4	+ 5.8
- Cheese	1333	2030	+ 52.3	+ 6.2
- Chocolate crumb	205	219	+ 6.8	+ 0.9
Proportion of milk used in factories in total sales (%)	30.7	36.1	-	-

[a] Liquid milk, fresh cream, yoghourt, milk drinks (milk shakes etc.) and ice cream. [b] Whole milk powder, condensed whole milk of all kinds and tinned cream.

Source: See annexed Table 15*.

The demand for fresh milk has to be met primarily from these sales. Imports of fresh products are normally of only marginal importance for both technical (e.g. the problem of adequate chilling facilities) and economic reasons (e.g. the very high transport costs for liquid milk due to the high water content). The consumption of fresh milk in 1977 was forecast at 9 362 000 tons, of which 7 931 000 tons will be accounted for by liquid milk, 1 288 000 tons by fresh cream, and 143 000 tons by yoghourt, milk drinks (milk shakes etc.) and ice cream. After deducting the consumption of fresh milk from total milk sales we obtain for 1977 a manufacturing milk supply of 5 280 000 tons (1969/71: 3 768 000 tons; + 40.1 %).

It would be outside the scope of this study if we attempted to set out here even in incomplete form all the considerations which, as regards the "distribution" of the available supply of manufacturing milk, relate to the individual products. For this reason, we shall confine ourselves to a brief summary of the most important hypotheses and considerations concerning the various products:

- Condensed milk: The total per capita consumption of condensed milk in 1977 was estimated at 3.00 kg product weight; this included unsweetened condensed whole milk, sweetened condensed whole milk and sweetened condensed skimmed milk. The "dynamics" of the demand for condensed milk is determined almost exclusively by unsweetened condensed whole milk. The demand for sweetened condensed milk (whole and skimmed) is predominantly linked to traditional consumption habits (tea-drinking) so that a graphical trend extrapolation until 1977 seems plausible. The latter gave a per capita consumption of 0.35 kg for sweetened condensed whole milk and of 0.30 kg for sweetened condensed skimmed milk, thus leaving 2.35 kg (total consumption: 135 000 tons product weight; sweetened condensed whole milk: 20 000 tons) for unsweetened condensed whole milk. The demand for the latter on international markets is still expanding slowly in spite of competition from "recombined milk". Furthermore, the UK condensed milk industry would perhaps find marketing outlets opening up for it on the markets of a number

of other EEC countries (Germany, Italy). It must, however, be expected that the Netherlands and France in particular will as from 1973 intensify their efforts to obtain a larger share of the UK condensed milk market. (Duthc exporters have, in recent years, been able to achieve considerable marketing success with unsweetened condensed whole milk in the United Kingdom.) We shall, therefore, assume for 1977 a moderate rise in exports (to 40 000 tons) and a large increase in imports (to 25 000 tons) (see Table 17* for details). The trend in the demand for sweetened condensed whole milk on international markets is strongly downwards; in the other EEC countries the market for this type of condensed milk is very limited. Thus exports of sweetened condensed whole milk might increase hardly at all (5 000 tons in 1977). Imports too will be practically non-existent in 1977 owing to the overall declining market in the United Kingdom. From the assumptions on foreign trade and the estimates of domestic consumption we obtain a necessary production of 150 000 tons of unsweetened and 25 000 tons of sweetened condensed whole milk in 1977 (milk equivalent: 467 000 tons in all).

- Whole milk powder: The forecast for the consumption of whole milk powder in 1977 can be obtained directly from Table 12 (25 000 tons). The downward trend in domestic demand and the fact that Austrian suppliers, who until now have been by far the strongest competitors of the UK milk powder industry on the domestic market, will be practically excluded from the UK market by the levy arrangements, could cause a sharp contraction in imports of whole milk powder (assumption: 10 000 tons; for details see Table 17*)[1]. The exports of the United Kingdom milk powder industry are mainly intended for developing

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[1] At the end of January 1973 the Austrian Government, in connection with their request that the UK Government accord preferential treatment to Austrian exports of whole milk powder exports to the United Kingdom, even threatened to impose a "retaliatory duty" on UK exports of whisky to Austria. It is very doubtful whether Austria's request will meet with much sympathy from the other EEC member countries. We, therefore, saw no reason to revise our assumption on UK whole milk powder imports in 1977 (see also The Financial Times, London, 22 January 1973).

countries. The fact that they may receive EEC export refunds would enable UK exporters to pursue a decidedly more aggressive price policy on these markets. This, along with the increase in demand on the part of the developing countries on the world market, could result in a considerable rise in exports (to 15 000 tons in 1977). From the estimates on consumption and foreigns trade we obtain a necessary home production of 30 000 tons of whole milk powder (milk equivalent: 252 000 tons).

- Tinned cream: Estimate of consumption (from Table 12): 27 000 tons. Both Denmark and, above all, Ireland ought, under EEC conditions, to strive to obtain a larger share of the UK tinned cream market, so that we can reckon on a renewed rise in imports, which have been on the decline since 1965 (assumption for 1977: 10 000 tons; for details see Table 18*). On that basis, 17 000 tons (milk equivalent: 119 000 tons) will remain for domestic producers.

- Chocolate crumb: Estimate of consumption: 107 000 tons. As regards imports of chocolate crumb (exclusively from Ireland), we must content ourselves with a vague assumption, since at present it cannot be foreseen to what extent UK parent companies will, under EEC conditions, transfer production to their Irish subsidiaries (1977: 30 000 tons - this corresponds to the 1969/71 average: 31 600 tons; cf. Table 18*). Exports were intended solely for the US market; since imposition of import quotas by the US, the sales prospects for UK exporters have been rather unfavourable (assumption: 5 000 tons in 1977). Necessary home production: 82 000 tons (219 000 tons milk equivalent).

- Butter and cheese: A total of 4 223 000 tons of manufacturing milk (1969/71: 2 811 000 tons; + 50.2 %) will still be available for the production of butter and cheese after deduction of the whole milk requirements in the above sectors. As regards the "allocation" of quantity of manufacturing milk to butter and cheese production we assume that, normally, higher profits per unit of weight of raw milk used are to be obtained from processing whole milk into cheese than from converting it into butter. Thus

Table 31 - The supply of butter and cheese in the United Kingdom Ø 1969/71 and forecasts for 1977

('000 t)

	Ø 1969/71	1977	Percentage change Ø 1969/71 to 1977	Average annual percentage change Ø 1969/71 to 1977
BUTTER				
Production	26.1	90.2	+ 45.2	+ 5.5
Net imports	405.1	264.8	-	-
Consumption	470.0	355.0	- 24.5	- 3.9
Degree of self-sufficiency (%)	13.2	25.4	-	-
CHEESE				
Production	135.7	200.0	+ 47.4	+ 5.7
Net imports	156.6	75.0	-	-
Consumption	297.6	275.0	- 7.6	- 1.1
Degree of self-sufficiency (%)	45.6	72.7	-	-

Source: See annexed Table 16*.

butter manufacture would be a predominantly residually determined quantity (this can also be shown to be true in many continental European countries). Therefore, the projection of the domestic production of cheese is of decisive significance. The competitive position of UK cheese manufacturers on the domestic market should, under EEC conditions, improve rather than deteriorate. New Zealand, Australia and Canada will, owing to the levy arrangements, find it difficult to hold a significant share of the UK market after the expiration of the transitional period[1]. The Netherlands, France and Ireland in particular will certainly try to increase considerably their share of the UK market, whereby not so much competition with respect to prices as competition in terms of quality and marketing will predominate. As regards quality, the lead of domestic cheese manufacturers is already so great that foreign suppliers will find it difficult to catch up by 1977. Manufacturing milk prices in 1977 should not differ too much between the United Kingdom, on the one hand, and Ireland, France and the Netherlands, on the other should, with the result that this competitive factor (cost price of raw milk) will lose much of its significance. UK cheese manufactures have already set their sights on making appropriate use of the chances offered them under EEC conditions. The English Country Cheese Council announced, in September 1972, an advertizing campaign costing £ 500 000 for "English cheese" on television, in supermarkets and in other retail trade establishments, which is intended to improve the starting position of domestic cheese manufacturers in the market struggle expected after 1973[2]. Furthermore, the UK cheese industry should in future find substantially improved marketing opportunities in other EEC countries (Belgium, France, Germany and Italy above all). These considerations lead us to assume that cheese production will rise between 1969/71 and 1977 by 47 %, to 200 000 tons (for details see Table 16*). Just

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1 The amount of cheddar cheese which New Zealand was allowed to import to the United Kingdom on preferential terms (exemption from the normal levy on imports from third countries, whereby New Zealand exporters have to keep their prices above a minimum level) was fixed at 69 677 tons in 1973; it will rise to 15 484 tons in 1977.

2 See The Financial Times, London, 12 September 1972.

under 14 000 tons are already accounted for by the production of farm-house cheese, still leaving a quantity of about 186 000 tons (milk equivalent: 2 030 000 tons) for cheese production in dairies or cheese factories.

The residual quantity of manufacturing milk available for butter production can now be ascertained (see above): 4 223 000 - 2 030 000 = 2 193 000 tons in 1977; that would correspond to a butter production of about 90 000 tons fresh weight (1969/71: 62 000 tons; + 45 %).

The projected slight decrease in cheese consumption, together with the large rise in domestic production, result in a sharp decline of 52 % in the expected net import demand for cheese in 1977 to only 75 000 tons. As a result of the pronounced convergent trend in production and consumption up to 1977 net imports of butter too would fall considerably (1969/71: 405 000 tons; 1977: 265 000 tons; fall: 35 %), although the expected, price-induced decline in butter consumption is of the greatest significance here. Expressed in terms of the whole milk equivalent, the net import demand of the United Kingdom for butter and cheese in 1977 would amount to about 7 300 000 tons.

k. Eggs and poultrymeat

As already explained in detail, the estimate of the domestic production of eggs and poultrymeat is based primarily on the demand forecast for these two products. We have assumed that, in view of the clear lead in terms of efficiency of the UK egg and poultry industry over that in most other EEC countries, domestic production in 1977 will not only cover domestic consumption but also result in an admittedly modest surplus for export (cf. Tables 21* and 22*).

l. Apples, pears and tomatoes

The competitive position of UK producers of apples and pears is expected to deteriorate steadily between 1973 and 1977 (the period of the gradual removal of UK protective tariffs and quotas for fruit and vegetables imported from other EEC countries) vis-à-vis producers in France and Italy in particular. The main reason for this is that the average producer prices for apples and

Table 32 - The supply of apples, pears and fresh tomatoes in the United Kingdom Ø 1966/67 - 1968/69 and forecasts for 1977/78

('000 t)

	Ø 1966/67 - 1968/69	1977/78	Percentage change Ø 1966/67-1968/69 to 1977/78	Average annual percentage change Ø 1966/67-1968/69 to 1977/78
APPLES				
Total commercial production	355	290	- 18.3	- 2.0
Total net imports[a]	303	533	-	-
Domestic consumption[a]	658	823	+ 25.1	+ 2.3
Degree of self-sufficiency (%)	54.0	35.2	-	-
PEARS				
Total production	49	44	- 10.2	- 1.1
Total net imports[b]	121	137	-	-
Domestic consumption[b]	170	181	+ 6.5	+ 0.6
Degree of self-sufficiency (%)	28.8	24.3	-	-
FRESH TOMATOES[c]				
Production (calculated)	176	130	- 26.1	- 3.0
Net imports	163	249	-	-
Domestic consumption	339	379	+ 11.8	+ 1.1
Degree of self-sufficiency (%)	51.9	34.3	-	-

[a] Including preserved apples and cider apples

[b] Including preserved pears

[c] Calendar years Ø 1967/69 and 1977

Source: See annexed Tables 23*, 24* and 26*.

pears (dessert and cooking) in the Six are considerably lower than the comparable prices in the United Kingdom, and so UK producers must reckon with a corresponding fall until 1977 in the prices they obtain. (This refers solely to the long-term price level, the short-term and sometimes very sharp price changes due to varying harvest yields having been disregarded.) In addition, it must be remembered that French and Italian producers enjoy a strong competitive advantage over UK producers given merely the essentially more favourable climate in these countries. Apart from some growers in southern England, most UK apple and pear producers are, in terms of both technical competence and organization, inferior to producers in France, Italy, the Netherlands and Belgium. Marketing on a cooperative basis is only in its infancy in the United Kingdom so that in this field too there is a need to catch up with the above EEC countries. Under these circumstances, it must be expected that many UK apple and pear producers will have to cease business after 1973. For 1977, therefore, we have assumed a reduction in the apple-growing area of 39 % to 30 000 ha and a reduction in the pear-growing area of 25 % to 7 100 ha (for details see Tables 23* and 24*). Since a significant increase in yields per unit area is hardly to be expected, the assumed reduction in the cultivated area would be fully reflected in total production. An increase in the consumption of apples as a result of a fall in prices was forecast, and, in view of the appreciably lower production, this would result in a sharp rise in the net import demand of 75 % between 1966/68 and 1977 (to 533 000 tons). In the case of pears, however, an increase in net import demand of only 13 % is estimated for the same period since, according to the demand forecast, pear consumption will not expand further by 1977.

As regards commercial tomato-growing under glass, it is unlikely, for reasons similar to these set out in respect of producers of apples and pears, that UK producers will maintain their share of the market after 1973. It was assumed that total production would fall by 26 % to 130 000 tons between 1967/69 and 1977 (cf. Table 26*). In contrast, it is forecast that the total consumption of tomatoes will grow rapidly so that, in the case of tomatoes too, a considerable increase in the net import demand can be expected (+ 35 % to about 870 000 tons between 1967/69 to 1977).

V. Forecasts of the sale value of some important output items in the national agricultural accounts

In principle, it should be pointed out that "well-founded forecasts" of UK agricultural receipts in the EEC in 1977 could be drawn up only for those products for which detailed supply forecasts had already been worked out in Part IV of the study (and for which, by way of necessity, hypotheses on the producer prices in 1977 had also been formulated). As Table 33 shows, during the years 1967-69 receipts from the sales of these products amounted, on average, to more than 80 % of the total receipts of UK farmers; to that extent, Table 33 does give at least an idea of the expected changes which ought primarily to determine total receipts in 1977.

It is quite simple to estimate the receipts from the sales of the relevant products in 1977 if for the reference period adequate information is available on the price and quantity components on which the receipts for the individual items are based. Then it is necessary merely to subtract the quantity in question for 1977 from the supply forecasts and to multiply it by the hypothetical average producer price for 1977 (likewise adjusted to the price defined for the reference period). Unfortunately, we possess no information on the quantity and price components which were used to draw up the agricultural accounts of the United Kingdom. In order to make any estimate at all of the receipts in 1977 we were compelled to construct a model of our own showing output quantities and prices for the reference period. The average 1967/69 receipts worked out on this basis are compared in Table 33 with the figures provided by the United Kingdom Central Statistical Office. On the whole, they tally to a very large extent; there was only one important discrepancy, and that was to be found under the heading "Cattle and beef". This discrepancy could, however, be explained methodically and was taken into consideration explicitly in the estimate for 1977.

With regard to the quantities of output used, it should be pointed out that in the case of wheat, barley, oats and potatoes it is the total sales of

Table 33 - The receipts of UK agriculture from the sale of important products ø 1967/69 and forecasts for 1977[a] (£ m)

		ø 1967/69	1977	Percentage change ø 1967/69 to 1977		
				Quantity	Price	Income
Wheat	- own calculation	84.3[e]	272.8	+ 72.8	+ 87.2	+ 223.6
	- official statistics	(83.3)[e]	-	-	-	-
Barley	- own calculation	134.7[e]	238.4	- 3.6	+ 83.5	+ 77.0
	- official statistics	(134.1)[e]	-	-	-	-
Oats	- own calculation	8.5[e]	9.4	- 27.9	+ 53.3	+ 10.6
	- official statistics	(8.0)[e]	-	-	-	-
Sugar beet	- own calculation	44.9[f]	49.0	- 7.2	+ 17.4	+ 9.1
	- official statistics	(42.0)[f]	-	-	-	-
Potatoes	- own calculation	86.2[f]	89.0	- 5.9	+ 9.7	+ 3.2
	- official statistics	(92.3)[f]	-	-	-	-
Cattle and beef	- own calculation	291.2	771.5	+ 28.3	+106.5	+ 164.9
	- official statistics	(319.1)	-	-	-	-
Difference (own calculation - official statistics): almost entirely receipts from the sale of Irish store cattle which, after being imported into the United Kingdom, are fattened)		(27.9)	(26.8)	(- 53.5)	(+106.5)	(- 3.9)
Sheep, mutton and lamb	- own calculation	89.6	215.9	+ 17.6	+105.0	+ 141.0
	- official statistics	(87.0)	-	-	-	-
Pigs for slaughter	- own calculation	231.0	314.5	- 3.4	+ 40.9	+ 36.1
	- official statistics	(219.1)	-	-	-	-
Milk and milk products						
Sales through the Milk Marketing Boards	- own calculation	421.3	868.3	+ 23.8	+ 66.4	+ 106.1
Farm household consumption	- own calculation	22.1	24.0	- 34.7	+ 66.4	+ 8.1
Farmhouse cheeses	- own calculation	2.7	10.3	+ 35.3	+180.6	+ 281.5
Milk and milk products: total	- own calculation	446.1	902.6	-	-	+ 102.3
	- official statistics	(449.5)	-	-	-	-
Eggs[c]	- own calculation	177.0[d]	220.8	+ 12.5	+ 10.9	+ 24.7
	- official statistics	(192.4)[d]	-	-	-	-
Poultrymeat	- own calculation	109.1	281.9	+ 66.8	+ 54.9	+ 158.4
	- official statistics	(110.5)	-	-	-	-
Total receipts of UK agriculture	- official statistics	(2151.0)	-	-	-	-
Receipts from the products covered	- own calculation	1730.5	3392.6	-	-	+ 96.0
	- official statistics	(1737.3)	-	-	-	-
Percentage of total receipts accounted for by the products covered (basis: official statistics)		80.8	-	-	-	-

[a] Estimated on the basis of the projections of production and utilisation and also on the basis of assumptions on producer prices for 1977/78. [b] Consumption of liquid milk on farms (including direct sales from the farm), production of farmhouse butter, fresh cream. [c] Hen and duck eggs. [d] The very considerable difference between our own calculation and the official statistics is principally because in our own calculation all the hen eggs could be assessed only on the basis of the average producer price of the British Egg Marketing Board, although some of the eggs sold freely (i.e. not through the Egg Marketing Board) are presumably sold at considerably higher prices. [e] Average for the 1966/67 - 1968/69 farm years. [f] Average for the 1967/68 - 1969/70 farm years.

Source: Central Statistical Office, Annual Abstract of Statistics, No 107, London, H.M.S.O., p. 204; Own calculations and estimates.

also Table 33). According to our forecasts, therefore, the receipts of UK farmers from the sale of their most important products would, under EEC conditions, increase much more sharply than in the reference period (1959/60 to 1968/69: +36.2 %).

Particularly in the case of cereals and products of pasture farming (cattle, sheep, milk) a sharp increase in receipts can be expected (between 1967/69 and 1977: + 129 % in the case of cereals and + 124 % in the case of products of pasture farming). About 75 % of this increase will result from the upward adjustment of UK producer prices to the EEC level and only about 25 % from increased output (the latter will be due mainly to the higher producer prices).

ANNEX

List of the symbols used in the analysis of supply in the United Kingdom

CEREALS MODEL

A^w : Area under wheat in June ('000 ha)

P(w) or P(b) : Average national total producer price (market price plus guarantee payments) for wheat or barley, where appropriate (£/100 kg)

$Q_1(\frac{R}{S})$: Quotient found on dividing the amount of precipitation (mm) by sunshine (hours per day) in England and Wales in October of the preceding year

A^b : Area under barley in June ('000 ha)

POTATO MODEL

A^{mp} : Area under maincrop potatoes in June ('000 ha)

P(mp) : Average producer price of the Potato Marketing Board for maincrop ware potatoes

$Q_2(\frac{R}{S})$: Quotient found on dividing the amount of precipitation (mm) by sunshine (hours per day) in April in the United Kingdom (weightings: England and Wales 0.75, Scotland 0.15, Northern Ireland 0.10)

MAT : Mean daily air temperature at sea level in April in the United Kingdom (weightings: see above)

CATTLE MODEL

P(bf) or P(s) : Average national total producer price (market price plus guarantee payments) for fat cattle or for fat sheep and fat lambs, where appropriate (£/100 kg live weight)

P(m) : Average pool price of all sales of liquid and manufacturing milk through the Milk Marketing Boards (£/100 kg at natural fat content, free from dairy)

P(p) : Average national total producer price (market price including guarantee payments) for fattened pigs of all sorts (bacon and pork pigs, but excluding sows and boars) (£/100 kg live weight)

DC : Number of dairy cows in June ('000)

D^{bc} : Dummy variable for hill and beef cow subsidies (cf. text for details)

BC	: Stock of beef cows in June ('000)
TC	: Total stock of cows in June ('000)
TCC	: Total available supply of calves ('000)
SLCV	: Domestic slaughterings of new-born calves ('000)
D^c	: Dummy variable for the calf subsidy (cf. text for details)
EXCV	: Export of live calves ('000)
TCCR	: Total number of calves retained as replacements for the stock of cows and bulls for service and total number of these retained for fattening or for export as store or fat cattle
SLCW	: Domestic cow slaughterings ('000)
EXCW	: Export of live cows for slaughter ('000)
CWR	: Total number of calves required as replacements for the stock of cows
BS	: Stock of bulls for service in June ('000)
SLBS	: Domestic slaughterings of bulls for service ('000)
BSR	: Inflow into the stock of bulls for service ('000)
SLFC	: Domestic slaughterings of home-bred fat cattle ('000)
EXSF	: Exports of home-bred fat and store cattle
BEZB	: Gross domestic production of beef and veal ('000 t)
MP	: Total milk production ('000 t)
AMY	: Average milk yield per dairy cow (t)

SHEEP MODEL

EW	: Stock of ewes in June ('000)
D^{hs}	: Dummy variable for the hill sheep subsidy (cf. text)
TLC	: Number of lambs reared ('000)
EWR	: Inflow into the ewe stock ('000)
SLEW	: Domestic slaughterings of ewes ('000)
R	: Stock of rams for service in June ('000)
SLR	: Domestic slaughterings of rams for servide ('000)
RR	: Inflow into the stock of rams for service ('000)
MLF	: Total number of lambs remaining for domestic fattening and for export as store of fat lambs ('000)
SLML	: Slaughterings of fat lambs from the domestic stock ('000)

EXML : Exports of store and fat lambs from domestic stock ('000)

BEZS : Gross domestic production of mutton and lamb ('000 t)

PIG MODEL

SW : Stock of sows in June ('000)

P(e) : Average producer price of the Egg Marketing Board for top-quality hen eggs (£/100 kg; including the guarantee payments of the Government to the Egg Marketing Board)

TSSP : Total available supply of slaughter pigs

TSPP : Slaughter pigs made available at home for pork production ('000)

CP : (Forecast) domestic consumption of pork ('000 t slaughter weight)

α : Assumed degree of self-sufficiency in pork

TSBP : Slaughter pigs used at home for bacon production ('000)

EXLP : Exports of live pigs ('000)

BEZP : Gross domestic production of pork and bacon in slaughter weight ('000 t)

NEP : Net domestic production of pork in slaughter weight ('000 t)

NEB : Net domestic production of bacon in slaughter weight ('000 t)

Table 1* - Supply of cereals for human consumption in the United Kingdom 1958/59 - 1970/71[a] and forecasts for 1977/78
('000 t)

	1958/59	1959/60	9160/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total supply of cereals for human consumption from domestic sources for the domestic market	1 123	1 497	1 468	1 454	1 720	1 646	1 960	1 698	1 788	1 861	1 632	1 821		2 561
Wheat for milling	961	1 311	1 300	1 282	1 539	1 484	1 787	1 541	1 647	1 710	1 483	1 671	1 424	2 443
Barley (for roasting, milling, as pearl and flaked barley etc.)	50	50	50	50	50	50	50	37	37	37	37	37		40
Oats for milling	101	128	110	112	120	98	107	107	100	109	108	108		70
Rye for milling; for production of germ[b]	11	8	8	10	11	14	16	13	4	5	4	5		8
Total supply of cereals for human consumption from foreign sources for the domestic market	4 421	3 968	4 163	3 954	3 779	3 846	3 496	3 994	3 703	3 568	3 916			2 786
Wheat for milling	4 176	3 752	3 921	3 702	3 528	3 569	3 244	3 680	3 443	3 309	3 634	3 476	3 587	2 443
Barley (for roasting, milling, for flaked barley[c])	10	10	9	8	9	12	10	8	7	6	7	10		4
Oats for milling	72	15	29	26	23	30	18	24	20	8	7	5		5
Maize for the manufacture of corn flakes	91	116	111	108	115	153	131	143	149	152	162	170	183	208
Rice for direct consumption and for use in other foodstuffs, puffed rice etc.	66	68	86	105	100	77	90	93	77	85	98			115
Rye for milling; for production of germ[d]	6	7	7	5	4	5	3	6	7	8	8	15		11
Total supply of cereals for human consumption from domestic and foreign sources for the domestic market	5 544	5 465	5 631	5 408	5 499	5 492	5 456	5 652	5 491	5 429	5 548			5 347
Proportion of home-grown cereals in total supply (%)	20.3	27.4	26.1	26.9	31.3	30.0	35.9	30.0	32.6	34.3	29.4			47.9
Total imports of products containing cereals for human consumption in grain equivalent	583	529	547	580	481	466	373	308	234	139	125			125
Wheat flour	569	515	533	564	464	450	356	288	212	117	103	118	117	100
Products containing wheat flour or wheat meal (bread, biscuits etc.)	14	14	14	16	17	16	17	20	22	22	22			25
Total exports of products containing cereals for human consumption in grain equivalent	32	26	28	29	33	34	33	35	42	46	49			60
Wheat flour	13	6	7	8	11	10	6	6	11	11	10	18		10
Products containing wheat flour or wheat meal (bread, biscuits etc.)	19	20	21	21	22	24	27	29	31	35	39			50
Total net domestic consumption of home-grown and foreign cereals for human consumption[e]	6 095	5 968	6 150	5 959	5 947	5 924	5 796	5 925	5 683	5 522	5 624			5 412
Net domestic consumption of home-grown cereals	1 091	1 471	1 440	1 425	1 687	1 612	1 927	1 663	1 746	1 815	1 583			2 501
Proportion of home-grown cereals for human consumption in net domestic consumption (%)	17.9	24.6	23.4	23.9	28.4	27.2	33.2	28.1	30.7	32.9	28.1			46.2

[a] Farm years beginning 1 July. [b] Own estimate (assumption: ≈75 % of total disposals of home-grown rye for human consumption and for distilling is accounted for by human consumption). [c] Own estimate (assumption: ≈ 10 % of total disposals of imported barley for food and for brewing and malting is accounted for by food). [d] Own estimate (assumption: ≈ 75 % of the total disposals of foreign rye for human consumption and for distilling is accounted for by human consumption). [e] Own estimate: total supply of home-grown and foreign cereals for the domestic market less exports and plus imports of flour and products containing cereals.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulletin , London, various issues; Commonwealth Secretariat, Rice Bulletin, London, various issues; Own calculations and estimates.

Table 2* - Supply of cereals for animal feed in the United Kingdom 1958/59 - 1970/71[a] and forecasts for 1977/78
('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total supply of cereals for animal feed from domestic sources for the domestic market	5 613	5 790	6 320	6 140	7 798	7 709	8 633	9 089	8 350	9 609	9 423			
Total home-grown wheat for animal feed	1 540	1 295	1 493	1 146	2 015	1 257	1 783	2 331	1 585	1 849	1 814			
used on farm	172	26	31	108	23	81	39	112	139	121	107			300
sales to feed industry	1 368	1 269	1 462	1 038	1 992	1 176	1 744	2 219	1 446	1 728	1 707			
Total home-grown barley for animal feed	1 912	2 393	2 818	3 255	4 142	5 101	5 624	5 645	5 759	6 571	6 457			
used on farm	1 071	1 253	1 452	1 503	1 874	2 281	2 618	2 601	2 642	2 784	2 690			4 000
sales to feed industry	841	1 140	1 366	1 752	2 268	2 820	3 006	3 044	3 117	3 787	3 767			
Total home-grown oats for animal feed	1 876	1 838	1 782	1 563	1 486	1 231	1 121	1 019	908	1 066	995			
used on farm	1 586	1 539	1 475	1 280	1 259	1 027	925	858	760	886	814			887
sales to feed industry	290	299	307	283	227	204	196	161	148	180	181			150
Total home-grown maslin for animal feed	279	263	222	172	154	119	102	91	93	118	152			190
Total home-grown rye for animal feed	6	1	5	4	1	1	3	3	5	5	5			5
Total supply of cereals for animal feed from foreign sources for the domestic market	4 585	4 107	3 890	4 522	4 064	3 578	3 517	3 635	3 495	3 451	3 413			
Imported maize for animal feed[b]	2 426	2 541	2 447	3 136	3 183	2 485	2 343	2 429	2 353	2 755	2 311	1 867	1 567	
Imported barley for animal feed	1 026	759	854	523	213	291	196	128	104	69	209	837		
Imported wheat for animal feed	395	220	208	289	241	539	578	553	522	491	722	1 138		
Imported oats for animal feed	98	22	18	16	26	0	8	6	7	5	9	6		
Imported sorghum	640	565	363	558	401	263	392	519	504	125	156	77		
Imported rice for animal feed	-	-	-	-	-	-	-	-	5	6	6			
Total disposals of home-grown and foreign cereals for animal feed on the domestic market[c]	10 198	9 897	10 210	10 662	11 862	11 287	12 150	12 724	11 845	13 060	12 836			
Proportion of home-grown cereals for animal feed in total domestic consumption (%)	55.0	58.5	61.9	57.6	65.7	68.3	71.1	71.4	70.5	73.6	73.4			

[a] Farm years beginning 1 July. [b] Including maize flour for animal feed purposes (grain equivalent). [c] In part, changes in stocks disregarded.

Sources: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulleting, London, various issues; Commonwealth Secretariat, Rice Bulleting, London, various issues; Own calculations and estimates.

Table 3* - Supply of cereals for industrial use in the United Kingdom 1958/69 - 1970/71[a] and forecasts for 1977/78

('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total supply of home-grown cereals for industrial use for the domestic market	882	1 007	1 016	1 080	1 111	1 066	1 300	1 237	1 359	1 276	1 247			1 738
Total grain for malting	761	867	895	933	955	907	1 119	1 044	1 098	997	965			1 230
barley for malting	758	862	889	931	949	904	1 116	1 041	1 095	994	962			1 200
wheat for malting	3	5	6	2	6	3	3	3	3	3	3			30
Total grain for distilling	116	135	116	142	151	154	176	188	256	274	277			503
barley for distilling	113	132	113	139	148	149	171	184	255	273	276			500
rye for distilling	3	3	3	3	3	5	5	4	1	1	1	1		3
Other wheat for industrial use	5	5	5	5	5	5	5	5	5	5	5	5		5
Total supply of cereals for industrial use from foreign sources for the domestic market	607	717	821	814	873	1 001	1 025	1 112	1 112	1 049	1 179			1 325
Total foreign grain for distilling and malting[c]	356	387	431	451	484	549	579	608	599	550	595			575
Maize for starch and glucose production	251	330	390	363	389	452	446	504	513	499	584	552	607	750
Imported wheat for distilling and malting[d]	55	50	52	52	55	54	58	61	65	66	67	68		45
Imported barley for distilling and malting[e]	85	85	78	76	78	107	87	72	58	53	61	90		21
Imported rye for distilling and malting[f]	2	2	2	1	1	1	1	2	2	3	3	5		4
Maize for distilling and malting	200	237	284	307	335	373	419	451	452	414	458	548	578	500
Rice for distilling, brewing and starch production	14	13	15	15	15	14	14	22	22	14	6			5
Total supply of home-grown and foreign cereals for industrial use for domestic market	1 489	1 724	1 837	1 894	1 984	2 067	2 325	2 349	2 471	2 325	2 426			3 063
Proportion of home-grown cereals in total industrial disposals (%)	59.2	58.4	55.3	57.0	56.0	51.6	55.9	52.7	55.0	54.9	51.4			56.7

[a] Farm years beginning 1 July. [b] Own estimate (assumption: ≈ 25 % of total disposals of home-grown cereals for food and distilling). [c] Including small quantities of imported wheat for other industrial purposes. [d] Own estimate (assumption: ≈ 90 % of total disposals of foreign barley for food, distilling and malting). [e] Own estimate (assumption: ≈ 25 % of total disposals of foreign rye for food and distilling). [f] Including small quantities of rice for starch production.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulletin, London, various issues; Commonwealth Secretariat, Rice Bulletin, London, various issues; Own calculations and estimates.

Table 4* - Supply of wheat in the United Kingdom 1958/69 - 1971/72[1] and forecasts for 1977/78

('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Area under cultivation ('000 ha)	894	781	851	739	913	780	893	1026	906	933	978	833	1010	1 096	1 400
Yield (100 kg/ha)	30.9	36.3	35.8	35.4	43.6	39.0	42.4	40.7	38.4	41.8	35.5	40.4	41.9	44.0	45.0
Total production	2754	2830	3040	2614	3974	3046	3793	4171	3475	3902	3469	3364	4236	4 824	6 300
Farmers' own consumption[a]	357	224	222	319	225	292	284	340	367	360	314				652
Feed[b]	172	26	31	108	23	81	39	112	139	121	107				300
Seed[c]	150	162	152	178	152	173	197	176	184	190	163	199			273
Wastage[d]	35	36	39	33	50	38	48	52	44	49	44	42	52		79
Total farm sales	2397	2606	2818	2295	3749	2754	3509	3831	3108	3542	3155				5 648
to the milling industry	1000	1310	1383	1232	1589	1545	1736	1560	1632	1782	1423				2 443
for malting	3	5	6	2	6	3	3	3	3	3	3				30
for industrial use	5	5	5	5	5	5	5	5	5	5	5				5
for feed	1368	1269	1462	1038	1992	1176	1744	2219	1446	1728	1707				3 150
for export	12	4	20	6	138	10	3	3	5	5	2				
wastage by processors and distributive trade	10	13	14	12	17	15	17	15	17	19	15				20
Total exports[e]	44	30	47	34	174	44	41	45	51	57	62				
in the form of grain	12	4	19	5	141	10	8	10	9	11	13	6			
in the form of flour	13	6	7	8	11	10	6	6	11	11	10	18			10
in the form of products containing meal and flour[f,g]	19	20	21	21	22	24	27	29	31	35	39				50
Total imports[f,g]	5313	4482	4719	4699	4266	4624	4201	4685	4197	4089	4593				
in the form of grain	4730	3953	4172	4119	3785	4158	3828	4377	3963	3950	4468	4681	5268		
in the form of flour	569	515	533	564	464	450	356	288	212	117	103	118	117		100
in the form of products containing meal and flour[f,g]	14	14	14	16	17	16	17	20	22	22	22				25
Total net imports	5269	4452	4672	4665	4092	4580	4160	4640	4146	4032	4531				
Opening stocks (distributive trade+processors)[h]	.	.	1022	1166	1200	1195	1228	1122	1236	1164	1215	1156	1088		
Closing stocks (distributive trade+processors)[h]	.	1022	1166	1200	1195	1228	1122	1236	1164	1215	1156	1088	1083		
Total available supply[i] (= total domestic disposals)	8023[j]	7282[j]	7568	7245	8071	7593	8059	8697	7693	7883	8059				
Milling percentrage for home-grown wheat	36.3	46.3	45.5	47.1	40.0	50.7	45.8	37.4	47.0	45.7	41.0				38.8
Milling industry:															
total milled	5137	5063	5221	4984	5067	5053	5031	5221	5090	5019	5117	5147	5011		4 886
home-grown wheat	961	1311	1300	1282	1539	1484	1787	1541	1647	1710	1483	1671	1424		2 443
foreign wheat	4176	3752	3921	3702	3528	3569	3244	3680	3443	3309	3634	3476			2 443
extraction rate (%)	71.6	72.4	71.8	72.3	72.3	72.2	72.7	71.9	72.7	73.8	72.6	72.7	74.4		73.0
Flour production ('000t product weight)	3676[k]	3668	3748	3603	3665	3646	3659	3756	3700	3702	3714	3743	3728		3 567
Domestic flour consumption (kg product weight)	4066	4036	4091	3993	3991	3946	3909	3967	3842	3794	3796				3 614
Per capita consumption (kg product weight)	78,5	77,4	77,8	75,2	74,6	73,3	72,1	72,8	70,1	68,8	68,5				63,0
Feed industry:															
total disposals	1763	1489	1670	1327	2233	1715	2322	2772	1968	2219	2429				
of which wheat	395	220	208	289	241	539	578	553	522	491	722	1138			
Other disposals:															
foreign wheat for the manufacture of malt and alcohol	55	50	52	52	55	54	58	61	65	66	67	68			45

[a] Consumption for food purposes (farmhouse bread) negligible as hardly any wheat is now milled on farms. [b] Including domestic seed marketed (purchases from and sales to the seed trade). [c] Official estimate (1.25 % of total crop). [d] Excluding seed grain. [e] Including re-exports. [f] Mainly noodles, bread, pastry, cakes, biscuits. [g] Converted from calendar years (K) to farm years by Wt/t-1 ≅ ½ (Kt+ Kt - 1). [h] Wheat and wheat flour in wheat equivalent. [i] Total production + net imports ± changes in stocks. [j] Excluding changes in stocks. [k] Domestic production ± net imports of flour and products containing flour (± changes in stocks; statistics for these are somewhat incomplete). [1] Farm years beginning 1 July.

Source: Ministry of Agriculture, Fisheries and Food, Statistics Division ID, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulleting, London, various issues; Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Own calculations and estimates.

Table 5* - Supply of barley in the United Kingdom 1958/69 - 1971/72[a] and forecasts for 1977/78

('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Area under cultivation ('000 ha)	1 115	1 238	1 365	1 549	1 614	1 907	2 036	2 183	2 481	2 439	2 401	2 413	2 245	2 290	2 400
Yield (100 kg/ha)	28.9	33.0	31.6	32.6	36.4	35.1	36.9	37.5	35.2	37.8	34.4	35.9	33.6	37.4	41.0
Total production	3 221	4 080	4 309	5 054	5 865	6 705	7 522	8 191	8 723	9 214	8 270	8 663	7 529	8 576	9 840
Farmers' own consumption	1 305	1 514	1 750	1 819	2 245	2 683	3 050	3 089	3 128	3 271	3 171				4 494
feed	1 071	1 253	1 452	1 503	1 874	2 281	2 616	2 601	2 642	2 784	2 690				4 000
seed[b]	201	220	255	265	312	335	357	406	399	395	399	373			396
wastage[c]	33	41	43	51	59	67	75	82	87	92	82	87	75		98
Total farm sales[d]	1 915	2 566	2 559	3 234	3 620	4 019	4 472	5 086	5 594	5 941	5 097				5 346
for malting	758	862	889	931	949	904	1 116	1 041	1 095	994	962				1 200
for the manufacture of flaked and roasted barley	25	25	25	25	25	25	25	25	25	25	25				
for the manufacture of pearl barley	25	25	25	25	25	25	25	12	12	12	12				40
for distilling	113	132	113	139	148	149	171	184	255	273	276				500
for feed	841	1 140	1 366	1 752	2 268	2 820	3 006	3 044	3 117	3 787	3 767				
for export	137	361	124	340	185	79	108	751	1 052	819	35				3 566
wastage (by processors and distributive trade)	16	21	17	22	20	17	21	29	38	31	20				40
Total exports[e,f]	186	414	180	399	243	137	171	735	1 173	884	178				
in the form of grain	137	361	124	341	185	76	111	679	1 110	796	76	12			
in the form of malt[g]	49	53	56	58	58	61	60	56	63	88	102				150
Total imports[e]	1 142	829	967	542	301	432	292	219	212	123	393				
in the form of grain	1 141	828	965	539	297	426	278	195	191	109	372	957	1 052		
in the form of malt[g]	1	1	2	3	4	6	14	24	21	14	21				20
Total net imports (-) or exports (+)	- 956	- 415	- 787	- 143	- 58	- 295	- 121	+ 516	+ 961	+ 761	- 215				
Opening stocks (distributive trade and processors)	.	.	289	356	307	483	427	509	523	494	559	490	549		
Closing stocks (distributive trade and processors)	.	289	356	307	483	427	509	523	494	559	490	549	508		
Total available supplies (= total domestic disposals)	4 177[i]	4 495[i]	5 029	5 246	5 747	7 056	7 561	7 661	7 791	8 388	8 554				
Total disposals for food, distilling and malting	1 016	1 139	1 139	1 204	1 234	1 222	1 434	1 342	1 452	1 363	1 343	1 528	1 740		
manufacture of pearl, roasted and flaked barley, from home-grown barley	50	50	50	50	50	50	50	37	37	37	37				40
manufacture of malt and alcohol from home-grown barley	871	994	1 002	1 070	1 097	1 053	1 287	1 225	1 350	1 267	1 238				1 700
foreign barley for food, malting and the manufacture of alcohol[k]	95	95	87	84	87	119	97	80	65	59	68	100			25
Feed industry															
total disposals	1 867	1 899	2 220	2 275	2 481	3 111	3 202	3 172	3 221	3 856	3 976				
foreign barley	1 026	759	854	523	213	291	196	128	104	69	209	837			

[a] Farm years beginning 1 July. [b] Including seed marketed (purchases from and sales to the seed trade) and including 50 % of seed requirements for meslin. [c] Official estimate (1 % of total crop). [d] Excluding seed grain. [e] Excluding foreign trade in pearl, roasted and flaked barley, which is of only marginal importance and is, therefore not listed separately in foreign trade statistics. [f] Including re-exports. [g] Converted from calendar years (K) to farm years (W) by $W_{t/t-1} \simeq \frac{1}{2}(K_t + K_{t-1})$. [h] Total production ± foreign trade balance ± changes in stocks. [i] Excluding changes in stocks. [k] It is impossible, for statistical reasons, to differentiate clearly between the amount of imported barley used for distilling and malting, and that used for food.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulleting, London, various issues; Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Own calculations and estimates.

Table 6* - Supply of oats in the United Kingdom 1958/69 - 1971/72[a] and forecasts for 1977/78
('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Area under cultivation ('000 ha)	897	822	799	701	615	524	455	410	367	410	382	382	376	363	300
Yield (100 kg/ha)	24.2	27.0	26.2	26.4	28.9	27.9	29.6	30.0	30.5	33.8	32.0	34.2	32.4	37.7	40.0
Total production	2 172	2 222	2 091	1 851	1 775	1 461	1 346	1 232	1 120	1 386	1 224	1 308	1 217	1 368	1 200
Farmers' own consumption	1 770	1 719	1 665	1 448	1 406	1 153	1 039	961	869	1 000	926				975
feed[b]	1 586	1 539	1 475	1 280	1 259	1 027	925	858	760	886	814				887
seed[b]	146	141	153	135	116	101	91	82	90	90	91	92			66
wastage[c]	38	39	37	33	31	25	23	21	19	24	21	23	22		22
Total farm sales[d]	403	504	424	404	369	310	305	271	251	384	300				225
to milling industry	101	129	108	113	120	100	105	107	100	117	99	117			70
to feed industry	290	299	307	283	227	204	196	161	148	180	181				150
for export	9	70	6	5	18	3	1	-	-	81	16				
wastage (by processors and distributive trade)	3	6	3	3	4	3	3	3	3	6	4				5
Exports[e]	9	70	6	5	18	4	1	-	-	73	26	4			
Imports[e]	185	25	48	43	54	21	23	34	25	5	25	10			
Net imports (-) or net exports (+)[f]	- 176	+ 45	- 42	- 38	- 36	- 17	- 22	- 34	- 25	+ 68	+ 1	- 6			
Opening stocks (distributive trade and processors)	.	.	45	46	40	51	40	35	38	35	37	27	35		
Closing stocks (distributive trade and processors)	.	45	46	40	51	40	35	38	35	37	27	35	31		
Total available supply (= total domestic disposals)	2 348[g]	2 177[g]	2 132	1 895	1 800	1 489	1 373	1 263	1 148	1 316	1 233	1 306			
Milling industry:															
total milled	173	143	139	138	143	128	125	131	120	117	117	113	115		75
home-grown oats	101	128	110	112	120	98	107	107	100	109	108	108			70
foreign oats	72	15	29	26	23	30	18	24	20	8	7	5			5
extraction rate (%)	53.8	57.3	56.8	57 2	58.0	57.8	57.6	58.0	59.2	59.0	59.0	61.9	59.1		60.0
production (product weight) of rolled oats	93	82	79	79	83	74	72	76	71	69	69	70	68		45
domestic consumption (product weight) of rolled oats[h]	92	87	80	80	81	79	76	74	70	69	69				45
per capita consumption (kg)[h]	1.77	1.66	1.52	1.50	1.52	1.47	1.41	1.36	1.27	1.25	1.25				0.78
Feed industry:															
total disposals	388	321	325	299	253	204	204	165	155	185	190				
foreign oats	98	22	18	16	26	0	8	6	7	5	9	6			

[a] Farm years beginning 1 July. [b] Including seed marketed (purchases from and sales to the seed trade) and including 50 % of seed requirements for mesling. [c] Official estimate (1.75 % of total crop. [d] Excluding seed grain. [e] Excluding external trade in rolled oats and other products containing oats which are not listed separately in foreign trade statistics. [f] Total production ± foreign trade balance ± changes in stocks. [g] Excluding changes in stocks. [h] Data only available for calendar years (K); converted to farm years (W) by $W_{t/t-1} \approx \frac{1}{2}(K_t + K_{t-1})$.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulleting, London, various issues; Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Own calculations and estimates.

Table 7* - Supplies of maize in the United Kingdom 1958/69 - 1970/71[a] and forecasts for 1977/78

('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total imports	3 123	3 292	3 121	4 012	3 911	3 558	3 267	3 585	3 445	3 858	3 513	3 153		
Grain maize	2 966	3 213	3 093	4 001	3 892	3 486	3 190	3 546	3 384	3 801	3 477	3 101	2 900	
Maize flour and meal	157	79	28	11	19	72	77	39	61	57	36	52		
Re-exports[b]	2	4	4	4	4	4	5	10	12	15	13	17	15	15
Total net imports	3 121	3 288	3 117	4 008	3 907	3 554	3 262	3 575	3 433	3 843	3 500	3 136	2 885	
Opening stocks (distributive trade and processors)	.	.	.	189	297	200	253	140	203	217	218	198	203	
Closing stocks (distributive trade and processors)	.	.	189[d]	297	200	253	140	203	217	218	198	203	138	
Total available supply (= total domestic disposals)	3 121[d]	3 288[d]	3 117[d]	3 900	4 004	3 501	3 375	3 512	3 419	3 842	3 520	3 131	2 950	
Food industry:														
Corn flakes	91	116	111	108	115	153	131	143	149	152	162	170	183	208
Per capita consumption (kg)	1.76	2.22	2.11	2.04	2.15	2.84	2.42	2.62	2.72	2.76	2.92	3.06	3.28	3.63
Industrial processing:														
Distilling, malting	200	237	284	307	335	373	419	451	452	414	458	548	578	500
Starch and glucose production	251	330	390	363	389	452	446	504	513	499	584	552	607	750
Feed industry:														
Total use	2 426[f]	2 541[f]	2 447[f]	3 136	3 183	2 485	2 343	2 429	2 353	2 755	2 311	1 867	1 567	
Grain maize[e]	2 331[f]	2 464[f]	2 387[f]	3 083	3 146	2 451	2 301	2 374	2 243	2 687	2 284	1 837	1 550	
Maize flour	95[f]	77[f]	60[f]	53	37	34	42	55	110	68	27	30	16	

[a] Farm years beginning 1 July. [b] 1958/59 - 1963/64 figures based on figures for calendar years but excluding maize flour and meal. [c] Net imports ± changes in stocks. [d] Excluding changes in stocks. [e] Including wastage. [f] Estimate.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulletin, London, various issues; Secretary of State for the Home Department, Secretary of State for Scotland, Secretary of State for Wales and the Minister of Agriculture, Fisheries and Food, Annual Review and Determination of Guarantees, London, various issues; Own calculations and estimates.

Table 8* - Supply of "other cereals" in the United Kingdom 1958/59 - 1971/72[a] and forecasts for 1977/78

('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Imports of sorghum (= total domestic disposals for animal feed)	640	565	363	558	401	263	392	519	504	125	156	77			
Meslin															
Area under cultivation ('000 ha)	115	95	83	60	51	40	32	30	30	36	45	63	79	54	55
Yield (100 kg/ha)	24.5	28.0	27.1	29.0	30.6	30.0	32.2	30.7	31.3	33.1	34.0	34.8	32.5	38.1	35.0
Total production	282	266	225	174	156	120	103	92	94	119	153	219	257	206	193
Total farm use	272	256	216	166	149	114	97	87	89	114	145				188
Feed[b]	269	253	213	164	147	113	96	86	88	113	143				185
Wastage[b]	3	3	3	2	2	1	1	1	1	1	2				3
Farm sales to feed industry[b]	10	10	9	8	7	6	6	5	5	5	8				5
Rye															
Area under cultivation ('000 ha)	9	6	8	8	7	8	8	7	4	4	4	4	4	5	5
Yield (100 kg/ha)	23.3	21.7	22.5	22.5	24.3	27.5	31.3	30.0	27.5	30.0	27.5	27.5	32.5		33
Total production	21	13	18	18	17	22	25	21	11	12	11	11	13		17
Imports	8	9	9	6	5	6	4	8	9	11	11	20			15
Total available supply (= total domestic disposals)	29	22	27	24	22	28	29	29	20	23	22	31			32
Food industry; distilling[d]	22	20	20	19	19	25	25	25	14	17	16	26			26
home-grown rye	14	11	11	13	14	19	21	17	5	6	5	6			11
foreign rye	8	9	9	6	5	6	4	8	9	11	11	20			15
Feed instry; for animal feed;															
wastage	6	1	5	4	1	1	3	3	5	5	5	4			5
seed	1	1	2	1	2	2	1	1	1	1	1	1			1
Rice															
Imports (milled rice)	91	86	106	124	120	96	109	120	109	110	115	118			125
Re-exports (milled rice)	11	5	5	4	5	5	5	5	5	5	5				5
Total available supply[f] (milled rice) (= total domestic disposals)	80	81	101	120	115	91	104	115	104	105	110				120
Total consumption as food (milled rice)	66	68	86	105	100	77	90	93	77	85	98				115
Direct consumption as food (milled rice)	.	.	72	83	83	63	78	78	59	65	80				98
Per capita consumption (kg)	1.27	1.30	1.64	1.98	1.87	1.43	1.66	1.71	1.40	1.54	1.77				1.70
Processed rice in food products, puffed rice etc.	.	.	14	22	17	14	12	15	18	20	18				17
Industrial consumption (distilling, brewing, starch production)	14	13	15	15	15	14	14	22	22	14	6				5
Consumption as animal feed	-	-	-	-	-	-	-	-	5	6	6				-

[a] Farm years beginning 1 July. [b] 1958/59-1963/64 own estimates; 1964/65-1968/69 official estimates. [c] Total production plus imports; no rye is exported and no data on stocks are available. [d] About 3/4 of this item concerns the food industry; no detailed information is available which would make it possible to differentiate clearly between the amount used for food and that used for industrial purposes. [e] Excluding imports of products containing rice (puffed rice etc.), which are of only minor importance and are not listed separately in foreign trade statistics. [f] Imports less re-exports; details on changes in stocks are not available.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commonwealth Secretariat, Grain Crops, London, various issues; Commonwealth Secretariat, Grain Bulleting, various issues; Commonwealth Secretariat, Rice Bulletin, London, various issues; Own calculations and estimates.

Table 9* - Supply of sugar in the United Kingdom 1958/59 - 1971/72[a] and forecasts for 1977/78

('000 t white sugar)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Total sugar beet area ('000 ha)	178	176	176	173	172	171	179	184	180	185	188	185	187	191	166
for beet production ('000 ha)	176	174	175	172	170	170	178	183	179	184	187	184	186	190	165
for seed ('000 ha)	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1
Yield (t/ha) of beet	33.1	32.2	41.9	35.1	31.8	31.4	35.5	37.2	36.9	37.4	35.5	32.8	34.5	40.6	37.5
Sugar beet crop[b,c]	5 834	5 598	7 330	6 031	5 398	5 338	6 317	6 812	6 599	6 883	7 118	6 034	6 412	7 712	6 200
Calculated actual white sugar extraction rate (%)	12.6	14.0	12.3	12.8	12.9	14.1	14.9	12.6	13.1	12.9	12.6	14.3	14.1	14.1	14.5
White sugar production	735	785	902	772	698	751	943	860	862	887	898	862	905	1 085	900
Total exports	634	616	447	420	353	549	464	372	445	341	313				
Refined sugar	573	552	379	350	279	475	387	287	356	247	201	193	202		
Products containing sugar[e]	61	64	68	70	74	74	77	85	89	94	112				
Total imports	2 842	2 715	2 542	2 604	2 479	2 886	2 348	2 586	2 543	2 506	2 406				
Raw sugar[d]	2 572	2 410	2 226	2 262	2 150	2 570	2 006	2 214	2 160	2 127	2 021	2 002	1 902		
Products containing sugar[e]	270	305	316	342	329	316	342	372	383	379	385				
Total net imports	2 208	2 099	2 095	2 184	2 126	2 337	1 884	2 214	2 098	2 165	2 093				2 100
Opening stocks[f]	.	.	.	835	781	574	733	568	617	600	679	712	657	724	
Closing stocks[f]	.	.	835[h]	781	574	733	568	617	600	679	712	657	724		
Total available supply[g]	2 943[h]	2 884[h]	2 997[h]	3 010	3 031	2 929	2 992	3 025	2 977	2 973	2 958				3 000
Statistical errors	+ 103	+ 88	+ 9	+ 38	+ 19	+ 114	+ 39	+ 49	+ 23	+ 39	+ 34				(+34)
Total domestic consumption	2 840	2 796	2 988	2 972	3 012	2 815	2 953	2 976	2 954	2 934	2 924	(2 982)	(2 971)		2 966
Per capita consumption (kg)	54.82	53.60	56.82	56.01	56.32	52.30	54.50	54.60	53.89	53.22	52.77	(53.61)			51.7

[a] Farm years beginning 1 July. [b] Beet delivered to sugar factories (washed and without heads). [c] No sugar beet is used for the production of beet juice or alcohol; as foreign trade and the use of beet for animal feed are practically negligible, there is no need to compile a special balance sheet for sugar beet (total sugar beet production = processing of sugar beet in sugar factories). [d] Mainly imported raw sugar which has been refined in the United Kingdom and subsequently re-exported. [e] The measurement of foreign trade in products containing sugar has been made with the help of annual trade statistics; conversion from calendar years (K_t) to farm years ($W_{t/t-1}$): $W_{t/t-1} \simeq \frac{1}{2}(K_t + K_{t-1})$. [f] Stocks of both imported and home-produced white and raw sugar (raw sugar in white equivalent); excluding all products containing sugar.
[g] Domestic production of white sugar plus total net imports ± changes in stocks of raw and refined sugar. [h] Excluding changes in stocks.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Own calculations and estimates.

Table 10* - Supply of potatoes in the United Kingdom 1958/59 - 1971/72[a] and forecasts for 1977/78
('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1977/78
Total area under cultivation ('000 ha)	332	330	335	284	298	311	315	300	271	287	279	248	271	254	180
Maincrop potatoes ('000 ha)	288	284	283	237	253	263	267	257	234	251	247	219	239	226	160
Early potatoes ('000 ha)	44	46	52	47	45	48	48	43	37	36	32	29	32	30	20
Yield (100 kg/ha)															
Maincrop potatoes (100 kg/ha)	174	223	228	239	242	226	236	267	255	263	253	265			310
Early potatoes (100 kg/ha)	146	151	160	147	143	151	161	168	168	165	193	144			190
Total production	5 660	7 027	7 273	6 358	6 765	6 672	7 063	7 577	6 560	7 200	6 871	6 215	7 482	7 173	5 340
Maincrop potatoes	5 018	6 334	6 441	5 666	6 122	5 947	6 289	6 856	5 958	6 607	6 254	5 798			4 960
Early potatoes	642	693	832	692	643	725	774	721	622	593	617	417			380
Total farmers' own consumption[b]	1 405	2 263	2 409	1 692	2 027	1 871	2 058	2 260	1 440	2 118	1 675				608
Feed[c]	554	1 396	1 675	913	1 221	1 063	1 289	1 566	708	1 407	1 045				160
Seed potatoes[d]	851	867	734	779	806	808	769	694	732	711	630				448
Total farm sales[b]	4 225	4 767	4 858	4 667	4 708	4 821	5 008	5 301	5 120	5 074	5 196	4 818			4 732
of ware potatoes (total)	4 116	4 629	4 737	4 546	4 603	4 700	4 897	5 170	5 009	4 956	5 076	4 401	5 127		4 612
maincrop ware potatoes	3 474	3 936	3 905	3 854	3 960	3 975	4 123	4 449	4 387	4 363	4 459				4 232
early potatoes	642	693	832	692	643	725	774	721	622	593	617	417			380
of seed potatoes (total)[f]	109	138	121	121	105	121	111	131	111	118	120				120
seed potatoes for gardens	65	65	63	61	61	60	60	60	59	59	59				50
Total exports[e]	52	158	74	71	51	77	132	209	70	74	82	99			70
Seed potatoes	44	73	58	60	44	61	51	71	52	59	61				70
Maincrop ware potatoes	8	85	16	11	7	16	81	138	18	15	21				0
Total imports[g]	538	281	273	413	570	247	279	251	275	323	323	260			995
Seed potatoes	6	7	10	9	6	10	13	8	8	10	13	15			20
Maincrop ware potatoes	258	1	4	152	192	1	0	0	27	0	0	0			569
Early potatoes	274	273	259	252	372	236	266	243	240	313	310	245			406
Total net imports[g]	486	123	199	342	519	170	147	42	205	249	241	161			925
Opening stocks[h]	.	.	.	6	2	27	57	248	114	12	361	41	20	7	
Closing stocks[h]	.	.	6	2	27	57	248	114	12	361	41	20	7		
Total available supply[i] (= total domestic disposals)	6 131[j]	7 150[j]	7 472[j]	6 704	7 259	6 812	7 019	7 753	6 887	7 100	7 432	6 397			6 265
Disposals[k]															
Domestic consumption of maincrop ware potatoes	3 724	3 852	3 893	3 995	4 141	3 960	4 042	4 311	4 396	4 348	4 438				4 801
Domestic consumption of early potatoes ...	916	966	1 091	944	1 013	961	1 040	964	862	906	927	662			786
Total domestic consumption of ware potatoes	4 640	4 818	4 984	4 939	5 160	4 921	5 082	5 275	5 258	5 254	5 365				5 587
Per capita consumption (kg)															
Total (kg)	89.6	92.3	94.7	93.1	96.5	91.5	93.8	96.8	95.9	95.3	96.8				97.4
Maincrop ware potatoes (kg)	71.9	73.8	74.0	75.3	77.5	73.6	74.6	79.1	80.2	78.9	80.1				83.7
Early potatoes (kg)	17.7	18.5	20.7	17.8	19.0	17.9	19.2	17.7	15.7	16.4	16.7	11.9			13.7
Proportion of ware potatoes in the main crop(%)	69.4	62.1	60.6	68.0	64.7	66.8	65.6	64.9	73.6	66.0	71.3				65.3
Total domestic demand for seed potatoes	922	939	807	849	873	878	842	762	799	780	702				518

[a] Farm years beginning 1 July. [b] Excluding consumption as food by producers. [c] Including ware potatoes either used as feed potatoes or destroyed on producer farms under the Potato Marketing Board's diversification programme as well as "chats" and wastage. [d] Including producer consumption as food. [e] Maincrop ware potatoes for domestic consumption and export. [f] Including seed potatoes for export. [g] Foreign trade in products with potato content has not been included because of the lack of suitable statistical data. [h] Farms and ware potato trade. [i] Total production + imports ± changes in stocks. [j] Excluding changes in stocks. [k] Own estimates; for maincrop ware potatoes: total sales of domestic maincrop ware potatoes less exports and plus imports of maincrop ware potatoes; for early potatoes: production plus imports. [l] Foreign seed potato utilisation on domestic farms, in private gardens (from the domestic crop) and imports of seed potatoes from Ireland.

Table 11* - Supply of beef in the United Kingdom 1958-71 and forecasts for 1977
('000 t slaughter weight)[a]

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total gross domestic production[d]	708.8	638.5	719.0	789.5	822.9	848.7	798.0	792.5	782.4	851.8	817.8	804.7	892.5	858.2	1058.4
Exports of live cattle:															
Breeding cattle ('000 head)	1.7	2.9	2.8	4.0	5.8	8.2	7.8	6.7	7.3	7.7	7.2	10.7	6.7	8.2	
Slaughter cattle and calves ('000 head)	95.0	71.7	42.3	65.7	65.8	72.4	145.1	176.5	103.5	142.3	71.2	105.3	100.2	55.7	450.0[k]
Heifers and young steers ('000 head)	53.9	26.3	15.3	118.7	50.7	89.6	153.1	141.4	61.3	129.5	82.2	88.0	125.4	59.6	
Total meat equivalent of live cattle exports[b]	31.8	21.1	12.5	39.4	26.4	35.1	61.5	65.1	34.2	55.1	32.1	40.8	46.5	25.0	84.5
Total net domestic production[d]	677.0	617.4	706.5	750.1	796.5	813.6	736.5	727.4	748.2	796.7	785.7	763.9	846.7	830.8	973.9
Live cattle imports:															
Breeding cattle ('000 head)	5.9	7.0	5.6	6.7	5.0	6.0	5.7	10.6	11.1	7.1	11.0	6.7	13.8	18.3	
Fat cattle ('000 head)	40.2	64.8	181.1	254.5	130.6	68.5	62.8	63.9	159.5	17.6	19.2	4.6	1.8	1.9	
Store cattle and calves ('000 head)	596.0	402.1	321.0	430.2	431.4	564.4	637.6	436.6	395.9	623.8	589.3	542.7	508.9	599.4	
Total meat equivalent of live cattle imports[c]	135.1	101.2	114.1	154.7	121.6	130.4	140.5	103.7	119.2	124.6	120.0	106.7	101.3	119.8	35.0
Total net imports of live cattle (in meat equivalent)	103.3	80.1	101.6	115.3	95.2	95.3	79.0	38.6	85.0	69.5	87.9	65.9	54.8	94.8	-49.5
Total net production	812.1	718.6	820.6	904.8	918.1	944.0	877.0	831.1	867.4	921.3	905.7	870.6	947.3	953.0	1008.9
Beef	795.9	704.4	801.1	884.1	898.2	928.2	865.8	822.4	856.0	907.5	894.9	861.3	939.2	943.8	1006.6
Veal[e]	16.2	14.2	19.5	20.7	19.9	15.8	11.2	8.7	11.4	13.8	10.8	9.3	8.1	9.2	2.3
Total exports of beef and veal[f]	18.5	7.0	4.5	4.7	4.3	2.9	10.7	11.8	6.9	6.8	3.0	7.6	9.9	13.7	100.0
Total imports of beef and veal[g]	616.6	559.8	513.9	457.2	492.1	503.7	495.0	410.7	416.6	427.2	407.8	463.5	403.7	385.6	122.1
Bone-in beef[h]	348.7	309.0	306.8	253.5	287.0	321.2	249.4	176.0	185.6	226.1	207.9	275.3	120.6	122.4	
Boneless beef[h]	60.4	52.5	53.1	39.0	45.8	42.3	101.2	118.7	104.5	47.2	53.3	69.6	144.3	130.4	
Preserved beef[h]	99.2	95.2	73.0	79.4	76.2	66.9	46.6	49.1	55.4	73.4	69.3	54.1	58.6	56.6	
Total net imports of beef and veal	598.1	552.8	509.4	452.5	487.8	500.8	484.3	398.9	409.7	420.4	404.8	455.9	393.8	371.9	22.1
Opening stocks[i]	49.1	39.2	31.2	40.7	32.7	20.5	12.3	42.2	32.2	36.7	13.4	24.7	29.2	24.4	
Closing stocks[i]	39.2	31.2	40.7	32.7	20.5	12.3	42.2	32.2	36.7	13.4	24.7	29.2	24.4	19.3	
Total domestic consumption of beef and veal[j]	1420.1	1279.4	1320.5	1365.3	1418.1	1453.0	1331.4	1240.0	1272.6	1365.0	1299.2	1322.0	1345.9	1330.0	1031.0
Per capita consumption (kg)	27.49	24.62	25.21	25.85	26.60	27.09	24.65	22.81	23.28	24.83	23.50	23.81	24.16	23.80	18.00

[a] [b] Estimated dressed carcase weight - i.e. weight of the slaughtered and eviscerated animal including bones and slaughter fat, but exluding hide, hooves, head, offals and offal fat. Own estimate: breeding cattle 100 % of the average slaughter weight for all domestic cattle (cows, bulls, calves - as slaughter animals: 75 %; heifers and young steers and bulls: 80 %). [c] Own estimate: breeding cattle 100 % of the average slaughter weight for all domestic cattle (fat cattle 100 %; store cattle and calves 75 %). [d] Own estimate: net production less net imports of live cattle in meat equivalent (for gross domestic production) and net production less imports of live cattle (for net domestic production). [e] All animals are considered as calves up to a slaughter weight of 200 lb (≈ 91 kg); in fact, mainly new-born calves with an average slaughter weight of only 23 kg are meant. [f] Including re-exports. [g] On a slaughter weight basis; for which the following (approximate) conversion factors were use: bone-in beef: 1.00; boneless beef: 1.15; preserved beef: 2.00. [h] Fresh, chilled and frozen in product weight (including veal). [i] Only imported beef and veal. [j] Own estimate: net production plus total net imports of beef and veal ± changes in stocks. [k] 50 000 calves, 300 000 store or fat cattle and 100 000 slaughter cows.

Source: Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Meat, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.

Table 12* - Supply of mutton and lamb in the United Kingdom 1958-71 and forecasts for 1977
('000 t slaughter weight)[a]

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total gross domestic production[c]	190.9	250.1	226.1	267.2	254.4	248.8	256.2	248.2	269.7	262.8	249.0	212.7	230.8	231.6	284.0
Live exports of sheep:															
Sheep and lambs of all types ('000 head)	95.0	244.0	247.0	354.0	406.0	486.5	325.8	410.7	137.2	187.2	245.2	390.9	267.9	222.9	300.0
Meat equivalent of total live exports of sheep[b]	1.9	4.9	4.9	7.1	8.1	9.7	6.5	8.2	2.7	3.7	4.9	7.8	5.4	4.5	6.0
Total net domestic production[c]	189.0	245.2	221.2	260.1	246.3	239.1	249.7	240.0	267.0	259.1	244.1	204.9	225.4	227.1	278.0
Imports of live sheep:															
Sheep and lambs of all types ('000 head)	193.0	240.8	313.2	347.7	379.3	312.5	292.4	213.1	169.8	133.0	118.6	88.3	71.0	129.9	150.0
Meat equivalent of total live imports of sheep[b]	3.9	4.8	6.3	7.0	7.6	6.3	5.8	4.3	3.4	2.7	2.4	1.8	1.4	2.6	3.0
Balance of external trade in live sheep in meat equivalent (net imports -; net exports +)	-2.0	+0.1	-1.4	+0.1	+0.5	+3.4	+0.7	+3.9	-0.7	+1.0	+2.5	+6.0	+4.0	+1.9	+3.0
Total net production	192.9	250.0	227.5	267.1	253.9	245.4	255.5	244.3	270.4	261.8	264.5	206.7	226.8	229.7	281.0
Mutton (alder, hoggets, ewes, rams)	.	.	.	.	.	.	.	.	.	.	48.1	44.7	44.2	41.5	
Lamb (young fat lambs and hoggets)	.	.	.	.	.	.	.	.	.	.	198.4	162.0	182.6	188.2	
Total exports of mutton and lamb[d]	3.3	2.1	1.7	2.3	1.0	4.0	5.7	4.3	6.5	7.8	4.0	8.3	10.6	15.4	50.0
Total imports of mutton and lamb[e]	357.6	384.7	410.3	370.1	372.9	356.3	351.6	357.1	325.8	350.8	360.8	376.4	336.4	364.0	244.0
Mutton and lamb, fresh, chilled and frozen, bone-in	345.2	370.3	389.9	352.3	357.3	347.9	344.4	350.5	320.6	344.2	350.4	367.8	331.2	353.2	
Mutton and lamb in tins (product weight)	6.2	7.2	10.2	8.9	7.8	4.2	3.6	3.3	2.6	3.3	5.2	4.3	2.6	5.4	
Total net imports of mutton and lamb	354.3	382.6	408.6	367.8	371.9	352.3	345.9	352.8	319.3	343.0	356.8	368.1	325.8	348.6	194.0
Opening stocks	36.8	31.7	35.7	38.5	30.1	23.3	22.7	18.0	27.0	17.8	13.5	14.4	26.1	29.2	
Closing stocks	31.7	35.7	38.5	30.1	23.3	22.7	18.0	27.0	17.8	13.5	14.4	26.1	29.2	23.7	
Total domestic consumption of mutton and lamb[f]	552.3	628.6	633.3	643.3	632.6	598.3	606.1	588.1	598.9	609.1	602.4	563.1	551.6	583.8	475.0
Per capita consumption (kg)	10.69	12.10	12.09	12.18	11.87	11.15	11.22	10.82	10.96	11.08	10.90	10.14	9.90	10.45	8.30

[a] Estimated dressed carcase weight - i.e. weight of the slaughtered and eviscerated animal including bones and slaughter fat, but excluding skin, hooves, head, offals and offal fat. [b] Own estimate based on an average slaughter weight for domestic sheep and lambs of about 20 kg. [c] Own estimate: total net production less the meat equivalent of live imports of sheep (net domestic production) and less net imports of live sheep in meat equivalent (for gross domestic production). [d] Including re-exports. [e] On the basis of slaughter weight and using the following conversion factors: mutton and lamb fresh, chilled, frozen, bon-in 1.00; mutton and lamb in tins 2.00. [f] Own estimate: total net production plus net imports ± changes in stocks.

Source: Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Commonwealth Secretariat, Meat, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

Table 13* - Supply of pork and bacon in the United Kingdom 1958-71 and forecasts for 1977

('000 t slaughter weight)[c]

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total gross domestic production	711.7	714.6	676.8	705.1	788.0	807.2	848.1	934.8	888.6	814.2	851.2	918.9	940.7	1026.6	832.0
Pork	437.4	440.6	447.9	448.2	506.7	531.2	569.8	639.2	627.1	562.2	577.2	622.4	627.6	661.5	609.0
Bacon - fresh weight[a]	274.3	274.0	228.9	256.9	281.3	276.0	278.3	295.6	261.5	252.0	274.0	296.5	313.1	365.1	223.0
Export of live pigs ('000 head)	-	-	-	-	-	15.5	57.7	37.9	36.1	13.1	13.3	87.8	65.2	26.6	10.0
Meat equivalent[b]	-	-	-	-	-	1.0	3.8	2.5	2.3	0.9	0.9	5.7	4.2	1.7	0.7
Total net domestic production	711.7	714.6	676.8	705.1	788.0	806.2	844.3	932.3	886.3	813.3	850.3	913.2	936.5	1024.9	831.3
Imports of live pigs ('000 head)	-	-	-	-	-	1.4	1.3	0.8	1.2	4.5	1.1	1.0	1.0	1.0	10.0
Meat equivalent[b]	-	-	-	-	-	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.7
Net exports of live pigs in meat equivalent	-	-	-	-	-	0.9	3.7	2.4	2.2	0.6	0.8	5.6	4.1	1.6	0
Total net production	711.7	714.6	676.8	705.1	788.0	806.3	844.4	932.4	886.4	813.6	850.4	913.3	936.6	1025.0	832.0
Total exports of pigmeat[d]	0.2	0.3	0.1	0.1	-	5.5	8.7	3.7	12.3	3.0	1.8	12.2	14.5	10.3	5.0
Total imports of pigmeat	526.2	548.0	641.0	633.5	635.3	604.4	621.8	640.2	629.4	641.3	649.9	621.0	606.8	621.1	827.0
Pork	18.8	14.2	21.9	18.0	20.1	11.5	9.9	20.9	10.5	11.0	18.0	19.7	11.4	28.1	
Bacon - fresh weight[a]	429.4	441.3	514.9	500.9	506.1	488.8	496.3	504.4	504.3	510.4	515.4	489.8	480.0	468.5	561.0
Bacon and ham in tins - fresh weight[a]	32.4	40.3	45.4	46.0	43.9	38.6	45.8	45.9	42.5	42.6	40.4	34.8	37.0	40.4	
Pork in tins - slaughter weight[e]	45.6	52.2	58.8	68.6	65.2	65.5	69.8	69.0	72.1	77.3	76.1	76.7	78.4	84.1	266.0
Total net imports of pigmeat	526.0	547.7	640.9	633.4	635.3	598.9	613.1	636.5	617.1	638.3	648.1	608.8	592.3	610.8	822.0
Opening stocks[f]	2.7	1.9	2.7	2.2	2.7	1.6	1.0	1.3	1.7	1.8	1.7	1.3	1.3	1.7	
Closing stocks[f]	1.9	2.7	2.2	2.7	1.6	1.0	1.3	1.7	1.8	1.7	1.3	1.3	1.7	1.1	
Total domestic consumption of pork and bacon[g]	1238.5	1261.5	1318.2	1338.0	1424.4	1405.8	1457.2	1568.5	1503.4	1452.0	1498.9	1521.0	1528.5	1636.4	1654.0
Total per capita consumption (kg)	23.98	24.28	25.17	25.34	26.72	26.21	26.98	28.85	27.51	26.41	27.11	27.39	27.44	29.29	28.90
Domestic consumption of bacon in fresh weight[a,h]	736.1	755.6	789.2	803.8	831.3	803.4	820.4	845.9	808.3	805.0	829.8	821.1	830.1	874.0	784.0
Per capita consumption of bacon (kg)	14.25	14.54	15.07	15.22	15.59	14.98	15.19	15.56	14.79	14.64	15.01	14.79	14.90	15.64	13.70
Domestic consumption of pork[i]	502.4	505.9	529.0	534.2	593.1	602.4	636.8	722.6	695.1	647.0	669.1	699.9	698.4	762.4	970.0
Per capita consumption of pork (kg)	9.73	9.74	10.10	10.12	11.13	11.23	11.79	13.29	12.72	11.77	12.10	12.60	12.54	13.64	15.20

[a] 1 kg of bacon in product weight ≈ 1.25 kg of bacon fresh weight. [b] Based on an average slaughter weight of 65 kg. [c] Estimated dressed carcase weight i.e. including slaughter fat and bones, but excluding head, skin, offals and offal fat. [d] Pork only. [e] 1 kg tinned pork ≈ 1.20 kg pork slaughter weight. [f] Pork only; figures for bacon stocks not available. [g] Total net production plus net imports ± changes in stocks. [h] Domestic production of bacon and ham plus imports of bacon, and bacon and ham in tins. [i] Gross domestic production of pork less the meat equivalent of net exports of live pigs and plus net imports (less net exports) of pork and plus imports of pork in tins (in slaughter weight) ± changes in stocks of pork.

Source: Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Meat, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.

Table 14* - Supply of edible offals in the United Kingdom 1958-71 and forecasts for 1977
('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total domestic production of offals[a]	130.3	129.8	135.0	149.3	151.8	153.4	149.7	147.2	152.7	153.7	153.7	144.8	155.4	159.5	163.7
Cattle[b]	71.6	63.4	72.1	79.6	80.8	83.5	77.9	74.0	77.0	81.7	80.5	77.5	84.5	84.9	90.6
Calves[c]	3.2	2.8	3.9	4.1	4.0	3.2	2.2	1.7	2.3	2.8	2.2	1.9	1.6	1.4	0.5
Sheep[d]	27.0	35.0	31.9	37.4	35.5	34.4	35.8	34.2	37.9	36.7	37.0	28.9	31.8	32.2	39.3
Pigs[e]	28.5	28.6	27.1	28.2	31.5	32.3	33.8	37.3	35.5	32.5	34.0	36.5	37.5	41.0	33.3
Total exports[f]	0.4	0.3	0.2	0.3	0.4	0.9	0.8	0.8	1.3	1.2	1.0	2.2	2.2	4.3	5.0
Total imports	72.9	77.3	83.3	81.9	86.1	94.7	101.6	108.1	104.4	104.9	111.4	109.3	97.0	96.8	104.3
Cattle and calves	44.9	45.5	43.7	44.1	45.0	52.0	54.7	55.9	53.8	51.0	53.9	52.6	46.0	44.2	
Sheep and lambs	17.5	17.9	22.8	22.8	24.5	25.9	26.9	28.2	30.7	33.0	33.4	33.0	34.5	35.9	
Pigs	10.5	13.9	16.8	15.0	16.6	16.8	20.0	24.0	19.9	20.9	24.1	23.7	16.0	16.1	
Total net imports	72.5	77.0	83.1	81.6	85.7	93.8	100.8	107.3	103.1	103.7	110.4	107.1	94.8	92.5	99.3
Opening stocks	8.4	9.1	12.3	13.4	13.3	9.9	13.1	11.4	15.2	17.8	16.4	14.7	12.3	17.6	
Closing stocks	9.1	12.3	13.4	13.3	9.9	13.1	11.4	15.2	17.8	16.4	14.7	12.3	17.6	17.2	
Total domestic consumption of offals	202.1	203.6	217.0	231.0	240.9	244.0	252.2	250.7	253.2	258.8	265.8	254.3	244.9	252.4	263.0
Per capita consumption (kg)	3.91	3.92	4.14	4.37	4.52	4.55	4.67	4.61	4.63	4.71	4.81	4.58	4.40	4.52	4.60

[a] Liver, heart, kidneys and other edible offals from the slaughter of domestic and live imported animals. [b] Estimate: 9 % of net production of beef. [c] Estimate: 20 % of net production of veal. [d] Estimate: 14 % of total net production of mutton and lamb. [e] Estimate: 4 % of total net production of pigmeat. [f] Including re-exports. [g] Domestic production plus net imports ± changes in stocks.

Source: Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Own calculations and estimates.

Table 15* - Production and utilisation of whole milk in the United Kingdom 1958-71 and forecasts for 1977

('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Dairy cow herd (June) ('000 000)[a]	3.676	3.676	3.790	3.899	3.950	3.867	3.809	3.808	3.768	3.900	3.920	3.940	3.939	3.898	4.300
Milk yield per cow (kg)	2954	2866	3028	3080	3108	3095	3092	3209	3192	3181	3274	3315	3352	3412[h]	3 600
Milk production of dairy cows[a]	10858	10537	11476	12010	12277	11970	11779	12219	12028	12406	12834	13062	13205	13300[h]	15 480
Milk production of beef cows[b]	571	555	604	632	646	630	620	643	633	653	675	688	695	700[h]	774
Total milk production	11429	11092	12080	12642	12923	12600	12399	12862	12661	13059	13509	13750	13900	14000	16 254
Utilization of cow's milk on farms:															
Total liquid milk[c]	473	458	443	443	443	443	413	388	388	386	381	378	373	343[h]	305
Own use[c]	440	425	410	410	410	410	385	360	360	358	353	350	345	315[h]	280
Sales off farms[d]	33	33	33	33	33	33	28	28	28	28	28	28	28	28	25
Farmhouse cheese[c,d]	58	61	76	88	92	91	93	99	94	106	113	107	115	131[h]	150
Farmhouse butter; own use of fresh cream, wastage[c,d]	167	214	145	177	119	154	226	222	147	134	246	336	244	17[h]	100
Whole milk fed to stock[c,f]	777	754	821	860	866	844	831	862	848	862	892	908	917	924	1 057
Sales via the Milk Marketing Boards	9954	9605	10595	11074	11403	11068	10836	11291	11184	11571	11877	12021	12251	12585	14 642
Sales as a percentage of total milk production	87.1	86.6	87.7	87.6	88.2	87.8	87.4	87.8	88.3	88.6	87.9	87.4	88.1	89.9	90.1
Utilization of whole milk in the dairies and by other milk processors:															
Total fresh consumption	7304	7448	7592	7769	7927	8058	8219	8288	8384	8496	8509	8529	8537	8487	9 362
Liquid milk	7093	7184	7285	7400	7507	7578	7669	7678	7714	7759	7727	7699	7669	7585	7 931
Fresh cream	173	216	257	306	349	398	454	519	568	634	669	720	753	784	1 288
Other[g]	38	48	50	63	71	82	96	91	102	103	113	110	115	118	143
Butter	776	373	982	1271	1482	1064	574	887	748	916	1241	1346	1518	1571	2 193
Cheese	974	892	1109	1136	1130	1042	1098	1127	1066	1197	1166	1176	1278	1546	2 030
Whole milk powder	227	218	207	207	202	221	234	227	205	217	223	219	195	245	252
Condensed milk	396	415	437	426	420	421	429	472	444	430	411	432	431	428	467
- unsweetened in tins	274	276	290	288	299	298	315	364	355	345	333	358	362	353	399
- sweetened in tins	87	100	107	99	76	91	76	62	52	49	43	41	36	36	68
- sweetened in bulk	35	39	40	39	45	32	38	46	37	36	35	33	33	39	
Sterilised tinned cream	71	75	76	68	60	73	78	94	87	88	103	102	103	102	119
Chocolate crumb	204	183	192	198	181	189	204	197	248	227	226	217	189	206	219

[a] Cows and heifers in milk; cows in calf but not in milk; heifers in calf with first calf. [b] Official estimates: ≈ 5 % of total milk production. [c] Estimated on the basis of official estimates by the Ministry of Agriculture, Fisheries and Food, which are available only for farm years (June to May). [d] Figures of the Milk Marketing Boards, which are responsible for the Farmhouse Cheesemakers' Scheme. [e] Residual value; contains also the statistical errors which were made in the compilation of the whole milk balance for farms. [f] 1958-61 = 6.8 % of total milk production (1962-66 = 6.7 %; 1967-71 = 6.6 %; assumption for 1977: 6.5 %). [g] Mainly yoghourt, milk drinks (milkshakes etc. and ice cream. [h] Own estimates.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Dairy Produce, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

Table 16* - Supply of butter and cheese in the United Kingdom 1958-71 and forecasts for 1977
('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
BUTTER															
Domestic production in dairies	30.2	15.1	40.2	51.6	60.6	43.9	23.7	36.6	30.8	38.4	52.0	56.6	63.9	65.8	90.2
Exports	3.5	2.5	2.7	3.2	3.1	2.0	2.1	2.2	2.3	2.3	1.8	1.6	1.7	2.4	3.0
Total imports	429.4	407.1	411.7	429.8	413.2	420.9	471.2	448.9	461.9	490.9	453.0	424.5	406.5	390.0	267.8
Fresh butter	429.4	407.1	411.7	429.8	413.2	420.9	471.2	446.1	451.6	460.5	446.4	416.6	394.6	373.4	
Butter-oil and rendered butter[a]	.	.	.	.	.	.	.	2.8	10.3	30.4	6.6	7.9	11.9	16.6	
Total net imports	425.9	404.6	409.0	426.6	410.1	418.9	469.1	446.7	459.6	488.6	451.2	422.9	404.8	387.6	264.8
Opening stocks[b]	36.1	31.5	11.2	27.4	34.5	13.2	16.3	36.6	42.7	38.6	36.6	51.8	30.3	18.5	
Closing stocks[b]	31.5	11.2	27.4	34.5	13.2	16.3	36.6	42.7	38.6	36.6	51.8	30.3	18.5	26.9	
Domestic consumption[c]	470.1	436.9	436.2	472.5	479.7	467.1	464.1	477.6	488.9	487.8	483.1	484.6	480.5	445.0	355.0
Per capita consumption (kg)	9.10	8.41	8.33	8.95	9.00	8.71	8.59	8.74	8.95	8.87	8.74	8.73	8.62	7.96	6.20
CHEESE															
Total domestic production	96.7	88.9	110.4	114.3	114.1	106.2	111.7	114.9	108.8	122.1	120.7	120.2	130.6	156.4	200.0
in dairies and cheese factories	91.2	83.1	103.3	106.1	105.6	97.8	103.0	105.7	100.1	112.2	110.1	110.2	119.8	144.3	186.2
farmhouse cheese	5.5	5.8	7.1	8.2	8.5	8.4	8.7	9.2	8.7	9.9	10.6	10.0	10.8	12.1	13.8
Exports	5.5	2.5	3.1	3.0	2.9	2.7	2.5	2.7	3.2	3.0	2.6	3.3	3.3	3.4	10.0
Imports	120.5	138.5	133.5	136.6	140.9	139.6	152.0	151.9	143.5	159.1	180.3	155.5	156.9	167.4	85.0
Net imports	115.0	136.0	130.4	133.6	138.0	136.9	149.5	149.2	140.3	156.1	177.7	152.2	153.6	164.0	75.0
Opening stocks[a]	37.8	15.8	21.3	29.0	34.8	35.6	27.3	28.2	52.6	42.1	52.0	71.8	58.8	45.6	
Closing stocks[a]	15.8	21.3	29.0	34.8	35.6	27.3	28.2	52.6	42.1	52.0	71.8	58.8	45.6	56.7	
Domestic consumption	233.8	219.5	234.9	242.0	251.5	251.7	259.2	249.8	259.7	268.1	278.6	286.1	297.4	309.3	275.0
Per capita consumption (kg)	4.53	4.22	4.49	4.58	4.72	4.69	4.80	4.60	4.75	4.88	5.04	5.15	5.34	5.54	4.80

[a] Before 1965 not listed separately in foreign trade statistics since imports of butter-oil and rendered butter were insignificant until 1964. [b] In public and government cold stores; until 1963: only at 14 - 18° - from 1964 at all temperatures. [c] Excluding the domestic consumption of domestic farmhouse butter the statistics for which are very incomplete and which cannot be ascertained accurately.

[a] Thedefinition of stocks used in official statistics was considerably widened in 1961 and 1965.

Source: Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commonwealth Secretariat, Dairy Produce, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.

Table 17* - Supply of preserved whole milk products in the United Kingdom 1958-71 and forecasts for 1977

('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
WHOLE MILK POWDER															
Domestic production	29.0	27.9	26.3	27.1	25.3	25.2	26.4	25.9	27.8	23.3	24.5	23.6	21.3	27.6	30.0
Exports	1.5	1.6	1.0	1.6	2.1	7.2	5.8	6.6	7.1	7.2	9.9	9.5	8.3	9.5	15.0
Imports	9.2	15.1	15.0	16.0	21.2	22.5	22.0	23.8	24.1	27.6	18.6	16.5	19.2	17.8	10.0
Net imports	7.7	13.5	14.0	14.4	19.1	15.3	16.2	17.2	17.0	20.4	8.7	7.0	10.9	8.3	5.0
Total domestic consumption	38.6	41.4	40.5	41.1	44.4	40.4	41.9	44.1	44.0	42.5	33.4	30.2	31.4	33.7	25.0
imported whole milk powder	11.0	14.8	15.2	15.4	21.2	22.4	21.3	24.8	23.3	26.4	18.7	16.1	18.4	15.6	10.0
domestic whole milk powder	27.6	26.6	25.3	25.7	23.2	18.0	20.6	19.3	20.7	16.1	14.7	14.1	13.0	18.1	15.0
Proportion of imported powder in total domestic consumption (%)	28.5	35.7	37.5	37.5	47.7	55.4	50.8	56.2	53.0	62.1	56.0	53.3	58.6	46.3	40.0
per capita consumption (kg)	0.75	0.80	0.77	0.78	0.83	0.75	0.78	0.81	0.81	0.77	0.60	0.54	0.56	0.60	0.44
CONDENSED WHOLE MILK unsweetened															
Domestic production	114.6	107.3	113.7	108.8	120.0	113.9	121.6	140.7	139.7	139.8	137.3	152.5	152.6	152.4	150.0
Exports	16.9	13.7	15.2	12.3	15.8	16.7	20.7	25.7	24.2	24.1	24.3	29.4	26.3	29.9	40.0
Imports	2.5	7.7	7.3	7.6	7.6	7.7	7.7	4.9	4.4	6.2	7.6	10.9	11.4	13.3	25.0
Net exports	14.4	6.0	7.9	4.7	8.2	9.0	13.0	20.8	19.8	17.9	16.7	18.5	14.9	16.6	15.0
Domestic consumption	109.4	103.6	99.7	104.4	112.9	105.5	111.3	122.2	115.0	126.2	127.1	157.4	137.3	134.0	135.0
Per capita consumption (kg)	2.12	1.99	1.90	1.98	2.12	1.97	2.06	2.25	2.10	2.30	2.30	2.83	2.46	2.40	2.35
sweetened															
Domestic production	45.1	48.2	52.6	49.5	43.4	48.5	46.8	44.7	48.0	38.6	35.9	34.7	34.0	26.2	25.0
Exports	21.2	19.9	25.7	26.7	19.2	23.4	19.9	20.3	11.8	7.8	6.7	6.9	9.2	5.0	5.0
Imports	1.4	2.1	1.3	1.5	1.2	0.8	0.5	0.4	0.4	0.4	0.0	0.0	0.2	0.1	.0
Net exports	19.8	17.8	24.4	25.2	18.0	22.6	19.4	19.9	11.4	7.4	6.7	6.9	9.0	4.9	5.0
Domestic consumption	27.5	28.2	27.0	25.2	26.3	25.9	26.8	28.4	37.2	30.5	28.0	23.2	24.5	22.9	20.0
Per capita consumption (kg)	0.53	0.54	0.52	0.48	0.49	0.48	0.50	0.52	0.68	0.55	0.51	0.42	0.44	0.41	0.35

Source: Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commonwealth Secretariat, Dairy Produce, London, various issues; Commonwealth Secretariat, Meat and Dairy Bulletin, London, various issues; Own calculations and estimates.

Table 18* - Supply of cream and chocolate crumb in the United Kingdom 1958-71 and forecasts for 1977
('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
FRESH CREAM															
Domestic dairy production	12.4	15.4	18.4	21.9	24.9	28.4	32.4	37.1	40.6	45.3	47.8	51.4	53.8	56.0	92.0
Imports[a]	1.4	1.3	1.3	1.4	1.7	2.0	1.9	1.8	2.0	2.2	2.3	2.7	4.9	5.6	0
Domestic consumption[b]	13.8	16.7	19.7	23.3	26.6	30.4	34.3	38.9	42.6	47.5	50.1	54.1	58.7	61.6	92.0
Per capita consumption (kg)	0.267	0.321	0.376	0.441	0.499	0.567	0.635	0.716	0.779	0.864	0.906	0.974	1.054	1.102	1.600
STERILIZED TINNED CREAM															
Domestic production	10.1	10.7	10.9	9.7	8.6	10.4	11.1	13.4	12.4	12.6	14.7	14.6	14.7	14.6	17.0
Imports	1.0	2.4	4.8	8.1	9.6	11.1	11.6	9.7	8.9	8.8	8.6	9.1	8.6	7.5	10.0
Domestic consumption	11.1	13.1	15.7	17.8	18.2	21.5	22.7	23.1	21.3	21.4	23.3	23.7	23.3	22.1	27.0
Per capita consumption (kg)	0.215	0.252	0.300	0.337	0.341	0.401	0.420	0.425	0.390	0.389	0.421	0.427	0.418	0.396	0.470
CHOCOLATE CRUMB															
Domestic production	76.4	68.5	71.9	74.2	67.8	70.8	76.4	73.8	92.9	85.0	84.6	81.3	70.8	77.2	82.0
Exports	-	-	-	-	-	-	-	-	.	.	.	.	9.1	8.7	5.0
Imports	32.0	35.4	35.0	34.4	37.4	35.5	35.7	33.6	41.0	40.9	35.7	33.7	29.7	31.3	30.0
Net imports	32.0	35.4	35.0	34.4	37.4	35.5	35.7	33.6	41.0	40.9	35.7	33.7	20.6	22.6	25.0
Domestic consumption	108.4	103.9	106.9	108.6	105.2	106.3	112.1	107.4	133.9	125.9	120.3	115.0	91.4	99.8	107.0
Per capita consumption (kg)	2.10	2.00	2.04	2.06	1.97	1.98	2.08	1.98	2.45	2.29	2.18	2.07	1.64	1.79	1.87

[a] Including marginal amounts of fresh milk. [b] Excluding consumption of fresh cream on farms producing milk.

Source: Commonwealth Secretariat, Dairy Produce, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.

Table 19* - Production and utilisation of skimmed milk in the United Kingdom 1958-71 and forecasts for 1977

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Amount of skimmed milk produced in dairies, total [a]	847	577	1136	1411	1630	1340	979	1320	1240	1460	1785	1928	2110	2178	2 768
from butter production [b]	625	313	832	1068	1254	909	491	758	638	795	1076	1172	1323	1362	1 470
from fresh cream production [b]	161	200	239	285	324	369	421	482	528	589	621	668	699	728	1 196
from the production of sterilized tinned cream [c]	61	64	65	58	52	62	67	80	74	76	88	88	88	88	102
Utilization:															
skimmed milk powder production	319	235	657	736	838	571	342	765	676	825	1077	1004	1048	1219	2 015
production of sweetened condensed skimmed milk	69	89	71	81	82	71	75	64	65	73	56	62	57	56	53
production of unsweetened condensed skimmed milk [d]	25	25	15	105	85	96	59	53	66	93	101	108	107	105	150
other, total [e]	434	228	393	489	625	602	503	438	433	469	551	754	892	798	550
sales to pig farmers [e,f]	.	.	.	.	.	.	.	234	229	220	245	344	400	.	150
liquid milk standardization [e]	.	.	.	.	.	.	.	61	61	51	51	56	56	.	100
other uses and wastage	.	.	.	.	.	.	.	143	143	198	255	354	442	.	300

Table 20* - Supply of skimmed milk powder and buttermilk powder in the United Kingdom 1958-71 and forecasts for 1977 (1 000 t)

SKIMMED MILK POWDER															
Domestic production	28.5	21.0	58.7	65.7	74.8	51.0	30.5	68.3	60.4	73.7	96.2	89.6	93.6	108.8	180.0
Exports	11.5	5.6	8.3	13.8	21.9	12.2	4.0	9.0	21.2	15.0	28.2	27.0	21.3	31.1	64.0
Imports	44.1	75.6	42.8	35.0	30.1	37.4	65.4	49.2	30.7	38.8	38.3	28.1	29.7	18.7	20.0
Net imports	32.6	70.0	34.5	21.2	8.2	25.2	61.4	40.2	9.5	23.8	10.1	1.1	8.4	-12.4	- 44.0
Total domestic consumption	74.3	84.3	81.5	75.0	98.0	87.5	95.0	80.3	87.7	81.0	99.6	105.4	105.0	100.3	136.0
as feed	27.3	27.7	19.7	22.2	37.8	22.1	23.7	23.8	23.2	23.8	34.4	34.9	34.2	(34.0) [g]	60.0
for human consumption	47.0	56.6	61.8	52.8	60.2	65.4	71.3	56.5	64.5	57.2	65.2	70.5	70.8	(66.3) [g]	76.0
Per capita consumption (kg)	0.91	1.09	1.18	1.00	1.13	1.22	1.32	1.04	1.18	1.04	1.18	1.27	1.27	1.19	1.33
BUTTERMILK POWDER AND WHEY POWDER															
Domestic production	7.2	8.3	12.2	11.5	14.6	10.9	12.2	12.5	10.6	13.8	12.6	14.4	12.5	13.8	15.0
Imports [h]	9.4	15.0	7.0	7.9	10.4	10.5	9.9	8.8	4.6	4.4	5.4	6.3	5.9	3.1	5.0
Total domestic consumption	16.6	23.3	19.2	19.4	25.0	21.4	22.1	21.3	15.2	18.2	18.0	20.7	17.3	15.4	15.0
Exports	.	.	.	.	.	.	.	.	.	.	.	.	1.4	3.3	5.0

[a] Based on the assumption that 1 kg butter ≈ 20.7 kg skimmed milk. [b] ... 1 kg fresh cream ≈ 13 kg skimmed milk ... [c] .... 1 kg sterilized tinned cream ≈ 6 kg skimmed milk ... [d] Skimmed concentrate milk for the margarine industry and in part for the ice cream industry. [e] Own estimate based on the official estimates of the Ministry of Agriculture, Fisheries and Food and the Federation of British Milk Marketing Boards for farm years (June - May and April - March respectively). [f] Organized by the Milk Marketing Organizations. [g] Own estimate. [h] For human consumption and feed.

Source: Federation of United Kingdom Milk Marketing Boards, Dairy Facts and Figures - United Kingdom, place of publication not given, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Own calculations and estimates.

Table 21* - Supply of eggs in the United Kingdom 1958-71 and forecasts for 1977

('000 000 dozens)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Number of laying hens June ('000 000)[a,b]	53.95	57.37	54.67	55.10	58.96	59.04	61.99	58.75	58.64	59.79	58.84	59.63	64.15[c]	61.05[c]	61.40
Yield per hen (eggs)	231	230	241	244	235	235	238	251	262	260	270	262			290
Total production of hen eggs[b]	1036.6	1100.9	1099.1	1122.5	1156.3	1156.3	1230.1	1227.5	1281.7	1295.5	1324.2	1303.9			1483.6
Production of duck eggs for eating[c]	11.7	11.4	11.3	9.8	7.5	6.5	6.1	5.7	5.3	5.1	5.2	5.1	5.0		3.0
Hatching eggs (hens)	28.0	30.8	37.4	38.2	39.3	39.3	40.6	40.5	46.1	47.9	50.3	53.5			66.8
as a percentage of total production of hen eggs	2.7	2.8	3.4	3.4	3.4	3.4	3.3	3.3	3.6	3.7	3.8	4.1			4.5
Wastage	10.4	11.0	11.0	11.2	11.6	11.6	12.3	12.3	12.9	13.0	13.3	13.0			14.8
Production of hen eggs for eating	998.2	1059.1	1050.7	1073.1	1105.4	1105.4	1177.2	1174.7	1222.7	1234.6	1260.6	1237.4			1402.0
Egg production for human consumption, total	1009.0	1070.5	1062.0	1082.9	1112.9	1111.9	1183.3	1180.4	1228.0	1239.7	1265.8	1242.5			1405.0
Total exports	2.6	2.1	1.2	1.7	1.4	6.4	8.4	17.3	44.1	33.2	41.8	32.5	26.5	17.4	
Shell eggs	0.8	1.3	0.9	0.9	1.1	3.4	4.6	4.0	2.1	2.2	4.3	5.0	3.6	1.4	
Egg products in shell egg equivalent[e]	1.8	0.8	0.3	0.8	0.3	3.0	3.8	13.3	42.0	31.0	37.5	27.5	22.9	16.0	
Total imports	60.2	40.0	65.2	80.6	57.0	52.2	40.3	46.4	41.3	48.8	42.9	44.1	33.1	39.7	
Shell eggs	14.9	12.8	35.1	39.3	24.9	27.9	21.5	22.5	19.8	26.8	20.4	17.5	17.1	12.4	
Egg products in shell egg equivalent[f]	45.3	27.2	30.1	41.3	32.1	24.3	18.8	23.9	21.5	22.0	22.5	26.6	16.0	27.3	
Net imports (-) or net exports (+) of eggs and egg products, total	-57.6	-37.9	-64.0	-78.9	-55.6	-45.8	-31.9	-29.1	+2.8	-15.6	-1.1	-11.6	-6.6	-22.3	+ 50.0
Total domestic consumption of hen and duck eggs	1067.5	1108.4	1126.0	1161.8	1168.5	1157.7	1215.2	1209.5	1225.2	1255.3	1266.9	1254.1			1355.0
Total per capita consumption (eggs)	248	256	258	264	263	259	270	267	269	274	275	271			284
Shell eggs (eggs)	231	232	237	243	242	237	248	248	245	248	252	248			258
Egg products (eggs; in shell egg equivalent)	17	24	21	21	21	22	22	19	24	26	23	23			26

[a] All laying hens from point of lay to completion of first full moult, all laying hens after completion of first full moult and all hatching hens. Complete sets of statistics are available only for all laying hens (including day old chicks until time of first full moult) and for all hatching hens and breeding cocks of all ages. The above figures are based on the assumption that on average about 29 % of the total number of laying hens is accounted for by the category "day-old chicks until time of first full moult" and around 10 % of the total number of breeding cocks and hatching hens is accounted for by breeding cocks of all ages. [b] On all farms ("agricultural holdings" $\geq$ 1 acre agricultural area); intensive market production on farms of $\leq$ 1 acre and producers producing mainly or wholly for their own requirements with an area of $\leq$ 1 acre ("domestic poultry keepers"). [c] Since June 1970 "domestic poultry keepers" have not been included in censuses of poultry numbers; in order to guarantee an approximate comparability with pre-1970 figures, the figures for 1970 onwards have been multiplied by the factor 1.01, as the proportion of fowls kept by the "domestic poultry keepers" is about 1 % of the total. [d] Figures are only available for farm years (June-May); converted to calendar years by: $Kt \approx \frac{1}{2} [Wt-1/t + Wt-1/t+1]$. [e] About 1 % of total hen egg production. [f] 1 kg dried whole egg $\approx$ 50 shell eggs; 1 kg frozen whole egg $\approx$ 20 shell eggs; 1 kg dried egg yolk $\approx$ 50 shell eggs. [g] As a more detailed breakdown of the individual kinds of egg products is not available, 1 kg of egg product was taken to correspond to approximately 30 shell eggs.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Ministry of Agriculture, Fisheries and Food, Department of Agriculture and Fisheries for Scotland, Ministry of Agriculture, Northern Ireland, Agricultural Statistics, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; FAO, Trade Yearbook, Rome, various issues; Own calculations and estimates.

Table 22* - Supply of poultrymeat and poultry numbers in the United Kingdom 1958-71 and 1958/59 - 1968/69[i] and forecasts for 1977

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total number of poultry in June ('000 000)[a]	99.72	106.61	103.01	114.29	109.03	112.18	118.38	118.14	118.94	125.62	127.46	126.51	143.43	139.12	
Total fowls ('000 000)[a]	95.89	102.26	98.36	108.40	104.03	106.84	112.92	112.13	113.53	120.15	121.75	120.61	137.21	133.02	
Laying and hatching hens ('000 000)[a]	.	.	.	.	.	.	85.74	80.91	80.75	82.37	81.03	82.19	87.42	83.24	
Broilers etc. ('000 000)[a]	.	.	.	.	.	.	27.18	31.22	32.78	37.78	40.72	38.42	49.78	49.78	
Total ducks ('000 000)[a]	1.27	1.22	1.30	1.56	1.34	1.27	1.33	1.35	1.23	1.20	1.16	1.27			
Total geese ('000 000)[a]	0.43	0.40	0.39	0.36	0.30	0.25	0.24	0.24	0.22	0.23	0.20	0.17	6.22	6.10	
Total turkeys ('000 000)[a]	2.14	2.72	2.96	3.97	3.36	3.81	3.89	4.43	3.97	4.05	4.35	4.47			
Total net production of poultrymeat ('000 t)[b] ..	211.3	261.0	290.1	348.8	346.5	349.5	371.9	391.0	426.7	463.3	508.0	555.8			849.0
Total exports ('000 t)[c]	1.0	1.1	1.2	1.5	1.6	0.4	0.2	0.4	0.3	0.3	0.4	0.8			
Total imports ('000 t)[c]	15.8	12.9	12.3	11.8	12.9	9.2	17.4	21.6	17.1	20.6	14.6	10.2	11.5	15.8	
Fresh, chilled, frozen poultry, total ('000 t)	11.1	8.7	5.7	4.7	4.9	2.4	9.3	12.6	7.9	11.0	7.5	3.9	5.8	10.4	
Preserved poultrymeat ('000 t)[d]	4.7	4.2	6.6	7.1	8.0	6.8	8.1	9.0	9.2	9.6	7.1	6.3	5.7	5.4	
Total net imports of poultrymeat ('000 t)	14.8	11.8	11.1	10.3	11.3	8.8	17.2	21.2	16.8	20.3	14.2	9.4			- 30.0
Total domestic poultrymeat consumption ('000 t)[e]	226.1	272.8	301.2	359.1	357.8	358.3	389.1	412.2	443.5	483.6	522.2	565.2			819.0
Per capita consumption (kg)	4.38	5.25	5.75	6.80	6.71	6.68	7.20	7.58	8.11	8.80	9.45	10.18			14.30

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
Slaughterings ('000 000)[h]											
Total fowls ('000 000)	150.6	171.2	195.8	217.9	218.1	225.1	237.6	255.2	275.2	300.9	323.7
Total ducks ('000 000)	2.9	2.8	4.3	4.5	3.7	4.3	4.8	4.7	5.1	5.3	5.9
Total geese ('000 000)	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total turkeys ('000 000)	3.3	4.2	4.6	6.4	5.6	6.6	7.6	9.3	9.0	10.1	12.2
Number of slaughterings per unit of poultry[f,h]											
Total fowls (head)	1.52	1.71	1.89	2.05	2.07	2.05	2.11	2.26	2.36	2.49	2.67
Ducks (head)	2.33	2.22	3.01	3.10	2.84	3.31	3.58	3.64	4.20	4.49	4.86
Geese (head)	1.20	1.27	1.07	1.21	1.09	1.22	1.25	1.30	1.33	1.40	1.62
Turkeys (head)	1.36	1.48	1.33	1.75	1.56	1.71	1.83	2.21	2.24	2.40	2.77
Total poultrymeat production ('000 t)[g,h]	232.3	262.1	312.4	351.6	345.8	361.9	380.6	412.5	447.2	488.3	536.6
Total fowls ('000t)	208.8	234.6	280.5	310.8	311.6	322.3	339.4	361.8	392.8	428.7	467.3
Ducks and geese ('000 t)	7.8	7.4	10.2	10.4	8.4	9.2	8.5	11.0	12.3	12.9	14.1
Turkeys ('000 t)	15.7	20.1	21.7	30.4	25.8	30.4	32.7	39.7	42.1	46.7	55.2

[a] From 1958 to 1969: the number of poultry on all farms with an agricultural area of more than 1 acre (agricultural holdings) and on all farms with an area of $\leq$ 1 acre which, however, have either a sizeable marketable production (intensive farming) or produce almost exclusively for their own requirements (domestic poultry keepers); from 1970 onwards: excluding poultry of domestic poultry keepers, otherwise as for 1958-69. [b] Estimated dressed carcase weight - i.e. oven-ready without head and claws but with edible offals (heart, gizzard, liver) and offal fats. [c] Including re-exports. [d] 1 kg preserved poultrymeat $\approx$ 1.5 kg fresh, chilled or frozen poultry. [e] Net production plus net imports. [f] Number in farm-year (t/t+1) $\approx \frac{1}{2}$ (June number t + June number t+1). [g] The average slaughter weight (for definition see (b)) was estimated at around 1.43 kg for all fowls, around 2.00 kg for ducks, around 4.50 kg for geese and around 4.60 kg for turkeys (official estimates based on live weight, whereby it was assumed that slaughterweight $\approx$ 75 % of live weight - this is valid for all the above types of poultry). [h] Poultry on all farms with an agricultural area of more than 1 acre. [i] Farm years beginning 1 June.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilization of Farm Produce in the United Kingdom, London, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulleting, London, various issues; Own calculations and estimates.

Table 23* - Supply of apples in the United Kingdom 1958/59 - 1970/71[a] and forecasts for 1977/78

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total area ('000 ha)	67.5	65.5	64.2	61.0	58.5	56.9	54.8	52.1	49.5	49.3	49.4	42.4	43.1	30.0
Apples - dessert ('000 ha)	26.3	26.3	26.4	25.9	25.5	25.3	24.8	24.0	23.3	23.4	23.8	23.5	23.3	15.0
Apples - cooking ('000 ha)	25.5	24.4	23.8	22.1	20.9	20.0	19.1	18.2	17.0	16.8	16.4	13.7	14.1	10.0
Apples - cider ('000 ha)	15.7	14.8	14.0	13.0	12.1	11.6	10.9	9.9	9.2	9.1	9.2	5.2	5.7	5.0
Yield (t/ha)														
Apples - dessert (t/ha)	10.2	9.1	10.9	7.7	10.1	10.7	12.5	10.8	9.1	8.2	8.6	12.0		11.0
Apples - cooking (t/ha)	13.3	11.6	13.2	5.1	10.8	11.2	15.1	12.1	7.8	6.7	9.1	11.1		11.0
Apples - cider (t/ha)	6.2	4.5	6.1	2.1	8.1	4.4	5.0	4.9	2.5	3.0	4.0			4.5
Total production	705	589	686	339	582	545	653	529	368	332	390			298
Apples - dessert	269	239	288	199	258	271	310	259	213	192	204	281		165
Apples - cooking	338	283	313	113	226	223	288	221	132	113	149	152		110
Apples - cider	98	67	85	27	98	51	55	49	23	27	37			23
Non-marketed production of apples - dessert and cooking	75	37	74	4	16	21	44	18	11	6	9	20		8
Total commercial production[b]	630	552	612	335	566	524	609	511	357	326	381			290
Total exports[c]	2	3	4	5	5	4	3	5	4	2	2			0
Total imports	216	196	204	278	219	238	259	281	273	344	302			533
Total apples - dessert and cooking	204	190	199	252	208	230	245	267	241	288	257			452
Apples - cider	5	2	0	16	0	0	7	5	15	35	28	33	6	37
Apples - preserved[d]	7	4	5	10	11	8	7	9	17	21	17	17		44
Total net imports	214	193	200	273	214	234	256	276	269	342	300			533
Total available supply[e] (= total domestic consumption)	844	745	812	608	780	758	865	787	626	668	681			823
Total apples - dessert and cooking[f]	734	672	722	555	671	699	796	724	571	585	599			719
Fresh consumption of apples - dessert and cooking[g]	676	583	634	525	603	634	726	661	518	544	546			694
Processing of apples (dessert and cooking) by industry[h]	58	89	88	30	68	65	70	63	53	41	53	54		25
Apples - cider[i]	103	69	85	45	98	51	62	54	38	62	65			60
Imported preserved apples	7	4	5	10	11	8	7	9	17	21	17	17		44
Per capita consumption (kg)														
Fresh apple consumption - dessert and cooking (kg)	13.05	11.18	12.06	9.89	11.28	11.78	13.40	12.13	9.45	9.87	9.85			12.10
Total preserved apples[j]	1.25	1.78	1.77	0.75	1.48	1.36	1.42	1.32	1.28	1.12	1.26			1.20

[a] Farm years beginning 1 August. [b] Dessert and cooking apples. [c] Mainly re-exports of dessert and cooking apples. [d] Tinned and bottled apples, unsweetened; estimated for farm years ($W_{t/t-1}$) on the basis of figures for calendar years (K_t) : $W_{t/t-1} \approx \frac{1}{2}(K_t + K_{t-1})$. [e] Commercial production plus total net imports. [f] Total domestic production of dessert and cooking apples minus non-marketed production and total exports, plus imports of dessert and cooking apples. [g] Including apples used in households for cooking. [h] Industrial production of apple puree and similar products: these are estimates by the Commonwealth Secretariat (see Sources) for calendar years but are clearly related to the harvests in question with the result that they can be used without reconversion in the farm year balance. [i] Total domestic cider apple production plus cider apple imports. [j] Imported preserved apples, and dessert and cooking apples used by the domestic food preservation industry.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Ministry of Agriculture, Fisheries and Food, Department of Agriculture and Fisheries for Scotland, Ministry of Agriculture, Northern Ireland, Agricultural Statistics, London, various issues; Commonwealth Secretariat, Fruit, London, various issues; Commonwealth Secretariat, Fruit Intelligence, London, various issues; Own calculations and estimates.

Table 24* - Supply of pears in the United Kingdom 1958/59 - 1970/71[a] and forecasts for 1977/78
('000 t)

	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1977/78
Total area ('000 ha)	8.17	8.17	8.17	7.89	7.77	7.73	7.69	7.44	7.12	7.08	7.10			5.30
Pears (dessert+cooking) ('000 ha)	7.12	7.16	7.16	6.84	6.72	6.64	6.60	6.35	6.15	6.15	6.17	5.67	5.63	4.50
Pears perry[b] ('000 ha)	1.05	1.01	1.01	1.05	1.05	1.09	1.09	1.09	0.97	0.93	0.93			0.80
Yield (t/ha)														
Pears (dessert+cooking) (t/ha)	10.96	9.05	9.64	7.62	7.83	9.50	9.94	10.02	5.92	3.82	12.46			9.00
Pears perry[b] (t/ha)	5.52	2.97	4.85	0.95	6.48	2.84	2.29	2.84	3.40	1.51	5.48			4.00
Total production[c]	83.8	67.8	73.9	53.1	59.4	66.2	68.1	66.7	39.7	24.9	82.0			43.7
Pears (dessert+cooking)	78.0	64.8	69.0	52.1	52.6	63.1	65.6	63.6	36.4	23.5	76.9			40.5
Pears perry[b]	5.8	3.0	4.9	1.0	6.8	3.1	2.5	3.1	3.3	1.4	5.1			3.2
Total exports[d]	2.4	1.4	1.7	2.6	2.7	2.5	1.5	1.2	0.9	0.7	0.9			0
Total imports	110.6	115.2	122.2	135.2	127.7	133.2	124.1	132.8	122.7	134.8	109.5			137.5
Pears (dessert+cooking)[e]	61.1	60.5	64.7	72.2	61.8	65.7	60.0	70.0	60.0	72.2	44.2			68.5
Pears - preserved[f]	49.5	54.7	57.5	63.0	65.9	67.5	64.1	62.8	62.7	62.6	65.3			69.0
Total net imports	108.2	113.8	120.5	132.6	125.0	130.7	122.6	131.6	121.8	134.1	108.6			137.5
Total available supply[g] (= total domestic utilization)	192.0	181.6	194.4	185.7	184.4	196.9	190.7	198.3	161.5	159.0	190.6			181.2
Total pears (dessert and cooking)[h]	136.8	124.1	132.1	121.9	111.8	126.5	124.2	132.5	95.5	95.1	120.3			109.0
Fresh pears (dessert+cooking)	132.8	121.6	129.3	119.2	109.2	124.5	122.7	130.6	93.9	94.4	119.4			109.0
Pears for the food preservation industry	4.0	2.5	2.8	2.7	2.6	2.0	1.5	1.9	1.6	0.7	0.9	0.5		0
Foreign preserved pears[i]	49.4	54.5	57.4	62.8	65.8	67.3	64.0	62.7	62.7	62.5	65.2			69.0
Per capita consumption														
Fresh pears (dessert+cooking) (kg)	2.56	2.33	2.46	2.25	2.04	2.31	2.26	2.40	1.71	1.71	2.15			1.90
Total preserved pears (kg)	1.03	1.09	1.14	1.23	1.28	1.29	1.21	1.19	1.17	1.15	1.19			1.20

[a] Farm years beginning 1 August. [b] Perry production. [c] As no figures are available for non-marketed pear production (dessert + cooking), total production must be taken as commercial production; it can be assumed that non-marketed production is of only marginal importance for commercial producers. [d] Almost exclusively re-exports of dessert and cooking pears. [e] Possibly including small quantities of perry pears. [f] Bottled and tinned pears, sweetened; the figures, which are only available for calendar years (K), have been reconverted to farm years ($W_{t/t-1}$) : $W_{t/t-1} \approx \frac{1}{2}(K_t + K_{t-1})$. [g] Total domestic production of pears plus net imports. [h] Domestic production of dessert and cooking pears minus re-exports and plus imports of dessert and cooking pears. [i] Imports minus re-exports.

Source: Ministry of Agriculture, Fisheries and Food, Output and Utilization of Farm Produce in the United Kingdom, London, various issues; Ministry of Agriculture, Fisheries and Food, Department of Agriculture and Fisheries for Scotland, Ministry of Agriculture, Northern Ireland, Agricultural Statistics, London, various issues; Commonwealth Secretariat, Fruit, London, various issues; Commonwealth Secretariat, Fruit Intelligence, London, various issues; Own calculations and estimates.

Table 25* - Supply of peaches in the United Kingdom 1958-70 and forecasts for 1977

('000 t)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1977
Total imports [a]	95.1	90.5	109.1	115.7	120.0	124.2	129.7	127.2	125.0	113.9	139.9	114.4	130.9	160.0
Fresh peaches [b]	9.0	14.9	16.3	18.9	15.6	21.3	24.2	25.0	24.7	23.7	34.1	22.4	36.7	57.0
Preserved peaches	86.1	75.6	92.8	96.8	104.4	102.9	105.5	102.2	100.3	90.2	105.8	92.0	94.2	103.0
Total re-exports	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.6	0.5	0.4		0
Fresh peaches	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.4	0.2	0.3		0
Preserved peaches	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.3	0.1		0
Total net imports (= total available supply)	94.9	90.1	108.8	115.4	119.7	123.9	129.4	126.9	124.6	113.3	139.4	114.0		160.0
Utilization														
Consumed fresh [c]	2.5	10.1	12.3	13.3	11.8	18.4	21.0	21.3	21.8	21.2	32.3	20.7		57.0
By domestic food preservation industry	6.5	4.7	3.9	5.5	3.6	2.8	3.1	3.5	2.7	2.1	1.6	1.4		0
Consumption of imported preserved peaches [d]	85.9	75.3	92.6	96.6	104.3	102.7	105.3	102.1	100.1	90.0	105.5	91.9		103.0
Total per capita consumption (kg)	1.84	1.73	2.08	2.19	2.25	2.31	2.40	2.33	2.28	2.06	2.52	2.05		2.80
Consumed fresh (kg)	0.05	0.19	0.24	0.26	0.23	0.34	0.39	0.39	0.40	0.38	0.58	0.37		1.00
Total preserved peaches (kg)	1.79	1.54	1.84	1.93	2.02	1.97	2.01	1.94	1.88	1.68	1.94	1.68		1.80

[a] Including nectarines. [b] Sweetened, bottled or tinned. [c] Imports of fresh peaches minus re-exports of fresh peaches and utilization of fresh peaches by domestic food preservation industry. [d] Imports of preserved peaches minus re-exports of preserved peaches.

Source: Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Commonwealth Secretariat, Fruit, London, various issues; Commonwealth Secretariat, Fruit Intelligence, London, various issues; Own calculations and estimates.

Table 26* - Supply of tomatoes in the United Kingdom 1958-71 and forecasts for 1977

('000 t fresh weight)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
Total area of tomatoes under glass in England and Wales (ha)[a]	.	918	859	830	805	775	796	777	847	853	867	888	883	899	
with artificial heating (ha)	.	.	.	.	460	436	463	436	459	452	452	472	494	510	
without artificial heating (ha)	.	.	.	.	345	339	333	341	388	401	415	416	389	389	
Area of tomatoes in the open in England and Wales (ha)	243	162	121	121	81	81	40	.	.	.					
Area of tomatoes under glass in Scotland (ha)	81	81	81	81	81	81	81	81	81	81					
Statistically evaluated domestic production[b]	92.5	102.6	91.4	88.4	83.3	77.2	83.3	79.2	81.3	85.3					
Calculated domestic production[c]	195.7	225.5	196.5	198.9	181.8	156.2	179.4	156.7	170.2	181.1	166.1	181.9			130.0
Total imports	482.2	484.8	512.9	505.2	530.5	570.4	544.8	584.3	648.5	627.6	701.8	612.6	682.6		871.0
fresh and chilled tomatoes	141.7	147.0	159.7	160.4	154.7	165.3	168.5	166.3	157.3	158.4	170.1	160.9	164.9		249.0
tomato pulp, tomato concentrates[d]	258.0	262.8	260.4	256.2	277.8	312.6	265.2	323.4	393.0	357.0	399.6	318.6	382.8		
preserved tomatoes[e]	75.8	67.9	85.0	79.1	87.5	78.8	97.1	80.6	83.3	96.8	107.9	113.9	114.0		622.0
tomato juice[f]	6.7	7.1	7.8	9.5	9.5	7.7	10.0	11.0	10.9	10.4	13.2	9.2	9.9		
dried tomatoes[g]	.	.	.	.	1.0	6.0	4.0	3.0	4.0	5.0	11.0	10.0	11.0		
Total exports[h]	1.7	1.6	2.0	1.5	2.6	1.5	2.3	2.6	1.4	1.3	1.1	6.3			0
fresh and chilled tomatoes	0.1	0.0	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.3	0.1	0.2			
tomato concentrates and preserved tomatoes [d,e]	1.5	1.5	1.8	1.2	2.4	1.2	2.1	2.4	1.2	0.9	0.9	6.0			
tomato juice[f]	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Total net imports	480.5	483.2	510.9	503.7	527.9	568.9	542.5	581.7	647.1	626.3	700.7	606.3			871.0
Total available supply[i] (= total domestic utilisation)	676.2	708.7	707.4	702.6	709.7	725.1	721.9	738.4	817.3	807.4	866.8	788.2			1001.0
fresh and chilled tomatoes	337.3	372.5	356.1	359.1	336.4	321.3	347.8	322.9	327.4	339.2	336.1	342.6	333.7		379.0
tomato pulp, tomato concentrates, preserved tomatoes and dried tomatoes[j]	332.3	329.2	343.6	334.1	363.9	396.2	364.2	404.6	479.1	457.9	517.6	436.5			608.0
tomato juice[k]	6.6	7.0	7.7	9.4	9.4	7.6	9.9	10.9	10.8	10.3	13.1	9.1	9.8		14.0
Total per capita consumption (kg)	13.09	13.64	13.51	13.31	13.32	13.52	13.36	13.58	14.96	14.69	15.68	14.19			17.45
fresh and chilled tomatoes (kg)	6.53	7.17	6.80	6.80	6.31	5.99	6.44	5.94	5.99	6.17	6.08	6.17	5.99		6.60
tomato pulp, tomato concentrates, preserved and dried tomatoes (kg)	6.43	6.34	6.56	6.33	6.83	7.39	6.74	7.44	8.77	8.33	9.36	7.86			10.60
tomato juice (kg)	0.13	0.13	0.15	0.18	0.18	0.14	0.18	0.20	0.20	0.19	0.24	0.16	0.18		0.25

[a] July figures. Cultivation for commercial purposes only on farms with an area under glass (for tomatoes and other vegetables) of at least 1000 square feet. [b] Farm years June-May; from 1965/66 excluding tomatoes in the open. [c] Consumption of fresh and chilled tomatoes (official estimate) minus net imports of fresh and chilled tomatoes; the large discrepancy between the statistically evaluated and the estimated production is probably due to the very extensive area cultivated for own consumption by producers which is not reflected in the statistics of the Ministry of Agriculture, Fisheries and Food. [d] In conformity with EEC agricultural statistics it was assumed that 1 kg of tomato concentrate or pulp ≈ 6 kg of fresh tomatoes. [e] 1 kg of preserved tomatoes ≈ 1.2 kg fresh tomatoes. [f] 1 kg tomato juice with an average dry matter content of 7 % ≈ 0.7 kg fresh tomatoes (calculations based on EEC agricultural statistics: 1 kg dried tomatoes ≈ 10 kg fresh tomatoes; with an average dry matter content of 7 % this corresponds a fresh tomato equivalent for juice of 0.07 x 10.0 = 0.7; from 1958-1961 imports of dried tomatoes are only of minor importance. [h] Almost exclusively re-exports. [i] Calculated domestic production plus total net imports. [j] Net imports. [k] Net imports of tomato juice.

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Ministry of Agriculture, Fisheries and Food, Output and Utilisation of Farm Produce in the United Kingdom, London, various issues; Ministry of Agriculture, Fisheries and Food, Department of Agriculture and Fisheries for Scotland, Ministry of Agriculture, Northern Ireland, Agricultural Statistics, London, various issues; Commonwealth Secretariat, Fruit, London, various issues; Commonwealth Secretariat, Fruit Intelligence, London, various issues; Own calculations and estimates.

Table 27* - Supply of fats and oils (excluding butter) in the United Kingdom 1958-71 and forecasts for some items for 1977

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
				(1000 t raw oil or raw oil equivalent)											
Total imports of oil seeds and vegetable oils:	733	776	730	714	668	678	645	668	696	642	698	726			
in the form of fruit and seeds (crude oil equivalent)	379	394	366	366	379	372	319	304	277	234	214	204			
in the form of oil	354	382	364	348	289	306	326	364	419	408	484	522			
Ground nuts:															
shelled nuts in product weight	210	231	129	161	211	194	147	89	75	100	116	70			
extraction rate (%)	45.7	45.5	46.5	46.6	45.5	45.4	45.6	46.1	45.3	46.0	45.7	47.1			
oil equivalent of groundnut imports	96	105	60	75	96	88	67	41	34	46	53	33			
imports of kernels and nuts	28	49	46	36	40	44	54	70	103	105	127	85			
total imports of groundnut oil	124	154	106	111	136	132	121	111	137	151	180	118	124	90	
Palm nuts, palm kernels:															
nuts and kernels in product weight	278	237	241	228	212	211	194	207	166	98	52	44			
extraction rate (%)	46.6	48.1	47.7	48.2	47.6	47.4	46.9	47.3	47.6	48.0	50.0	50.0			
oil equivalent of nut and kernel imports	130	114	115	110	101	100	91	98	79	47	26	22			
imports of palm kernel oil	0	0	0	0	0	0	0	1	16	35	23	30	53		
imports of palm oil	185	197	178	163	113	114	116	117	150	99	109	139	163		
total imports of palm oil and palm kernel oil	315	311	293	273	214	214	207	216	245	181	158	191	215	283	
Coconuts:															
copra in product weight	94	65	76	99	72	78	56	57	56	42	48	46			
extraction rate (%)	62.8	63.1	64.5	64.6	63.9	62.8	64.3	63.2	64.3	66.7	62.5	63.0			
oil equivalent of copra imports	59	41	49	64	46	49	36	36	36	28	30	29			
imports of coconut oil	33	27	25	40	32	43	47	43	36	38	48	43			
total imports of coconut oil	92	68	74	104	78	92	83	79	72	66	78	72	68	66	
Soya beans:															
soya beans in product weight	130	222	318	184	243	269	294	287	286	253	241	323			
extraction rate (%)	16.9	17.1	17.3	17.4	16.9	17.5	17.0	17.1	17.1	17.0	17.0	17.0			
oil equivalent of bean imports	22	38	55	32	41	47	50	49	49	43	41	55			
imports of soya oil	7	12	18	18	20	25	18	21	17	16	15	25			
total imports of soya oil	29	50	73	50	61	72	68	70	66	59	56	80	124	143	
Linseed:															
seed in product weight	123	156	160	153	132	111	115	127	100	96	61	67			
extraction rate (%)	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0			
oil equivalent of seed imports	43	55	56	54	46	39	40	44	35	34	21	23			
imports of linseed oil	66	66	46	48	57	47	43	42	36	39	39	37			
total imports of linseed oil	109	121	102	102	103	86	83	86	71	73	60	60			
Cottonseed:															
seed in product weight	104	152	140	129	189	179	113	105	49	27	21	21			
extraction rate (%)	15.4	15.8	16.4	15.5	15.3	16.2	15.9	16.2	16.3	14.8	14.3	14.3			
oil equivalent of seed imports	16	24	23	20	29	29	18	17	8	4	3	3			
imports of cottonseed oil	2	2	12	6	1	7	11	33	36	12	12	12			
total imports of cottonseed oil	18	26	35	26	30	36	29	50	44	16	15	15	42	35	

Table 27* (continued)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
				(1000 t crude oil or crude oil equivalent)											
Rape:															
seed in product weight	4	5	4	5	7	8	12	33	43	41	81	78			13
extraction rate (%)	25.0	40.0	25.0	40.0	28.6	25.0	33.3	36.4	34.9	34.1	34.6	35.9			40.0
oil equivalent of seed imports	1	2	1	2	2	2	4	12	15	14	28	28			5
imports of rapeseed oil	0	0	0	0	2	4	0	0	0	0	11	12			5
total imports of rapeseed oil	1	2	1	5	2	6	4	12	15	14	39	40	33	28	10
Sunflower:															
oil imports and total	0	0	0	3	0	4	5	2	5	39	66	100	35	24	10
Olives:															
oil imports and total	2	3	3	3	3	2	3	3	3	3	3	3			
Castor seed:															
seed in product weight	14	13	9	12	21	32	19	10	32	31	19	12			
extraction rate (%)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0			
oil equivalent of seed imports	7	7	5	6	11	16	10	5	16	16	10	6			
castor oil imports	15	13	22	17	13	9	20	24	8	13	21	24			
total castor oil imports	22	20	27	23	24	25	30	29	24	29	31	30			
Tung oil:															
oil imports and total	11	10	10	7	5	5	5	5	5	5	5	6			
Other:															
seed in product weight	16	26	5	9	24	5	10	8	17	7	35	18			
extraction rate (%)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0			
oil equivalent of seed imports	5	8	2	3	7	2	3	2	5	2	2	5			
oil imports	5	3	4	4	5	2	4	3	4	4	5	6			
total oil imports	10	11	6	7	12	4	7	5	9	6	7	11			
Total exports of oil seeds and vegetables oils	47	49	32	27	34	50	20	20	18	15	18	22			
oil seeds in product weight	1	2	3	3	3	3	5	8	8	10	8	8			
extraction rate (%)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0			
oil equivalent	1	1	2	2	2	2	3	4	4	5	4	4			
exports of vegetable oils[a]	46	48	30	25	32	48	17	16	14	10	14	18			
Total net vegetable oil exports	686	727	698	687	634	628	625	648	678	627	680	704			
				(1000 t crude oil equivalent or rendered fat)											
Total imports of animal fats and oils	305	382	457	407	439	469	549	500	449	541	492	446			
lard	116	171	205	174	201	227	278	213	186	187	193	178	190	204	
other animal fats for human consumption[b]	13	19	13	11	14	14	16	11	13	11	11	11			
whale and fish oil	149	124	171	162	170	171	165	190	181	286	225	200	207	227	
industrial tallow	23	62	61	52	46	50	79	77	59	46	55	52			
other fats not intended for human consumption[c]	4	6	7	8	8	7	11	9	10	11	8	5			

Table 27* (continued)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
				(1000 t raw oil equivalent or rendered fat)											
Total exports of animal fats and oils	1	1	1	1	1	2	7	0	0	1	2	1			
Total net imports of animal fats and oils ...	304	381	456	406	438	467	542	500	449	540	490	445			
Total net imports of animal and vegetable fats and oils	990	1 108	1 154	1 093	1 072	1 095	1 167	1 146	1 127	1 167	1 170	1 149			
					(1000 t raw fat)										
Domestic production of animal fats:															
Total slaughter fats[d]	58	56	59	65	66	68	66	66	67	67	68	65	71	71	
from net domestic production of slaughter cattle	30	27	31	33	35	36	33	32	33	35	35	34	38	37	
from net domestic production of slaughter calves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
from slaughterings of imported live cattle	6	5	5	7	5	6	6	5	5	6	5	5	6	5	
from net production of pigmeat[e]	14	14	14	14	16	16	17	19	18	16	17	18	19	20	
from net production of mutton and lamb[e] .	8	10	9	11	10	10	10	10	11	10	11	8	9	9	
Reconverted to rendered fat (80 % of untreated fat weight)	46	45	47	52	53	54	53	53	54	54	54	52	57	57	
				(1000 t raw oil equivalent or rendered fat)											
Total available domestic supply of animal and vegetable fats and oils[f]	1 036	1 153	1 201	1 145	1 125	1 149	1 220	1 201	1 181	1 221	1 224	1 201			
Utilisation of oils and fats:															
Human consumption:															
total margarine production	272	294	304	275	273	280	281	270	264	257	270	277	276	295	308
groundnut oil	35	38	22	19	18	20	13	11	14	15	17	9	10	8	
soya oil	9	17	24	17	24	27	28	31	25	21	16	24	48	61	
cottonseed oil	5	4	11	9	7	5	5	7	4	3	-	-	12	1	
rapeseed oil	-	-	-	-	-	.	-	-	-	6	12	13	2	4	50
sunflowerseed oil	-	-	-	-	-	.	-	-	-	10	22	33	9	4	5
coconut oil	41	20	19	21	23	16	13	10	8	8	2	2	2	2	
palm kernel oil	13	9	8	7	6	3	2	1	1	1	1	1	1	2	
palm oil	74	85	66	62	33	24	30	25	42	21	20	25	29	54	
other vegetable oils	12	14	17	16	13	17[g]	14	15	24	15	17	14	14	8	
total vegetable oils	187	185	169	151	124	110	105	100	118	98	107	121	127	144	
lard	1	15	33	17	42	54	43	52	14	12	10	8	15	15	
other animal fats	1	1	3	2	2	2	2	4	5	3	4	4	5	6	
whale and fish oils	41	42	99	92	103	108	99	114	121	142	155	144	126	125	
total animal oils	44	58	135	110	147	164	144	170	140	157	169	156	146	147	

Table 27* (continued)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1977
	('000 t crude oil equivalent or rendered fat)														
Total production of manufactured edible fats and oils	144	141	140	143	145	154	150	140	139	139	140	142	137	144	115
groundnut oil	24	24	11	12	9	9	5	4	5	4	3	2	2	3	
soya oil	8	9	14	8	12	12	15	11	6	6	3	5	7	8	
cottonseed oil	3	4	4	4	2	2	1	2	2	-	-	-	1	-	
rapeseed oil	-	-	-	-	-	-	-	-	0	4	6	6	5	4	(7)
sunflowerseed oil	-	-	-	-	-	-	-	-	0	2	5	5	2	-	3
coconut oil	2	1	1	2	2	1	1	1	1	2	1	1	1	1	
palm kernel oil	8	3	4	2	2	2	1	2	2	3	2	2	2	2	
palm oil	36	34	28	36	33	30	26	24	23	20	19	24	28	26	
other vegetable oils	7	5	5	4	3	4	5	5	8	3	5	3	1	2	
total vegetable oils	88	80	67	68	63	60	54	49	47	44	44	48	49	47	
lard	4	10	21	15	19	28	39	23	16	12	14	10	14	31	
other animal fats	4	5	6	6	6	8	11	12	12	12	7	8	10	13	
whale and fish oil	48	46	46	54	57	58	46	56	64	71	75	76	64	53	
total animal oils	56	61	73	75	82	94	96	91	92	95	96	94	88	97	
Direct consumption of lard[h]	121	156	161	152	152	156	171	153	170	173	160	173	172	172	
Other edible fats and oils	230	226	226	261	266	272	272	284	297	284	343	335			385
Industrial utilisation:															
Total[i]	289	338	368	313	289	287	346	354	311	368	301	271			

[a] Crude oil; oil, purified or refined, but not processed further (e.g. solidified, polymerised). [b] Goose fat, other pig fat, edible tallow "premier jus" and the like. [c] Oleostearin, lanolin, neat's foot oil and oil from bones, etc. [d] Only offal fats; the following rates were used - in conformity with EEC agricultural statistics - in the calculation of offal fat production for cattle: 4.5 % of the slaughter weight, 1.0 % for calves, 2.0 % for pigs and 4.0 % for sheep. [e] External trade in live pigs and sheep in slaughter weight is very small and therefore does not need to be calculated separately in the estimation of offal fat production. [f] Domestic animal fat production (estimated) plus net imports of animal and vegetable fats and oils; trimmed fat and (possible) domestic production of fish oil, for which no figures are available, are not included in slaughter fats. In so far as they are available, they are of only marginal importance. [g] Rape is grown in Great Britain; reliable figures on the quantities of rape used for oil production are not however available. [h] Including considerable quantities of rapeseed and sunflowerseed oil. [i] Estimated as residual quantities: net imports of lard minus amount of lard used in the production of margarine and of manufactured edible fats and plus home production of lard. Residual quantity: total available domestic supply of animal and vegetable oils and fats minus total human consumption (margarine, manufactured edible fats, direct consumption of lard and of other oils and fats).

Source: Central Statistical Office, Annual Abstract of Statistics, London, various issues; Central Statistical Office, Monthly Digest of Statistics, London, various issues; Commissioners of H.M. Customs and Excise, Annual Statement of the Trade of the United Kingdom with Commonwealth Countries and Foreign Countries, London, Vol. II and Vol. III, various issues; Commonwealth Secretariat, Meat and Dairy Produce Bulletin, London, various issues; Own calculations and estimates.