RESEARCH REPORT NO. 11

THE IMPACT ON U.S. AGRICULTURAL TRADE OF THE ACCESSION OF THE UNITED KINGDOM, IRELAND, DENMARK AND NORWAY TO THE EUROPEAN ECONOMIC COMMUNITY

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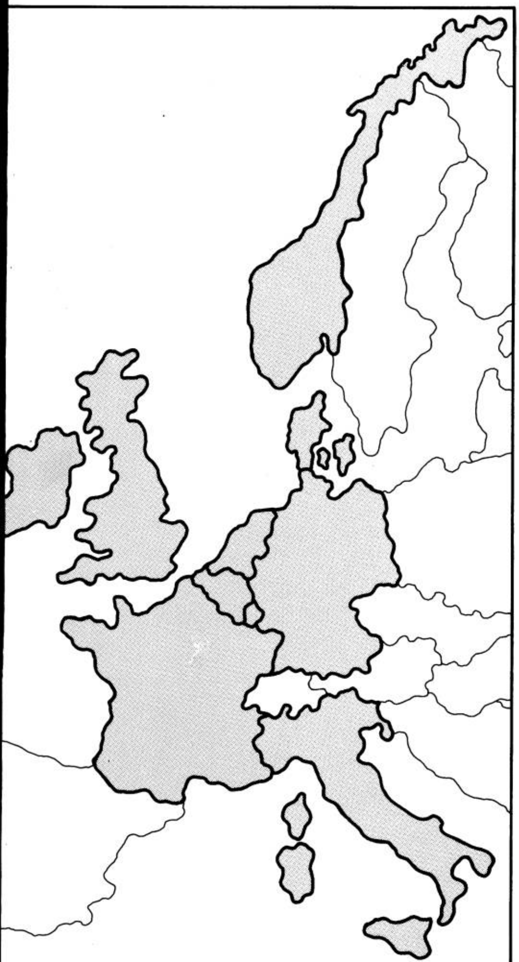

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CONVERSION COEFFICIENTS

Weights and Measures

1 hectare = 2.47109 acres
1 acre = .40468 hectares
1 kilogram = 2.20462 pounds = .019684 long cwt.
1 long ton = 1.01605 metric tons = 2240 pounds
1 metric ton = .98421 long tons = 19.684 long cwt.
1 long cwt. = .050802 metric tons = 112 pounds
1 Imperial gallon = 10.32 pounds = 4.681 kilograms = 1.20095 U.S. gallons = 4.54596 liters
1 score = 20 pounds = 9.0718 kilograms
1 egg = 2 ounces = .0567 kilograms
1 long cwt./acre = 125.536 kilograms/hectare

Prices, U.K. and Ireland (at $2.40/Ł)	To Convert to $/kg; multiply by:
Old pence (d) per lb.	.022046
New pence (p) per lb.	.052910
Shilling (s) per lb.	.26455
Pounds (Ł) per long cwt.	.047242
Old pence (d) per long cwt.	.00019684
New pence (p) per long cwt.	.00047242
Shillings (s) per long cwt.	.0023621
Pounds (Ł) per long ton	.0023621
Old pence (d) per Imperial gallon	.0021363
New pence (p) per Imperial gallon	.0051271
Old pence (d) per pint	.01709
New pence (p) per pint	.04102
Old pence (d) per egg	.17367
New pence (p) per egg	.41681
Old pence (d) per dozen eggs	.014697
New pence (p) per dozen eggs	.035274
Shillings (s) per dozen eggs	.17637
Old pence (d) per score	.0011023
New pence (p) per score	.0026456
Shillings (s) per score	.013228

Prices, Denmark (at $.1333 per kroner)

1 ore = $.001333

Foreword

> "I would willingly say that forecasting would be an absurd enterprise were it not inevitable. We have to make wagers about the future; we have no choice in the matter."
>
> Bertrand de Jouvenel

To place this document in proper perspective, the reader should consider this report as a stage in an on-going analysis. The results described represent the output of models considered a priori as realistic. Some modifications were made in the original models based upon what the researchers considered to be obvious deficiencies. Such modifications, for example, dealt with placing upper limits on the total land area available for cereals and forage crops, and restricting the extent of adjustment on certain livestock enterprises to conform more with historical relationships on consumption and trade. Over time new information will become available about prospective price policies, trade agreements, crop yields, etc. that will warrant re-computation of the estimates and may suggest other modifications in the model. Considerable effort was made in developing the computer program to facilitate such changes.

Since the U.K. supply model is crucial to the entire analysis for the applicant countries, two analytical techniques were followed. One was the combination of time series analysis and recursive generation of endogenous variables--a predictive model. The other was a linear programming analysis of representative types of farm--a normative model (Appendix A). In the initial analysis, the same assumptions regarding prices, crop yields, livestock production rates, and feed conversion rates were used in both approaches. Assumptions on labor coefficients did differ somewhat. In the time series analysis, projections were made of the Ministry's "standard man days" from past trends in these estimates. In the linear programming study, projections were based on labor requirements on "above average" farms as estimates by John Nix, a recognized farm management authority.

Except for the common assumptions, the two approaches were followed independently, in part as a test of alternative analytical procedures. However, these two approaches yield results that are not strictly comparable. The time series recursive model uses actual levels of output at present as a base for projections. The linear programming model compares projections of optimal combinations in the future with optimal combinations at present.

Thus, to interpret the linear programming solutions for projection purposes, it is necessary to assume a constant relationship between actual and optimal conditions. For example, the linear programming model projects an increase in dairy cow numbers from the optimal situation in 1968 to the optimal situation in 1977. However, the optimal solution for 1977 involves a decline from 1968 actual numbers of dairy cows. This is because the optimal solution for 1968 calls for a very substantial reduction in dairy cow numbers from 1968 actual levels.

Another difference which should be noted is that the linear programming model applies to Great Britain rather than the United Kingdom. This would have a relatively minor effect on the general conclusions, however.

Because of inherent differences in the two approaches, the decision was made to use the time series-recursive model for projecting U.K. supply rather than a hybrid of the two approaches as originally intended. This is not to say that such a hybrid would not improve the results. The main reason was the lack of time and resources to probe into possible linkages between the two approaches. The results of the linear programming model, nevertheless, did influence the nature of the restrictions imposed on the time series-recursive model.

This study was undertaken by Michigan State University through contractual arrangement with the Economic Research Service, U.S.D.A. Dr. Vernon Sorenson was responsible for initiating the project and for its overall implementation. The study has benefited from the cooperation of a number of persons and institutions. A cooperative arrangement was made with the Agricultural Adjustment Unit at the University of Newcastle Upon Tyne. Through this arrangement Dr. John Ferris was in residence in Newcastle Upon Tyne for one year during which time he conducted supply analysis and directed project activity in Europe. A linear programming analysis of the "Feed-Grain Livestock Economy in Great Britain in 1968, 1972, and 1977" was prepared by B. H. Davey and P. W. H. Weightman at the University of Newcastle Upon Tyne as a part of the U.K. supply analysis.

The supply equations for Ireland were prepared by Dr. Denis Lucey and Mr. Liam O'Callaghan through an arrangement with the Agricultural Institute in Dublin.

Dr. Timothy Josling at the London School of Economics and Political Science developed the demand analysis and much of the policy material.

Dr. William E. Kost assisted with the updating of the EEC projections and the trade analysis.

We express our gratitude for the cooperation by the above named individuals.

Beyond these formal arrangements assistance was obtained from a large number of people in Europe. In particular we want to recognize the cooperation of Professor John Ashton, Professor John Rogers, Dr. Truman Phillips and Mrs. Gillian Thomasson of the Agricultural Adjustment Unit, University of Newcastle Upon Tyne and Mr. Erik Jorgensen and Mr. Poul Stryg of the Royal Veterinary and Agricultural College, Copenhagen.

Finally the cooperation of several people in the Economic Research Service, and Foreign Agricultural Service of the U.S.D.A. including the Agricultural Attache offices in the countries studied represent an important input into the project. We, of course, are responsible for the total project including the conclusions and recommendations. The conclusions and views expressed do not necessarily represent those of the U.S.D.A.

Michigan State University
March 1971

Vernon L. Sorenson
John N. Ferris

THE IMPACT ON U.S. AGRICULTURAL TRADE OF THE ACCESSION OF THE UNITED KINGDOM, IRELAND, DENMARK AND NORWAY TO THE EUROPEAN ECONOMIC COMMUNITY

SUMMARY

This study was undertaken to evaluate how accession to the EEC by the United Kingdom, Ireland, Denmark and Norway will affect their supply-demand and trade balances for grain and livestock products. Comparisons were also made for the total trade balance of the four applicant countries plus the original six EEC countries. Previously projected supply-demand balances for the existing six EEC countries were updated.[1] Also, past trends in trade were studied as part of the analysis of the probable trade effects of expansion of the EEC.

Policy shifts that will occur if these countries enter the EEC are profound. Changes in agricultural policy as a result of entry will vary among countries. In the U.K., agricultural policy in the postwar period has been pointed toward expansion of output, with emphasis shifting to improved structure and productivity in the late 1950's, then to import saving and finally to selective expansion of certain products. Support programs have been based on deficiency payments and a system of long-term guarantees. For example, current legislation for grain-livestock provides guarantees that the total returns to agriculture will not be less than 97.5 percent of the total existing the preceding year and that the level of guarantee for any individual commodity will not be less than 96 percent of the preceding year's level. Price support covers most major commodities. Guarantee levels among commodities have been adjusted over time to achieve desired redirection for expansion of overall output. Beginning in 1971 the deficiency payment system will

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[1] Vernon L. Sorenson and Dale E. Hathaway, The Grain-Livestock Economy and Trade Patterns of the European Economic Community, Research Report No. 5, Institute of International Agriculture, MSU, 1968.

be in part replaced by minimum import prices and levies with the effect that the price of some foods will be increased to consumers.[2] With entry, additional, and in most cases significant, price increases will occur both at the farm and consumer level.

In addition to price guarantees, U.K. agriculture has been supported through a series of input subsidies and capital grants that have annually involved an Exchequer cost nearly as large as the outlays on price guarantees. These grants are for a wide range of purposes including direct fertilizer and lime subsidy, field drainage, water supply grants, grants for improving livestock rearing land, direct grants for maintaining hill cattle and hill sheep, and for rearing calves, grants for improvement of silos and other farm structures and direct grants to disadvantaged small farmers. With entry into the EEC many of these subsidies will be abandoned and others will likely be changed in light of the financial cost imposed on the U.K. through the EEC price support and structural reform programs.

The main historical focus of Irish agricultural policy has been to increase output with emphasis on exports primarily of cattle and livestock products. Production expansion has been encouraged through a subsidy program on inputs and costs. Price supports exist on most livestock and grain commodities. Support levels, however, have been low relative to EEC prices and a significant overall increase in Irish farm prices will occur with entry. Cattle and milk prices in particular will increase substantially in an absolute sense, and relative to grain prices. This will reinforce a preexisting direction for expansion in Irish agriculture.

Danish agricultural policy has been striving for full utilization and continuing improvement of agricultural resources including both production and

---

[2] In July 1971 imports of fresh chilled and frozen beef and veal and of fat cattle will become subject to a system of general variable levies to support minimum import prices. For mutton and lamb specific duties will be instituted. Imports from the Irish Republic will be exempted in both cases.

Also beginning in July 1971, minimum import prices and levies where necessary will be established on fresh cream, canned cream, skim-milk powder, whole milk powder, and condensed milk. Increases in minimum import prices on shell eggs and egg products took effect on March 29, 1971, and on grains increases will occur on July 1, 1971. Source: David P. Evans, "U.K. Sets New Farm Price Guarantees, Moves Toward Variable Levies--Part II," Foreign Agriculture, May 10, 1971.

market industries. Because of heavy reliance on export markets, emphasis has been placed on quality production and the development of a highly-integrated system of production and marketing. Despite this general emphasis, Denmark has found it necessary to enter into specific programs aimed at direct improvement of farm income. This has resulted in a system of price supports and variable import levies on grain, and a two-price scheme to maintain relatively high prices in the home market for the major livestock products that figure importantly in Danish exports. The major change that will occur for Denmark with accession is that prices for export items will increase. These include primarily pigmeat, beef, poulty and dairy products. Danish agriculture will continue to have the advantage of closely controlled quality and a strong marketing system.

Norway's agricultural policy has had three major targets: (1) to increase production in sectors which are on an import basis, such as grain, fruit and vegetables, (2) to maintain self-sufficiency in the animal products sector but avoid surpluses, and (3) to maintain population in remote areas. With entry into the EEC, returns to agriculture will decline since farm prices on several major products (cereals, milk, eggs) will adjust downward to EEC levels and certain direct subsidies will not likely be retained.

These policy changes in the applicant countries will be imposed on agricultural sectors that occupy widely divergent roles in the economy of each country and where considerable change in production and trade patterns has occurred in recent years. In the U.K., agriculture is a relatively small component in the total economy and produces only about 60 percent of the total food requirements. In both Ireland and Denmark, agriculture is relatively much more important and is a major source of foreign exchange earnings. In both of these smaller countries livestock production predominates.

The most important production change during the 1960s has been an increase in total U.K. output of grain from below 10 million metric tons to approximately 15 million metric tons. The U.K. also has substantially increased beef, pigmeat, poultry and egg production and is approaching self-sufficiency in eggs. In Ireland expansion in output of dairy products and beef has been substantial, but pigmeat, poultry and egg production have been relatively stable. Total grain output has declined moderately. Denmark has become self-sufficient in grain and has boosted pigmeat production substantially. Beef output increased moderately and poultry, egg, cheese and butter production have remained stable or declined somewhat.

A number of shifts also have occurred in trade patterns for the applicant countries. For the U.K. the most important shifts include an overall decline in net imports of grain and grain products, eggs and beef and an increase in imports of dairy products. Irish imports of grain and grain products have increased while a substantial decline has occurred in Denmark. Growth in Irish exports has centered on beef and dairy products. Danish exports of live cattle, dairy products, poultry and eggs have declined, but these losses have been offset by increases in net exports of pigmeat, processed meats and beef. Ireland has expanded overall exports of livestock products substantially due to increases in beef and dairy products while Danish exports have largely shifted composition without any overall increase or decrease. Norway's deficit in grain has increased and a deficit in meat has developed. Exports of dairy products have continued at approximately their 1962 level.

The conditions that influenced output and trade in the 1960s will not persist in the future. U.K. price policy has been changed in a major way and even without entry will not likely return fully to the system that prevailed in the 1960s. With entry important price shifts will occur for all countries; existing trade arrangements among the applicant countries and with third countries will change and trade between these countries and the existing EEC will be freed.

Price Projections

In the 15-year period from the mid-1950's to the late 1960's, prices to farmers in the U.K., Ireland and Denmark generally increased on livestock, moved up slightly on milk, stabilized on eggs and cereals and declined substantially on poultrymeat. Similar trends were underway in other parts of the world. When the issue of entry into the EEC again surfaced in 1969, the three countries faced rather substantial increases in farm prices if they were to adjust to the levels of the Common Agricultural Policy.

In 1970 and 1971, the gap between farm prices in the applicant countries and in the six was reduced considerably. This was accomplished partly as a deliberate move to begin adjusting prices to EEC levels in anticipation of entry and as the result of unexpected market developments. Corn blight in the U.S. pushed up world market prices on cereals. The world dairy market situation improved materially. A drought in Argentina resulted in a reduction in cattle numbers, and in the rebuilding process, beef exports dropped and prices advanced sharply. These events, coupled with accelerated inflation, prompted the U.K. to raise support prices on cereals, livestock and milk in October 1970 above levels established earlier in the year. This was done without committing additional funds from the Exchequer since market prices were substantially higher. As it turned out, Exchequer costs for the deficiency payments scheme in 1970-71 were actually lower than in 1969-70. Somewhat higher support levels were established for 1971-72. The Conservative government of the U.K., in their program to shift the cost of supporting farm prices from the Exchequer to consumers, set new minimum import prices on certain major products. In addition recent price increases have occurred in the EEC.

As a consequence of these events in 1970 and 1971, a higher price base was established. The impact of entry has thereby been lessened from the situation existing in 1968-69. This is true not only for the U.K. but also for Ireland and Denmark whose export prices reflect changing market prices in the U.K. and other parts of the world. Table S-1 shows projections of key farm prices in the three countries assuming they enter the EEC and assuming they do not.

The major impact on farm prices with entry will be on milk (except the blend price in the U.K.), cattle and cereals. Pigmeat prices will increase substantially in Ireland and Denmark. Most other prices will also be somewhat higher with entry. In the U.K., blend prices received by farmers for milk have already moved up near to EEC levels. Market prices on manufactured products in the U.K. would rise substantially, however, because fluid milk is priced at a level more than double that of manufacturing milk. With entry it is assumed that price differentiation on milk will be minimal.

The assumption is made in making these price projections that world cereal prices will fall back from the abnormally high level of 1970-71, but will remain above the level of 1968-69.

The possible impact of entry on food prices has been a sensitive issue, particularly in the U.K. where a low food price policy has prevailed. Assuming that marketing margins on food will not be much greater with entry than without, retail food prices (on livestock-cereal products) in the U.K. are estimated to increase by nearly 30 percent in the transition period between 1972 and 1977 with entry and about 20 percent without entry. (This compares

Table S.1 Prices on Major Farm Products in U.K., Ireland and Denmark, 1968 and Projected to 1972 and to 1980 Under Alternative Policy Assumptions

	1968	1972	1980		
			Out EEC[1]		In EEC[2]
			Case I	Case II	
			$/kg		
United Kingdom					
Milk					
Liquid	.1069	.1284	.1364	.1364	.1090
Manufacturing	.0437	.0509	.0540	.0540	.1090
Blend	.0849	.1003	.1074	.1074	.1090
Fat cattle, live					
Market	.4490	.5070	.5600	.6615	.8265
Gross[3]	.4857	.5900	.6615	.6615	.8265
Lambs, dressed wt.					
Market	.8677	.9762	1.0762	1.3000	1.3230
Gross[3]	.9418	1.2000	1.3000	1.3000	1.3230
Pigs, deadweight					
Market	.5873	.6879	.6465	.8294	.9000
Gross[3]	.6323	.7462	.7837	.8294	.9000
Broilers, live	.3706	.4000	.4000	.4165	.4631
Eggs	.5397	.5079	.5079	.5400	.5800
Barley					
Market	.0515	.0615	.0615	.0715	.0928
Gross[3]	.0595	.0685	.0715	.0715	.0928
Ireland					
Milk, including subsidies	.0549	.0632	.0744	.0744	.1090
Fat cattle, live, including subsidies	.4539	.5481	.6166	.6166	.7637
Fat lambs, live	.5008	.5857	.6457	.6457	.7692
Bacon pigs, dressed wt.	.6425	.7181	.6840	.6840	.9000
Eggs	.6319	.6319	.6319	.6319	.5800
Barley	.0566	.0615	.0615	.0615	.0928
Denmark					
Milk, 3.65 b.f.[4]	.0575	.0683	.0762	.0762	.0978
Heifer beef, slaughter wt.[4]	.6373	.8578	.9699	.9699	1.3775
Pigmeat, slaughter wt.[4]	.6800	.7608	.7903	.7903	.9493
Broilers, slaughter wt. extra class[4]	.4701	.4587	.4217	.4217	.6175
Eggs[4]	.5589	.5192	.4216	.4216	.5800
Barley, 112 pd. hollister, Copenhagen	.0564	.0665	.0665	.0665	.0928

[1]Case I assumes deficiency payment system in the U.K. and Case II assumes variable levy-minimum import price system.

[2]Assumed EEC prices were as follows: Milk prices at the 1971-72 target, cattle prices somewhat above and pig prices at 1970-71 levels, broiler prices at 1970-71 levels, egg prices somewhat below 1970-71 levels, grain prices at 1971-72 intervention levels.

[3]Market price plus a deficiency payment.

[4]Blend farm price including subsidies.

with an overall assumed inflation of 22 percent for the same period.) Food prices affected most would be dairy products (except liquid milk), beef and veal and cereal products. Similar changes will occur in Ireland and in addition, liquid milk prices will also be appreciably higher. In Denmark where domestic levies have helped support farm prices, retail food prices will not be affected very much by entry.

Producer Response

In view of the changes in prices in 1970-71 and those contemplated if the applicant countries join the EEC, producers' response to price becomes of prime importance. Two methods were used in measuring this response. One was to study how producers have reacted in the past when farm prices and gross margins have changed. This was accomplished by a time series statistical regression analysis. Another approach was to determine optimum adjustments among farm enterprises, using linear programming. The latter approach was used in conjunction with the time series analysis on U.K. only.

The time series analysis revealed statistically "significant" relationships between farm prices (or gross margins) and production on most farm products. On sheep, eggs and poultrymeat, however, no consistent relationship was detected. Also in Denmark, how dairy farmers respond to prices was not well established from historical data. To complete the models, judgments by knowledgeable people were used as a basis for projecting these supply relationships.

Certain modifications were made in the supply models. Area in cereals was restricted to certain upper limits based upon projections of total land available for roughage and grain minus land requirements for roughage-consuming livestock. Other restrictions were placed on total production based on projected levels of domestic consumption and market shares.[3] Historical patterns and anticipated policies were used in establishing these restrictions.

Technical coefficients, such as crop yields, livestock production rates and

[3]Projected output of eggs and poultrymeat in the U.K. was restricted to levels no higher than 5 percent over consumption and pigmeat production was similarly limited by total consumption and an allowance for imports equal to 55% of bacon and ham consumption. On pigmeat and poultrymeat the unrestricted supply equations generated substantially more output than the upper limit.

feed conversion rates were projected from past trends and from judgment. Combining the basic supply equations with the projected technical coefficients and prices in a recursive model, projections were made of the output of livestock products and cereals under the alternative policy assumptions (Table S-2). Estimates for Norway, based partly on OECD projections, were added to complete the tabulation for the applicant countries.[4]

Alternative projections to 1980 are presented under three policy assumptions. Case I assumes a deficiency payment system in the U.K. and the continuation of domestic policies of recent years in Ireland and Denmark. Case II assumes continuation of the variable levy-minimum import price program of the Conservative government for the U.K. and recent policies in Ireland and Denmark. Case III refers to entry into the EEC with a five-year transition period from 1972 to 1977.

The major impacts of entry would be (1) to generate increased output of dairy and beef in Ireland and Denmark, (2) to stimulate cereal production and reduce milk and beef production in the U.K. and (3) to encourage pigmeat production in Denmark. Changes in domestic policies within the U.K. will also generate some shifts in production. The estimated increase in grain production caused by moving from deficiency payments to the import levy policy is nearly half the increase that would be generated by moving from deficiency payments to the EEC policy.

The results of the linear programming analysis of representative farms in the U.K. differ somewhat from the time series study. The major difference is in grain prospects. The linear programming analysis questions whether entry will have much impact on cereal area in the U.K. and indeed whether cereal area will expand much further in any case. Constraints were imposed on cereal area in the linear programming analysis because of rotational requirements. Intensive cereal operations have been encountering disease problems and reduction in yields.

Consumer Response

Consumers as well as producers have responded to changing prices in the applicant countries. A time series analysis was used in measuring this

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[4]OECD, Norway, one of a series of country studies connected with the summary publication, Agricultural Projections for 1975 and 1985, Paris, 1968.

Table S.2 Production, Consumption, Net Deficit (-) or Surplus (+) of Major Grain-Livestock Products for 1968 and 1980 (1000 m.t.)[1]

				Case I			Case II			Case III		
				Out EEC, Deficiency Payment Policy in U.K.			Out EEC, Import Levy Policy in U.K.			In EEC		
	1968			1980			1980			1980		
	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.
Grains												
United Kingdom	13,363	21,724	-8,361	18,449	24,734	-6,285	20,215	23,893	-3,678	22,839	22,989	-150
Ireland	1,427	1,380	+47	1,256	1,662	-406	1,256	1,662	-406	1,296	1,639	-343
Denmark	6,784	6,132	+652	8,112	7,254	+858	8,112	7,254	+858	6,832	8,786	-1,954
Norway	820	1,170	-350	763	1,582	-819	763	1,582	-819	678	1,653	-975
Sub-total (4)	22,394	30,406	-8,012	28,580	35,232	-6,652	30,346	34,391	-4,045	31,645	35,067	-3,422
EEC-6	70,400	73,271	-2,871	89,181	87,557	+1,624	89,181	87,557	+1,624	89,181	87,557	+1,624
Total (10)	92,794	103,677	-10,883	117,761	122,789	-5,028	119,527	121,948	-2,421	120,826	122,624	-1,798
Milk (fat equivalent)												
United Kingdom	510	1,030	-520	600	1,475	-875	556	1,462	-906	486	1,248	-762
Ireland	126	72	+54	236	85	+151	236	85	+151	316	83	+233
Denmark	217	113	+104	220	130	+90	220	130	+90	271	129	+142
Norway	74	66	+8	76	72	+4	76	72	+4	82	72	+10
Sub-total (4)	927	1,281	-354	1,132	1,762	-630	1,088	1,749	-661	1,155	1,532	-377
EEC-6	2,659	2,094	+565	3,422	2,574	+848	3,422	2,574	+848	3,422	2,574	+848
Total (10)	3,586	3,375	+211	4,554	4,336	+218	4,510	4,323	+187	4,577	4,106	+471
Beef and Veal												
United Kingdom	906	1,130	-224	1,219	1,274	-55	1,151	1,222	-71	1,063	1,063	-0-
Ireland	337	52	+285	507	63	+444	507	63	+444	682	62	+620
Denmark	247	92	+155	260	106	+154	260	106	+154	325	106	+219
Norway	53	60	-7	57	64	+7	57	64	-7	64	64	-0-
Sub-total (4)	1,543	1,334	+209	2,043	1,507	+536	1,975	1,455	+520	2,134	1,295	+839
EEC-6	3,952	4,341	-389	5,053	6,001	-948	5,053	6,001	-948	5,053	6,001	-948
Total (10)	5,495	5,675	-180	7,096	7,508	-396	7,028	7,456	-428	7,187	7,296	-109

(continued)

Table S.2 (continued)

				Case I			Case II			Case III		
				Out EEC, Deficiency Payment Policy in U.K.			Out EEC, Import Levy Policy in U.K.			In EEC		
	1968			1980			1980			1980		
	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.
Pigmeat												
United Kingdom	826	1,216	-390	1,194	1,558	-364	1,121	1,475	-354	1,122	1,470	-348
Ireland	115	73	+42	108	95	+13	108	95	+13	39	88	-49
Denmark	739	159	+580	947	195	+752	947	195	+752	1,191	227	+964
Norway	61	61	-0-	77	80	-3	77	80	-3	83	80	+3
Sub-total (4)	1,741	1,509	+232	2,326	1,928	+398	2,253	1,845	+408	2,435	1,865	+570
EEC-6	4,780	4,717	+63	6,195	6,057	+138	6,195	6,057	+138	6,195	6,057	+138
Total (10)	6,521	6,226	+295	8,521	7,985	+536	8,448	7,902	+546	8,630	7,922	+708
Poultrymeat												
United Kingdom	490	509	-19	732	697	+35	730	696	+34	722	688	+34
Ireland	25	25	-0-	37	50	-13	37	50	-13	45	47	-2
Denmark	65	24	+41	68	33	+35	68	33	+35	69	31	+38
Norway	4	4	-0-	8	8	-0-	8	8	-0-	8	8	-0-
Sub-total (4)	584	562	+22	845	788	+57	843	787	+56	844	774	+70
EEC-6	1,726	1,744	-18	3,043	2,898	+145	3,043	2,898	+145	3,043	2,898	+145
Total (10)	2,310	2,306	+4	3,888	3,686	+202	3,886	3,685	+201	3,887	3,672	+215
Eggs												
United Kingdom	900	855	+45	1,101	1,049	+52	1,074	1,023	+51	1,028	1,008	+20
Ireland	41	39	+2	34	30	+4	34	30	+4	34	31	+3
Denmark	86	57	+29	79	68	+11	79	68	+11	107	66	+41
Norway	36	38	-2	44	44	-0-	44	44	-0-	44	44	-0-
Sub-total (4)	1,063	989	+74	1,258	1,191	+67	1,231	1,165	+66	1,213	1,149	+64
EEC-6	2,254	2,264	-10	3,103	2,955	+148	3,103	2,955	+148	3,103	2,955	+148
Total (10)	3,317	3,253	+64	4,361	4,146	+215	4,334	4,120	+214	4,316	4,104	+212

[1]The price assumptions used in making these projections include actual prices for 1968, 1969 and 1970, partial forecasts for 1971, and the EEC's and U.K.'s announced support levels for 1971-72. These projections represent an updated version of an original model which did not entirely account for the sharp increases in certain prices in 1970-71. The major revisions in net balances were in the U.K.

response as a part of an analytical procedure which took into account consumer budget constraints. The time series analysis confirmed the presumption that retail prices had an effect on consumption of most food products. Direct price elasticities were low except on beef and veal, mutton and lamb and pigmeat. Measurements were also made of cross elasticities, that is the effect of a change in the price of one food on the consumption of another. These were most important among the various types of red meat and between butter and margarine. Another measurement was made on the effect of non-food prices on the consumption of individual foods.

Changing consumer incomes also had some effect on consumption. Income elasticity of demand was strongest on poultrymeat, beef and veal, cheese and cream. A negative income elasticity was indicated on some foods, primarily cereal products.

Combining these measurements with projections of population, consumer incomes and food prices, projections were made of consumption of major food items for the U.K., Ireland and Denmark. Estimates were made for Norway based on OECD studies. The projections are shown in Table S-2. The data on milk and cereal utilization include amounts fed to livestock and used for industrial purposes.

The total impact on the applicant countries of entry into the EEC would be to restrict materially human consumption of dairy products (milk fat equivalent), beef and veal, and mutton and lamb. Entry would have little effect on human consumption of cereals. With or without an expanded EEC the outlook is promising for increased consumption of pigmeat and poultrymeat. On poultrymeat, not only is there a high income elasticity but also the anticipated price increase is relatively small. The prospective price increase on pigmeat is also somewhat less than on competing products.

What is assumed as the future rate of increase on consumer incomes does make a difference in projecting consumption of certain products. For both "Out EEC" and "In EEC" cases, the assumed rate of growth in the real Gross Domestic Product in the U.K. was 2.9 percent per year and the assumed inflation rate was 4.0 percent per year. An alternative assumption was made that the economic growth rate would be 3.4 percent and inflation would proceed at 5 percent per year. If entry into the EEC does stimulate the U.K. economy, the shift in consumption from cereals to meat would be accelerated. This is indicated in Table S-3.

Table S.3 Total Human Consumption of Major Grain-Livestock Products in the U.K., 1968 and Projected to 1980 in the EEC under Alternative Economic Conditions[1]

	1968	1980: In EEC	
		2.9% Growth 4.0% Inflation	3.4% Growth 5.0% Inflation
		1000 M.T.	
Cereal Products, grain equivalent	5338	5052	4828
Milk, fat equivalent	1014	1232	1274
Beef and veal	1130	933[2]	1059
Mutton and lamb	582	738	783
Pigmeat	1216	1471	1537
Poultrymeat	509	688	725
Eggs	855	1008	1038
Margarine	271	351	333

[1]Growth rates refer to the annual increase in the Gross Domestic Product and the inflation rates refer to annual increase in the general price level.

[2]This figure differs from Table S-2 where beef and veal consumption in the U.K. was restricted to levels at or above total production. Total beef and veal production was projected to 1063 thousand metric tons in 1980 for the 2.9% growth and 4.0% inflation assumption.

Net Balances of Applicant Countries

The composite or net effect of these production and consumption projections are shown in Table S-2. The applicant countries are expected to remain self-sufficient in poultrymeat and eggs with the strongest pressures for expansion of output in the U.K. In pork, bacon and ham, incentives to increase output both in the U.K. and Denmark will lift supplies to levels which will require the development of new markets.

Danish bacon and ham enjoys a quality preference in their traditional export markets. The projections assume that Denmark will continue to supply an important part of the British market. An important unknown concerning future expansion of Danish pigmeat output is whether markets lost through formation of the six member EEC can be regained. These were largely in Germany. This gap has since been filled by production within the EEC. But, if consumer acceptance of high quality bacon and ham can be developed in the EEC countries, and if third country markets can be enlarged, opportunities for market expansion would be substantial.

In cattle, entry to the EEC will tend to create a significant expansion that will increase the beef surplus for the four country area. In Ireland, Denmark and Norway incentives for expansion will be greater than without entry but in the U.K. expansion with entry probably would be less than could be anticipated without entry. This reflects elimination of important cattle production subsidies if EEC policy is implemented along with the fact that U.K. milk prices will not increase appreciably.

The grain deficit for the applicant countries is projected to decline whether or not they enter the EEC. A key question is whether rotational constraints will limit U.K. production. Should cereal area be held in check, the grain deficit in the applicant countries could remain as large as in recent years with or without entry.

The estimates presented in Table S-2 need to be interpreted in light of one important unknown. The extent to which grain feeding rates will be affected by movement from a deficiency payment system to the import levy system or by entry into the EEC has not been fully assessed in this study and, thus, cannot be projected. Some allowance was made for shifts in utilization between roughage and concentrates by ruminant animals as product-feed price relationships change. Substitution among concentrate feeds in compounding or in rations used by farmers, however, is not reflected. The projections assume that cereals continue to represent the same proportion of total concentrates as during recent years. The effect of this kind of substitution can be illustrated only hypothetically but clearly it could be substantial.

If, for example, the cereal component of concentrated feeds in the U.K. dropped from the current level of approximately 71 percent to 50 percent, cereal consumption by livestock would decline from the projected level, with entry, of 13.5 million metric tons to about 9.5 million metric tons. A similar shift in Irish feed utilization would result in 700,000 metric tons of cereals being fed in 1980 rather than the 1,069,000 metric tons projected. If the cereal component in Denmark dropped from the current level of approximately 80 percent to 50 percent, projected cereal consumption by livestock in 1980, with entry, would drop from 7,922,000 metric tons to about 4,952,000 metric tons. The total shift in the three countries would amount to over 7 million metric tons. This would be enough to turn the projected cereal deficit for the applicant countries into a surplus or it would be sufficient to maintain the projected balances on cereals should there be no further expansion of the cereal area in the U.K.

Net Balances of EEC-10

The final step in this study was to update previously developed projections for the cereal-livestock economy of the six-member EEC and combine these with projections for the applicant countries. The purpose was to assess overall balances for the 10-member EEC and to develop an assessment of the trade impact of expansion.

As shown in Table S-2, some substantial changes in the position of the ten countries and differences in net balances for the major grain-livestock commodities are indicated depending on whether accession occurs. The EEC-6 will probably continue to have a surplus of milk and face an increasing deficit of beef and veal. A grain deficit will likely turn into a surplus. On other commodities where production and consumption have been in balance, tendencies for production to exceed utilization will develop.

In an EEC-10, the overall dairy surplus will be less than for the EEC-6 because of the major deficit in the U.K. that is not fully compensated by excess production in Denmark and Ireland. The overall beef and veal deficit for the 10 would be reduced substantially in 1980 with accession due to the effect of higher prices on production and utilization in the applicant countries. Existing small overall surpluses for the 10-member EEC are projected to increase moderately on poultry and eggs and substantially on pigmeat. The substantial deficit in grain for the 10 countries in 1968 will largely disappear by 1980 under existing U.K. policy and under accession. Feed grain production would be well below quantities fed to livestock but this gap would be largely made up by wheat production well in excess of human food needs. Ths model results indicate that an overall surplus would develop if price shifts cause a reduction in grain feeding rates in the applicant countries. Since some reduction in feeding rates will likely occur particularly in the U.K. and Denmark, the shift in grain balance indicated for the EEC-10 probably is estimated conservatively.

All of the projections indicate that pigmeat, poultry and eggs will be in surplus by 1980, even with certain restrictions placed on their production in the U.K. That surpluses could arise is fairly clear; the question being how extensive they would be? The economic and technical base exists for expanded production. But surpluses beyond that which can be disposed of in external markets probably can not be continued very long and policy adjustments will be required. The projections of surpluses on these commodities, therefore, should be interpreted as indicators that market pressures will arise in each case but not as precise quantitative estimates of the level of surplus that will exist in 1980. This caution holds for all three cases shown in Table S-2.

Trade Effects

The total effect on trade of accession by the four countries is difficult to project. There has been a trend toward self-sufficiency in European countries in grain and livestock products. This would have occurred without the formation of the 6-member EEC and could continue for the four applicant countries without accession to the EEC, particularly if recent trends in U.K. price policy continue. For the EEC-10, some internal diversion of all major products--dairy, meat and grain--will likely occur. This along with a projected rate of increase in output greater than the rates of increase in utilization will result in diminishing export opportunities for third country suppliers of each of the three commodity groups.

Danish and Irish dairy products along with existing EEC surpluses are more than adequate to displace existing U.K. Commonwealth imports. In the case of soft wheat, internal transfers from France can easily fill the U.K. deficit so that little if any will be imported from external sources. Imports of hard wheat for mixing purposes will continue. In feed grain, specific deficits will exist in some countries and imports from third countries, particularly of corn, will likely continue. Overall self-sufficiency and some export surpluses will exist for pork, poultry and eggs. The small deficit in beef that is indicated with entry reflects a projected expansion in beef production in Ireland that may be high. However, even with a somewhat reduced rate of expansion in Ireland the EEC-10 will likely represent a reduced market for external suppliers.

Policy Issues

The demand, production and trade data presented in this study raise two principal policy issues from the viewpoint of the American agricultural interest. One centers on feed grain and is concerned with the balance between production and consumption within Europe. The maintenance of feed grain prices at a high level probably will encourage increased output in the U.K. The other part of the feed grain picture is that high prices tend to reduce materially the level of utilization in the livestock production. This has been dramatically illustrated in the Netherlands where a grain component of mixed feeds declined from about 66.1 percent in the early 1960's to 34.8 percent in 1969.[5] At present, grain utilization rates in livestock are high in Denmark and the U.K. but any major shift away from grain in these two countries would have a serious impact on the level of feed grain consumption. Some shift most certainly will occur if EEC prices are adopted and have an impact on import needs. If it were possible to achieve reduced grain prices in the existing 6-member EEC so that grain utilization rates increase to the level existing in Denmark and the U.K., the EEC would continue as a deficit producer of grain and in turn represent a continuing even if not rapidly expanding market for other areas. On the other hand, a shift in the U.K. and Denmark to continental utilization levels along with stimulated production in the U.K. seem likely to result in a total surplus of grain.

The other policy issue that emerges involves the competitive position of European producers on world markets. Grain trade among the EEC countries has increased substantially and this is to be expected. But, wheat exports from France to other parts of the world also have increased dramatically. These exports are on a subsidized basis and clearly represent a challenge to traditional exporters. The International Grains Arrangement appears not to have normalized world wheat trade and certainly has not protected the position of traditional world market suppliers--the U.S., Canada, Australia and Argentina. Expansion of the EEC on the basis of the present Common Agricultural Policy will result in continued excess capacity in wheat and continued pressures on world markets.

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[5] Brice K. Meeker, "U.S. Feedgrain Markets in the Netherlands," USDA Foreign Agriculture, August 24, 1970.

Accession by these four countries also raises a number of policy questions of less direct concern to U.S. agricultural export interests. One of these relates to the kinds of agricultural concessions granted to Commonwealth countries. Accession will reduce external requirements of livestock products and potentially sugar. Significant concessions to New Zealand have been agreed upon. If remaining import requirements are granted preferentially this can have a significant impact on exports by a number of other countries.

Additionally, the EEC has implemented or is negotiating preferential trade arrangements on a much broader basis than that involved in the reduction of trade barriers among member countries. Association agreements have been entered into with Greece and Turkey and are being considered with other European countries. Preference arrangements exist for 18 central and north African countries that were linked to the past as colonies of EEC member countries. Further extension of association arrangements both within Europe and to include certain British Commonwealth countries could create a largely self-sufficient economic trading bloc. How wide a preferential trading bloc ultimately results from expansion of the EEC should be of concern to the U.S. and many other countries.

CHAPTER I

BACKGROUND AND SETTING

Introduction

Accession to the EEC by the U.K., Ireland, Denmark and Norway will have important internal and external economic consequences, particularly for agriculture. For the U.K., Ireland, and Denmark, entry will mean substantially higher farm price levels and important shifts in the relationships among farm prices. In Norway farm prices will decline unless special concessions are granted. For the U.K. and Ireland food prices to consumers will increase considerably. In Ireland and Denmark export prices will increase and markets in the existing Economic Community will become more accessible. The opposite aspect of the trade picture is that the U.K. market will become more accessible to producers in the EEC where existing surpluses of grains, dairy products, and sugar and impending excess capacity in certain fruits and to some degree in pork, complement U.K. import needs.

This study was begun prior to start of the recent negotiations by these countries for entry into the EEC. It was undertaken knowing that both the Labor and Conservative Parties in the U.K. were committed to pressing for entry into the EEC but when an apparent swing in public opinion was away from entry. At the same time widely different views existed between the two political parties as to the course that U.K. agricultural policy should take in case entry into the Economic Community was not achieved. The Labor Party had indicated that it would continue a low food cost policy whereas the Conservative Party had stated its intention to move toward import protection with higher food prices.

As a result of these uncertainties in the U.K. and further uncertainties concerning the potential course of agricultural policy in Ireland and Denmark, major emphasis has been placed on structuring a framework for analysis (modeling) of the cereal-livestock sector of the three countries in such a way that the production, consumption, and trade effects of a range of policy alternatives can be estimated. Very importantly, this procedure has the added implication that it can be used for quantitatively testing alternative policies and thus contribute to the process of effective policy formation.

The actual projections presented are based on what we consider logical assumptions under the major alternatives of entry and non-entry into the EEC. They are neither exhaustive nor exclusive but are simply a set of projections arrived at with the research methodology and the assumptions used. While it was not possible with the resources available to include Norway in our detailed study and modeling, a set of estimates for change in the Norwegian grain-livestock sector is included in the final results presented in Chapter V. The projections developed in this study are used in conjunction with updated estimates of change to 1975 and 1980 for the feed-livestock sector of the six-member EEC to present a composite picture of perspective conditions in an expanded economic community.[1/]

Economic Setting

Formation of a 10-member EEC will create an economy that generates a gross domestic product approximately 60 percent of that in the United States (Table 1.1). Population will exceed that in the United States and total employment will be about 25 percent greater. The proportion of gross domestic product and employment in agriculture will be considerably greater than in the United States.

The total volume of trade and both agricultural imports and exports for the 10 countries far exceed that in the United States. In agricultural products, Italy, Germany and the U.K. are major net importers, the Netherlands, Ireland, and Denmark are major net exporters. The area in total in 1968 had a net import balance on agricultural commodities[2/] of approximately 7.6 billion dollars and thus is a market of major importance.

Future change in the cereal-livestock economy of the EEC and applicant countries will be conditioned by changes in the total economy of each country and by structural characteristics in agriculture. In general, economic growth

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[1/] The updated estimates for the six-member EEC are included in Appendix E of this document. They are based on previous work at Michigan State University under contract to the U.S. Department of Agriculture. A listing of the five reports developed under that project is included on the inside back cover of this document.

[2/] SITC groups 0, 1, 4, 22, and 29.

Table 1.1 Gross Domestic Product, Employment and Trade, Totals for EEC Countries, Applicant Countries and the United States, 1968.[1/]

Item	EEC	Applicant Countries	Total 10 Countries	United States
GDP (bil. U.S. dol.)[2/]	365.5	108.2	473.7	876.0
GDP in Agriculture	23.4	4.8	28.2	25.3
Percent GDP in Agriculture	6.4	4.4	5.9	2.9
Total Employment (000)	74,353	30,212	104,565	79,455
Employment in Agriculture	10,568	1,609	12,177	3,817
Percent Employment in Agriculture	14.2	5.3	11.6	4.8
Total Imports (bil. U.S. dol.)	61,952	26,049	88,001	33,114
Agricultural Imports	11,614	5,840	17,454	5,778
Agricultural Imports As a Percent of Total	18.7	22.4	19.8	17.4
Total Exports (bil. U.S. dol.)	64,201	20,116	84,317	33,981
Agricultural Exports	6,999	2,801	9,800	5,781
Agricultural Exports As a Percent of Total	10.9	13.9	11.6	17.0

[1/] Data on GDP are at factor cost except France and Germany where value is at market prices. Data used for Luxembourg are 1967. Irish national account data from U.N. Yearbook of National Account Statistics, 1969.

[2/] Converted on the basis of $1 U.S. = 50 Belgian Francs, 4.937 French Franc, 7.5 Danish Kroner, 7.142 Norwegian Kroner, .416667 Pound, 3.62 Gilder, 4.0 Deutsche-Mark, and 625 Lire.

Source: OECD National Accounts of OECD countries, 1950-68.
OECD Labor Force Statistics, 1957-68.
OECD Trade by Commodities, January-December, 1968.
OECD Agricultural Statistics, 1955-1968.

in the 10 countries during the 1960s has provided a favorable setting for change and expansion in agriculture. As indicated in Table 1.2, relatively rapid rates of real economic growth have occurred except in the U.K. and to a lesser extent in Ireland.

In the EEC-6, the percent of GDP and employment in agriculture is highest in Italy where in 1968 they were 11 and 22 percent respectively. Germany has the lowest proportion of GDP in agriculture at 3.9 percent and Belgium-Luxembourg have the lowest employment at 5.6 percent. Relatively rapid shifts have occurred in all countries.

For the applicant countries rather substantial differences exist in the place of agriculture in the economy and in recent rates of change. Both the proportion of employment and gross domestic product in agriculture in the U.K. are relatively low and their close relationship indicates a parity of income in agriculture. Change in the proportions, while continuous, has not been large in an absolute sense. This, combined with income parity, indicates that both stability and relative efficiency of resource use in agriculture exist.

In Denmark, rapid change has occurred but employment in agriculture remains substantially above the share of GNP generated within the sector. Pressures for change within the agriculture sector obviously have existed in the past and can be expected to continue in the future. Both industrial development and the nature of the agricultural labor force would appear to be such that this adjustment can be accommodated at a relatively rapid pace.

Only Ireland appears to face employment and demographic characteristics that will materially influence, and potentially reduce, future response in agriculture to price and policy changes. Historically, growth and increases in industrial employment within Ireland have not been sufficient to accommodate movement of people out of agriculture comparable to other countries in North and Central Europe. Hence, a large population remains in agriculture and a relatively large percent of GDP is generated within the sector. Lack of internal industrial employment has resulted in a heavy outmigration from the country, particularly of people in prime productive ages. As a result, total population declined during much of the 1960s and its distribution tends toward a heavy proportion of old and young people. This, in turn, has inhibited structural adjustment in agriculture and has resulted in the continued existence of relatively large numbers of small farms. Given the overall characteristics of

Table 1.2. Average Annual Rates of Growth in Gross Domestic Product* and Percent of GDP and Employment in Agriculture, Individual EEC and Applicant Countries.

Country	Annual Growth in GDP, 1960-68	Percent of Gross Domestic Product in Agriculture		Percent of Employment in Agriculture	
	Percent	1960	1968	1960	1968
Belgium	4.3	7.3	5.5	7.6	5.6
France	5.6	9.7	6.6	22.4	15.4
Germany	4.3	6.0	3.9	14.0	10.0
Italy	4.9 1/	15.1	11.0	32.8	22.0
Netherlands	5.1 2/	10.5	7.1	11.5	7.0
United Kingdom	2.9 1/	4.0	3.1	4.3	3.0
Ireland	3.4 1/	25.1	20.0	37.3	29.4
Denmark	4.6 1/	14.4	10.5	21.2	12.8
Norway	5.0	10.7	6.1	23.5	15.1

* At factor cost and in constant prices.

1/ 1960-67.

2/ At market prices.

Sources: U.N. Yearbook of National Account Statistics, 1969 and OECD Agricultural Statistics, 1955-1968.

climate and the heavy emphasis on cattle in Irish agriculture, small farms (as measured by land area) have relatively low incomes and in Western counties a great deal of poverty in agriculture exists. Irish farmers have not succeeded in shifting to capital and labor intensive enterprises such as hogs and poultry that would maximize output from limited land areas.

With the exception of Northern Ireland 3/ agriculture in the U.K. is characterized by a relatively good structure, by European standards, and by some regional differences in commodity and enterprise specialization. In England

3/ Throughout this report "Ireland" refers to the Republic of Ireland. The six counties which make up "northern Ireland" are a part of the United Kingdom.

and Wales over half the livestock holdings are in the hill and upland areas of Northern England, primarily a grazing area. Pig and poultry holdings tend to be concentrated in the eastern half of England near areas of high cereal production. Crop farming tends to be located in the east and southeast of England and on relatively large units. Thirty-five percent of the total holdings classified as large account for approximately 70 percent of total labor requirements on full-time cropping holdings. Farm size in Scotland is similar, although large holdings are more predominant in their contribution to total output than in the U.K. as a whole. Agriculture in Northern Ireland is predominantly mixed farming based on family labor and with a relatively large proportion of small farms.

Danish agriculture is characterized by modest sized farms (relative to the U.K.) and a well developed marketing structure. Most farms maintain dairy-swine operations and a high percentage of agricultural land is in cereals. Milk and swine production represent two-thirds of the total value of agricultural output. Adding the value of cattle and calves produced, nearly all of which originated with the dairy herd, cattle and swine represented 83 percent of the total value of agricultural output in 1968.

Approach to the Analysis

As indicated, one purpose of this analysis is to provide a set of logical estimates of how production, utilization and trade will change for the three countries within the framework of alternative policy assumptions. Another is to generate an analytical framework that will permit further analysis as the available data and specific policies change. Three basic techniques are used. Demand analysis is based on estimates of per capita consumption as functions of income level, prices of the product, prices of competing products, non-food prices and trend factors. Estimates for the coefficients for these relationships were obtained through direct computation from time series, from cross-sectional and budget studies and by using theory of consumer demand to place restrictions on the elasticity relationships used. Supply analysis is based on time series correlation using prices or gross margins as key variables in explaining historical shifts in output. In the U.K. a study of five types of farms using linear programming to determine optimal organization under different price assumptions was developed as a part of the supply analysis. Projections of consumption and production were made through recursive procedures with projections for one year used as explanatory variables for the following year. Trade matrices are used for assessing recent changes in trade patterns but estimates of future change in response to demand and supply changes and policy adjustments are less formalized.

The study is presented in three chapters that develop the supply and demand analysis and projections for each country. A final chapter brings these together into an assessment of potential developments under the assumption that these countries remain outside the EEC and under the assumption that entry is achieved.

CHAPTER II

DEMAND AND SUPPLY ANALYSIS FOR GRAIN-LIVESTOCK IN THE UNITED KINGDOM

Introduction

The United Kingdom is a large and relatively affluent nation. The population, at about 56 million, is over one fourth that of the United States. Per capita income is around $1900 compared with over $3000 in the United States. The economic size of the United Kingdom still ensures that major developments in the U.K. are likely to be of significance to other countries. This is especially true regarding changes in trade policy, since some 20 percent of goods used in the U.K. are imported.

Accession to the European Economic Community would represent a major change in trade policy for the United Kingdom. On the industrial side, European exporters would be accorded essentially free access to the British market, while other countries would face the Common External Tariff. British exporters would have similar preferences in the continental European markets. If the trade barriers between the EFTA countries which have been reduced during the last decade were not re-erected, and if trade agreements were signed between the EEC and many of the countries of the developing commonwealth, a major portion of world trade would be on preferential terms within the European orbit.

These changes would affect the development of world trade over a number of years. One would expect some initial trade diversion of third country exports offset somewhat by a similar diversion on the import side. The long term effect will depend on how exporters in the enlarged community react to the expansion of tariff-free markets. In particular, a marked increase in British exports could conceivably alter the basic growth characteristics of the U.K. economy. If exporters looked upon the EEC market as a 'home' market, then there could be an expansion of U.K. exports.

Two consequences of such an expansion would be a rise in productivity as scale economies were realized in some markets and a relaxation of financial constraint as the country embarked on an 'export-led boom'. It is effects such as these that have lead some commentators to expect an increase in the rate of growth of the British economy. To weigh against these effects one could cite the corresponding scale effect in other European countries leading to more export competition, and a possible need for more demand restraint if U.K. accession generated domestic inflation. The net effect is likely to be a small but positive influence on income growth in the U.K. arising from a complex form of 'hybrid vigor' noted when other nations have reduced economic frontiers.

Whatever macro-economic effects might be expected, there is no doubt that in some markets EEC accession will radically alter trade patterns. The chief among these is the market for agricultural produce. There are three main effects on the food market: (1) the change in preference areas, (2) the change in agricultural policy, (3) the change in relative price levels. The analysis that follows includes an estimation of the effects on consumption and production of each of these changes. The impact on trade patterns will be dealt with in a later chapter. This present chapter will deal with policy and price changes.

Agricultural Policy

Since the war United Kingdom agricultural policy has been based on the principles of the 1947 Agriculture Act. This Act decreed that the objective of farm policy was to ensure the desired quantity of domestic output consistent with adequate resource returns. This objective has been interpreted in varying ways in the intervening years. In the food shortage years during the first post war decade production was encouraged indiscriminately. As food became more plentiful with the reestablishment of trading patterns, the emphasis switched to enhancing farm productivity and structure. Farmers were given long term guarantees under the 1957 Agriculture Act that support levels would not be drastically reduced. There followed a period until the early 1960s when many farm prices were cut by small amounts.

By the early 1960s it became apparent that the policy of a general economic squeeze in periods of balance of payments deficit was becoming less effective. Agricultural policy began officially to embrace the concept of selective expansion of domestic farm output in order to displace imports. From the return of the Labour Government in 1964, farm prices were steadily increased. Hence the market for imports of agricultural goods has been static for many years.

To counter the prospective rise in domestic support costs, the government began to employ direct trade barriers against agricultural imports. The mainstay of the domestic farm program had been the system of deficiency payments, whereby the shortfall between the realized market price and the announced guaranteed price was paid directly to the farmer from Exchequer funds. Though most of the support still continued to come from deficiency payments, an increasing number of commodities came under schemes which restricted trade by minimum import prices or by quotas.

The Conservative Party, in opposition, decided that on return to power they would take this process much further by replacing the deficiency payment system with variable import levies. This would be consistent with their general economic policy platform of switching taxation away from incomes and onto consumption.

The Conservative Party was returned to power in June 1970. In October, plans were announced for a gradual change in a variable levy system of support. If the U.K. were to accede to the Treaty of Rome, such a policy would make the transition less severe. If satisfactory terms for membership of the EEC were not possible, then the move would be in line with the general government aims. Just as the policy it would be replacing was in reality a complex mixture of support systems dominated by the deficiency payment schemes for cereals and meat, so the new policy was also to be a mixed package.

For cereals the change will probably involve the raising of the levels of the present low minimum import prices, negotiated with major suppliers in 1964, to around the present guaranteed prices. The first move in this direction occurred in July 1971. A fall-back guarantee system is also to be introduced so that, in the event import demand is insufficient to maintain domestic prices, the U.K. farmer can still count on a certain level of returns. There is no plan for introducing intervention buying along the lines of that employed in the EEC; the fall-back will probably be sustained by direct payments.

For livestock products the prospective support system is less well defined. This is partly due to the market situation for some products and partly due to the existence of trade agreements with major suppliers. It appears likely that produce from the Irish Republic will not have to mount the levy wall. The Anglo Irish Free Trade Treaty, which will be discussed further in the chapter on Ireland, would seem to preclude in letter and spirit any significant trade barriers against Irish products. Similarly the partnership with Denmark within the EFTA would make any significant barriers against Danish bacon and butter unlikely. Beginning in July 1971 levies were imposed on manufactured dairy products excluding cheese and butter. Imports of these latter commodities are already controlled. A fixed levy is attached to imports of mutton and lamb. The Bacon Market Agreement will probably continue, but a levy on beef somewhat higher than that for sheepmeat is probable. This latter levy will be tied to a threshold price to isolate the domestic market from world price fluctuations.

In the projections reported below, it has been assumed that these policies will be introduced in stages. As more information on future policy becomes available, it will be possible to revise the estimates. A similar uncertainty surrounds the policy prices and assumptions that are appropriate in the event of accession to the EEC. There is no doubt that the U.K. would move over a transition period to a system of support compatible with the present Common Agricultural Policy of the EEC. This would imply a switch to support by variable levies at prices in general above the present U.K. producer prices, and for a wider range of goods than envisaged in the new Government policy.

The impact of these policy changes is in the present study confined to the influence on prices and profitability. The particular price changes at the producer level are discussed with the farm production model later in this chapter. The projected retail price changes are examined in the next section below.

Food Consumption

Projections of food demand at the retail level under the various alternative policies involved the following stages:

(1) estimation of price and income response at retail level,

(2) specifying future growth in real income and consumption, inflation levels, and population,

(3) specifying price levels and marketing margins consistent with policy alternatives, and

(4) applying projected changes in food demand to the total consumption of various products in the 'base year' of 1968.

These steps will now be discussed in more detail.

Price and Income Response

The most complete survey of household expenditure on food in the U.K. is contained in the annual National Food Survey (NFS). This survey has reported on food consumption in the U.K. since the year 1940. Because of the prevalence of rationing in the post war period, the present study made use of consumption data from 1955 to 1968.

Households taking part in the survey are asked to record the amount of various goods that they purchase during the survey period and their expenditure on these items. A 'unit value' can then be derived which corresponds to a weighted average price for each commodity.

The first stage in the process was to select retail commodities which closely corresponded to the major outlets for the agricultural goods included in the full study. Table 2.2 shows this correspondence. For these products single equation least squares multiple regression analysis was used to estimate price and income effects on quantity demanded.

The 'income' term was represented by the per capita total consumption expenditure on all goods and services, from the series in the National Income and Expenditure publication from the Central Statistical Office. The use of consumption rather than income eliminates some short run fluctuations which are thought to have little relevance to food consumption patterns.

Five separate functional forms were employed for each commodity demand equation, since there is little a priori evidence as to which form is appropriate for individual commodities. These functional forms allow for different patterns of income and price response over time. The forms were:

(1) $C = f_1(P,LY)$

(2) $C = f_2(LP,LY)$

(3) $LC = f_3(LP,LY)$

(4) $LC = f_4(LP,Y)$

(5) $LC = f_5(LP,Y^{-1})$

where C is per capita consumption, Y per capita income, P is retail prices. A prefix L denotes a natural logarithm and a prefix R denotes a reciprocal. Equations were estimated in a linear form. Equation (3) is thus the 'double log' function, (5) the 'log inverse' form, and the other equations are 'semi-logarithmic' functions. Pricesof substitute and complementary goods were included where obviously appropriate. All prices and income were in money (i.e. undeflated) terms. The characteristics of those functions have been commented on by other writers; in the present context it is sufficient to summarize the implied elasticities of these forms. These are as below:

	Price Elasticity	Income Elasticity
(1)	$b_p(\frac{P}{C})$	$b_Y(\frac{1}{C})$
(2)	$b_p(\frac{1}{C})$	$b_Y(\frac{1}{C})$
(3)	b_p	b_Y
(4)	b_p	$b_Y(Y)$
(5)	b_p	$-b_Y(\frac{1}{Y})$

where b_p, b_Y are the regression coefficients of the price and income variables. The regressions chosen for the demand model are given in Table 2.1; the explanation of the variables is contained in Table 2.2. In general the results for the demand for meats were adequate. There was evidence of multicollinearity among the explanatory variables which tended to increase the standard errors of the estimators but not impart bias. But the high Durbin-Watson statistics imply some serial correlation, probably indicating the existence of simultaneous equation bias in the estimation of structural parameters. Since the model is used essentially as a set of single equation estimators the bias in estimating the true partial elasticities does not invalidate the predictions.

A notable feature of the meat equations was the high cross elasticity among the competitive meats -- beef, pork, mutton, and lamb. Alternative formulations including other meat prices as explanatory variables did not improve the demand equation for poultry; and the equation for bacon and ham showed an unexpected (but not significant) negative cross elasticity with respect to pork price. All other signs in the meat equations were as expected.

The demand equations for dairy products were less satisfactory. No price or income effects were isolated for dried whole milk or for condensed milk, and projections were made on the basis of past trends. For liquid milk even the past trend was uncertain, and the projected consumption was a constant per capita value of 147 kilogram per head. The cross elasticity of butter consumption and margarine price was the 'wrong' sign, and in the projections this elasticity was imputed from a symmetry condition imposed on the elasticity of margarine consumption with respect to butter price. Equations for cheese, cream, eggs and margarine were satisfactory.

The price elasticity for bread showed a positive sign, perhaps because of a specification error. However, no modification of the equation proved as

Table 2.1. Demand Equations, United Kingdom[1/]

Equation	$\bar{R}^2$	D.W.
LBFV = 4.68 - 2.49 LBVP + 0.52 LPKP + 0.72 LMLP + 1.30 EXP (0.41) (0.12) (0.17) (0.21)	0.96	1.90
LPRK = 4.55 - 2.37 LPKP + 0.74 LBVP + 0.61 LMPL - 0.72 REXP (0.24) (0.34) (0.31) (0.17)	0.94	2.71
BAH = 13.41 - 0.31 BHP - 0.16 PKP + 2.69 LEXP (0.10) (0.10) (0.56)	0.67	2.73
LMUL = 3.05 - 1.35 LMLP + 0.58 LBVP + 0.26 LPKP + 0.11 REXP (0.34) (0.37) (0.26) (0.19)	0.72	2.28
PLTR = 9.71 - 2.26 LPLP + 7.24 LEXP (1.15)	0.98	2.05
LEGG = 4.24 - 0.16 LEGP - 0.19 LBHP - 0.19 REXP (0.08) (0.04) (0.11)	0.85	1.62
LBUT = 4.43 - 0.38 LBUP - 0.49 LBRP - 0.21 LMGP - 0.71 REXP (0.09)	0.95	2.56
LCHS = 1.71 - 0.12 LCHP + 0.39 LEXP (0.08) (0.06)	0.89	1.99
CREM = 2.66 - 0.38 LCMP + 0.89 LEXP (0.15)	0.74	2.63
LMRG = 0.42 - 0.28 LMGP + 0.44 LBUP + 0.57 REXP (0.39) (0.09) (0.08)	0.96	2.10
LWHF = 3.12 - 1.02 LWFP - 0.41 EXP (0.53) (0.13)	0.86	1.94
LBRD = 3.89 + 0.31 LBRP - 0.76 LEXP (0.09) (0.08)	0.97	2.58
LCON = 1.31 + 0.02 T (0.00)	0.65	0.98
DWMK = 0.97 + 0.17 T (0.02)	0.87	1.81
LOAT = 0.44 - 0.03 T (0.01)	0.26	1.32
MILK = 146.34 + 0.18T (0.11)	0.10	1.26

1/ For variable identification, see Table 2.2. Figures in brackets are standard errors.

Table 2.2. Explanation of Variable Labels for Table 2.1 and Correspondence with Product Categories in National Food Survey

	Consumption	Log of Consumption[1/]	Price	Log of Price[1/]	National Food Survey Category
Beef and veal	BFV	LBFV	DVP	LBVP	Carcass meat beef and veal
Pork	PRK	LPRK	PKP	LPKP	Carcass meat pork
Bacon and ham	BAH	LBAH	BHP	LBHP	Bacon and ham uncooked
Mutton and lamb	MUL	LMUL	MLP	LMLP	Carcass meat mutton and lamb
Poultry	PLTR	LPTR	PLP	LPLP	Broiler chicken uncooked; other poultry uncooked, not quick frozen
Eggs	EGGS	LEGG	EGP	LEGP	Total eggs
Liquid milk	MILK	LMLK	LMP	LLMP	Total liquid milk
Cream	CREM	LCRM	CMP	LCMP	Cream
Butter	BUTT	LBUT	BUP	LBUP	Butter
Cheese	CHSE	LCHS	CHP	LCHP	National cheese
Dried whole milk	DWMK	LDWM	DMP	LDMP	Dried milk, branded
Condensed milk	COND	LCON	CDP	LCDP	Condensed milk
Margarine	MARG	LMRG	MGP	LMGP	Margarine
Wheat flour	WHFL	LWHF	WFP	LWFP	Flour
Bread	BRED	LBRD	BRP	LBRP	Total bread
Oatmeal	OATM	LOAT	OPP	LOPP	Oatmeal and oat products

[1/] Logs to the base 10.

satisfactory for estimation and this was allowed to remain in the model. Wheat flour use, excluding that for bread, was satisfactorily explained by the regression equation; in the case of oatmeal a trend equation proved most reliable.

The parameters from the regression equations formed the basis for the demand projection model. Briefly, the parameters were converted to elasticity values for those variables included in the regressions. The remaining inter-food cross elasticities were developed on the neutral assumption that the effect the price of one food has on another is adequately expressed through the impact on the household budget. The cross elasticities with respect to non-food goods were chosen so that consumption patterns were neutral with respect to inflation.

The resultant complete matrix of direct and cross price elasticities and income elasticities was used for projecting future demand under given price and income assumptions. Since many of the elasticities were allowed to change over time the computer program generated this matrix anew for each year to be used in the projection of the next year's demand.

Assumptions on Economic Growth Rate, Population and Inflation

The levels of GNP and private consumption expenditure and the rate of increase of the general price level were taken as exogenous to the food demand model. These values were projected separately on the basis of past trends and future expectations. Table 2.3 gives the projected levels of population and income based on an assumption of a continued upward trend of 0.67 percent in the population per annum, and an underlying rate of growth in productive potential (including population change) of 2.9 percent. This was in accordance with the calculations of the U.K. government document 'The Task Ahead' and takes into account changes in the composition of the work force.

Recent rates of inflation have been much higher than those experienced over the past fifteen years. It is unlikely that such inflation will be allowed to continue until 1980; the assumption has therefore been made that the general level of prices will rise by four percent per year on average. This assumption, coupled with productivity and population increases, points to a near doubling of the money GNP over the next decade even though real income increases by only 30 percent.

The projections allow for a slight decline in the proportion of consumption expenditure in total GNP. The decline is assumed to follow the pattern of the

Table 2.3. Projected Population and Income Levels, United Kingdom, 1968-1980, assuming 2.9 Percent Growth, 4 Percent Inflation.[1/]

	Population (million)	Real GNP ($/billion) 1968 prices	Current GNP ($/billion)	Private Consumption Expenditure ($/billion)	Private Consumption Expenditure Per Capita ($/1000)
1969	55.65	90.61	94.23	69.31	1.25
1970	56.03	93.24	100.70	73.83	1.32
1971	56.40	95.94	107.45	78.54	1.39
1972	56.78	98.72	114.52	83.45	1.47
1973	57.16	101.59	121.90	88.56	1.55
1974	57.54	104.53	129.62	93.87	1.63
1975	57.93	107.56	137.68	99.40	1.72
1976	58.32	110.68	146.10	105.15	1.80
1977	58.71	113.89	154.89	111.13	1.89
1978	59.10	117.20	164.07	117.35	1.99
1979	59.50	120.59	173.66	123.82	2.08
1980	59.91	124.07	183.67	130.55	2.18

[1/] Historical data given in Table B.3 of Appendix B.

last fifteen years -- the average propensity to consume decreasing by 0.3 percent per year. Taken in conjunction with the population increase, this implies a per capita private consumption expenditure rising from $1,250 in 1969 to $2,180 in 1980. It is this series that was used in the demand estimates as the 'income' variable. It should be emphasized that the model can be run with any set of these exogenous factors.

Assumptions on Retail Prices and Margins

Projections of retail food prices were derived, for the most part, from farm prices plus a marketing margin. Only on margarine were retail prices projected directly. The farm prices used were the market rather than gross prices since the deficiency payment included in the gross price comes directly from the Exchequer rather than from the prices paid by buyers of farm products. These farm prices were projected to 1980 as a part of the supply model and are presented in Table 2.4. The following section "Supply Analysis" explains the rationale for these projections.

Four alternative economic and policy situations were contemplated. In the first three, economic growth of 2.9 percent and inflation of 4 percent were assumed. In Case I, the current domestic agricultural program is assumed to continue. In Case II, the variable levy system proposed by the Conservative government is assumed to be enacted in 1972 and have a transition period of three years. In Case III, the United Kingdom is assumed to join the European Economic Community in 1972 with a 5 year transition period to 1977. Case IV is the same as Case III except that an annual growth rate of 3.4 percent and an annual inflation rate of 5 percent is projected.

Estimates were made of marketing margins by comparing annual retail prices over the 1955 to 1968 period with farm prices. The differences, i.e. margins, were projected to 1979 using graphic techniques; the projections were, in general linear extrapolations of past trends (Table 2.4).

No official statistics were available on marketing margins. Consequently this investigation could not go much further than comparing farm prices on the raw product with retail prices on the finished good. This meant, for example, looking at cattle prices (dressed basis) versus retail beef prices without putting a value on the by-products. Only on butter was this done using an estimate of the value of the skim milk. Another complication was that, for some products, import prices were more relevant than domestic farm prices in

Table 2.4. Farm Price Equivalents and Marketing Margins in Selected Years, 1955-68 and Projections to 1979 Under Alternative Policy Assumptions, U.K.[1]

Item	Farm Price (F) or Margin (M)	Actual 1955	Actual 1960	Actual 1965	Actual 1968	Projected 1979 Case I	Projected 1979 Case II	Projected 1979 Case III	Projected 1979 Case IV [2]
		$/kg				$/kg			
Beef and veal	F	.606	.582	.699	.757	1.019	1.204	1.504	1.504
	M	.305	.520	.663	.801	1.425	1.425	1.425	1.563
Pork	F	.490	.538	.467	.591	.646	.829	.900	.900
	M	.360	.560	.703	.785	1.262	1.262	1.262	1.388
Bacon and ham	F	.490	.538	.467	.591	.646	.829	.900	.900
	M	.458	.512	.688	.705	1.082	1.082	1.082	1.192
Mutton and lamb	F	.687	.648	.752	.807	1.076	1.300	1.323	1.323
	M	.120	.249	.315	.370	.518	.518	.518	.572
Poultry	F	.811	.680	.559	.518	.556	.579	.643	.643
	M	.402	.365	.378	.384	.498	.498	.498	.553
Eggs	F	--	.662	.578	.518	.508	.540	.580	.580
	M	--	.079	.127	.205	.284	.284	.284	.315
Liquid milk	F	--	--	.097	.107	.135	.135	.109	.109
	M	.038	.046	.058	.065	.101	.101	.101	.112
Cream	F	.651	.676	.728	.743	.836	.836	1.384	1.384
	M	.570	.503	.435	.500	.639	.639	.639	.709
Butter	F	--	.664	.950	.671	.781	.781	2.354	2.354
	M	--	.469	.377	.511	.693	.693	.693	.767
Cheese	F	.440	.442	.529	.541	.648	.648	1.208	1.208
	M	.228	.422	.434	.468	.734	.734	.734	.809
Dried Whole milk	F	--	--	--	.044	.054	.054	.109	.109
	M	--	--	--	.105	.137	.137	.137	.152
Condensed milk	F	--	--	--	.044	.054	.054	.109	.109
	M	--	--	--	.108	.141	.141	.141	.156
Wheat flour	F	.071	.065	.070	.072	.084	.110	.138	.138
	M	.073	.092	.100	.100	.140	.140	.140	.155
Bread	F	.045	.041	.044	.045	.053	.069	.087	.087
	M	.107	.105	.150	.193	.335	.335	.335	.367
Oatmeal	F	--	--	--	.083	.096	.119	.150	.150
	M	--	--	--	.292	.379	.379	.379	.420

1/ Farm prices represent market prices converted to carcass basis on livestock and retain weight basis on poultry, cream, butter, cheese, wheat flour, bread and oatmeal. Farm prices, except on dairy products were on a calendar year basis and not strictly comparable to farm prices used in the supply model. The value of skim milk must be deducted from "farm price of butter plus marketing margin" to yield retail prices.

2/ Rate of increase in marketing margin for 1968-1979 was 1 percent per year higher than for Case I, II and III.

establishing retail prices. The assumption was made that domestic farm prices would move in parallel with import prices on these products.

The decision was made to view marketing margins in absolute terms with a built-in inflationary factor rather than as a constant percentage markup. The rationale is that marketing costs per unit would tend to be constant, or increasing with inflation, and would not be closely related to the price level on the product in question. Some additional costs would be involved at higher price levels such as the interest and insurance cost on inventories, but these additional costs would be relatively small. An informal survey of individuals in the food industry revealed some support for this position, with the exception that several felt that margins on meat would be more on a constant percentage basis because of low margins in the past.

The marketing margin projected for eggs represents a leveling off from past trends. With the phasing out of the British Egg Marketing Board, some economies in transporting eggs are expected to be introduced. Marketing margins for eggs sold at retail are somewhat misleading because direct selling has become more prominent. In recent years half or more of the sales have been direct from farm to consumer.

Adding the marketing margin to farm prices yields approximately the retail prices presented in Table 2.5. Some transformations are required as explained in the footnote to Table 2.4.

In general it has been assumed that retail food prices will rise somewhat less than the rate of inflation in the economy except during the transition period with entry into the EEC. Under EEC membership the price of processed dairy products would rise dramatically as manufacturing milk prices move up to EEC levels. Retail prices on butter and cheese would be at least double their 1968 levels. Meat prices similarly are expected to rise faster under EEC conditions. Retail price projections under Case II represent a middle group between Case I and the "In-EEC" cases.

Recent Trends and Projections of Per Capita Consumption

Table 2.6 shows per capita consumption (and expenditures) for 1968 and the projections to 1980. The per capita data are taken from the Board of Trade Journal from figures provided by the Ministry of Agriculture, Fisheries and Food. These data cover all domestic consumption whether by households or by firms and institutions. They are more compatible with the total production

Table 2.5. Retail Prices in Selected Years, 1955-68, and Projections to 1979 Under Alternative Policy Assumptions, U.K.[1/]

Item	Actual Prices				1979 Projections and Change from 1968							
					Case I		Case II		Case III		Case IV	
	1955 $/kg	1960 $/kg	1965 $/kg	1968 $/kg	Price $/kg	Index 1968=100	Price $/kg	Index 1968=100	Price $/kg	Index 1969=100	Price $/kg	Index 1968=100
Beef and veal	.91	1.10	1.36	1.65	2.44	148	2.63	159	2.93	178	3.07	186
Pork	.85	1.10	1.17	1.37	1.91	139	2.09	152	2.16	158	2.29	167
Bacon and ham	.95	1.05	1.16	1.29	1.73	134	1.91	148	1.98	153	2.09	162
Mutton and lamb	.81	.90	1.07	1.24	1.59	128	1.82	147	1.84	148	1.90	153
Poultry	1.21	1.04	.94	.90	1.05	117	1.08	120	1.14	127	1.20	133
Eggs	.82	.74	.71	.74	.79	107	.82	111	.86	116	.89	120
Liquid milk	.12	.14	.16	.17	.24	141	.23	135	.21	124	.22	129
Cream	1.22	1.18	1.16	1.24	1.47	118	1.47	118	2.02	163	2.09	168
Butter	1.00	.90	.98	.90	1.14	127	1.14	127	2.48	276	2.56	278
Cheese	.67	.86	.96	.99	1.38	139	1.38	139	1.94	196	2.02	204
Dried whole milk	.12	.14	.14	.15	.19	127	.19	127	.25	167	.26	173
Condensed milk	.13	.15	.16	.15	.20	133	.21	140	.23	153	.24	133
Margarine	.46	.49	.54	.52	.81	156	.81	156	.81	156	.90	173
Wheat flour	.14	.16	.17	.17	.22	129	.25	147	.28	165	.29	170
Bread	.15	.15	.19	.24	.39	162	.40	167	.42	175	.45	188
Oatmeal	.27	.33	.33	.37	.47	127	.50	135	.53	143	.57	154

[1/] More historical data given in Table B.2. of Appendix B.

Table 2.6. Per Capita Consumption in 1968 and Projections to 1980 Under Alternative Policy Assumptions, U.K.[1]

Item	1968 Expen-diture	1968	Projected 1980 per capita consumption and change from 1968: Case I Quan-tity	Case I Index	Case II Quan-tity	Case II Index	Case III Quan-tity	Case III Index	Case IV Quan-tity	Case IV Index
	$	kg	kg	1968=100	kg	1968=100	kg	1968=100	kg	1968=100
Beef and veal	33.77	20.45	21.27	104	20.40	100	15.58[2]	76	17.68[2]	82
Pork	14.52	10.57	13.23	125	12.25	116	12.36	117	12.98	123
Bacon and ham	14.79	11.43	12.77	112	12.38	108	12.20	107	12.68	111
Mutton and lamb	12.99	10.52	13.05	124	11.60	110	12.32	117	13.07	124
Poultry	8.29	9.21	11.64	126	11.62	126	11.48	125	12.10	131
Eggs	11.52	15.48	17.51	113	17.08	110	16.84	109	17.33	112
Liquid milk	24.97	145.17	145.17	100	145.17	100	145.17	100	145.17	100
Cream	1.26	1.27	1.59	125	1.59	125	1.47	116	1.56	123
Butter	2.58	8.93	10.55	118	10.36	116	7.23	81	7.76	87
Cheese	4.95	4.99	5.56	111	5.56	111	5.34	107	5.52	111
Dried whole milk	0.09	0.59	2.63	446	2.63	446	2.63	446	2.63	446
Condensed milk	0.25	1.63	2.07	127	2.07	127	2.07	127	2.07	127
Margarine	2.57	4.90	4.07	83	4.06	83	5.87	120	5.56	113
Wheat flour	2.06	11.99	12.44	104	11.10	93	9.89	82	9.87	82
Bread	19.38	85.02	71.74	84	72.47	85	73.45	86	69.16	81
Oatmeal	0.48	1.27	0.88	69	0.88	69	0.88	69	0.88	69

1/ More historical data given in Table B.1. of Appendix B.

2/ Unrestricted per capita consumption. In subsequent analysis, beef and veal consumption was restricted to be equal to or greater than beef and veal production. With this restriction, per capita beef and veal consumption would be about 17.7 kg per capita in both Case III and Case IV.

data than are the household survey data. In effect by using the NFS to detect response to price and income and applying the resultant demand matrix to overall consumption, the assumption is made that non-household demand follows the same pattern as household purchases. The per capita demand for meats is expressed in Table 2.6 on a 'carcass equivalent' basis, for ease of comparison with production projections.

The trend in consumption away from starchy and farinaceous foods has been evident in the United Kingdom as in other industrial nations. Consumption of bread, wheat flour and oatmeal particularly has fallen steadily. Purchases on cheese and poultry have increased, reflecting both a positive income effect and a declining relative price. Consumption of pigmeat has remained fairly steady over fifteen years, the main change being a slight switch to pork away from bacon in the early 1960s. Even this trend has been reversed in the last four years. Beef consumption fell steadily from 1957 but has stabilized recently.

Butter consumption showed a steady rise until recently, whereas the demand for margarine has contracted. The market for cream and some other milk products has expanded; consumption of eggs has changed little over the period.

The demand model described in Appendix F generated projections of per capita and total consumption for each year in 1969-80. The 1980 per capita projections are shown in Table 2.6 of this chapter. The products most affected by EEC membership are beef, butter and margarine. Beef consumption is projected to remain about steady if the U.K. remains outside the EEC. With the higher EEC beef prices, the projected consumption declines. Pork consumption is little affected by membership, the higher pork prices offsetting the substitution to pork as beef prices rise. Similarly the model predicts little effect on the per capita consumption of bacon and ham. The growth of poultry consumption is similar both in the 'in' and 'out' situations. A moderate rise in consumption of mutton and lamb is indicated for all four cases.

Since no consistent price or income effect on consumption of liquid milk is evident, a constant per capita figure is projected in both policy situations. Cream use increases somewhat under entry conditions. Dried and condensed milk are predicted to follow a trend unrelated to agricultural policy. A marked switch from butter to margarine is indicated by the projections in the event of EEC membership. Butter consumption is reduced by about 15-20 percent as a result of the EEC price levels over the decade 1970-1980, as opposed to a 15 to 20 percent rise in the event of non-entry. Margarine consumption increases 15-20 percent over the same period with entry so that total butter and margarine use drops marginally with entry. On the other hand, total butter and margarine consumption rises slightly with non-entry. Consumption of wheat flour declines in all cases except Case I while bread and oatmeal drop under all assumptions. Egg consumption increases in all projections. Projections of total food demand (per capita demand times population) are presented in the final section of this chapter. The comparison of these projected food demand quantities with available domestic supplies is also discussed.

Supply Analysis

Structure

Most of the production of livestock and cereals in the United Kingdom is on farms of "substantial" size as compared with other European countries. These farms would even rank well in comparison with farms in the United States.

Consider the statistics for England and Wales.[1/] Farms are classified by size according to "standard man days" (smd's) required for the volume produced. Holdings with 275 smd's and over are considered to be providing employment for at least one full-time man. In 1967, there were 147,335 such holdings, just under half of all holdings. Of these full time holdings, 42 percent had 275-599 smds, 35 percent had 600-1199 smds and 23 percent had 1200 or more smds.

These full-time operations represented 93 percent of total smd requirements in the agriculture of England and Wales even though by number they were only half. Of particular interest is the fact that over half the smd requirements in the agriculture of England and Wales were on holdings requiring 1200 smds or more. To the extent that smds are a measure of the volume of output, this is similar to saying that over half of the farm production of England and Wales was on holdings employing 4 or more men. The concentration of production in the larger size farms was somewhat less in dairy, cattle and sheep operations and somewhat more in poultry production and general cropping farms.

[1/] See Appendix B, Tables B.4. to B.8.

In England and Wales, about one-third of the labor requirements on full-time holdings were on dairy farms in 1967. Crop farms represented nearly one fourth of the labor requirements with livestock farms claiming about 11 percent and pig poultry farms about 7 percent of the total. The remaining 28 percent of the labor requirement was on horticulture and mixed farms.

Another characteristic of agriculture in the United Kingdom is the degree of specialization. In 1967, nearly 80 percent of the dairy cows in England and Wales were on farms classified as "specialist dairy" or "mainly dairy". Over half the cereal area was on farms classified as "cropping". Egg and poultry meat production was concentrated in specialized operations with 56 percent of hens and pullets, 88 percent of broilers and 68 percent of turkeys on holdings classified as "predominately poultry" or "pigs and poultry". Pig production is somewhat less specialized, with only 25 percent of breeding pigs on "pig and poultry" farms in 1967.

Beef and sheep herds tend to be found in specialized livestock operations with about 70 percent of beef cows and 57 percent of breeding sheep on holdings designated as livestock rearing and fattening in 1967.

Data for Scotland and Northern Ireland are available in less detail than for England and Wales but would not alter the general conclusion that agriculture in the United Kingdom is characterized by medium to large farms with substantial specialization. This structure would be expected to influence how producers respond to changing economic conditions. Presumably, such a structure would add some stability to production patterns. Less shifting in and out of enterprises or among enterprises would be expected than for an agriculture characterized by small, general farms.

Another stabilizing influence in the cereal-livestock sector of U.K. agriculture has been the government program to support farmer returns. Year to year changes in gross prices under the deficiency payment scheme (which covers fat cattle, fat lambs, fat pigs, wheat, barley and oats) have been small. Milk prices have been stabilized through control over retail prices and distributors' margins on fluid milk.

Time Series Analysis

A time series analysis was conducted in an attempt to determine whether U.K. farmers did respond to changes in relative returns on major cereal and livestock enterprises and if so to what extent did they respond. Because prices have been relatively stable, the standard supply analysis using product and input prices as explanatory variables did not appear to be promising. Instead, returns from major enterprises were represented by gross margin type variables, hereafter referred to as simply gross margins. Typically this was the gross return per production unit less the cost per production unit of major input(s). Examples of this are net return on barley per hectare over the cost of fertilizer and net return per pig over the cost of concentrates.

The use of the gross margin variable has the advantage that it incorporates several factors which affect profits and thereby conserves on degrees of freedom in a regression analysis, and it reduces the problem of intercorrelation among independent variables. The gross margin also allows more a priori information to be included than if product and factor prices cannot be measured except to the extent that they affect the gross margin. The assumption is made that the farmer responds in the same way to a dollar increase in gross margin whether it is due to higher product prices, lower factor prices or improved technology. ?

Annual estimates of gross margins were made and other data were obtained for 1954 to 1969. The Ministry of Agriculture, Fisheries and Food was the source of most of these statistics supplemented by data from various other sources.[2/] Appendix Tables B.9. to B.25. include most of the annual figures used in this analysis. A description of the computation of some of these variables is included in the instructions for computer programming of the United Kingdom Supply Model.

On the first run of these basic supply equations, the general format was to include among the independent variables; (1) the dependent variable lagged one year, (2) the gross margin type variable lagged one year, (3) an index of prices

[2/] The following publications were particularly helpful: Annual Review and Determination of Guarantees, various years, Her Majesty's Stationary Office; Central Statistical Office, Monthly Digest of Statistics, various issues, H.M.S.O.; Commonwealth Economic Committee, Dairy Produce, Grain Crops, Meat, various years, H.M.S.O.; Federation of United Kingdom Milk Marketing Boards, Dairy Facts and Figures, various issues, Thames Ditton Surrey; Hunt, K.E. and K.R. Clark, Poultry and Eggs in Britian, 1966-67, and earlier editions, Agricultural Economics University of Oxford, Aug. 1967; Meat and Livestock Commission, Meat and Livestock Statistics, and various handbooks, P.O. Box 44, Queensway House, Bletchley, Buckinghamshire; Nix, John, Farm Management Pocketbook, Department of Agricultural Economics, Wye College, 1969.

paid by farmers for inputs other than those included in the gross margin type variable, and (4) variable(s) representing the profitability of alternative enterprises. Variables (3) and (4) were also lagged one year. Built into the gross margins on livestock were allowances for increased efficiency in feed conversion where deemed important and where some measurement was possible.

The rationale for the lagged dependent variable was to measure expectation and adjustment lags. The results of the first computer run appeared to substantiate this approach, comparing equations with and without the lagged dependent variable. On the supply equations, the $\bar{R}^2$ s, standard error of estimates and the "t" values on the gross margin variables were more "favorable" for most of the commodities when the lagged dependent variable was included as an independent variable. The decision was made to standardize all the basic supply equations with this formulation whether or not they happened to produce better statistical results. The a priori belief was that distributed lags are representative of the process of producer response to changing profit prospects.

A problem developed from the inclusion of the prices paid variable. In most equations, the correlation between the prices paid variable and the gross margins was relatively high. In most equations, the coefficients on the gross margins were insignificant or carried the wrong sign. Wrong signs appeared on equations dealing with dairy cow numbers, ewe numbers, sow numbers and poultry meat production.

In the second computer run of the regression equations, two major changes were made in the format. First, the index of prices paid by farmers was deleted. Secondly, estimates were made of improvements in labor efficiency over the 1954-69 period in pig, egg and poultry production -- enterprises which have undergone substantial structural change in recent years. The labor input variable is, of course, only one representation of that change. These estimates of improvement in labor efficiency were based on M.A.F.F.'s (Ministry of Agriculture Fisheries and Food) estimate of "standard man days" by class of livestock and on available costing studies. A transformation of gross margins was made to a "per hour of labor basis" by dividing gross margins by the estimate of the hours required per production unit.

The second computer run produced more satisfactory results. Only on ewe numbers did the coefficient on the gross margin type variable have the incorrect sign. The coefficient on the gross margin variable was not significantly different from zero at the 5 percent level, however, on layers and turkeys -- even after allowing for gains in both feeding and labor efficiency. The "t" value on the coefficient for gross margins on layers was 1.44 and on turkeys was 1.93. The $\bar{R}^2$ values on equations dealing with sow numbers (.56) and on milk cow numbers (.61) were somewhat less than desired. All other basic supply equations carried $\bar{R}^2$ s of .80 or above except on wheat.

Not only did the wheat equation explain a small part of the variation in acreage, the coefficient on net returns per acre over fertilizer costs was not significant. The format of the equation was inappropriate in this case because farmers do not respond so much to returns in the past year as to how much favorable weather they have in the fall to put in the winter wheat crop. Last year's acreage happened to be a poor guide because of a phenomenon of a two year rainfall cycle in the 1954-68 period.

Wheat acreage cannot easily be forecast because of the importance of fall rainfall. This is not a major difficulty in this study, however, since an adequate equation was developed to explain total cereal acreage. Considering that a sizeable proportion of the wheat crop is utilized as animal feed, predicting total cereal acreage is more relevant than predicting wheat acreage and feed grain acreage separately.

On sheep, ewe numbers were negatively correlated with net returns per ewe over concentrate costs. This was somewhat surprising upon inspection of the data since both series have increased between 1954 and 1965, although ewe numbers have declined and returns from sheep have increased since 1966.

On egg and poultry production, it is doubtful that further refinement in time series data would be of much value. There has been such a dramatic change in the structure of the industry during the 1960s that it is difficult to obtain consistent data on representative farms. The estimates of the improvements in feeding and labor efficiency, while contributing to the understanding of the expansion in poultry, were probably conservative considering the rapid shift from small to very large operations. Moreover, average feed prices and average product prices were applied in computing "net returns over concentrates". No measurement was possible of the economies to milling and distribution of feed and to the processing and marketing of the product with respect to the large operations. There was no convenient way to measure their bargaining power.

The time series analysis of the major livestock-feed grain enterprises did not establish significant cross elasticities of supply. This is not to say that such relationships do not exist but, at least in the U.K., changes in relative profitability of various enterprises did not change enough in 1954-68 to establish such relationships. If major shifts in relative profitability are contemplated in the future, some judgement will have to be employed to estimate these cross elasticities.[3/]

The set of equations selected as best representing supply relationships in the U.K. is as follows. The figures in parentheses are the standard errors on the coefficients. Data are on a crop year basis unless otherwise noted.

Milk

(1) Number of milk cows on farms $(1000)_t$ = 1053

+ .5806 Number of milk cows on farms $(1000)_{t-1}$
(.1924)

+ 7.922 Net returns from milk and calf over the cost of
(3.130) of concentrates $(\text{£}/\text{cow})_{t-1}$

- 3.574 Price of cull cows $(\text{shilling/hundredweight})_{t-1}$
(1.884)

$\bar{R}^2$ = .61 S.E.E. = 58

(2) Milk production per cow $(\text{gallon})_t$ = 634

+ 1.461 Percent Friesians in National Herd_t

+ 5.585 Time (1955 =1)
(.825)

$\bar{R}^2$ = .78 S.E.E. = 12

Beef

(1) Number of beef cows on farms $(1000)_t$ = 211

+ .5974 Number of beef cows on farms $(1000)_{t-1}$
(.1521)

+ 8.111 Net return from beef calves (including calf subsidy and
(3.530) production grants over cost of concentrates)
$(\text{£}/\text{cow})_{t-1}$

-1.007 Price of cull cows $(\text{shilling/hundredweight})_{t-1}$
(1.045)

$\bar{R}^2$ = .96 S.E.E. = 31

[3/] An alternative approach to the time series model was a linear programming analysis by B. H. Davey and P. W. H. Weightman of the Agricultural Adjustment Unit at the University of Newcastle Upon Tyne. This study reported in Appendix A, provides insights into these cross elasticity relationships.

(2) Dairy calves reared as a percent of those surviving birth_t = -7.94

+ .6342 Dairy calves reared as a percent of those surviving birth_{t-1}
(.1505)

+ 1.609 Price of rearing calves ÷ Index of veal prices,
(.750) Calendar year $(\text{£/head})_t$

$\bar{R}^2 = .80$ S.E.E. = 4.24

Sheep

(1) Number of ewes for breeding $(1000)_t$ = 2467

+ .9410 Number of ewes for breeding $(1000)_{t-1}$
(.0419)

- 15.51 Index of net returns from sheep production over
(3.271) cost of concentrates per ewe $(1954\text{-}56 = 100)_{t-1}$

$\bar{R}^2 = .98$ S.E.E. = 143

Pigs

(1) Number of sows and gilts for breeding $(1000)_t$ = 124

+ .6075 Number of sows and gilts for breeding $(1000)_{t-1}$
(.1931)

+ 548.9 Net returns from pigs over the cost of concentrates per
(239.0) per hour of labor $(\text{£/hour})_{t-1}$

$\bar{R}^2 = .56$ S.E.E. = 58

Eggs

(1) Average number of laying fowl on farms $(1000)_t$ = 18449

+ .6842 Average number of laying fowl on farms $(1000)_{t-1}$
(.1173)

+ 501.1 Net returns from eggs over the cost of concentrates
(348.9) per hour $(\text{shilling/hour})_{t-1}$

$\bar{R}^2 = .80$ S.E.E. = 1929

(2) Number of dozens of eggs per layer_t = 14

+ .2776 Time (1955 = 1)
(.0119)

- .02201 Net returns from eggs over the cost of concentrates
(.02942) per hour $(\text{shilling/hour})_{t-1}$

$\bar{R}^2 = .98$ S.E.E. = .1497

Broilers

(1) Meat produced from fowls under 6 months $(1000\text{T})_t$ = -39.31

+ .9896 Meat produced from fowls under 6 months $(1000\text{T})_{t-1}$
(.0309)

+ 1.6678 Net returns from broilers over the cost of concentrates
(.5418) per hour of labor $(\text{shilling/hour})_{t-1}$

$\bar{R}^2 = .99$ S.E.E. = 10

Turkeys

(1) Turkey meat produced $(1000T)_{t-1}$ = 3.59

+ .6889 Turkey meat produced $(1000T)_{t-1}$
(.1685)

+ .2178 Net return from turkeys over the cost of concentrates
(.1130) per hour of labor $(\text{shilling/hour})_{t-1}$

$\bar{R}^2$ = .92 S.E.E. = 3.3

Cereals[4/]

(1) Total acreage of cereals $(1000)_t$ = -1387

+ .9521 Total acreage of cereals $(1000)_{t-1}$
(.0611)

+ 71.76 Net returns on barley and wheat over fertilizer cost
(20.67) $(\text{£/acre})_{t-1}$

- 1.412 August-November rainfall in England and Wales $(\text{m.m.})_{t-1}$
(.460)

$\bar{R}^2$ = .96 S.E.E. = 177

(2) Acreage of feed grain $(1000)_t$ = -1532

+ .9519 Acreage of feed grain $(1000)_{t-1}$
(.0736)

+ 69.72 Net returns on barley over fertilizer costs $(\text{£/acre})_{t-1}$
(23.32)

- .1792 Acreage of winter wheat in England and Wales (1000)
(.1484) December_{t-1}

$\bar{R}^2$ = .95 S.E.E. = 173

(3) Acreage of wheat $(1000)_t$ = 1901

+ .1093 Acreage of wheat $(1000)_{t-1}$
(.2589)

+ 10.34 Net returns on wheat over fertilizer cost $(\text{£/acre})_{t-1}$
(14.14)

- 1.029 August-November rainfall in England and Wales $(\text{m.m.})_{t-1}$
(.516)

$\bar{R}^2$ = .14 S.E.E. = 183

(4) Wheat yield $(\text{hundredweight/acre})_t$ = 24.9

+ .2407 Net returns on wheat over fertilizer costs $(\text{£/acre})_{t-1}$
(.2035)

-.0309 June-August rainfall, England and Wales $(\text{m.m.})_t$
(.0109)

[4/] Rainfall variables were used by D. R. Coleman, "An Econometric Study of the United Kingdom Cereal Market, 1954-1967" Unpublished Ph.D. thesis at the University of Manchester, Manchester, England, 1969.

$+ .4095$ Time (1955 = 1)
$(.1691)$

$\bar{R}^2 = .61 \qquad$ S.E.E. = 2.09

(5) Feed grain yield (hundredweight/acre)$_t$ = 18.1

$+ .1695$ Net returns on barley over fertilizer cost (£/acre)$_{t-1}$
$(.3999)$

$- .003917$ June-August rainfall, England and Wales (m.m.)$_t$
$(.010928)$

$+ .4340$ Time (1955 = 1)
$(.2251)$

$\bar{R}^2 = .42 \qquad$ S.E.E. = 2.19

The time series analysis provided the basic equations for the development of a supply model for the feed grain-livestock economy. Two of the equations were not used, however, because of "wrong" signs on independent variables. The equations rejected were on number of ewes for breeding and number of dozens per layer. Replacing these equations were functions of time assumed for the period of the projections. Another change was to make feed grain area a function of total cereal area minus wheat area rather than using three separate equations. This eliminated small inconsistencies.

Alternative Equation Forms

Alternative equations were tried on milk and beef cows and on cereal area, but were not employed in the model. The results may be of some interest just the same because of the importance of these commodities.

In both the supply equations on milk cows and on beef cows, cow prices had a negative effect on cow numbers. The coefficient was close to significant at the 5 percent level on dairy cows but carried a "t" value of only about one in the beef cow equation.

There may be several reasons for this negative effect. Dairy and beef producers may be inclined to cull closer when cow prices are attractive and postpone culling when cow prices are low. Also, prices on replacement cows tend to be correlated with cull cow prices. Higher replacement costs would inhibit expansion, _ceteris paribus_. Cull cow prices also reflect the general level of cattle prices and may thereby be measuring the substitution effect between dairy and beef.

Even so, questions might be raised as to whether rising cull cow prices would inhibit expansion of dairy and beef cow numbers in the long run regardless of the short term effect. To investigate this possibility, an alternative formulation was tried in which cull cow prices were deleted from the dairy cow and beef cow equations. On the dairy cow equation, returns from sale of rearing calves was also eliminated from the gross margin variable. This was done because costing studies show that the returns from cull cows and calves about offset the cost of replacement cows. The gross margin variable then became returns from milk per cow over the cost of concentrates.

The time series analysis resulted in the following equation on milk cows:

Number of milk cows on farms $(1000)_t$ = 850

+ .6573 Number of milk cows on farms $(1000)_{t-1}$
(.2092)

+ 3.273 Net returns from milk over cost of concentrates $(£/\text{cow})_{t-1}$
(2.267)

$\bar{R}^2 = .52$ S.E.E. = 65

The statistical properties were less favorable than on the original equation. Not only was the coefficient on the net returns variable not significant, the $\bar{R}^2$ was lower and the standard error of estimate was higher on the alternate equation.

On beef cows, the gross margin variable was the same as used previously and the equation was as follows:

Number of beef cows on farms $(1000)_t$ = 133

+ .6681 Number of beef cows on farms $(1000)_{t-1}$
(.1328)

+ 5.640 Net return from beef calves (including calf subsidy)
(2.419) and production grants over cost of concentrates $(£/\text{cow})_{t-1}$

$\bar{R}^2 = .96$ S.E.E. = 31

The statistical properties of the above equation were very close to those of the equation which included cull cow prices.

Even though the statistical properties of the supply equation on total cereals were acceptable, it did seem that the use of this equation in the model generated an over expansion in cereal area. An alternative equation was developed based upon a simple expectation model. Instead of using the gross margins (returns per hectare over fertilizer costs) in the previous year as an independent variable, the gross margins for the past two years were averaged, weighting the gross margin in the past year by two and the gross margin two years before by one. The rationale is that expectations about gross margins do not change directly with annual changes but are conditioned by the gross margins realized in the previous year or years. In this case, only two years were examined.

The use of the lagged dependent variable also is a means of tracing the impact of previous years' gross margins on cereal area and was retained in this reformulation. The results of the time series analysis were as follows:

Total acreage of cereals $(1000)_t$ = -1712

+ .9074 Total acreage of cereals $(1000)_{t-1}$
(.0578)

+ 93.44 Net returns from barley and wheat over fertilizer cost
(23.39) $(£/acre)_{.67t-1 + .33t-2}$

- 1.455 August-November rainfall in England and Wales $(m.m.)_{t-1}$
(.449)

$\bar{R}^2 = .96$ S.E.E. = 158

The statistical properties were even more favorable than the original equation. While the process of selecting supply equations in this analysis was not solely on the basis of the best statistical fits -- a general equation form was selected for all or groups of the products -- this particular formulation of the cereal equation appeared promising. However, such a modification would not have a material effect on the results and consequently the original equation was retained.

Assumptions

In selecting the alternative policy situations to investigate, some arbitrary decisions were made. Just what form the proposed variable levy system of the Conservative Government may take is difficult to say at this time. From statements made by the government, this would likely involve raising market prices on fat cattle, fat lambs, fat pigs and cereals and phasing out the deficiency payments being made on these commodities. Presumably the increase in market prices would be sufficient to offset the reduction in deficiency payments.

Rising feed costs would result but it is not clear what, if any, adjustments might be made in livestock and poultry prices to compensate producers. Pig and poultry producers would be most affected. Assumed in this model are some price adjustments for pig, poultrymeat and egg producers.

The current Common Agricultural Policy is assumed for Cases III and IV.

Grain prices were projected for 1980 at 1971-72 intervention levels and milk prices at 1971-72 target prices. Cattle prices were projected somewhat above and pig prices near the 1970-71 levels in the EEC. Broiler prices for the U.K. were projected near 1970-71 levels and egg prices below 1970-71 levels for Cases III and IV. Deficiency payments and production grants identified with particular commodities would be eliminated except the production grants on hill cattle and hill sheep.

Price Projections -- In the 15-year period from the mid-1950s to the late 1960s, prices to farmers in the U.K. generally increased on livestock, moved up slightly on milk, stabilized on cereals and declined substantially on eggs and poultrymeat. Similar trends were underway in Ireland and Denmark except that egg prices were fairly steady. When the issue of entry into the EEC again surfaced in 1969, the three countries faced rather substantial increases in farm prices if they were to adjust to the levels of the Common Agricultural Policy.

In 1970 and 1971, the gap between farm prices in the applicant countries and in the six was reduced considerably. This was accomplished partly as a deliberate move to begin adjusting prices to EEC levels in anticipation of entry and as the result of unexpected market developments. Corn blight in the U.S. pushed up world market prices on cereals. The world dairy market situation improved materially. A drought in Argentina resulted in a reduction in cattle numbers, and in the rebuilding process, beef exports dropped and prices advanced sharply. These events, coupled with accelerated inflation, prompted the U.K. to raise support prices on cereals, livestock and milk in October 1970 above levels established earlier in the year. This was done without committing additional funds from the Exchequer since market prices were substantially higher. As it turned out, Exchequer costs for the deficiency payments scheme in 1970-71 were actually lower than in 1969-70. Somewhat higher support levels were established for 1971-72. The Conservative government of the U.K. in their program to shift the cost of supporting farm prices from the Exchequer to consumers, established new minimum import prices on certain major products.

Trends in U.K. commodity prices and projections for the four cases are illustrated in Figures 2.1 to 2.8.[5/] Liquid milk prices at the producer level

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[5/] A complete tabulation is presented in Appendix G.

Figure 2.1. Prices on Liquid and Manufacturing Milk, Farm Equivalent, U.K.

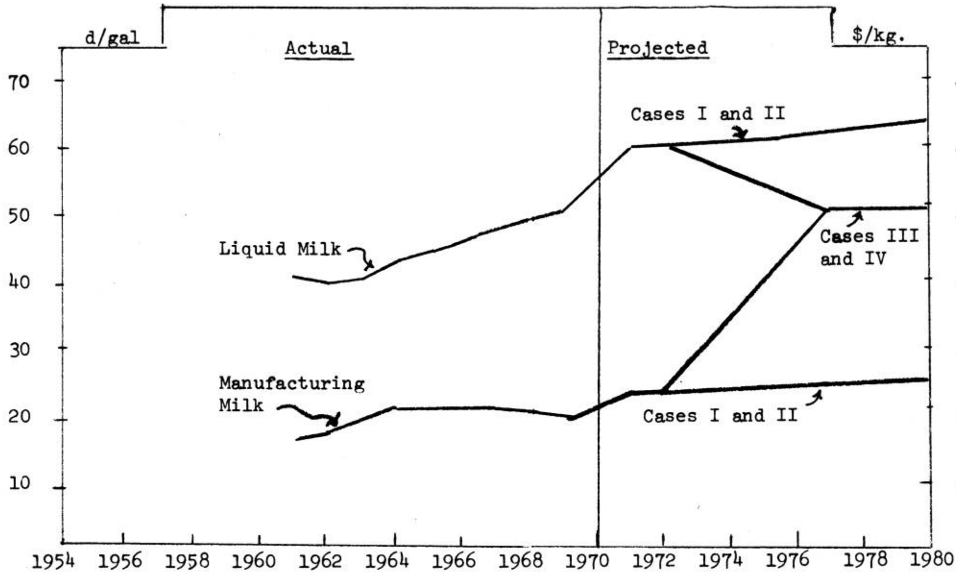


Figure 2.2. Prices on Fat Cattle, Live., U.K.

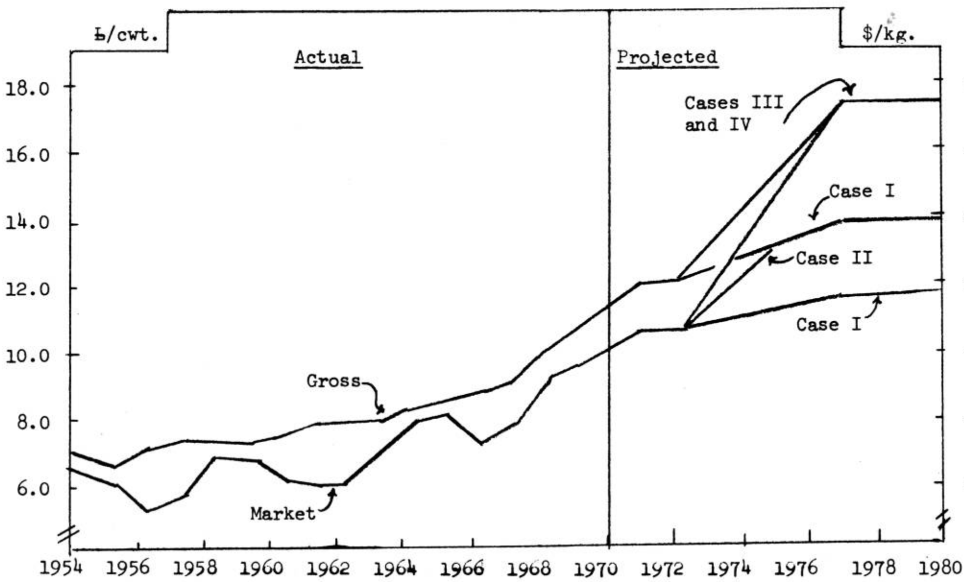


Figure 2.3. Prices on Fat Lambs, Dressed Weight, U.K.

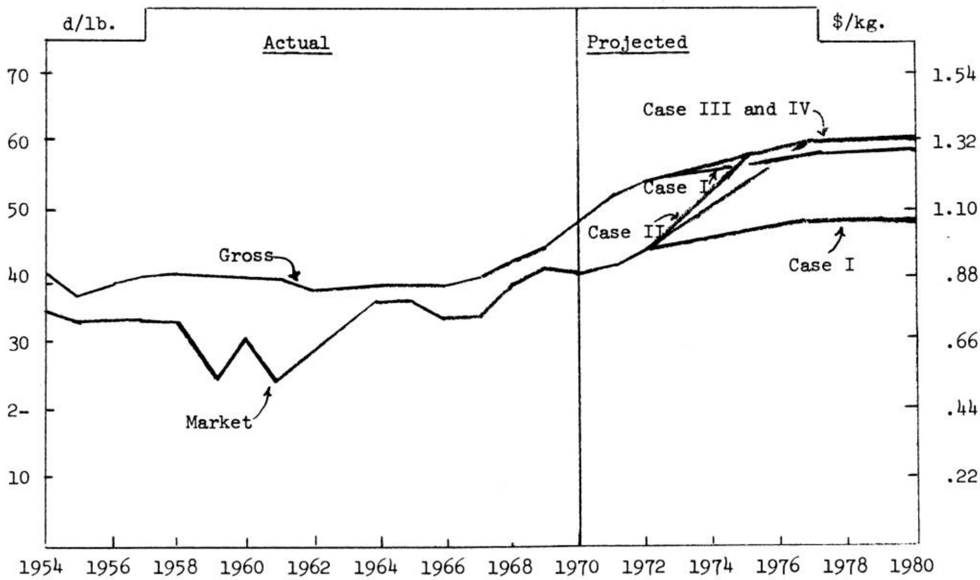


Figure 2.4. Prices on Fat Pigs, Dressed Weight, U.K.

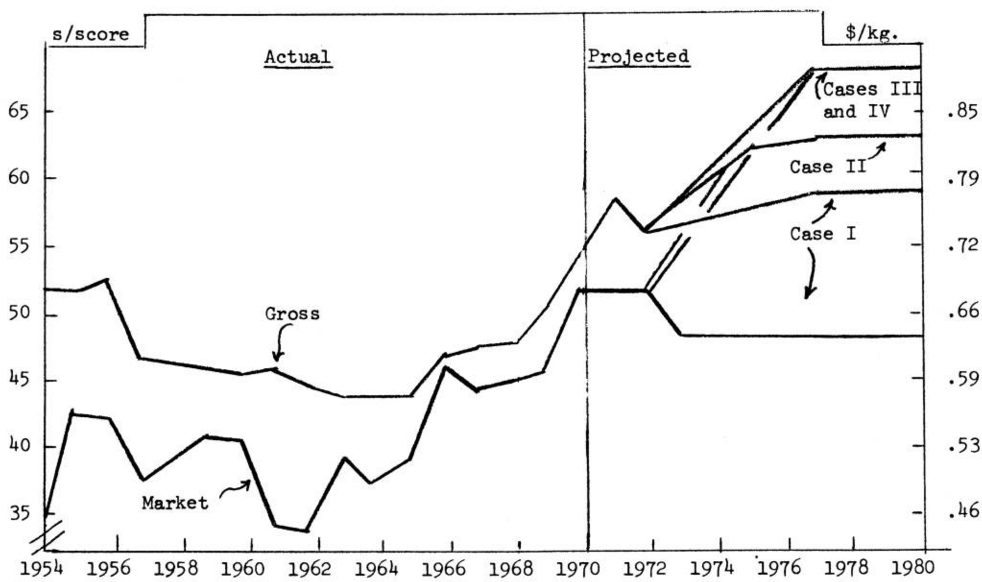


Figure 2.5. Prices on Broilers, Live, England and Wales

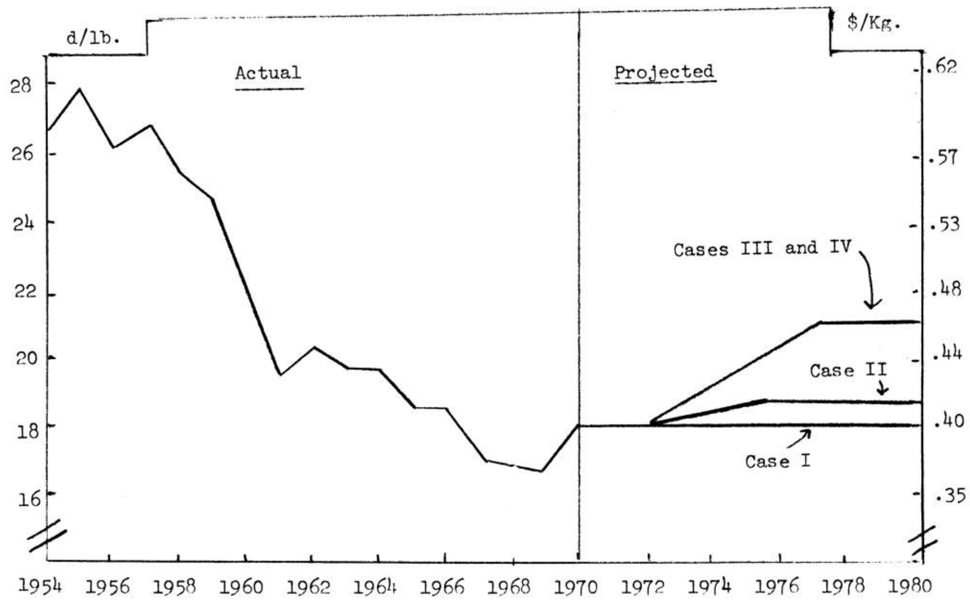


Figure 2.6. Prices on Eggs, U.K.

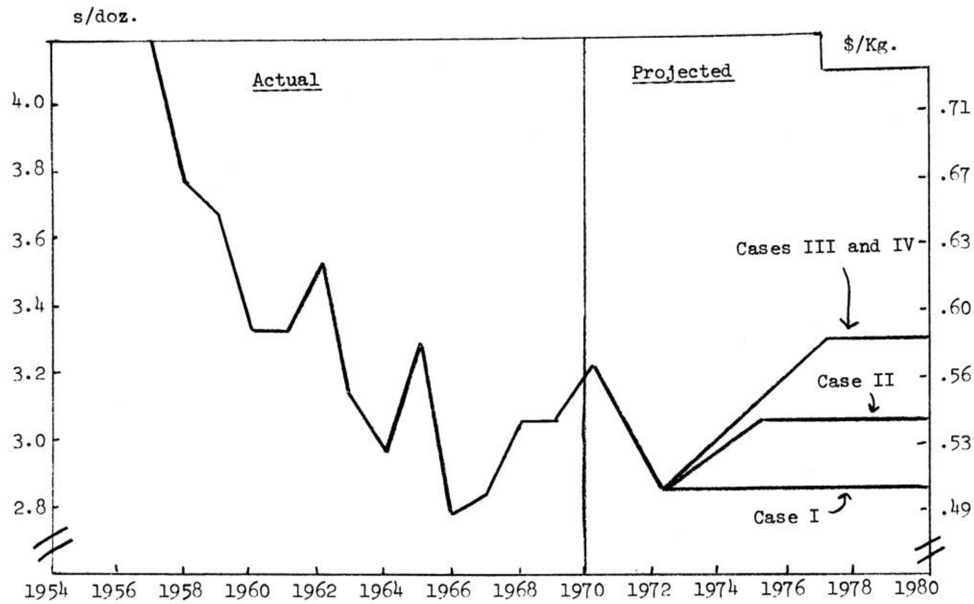


Figure 2.7. Barley Prices, U.K.

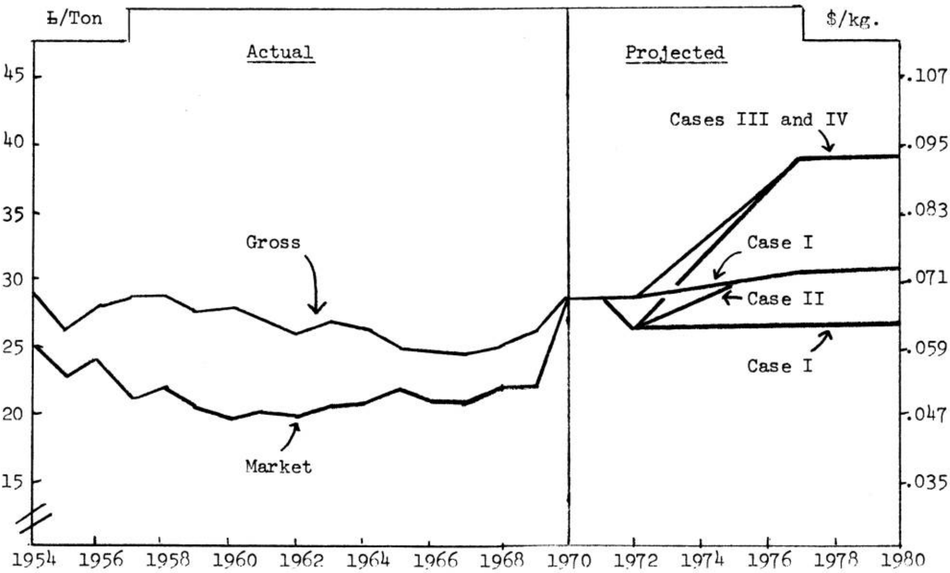
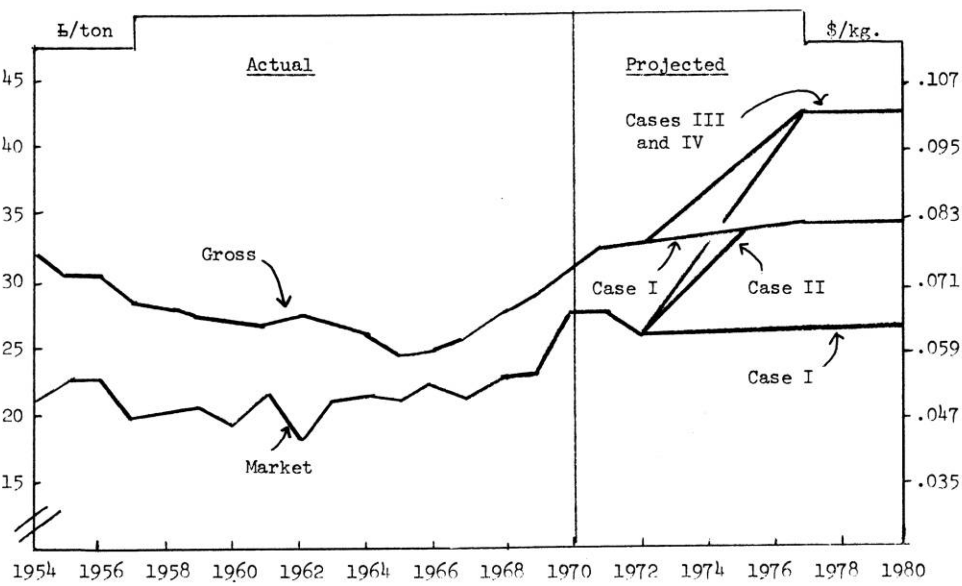


Figure 2.8. Wheat Prices, U.K.



have been rising steadily in recent years with both retail prices and distributor margins being administered by the government (Figure 2.1). This trend would be expected to continue under Cases I and II. Manufacturing milk obtains a much lower return and is in competition with imported dairy products. Although the dairy surplus problem was alleviated in 1970-71, ample world supplies are expected to keep some downward pressure on manufactured milk prices, so only a modest price rise is projected for Cases I and II.

Because a two-price plan on milk is not allowed in the EEC, there would be little difference in price between liquid and manufacturing milk except perhaps for some quality differential if U.K. were to join. The result would be substantially higher manufacturing milk prices but somewhat lower prices realized on milk for liquid purposes. Since most of U.K.'s milk is used for liquid, the net effect would raise the blend farm price on milk for all uses only about 30 percent by 1980 over 1968 and 10 percent over 1971.

Both market and gross (includes deficiency payment) prices on fat cattle have been increasing and are expected to continue to rise (Figure 2.2). World beef supplies will begin to increase at a somewhat more rapid pace than in recent years but a growing demand should keep prices firm. Gross prices would also increase in Case II. In Case II market prices would be boosted to the level of gross prices, eliminating the deficiency payments. A rather substantial further increase in cattle prices would result from entry into the EEC if current EEC cattle prices hold.

Little trend had been noted in fat lamb prices until recently (Figure 2.3). Both market and gross prices increased noticeably in 1968 and 1969, with gross prices continuing upward in 1970 and 1971. Some further increase is projected on the strength of higher beef prices. No program exists on lambs in the EEC but the advanced level on beef prices would tend to support lamb regardless.

Increased demand is also expected to keep market prices on pigmeat above 1968 levels, but ample supplies will tend to keep some pressure on prices. Market prices are projected to decline from 1970-71 levels along with grain prices (Figure 2.4). Gross prices in Case I will tend to increase moderately after 1972. For Case II, it is assumed that variable levies may be set to yield even higher prices (gross) than would have the deficiency payment program of Case I. This is because of higher market prices for concentrate feed under Case II. Entry into the EEC would boost grain prices even further; consequently higher pigmeat prices are assumed.

Some leveling off from a 10 year decline is projected for broiler prices and poultry meat in general (Figure 2.5). This projection is based on the expected rise in poultry feed prices coupled with a leveling off in other major factors contributing to the long term decline in costs of production -- feed conversion efficiency and structural shifts in production. With poultry feed prices expected to be higher in Case II than in Case I and higher yet with entry, projected poultrymeat prices are adjusted accordingly.

More opportunities exist for economies in egg production than in broilers and consequently egg prices are projected to decline from 1968-70 levels in Case I (Figure 2.6) As with poultrymeat, higher prices are projected for Case II, III and IV.

Cereal prices were relatively stable until 1970-71 and under some pressure from large world supplies (Figures 2.7 and 2.8) Corn blight in the United States contributed to a sharp advance in world grain prices in 1970-71. Some fall-back in market prices from 1970-71 is anticipated for Case I, but not back to 1968 levels. Even if world grain prices decline to 1968 levels, the U.K. may be reluctant to reduce their minimum import levies to that extent.

The variable levy system under Case II would boost market prices on grain by £4 to £8 per ton ($.010 - .020 kg.) over Case I based on the anticipated level of deficiency payments under the Labor program. Entry into the EEC would push gross prices up by over 50 percent and market prices up by 80 percent over 1968 levels, assuming, of course, that 1971-72 EEC price levels are maintained. Compared with market prices for 1970-71, the increase to EEC levels would amount to only 35 percent for barley and 50 percent for wheat. Compared with the 1971-72 guaranteed (gross) prices, the increase to EEC levels would be 30-35 percent on both wheat and barley.

Based upon the price projections of the commodities illustrated in Figures 2.1 to 2.8, other related prices were also projected. For example, the projection on market prices on fat cattle was the basis for projections on prices of cull cows. Price relationships projected were derived from past relationships. In addition, a number of other projections were made to complete the model. Projections on prices on imported grain and high protein feeds in combination with prices on home-grown barley and wheat were used to establish future prices on purchased feed. Since purchased feed has represented about 80 percent of total feed utilized, some allowances for distribution and processing costs on purchased feed were necessary.

The Ministry of Agriculture, Fisheries and Food estimates that the difference between the cost of raw materials and the cost of deliveries of concentrates from manufactures has increased from around £5/long ton ($.0118/kg.) in the mid 1950s to £7-8/long ton ($.0165 - .0189/kg.) in the mid 1960s.[6] This margin is projected to increase to £11-13/long ton ($.027 - .030/kg.) by 1980.

Price projections for particular purchased feeds were derived from price projections of the ingredients and estimates of the relative importance of each ingredient. The composition of the purchased concentrates in terms of cereals, byproduct feeds, and high protein feeds was assumed to be constant in the projections. With changing relative prices of ingredients some major shifts in the composition could well take place. Compounders in the U.K. are sensitive to changing price relationships and would undoubtedly make adjustments. A study of the rate of substitutions among feed ingredients and an analysis of the world supply-demand functions for feed ingredients, particularly by-product and other minor feed sources would be necessary to determine what these shifts would be. Such an investigation was beyond the scope of this study. To allow for such shifts in composition of purchased concentrates, some scaling down of the projected prices on these feeds might be in order.

The ingredient feeds were divided into three components for projecting prices on purchased concentrates (1) home-grown cereals, (2) imported cereals and (3) imported high protein feeds. Projections of market prices on home-grown cereals have already been discussed. Prices for imported cereals were represented by United States maize prices. These prices were expected to stabilize at around £29/long ton ($ .0684/kg.) in the 1970s. Variable levies under Cases II, III and IV would raise these prices to producers, of course. Prices on imported oil cakes and fish meals, cif. increased steadily in the 1960s from £30.64/long ton in 1960 to £43.17/long ton in 1967. These prices are projected to increase to £51/long ton ($.1214/kg.) by 1980. It is assumed

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[6] Ministry of Agriculture, Fisheries and Food, U.K., "Developments in the Feedingstuffs Manufacturing Industry and the Production and Utilization of Concentrated Feedingstuffs Since 1953," Economic Trends, Central Statistical Office, HMSO, No. 130, August 1964. Subsequent reports from M.A.F.F. have updated these statistics.

that high protein feed prices will be unaffected by variable levies in Cases II, III and IV.

Projections of prices on purchased concentrates differed somewhat according to the particular type of feed. Differences, however, were small. On the average, purchased concentrate prices were projected to increase between 1968 and 1980 by about $.02/kg. in Case I, $.03/kg. in Case II and $.05/kg. ton in Cases III and IV.

A further calculation was made to determine the feed price level faced by livestock producers. About one fourth of the concentrates used by cattle (dairy and beef) and pigs are retained on the farms where grown. Market prices on barley were used to represent this portion in the computation for average prices for all concentrates -- purchased and retained.

Based on estimates from several sources including M.A.F.F., costs per acre for fertilizer for barley and wheat did not change very much from the mid 1950s to the mid 1960s. Prices on fertilizer declined in this period even though the nutrient level per ton of fertilizer increased. Some increase in fertilizer prices and costs per acre has been noted since 1965. Moderate further increases in costs per acre are projected from the levels reached in 1968 for Cases I and II. Since fertilizer use is subsidized by the government, this projection assumes continued application of the subsidy. The possibility that such a subsidy would not be allowed in the EEC, prompted the projection of a sharp rise in fertilizer prices for Cases III and IV, an increase of about 50 percent.

Production grants on cattle and sheep are projected to continue under Cases I and II but only the hill subsidies are to continue under Cases III and IV. For Cases I and II, some further increase is anticipated in beef and hill cow subsidies to provide incentive for expanding the beef herd. Increased hill sheep subsidies and moderately higher beef calf subsidies are also projected.

Projections of Technical Coefficients -- Projections were made of production rates, concentrate usage and, for selected commodities, labor requirements. These projections were primarily extensions of past trends modified by judgement. Trends and projections on major technical coefficients are presented in Tables 2.7 and 2.8.

The upward trend in milk production per cow is expected to level off in the 1970s (Table 2.7). This is partly due to an expected slowing of the shift to Friesian cows. The proportion of the dairy herd represented by Friesians increased from 42.4 percent in 1955 to 52.7 percent in 1960 to 65.7 percent in 1965.

Table 2.7. Technical Coefficients on Production Rates and Concentrate Usage, U.K.

Item	Unit	Actual 1955	Actual 1960	Actual 1965	Actual 1968	Projected 1980 Case I	Projected 1980 Case II	Projected 1980 Cases III & IV
Milk production per cow	Kg	3206	3567	3721	3815	4096	4096	4096
Calves saved per cow	No	.891	.919	.919	.907	.907	.907	.907
Production of lamb and mutton per ewe	Kg	20.43	21.46	21.26	21.95	23.15	23.15	23.15
Production of pigmeat per sow	Kg	951	932	958	989	1037	1037	1037
Egg production per layer	Kg	9.53	10.66	11.44	11.85	14.12	14.12	14.12
Barley yield	Kg	2988 1/	3243 1/	3653 1/	3627 1/	4383 2/	4383 2/	4383 2/
Wheat yield	Kg	3105 1/	3582 1/	4046 1/	3907 1/	4663 2/	4663 2/	4663 2/
Kilograms of Concentrates Fed Per 3/								
Kg. of milk	Kg	.359	.367	.364	.362	.346	.341	.329
Kg. of beef dressed	Kg	3.58	4.16	4.78	4.88	5.24	5.16	4.99
Kg. of lamb and mutton	Kg	1.90	1.97	2.31	2.24	2.31	2.27	2.20
Kg. of pigmeat dressed	Kg	6.14	5.90	5.38	5.45	4.85	4.85	4.85
Kg. of poultrymeat dressed (except cull layers)	Kg	5.26	4.54	3.78	3.30	2.90	2.90	2.90
Kg. of eggs produced	Kg	6.35	5.50	4.66	4.58	3.97	3.97	3.97

1/ Three year average centered on given year.

2/ Projections based on Modification 1, Alternative 1 of the U.K. Supply Model.

3/ Feeding rates include an allowance for replacements and breeding herd.

Table 2.8. Technical Coefficients on Labor Requirements for Livestock, U.K.

Item		Estimated 1/ 1955	1960	1965	1968	Projected 1980	Percent Change From 1968
		Man Hours Required					
Pigs, including share of sow	Pig	15.2	13.2	11.2	10.0	6.6	-34
Broilers	Broiler	.116	.106	.066	.058	.044	-25
Turkeys	Turkey	1.10	.76	.42	.30	.21	-30
Hens and replacements	Hen	2.38	2.24	1.56	.97	.62	-36

1/ Derived from or interpolated from estimates of M.A.F.F. of standard man day requirements for selected classes of livestock. The standard man day was multiplied by 8 to obtain man hours.

This proportion is projected to reach 85 percent by 1980. Application of the time series equation for milk production per cow would project a 10 percent increase between 1968 and 1980. Because of projected increases in dairy concentrade prices and possible shift to more roughage feeding, the increase was set at 7 percent.

Little trend is noted in calves saved per cow and no change is projected. Calves saved per cow were estimated by adding calves slaughtered during the year to the ending inventory of calves under one year. This sum was then divided by the number of cows on hand at the beginning of the year. Production of lamb and mutton per ewe has increased gradually and is expected to continue upward.

Production of pigmeat per sow has been increasing partly because of a shift to heavy hog production and away from the light bacon and "porker" pigs. The upward projection on pigmeat per sow is partly in anticipation of a continuation of this shift and of a move toward a more standard pig representing a compromise between the heavy hogs on one hand and the lighter baconers and porkers on the other. Another reason for the expected increase in pigmeat per sow is the potential for increasing pigs saved per sow per year by earlier weaning. The actual increase in pigmeat produced per sow could be more than indicated in Table 2.7 because of the impact of the shift to a heavier pig. This, however, would tend to overestimate total pigmeat production from the equations used in this model, so the decision was made to project pigmeat production per sow from past trends.

With continued adjustment in the structure of egg production likely, a projection of egg production per hen was made in line with trends over the past 15 years. Similarly trends were extrapolated for cereals. Projecting cereal yields presented some particular problems. The projections for 1980 in Table 2.7 are in line with the trends of the past 15 years. But looking at the period since 1962, cereal yields have changed very little. Should cereal acreage expand, the expansion would likely be into areas less suitable for cereals than in the past 15 years. An alternative projection for 1980 is that cereal yields remain the same as the average for 1967-69.

Feeding rates were calculated by using information from various sources. The study, Concentrated Feedingstuffs for Livestock in the United Kingdom, provided benchmark statistics for the years 1960-61 to 1965-66.[7/] The M.A.F.F.

[7/] Paul W. H. Weightman, Concentrated Feedingstuffs for Livestock in the United Kingdom, 1960-61 to 1965-66, Department of Agricultural Economics, Cornell University, A. E. Res. 225, June 1967.

data for broad classifications of total concentrate usage (cattle, pigs, poultry and other) were used to match feeding rates by detailed classes to the aggregate.[8] Additional information was obtained from various surveys of livestock feeding practices and costing studies.

Table 2.7 indicates the trends and projections in concentrate usage per unit of production. On milk production, farm survey data indicate very little change in rate of concentrate feeding per unit of output. The decline projected in concentrates fed to milk cows is explained by the increase anticipated for feed prices, particularly for Cases II, III and IV. Increased feeding rates on concentrate feeds for beef is expected in spite of higher concentrate prices. The trend, however, is expected to be more toward a "semi-intensive" type feeding program than to "intensive" program with high level concentrate rations.

Little change is anticipated in concentrate feeding of sheep and lambs. The trend has been upward.

Feed conversion efficiency in pigmeat production is expected to continue to increase in line with trends of the past 10 years. The best producers are now easily obtaining conversion rates being projected for the average producer in 1980. Progeny testing, improved breeding stock, artificial insemination and earlier weaning will all likely contribute to this improvement.

Poultry meat producers have succeeded in obtaining pronounced gains in feeding efficiency during the past 15 years. Further improvement is expected but at a slower rate. The very rapid structural adjustments in the broiler industry in the 1960s is not likely to continue at the same pace. The point has been reached where further gains in production efficiency will be more difficult to achieve.

While the production of poultrymeat is highly concentrated in large operations, egg production is divided between the large and small-to-moderate sized units. If the shift continues to more concentration in the egg business, presumably this will result in overall improvement in feed conversion efficiency. For this reason, the kilograms of feed required per kilogram of eggs was projected to decline from 4.58 in 1968 to 3.97 in 1980. This represents a somewhat slower rate of gain than in the past 10 years.

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[8] M.A.F.F., U.K., "Developments in the Feedingstuffs Manufacturing Industry..."

For similar reasons, projections of man hour requirements for poultry and egg producers were set at levels representing a tapering off of gains realized in the past 10-15 years. (Table 2.8). More opportunity for gains in labor efficiency is expected in eggs. On pigmeat production, the decline of a third in labor requirement per pig was in line with the percentage decline for 1955 to 1968.

Model Development

The demand and supply relationships and the assumptions described earlier in this chapter formed the nucleus for the United Kingdom Model. To complete the model, a few other equations were included, primarily for linking and adjustment purposes. With initial conditions specified for 1968, this model generated recursively annual data for 1969 to 1980. The computer printout included a number of variables of interest such as retail prices, consumption, demand elasticities, supply elasticities, quantities produced, area for crops, numbers of livestock, concentrate utilization, and subsidy costs. A brief description of the methodology is given in Appendix F.

On first run of the model (before 1970 and 1971 price developments could be taken into account), the area projected for cereals seemed clearly out of line with the land available for cereal production. It was felt that the equation for cereal yields was distorting the picture since higher yields increase returns per hectare which in turn influence yields. In addition, the statistical properties of the wheat and feed grain yield equations were not entirely satisfactory. Therefore, a modification was introduced which included two alternatives: (1) Make yields a function of trends of the 1954-68 period, and (2) Hold yields constant at 1967-69 averages. For Alternative 1, the projections for 1980 ranged from 6.66 million hectares for Cases I and II to 8.19 million hectares for Cases III and IV. Even using the assumption that there would be no increase in cereal yields between 1968 and 1980 resulted in an expansion in area that seemed extreme: with 5.45 million hectares projected for Cases I and II and 6.75 million projected for Cases III and IV.

Land Restriction -- This prompted imposing an upper limit on the land available for cereal production. First of all, projections were made of the total land available to agriculture, including rough grazings. Deducted from the total figure were projections of the total area of fruit, vegetables, potatoes for human consumption and other non-forage crops. The difference was the total land available for forage and cereals. Certain consistent trends were identified for rough grazings and forage root crops. Rough grazings were projected to decline by 40,000 hectares per year and forage root crops were projected to decline virtually to zero by 1980. Deducting these projections from total forage and cereal area left the number of hectares for pasture or cereals.

To determine how many hectares would be required for pasture, an estimate was made of the total forage requirement of roughage consuming animals. A fixed coefficient was used for each class of roughage consuming livestock. This coefficient was the number of "permanent pasture equivalent" hectares required. Multiplying these coefficients by the respective livestock classes yielded the total forage area required on a permanent pasture basis.

At present, it is estimated that forage area required represents only 85 percent of the actual forage area, on a permanent pasture basis. The degree of utilization has been increasing. Consequently, fuller utilization was projected to 1980 -- to 95 percent. For this reason, actual pasture area would be expected to increase somewhat less than the calculated requirement.

Productivity of forage area has also been increasing. A 1.5 percent increase per year was projected. This reduces the area requirement, <u>ceteris paribus</u>.

The contribution from rough grazings and fodder roots was deducted from the projected actual forage area (in permanent pasture equivalent). The balance represented the area of pasture (permanent and rotation) required. Adjusting for increasing productivity of pasture and the additional contribution of rotation pasture (1.2 times permanent pasture), a projection of actual pasture area was made. The assumption was made that rotation pasture would represent 30 percent of the total pasture area. This would be near the proportion of recent years.

The projected pasture area along with the projected areas for fodder roots, rough grazings and other crops except cereals were deducted from the projected total agricultural area to establish a projection of upper limits for cereal area. As pointed out by Davey and Weightman, there are some critical rotation constraints on cereals.[9] The leveling off in cereal yields in recent years

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[9] See Appendix A.

supports the position of those who claim that future response to economic incentives will not be as rapid as in the past. So on the basis of the conclusion of the Davey-Weightman linear programming model, the decision was made to make cereal area the residual claimant on land available for both cereals and ruminant animals, rather than limiting numbers of ruminant animals by the projected cereal area.

Three Versions of the Model -- The model just described with the upper limits on cereal area and with cereal yields projected as a function of trends in 1954-68, is called the "original model". This model was completed in late 1970 and the results were incorporated in a draft manuscript for review purposes. Based on this review, on a more thorough study of the results, and on more recent information which had just become available, certain modifications were made in the original model. The 1980 projections of production, consumption and net balances under the "original model" are presented in Appendix B (Table B.25.) along with projections of modified models. B.26

The first set of modifications introduced formed what is called the "revised unrestricted model". Incorporated in this model were the higher levels of price supports and production payments announced by the U.K. in their 1971 Annual Review. Also used were the 1971-72 price support levels announced by the EEC. The original projections on margins were revised upward to improve the internal consistency of the model. (The projections in Table 2.4 are the revised margins.) Another change from the original model was a lowering of the projected price level on poultrymeat for Cases I and II. The projected surplus in the original model was believed to be untenable.

The results of the "revised unrestricted model" indicated where the greatest pressures for change will occur, and in doing this, served a very useful purpose. On the other hand, the projections were not necessarily the most likely developments considering certain political constraints. Projections on pigmeat, poultrymeat and eggs exceeded utilization levels. While the U.K. could become an exporter of these products, domestic policies and trade commitments would likely preclude this, particularly in Cases I and II.

Therefore, poultrymeat and egg production were restricted to levels no higher than 5 percent over consumption. Pigmeat production was restricted to 5 percent over the total of pork consumption plus 45 percent of bacon and ham consumption (to protect about half of the U.K. market for countries supplying bacon and ham). Beef consumption was restricted to fall no lower than beef production, a limit reached only in Case III.

This latter version of the model, called the "revised restricted model" is the basis for the projections discussed in the subsequent parts of this chapter. The results of the "revised unrestricted model" are also presented.

Trends and Projections

The results of the computer run of the revised models, (restricted and unrestricted) will be discussed in the context of past trends. Figures 2.9 to 2.17 highlight the important projections.

Dairy -- Milk cow numbers have edged irregularly upward since the mid 1950s, but essentially have changed relatively little (Figure 2.9). Net returns per cow from milk and calf over the cost of concentrates did increase in this period. However, prices on inputs other than feed and livestock increased 60 percent with farm wage rates nearly doubling. Dairy farmers have made more efficient use of labor, with many shifting to loose housing, parlors, pipelines and bulk tanks. Even so, there is still considerable opportunity for improved labor efficiency.

If the current farm programs continue, a modest increase of about 10 percent is projected in milk cow numbers (Figure 2.9). For Case II, rising feed costs would offset higher milk prices and cow numbers would stabilize. Also cull cow prices would be boosted, which would encourage some sell off of milk cows, at least initially. These same forces would be acting on the dairy industry in Cases III and IV but to a greater degree.

Even with the decline projected for milk cow numbers in Cases III and IV, production would be sufficient to cover liquid milk requirements (Table 2.12 - 2.13). Projections indicate that annual production would be well in excess of liquid milk utilization. Projections indicate that liquid requirements would be covered even in the winter when production is at a seasonal low.

There is a question of whether the seasonal variation in milk production might be accentuated by the Common Agricultural Policy. Not only would concentrate prices be considerably higher but at present there is a lack of seasonal price differences built into support measures in the EEC. As an overall result, there could be greater emphasis on summer milk production off grass.[10]

Beef -- There are many systems for producing beef in the U.K. For purposes of analysis five were considered: (1) Beef cow and calf operation (suckler herd), (2) Fattening of suckler calves, (3) Fattening of Irish stores (feeder

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[10] This activity entered the optimum solutions in 1977 for EEC entry in the Davey-Weightman model discussed in Appendix A.

Figure 2.9. Dairy Cows on Farms, U.K.

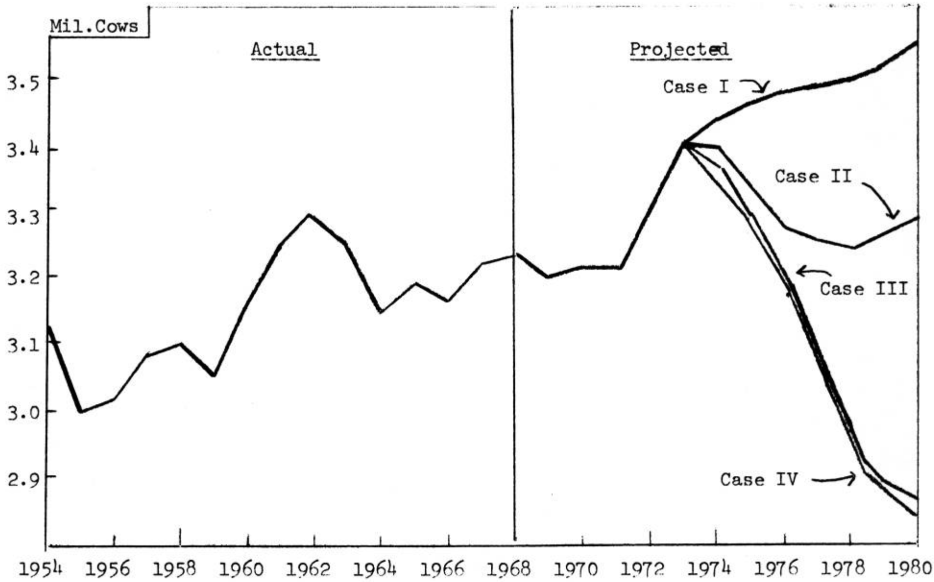
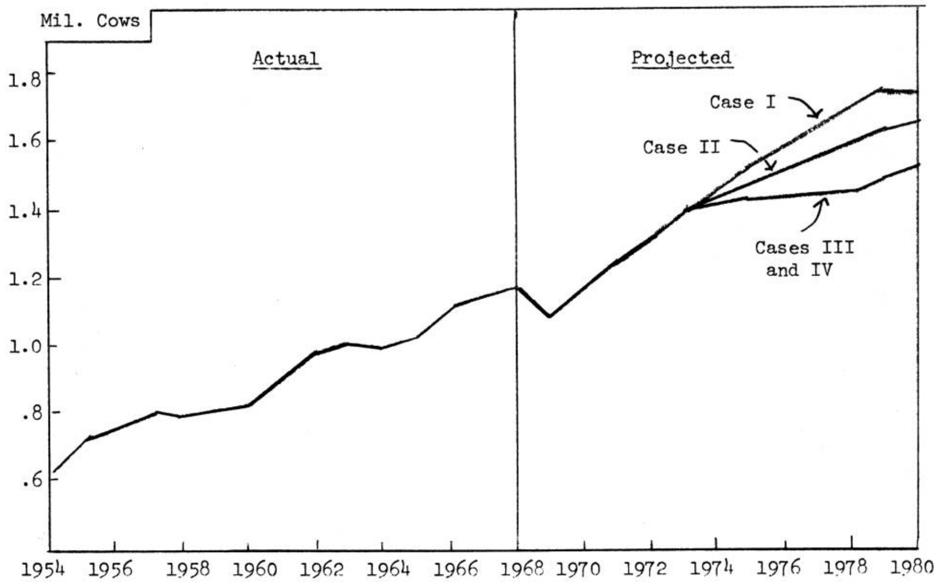


Figure 2.10. Beef Cows on Farms, U.K.



cattle), (4) Semi-intensive fattening of dairy calves and, (5) Intensive fattening of dairy calves. No official data exist on the numbers slaughtered from each system although Irish imports are known. The estimates presented in Table B.11 were partly derived from judgement and were compared with actual slaughter of steers and heifers.

Over half the number of steers and heifers slaughtered have been from the fattening of home reared dairy calves. Intensive feeding of dairy calves on an all-concentrate diet came into the picture in the early 1960s building up to about 8 percent of total steers and heifers fed.[11/] Since about 1965, however, its relative importance has not changed very much or has even declined due to problems of producing beef of acceptable quality and because of rising concentrate costs. Intensive feeding involves some 35 hundredweight (112 pounds per hundredweight) of concentrates per animal. In recent years greater emphasis has been placed on semi-intensive systems based on grass-cereal diets involving about 18-20 hundredweight of concentrates per animal.

Net returns over concentrate costs in a semi-intensive fattening program have increased, particularly since 1960. Concurrently, prices on the store calves have been bid up. This bidding by feeders has diverted calves from the slaughter houses and into fattening programs. In some cases, these animals have been fattened on the dairy farms where they were born. More often they have been sold at about 100 pounds and have passed through one or two owners before slaughter at 8 to 9 hundredweight some 18 to 24 months later. The age at slaughter as well as the average slaughter weight has been declining.

In recent years, about 60 percent of dairy calves surviving birth have been reared for fattening. This compares with 35-40 percent in the mid 1950s. The opportunities for increasing this percentage are beginning to wane, partly because the shift to Friesians is reaching an upper limit. If all dairy calves not used for replacement purposes were to be fattened to maturity, this percentage would rise to about 70 percent. Some of the calves now slaughtered for veal or as bobby calves (week old) would not be suitable for fattening, of course, so that 70 percent would be difficult to achieve. Some improvement

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[11/] Arnold Barfield, "The Pattern of Beef Production in the United Kingdom", Feeding for Beef Production, U.S. Feed Grains Council, 1966, pp. 20-21.

might be attained in the number of dairy calves surviving birth per 100 cows (about 90 percent) but little progress has been made in the past 15 years. The possibilities of reducing the culling rate and holding heifers for a calf before slaughter are being considered but do represent some difficult management problems.[12/]

Projections for 1980 are that 65 percent of the dairy calves saved will be reared for slaughter of these steers and heifers of dairy origin would increase by 17 percent over 1968 in Case I, would increase by 8 percent in Case II, and would decline by about 4 percent in Cases III and IV.

With the prospect of little increase, if not a decline, in dairy cow numbers in the future, any significant expansion in home grown beef supplies will increasingly be dependent on suckler herds. Efforts of the government to encourage beef cow numbers are indicated by the increased level of subsidization. The average subsidies per cow (calf, beef cow, hill cow and winter keep subsidies) increased from about £10 per head in the mid 1950s to £24 per head in 1968-69. In addition, price guarantees on fat cattle have been raised. The latter, of course, has encouraged feeding of dairy calves as well as beef calves.

Suckler calves have been increasing in relative importance and in recent years have represented about one fourth of fat cattle. With the exception of 1958 and 1964, beef cow numbers have increased steadily in the past 15 years. Certainly the doubling in net returns from beef calves over concentrate costs which occurred between 1954 and 1968 has been a major reason. Of this increase from around £25 per cow in the mid 1950s to about £50 per cow in the late 1960s, about half was due to market returns from the calf and the other half to the calf and production subsidies. Production subsidies (beef cow, hill cow and winter keep) increased by about £10 per cow and the calf subsidy by about £3 per cow.

As with dairy cows, rising cull cow prices tend to hold back expansion, at least in the short run.

The model projects a continued increase in beef cow numbers (Figure 2.10). In Case I, both rising gross fat cattle prices and increased production grants are expected to provide the incentive. Expansion in Case II is not quite as rapid since cull cow prices, dependent on market prices on fat cattle, would be

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[12/] Rosemary F. Walker and J. W. Gardner, Beef from the Dairy Herd, Bulletin 124/M23, Department of Agricultural Economics, University of Manchester, Manchester, England, January, 1969.

pushed up. This would tend to encourage culling of somewhat more of the beef cows than in Case I.

The projected rise in cattle prices in the transition period in Cases III and IV would provide additional encouragement to beef herd operators. However, the phasing out of the production grants would tend to offset the impact of higher prices.

Irish stores are typically purchased as heavy feeders (around 950 pounds) and sold in a few months at around 1,100 pounds. If the store is on a U.K. farm for a minimum of 9 weeks, it is eligible for the fatstock guarantee. Net returns from feeding Irish stores in the previous year seem to influence imports in the current year. Cattle numbers in Ireland as well as production conditions there are also relevant. The relative importance of Irish stores in total U.K. slaughter has varied considerably from year to year, averaging around 20 percent of total steer and heifer slaughter.

Projections of imports of Irish stores were based on the projected cattle output in Ireland. For Cases I and II, imports of Irish stores are set to increase from 621,000 head in 1968 to 893,000 by 1980. For Cases III and IV imports of Irish stores are projected to 936,000 by 1980. In the Irish Model, exports of stores are projected to increase to 1,111,000 head by 1980 in Cases III and IV. In these cases, the balance of total exports over exports to the U.K. were projected to go to the continent.

Combining the production of beef from steers and heifers of dairy origin with steers and heifers of beef origin (suckler calves), total steer and heifer production in the U.K. has increased only moderately in the past 15 years (Table B.16). There has been little change since 1961 with production around 700,000 metric tons. This has represented about three-fourths of total U.K. beef output. Beef from this source is projected to increase by about one-fourth over 1968 levels by 1980 in Case I, by 20 percent in Case II and by only about 10 percent in Cases III and IV.

Adding cow, bull and veal output to steer and heifer beef production, total beef and veal production has increased irregularly since the mid 1950s (Figure 2.11). Projections to 1980 indicate an increase of about a third for Case I, a fourth for Case II and 15-20 percent for Cases III and IV.

Sheep and Lambs -- The number of ewes on farms in the U.K. increased to a peak of 12 million in 1966 and has since declined (Figure 2.12). Approximately

Figure 2.11. Total Beef and Veal Production, U.K.

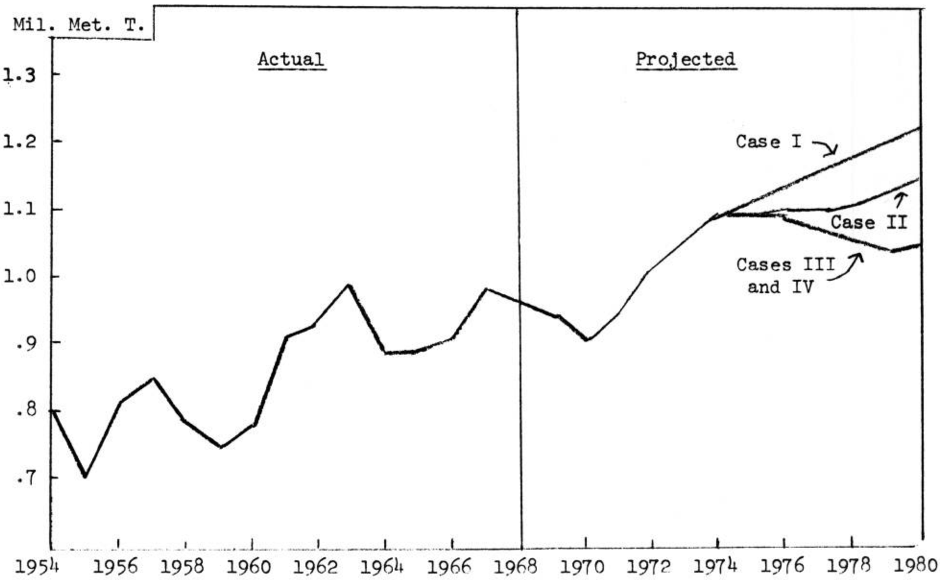
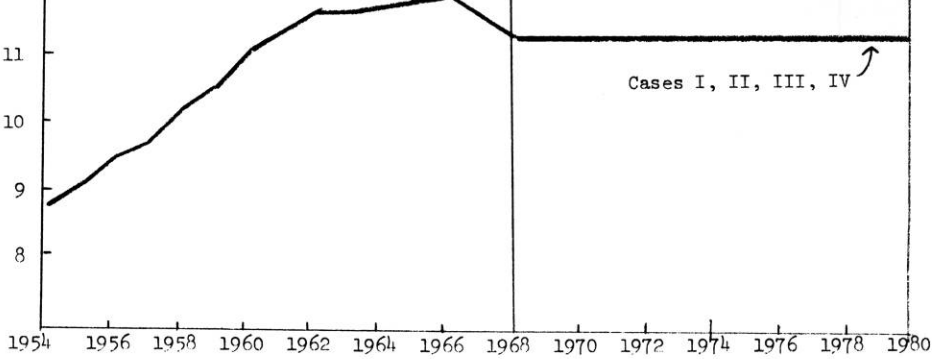


Figure 2.12. Breeding Ewes on Farms, U.K.



85 percent of the ewes have been in hill and upland areas, and just over half these ewes have been receiving hill sheep subsidies since 1967.

In spite of the production subsidies, returns from sheep have been relatively low especially in the hill and upland areas. In the upland areas, this has been due to low lambing percentages and the necessity of selling the lambs mostly as stores. Not until 1964 was there an appreciable increase in net returns over the cost of concentrates. This was followed by sharp gains in returns to competing enterprises, explaining part of the falling off in sheep numbers recently, particularly in lowland areas. The sheep enterprise, with its low capital requirement, has been comparatively easy for lowland farmers to drop in favor of other enterprises in the drive toward specialization.

Working against the sheep industry has been the lack of technological improvement especially in comparison with pigs, poultry and milk. Sheep can be profitable but a high level of expertise is needed to achieve high stocking rates. This is beyond the reach of many farmers. New developments such as two lamb crops per year appear to be a number of years in the future. Unless major technological breakthroughs develop, sheep and lamb numbers in the U.K. are not likely to expand in the coming decade. While cattle will become increasingly competitive for land in hill and upland areas, a certain degree of complementarity between cattle and sheep in these areas may help to maintain sheep numbers.

If the U.K. joins the EEC, not only would sheep and lamb prices be higher, but also, as has been negotiated, the Hill Sheep Subsidy would be retained. This should be sufficient encouragement to stem the recent downturn in sheep numbers.

In absence of a satisfactory supply equation on sheep and lambs, the assumption was made that sheep and lamb numbers will hold steady at around 11-12 million ewes. This projection was used for all four cases.

<u>Pigs</u> -- Sow numbers in the U.K. were around 700 to 800 thousand until 1962, when numbers began moving up to around 900 thousand (Figure 2.13). Numbers dipped to near the 800 thousand level in 1966 and 1967 and then recovered to the 900 thousand level. Net returns over the cost of concentrates per fat pig produced increased enough to trigger the expansion in the early years but the subsequent decline in returns suggests that labor efficiency must have increased significantly during the 1960s. The percentage of pigs produced on holdings

with 200 or more pigs increased from 35 percent in 1960 to 60 percent in 1968 in England and Wales.

Part of the explanation for the expansion in sow numbers may be attributed to the decline in gross cereal prices. Specialized cereal producers particularly in East Anglia area found it necessary to diversify in order to obtain satisfactory incomes. Some also had difficulty buying additional land and turned to pigs to supplement their incomes. A minor influence on expanding sow numbers may have been a rise in feeder pig prices. While fat pig prices declined in the early 1960s, feeder pig prices were increasing gradually. However, probably less than 20 percent of fat pigs produced each year had been sold as store pigs.

By 1967, there was a sufficient increase in returns from the combination of breeding and fattening to explain the recent recovery in pig numbers.

Pigmeat production in the U.K. can be divided into four categories: (1) baconers, (2) partly for bacon (mostly heavy pigs), (3) porkers and cutters (for pork) and (4) sows and boars (Table B.14). Baconers are specialized pigs for the production of Wiltshire bacon and are marketed at about 200 pounds liveweight. The heavy hogs are used partly for bacon, partly for the fresh meat trade and partly for manufactured pigmeat products. Production is largely under contract with processors. These hogs are marketed at about 265 pounds liveweight, considered by one processor as a compromise between the most efficient weight for producers (300 pounds) and the most acceptable weight for consumers.[13/] The heavy hog program began after decontrol on meat in 1954 and has expanded rapidly in recent years. By 1968, nearly one-fourth of the clean pigs slaughtered were of this type. Production of pigs wholly for bacon, on the other hand, declined after 1962. Production of porker and cutter pigs has exhibited no definite trend since 1962, but being in the hands of smaller producers, output has fluctuated considerably from year to year.

Feed requirements in each of the programs differ considerably. In recent years, porkers have required just over 5 hundredweight per pig, baconers over 7 hundredweight per pig and heavy pigs nearly 10 hundredweight per pig for both breeding and fattening stages.[14/] While the conversion rates of concentrates

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[13/] W. S. Bolitho, "Recent Developments in Meat Marketing", Journal of Agricultural Economics, Vol. XVI, pp. 355-365.

[14/] R. F. Ridgeon and F. G. Sturrock, Economics of Pig Production, Agricultural Economics Report No. 65, Department of Land Economy, University of Cambridge, July, 1969.

Figure 2.13. Sows and Gilts on Farms, U.K.

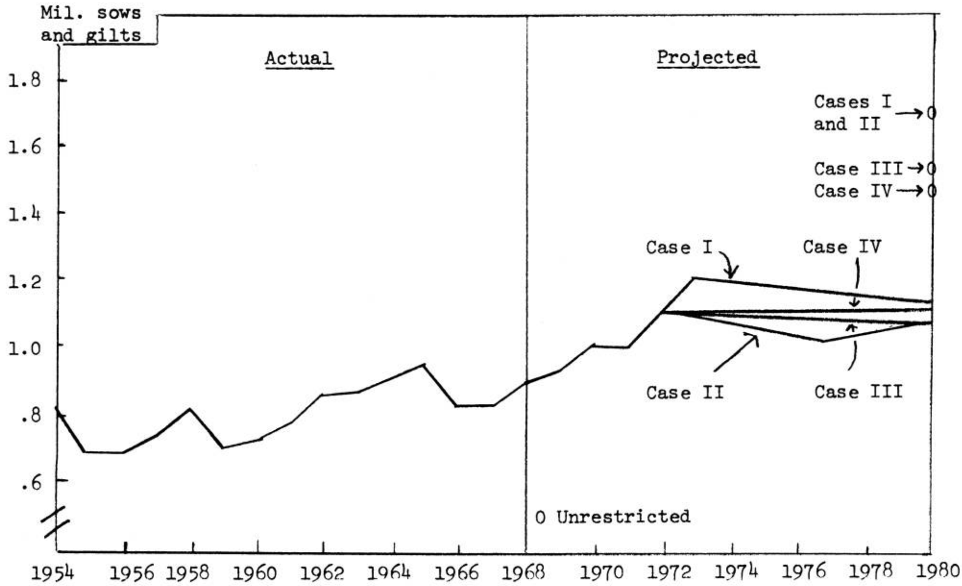
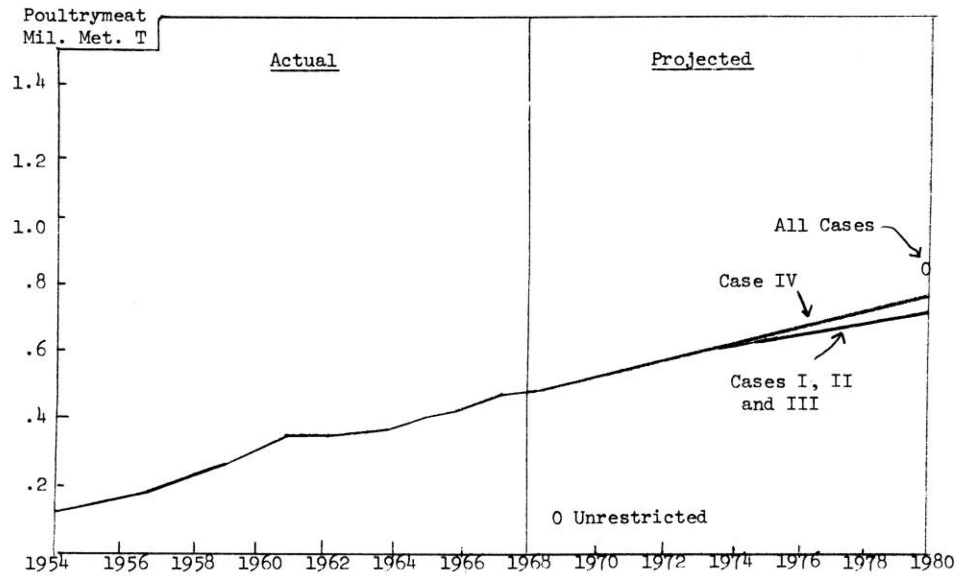


Figure 2.14. Total Poultrymeat Production, U.K.



to liveweight differ by program, the conversion rates to dressed weight do not differ appreciably. Over time, some improvement has been achieved in feeding efficiency. Whereas it took about 6 pounds of concentrates to produce a pound of pigmeat in the 1950s, about 5.5 pounds are required today.

Pigmeat production is most likely to expand, but there is some question about the future of the specialized bacon pig. One reason is the strong competition from foreign supplies. The Bacon Market Sharing Understanding has recently allowed 37 percent of the U.K. bacon market to be supplied by home producers, yet in 1967 only 33 percent was actually supplied. Another important questionmark in the outlook for the specialized bacon pig is whether or not the subsidy to curers will be continued.

The unrestricted model generated a doubling of sows and gilts on farms under Case I. This is attributed to the projected 25 percent rise in gross fat pig prices and technological improvement in feed conversion efficiency and labor efficiency. Partly offsetting would be a 25 percent increase in average prices on concentrate feeds. An assumed 30 percent increase in gross pig prices in Case II coupled with a 36 percent increase in concentrate prices generated about the same projections as in Case I. A less favorable relationship between pigmeat prices and concentrate prices in Cases III and IV held the expansion somewhat in check, but a substantial increase was still projected. The restricted model kept the expansion in all four cases from going much above 30 percent between 1968 and 1980.

Poultry Meat -- Poultry meat produced from fowls under 6 months of age increased nearly five fold between 1955 and 1968 (Table B.17). During the same period, broiler prices to producers declined by more than a third. Net returns from broilers over the cost of concentrates dropped in half, even though substantial progress was made in increasing feeding efficiency. Not taken into account in these calculations were the trends to earlier selling ages. Whereas a broiler reached 4 pounds liveweight at about 73 days of age in 1960, this weight was reached at about 67 days in 1967.[15/] This has enabled producers to turn out more batches per year or produce heavier birds in the same cycle period.

The technological progress alone does not explain the expansion in broiler production but in combination with the rapid structural change the developments can be rationalized. By 1968, nearly 80 percent of the broilers in the U.K. were on holdings with 20,000 or more birds in any one batch. In the mid 1950s,

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15/ Eric S. Clayton, The Economics of the Poultry Industry, (Longmans). 1967, pp. 96-98.

probably no more than one-fourth were being raised in operations of this size. This had the effect of cutting labor requirements per bird substantially, perhaps in half.

Assuming that labor requirements per bird were reduced by half, the net returns from broilers over the cost of concentrates on a per hour of labor basis did not change much over the 15 year period. Considering that prices on inputs other than concentrates increased by 50 percent in this period, net returns per hour of labor over all costs actually declined. The expansion evidently occurred for other reasons.

One explanation is that the feed prices assumed in this analysis are averages and are not representative of the prices paid by the large units. Other economies to scale are likely underestimated in view of the rapid shift to the large, intensive units. Experience in broiler production, virtually nil prior to 1958, grew rapidly and provided additional momentum in this period.

Similar developments have been underway on turkeys. Improvements in feed conversion and labor efficiency have apparently been sufficient to increase the net returns over the cost of concentrates per hour of labor input. The feed conversion rate has nearly been reduced by half. The percent of birds in flocks of 10,000 or more increased from 21 percent in 1960 to 63 percent in 1968 in England and Wales.

With no technical limits to expansion in poultry meat production, production in the future will likely be geared to the expanding demand. The poultry industry looks for further improvement in efficiency because of "better control of disease, improved nutrition, more knowledge of the optimum environment and higher management skills."[16/] Since there are no government price guarantees to the poultry meat industry, no specific policies relative to the long run growth of the industry have been articulated. Some protection is given to the industry through anti-dumping duties or agreements on phasing of imports.

The projected higher prices on poultrymeat coupled with some continued improvement in feed conversion efficiency and labor efficiency would double poultrymeat production in the unrestricted model for each case (Figure 2.14). These factors would be sufficient to offset the anticipated rise in poultry

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[16/] Economic Development Committee for Agriculture, Agriculture's Import Saving Role, N.E.D.O., June, 1968.

concentrate prices. The higher concentrate prices in Cases III and IV as well as in Case II would lower the projections only moderately. The restricted model would lower the projections even more and put them in line with past trends.

Eggs -- The expansion in the number of layers on farms since 1955 was interrupted only three times -- in 1960, 1962 and 1965 (Figure 2.15). The explanation for the expansion lies in the dramatic change in technology in egg production and in the structure of the egg industry, particularly in the 1960s. The farm flock has given way to the intensive system. The percent of layers in flocks over 1,000 birds increased from about 25 percent in 1960 to 75 percent in 1968 in England and Wales, while those in flocks over 10,000 birds increased from 2 percent to one-third of the total. The percent of birds in the battery system in commercial flocks increased from 17 percent in 1960 to 73 percent in 1967.[17/] These changes allow one man to handle more birds, reducing the gross margins required per bird.

Production per layer has increased steadily over the past 15 years because of improved stock (hybrid birds) and improved housing. In addition a higher proportion of the flock are first year birds. Management and feeding technology have also undoubtedly contributed to the 3 dozen per bird gain in yield in this period.

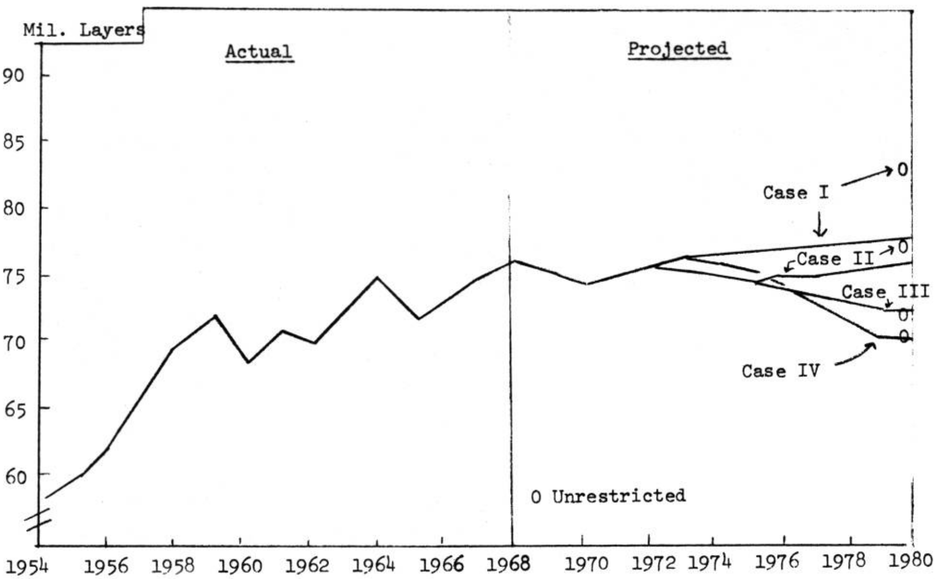
The feed conversion rate on eggs has declined by about a third, from over 4 pounds per dozen in the 1950s to just over 3 pounds per dozen recently. This has enabled the egg industry to produce at lower product prices. In fact, egg prices to producers declined from just over 4 shillings per dozen to 3 shillings per dozen.

Returns from eggs over the cost of concentrates have been quite variable even though the price guarantees have been based on concentrate prices. With concentrates representing two-thirds of the variable costs of production, gross margins are sensitive to small changes in product and/or concentrate prices.

The trend to larger production units and to increased feeding and labor efficiency should allow for some continued expansion in Case I. However, the higher concentrate prices in Case II would tend to hold back on any expansion. The even higher concentrate prices in Cases III and IV would likely result in a contraction. The restricted model lowered projections on layers by a small amount from the original projection in Cases I and II but had no effect on Cases III and IV.

[17/] British Egg Marketing Board Producer Surveys.

Figure 2.15. Average Number of Laying Fowls on Farms, U.K.



Cereals -- Cereal acreage expanded during the early 1960s in spite of lower product prices and rising costs (Figure 2.16). Actually, most of the expansion was in barley acreage which jumped nearly three fold between the mid 1950s and the late 1960s (Table B.20). Wheat acreage moved modestly and irregularly upward while acreage of oats and mixed corn dropped sharply. Only recently has there been an indication of a leveling off in the decline in oats and mixed corn.

Even with a lowering of the total return per ton under the Cereals Deficiency Payments Scheme, wheat and barley acreage expanded. On the other hand, oat acreage declined in spite of increased returns per ton.

Non-price factors were the major forces behind the developments in cereal production. Because of rising yields per acre, gross returns per acre increased on cereals (Table B.22). New varieties and increased application of fertilizer along with improved cultural practices and greater mechanization were responsible. New, strong strawed varieties allowed the higher application of nitrogen. Lodging problems were thereby been reduced and even when lodging occurred, combines were able to handle the grain adequately where previously binders could not. While these inputs represent increased costs, the value of the additional yields has no doubt exceeded the cost of the additional use of these inputs.

Apparently, net returns per acre over the cost of fertilizer increased. While the input of nutrients, particularly nitrogen, increased on cereals, fertilizer prices to farmers actually declined until recent years, with the help of a government subsidy. Considering that prices paid by arable farmers for inputs other than fertilizer have increased by 75 percent since 1954-56, the modest increase in net returns per acre over fertilizer cost does not adequately explain the expansion in acreage.

The guaranteed prices under the Cereals Deficiency Payments Scheme, while declining for wheat and barley, provided farmers the assurance that returns would not decline sharply in the coming year or even in the next several years. With prices reasonably assured but without much hope for large increases, farmers turned their attention toward reducing unit costs by adopting new technology and expanding the size of their operations in order to maintain and increase their incomes. The result was an overall expansion in acreage.

In addition to a subsidy on fertilizers, drainage grants and grassland ploughing grants encouraged cereal production. Since the late 1950s, cereal

Figure 2.16. Total Cereal Area, U.K.

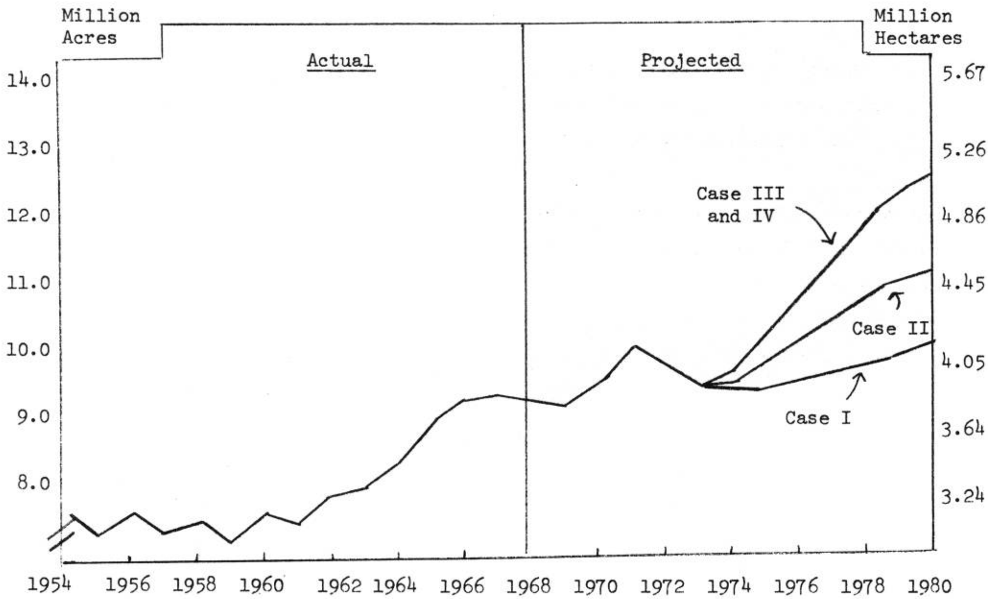
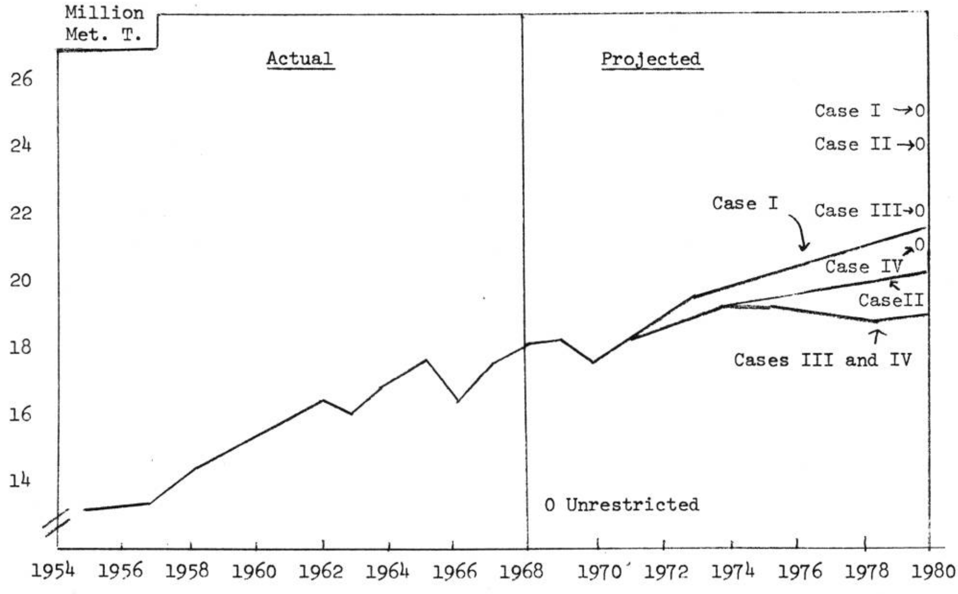


Figure 2.17. Total Concentrate Utilization, U.K.



production has been assisted by such measures as the Farm Improvement Scheme and Small Farmers Scheme. These plus tax concessions have stimulated investment in equipment for cereal production and storage.[18/]

More important, however, in stimulating mechanization were the changes in relative prices between capital and labor. From 1954-56 to 1968-69, machinery prices increased about 30 percent while wage rates to labor in agriculture nearly doubled. Even the 30 percent increase in the index of machinery prices probably overstates what actually happened because of the difficulty in handling quality changes in computing price indices.

With this encouragement, mechanization proceeded rapidly and was accompanied by a shift to larger sized units. With arable farmers making more progress in increasing labor efficiency than dairy and livestock producers, land shifted into cereals. Most of the expansion in cereal acreage was at the expense of other tillage crops and permanent grassland. Since 1961 there has been a drop in acreage in clover and rotation grasses.

Capital requirements per £100 of gross returns tend to be lower on cereals than on livestock and certain other crops. This may have been a factor of some importance because of tightness in capital markets in the post-war period.[19/]

In looking at the shifting acreage among cereals, one might question why barley rather than wheat increased so sharply since the net return over the cost of fertilizer on wheat remained about 10 percent higher than on barley. One reason is that barley is more suitable for continuous cropping.[20/] Continuous cropping makes wheat susceptible to diseases such as eyespot, take-all, yellow rust and root rot, and it complicates the control of perennial weeds. Other reasons could include the fact that wheat is less tolerant of unfavorable weather and soil conditions and is more difficult to cultivate. Net returns per acre over the cost of fertilizer have been more variable on wheat than on barley.

Of equal importance is the fact that weather conditions in the fall have a major impact on planting winter wheat. For example, three times as many acres of winter wheat were planted in the dry fall of 1961 than in the fall of

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[18/] Denis K. Britton, Cereals in the United Kingdom, Production Marketing and Utilization (Pergamon Press), 1969, p.22.

[19/] Britton, Cereals, p. 22.

[20/] Britton, Cereals, p. 25.

1960 which was wet. U.K. farmers can and do compensate for a wet fall by increasing acreage of spring planted cereals, mostly feed grains. Frequently, however, planting cereals in the spring does not fully offset the reduction in fall plantings.

Several developments favored barley over oats.[21] The major reason for the shift from oats to barley was that improved varieties of barley tended to outyield new varieties of oats. Nationally, barley yields were substantially above oat yields. It wasn't until recently (1967-69) that oat yields moved up to within a couple of hundredweight of barley yields per acre.

Subsidies encouraged farmers to use more lime. Since oats has more tolerance for acid soils than barley, this shifted the balance on many soils in favor of barley. Harvesting with a binder was generally considered to be more favorable for oats than barley. This advantage disappeared with the use of the combine. Oats, being a standard feed for horses, experienced a declining demand from this source.

Some feel, however, that oats still have a place in arable farming, serving as a break crop from wheat and barley.[22] There is some evidence of leveling off in the decline in acreage to support this position, but much depends on the development of adequate market outlets for an increased acreage of oats.

Even though total cereal acreage is near the wartime peak, this peak is not expected to be the upper limit on cereal acreage. Further expansion is likely under current programs though not at the same rate as in the early 1960s (Figure 2.16). At EEC prices, expansion could equal the rate of the early 1960s.

In Case I, cereal area expanded from 3.81 million hectares in 1968 to 4.15 million in 1980. Case II generated an increase to 4.55 million hectares in 1980. In Cases III and IV, nearly identical in terms of conditions for allowing cereal expansion, the 1980 projection was to about 5.15 million hectares.

The projections generated by the model for all four cases are under the restrictions described in the section on model development. Consequently, the higher projections for Cases II, III and IV are due to the lower numbers of roughage consuming animal units in these cases rather than the higher returns from cereal production. When restrictions were not placed on cereals, Cases I

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[21] Britton, Cereals, p. 24.

[22] Economic Development Committee for Agriculture.

and II generated a projection of 6.88 million hectares in 1980 while Cases III and IV generated 8.67 million. The higher projections for Cases III and IV over Cases I and II were due to the sharply higher prices on cereals. The higher cereal prices more than offset the higher fertilizer prices assumed with entry into the EEC. Projected fertilizer prices for 1980 were about 30 percent higher in Cases III and IV than in Cases I and II due to phasing out fertilizer subsidies with entry.

The differences between the 1980 projections for "In EEC" and Case I do vary depending upon whether or not restrictions are placed on cereals. With no restrictions, the difference is 1.8 million hectares. With restrictions, the difference is 1.0 million hectares. This translates to a difference in production of 7.9 million metric tons without land restrictions and 4.4 million metric tons with land restrictions.

Since the restrictions became the projections on cereals, this invited closer inspection of the restrictions themselves. The key projection in comparing projected cereal areas under different policy assumptions is the dairy cow. Dairy cows (including replacements) claim about half of the rotation and permanent pasture land being utilized by livestock. A crucial question becomes whether or not the dairy cow can compete for forage on land suitable for cereal production. In Case I, the projected gross margin on dairy cows increased by about one third between 1968 and 1980 while the gross margin on cereals increased 40 percent. The projections on crops and ruminant animals for Case I are well within the technical possibilities projected by the Economic Development Committees for 1972.[23/] Except for beef cows, these levels would not be exceeded even in 1980.

For Case II, the gross margins on dairy cows and cereals increased by about the same percentages as in Case I. Because of higher prices on cull cows, dairy cattle numbers declined in Case II and cereal area increased more than in Case I.

For Cases III and IV, the gross margin on dairy cows again increased by one-third between 1968 and 1980, while the gross margin on cereals increased by 80 percent in the same period. The projected 2.87 million dairy cows,

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[23/] Economic Development Committee for Agriculture, Import Saving.

1.53 million beef cows, 11.42 million ewes and 5.14 million hectares of cereals in 1980 compares with the Economic Development Committee's estimates for 1972 of 3.51 million dairy cows, 1.44 million beef cows, 14.42 million ewes and 4.49 million hectares of cereals. Assuming that one cow (and replacements) requires about one hectare, the additional .65 million hectares of cereals in the Model's projection for Cases III and IV nearly counter balances the .55 million more cows projected by the Economic Development Committee.

Another consideration is that the Economic Development Committee projected the technical possibilities for 1972. Most likely, the technical possibilities for 1980 would have been even more optimistic.

The 1972 possibilities indicated by the Economic Development Committee are not likely to be realized, and the committee made it clear that these were not predictions but were attainable levels. Even though actual developments fall short of these levels in 1972, they still represent very reasonable levels for 1980 under EEC prices.

Concentrate Utilization

Utilization of concentrates has increased annually with only two exceptions over the past 15 years (Figure 2.17). Concentrate feeds include cereals, high-protein feeds and by-product feeds. This increase has been attributed to increased numbers of dairy and beef cows, more cattle being finished for slaughter, increased pig and poultry numbers plus some increase in the proportion of concentrates in total feed utilized by cattle. Estimated concentrate requirements per head for 1954-68, amounts fed per unit of output, and estimates of the total utilization of concentrates by major product groups are given in Tables B.23 to B.25. Table 2.9 is an abbreviated form of Table B.25 with projections to 1980.

As expected, the greatest increase in concentrate utilization would occur under the deficiency payment program, because it would keep market prices on grain lower than under the variable levies of the Conservative Program or EEC. This, in turn, would encourage a greater expansion in livestock numbers and a higher rate of feeding per animal than in Cases II, III and IV. The increase would amount to about 40 percent over 1968 levels in the unrestricted model and 20 in the restricted model. Under the price structure in the EEC, concentrate utilizations would increase only about 20 percent unrestricted and

Table 2.9. Estimated Utilization of Concentrated Feedingstuffs by Livestock Production Categories, U.K.

Item	Actual				Projected 1980			
	1955	1960	1965	1967	Case I	Case II	Case III	Case IV
		1000 M.T.				1000 M.T.		
Milk	3,515	4,139	4,315	4,414	5,010	4,573	3,864	3,827
Net beef production	1,346	1,917	2,586	2,788	3,590	3,296	2,854	2,834
Sheep and lambs	367	487	605	548	610	600	582	580
Pigmeat 1/	4,115	4,119	5,029	4,572	5,789 (8,816)	5,436 (8,763)	5,443 (7,913)	5,699 (7,681)
Poultry meat 1/ (except cull layers)	479	1,071	1,263	1,382	1,860 (2,118)	1,873 (2,120)	1,863 (2,184)	1,983 (2,128)
Eggs (hen and duck) 1/	3,794	4,148	3,937	4,130	4,376 (4,658)	4,268 (4,334)	4,083 (4,083)	3,946 (3,949)
Other	155	156	173	187	194	194	194	194
Total 1/	13,773	16,037	17,908	18,021	21,429 (24,997)	20,241 (23,880)	18,883 (21,673)	19,065 (21,192)
Total cereal production	8,895	9,663	13,687	14,622	18,449	20,215	22,840	22,935

1/ Unrestricted levels in parentheses.

5 percent restricted.

The variable levies, because they tend to hold back the expansion in ruminant animals, would open the way to increasing the area in cereals. The Conservative program and the Common Agricultural Policy then would tend to restrict concentrate feeding and tend to encourage cereal production. For Case II, cereal production would increase by 5.6 million metric tons by 1980 over 1967, while concentrate utilization would increase only 2.2 million tons restricted or 5.9 million tons unrestricted (Table 2.9). For Cases III and IV, cereal production would increase by 8 million tons while utilization of concentrates would be up only about 1 million metric tons restricted, or just over 3 million tons, unrestricted. This constrasts with the projected result under Case I which indicates concentrate use expanding nearly as rapidly (restricted) or more rapidly (unrestricted) than cereal production.

According to M.A.F.F. data, an estimated 9.0 million tons of homegrown cereals were fed to livestock (out of the total of 14.6 million tons produced) in 1967-68.[24/] Total concentrate utilization was estimated to be 17.8 million tons, close to our estimate of 18.0 million tons. The difference of 8.8 million metric tons between concentrate utilization and cereals fed was made up of 3.6 million tons imported grain, 2.1 million tons of high protein feeds, 1.7 million tons of cereal by-products and 1.4 million tons of miscellaneous feeds. Total feeding of cereals, then, amounted to 12.6 million tons or about 71 percent of total concentrates.

Subsidy Costs

Computations were made of the cost to the Exchequer for selected government programs. These programs included the Fatstock Guarantee Scheme, the Cereals Deficiency Payments Scheme, and production grants for calves, beef cows, hill cows, hill sheep and winter keep. In 1968, these costs amounted to about £150 million ($363 million), 60 percent of the total cost for agricultural support. These are the subsidies most directly related to commodities and except for the hill subsidies would probably not be allowed should the U.K. enter the EEC. Another subsidy likely to be phased out with entry is on fertilizer and lime. This subsidy was not compiled in the model because of

[24/] M.A.F.F. Output and Utilization of Farm Produce in the United Kingdom, 1963/64 to 1967/68, May 1969 and M.A.F.F., Development in the Animal Feedingstuffs Industry, Stats. 85/69, June 2, 1969.

difficulty in tying it to a commodity. The fertilizer and lime subsidy amounted to £35.5 million ($85.2 million) in 1968-69.

The costs on the subsidies included in the model are likely to increase, perhaps double by 1980 in Case I (Table 2.10). Costs would decline with the elimination of deficiency payments in Case II and the further elimination of production grants in Cases III and IV. Some question might be raised as to whether a doubling of Exchequer costs in Case I is realistic. Since 1962, these subsidy costs declined, then increased, with estimates for 1970-71 somewhat less than in 1962-64. Considering agriculture's share of the total budget and the projected growth and inflation, however, a doubling of these costs is plausible.

Supply Elasticities

One of the major purposes of this study was to provide an analytical framework that will permit continuous reassessment as policies and other conditions change. In most instances where such a reassessment would be required the appropriate procedure would be to re-run the entire model after making the necessary changes in the model. Another use for the model is to provide information to be applied to other models or analyses. Estimates of supply elasticities were made for that purpose as well as to demonstrate the sensitivity of output to price changes.

Supply elasticities were calculated for each of the years from 1969 to 1973. (These are presented in Table 2.11.) In computing the elasticities, the designated prices were raised one percent over the actual or projected levels for 1968-72. The resulting production or utilization levels were measured in terms of percent over the levels predicted by the model before prices were increased.

The response to a change in price was not completed within a year but continued over several years. The five years tabulated in Table 2.11 are only indicative of this pattern. Some additional response would be noted on some commodities even beyond five years. This is particularly true on milk, broilers, eggs and cereals.

Producers of pigs and broilers were the most responsive to price, with production up two percent five years after prices were raised one percent. This is understandable because of the flexibility in such enterprises. Cereal and turkey producers ranked next, followed by egg and milk producers. Sheep

Table 2.10. Subsidy Rates and Estimated Exchequer Cost of Deficiency Payments and Selected Production Grants, U.K.

Item	Actual				Projected 1980			
	1965 -66	1966 -67	1967 -68	1968 -69	Case I	Case II	Case III	Case IV
	$				$			
Subsidy Rates:								
Deficiency Payments								
Fat cattle (per live kg.)	.0092	.0520	.0635	.0367	.1015	0	0	0
Fat lambs (per dressed kg.)	.0551	.1047	.1268	.0716	.2238	0	0	0
Fat pigs (per dressed kg.)	.1105	.0165	.0405	.0438	.1372	0	0	0
Barley (per kg.)	.0072	.0086	.0084	.0082	.0100	0	0	0
Wheat (per kg.)	.0086	.0067	.0102	.0107	.0185	0	0	0
Oats (per kg.)	.0145	.0140	.0186	.0177	.0136	0	0	0
Production Grants								
Average calf subsidy per head	21.6	21.9	24.3	24.3	28.5	28.5	0	0
Production grants per beeg cow1/	20.7	25.6	30.1	35.9	56.5	56.5	41.5	41.5
Production grants per ewe2/	1.9	3.3	2.6	2.9	5.0	5.0	5.0	5.0
	Mil. $				Mil. $			
Subsidy Costs:								
Beef1/	87.6	134.6	187.2	151.4	362.4	173.2	63.5	63.3
Sheep and lambs2/	26.4	45.1	43.9	38.4	85.4	35.1	35.1	35.1
Pigs	94.8	13.7	28.8	34.3	153.1	0	0	0'
Cereals3/	103.4	118.6	100.3	139.0	229.3	0	0	0
Total4/	312.2	312.0	360.2	363.1	830.3	208.3	98.6	98.4

1/ Includes calf, beef cow, hill cow subsidies and part of winter keep subsidies.

2/ Includes hill sheep and part of winter keep subsidies. Does not include wool subsidy.

3/ Does not include fertilizer and lime subsidy.

4/ In the unrestricted model, total subsidies in 1980 would amount to $910 million in Case I as subsidy costs on pigs would be $233 million.

Table 2.11. Supply Elasticities for Major Farm Products and Concentrate Utilization, U. K.[1]

Relationship		Percent change in quantity				
Effect of a 1 percent increase in price of:	On the Production of:	Years after price change 1	2	3	4	5
Milk	Milk	.34	.53	.68	.77	.82
Barley	Milk	-.06	-.10	-.14	-.16	-.16
Cattle	Beef	-.02	.10	.25	.13	-.07
Lambs	Lamb & Mutton	.00	.00	.00	.00	.00
Pigs	Pigmeat[2]	.97	1.51	2.00	2.19	2.22
Broilers	Broilers[2]	.45	.87	1.31	1.71	2.05
Turkeys	Turkeys[2]	.50	.79	.98	1.09	1.17
Eggs	Eggs[2]	.35	.60	.80	.96	1.06
Barley	Feed grain[2]	.25	.51	.74	.93	1.09
Wheat	Wheat	.19	.24	.25	.27	.27
Barley and wheat	Cereals[2]	.28	.56	.81	1.03	1.21
Barley, wheat and maize	Concentrate utilization	-.21	-.33	-.46	-.53	-.55

[1] Prices selected were those representing what farmers received (gross price including subsidies) or paid.

[2] Supply elasticities are those which are relevant if no restrictions are placed on production.

and lamb numbers were assumed to be constant.

The lack of response of cattle producers to prices was due in part to the dependence on milk cow numbers for calf supplies. Higher cattle prices actually reduces milk cow numbers as closer culling is undertaken. In addition, a steady trend in imports of Irish stores was assumed in the model which tended to bias the beef supply elasticity downward. In fact, by the end of 5 years, the higher cattle price actually resulted in a slightly negative elasticity. This figure is probably too low, but does indicate that higher cattle prices would have minimal effect on beef supplies in this period.

As expected, higher prices on grain fed to dairy cows would reduce milk production and consequently reduce concentrates fed. Raising prices by one percent on grain fed to all livestock and poultry tended to reduce total utilization by about .5 - .6 percent after 5 years.

Total Production and Utilization

The United Kingdom model generated annual estimates of production for 1969-80 under the four cases. The 1980 projections are compared with actual production figures for 1955-68 in Table 2.12. The most substantial increases are projected for pigmeat, poultrymeat and grain. On pigmeat and poultrymeat the unrestricted model projected a very rapid expansion in all four cases. Livestock production would be noticeably less and grain production noticeably more with the U.K. in the EEC than out. The variable levy system of the Conservative party would result in 1980 output about midway between the levels projected for a continuation of the deficiency payment program and the Common Agricultural Policy of the EEC.

Annual data on total consumption were also computed for this period. Projections for the four cases in 1980 are compared with estimates for 1960, 1965 and 1968 in Table 2.13. The most notable increases in total consumption are projected for pigmeat, poultrymeat, mutton and lamb, eggs, dried whole milk and cheese. If the U.K. remains outside the EEC, expansion in consumption of butter, beef and veal and wheat flour (except in bread) would also be significant. However the higher prices assumed with entry would stifle the consumption of these products. More margarine would be substituted for butter as a result.

Consumption of beef and veal, being sensitive to prices, would decline with

Table 2.12. Total Production in Selected Years, 1955-68 and Projections to 1980 under Alternative Policy Assumptions, U.K.

Item	Actual (June-May)				1980 Projections			
	1955	1960	1965	1968	Case I	Case II	Case III	Case IV
	1000 M.T.				1000 M.T.			
Milk1/								
Total product weight	11,113	12,245	12,732	13,411	15,786	14,634	12,794	12,722
Fat equivalent (3.8%)	422	465	484	510	600	556	486	483
Solids-not-fat equivalent (8.7%)	967	1,065	1,108	1,167	1,373	1,273	1,113	1,107
Beef and veal	701	784	895	906	1,219	1,151	1,063	1,059
Mutton and lamb	194	247	262	247	264	264	264	264
Pigmeat2/	769	633	871	826	1,194 (1,818)	1,121 (1,807)	1,122 (1,631)	1,175 (1,584)
Poultrymeat2/	141	312	413	490	732 (822)	731 (816)	722 (833)	761 (811)
Eggs2/	577	735	827	900	1,101 (1,172)	1,074 (1,091)	1,028 (1,028)	994 (994)
Cereals								
Bread grains (wheat)	2,641	3,040	4,171	3,571	4,513	4,513	4,824	4,824
Coarse grains	6,254	6,623	9,516	9,792	13,936	15,702	18,015	18,110
Total	8,895	9,663	13,687	13,363	18,449	20,215	22,840	22,935

1/Projections from the model were adjusted by multiplying by a factor of 1.09 to account for milk production from the beef herd and to account for certain other differences between the model and official statistics.

2/Unrestricted projections are in parentheses.

Table 2.13. Total Human Consumption by Specific Products in Selected Years, 1955-68, and Projections to 1980 Under Alternative Policy Assumption, U.K.

	Actual				1980 Projections			
	1955	1960	1965	1968	Case I	Case II	Case III	Case IV
		1000 M.T.				1000 M.T.		
Milk								
Products: Liquid		7645	8002	8025	8695	8695	8695	8695
Cream		30	54	70	95	95	88	93
Butter		436	478	494	632	620	433	465
Cheese		233	250	276	333	333	320	331
Dried whole				33	158	158	158	158
Condensed				90	124	124	124	124
Beef and veal		1165	1109	1130	1274	1222	1063 1/	1059 1/
Mutton and lamb		604	581	582	782	694	738	783
Pigmeat								
Pork		469	654	584	793	734	740	777
Bacon and ham		594	639	632	765	741	731	759
Total		1064	1293	1216	1558	1475	1471	1536
Poultrymeat		297	405	509	697	696	688	724
Eggs		766	824	855	1049	1023	1008	1038
Cereals								
Bread				4700	4297	4341	4399	4142
Wheat flour				663	745	665	592	591
Oatmeal		81	77	70	53	53	53	53
Margarine		369	307	271	244	243	351	333

1/ Because of the lower limit in effect on beef in Case III in 1980, the difference between Cases III and IV is understated.

entry into the EEC. The decline would be particularly noticeable in the mid-1970s during the transition period. By 1980, the trend could again be upward, particularly if the economy were growing at the pace assumed in Case IV. Lower beef consumption projected for Case III would help sustain the demand for pigmeat, mutton and lamb, and poultrymeat as indicated in Table 2.13. Consumption of these products would be further enhanced by the more rapid economic growth projected for Case IV.

To gain a broader perspective on the future utilization of milk and cereals, milk and milk products were converted to a fat equivalent and a solids-not-fat equivalent, while cereal utilization was converted to a grain equivalent basis. This facilitated adding the direct human consumption to livestock feeds and other uses. Data for the recent past and projections to 1980 are presented in Table 2.14. Utilization of milk for livestock feeding and other uses is assumed to continue at about the same low level as in the recent past and consequently will have little effect on total utilization.

On cereals, the reduction in use for human food projected to 1980 is expected to be offset by an increase in human non-food consumption, mostly for malting and distilling. Utilization for livestock feed would increase moderately if the U.K. does not enter the EEC and if the restrictions placed on production of pigmeat, poultrymeat and eggs prove to be valid. Unrestricted, utilization of grain by livestock would increase substantially. Use of cereals for seed and other purposes would be expected to increase along with the expansion in grain areas.

Should the U.K. enter the EEC, cereal utilization by livestock would not increase materially from 1968 levels. In fact, there is a good chance that cereal utilization would decline. The specific projection depends upon what is assumed about the substitution of high protein and by-product feeds for cereals. If cereals remain at the same percentage of total concentrates as in 1968 (71 percent), the small increase in utilization indicated in Table 2.14 is projected. Should cereal utilization decline to say 50 percent of total concentrates fed, utilization by livestock would decline to 9.5 million metric tons. In the Netherlands the percentage of cereals in livestock rations declined from 66 percent in 1960-61 to 44 percent in 1967-68 and then to 35 percent in 1968-69.[25/] It is

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[25/] Pearson, William E. and Reed E. Friend, The Netherlands Mixed Feed Industry -- Its Impact on Use of Grain for Feed, ERS-Foreign 287, ERS, USDA, May 1970.

Table 2.14. Total Consumption of Milk and Cereals in Selected Years 1955-68, and Projections to 1980 Under Alternative Policy Assumptions, U.K.

	Actual				1980 Projections			
	1955	1960	1965	1968	Case I	Case II	Case III	Case IV
		1000 M.T.				1000 M.T.		
Milk in fat equivalent								
Humans		880	972	1014	1459	1446	1232	1274
Livestock			15	15 [2/]	15	15	15	15
Other [1/]			1	1 [2/]	1	1	1	1
Total			988	1030	1475	1462	1248	1290
Milk in non-fat-solids equivalent								
Humans		999	1048	1128	1231	1238	1226	1237
Livestock			55	55 [2/]	55	55	55	55
Other [1/]			23	23 [2/]	23	23	23	23
Total			1126	1206	1316	1316	1304	1315
Cereals in grain equivalent								
Human, food		5627	5450	5338	5173	5102	5052	4828
Human, other [3/]			2716	2891 [2/]	3585	3585	3585	3585
Livestock [4/]	7444	8617 [5/]	11315	12795 [6/]	15215	14371	13407	13536
Seed, other [8/]			670	700 [2/]	761	835	945	1015
Total [9/]			20151	21724	24734	23893	22989	22964
					(27265)	(26477)	(24970)	(24474)

1/ Industrial use, waste, etc.
2/ Estimates.
3/ Projections based on changes projected by G. T. Jones in United Kingdom's Projected level of Demand, Supply and Imports of Agricultural Products, 1970, 1975 and 1980, University of Oxford, IREA in cooperation with ERS, USDA, 1969.
4/ Projections assume that cereals represent same proportion of total concentrates as in 1967-68 (71 percent).
5/ 1959-60.
6/ 1967-68.
7/ Alternatively, cereal consumption by livestock would decline to around 9,500,000 M.T. if cereal represented only 50 percent of total concentrates fed to livestock.
8/ Projections based upon constant relationship with cereal area (.1836 MT/ha.)
9/ Unrestricted projections are in parentheses.

questionable whether such a dramatic shift would occur in the U.K. which has a much larger livestock industry. A marked shift might well drive up prices on by-product feeds which in turn would discourage the shift. Nevertheless, some shift away from cereals in concentrates fed to livestock would likely develop with entry into the EEC, and U.K. would then become self sufficient in grain if not a surplus producer.

Implication for Trade

The projected levels of production and consumption indicate a growing deficit for milk products and mutton and lamb if the U.K. remains outside the EEC and continues the deficiency payment program. The beef deficit would be reduced. Pressures would develop toward self sufficiency in pigmeat and poultrymeat production and possibly toward an exportable surplus. The U.K. would continue to be self sufficient in eggs. Little change would be expected in the grain deficit.

Under the variable levy of the Conservative party, there would be some tendency to shift from milk to cereal production as compared with the deficiency payment program. This would increase the milk deficit and reduce the grain production-utilization gap.

Should the U.K. join the EEC, the deficit on milk products would still be higher than in 1968 but somewhat less than if they remained outside the EEC. The U.K. could be near self-sufficiency on beef and veal, and pressures would continue in that direction on pigmeat, poultrymeat and eggs. Conceivably, the U.K. could be a net exporter of pigmeat, poultrymeat and eggs, based on the results of the unrestricted model. Entry into the EEC would reduce the deficit on cereals and could even result in a small surplus, particularly if the cereal content of livestock rations were reduced.

CHAPTER III

DEMAND AND SUPPLY ANALYSIS FOR GRAIN-LIVESTOCK IN IRELAND

Introduction

Ireland applied for full membership in the EEC along with the United Kingdom in 1967. An Anglo-Irish Free Trade Treaty was signed with the U.K. in 1965, but Ireland is not a member of the EFTA. Trade between Ireland and the EEC has been growing of late, and would no doubt expand rapidly with membership in the Community. The Common Agricultural Policy of the EEC is of direct interest to Ireland. It would primarily ensure a higher price for its exports of livestock products -- beef, pigmeat, sheepmeat, butter and cheese -- in the traditional British market. It would obviate the necessity for the present expensive export subsidy program and release government funds for other programs. It would place remuneration of farmers in the Republic on equal footing to that of their neighbors in Northern Ireland who at present benefit from the British support system. This disparity is a source of resentment and of administrative inconvenience along the border.

The links between the Irish and British economies go beyond commercial trade. Two are particularly worthy of mention. The virtual free flow of labor from Ireland to the U.K. has meant that adjustment in the Irish agricultural sector has been accompanied by an outmigration, not just to domestic industry but also abroad. Recent Irish workforce projections have anticipated a decline in emigration and the Irish population is in fact rising after a steady period of decline. Enhanced labor mobility within the EEC could reverse this trend but it is likely that industrial growth in Ireland itself will provide many more off-farm opportunities for employment.

Another link with the U.K. is through the monetary system. The Irish pound has been fixed at parity with Sterling (£1 = $2.40), moving with it at times of devaluation. In fact there is no established foreign exchange market in Irish pounds. Any adjustment between the two countries must be made internally. Had this not been so the Irish pound would arguably have been devalued relative to sterling as an aid to industry and agriculture in place of expensive subsidy programs. A bill presented to the Irish parliament would allow the separation of the two currencies, but in this study no depreciation of the Irish pound is examined.

Agricultural Policy

In Ireland a struggle between those who advocated an expansion of Irish agricultural exports and those who wished to concentrate on a protected home market was to some extent resolved by the incorporation in the First Program for Economic Expansion in 1958 of the goals of increasing farm output and productivity especially in the beef cattle and sheep sectors. By the time of the Second Program in 1964 the emphasis had changed somewhat, and the desirability of structural change was mentioned. This Program assumed EEC membership during the second half of the sixties; it laid considerable emphasis on the procurement of reasonable markets for exportable produce. The plan as a whole seemed to switch emphasis to industrial development to catch up with the realities of the progress in Irish manufacturing.

The cost of agricultural support programs to the Irish exchequer has risen steadily. In 1962/63 it was about £37 million; by 1964/65 it had risen to £50 million; by 1968/69 the cost of £79 million, and is estimated that it could rise to around £100 million in the next year or two. The increase has been in the large part due to the higher cost of the dairy policies, which rose from £6 million in 1963/64 to £25 million in 1968/69, and to the relief of rates inherent in the Agricultural Grant, which increased from £9 million to £18 million over this period.

The present support scheme for beef began as a temporary measure in February 1965, when store cattle prices were abnormally high and meat factories found difficulty in getting supplies in competition with live exporters. The scheme was temporary in that it was intended to bridge the period until the new Anglo-Irish Free Trade Area Agreement was put into operation. The policy allowed for export subsidies on sales to the U.K. market. The Free Trade Agreement came into force on July 1, 1966. Under this agreement:

i) Store cattle, sheep and lambs were guaranteed free access to the U.K. market.

ii) The British deficiency payment scheme was to be extended to cover specified amounts of Irish carcass beef and lamb.

iii) The fattening period in the U.K. of Irish store cattle necessary to qualify for the deficiency payment was reduced from three months to two. Despite this arrangement, the Irish government has found it necessary to pay significant subsidies to beef producers in the last four years.

In addition to the beef price support program there is also a beef-cow scheme which entails a payment of £12 for each cow in excess of two which is matched by a calf. This scheme, introduced in 1969, is designed to make beef production more profitable relative to dairy.

The price support program for the dairy industry comprises

i) Creamery milk allowance on the quantity purchases by creameries for manufacturing purposes,

ii) Additional allowance for high quality creamery milk and

iii) Grant to the Dairy Board (Bord Bainne) to cover two-thirds of the cost of export subsidies and the losses incurred in exporting; the remainder being financed by a levy (at present 3 pence per gallon). The creamery allowance is (from September 1970) paid on the basis of farm production:

11 pence 1 gallon for up to 7,000 gallons
7 pence 1 gallon for from 7-30,000 gallons
3 pence 1 gallon for from 30-40,000 gallons (decreasing above 40,000 gallons)

In addition there is a fixed price for butter, at present 469 shillings per hundredweight. An Bord Bainne is the sole exporter of butter, and moreover collects a levy of 28 shillings of milk going to manufacturing uses is now estimated at 11.7 pence (1968/69) per gallon, a rise from about 2.6 pence per gallon in 1962/63; the exchequer payments on exports on a whole milk equivalent basis amounted to over 14 pence per gallon in 1968/69.[1/] Imports of dairy products are in general prohibited.

Price support for pigmeat is through the maintenance of a guaranteed minimum price and by export subsidies financed both by government price have been made periodically to compensate for increased costs. Export marketing is guided by the Pigs and Bacon Commission. State costs have been as high as £3 million in some years when world market prices were weak. The Government has also been active in promoting the modernization of bacon factories and in rationalizing the marketing arrangements.

There are no domestic price support programs for poultry and eggs, though producers are benefitted by many overall policy measures. Imports are prohibited for animal health reasons; the same is true of imports of cattle,

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[1/] R. O'Connor, "An Analysis of Recent Policies for Beef and Milk", unpublished.

sheep and pigs, though meat can enter the country under certain conditions.

Irish policy in the cereals market has been designed to restrict imports to those amounts and qualities of grain that cannot be produced domestically. Each year the government prescribes a guaranteed price for wheat and feed barley. Malting barley and oats are sold at market determined prices. For wheat, the guarantee is limited to 75 percent of the flour grist (about 240,000 tons); any wheat surplus to requirements is disposed of at the expense of wheat users. The exchequer at present does not subsidize this disposal. The maintenance of a price for feed barley (secured through the operations of An Bord Grain) at prices near those prevailing on the world market has brought criticism from pig farmers. The present Government view is that "the dependence on a fluctuating surplus (of barley) abroad, exported with the aid of subsidies, is not a secure basis on which to build a stable pig industry."[2]

The impact on Irish agricultural policy of adopting the CAP is discussed in detail in the publication issued by the Department of Agriculture and Fisheries, Dublin, "Irish Agriculture and Fisheries in the EEC." Some problems of non-price policy, such as animal health regulations may prove troublesome, but the transition to EEC price levels and support methods should be straightforward. Intervention buying would be introduced for livestock products and the present import licenses for cereals would be replaced by variable levies. Ireland could be a net contributor to the Farm Fund unless there were significant payments on restitutions and interventions. The Irish would likely benefit from structural policies within the Community.

If the U.K. and Ireland were to remain outside the EEC the place of Irish livestock exports to the U.K. would be less secure. As was mentioned in the last chapter, it is likely that arrangements would be made for much of the Irish-U.K. trade to enter without the penalty of the variable levy.

Food Consumption

The analysis of food consumption in Ireland follows closely that of the United Kingdom outlined in the previous chapter. Data on Irish food consumption and prices are not very complete or extensive. No cross section annual survey of household expenditures on food is carried out though such surveys

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[2] Third Program, p. 66.

have been undertaken occasionally. The per capita consumption data were taken from the Irish Statistical Bulletin, as were data on retail prices. From the quantity and price data for the period 1955-1968 were estimated price and income response coefficients. The alternative functional forms were as for the U.K. Table 3.1 shows the equations which were used as a basis for the elasticity values of the demand matrix.

In general the equations used explained most of the variation in consumption, and signs were mostly as expected. One exception was the price elasticity for eggs, which appeared as a positive number. On the assumption that this could be revealing some simultaneous equation bias in the estimation procedure, it was decided to leave it unchanged in the model. Durbin-Watson statistics were, in general, rather low, indicating autocorrelated disturbances. It was decided not to pursue the various methods for eliminating such autocorrelation since this should not bias the coefficients. The standard errors should, however, be treated with caution. The next steps in building the total food demand elasticity matrix were as described in the U.K. chapter above.

Growth rate assumptions

As before, the method was to assume a growth rate for productive potential in the economy, to apply this to base year (1968) GNP, to add a rate of inflation to get nominal GNP projections, to convert to private consumption expenditure by assuming a level of average propensity to consume, and to convert to per capita expenditure by means of projected population figures. This nominal per capita private consumption expenditure figure was used for "income" in the demand projections.

Table 3.2 shows the projected values for the major variables up to 1980.[3/] The Third Program projects output per head as increasing at 3.8 percent per annum over the next few years. This is somewhat higher than achieved in the period 1954-1968 (3.3 percent) but is probably realistic in view of the 4 percent growth during the 1960s. Adding the projected 0.4 percent growth in the labor force gives an increase in productive potential of 4.2 percent. The rate of inflation has been about 3.2 percent from 1954-68, but as in most European countries this rate has increased recently. Ireland is presently experiencing inflation at about 8 percent. The example reported in this chapter uses the somewhat conservative figure of 4 percent inflation on average

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[3/] Historical data used in the demand analysis are included in Appendix Tables C.1 through C.3.

Table 3.1. Demand Equations, Ireland[1/]

Equation		Income term	$\bar{R}^2$	D.W.
BEEF = 0.59	- 1.05 BFP + 1.27 MLP + 0.10 PKP (0.32) (0.64) (0.74)	+ 8.16 LEXP (2.04)	0.91	1.32
MUL = 34.10	-28.59 LMLP + 12.82 LBFP (4.12) (3.52)	+ 8.45 LEXP (1.89)	0.95	1.50
LPGM = 3.23	- 1.27 LPGP + 1.03 LMLP (0.83) (0.45)	+ 0.24 LEXP (0.18)	0.72	1.01
LPTR = 0.93		+ 0.17 EXP (0.02)	0.90	1.10
LEGG = 2.97	+ 0.09 LEGP (0.14)	- 0.07 EXP (0.01)	0.90	0.97
LMLK = 5.49		- 0.07 REXP (0.09)	0.80	0.43
LBUT = 2.36	- 0.00 LBUP + 0.03 LMGP - 0.38 LBRP (0.01) (0.01) (0.12)	+ 0.08 EXP (0.02)	0.36	1.67
CHSE =-1.02	- 0.03 LOHP (0.02)	+ 1.65 LEXP (0.08)	0.97	2.14
LMRG = 1.09	- 0.00 LMGP + 0.00 LBUP + 0.44 LBRP (0.01) (0.01) (0.14)	- 1.11 REXP (0.74)	0.95	1.33
LWFL = 4.67	- 0.09 LWFP (0.05)	- 0.51 LEXP (0.06)	0.97	1.96
LBRD = 4.55	- 0.15 LBRP - 0.00 LMGP - 0.00 LBOP (0.04) (0.00) (0.00)	- 0.17 LEXP (0.04)	0.98	1.88

1/ Variable code as for UK except

	Consumption	Log. of Cons.	Price	Log of Price
Beef (excluding veal)	BEEF	LBEF	BFP	LBFP
Pigmeat (including bacon and ham and pork)	PIGM	LPGM	PGP	LPGP

Prices are in \$/ton(metric)
Quantities are in kg/head/yr.
Income (expenditure) is in \$ hundreds/hd.
Time series based on years 1954-1968

Table 3.2. Projected Population and Income Levels, Ireland, 1969-1980, 4.2 Percent Growth, 4 Percent Inflation

	Population (millions)	Real GNP ($ bill.; 1968 prices)	Current GNP ($ bill.)	Private Consumption Expenditure ($ bill.)	Per Capita Private Consumption Expenditure ($1000)
1969	2.93	3.22	3.25	2.24	0.76
1970	2.94	3.36	3.43	2.38	0.81
1971	2.96	3.50	3.61	2.53	0.86
1972	2.97	3.64	3.80	2.68	0.90
1973	2.98	3.80	3.99	2.85	0.96
1974	2.99	3.96	4.20	3.03	1.01
1975	3.00	4.12	4.42	3.21	1.07
1976	3.02	4.30	4.65	3.41	1.13
1977	3.03	4.48	4.90	3.62	1.19
1978	3.04	4.66	5.15	3.84	1.26
1979	3.05	4.86	5.42	4.07	1.33
1980	3.06	5.06	5.70	4.31	1.41

until 1980, as in the case of the U.K. Average propensity to consume has been decreasing slightly over time. Real consumption therefore has been projected to increase at 3.7 percent per year to allow for the continuation of this trend.

Assumptions on Margins and Retail Prices

The general procedure for handling the margin between farm price and retail price was similar to the U.K. model. Table 3.3 gives farm equivalent prices and margins. Table 3.4 gives the retail price changes implied by the chosen farm prices and margins. Prices for eggs and poultrymeat are projected to hold steady or decline. All other prices rise, but prices of beef, pigmeat and especially dairy product rise faster in the event of EEC entry.

The prices and the income trends described above are used with the demand matrix to generate projections of per capita and total demand for food products.

Table 3.3. Farm Prices and Marketing Margins in Selected Years 1955-68 and Projections to 1979 Under Alternative Policy Assumptions, Ireland

Item	Farm Price (F) Margin (M)	Actual 1955	1960	1965	1968	1979 Projections Case I	Case III
		$/Kg.				$/Kg.	
Beef[1/]	F	.563	.537	.688	.782	1.029	1.499
	M	.421	.563	.915	1.001	1.821	1.821
Fat Lambs[1/]	F	.658	.609	.678	.861	1.111	1.321
	M	.363	.406	.643	.606	.979	.979
Pigmeat[2/]	F	.534	.541	.564	.642	.687	,897
	M	.355	.396	.501	.547	.873	.873
Poultry meat[2/]	F	.659	.539	.566	.500	.514	.764
	M	--	--	--	.529	.676	.676
Liquid Milk	F	.039	.041	.042	.041	.049	.109
	M	.052	.060	.082	.096	.151	.151
Butter[3/]	F	--	.832	.690	.701	1.038	2.548
	M	--	.354	.550	.600	.692	.692
Cheese[4/]	F	.436	.456	.467	.421	.491	1.121
	M	.319	.337	.454	.525	.769	.769
Eggs	F	.573	.498	.573	.632	.636	.576
	M	.209	.205	.212	.196	.264	.264
Bread[5/]	F	.056	.053	.054	.069	.058	.082
	M	.044	.096	.119	.144	.312	.312

[1/] Dressed weight equivalent farm price: Computed by multiplying live-weight farm price by a factor for dressing percentage. These are for beef 1.82, for lambs 1.72.

[2/] Carcass weight farm price reported directly.

[3/] Farm price equivalent computed by multiplying 28.57 times milk price and deducting an allowance for value of skim milk. For 1955-57 this allowance was calculated by multiplying 1.8 times the price of New Zealand skim milk powder in the U.K. 28.57 pounds of milk yield 2.6 pounds of powder and allowing a 30 percent processing margin this yields a factor of 1.82. This factor was increased to 2.3 for 1968.

[4/] Farm price equivalent computed by multiplying net milk price by a factor of 11 for the period 1955-67 and by 10.3 for 1968.

[5/] Farm price equivalent computed by multiplying farm price of wheat by a factor of .863.

Recent Trends and Projections of Per Capita Consumption

Consumption of most foods will continue to rise in Ireland irrespective of the relationship with the Common Market. However EEC entry is expected to depress the consumption of poultrymeat, mutton and lamb, beef, pigmeat, cheese, milk and bread; only margarine and eggs are expected to be consumed at higher levels within the EEC. Table 3.5 shows the per capita consumption projections under the two policy assumptions.

In general consumption changes are relatively small. Poultry consumption is expected to be some 5 percent higher in the "outside" case, and mutton and lamb demand about 12 percent higher. Butter consumption would be depressed by entry by about 5 percent, corresponding to the increase in margarine consumption expected. Pigmeat and beef consumption would be depressed by about 2 percent by entry while egg demand is enhanced by 2 percent if 1980 consumption projections are compared under alternative policies.

Supply Analysis

Structure

The amount of fertile land in Ireland is about 11.5 million acres. The Irish climate is characterized by mild, damp winters and cool summers. For most of the country the average rainfall is between 30 and 40 inches and Ireland is also noted for the large number of days in the year when some rain falls. These climatic conditions make tillage farming difficult with the result that the agricultural economy is based largely on livestock and livestock products. Eighty-eight percent of the fertile land is grassland, about 9 percent cereals and about 3 percent root and green crops.

Table 3.6 shows that the number of people engaged in agriculture declined from 382,000 in 1960 to 306,000 in 1968.

The decline in employees and in members of the farm family has been more rapid than the decline in farmers. There is also a tendency for the average age of the agricultural labor force to increase; between 1951 and 1966 the percentage under 30 years fell from 27.4 to slightly over 20 and the percentage over 45 increased from 46.7 to 57.7.

Concomitant with the decrease in the labor force has been an increase in the both short, and long-term capital inputs (Table 3.7.)

Table 3.4. Retail Prices in Selected Years, 1955-68 and Projections to 1980 Under Alternative Policy Assumptions, Ireland

Item	Actual Prices				Projections to 1980 and Change from 1968			
					Out EEC		In EEC	
	1955 $/Kg.	1960 $/Kg.	1965 $/Kg.	1968 $/Kg.	Price $/Kg.	Index 1968= 100	Price $/Kg.	Index 1968= 100
Beef	.98	1.10	1.60	1.79	2.85	159	3.32	185
Mutton and Lamb	1.02	1.01	1.32	1.47	2.09	142	2.30	156
Pigmeat	.89	.94	1.06	1.19	1.56	131	1.77	149
Poultrymeat	--	--	--	1.02	1.19	117	1.44	141
Eggs	.78	.70	.78	.83	.90	108	.84	101
Liquid Milk	.09	.10	.12	.14	.20	142	.26	186
Butter	.99	1.19	1.24	1.29	1.73	134	3.24	251
Cheese	.75	.79	.92	.95	1.26	133	1.89	199
Margarine	--	--	--	.53	.81	153	.81	153
Bread	.10	.16	.20	.24	.37	154	.40	167

Table 3.5. Per Capita Consumption in Selected Years 1955-68 and Projections to 1980 Under Alternative Policy Assumptions, Ireland

Item	1968 Expenditure	Actual Prices				Projections to 1980 and Change from 1968			
						Out EEC		In EEC	
	$	1955 Kg.	1960 Kg.	1965 Kg.	1968 Kg.	Kg.	Index 1968= 100	Kg.	Index 1968= 100
Beef	32.19	14.4	14.7	15.8	18.0	20.7	115	20.3	113
Mutton and Lamb	16.43	7.2	10.6	10.6	11.2	17.5	156	16.5	147
Pigmeat	29.73	23.0	21.6	28.3	25.0	30.9	124	28.8	115
Poultry meat	8.75	4.8	5.1	7.3	8.5	16.2	190	15.4	181
Eggs	11.26	17.9	16.7	15.6	13.6	9.9	73	10.1	74
Liquid Milk	29.25	196.7	210.4	216.5	214.0	219.4	102	219.1	102
Butter	16.84	14.3	13.2	15.2	13.0	17.7	136	17.1	131
Cheese	1.99	1.0	1.2	1.8	2.1	2.7	128	2.6	124
Margarine	1.94	2.2	3.1	3.3	3.7	3.8	103	3.9	105
Bread	13.92	77.1	67.5	63.0	58.9	55.6	94	55.1	93

Table 3.6. Numbers Engaged in Agriculture

	(000)
1960	382
1961	371
1962	362
1963	355
1964	346
1965	333
1966	326
1967	315
1968	306

Source: Irish Statistical Bulletin

The result of these changes in resource input is that gross agricultural output has grown at a faster rate than gross agricultural product (i.e. gross output minus costs other than those for labor and capital). From 1960 to 1968 gross agricultural product rose in real terms at an average annual rate of 1 percent. Product per head increased by 3.5 percent per annum. However, average gross output per man varies by size of farm and system of farming as can be seen from Table 3.8.

Table 3.9 shows how output per acre varied by size and system of farming. The outputs from the more intensive systems are much higher than the outputs from the other systems. Gross margins per acre (i.e. output minus direct costs) are also higher for the more intensive system (Table 3.10.)

As indicated in Table 3.11. the size structure of Irish agriculture has changed relatively little over time. Some decline in numbers has occurred in the 1-15 and the 15-30 acre size category, but there has been no general shift to larger scale farming. This is associated with lack of alternative industrial employment. Entry into the EEC is not likely to alleviate the employment situation in Ireland. Hence, it can be expected that the structure of Irish agriculture will remain relatively stable over time and that structural shifts will not influence supply response with or without entry into the EEC.

Table 3.7. Changes in Agricultural Inputs (1960 = 100)

	Building, Machinery & Land Improvement	Fertilizers, Feed and Seed
1960	100	100
1961	121	118
1962	128	129
1963	142	136
1964	162	139
1965	156	159
1966	163	155
1967	167	161
1968	n.a.	177

n.a. = not available

Source: Based on table by E. A. Attwood in Irish Journal of Agricultural Economics and Rural Sociology, Vol. 2, No. 2, 1969.

Table 3.8. Average Gross Output Per Man By Size and System of Farming

System	5-30	30-50	50-100	100-200	200	All Farms
Mainly creamery milk	386	524	765	969	1,207	591
Creamery milk & tillage	518	912	1,358	1,551	1,715	1,225
Creamery milk and pigs	835	867	1,201	936	1,211	996
Liquid milk	1,179	1,017	1,278	1,498	1,909	1,401
Mainly drystock	250	415	545	633	1,050	408
Drystock and tillage	383	652	869	1,202	1,588	927
Hill sheep and cattle	236	301	316	324	615	284
All Farms	361	597	878	1,025	1,474	703

Source: "Farm Management Survey 1966-'67" An Foras Taluntais, Dublin 1969

Table 3. 9. Average Gross Output by Size and System of Farming
(£ per adj. acre)

System	Size of Farm (Acres)					
	5-30	30-50	50-100	100-200	200	All Farms
Mainly creamery milk	22.3	19.8	20.3	17.3	15.0	19.1
Creamery milk and tillage	27.2	31.7	34.1	28.4	23.7	29.0
Creamery milk and pigs	39.8	32.9	34.8	26.4	24.2	30.9
Liquid milk	59.7	38.3	31.0	30.8	29.6	31.4
Drystock	13.3	13.9	13.9	13.0	8.9	12.8
Drystock and tillage	23.6	26.6	21.7	21.7	20.6	21.7
Hill sheep and cattle	11.0	8.1	7.8	6.6	5.3	7.1
All Farms	19.6	21.8	22.7	20.5	18.9	21.6

Source: "Farm Management Survey 1966-'67," An Foras Taluntais, Dublin, 1969.

Table 3.10. Average Gross Margin by Size and System of Farming
(£ per adj. acre)

System	Size of Farm (Acres)					
	5-30	30-50	50-100	100-200	200	All Farms
Mainly creamery milk	15.9	14.7	15.6	13.2	11.8	14.3
Creamery milk and tillage	18.6	22.1	23.9	21.4	18.0	20.9
Creamery milk and pigs	23.5	20.7	21.8	17.8	17.5	19.7
Liquid milk	29.9	28.6	25.1	21.8	20.0	22.2
Drystock	9.3	10.4	10.9	9.4	6.8	9.3
Drystock and tillage	15.1	18.6	16.0	16.1	15.2	15.8
Hill sheep and cattle	7.1	5.9	5.5	5.2	4.3	5.1
All Farms	13.3	15.4	16.4	15.1	13.9	15.6

Source: "Farm Management Survey 1966-'67," An Foras Taluntais, Dublin 1969.

Table 3.11. Number and Percentage of Holdings in Each Size Group By Year 1931 - 1965

	1-15		15-30		30-50	
	No.	%	No.	%	No.	%
1931	104,049	31.0	90,364	26.9	62,267	18.6
1939	95,103	29.1	90,765	27.8	62,478	19.1
1944	91,874	28.4	89,311	27.6	62,786	19.4
1949	88,783	27.9	86,983	27.3	62,453	19.6
1955	84,959	27.1	83,896	26.8	63,080	20.1
1960	70,788	24.4	73,295	25.3	62,056	21.4
1965	67,956	24.0	68,769	24.3	61,238	21.6

	50-100		100-200		200+	
	No.	%	No.	%	No.	%
1931	49,813	14.9	21,081	6.2	7,949	2.4
1939	49,966	15.3	21,021	6.4	7,399	2.3
1944	50,954	15.8	21,316	6.6	7,230	2.2
1949	51,281	16.1	21,772	6.8	7,270	2.3
1955	52,270	16.7	21,930	7.0	7,152	2.3
1960	54,209	18.7	22,884	7.8	7,076	2.4
1965	55,197	19.5	23,325	8.2	6,971	2.4

Source: Agricultural Enumeration in each year.

Time Series Analysis

The time series analysis on Ireland differs from that on the United Kingdom and Denmark in two major ways: (1) in general it was possible to get reasonably good direct price response relations, therefore, prices rather than profit variables are used, and (2) in a number of cases quarterly or semi-annual data were used. In general, quarterly price data were averaged to derive annual series. Some biannual production series were used directly in making output estimates.

The supply analysis and projections are based on a set of least squares estimates of herd numbers for the major livestock enterprises, and acreages for the grains. These in turn are used with projected data on production per animal and crop yields to project future output levels.

The set of equations selected for projecting are the following:

Cattle and Beef Breeding Herd

(1) (Number of cows on farms 1000) = 278.966

$+ \underset{(9.125)}{27.466}$ Price of milk $(\text{pence/gallon})_{t-1}$

$+ \underset{(2.903)}{11.562}$ Value per unit of cattle output $(\text{£/head})_{t-1}$

$+ \underset{(29.767)}{157.734}$ dummy variable to reflect effect of

Calves heifer scheme using 0 for each year prior to 1964 and 1 for 1964 and following years

$\bar{R}^2 = .97$

For prediction the dummy is included with the intercept (278.966 + 157.734 = 436.7) to provide the estimating equation.

$X_1 = 436.7 + 27.466^{X2} + 11.562^{X3}$

Sheep

(1) Breeding ewes on farms January 1 = 131.657

$+ \underset{(67.07)}{69.673}$ Value per unit of sheep output £/head, (t-1)

$+ \underset{(8.97)}{11.121}\ X_3$ Returns per unit of cattle output £/head, (t-1)

$- \underset{(14.81)}{56.109}\ X_4$ Price of milk $(\text{pence/gallon})_{t-1}$

$+ \underset{(.15)}{.999}\ X_5$ Number of breeding ewes in January $(1000)_{t-1}$

$\bar{R}^2 = .97$

Pigs

(1) June breeding herd = 67.537

$+ .631$ Price of young pigs, January-June $(\text{shilling/head})_{t-1}$

$- \underset{(.743)}{2.943}$ Price of barley meal, January-June $(\text{shilling/hundredweight})_{t-1}$

$+ \underset{(.090)}{.594}$ Breeding herd, January $(1000)_{t-1}$

$\bar{R}^2 = .84$

(2) January breeding herd = 67.537

+ .631 Price of young pigs July-December (shilling/head)$_{t-1}$

- 2.943 Price of barley-veal, July-December (shilling/hundredweight)$_{t-1}$
(.743)

+ .594 Breeding herd, June (1000)$_{t-1}$

$\bar{R}^2$ = .84

<u>Poultry</u>

(1) Fowl other than turkeys produced = -718.532

+ 1.176 Fowl other than turkeys produced (1000)$_{t-1}$
(.096)

$\bar{R}^2$ = .94

(2) Turkeys produced = -277.8

+ .903 Turkey output (1000)$_{t-1}$
(.087)

+ 7.572 Price of turkeys (shilling/head)$_{t-1}$
(2.845)

$\bar{R}^2$ = .90

<u>Cereals</u>

(1) Total grain acreage = -76.86

+ .634 Grain acreage (1000)$_{t-1}$
(.112)

+ 18.507 Realized price deflated by livestock price index (£/ton)$_{t-1}$
(4.201)

$\bar{R}^2$ = .91

<u>Price Projection</u>

Two cases are specified in making price projections for Ireland. In Case I Ireland and the other countries included in this study are assumed to remain outside the EEC and to maintain much the same trading policies as in the past. For Ireland this means continued preferential access to the U.K. market under the Anglo-Irish free trade agreement. It would also mean a partial participation by Ireland in the U.K. support program through export of live cattle. It was also assumed there would be no major change in Irish price support policy.

In the case of entry it was assumed that prices in Ireland for the main supported commodities would be the same as in the U.K. For livestock products this is consistent with existing EEC pricing where a single price is set for all producers. For grains this essentially assumes that there will be a change from the existing system of basing points and backoff prices to one of multiple price points -- probably ports of entry.

It is also assumed that adoption of the variable levy system by the U.K. will have a limited effect on Irish farm prices. U.K. pricing on dairy products probably would not change and, hence, Ireland's position in that market would not change. Ireland is expected to become deficit in grain and prices would be determined by its domestic support program. Poultry prices have been declining in both the U.K. and Ireland. This is expected to continue in Ireland during the early 1970s and thereafter prices will strengthen. Egg prices are projected to level off and remain relatively constant for the entire projection period. U.K. prices on these commodities will not likely be different with either policy if it remains outside the EEC, thus will not affect Irish prices.

Some price shift could occur for Irish beef, pork and lamb depending upon specific arrangements between the two countries. If Ireland were included within the protected area, its advantage in the U.K. market vis-a-vis other countries would increase and prices would be maintained at the U.K. protected level. If Irish exports entered the U.K. over protection levels there would be a loss of existing advantage due to elimination of U.K. price supports on Irish beef and the free trade advantage from the agreement between the two countries.

The price patterns assumed under Cases I and III are shown in Figures 3.1 through 3.8. These reflect a general upward trend for livestock products other than poultry and eggs. The gross milk price includes a direct government subsidy. Milk and grain prices will be policy determined. It is assumed that this will result in a gradually increasing price for milk and unchanged prices for grain.

Greater room still exists for improved production efficiency in eggs than in poultry meat. Gradual achievement of these efficiencies will result in holding egg prices steady throughout the 1970s despite increases in input prices. A leveling from declining prices on poultry meat is expected due to increasing input prices. Prices for meat animals are expected to increase due to relatively strong demand and due to price patterns in external markets particularly in the U.K.

Entry into the EEC will have its greatest impact on milk and cattle with prices substantially higher than projected 1980 levels without entry. Though no support program exists for lamb in the EEC, Irish lamb prices will also increase with entry. Irish lamb prices currently are substantially below U.K. prices and will benefit from expanded market potential in an enlarged EEC.

Figure 3.1. Prices on Milk, Farm Equivalent, Ireland

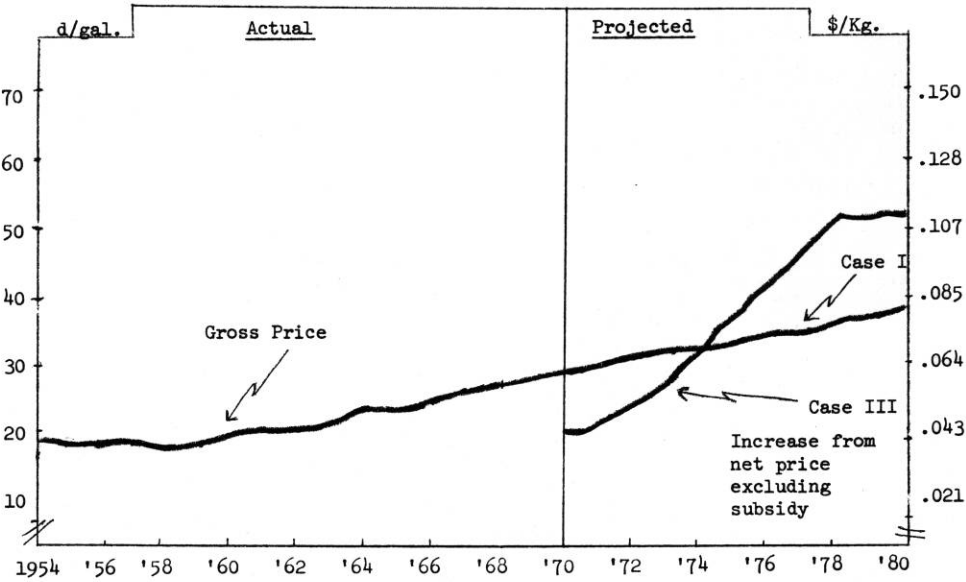


Figure 3.2. Prices on Fat Cattle, Live, Ireland

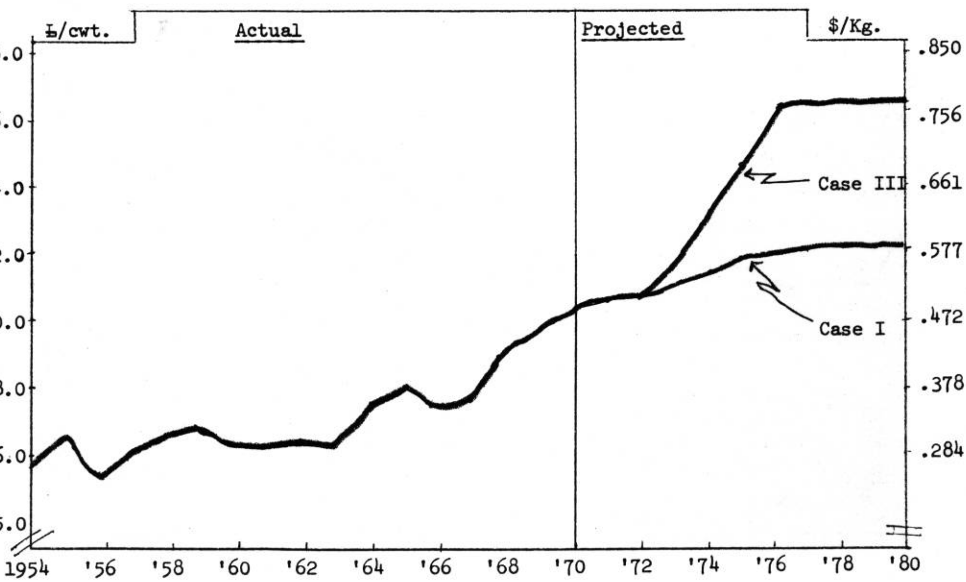


Figure 3.3. Prices of Fat Lambs, Live, Ireland

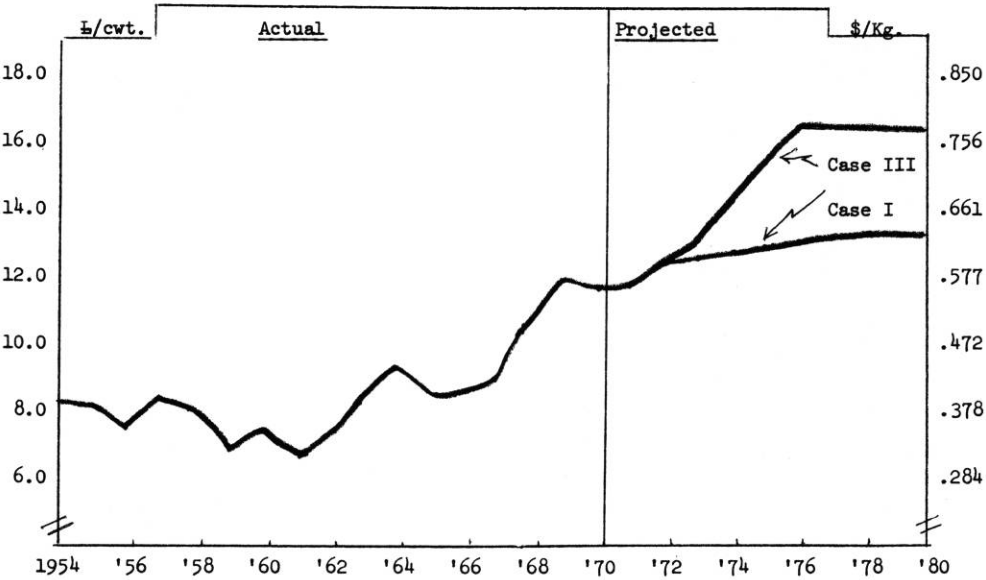


Figure 3.4. Price of Bacon Pigs, Ireland

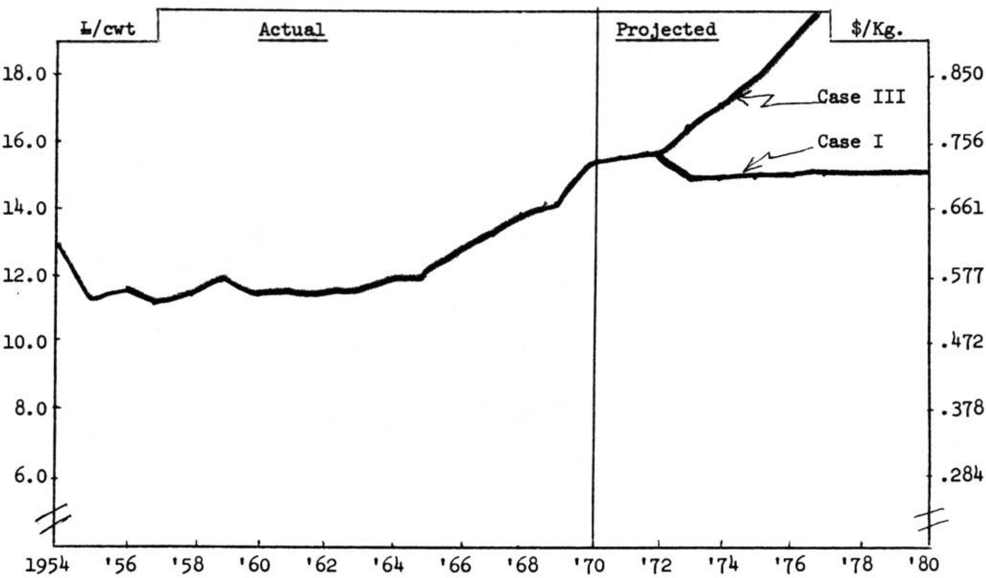


Figure 3.5. Price of Poultry Dressed, Average, Ireland

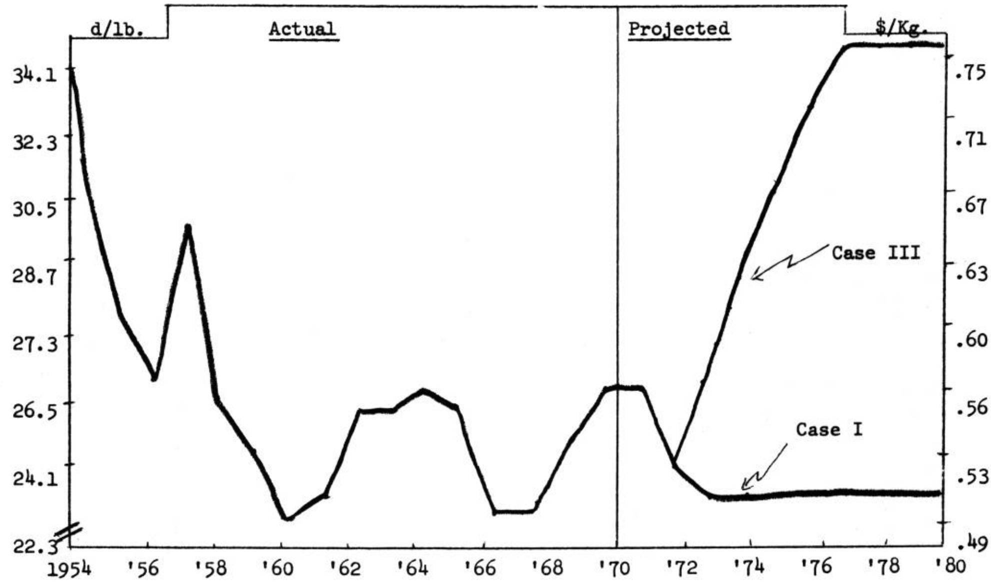


Figure 3.6 Price of Eggs, Ireland

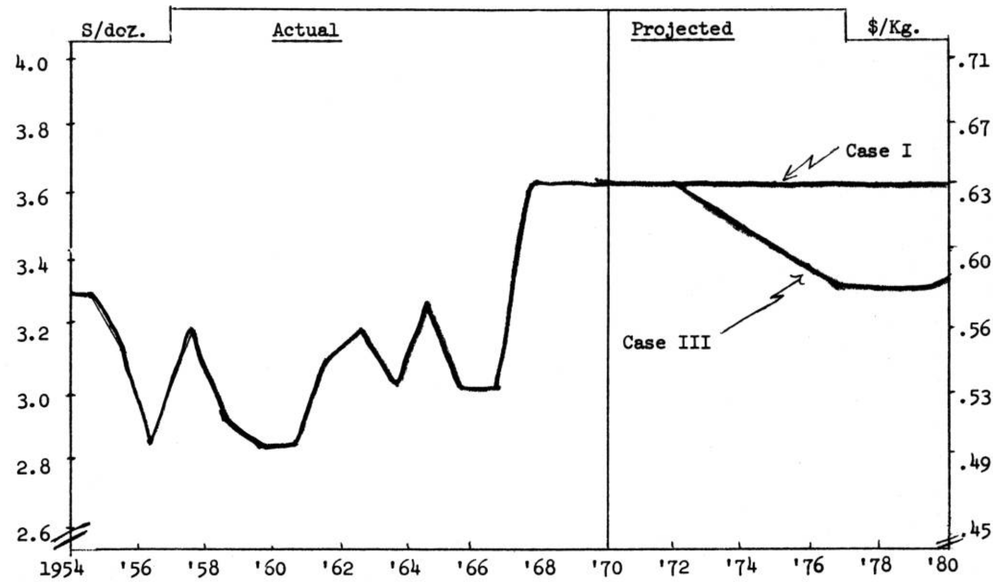


Figure 3.7. Price of Wheat, Ireland

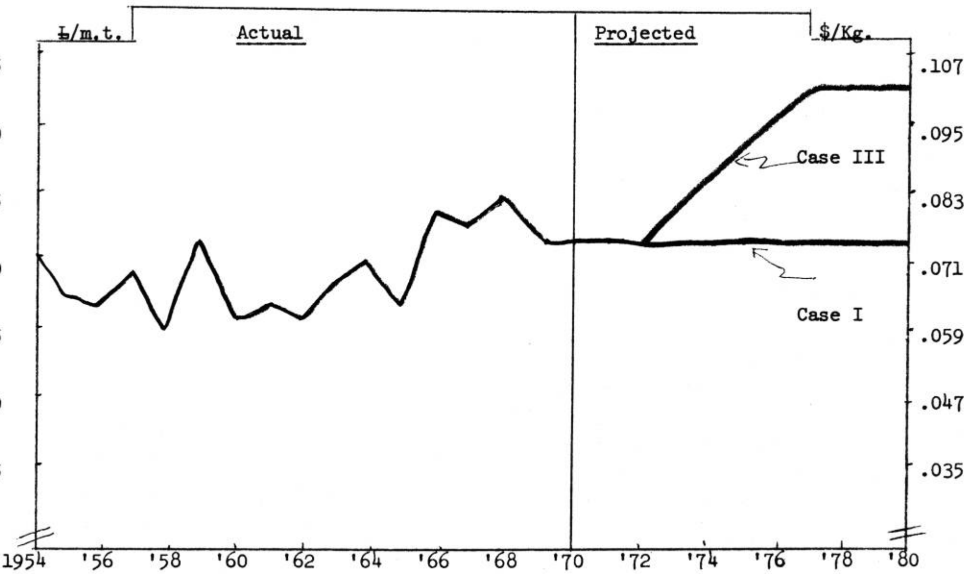
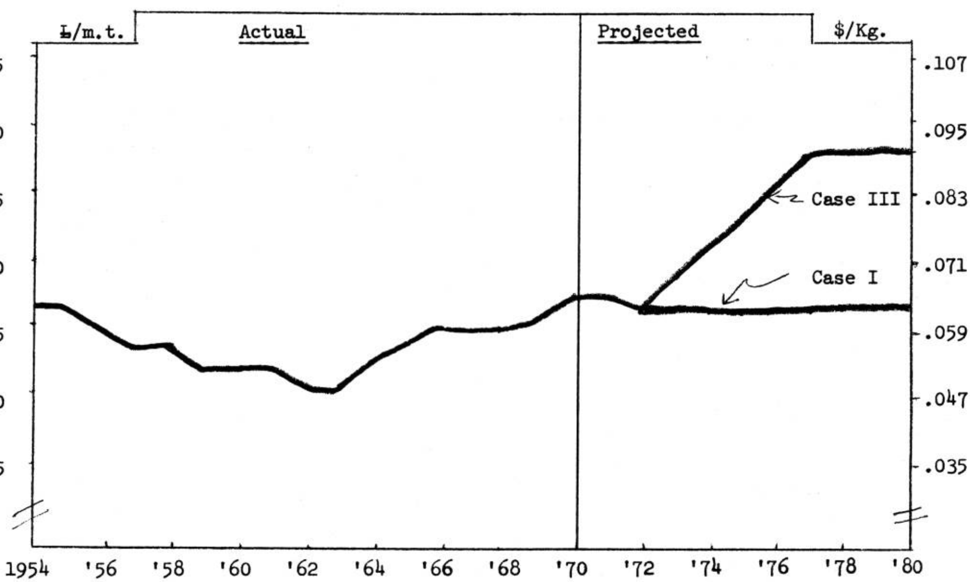


Figure 3.8. Price of Barley, Ireland



Grain prices will increase considerably due to differences in Irish support levels and those in the EEC. Hog prices will increase under EEC supports but only by about 20 to 25 percent. Poultry and egg prices will be affected only moderately or not at all by market conditions or policy in the EEC.

Model Development

The basic supply relationships and prices described above were used in conjunction with a number of subsidiary relationships to generate production estimates for each year. Annual estimates on a year to year basis were generated for quantities produced, crop area, livestock numbers and concentrate utilization. A full statement of all exogeneous variables and subsidiary equations are included in the program description. Some of the more important elements are summarized here.

Projections for production were obtained by combining a set of yield coefficients with the estimates on livestock numbers and acreage generated by the basic supply equations. Initial yield conditions were obtained or estimated and change was projected as a linear trend based on historical information in Ireland plus evidence available from comparable conditions in the U.K. Base year quantities and projections for 1980 are shown in Table 3.12.

The supply model for Ireland was used without specific constraints except in one case. With entry into the EEC the estimating equation projected a disappearance of sheep production. While historical data indicate the relationship between sheep and cattle prices have been effective in causing shifts in production this will not continue beyond certain limits. In much of Ireland the possibility of direct competition by the two enterprises for grassland exists. There also are areas particularly in Western counties where rugged terrain precludes successful cattle grazing and will unlikely replace sheep even with major price shifts. Thus the equations for sheep breeding herd which includes sheep, milk and cattle prices is valid within a range but not to the point of exclusion of sheep production. Production at approximately the low point of the period for which historical data were available was selected as a constraint in projecting to 1980.

Trends and Model Results

Historical trends and results of the supply response analysis for major commodities are shown in figures 3.9 through 3.13. Overall adjustment in Irish

Table 3.12. Technical Coefficients, Ireland

Item	Unit	Actual 1967	Actual or Estimated 1968	Projected 1980
Milk production per cow[1/]	kg.	2434	2476	2692
Output of cattle and calves$_t$ per cow$_{t-2}$	no.	.76	.76	.82
Output of sheep and lambs per breeding ewe	no.	.83	.83	.83
Pigs received at bacon factories$_t$ relative to sows$_t$	no.	13.17		14.96
Egg production per hen	kg.	8.38	8.30	9.00
Cereal yield per hectare	kg.	3565	4005	4205
Wheat yield per hectare	kg.	3904	4557	4457
Kilogram of Concentrates Fed per:[2/]				
Kg. of milk	kg.		.1075	.1075
Beef cow	kg.		114.6	114.6
Steer and heifer slaughtered or exported fat	kg.		214.6	214.6
Kg. of lamb and mutton	kg.		.7589	.7589
Kg. of pigmeat[3/]	kg.		5.082	5.082
Kg. of poultry meat	kg.		3.300	2.904
Kg. of eggs	kg.		4.585	4.585

[1/] Milk and beef cows combined.

[2/] Estimated from UK data, OECD studies and A. Gargan, "Animal Feedingstuffs-1969" Farm Bulletin, April 1970.

[3/] Assumes concentrates will largely replace skim milk in pig rations.

agriculture can come through shift among enterprises or through movement to higher levels of technical efficiency. The projections that have been derived involve both kinds of change.

Cattle. Ireland's cattle enterprise is at the center of prospective change and response to EEC pricing. Total numbers of milk and beef cows on farms have increased steadily since 1950 and with improved management, carrying capacity can be further increased. Under existing policies a continuation of this gradual upward trend is expected. With entry into the EEC some expansion of cattle output would result by utilizing grassland currently used for sheep. The major increase, however, would have to come from increased forage yields through better farm practices and especially use of fertilizer. The potential for increased forage yields and improved techniques of harvesting and storing roughage is substantial.

The output-input price ratio between cattle-milk and fertilizer would improve substantially in the EEC and, in line with indicated historical ability of Irish farmers to respond to price incentives, probably would result in increased use of fertilizer in forage production. The other route to expanded production--through greater use of feed concentrates--will not likely play an important role. EEC price relationships are not conducive to increased cattle feeding. A continuation of replacement of some grain acreage by forage production for cattle should occur both in and out of the EEC.

Sheep and Lambs. Historically the number of sheep in Ireland increased rapidly until 1966 and has since declined sharply. The projections indicate a recovery and general expansion in sheep production if Ireland remains outside the EEC but a sharp decline with entry. These trends are directly related to expected price relationships among sheep, milk and cattle and reflect the ability of sheep to compete with cattle for land that can be used for both. ?

Hogs and Poultry. As in other countries hog numbers in Ireland have been subject to year-to-year fluctuations but with a gradual increase in numbers from the mid-1950s through 1965. Since then hog numbers have declined and the longer term upward trend may have reversed although the number of years is not sufficient to be sure. Conditions underlying hog production in Ireland and the time series analysis of numbers would, however, tend to indicate that the trend has reversed.

Some hog production is in small units complementary to the dairy enterprise

Figure 3.9. Milk and Beef Cows on Farms, Ireland

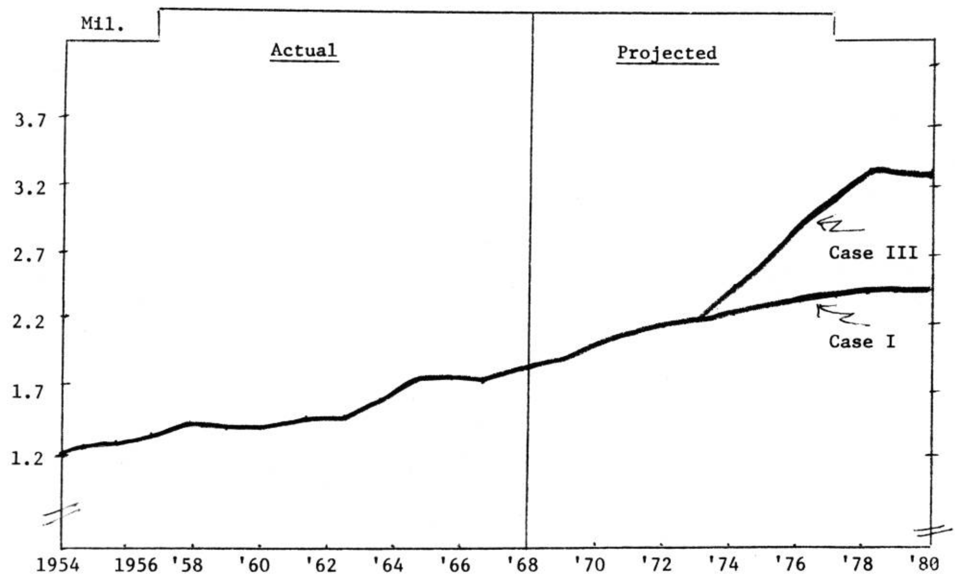


Figure 3.10. Number of Sheep and Lambs Produced, Ireland

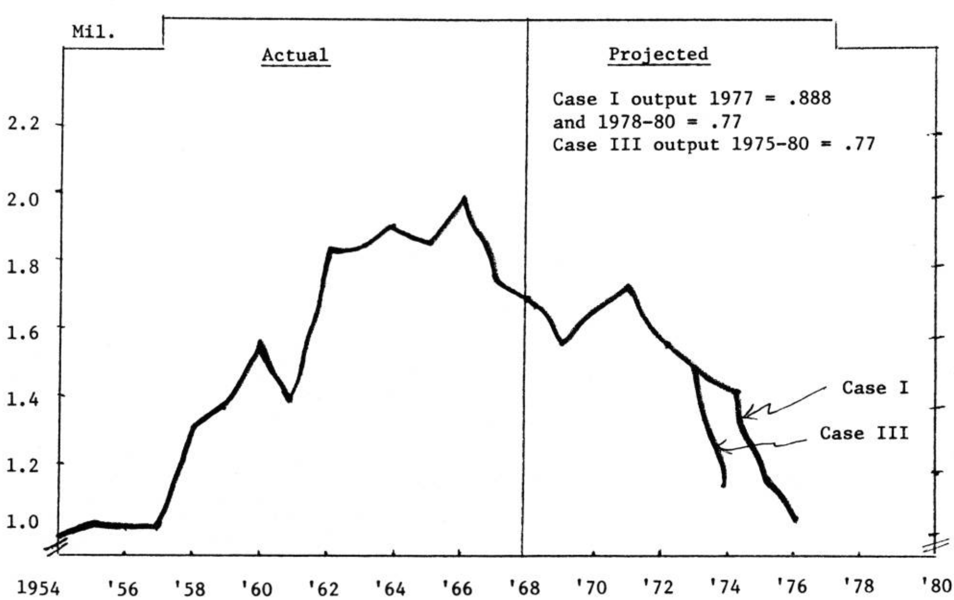


Figure 3.11. Number of Pigs Received at Bacon Factories, Ireland

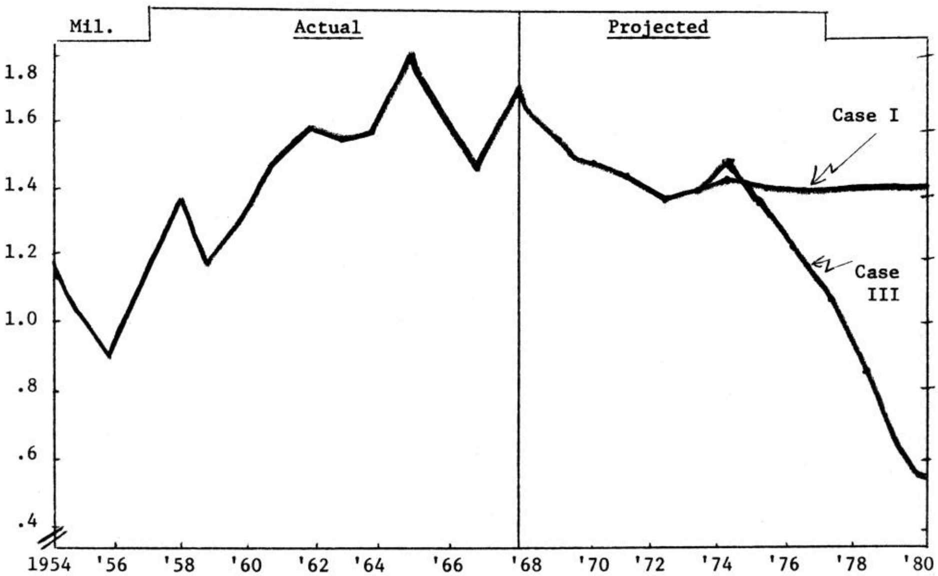


Figure 3.12. Number of Fowl Other Than Turkeys Produced, Ireland

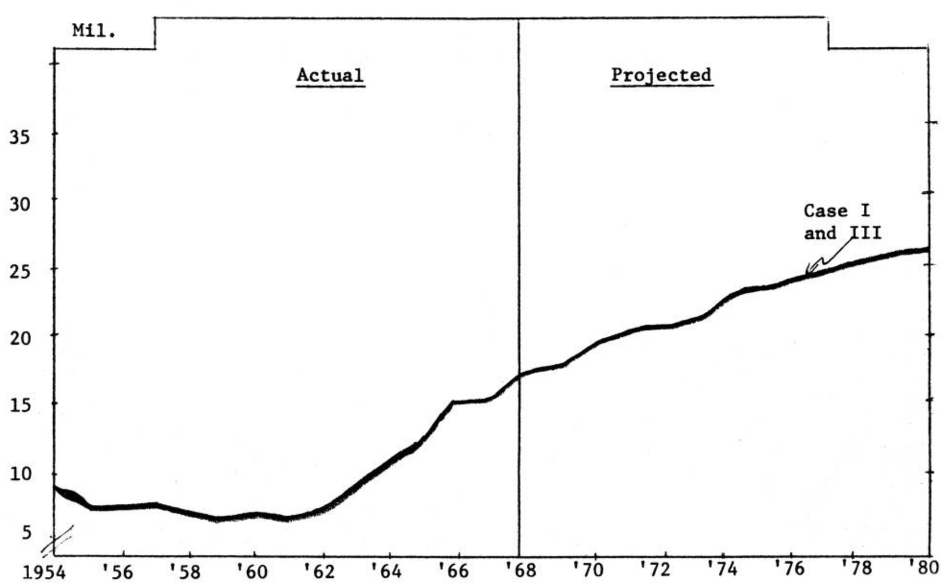


Figure 3.13. Total Grain Acreage, Ireland

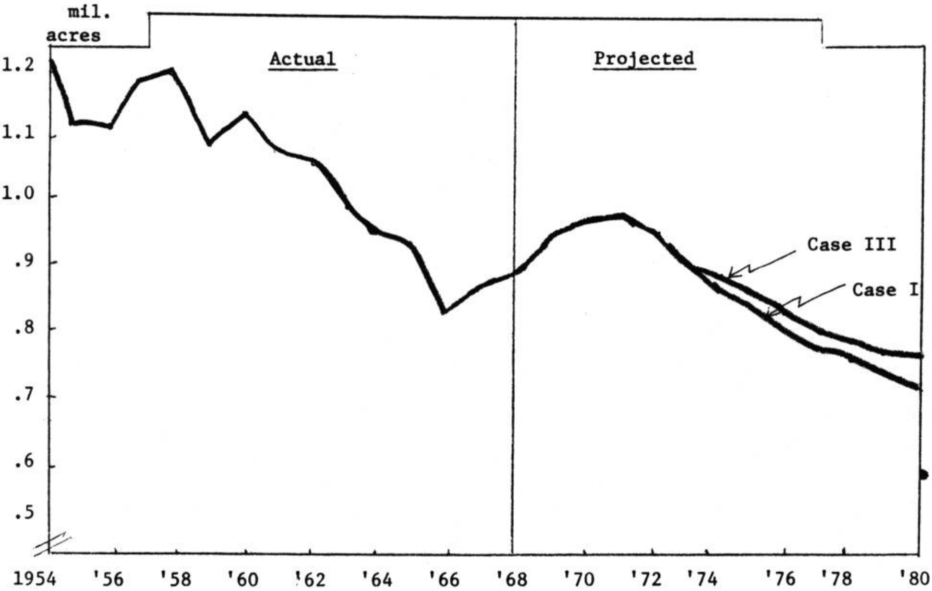
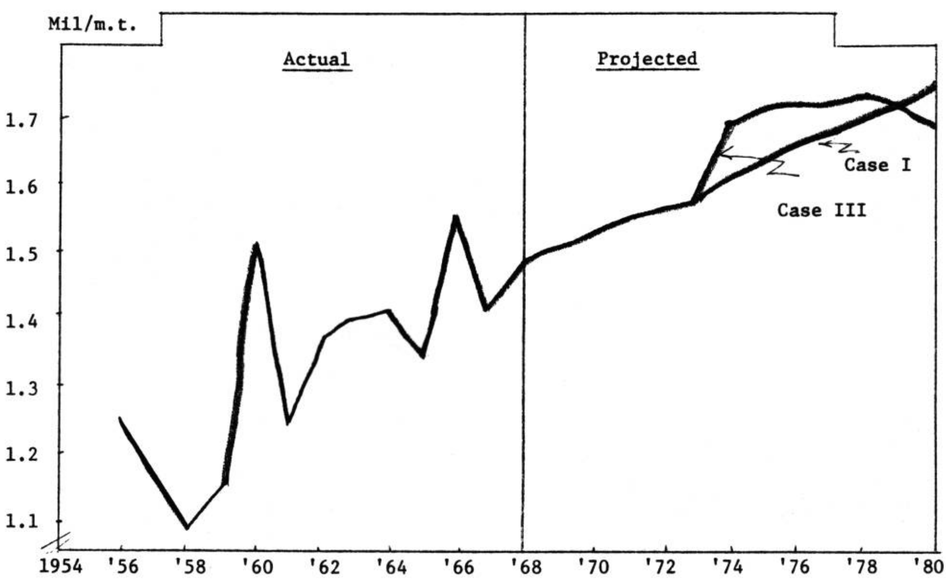


Figure 3.14. Total Feed Concentrate Utilization



and relies heavily on skim milk for feed. Increased movement toward selling whole milk and higher support prices for milk would have some impact. In recent years a more important component of the industry has become commercialized and production is sensitive to grain prices. The historical supply response analysis brings this out and along with projected hog and grain prices suggests that a relative plateau has been reached under the non-entry assumption. A modest decline might continue through the 1970s.

With entry to the EEC, hog production likely would decline sharply. This would result from an increase in grain prices relative to hog prices. The projections based on historical price relationships possibly overstate this decline since an adjustment to reflect strengthening market prices within Ireland as supplies diminish toward and below a level equal to domestic self-sufficiency would occur.

Ireland's poultry industry has been shifting composition and expanding fairly rapidly in total output since the early 1960s. Sharp declines have occurred in production of turkeys and "ordinary" fowl while broiler production has increased. The number of laying hens on farms and egg production have steadily declined in recent years. Because of sharp shifts in the structure and composition of the poultry industry no significant price related supply response could be obtained. Hence production both of poultry meat and eggs are included in the computerized model on a time trend basis both in and out of the EEC.

Grains. Total grain acreage has declined substantially since the early 1950s as indicated in figure 3.13. The total decline is from 1,182,000 acres in 1954 to 896,000 acres in 1968. However, due to increased yields, output increased from 1,140,000 tons to 1,427,000 tons during the same period. Considerable change in the composition of grain acreage and output also has occurred.

Acreage of oats has decreased from 533,000 in 1954 to 218,000 in 1968. Production of oats decreased from 475,000 tons in 1953 to 281,000 tons in 1968. Yields (hundredweight/acre) has increased from 17.8 in 1954 to 25.7 in 1968. Production decreased from 475,000 tons in 1954 to 281,000 tons in 1968.

Barley acreage rose from 163,000 acres in 1954 to 454,000 acres in 1968. Production increased from 176,000 tons in 1954 to 740,000 tons in 1968. Yield in hundredweight/acre rose from 21.7 in 1955 to 32.6 hundredweight in 1968. Sales off farms consequently rose from 116,000 tons in 1954 to 523,000 tons in 1968.

Wheat acreage although subject to some fluctuation fell from 486,000 acres in 1954 to 224,000 acres in 1968. Production fell from 489,000 tons in 1953 to 406,000 tons in 1968. Yield per acre increased from 20.1 hundredweights/acre in 1954 to 36.6 hundredweights in 1968 and sales off farms decreased from 488,000 tons in 1954 to 402,000 tons in 1968.

The percentage of grain acreage under wheat declined from 41.1 in 1954 to 25.0 in 1968. The percentage under oats decreased from 45.1 in 1954 to 24.4 in 1968. Barley acreage increased from 13.8 percent of total grain acreage in 1954 to 50.7 percent in 1968.

The dominant feature of the projections to 1980 is that total grain acreage will likely decrease further and with little difference caused by entry into the EEC. The estimating equation for acreage response uses grain prices deflated by the livestock price index. Given the competition between grain and livestock for land use this relation is to be expected, and since the relationship between these prices are projected to be similar in or out of the EEC, a similar acreage pattern should be expected in either case. This decline in acreage will be only partially offset by yield increases, hence, will lead to a modest decline in total production.

Supply Elasticities

As in the U.K. supply, elasticities were computed for the main products for the years 1969 to 1973 (Table 3.13.). The procedure used was the same as that used in the U.K. model and the elasticities should be interpreted the same way.

In Ireland no elasticities are included for poultry and eggs since no significant historical price-production relations were obtained. For the commodities included, pigmeat production is most responsive to price followed by lambs, grain, cattle and milk. In the case of cattle, virtually no change in output would occur the first two years and the major response would develop in the third year. Continuing response throughout the five years would occur for lambs, hogs and grains whereas the primary response for milk is indicated during the first year. These all appear to be logical patterns except in the case of milk where a smaller response the first year might be expected with a cumulative increase for three to four years. The total five year response on milk in relation to other products, however, does not appear unreasonable.

Table 3.13. Supply Elasticities on Major Farm Products, Ireland.

Relationship		Percent Change in Quantity				
Effect of a 1 percent increase in price of	on the production of	Years after price change				
		1	2	3	4	5
Milk	Milk	.36	.35	.35	.35	.36
Cattle	Beef	.01	.01	.42	.43	.44
Fat Lambs	Lambs & mutton	.35	.71	1.06	1.50	2.04
Hogs	Pigmeat	.35	1.26	1.70	2.00	2.05
Grain[1/]	Grain	.45	.75	.93	1.04	1.14

[1/] Weighted average realized price.

Total Utilization and Production

Tables 3.14, 3.15 and 3.16 include estimates of total food consumption and production for the major commodities included in this study. Ireland is unique among countries in that consumption levels from 1955 through 1965 were reduced by a net decline in population. This trend was reversed during the late 1960s and further -- though modest -- increases are projected through the 1970s. This along with improved incomes will result in expansion of needs for most livestock products and relatively steady requirement for bread and cereals for human consumption. Some increase in the use of cereals for industrial production will occur.

The most important change in production is the recent increase in beef and milk output. Further increase will occur particularly if entry to the EEC is achieved. If Ireland remains outside the EEC, mutton and lamb and pigmeat production are projected to remain approximately at or somewhat above domestic requirements. In the EEC price relationships shift so that the model indicates these enterprises will decline substantially. Declines of the extent indicated by the model, however, are not likely to occur. In the case of mutton and lamb, natural conditions and land use considerations can be expected to place a lower limit. In hogs the question of comparative advantage and the use of resources

Table 3.14. Total Human Consumption By Specific Products Selected Years 1955 - 68, and Projections to 1980 Under Alternative Policy Assumptions. 1/

Item	Actual				Projected 1980	
	1955	1960	1965	1968	Case I	Case III
	1000 m.t.				1000 m.t.	
Beef	42	43	45	52	64	62
Mutton and Lamb	21	31	30	32	54	50
Pigmeat	67	63	88	73	95	88
Poultrymeat	14	15	21	25	50	47
Eggs	52	49	45	39	30	31
Liquid Milk	574	616	623	623	672	671
Butter	42	39	44	38	54	52
Cheese	2	3	5	6	8	8
Margarine	6	9	9	11	11	12
Bread	225	198	181	171	170	169

1/ Historical data computed from population and per capita demand values used in the demand model.

Table 3.15. Total Production in Selected Years, 1955-68, and Projections to 1980 Under Alternative Policy Assumptions.

Item	Actual				Projected 1980		
	1955	1960	1965	1968	Case I	Case III	1971
	1000 m.t.				1000 m.t.		
Milk[1/]							
Product weight	2736	3132	3312	3606	6739	9018	3713
Fat equiv. (@ 3.5%)	96	109	116	126	236	316	
Solids-not-fat equiv. (@ 8.6%)	235	269	285	310	579	775	
Beef and Veal[2/]	225	252	262	337	507	682	225 ?
Mutton and Lamb[2/]	29	48	51	50	21	21	
Pigmeat[2/]	85	96	139	115	108	39	145
Poultrymeat[2/]	21	18	22	25	37	45	32
Eggs[2/]	56	48	45	41	34	34	40
Cereal[1/]							
Bread Grain (wheat)	399	461	229	406	80	86	
Feed Grain	813	854	925	1021	1176	1202	
Total	1212	1315	1154	1427	1256	1296	

Sources for historical data [1/]Irish Statistical Bulletin.
[2/]OECD Agricultural Statistics.

Table 3.16. Total Cereal and Milk Utilization, 1968 and Projected 1980, Under Alternative Policy Assumptions.

Item	1968	Case I 1980	Case III 1980
		1000 m.t.	
Grain equivalent			
Human Food1/	352 1/	352	356
Industrial2/	152	160	160
Livestock3/	950	1095	1067
Seed and Other4/	66	55	56
Total	1380	1662	1639
Milk			
Fat equivalent5/	72	85	83
Solid-not-fat equivalent6/	70	78	78

1/ Based on OECD data, 88.8 kg/capita total consumption in flour equivalent using a factor of 1.368 to compute grain equivalent. Total consumption in 1980 approximated by using model results for bread consumption.

2/ Computed using a constant factor of .052 m.t. per capita.

3/ Data for 1967/68 from OECD Agricultural Statistics. Estimates for 1980 are 63 percent of projected total concentrate utilization.

4/ Computed using a constant factor of .1836 m.t./ha.

5/ Computed using conversion factors of .038 for liquid milk, .95 for butter and .373 for cheese. The total from these three items was increased by 6.6 percent to account for cream, dried milk and condensed. This assumes a consumption pattern similar to the U.K.

6/ Computed using conversion factors of .087 for liquid milk, and .92 for cheese. The total from these items was increased by 18.4 percent to allow for cream, dried milk, and condensed. This assumes a consumption pattern similar to the U.K.

for the cattle enterprise as well as competition with Netherlands and Denmark will become important. Ireland could well become an importer of pork and bacon. The model clearly indicates that economic pressures will be in that direction.

As indicated by the footnotes to Table 3.17, the computations on total grain utilization are at best rough. Only bread consumption was incorporated into the food demand model. Industrial and seed use are based on use rates in the U.K. Estimates for livestock use in 1980 are from the model projection with 63 percent of total concentrate assumed to be grain. The OECD reports 950,000 metric tons of grain use for livestock in 1967/68 and this is used for the base year.[4/]

Trade Implications

The major conclusion concerning trade is that Ireland will have to continue to expand non-domestic outlets for products of its cattle enterprise whether entry occurs or not. Without entry this will require market development at least as rapid as has occurred during the 1960s. Given world market conditions the projected increase in dairy production could become burdensome. With entry and with existing EEC policy, price support sales will become available and Ireland will be able to contribute substantially to the existing surplus stocks of dairy products. Ireland will probably move to a deficit position on total grain. A slightly larger deficit is projected outside the EEC but in either case total imports will be small.

[4/] The historical data in Figure 3.14 are from OECD Agricultural Statistics. They are adjusted by a factor of 1.58 to make them comparable to the total concentrate use calculated through the model.

CHAPTER IV

DEMAND AND SUPPLY ANALYSIS FOR GRAIN-LIVESTOCK IN DENMARK

(with appended section on Norway)

Introduction

Denmark, by reason of its geographical location, has always maintained close ties with the European Continent. The country comprises the peninsula of Jutland, arising from the northern part of the Federal Republic of Germany, and some 600 islands, of which two, Funen and Zealand, account for most of the remaining land area. The population of just less than 5 million had an average income level of over $2300 in 1969. As with the Republic of Ireland, Denmark has an important livestock exporting sector and strong historical links with the British market. This made a study of Danish agricultural production imperative in assessing the effect of EEC expansion on agricultural trade patterns. Danish food consumption is analyzed in this chapter though the effect on Atlantic trade volume is unlikely to be crucial.

Denmark, along with the United Kingdom, is a member of EFTA. As such, trade in industrial goods has been virtually free of tariffs for some time. The reduction of trade barriers with the Community would give Danish industry an even larger market; development of a more elaborate road transport system linking the islands with Jutland and the mainland of Europe would open opportunities for industrial trade in both directions. The most immediate effect of full membership of the EEC, for which Denmark applied in 1967 along with the U.K., Ireland and Norway, would be to increase the price realized on agricultural exports to Britain. Whereas in the case of Ireland such an improvement in the terms of trade would benefit the exchequer in the first instance, in Denmark the advantage would be reflected in producer prices. Considerable expansion could aggravate incipient surpluses in Europe of pigmeat and add to stocks of dairy products; the Danes would, in effect, be inheriting at small cost an elaborate price support mechanism they have not chosen to afford.

The links between the Danish and British economies have been strong but less close than between Ireland and Britain. The U.K. has taken roughly one half of Danish agricultural exports and some 20 percent of total Danish exports. Sales to the EEC and the USA have accounted for 23 percent and 9 percent respectively, while other Scandinavian countries have taken about 25 percent of Danish exports. This latter proportion has risen from 13 percent in 1950; over the same period the U.K. market has dropped from 42 percent of exports. The Danish Kroner has been under some pressure in recent years as a result of a persistent trade deficit, balanced by significant inflows of long-term capital. This situation was presumably not helped by the devaluation in November, 1967, of the kroner by 7.9 percent (to 1 kr = $0.133), since the exchange rates of several competitors and markets also changed. Relative to the U.K. and Ireland, Denmark in effect revalued by over 6 percent; relative to New Zealand the revaluation was about 12 percent. A further devaluation in Denmark could be necessitated if export earnings continue weak. Entry into the EEC would probably forestall such a move.

Agricultural Policy

Denmark has been a relative latecomer among those countries which support farm prices by direct government involvement. With the advent of low priced grain from the New World in the 1880s, Denmark chose to develop an intensive livestock industry based on pig and poultry farming. Throughout the 1950s Danish farmers received prices for their products based on the export market. Cooperative marketing had developed to a high degree of efficiency and comprehensiveness. But pressure on export earnings in the late 1950s and the belief that agricultural incomes were lagging behind those in the rest of the economy led to the development of legislation designed to raise farm prices.

Two features are of general interest in the present context. First, the relative novelty of a government sanctioned support policy gives Danish attitudes a flexibility on questions of policy change not found elsewhere in Europe. Second, the importance of farmers and farm groups (such as the Export Marketing Boards) in the formulation and implementation of policy gives the industry a measure of self determination, again unusual in Europe. Thus the "home market prices" for livestock products mentioned below are, in effect, suggested by the marketing agencies and justified to a monopolies commission, rather than being imposed by government decision.

Another more specific aspect of Danish policy of some significance is the relationship between the feed grain program and the predominant livestock sector. It has often been said that recent grain price support policies have been intended to restrain the profitability of pigmeat production so that the export markets are not oversupplied. In particular there is the fear that the terms of trade loss arising from extra pigmeat sales on the U.K. market would more than counter the effect on earnings from the volume increase. Given the existence of the Bacon Market Understanding which allocates the British market among domestic and imported sources, such a fear may have a basis.

The present price support system for grains in Denmark has its origin in the 1958 measure which established guaranteed prices for domestic food grains to be maintained with intervention buying. Excess wheat was denatured for feed, and a minimum proportionate content of domestic grain had to be used in making flour. This mixing regulation has persisted to the present and is commonly set at 100 percent. In 1966 the guaranteed price system was abolished and replaced by a set of variable import levies designed to maintain basic prices. The measures for supporting food grain prices thus became comparable with those for animal feed grains established in 1958. The basic prices were made uniform for all grains at $69.33 per ton in 1966 and have remained at that level since then. Revenue from the grain levies, together with a government subsidy from the exchequer, is credited to the Grain Equalization Fund. This fund disburses money to certain grain exporters (mainly seed and malting barley), to pig and poultry producers as compensation for the higher feed costs, and to small (mainly dairy) farmers to offset the presumed benefit to large farms of the levy on grain.

Although there has been mounting criticism of the grain program, and mounting cost to the government, it has been assumed in the "outside EEC" alternative of the results reported in this study that this support system will continue. If Denmark were to adhere to the CAP, the transition to the European support system for grains would be straightforward. The Danish farm prices and feed costs implied by entry are discussed under the section on production changes.

The support system for livestock products differs from that for grain. Basically, marketing agencies discriminate between products for domestic and foreign use and charge a higher price for the former, the proceeds being shared over total production. Reimportation is restricted, and the home market price is decided with reference to cost conditions and vetted by the monopolies commission.

The first of such schemes was introduced for butter and some other milk products in 1959. The government imposed levy on home sales was replaced in 1961 by a voluntary scheme for milk products. The approved price for butter sales on the domestic market increased from \$.97 per kg. in 1961 to \$1.33 per kg. in 1967. A similar levy was introduced in 1961 for pigmeat. In 1962, this was superceded by a general home market levy system for beef, pigmeat, poultry and eggs. For these products, the levy varies with export market conditions since, in general, the scheme is designed to ensure a particular level of return to the producer. As the home market is often only a small part of total sales (especially in the case of pigmeat) the domestic price can differ sharply from the world trade price.

In adopting the CAP of the European Community, the major impact would, therefore, arise from the establishment of lucrative export sales especially in the U.K. market but also in other Western European countries. In addition, any surpluses that might develop would be purchased by the intervention authorities and stored or sold abroad with a restitution at the expense of the EEC Farm Fund. Danish consumer prices are not greatly different from those implied by adoption of the CAP.

It is considered unlikely that produce from Denmark would have to pay the full variable levy on entry into the U.K. market, even if EEC entry were not achieved. The products of most interest to Denmark (bacon, butter and cheese) are all at present covered by market-sharing agreements, and variable levies on them have not as yet been proposed. When in a similar situation, Sweden imposed levies on Danish agricultural goods, compensation was paid to Denmark--in effect the levy was returned--and this "Swedish money" has since been used for financing farm programs.

Food Consumption

The method of predicting retail demand for Denmark follows closely that used in the analysis for U.K. and Ireland. The description will not be repeated. Data on per capita food consumption and on retail prices were largely from a study by the Farmers' Union and the Agricultural Council of Denmark entitled, Danske Landbrugsvarer pa Hjemmemarkedet published in 1966. Of great value was the recent study on Projections of Supply and Demand for Agricultural Products in Denmark (1970-1980) conducted by the Aarhus University Economic Institute. Indeed the demand study for the commodities selected differs from the Aarhus report mainly in that this present analysis:

a) uses two more years data

b) employs different functional forms for demand equations

c) uses nominal rather than real prices and income, since homogeneity is imposed subsequently (see Chapter II) rather than being required by the form of the variables.

Where comparable, the two analyses yielded similar results, and the Aarhus study was used to fill in some "missing" elasticity values where the time series failed. The Aarhus study did not, however, project demand under different price assumptions, and their model is somewhat less adaptable to the analysis of policy changes. It is somewhat difficult to compare the projections of the two models.

The functional forms employed in the regression analysis of price and income response were as for the U.K. Table 4.1 gives the equations selected as the basis for the demand matrix. With the exception of the equation for milk consumption, the regression analysis was successful in explaining most consumption patterns. For oatmeal, margarine and poultrymeat, the price elasticity figure was taken from the Aarhus study since, in these instances, the earlier work was clearly more successful at isolating a price response. Since the data used in these two studies was, in general, comparable, it must be concluded that Aarhus had access to more satisfactory price series in these cases.

The elasticities implied by the estimated demand functions were transferred to the demand matrix, and the remaining cross elasticities were derived by the method explained in Appendix F.

Assumptions on Economic Growth Rate, Population and Inflation

The real per capita GNP has been growing at about 3.7 percent per annum over the period 1954-1968. However, there is considerable concern over whether the chronic balance of payments problem of Denmark will allow a continuation of this trend. The Aarhus study projects a growth rate of 3 percent per annum and this has been employed in the model described in this chapter. Inflation has been assumed to be at 4 percent per annum as with the other two countries.

The same rate of inflation is assumed with entry as without entry into the EEC. The higher input prices in the EEC as compared with Denmark are of concern to Danish farmers. Considering the 5-year transition period and the importance of cooperatives in supplying inputs to Danish farmers, it was felt that the greater upward pressure on input prices with entry would not materially affect production by 1980. The impact of higher feed grain prices, of course, is measured in the model.

Consumption as a proportion of GNP has declined steadily over the past fifteen years. This trend has been assumed to continue. Table 4.3 shows the

Table 4.1. Demand Equations, Denmark[1/]

	$\bar{R}^2$	D.W.
BFV = 23.17 - 0.19 BVP + 0.13 PGP + 5.99 LEXP (0.04) (0.05) (3.65)	0.84	1.75
LPGM = 7.58 - 1.37 LPCP + 0.66 LBVP - 0.42 REXP (0.22) (0.19) (0.10)	0.73	2.20
PLTR = 5.22 - 0.00 PLP + 3.84 LEXP (0.01) (0.98)	0.91	2.31
LEGG = 3.60 - 0.17 LEGP - 0.42 REXP (0.11) (0.06)	0.86	1.00
LMLK = 5.93 - 0.32 LMLP - 0.21 REXP (0.14) (0.09)	0.23	1.24
LBUT = 7.60 - 1.00 LBUP - 0.50 REXP (0.08) (0.04)	0.92	2.36
CHSE = 19.34 - 0.11 CHP + 9.14 LEXP (0.03) (1.55)	0.90	1.87
LMRG = 2.63 - 0.70 LEXP (0.03)	0.68	2.01
LWHF = 3.86 + 0.00 LWFP - 0.10 EXP (0.05) (0.02)	0.71	2.29
LOAT = 0.88 + 0.52 REXP (0.03)	0.95	2.31
LDCR = 2.40 - 0.23 LDCP + 0.60 LEXP (0.18) (0.10)	0.97	1.21
LCCR = 2.43 - 0.32 LCCR - 0.50 LEXP (0.16) (0.08)	0.99	1.49
LRYF = 2.88 + 0.41 REXP (0.03)	0.93	0.44

1/ For explanation of variable labels, see Table 4.2 and the discussion of Table 2.1. Prices are in \$/100 kg. except milk which is in \$/100 litres. Quantities are in kg/head/year. Expenditure is in \$1000/hd. Annual data for 1954-68 were included in this analysis.

Table 4.2. Explanation of Variable Tables for Table 4.1

Item	Consumption	Log of Consumption	Price	Log of Price
Beef and veal	BFV	LBFV	BVP	LBVP
Pigmeat	PIGM	LPGM	PGP	LPGP
Poultry	PLTR	LPTR	PLP	LPLP
Eggs	EGG	LEGG	EGP	LEGP
Liquid milk	MILK	LMLK	LMP	LLMP
Butter	BUTT	LBUT	BUP	LBUP
Cheese	CHSE	LCHS	CHP	LCHP
Cream for coffee (18%)	CCRM	LCCR	CCP	LCCP
Double cream (36%)	DCRM	LDCR	DCP	LDCP
Margarine	MARG	LMRG	MGP	LMGP
Wheat flour	WHFL	LWHF	WFP	LWFP
Oatmeal	OATM	LOAT	OPP	LOPP
Rye flour	RYFL	LRYF	RFP	LRFP

projected growth in income and consumption to 1980 based on these assumptions. The nominal per capita private consumption expenditure is thus expected to increase from $1,730 to $3,750 over the decade.

Table 4.3. Projected Population and Income Levels, Denmark, 1969-1980, 3.0 Percent Growth, 4 Percent Inflation.[1/]

	Population	Real GNP (1968 prices)	Current GNP	Private Consumption Expenditure	Per capita P.C.E.
	Mil.	$bil.	$bil.	$bil.	$1000
1969	4.89	13.90	14.45	8.44	1.73
1970	4.92	14.32	15.48	9.12	1.85
1971	4.96	14.74	16.59	9.85	1.99
1972	5.00	15.19	17.77	10.65	2.13
1973	5.03	15.64	19.03	11.51	2.29
1974	5.07	16.11	20.39	12.43	2.45
1975	5.10	16.60	21.84	13.44	2.63
1976	5.14	17.09	23.39	14.52	2.82
1977	5.18	17.61	25.06	15.69	3.03
1978	5.22	18.13	26.84	16.96	3.25
1979	5.25	18.68	28.75	18.32	3.49
1980	5.28	19.21	30.79	19.78	3.75

[1/] Historical data are given in Table D.3 of Appendix D.

Assumptions on Retail Prices and Margins

As in the U.K. and Irish demand analyses, projections of retail food prices were derived from farm prices plus a marketing margin except on margarine. The farm prices used were not the blend prices actually received by farmers but were the "home market" prices on dairy, poultry and livestock. Market prices were used on cereals. These price projections to 1980 were developed for both Case I (Out EEC) and Case III (In EEC) and are explained in the supply analysis section of this chapter.

Marketing margins were estimated from annual data for 1954-68 and were extrapolated linearly to 1980. An additional 1.5 percent per year increase was injected into projected margins to improve the consistency of the model with respect to anticipated change in the general price level. These margins and the relevant farm prices are presented in Table 4.4. Note that an allowance for processing costs was added to the margins on butter and cheese and was then deducted when adding margins to farm prices to obtain retail prices.

The retail prices for selected years and projections to 1979 are shown in Table 4.5. Most retail food prices would be expected to be somewhat higher in Case III than Case I, but the differences are small. This is because of the home market levies holding domestic prices well above export prices under the current farm program. Price increases of 50 to 70 percent between 1968 and 1979 were projected for most products, except that poultry and egg prices would be relatively stable as home market levies are reduced under Case I. Under Case III, poultry prices would remain fairly steady while beef, pigmeat, and cheese prices would rise more sharply than under Case I.

Recent Trends and Projections of Per Capita Consumption

Trends in the per capita consumption of major food products and projections to 1980 are indicated in Table 4.6. Beef and veal consumption per capita, which has been increasing, is expected to continue upward in the coming decade. However, higher prices forecasted for this period may retard this expansion. This will bolster the demand for pigmeat with per capita consumption expected to recover to the level achieved in 1960. Even higher projections are indicated for 1980 with entry into the EEC because retail pigmeat prices are slightly lower and beef and veal prices higher than in the "Out EEC" case.

Poultry and egg consumption have been rising and are projected to continue to increase in the 1970s. This is due in part to the stable retail prices anticipated.

Trends underway in the consumption of liquid milk and dairy products are expected to continue to 1980 with only minor modifications. A recent decline in liquid milk consumption is expected to level off and a moderate increase is projected in butter consumption in both Case I and Case III. Cheese consumption will continue upward as will consumption of double cream. Consumption of coffee cream is expected to stabilize at the low level of 1968.

Consumption of margarine, wheat flour, oatmeal and rye flour has been dropping off in recent years. This trend is projected to continue to 1980.

Because retail food prices are not expected to be much different in the EEC than out, consumption is also not expected to be affected very much. Only on pigmeat, for the reasons mentioned, are the differences significant.

Table 4.4. Farm Prices and Marketing Margins in Selected Years, 1955-68, and Projections to 1979 Under Alternative Policy Assumptions, Denmark.1/

Item	Farm Price (F) or Margin (M)	Actual 1955	Actual 1960	Actual 1965	Actual 1968	Projected 1979 Case I	Projected 1979 Case III
		$/kg				$/kg	
Beef and veal	F	.528	.565	.768	.662	1.003	1.378
	M	.251	.361	.546	.710	1.213	1.213
Pigmeat	F	.546	.532	.741	.810	.983	.900
	M	.344	.485	.698	.841	1.472	1.321
Poultry	F	--	--	.608	.696	.472	.618
	M	--	--	.346	.271	.351	.351
Eggs	F	.505	.423	.553	.633	.422	.580
	M	.147	.147	.265	.333	.648	.648
Liquid milk (3.65%)	F	.054	.052	.064	.072	.098	.109
	M	.041	.057	.085	.099	.176	.176
Butter	F	.893	.825	1.152	1.333	1.626	1.780
	M	.220	.259	.305	.326	.519	.519
Cheese	F	.506	.447	.565	.646	1.013	1.575
	M	.327	.407	.546	.620	1.061	1.061
Cream for coffee	F	.265	.257	.314	.354	.483	.537
	M	.201	.249	.365	.352	.555	.555
Double cream	F	--	.515	.629	.709	.966	1.075
	M	--	.210	.245	.304	.535	.535
Wheat flour	F	.085	.103	.105	.093	.106	.142
	M	.045	.087	.095	.107	.194	.194

1/ Farm prices represent "home market" prices and not blend prices to farmers (except on wheat flour which involves no home market levies) converted to carcass basis on livestock and retail weight basis on poultry, butter, cheese, cream for coffee and double cream. Allowances for processing costs were added to margins on butter and cheese and consequently must be deducted to derive retail prices from the stated farm prices and margins.

Table 4.5. Retail Prices in Selected Years, 1955-68, and Projections to 1979 Under Alternative Policy Assumptions, Denmark.

Item	Actual Prices				1979 Projections and Change From 1968			
					Case I		Case III	
	1955	1960	1965	1968	Price	Index	Price	Index
	$/kg				$/kg	1968=100	$/kg	1968=100
Beef and veal	.78	.93	1.31	1.37	2.22	162	2.59	189
Pigmeat	.89	1.02	1.44	1.65	2.46	149	2.37	144
Poultry	.92	.82	.95	.97	.82	85	.97	100
Eggs	.65	.57	.82	.97	1.07	110	1.23	127
Liquid milk (3.65%)	.10	.11	.15	.17	.27	159	.28	165
Butter	.99	.96	1.30	1.50	1.90	127	2.05	137
Cheese	.76	.78	1.03	1.20	1.93	161	2.50	208
Cream for coffee	.47	.51	.68	.71	1.04	146	1.09	154
Double cream	.60	.73	.93	1.01	1.50	149	1.61	159
Margarine	--	--	--	1.00	1.54	154	1.54	154
Wheat flour	.13	.19	.20	.20	.30	150	.34	170
Oatmeal	--	--	--	.20	.30	150	.34	170
Rye flour	--	--	--	.20	.30	150	.34	170

1/ More historical data are given in Table D.2 of Appendix D.

Table 4.6. Per Capita Consumptions in Selected Years, 1955-68, and Projections to 1980 Under Alternative Policy Assumptions, Denmark. 1/

Item	Expenditures 1968	Per Capita Consumptions							
		Actual				1980 Projections and Change From 1968			
		1955	1960	1965	1968	Out EEC		In EEC	
	$	kg	kg	kg	kg	kg	Index 1968=100	kg	Index 1968=100
Beef and veal	28.91	17.2	17.3	17.9	21.1	22.1	105	22.0	104
Pigmeat	61.88	36.7	42.7	39.4	37.5	42.3	113	49.4	132
Poultry	4.75	3.2	3.9	4.6	4.9	6.2	127	5.9	120
Eggs	11.35	9.0	10.3	12.4	11.7	12.8	109	12.5	107
Liquid milk	21.74	128.9	135.3	134.9	127.9	128.5	100	127.1	99
Butter	14.25	8.6	11.0	10.1	9.5	10.7	113	10.6	112
Cheese	12.24	6.6	9.0	9.5	10.2	11.8	116	11.7	115
Cream for coffee	1.63	4.3	3.7	2.6	2.3	2.2	96	2.2	96
Double cream	5.25	3.2	3.7	4.3	5.2	5.8	112	5.7	110
Margarine	12.80	15.2	14.6	13.6	12.8	11.2	88	11.5	90
Wheat flour	7.86	43.4	42.7	42.1	39.3	37.8	96	37.9	96
Oatmeal	.66	5.3	4.3	3.8	3.3	3.2	97	3.2	97
Rye flour	4.68	36.8	28.9	25.1	23.4	22.6	97	22.7	97

1/ More historical data are given in Table D.1 of Appendix D.

Supply Analysis[1/]

Danish agriculture is characterized by modest-sized dairy-swine operations and a high percentage of the agricultural land in cereals. A typical commercial farm would have 15-30 hectares, over half of which was in cereals, with around 15 milking cows and about 10 brood sows (Tables D.4 and D.5). The typical farm would be operated by the owner who would be about 55 years of age. He would have no regular workers. The typical farm would be smaller than in the U.K. but would be larger than found on the Continent.

In 1968, three fourths of the agricultural holdings in Denmark had both cattle and hogs. These farms with both cattle and hogs accounted for 94 percent of all cattle and 83 percent of all swine. Milk and swine production in Denmark represented two thirds of the total value of the agricultural product. Adding the value of cattle and calves produced, nearly all of which originated with the dairy herd, cattle and swine represented 83 percent of the total value in 1968.

The total value of the agricultural product in Denmark in 1968 was 9.6 billion kroner ($1.25 billion). This figure, of course, includes only the portion of feed produced which is actually sold. In 1968, 366 million kroner of cereals were sold from farms, mostly wheat and rye for milling and barley for malt production. The value of cereal production in 1967-68, priced at market value of about 50 kroner per 100 kg., was about 2.9 billion kroner. The other major products included eggs (319 million kroner), poultrymeat (226 million kroner) and sugar beets (246 million kroner).

In 1968, there were 152,708 farms in Denmark, a decline of 22 percent from 1960. Of this number, just over half were less than 15 hectares, 30 percent were 15 to 30 hectares, 14 percent were 30-60 hectares and only 5000 farms, or 3 percent, were larger than 60 hectares. The decline in numbers has been mostly among farms under 15 hectares, while those above 30 hectares have been increasing.

The small size of farm is also reflected in livestock numbers. Nearly half the dairy herds are under 10 cows and over half the farms with swine have less than 50 head (Table D.5). About 60 percent of the hens are in flocks of

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[1/] Most of the data used in the study was obtained from or derived from the series of annual statistical publications, Landbrugsstatistik from Denmark Statistics. Other widely used publications included Landbrugsstatistik 1900-1965 Bind I and Landbrugsstatistik, 1900-1965 Bind II.

under 300, with only 20 percent in flocks of 1000 hens or more. Poultry production tends to be concentrated in somewhat larger units. In June, 1968, 83 percent of the broilers on farms were in units with a stock of 5000 or more birds. Thirty-five percent of the broilers were in units of 25,000 or more birds. The average size of operation on poultry has increased substantially since 1960, but the growth in size of dairy and swine operations has been gradual.

One dramatic change in Danish agriculture in the past decade has been the decline in the labor force. During the 1960s when the number of farms was declining from 196,076 in 1960 to 152,708 in 1968, the number of workers on farms (excluding the farmer) declined from 128,319 to 44,073. This has made the farmer much more dependent upon his own personal labor. Since just over half the farms have dairy cows, a good share of Danish farmers are saddled with 7 days per week--52 weeks per year responsibility. Potentially, a large number of Danish farmers could be shifting enterprises or employment if reasonable opportunities exist. The potential for specialization is substantial.

The Danish livestock and dairy farmer is vulnerable to international developments since two thirds of his product is exported. The market is beyond his direct control except to the extent that the Danish farmer, his organizations and the government are able to develop quality products, engage in marketing activities, and subsidize exports. Under a two price plan, domestic prices are elevated through a levy system to help subsidize exports at a lower price level. But with only one-third going to the domestic market, this technique has severe limitations. To the usual uncertainties of the international market has been added the question of joining the EEC. It may well be that the modest size of Danish farms and the prevalence of dairy-swine combinations are in part due to the market risks Danish farmers face. Another reason is the long standing policy against mergers and amalgamations of farms. This policy, however, is being changed and will be less of a factor in the future. Tied in with this is the problem of finding non-farm employment opportunities. The future developments in the general economy of Denmark may have more bearing on the number and size of farms than developments in the agricultural sector itself.

In 1968, 20 percent of the farmers were under 40 years of age; 25 percent were 40-49; 30 percent were 50-59 and 25 percent were 60 or older. This indicates that most of the present farmers will be around for some time.

Over half the farmers are "middle aged" (40-59) and consequently have few alternatives other than to stay on the farm. Expanding non-farm employment opportunities will be necessary to facilitate needed adjustment, and even this is not likely to be sufficient in the next ten years to remove income disparity.

But within agriculture itself, that is among enterprises, adjustments could and would likely take place quickly as relative market prospects change and as encouragement is exerted through farm leadership and through government programs. More secure markets or resolution of the EEC question could result in rapid change in the agricultural production mix. Danish farmers have characteristically been market oriented with strong central direction from farmer co-operatives.

Time Series Analysis

A time series analysis was undertaken to determine whether Danish farmers do respond to changing profit levels on major enterprises and, if so, to measure the impact. The procedure used was similar to the techniques employed in the time series analysis of U.K. supply. Gross margin type variables were used instead of the prices in most of the supply equations.

One difference in Denmark, however, was the availability of enterprise accounts on representative farms over the post World War II period. This information has been collected and analyzed by Det Landøkonomiske Driftsbureau.[2/] These farms are somewhat above average but do give a picture of typical commercial operations over time. Consequently, net returns over variable costs on milk, pigs, eggs and cereals were taken directly from these accounts and they were also used in estimating returns on beef. Farm account data were more difficult to obtain on poultrymeat production but data from "demonstration" farms were available since 1958. These farms would likely be well above average and less representative than the standard farm accounts.

The following equations were estimated by least squares procedures. Standard errors of the coefficients are in parentheses below the coefficients.

Milk

(1) Number of cows on farms $(1000)_t$ = 591
$$+ \underset{(.1808)}{.6665} \text{ Number of cows on farms } (1000)_{t-1}$$

[2/] Det Landøkonomiske Driftsbureau, Undersogelser over Landbrugets Driftsforhold, 2 del. I Kominission Hos, Landhusholdningsselskabets Forlag, Copenhagen.

$$+ \underset{(.1370)}{.1384} \text{ Net returns over variable costs } (\text{Kr/cow})_{t-1}$$

$$- \underset{(37.4)}{110.7} \text{ Price of cull cows } (\text{Kr/Kg})_{t-1}$$

$$\bar{R}^2 = .81 \qquad \text{S.E.E.} = 34$$

(2) Milk production per cow $(\text{Kg})_t = 3286$

$$+ \underset{(3.71)}{34.11} \text{ Time } (1949 = 1)$$

$$\bar{R}^2 = .81 \qquad \text{S.E.E.} = 96$$

(3) Concentrates fed to milk cows, farm accounts $(\text{Kg})_t = 200$

$$+ \underset{(240.6)}{585.3} \text{ (Price of milk} \div \text{Price of concentrates, farm accounts})_t$$

$$+ \underset{(2.66)}{30.10} \text{ Time } (1948 = 1)$$

$$\bar{R}^2 = .89 \qquad \text{S.E.E.} = 67$$

Beef

(1) Slaughter of new-born calves per 100 $\text{cows}_t = 2.17$

$$+ \underset{(.0709)}{.9000} \text{ Slaughter of new-born calves per 100 cows}_{t-1}$$

$$\div \underset{(.00930)}{.01673} \text{ Net returns over variable costs } (\text{Kr./Calf})_{t-1}$$

$$\bar{R}^2 = .94 \qquad \text{S.E.E.} = 2.80$$

(2) Production of heifer beef in t per cow on farms in t-1 (Kg) = .0160

$$+ \underset{(.0818)}{.7660} \text{ Production of heifer beef in t-1 per cow on farms in t-2 (Kg)}$$

$$+ \underset{(.779)}{1.662} \text{ (Price of heifers} \div \text{Price of milk})_{t-1}$$

$$\bar{R}^2 = .91 \qquad \text{S.E.E.} = 3.24$$

Pigs

(1) Sows on farms, July 1 $(1000)_t = -126$

$$+ \underset{(.0572)}{.9567} \text{ Sows on farms, July 1 } (1000)_{t-1}$$

$$+ \underset{(1.109)}{3.509} \text{ Net returns over variable costs per 90 kg, farm accounts}_{t-1}$$

$$\bar{R}^2 = .94 \qquad \text{S.E.E.} = 54$$

(2) Number of swine slaughtered or exported per $\text{sow}_t = 15.55$

$$- \underset{(.0309)}{.1442} \text{ Time } (1949 = 1)$$

$$\bar{R}^2 = .51 \qquad \text{S.E.E.} = .86$$

Layers

(1) Hens, 6 months and over, on farms July 1 $(1000)_t$ = -506

+ .9965 Hens, 6 months and over, on farms July 1 $(1000)_{t-1}$
(.1259)

+ 34.94 Net returns over concentrate costs per hen,
(73.17) farm accounts $(Kr.)_{t-1}$

$\bar{R}^2 = .77$ S.E.E. = 778

Poultrymeat

(1) Production of poultrymeat, except cull layers $(Mil.\ Kg)_t$ = 24.4

+ .6632 Production of poultrymeat, except cull layers $(Mil.\ Kg)_{t-1}$
(.2569)

- 2.496 Net returns over cost of concentrates,
(14.22) demonstration farms $(Kr/Kg)_{t-1}$

$\bar{R}^2 = .80$ S.E.E. = 5.63

Cereals

(1) Total cereal area $(1000\ ha)_t$ = -41.9

+ 1.002 Total cereal area $(1000\ ha)_{t-1}$
(.0573)

+ .05743 (Gross Returns from Cereals per ha. - Gross Returns from
(.02845) Grass and Green Fodder per ha.$)_{t-1}$

$\bar{R}^2 = .95$ S.E.E. = 29.6

(2) Yield of feed grain (feed equivalent per hectare$)_t$ = 2788

+48.08 Time (1949 = 1)
(7.92)

$\bar{R}^2 = .65$ S.E.E. = 204

(3) Yield of wheat $(Kg/ha)_t$ = 2511

+ 75.78 Time (1949 = 1)
(8.32)

$\bar{R}^2 = .81$ S.E.E. = 215

The statistical properties of the equations were acceptable but not particularly "strong." The $\bar{R}^2$'s were satisfactory at .77 or above on all but swine production per sow and feed grain yields, and the signs on the coefficients were as expected except on poultrymeat and swine production per sow. In addition, the profit indicator variables were significant at the 5 percent level on concentrates fed to milk cows, production of heifer beef per cow, sow numbers and total cereal area. As in the U.K., cull cow prices in the previous year had a significant impact on cow numbers on farms. Significant upward time trends were evident on milk production per cow, concentrates fed to milk cows, and cereal yields. Somewhat surprising was a significant decline in the number of swine slaughtered or exported per sow. The signs were as expected, but the coefficients were not significantly different from zero (at the 5 percent level) on the profit indicator variables in the equations on number of milk cows, slaughter of new-born calves per 100 cows, and hen numbers.

The negative coefficient on the net returns over the cost of concentrates on poultrymeat was not significant. With only 11 years of data from a small number of demonstration farms, inconclusive results were not surprising.

Assumptions

Most of the time series equations presented in the previous section were incorporated in the supply model. The equations on slaughter of new-born calves per 100 cows and the number of swine slaughtered or exported per sow were not used because the past trends will not continue in the future. The poultrymeat equation was not used for reasons previously cited. The cereal yield equations were used as a guide but a somewhat less rapid increase in yields was projected for the future.

To be consistent with the classification used in the U.K. model, Cases I and III were considered for Denmark--Case I being the continuation of the current agricultural program and Case III being entry into the EEC.

As in the U.K. and Irish supply models, government subsidies related directly to specific farm products were phased out in Case III. The home market levies were eliminated since two-price plans are not allowed in the current Common Agricultural Policy of EEC.

Price Projections--Trends in Danish farm prices and projections under the two cases are illustrated in Figures 4.1 to 4.12. Both the home market and the export prices are presented. Home market levies are applied to dairy products, beef, pigmeat, poultry and eggs. This separates domestic prices from export prices. A weighted average of the two is used to calculate the blend price received by producers. The weights are equivalent to the proportion of output consumed at home and the proportion exported, respectively.

Some additional computations are necessary to translate home market and export prices to blend prices received by producers. On milk, processing costs are deducted from butter and cheese prices. On pigs, a payment for cooperative earnings is added. Payments from the "grain fund" are added to prices received by poultry and egg producers.

Projections of home market prices for Case I were based partly on anticipated increases in prices paid by farmers, since home market prices were designed to relate to factor prices. Also considered were recent trends in home market prices and prospects for export prices. Projections for export prices in Case I were related to the projections made for U.K. and Ireland.

Entry into the EEC would raise blend farm prices on milk substantially, primarily because of the increases in export prices on butter and cheese (Figures 4.1 to 4.4). The home market prices on butter and liquid milk would not be affected very much assuming the upward trend of recent years would continue anyway. The home market price on cheese would be sharply higher in Case III.

The price received by farmers for milk in Case I would, of course, depend on the relationship between domestic consumption and total production. How the assumed prices on dairy products would affect domestic consumption is discussed in the section on demand. The blend farm prices on milk were derived by estimating the total amount of home market levies on all dairy products per kilogram of milk produced and adding this to an export price equivalent on milk.

Export prices on beef fluctuated over a fairly wide range in the 1960s being tied to world markets (Figure 4.5). Home market prices which can be no lower than export prices also varied appreciably. With world prices expected to remain strong well into the 1970s, export and home market prices on beef in Denmark are expected to follow the trend of the 1960s. Entry into the EEC would accelerate this increase. Similar projections would be made for prices received by farmers for beef (Figure 4.6).

Export prices on pigmeat have edged irregularly upward in the 1960s (Figure 4.7). Some leveling off in this trend is projected for the 1970s, but prices should remain firm. Home market prices which increased from 4 kr/kg to 6 kr/kg in the 1960s are projected to rise to around 7.5 kr/kg by 1980. EEC prices would not differ much from recent home market prices but would be about 50 percent higher than 1968 export prices.

The net effect on blend farm prices on pigmeat in Case I would be a small rise over levels of 1969 and 1970 (Figure 4.8). Entry into EEC would boost prices by about 15-20 percent over Case I. Returns from cooperative earnings were retained in estimating the blend price to producers.

Figure 4.1 Home Market and Export Prices on Butter, Denmark

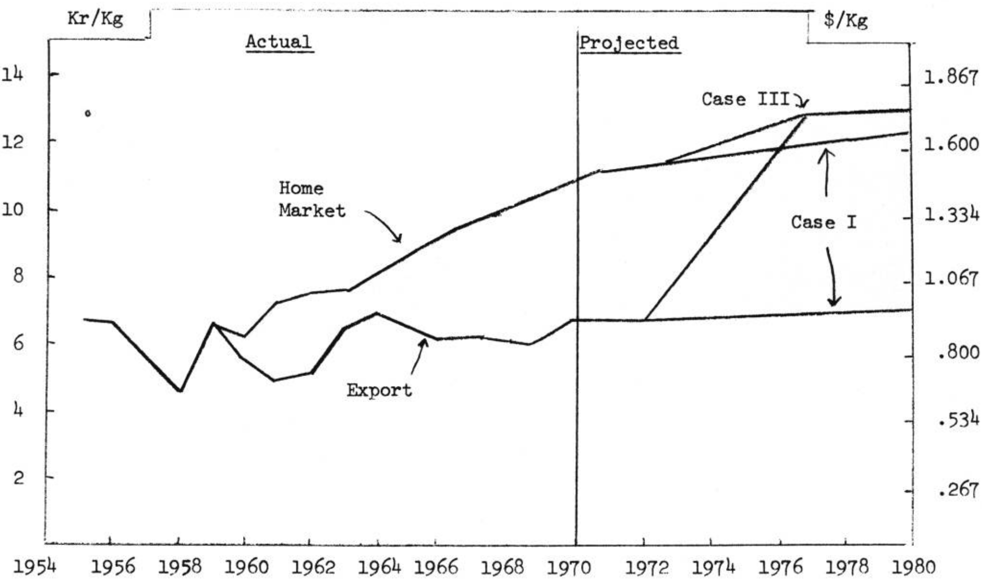


Figure 4.2 Home Market and Export Prices on Cheese, Denmark

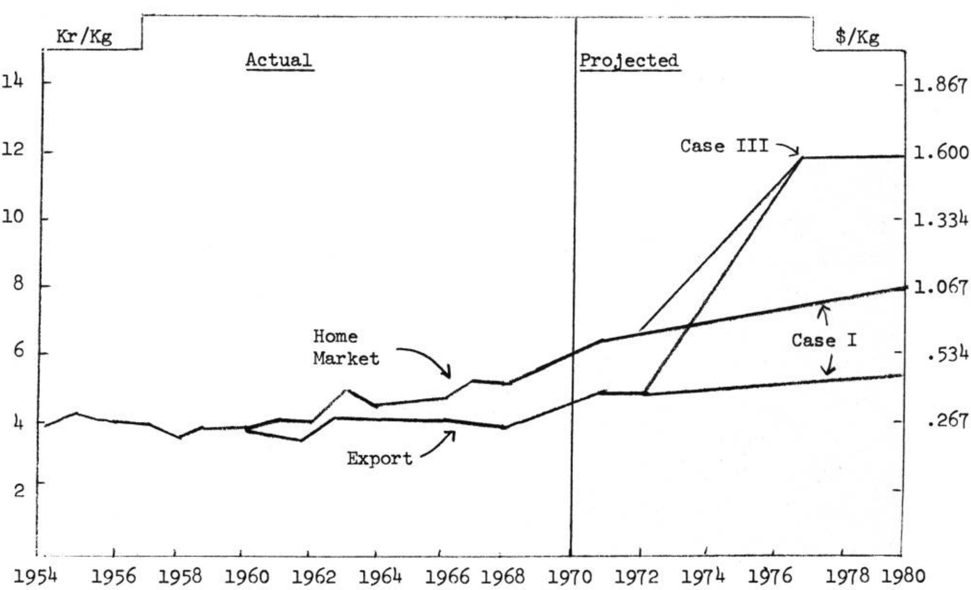


Figure 4.3 Home Market Price on Liquid Milk, 3.65% b.f., Denmark

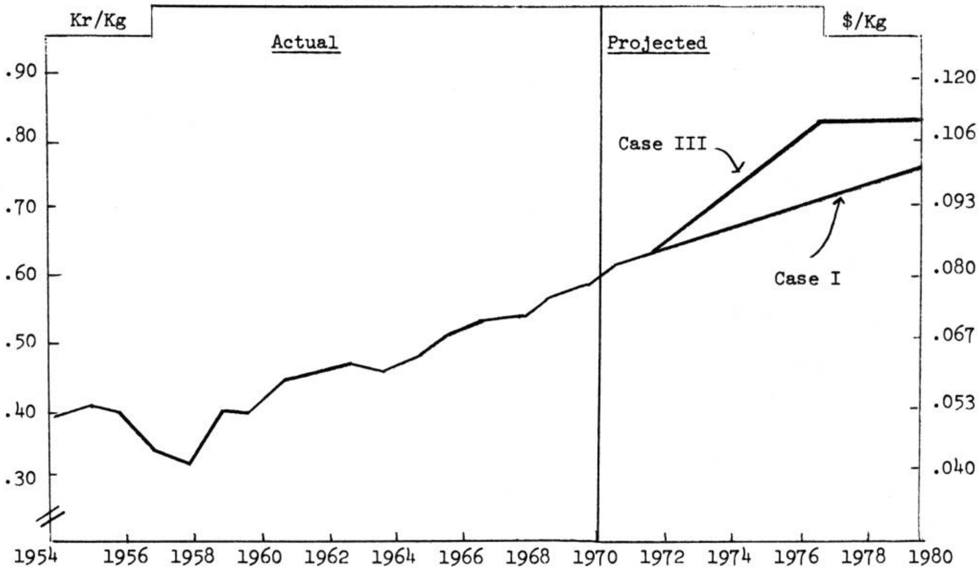


Figure 4.4 Blend Farm Prices on Milk, 3.65% b.f., Including Subsidies, Denmark

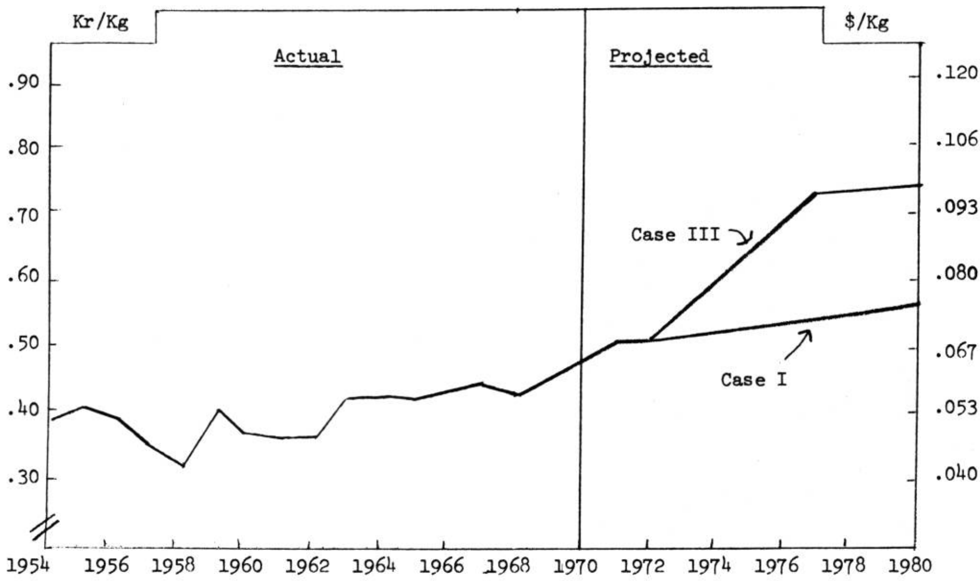


Figure 4.5 Home Market and Market (export) Prices on Heifer Beef, Slaughter Weight, Denmark

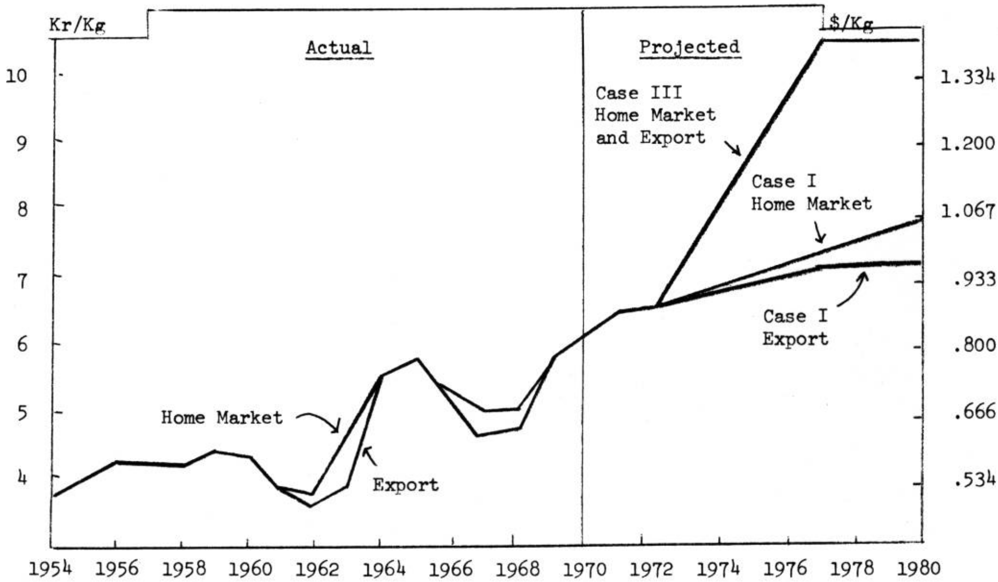


Figure 4.6 Blend Farm Prices on Heifer Beef, Slaughter Weight, Including Subsidies, Denmark

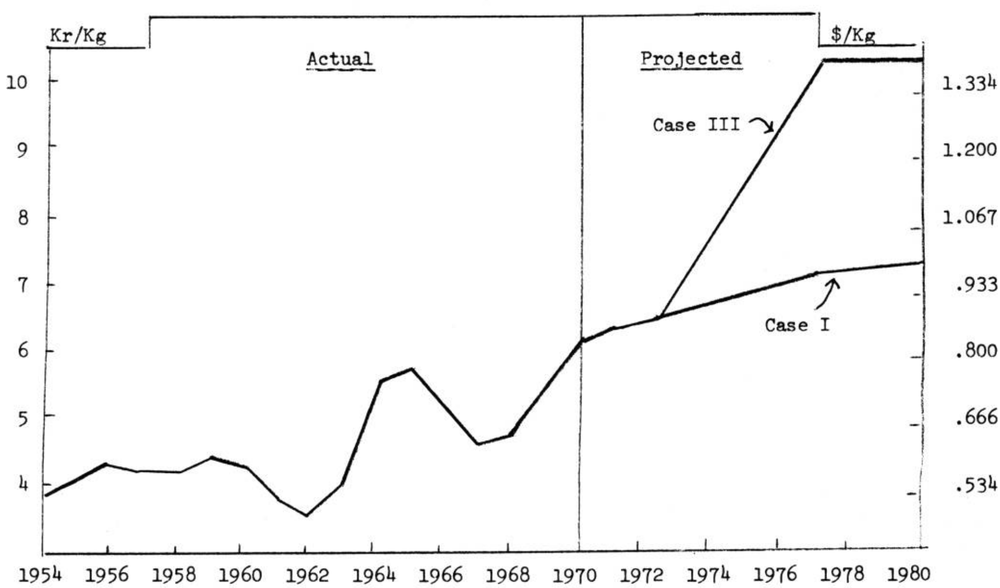


Figure 4.7 Home Market Prices and Nationwide Quotations (export) on Pigmeat, Slaughter Weight, Denmark

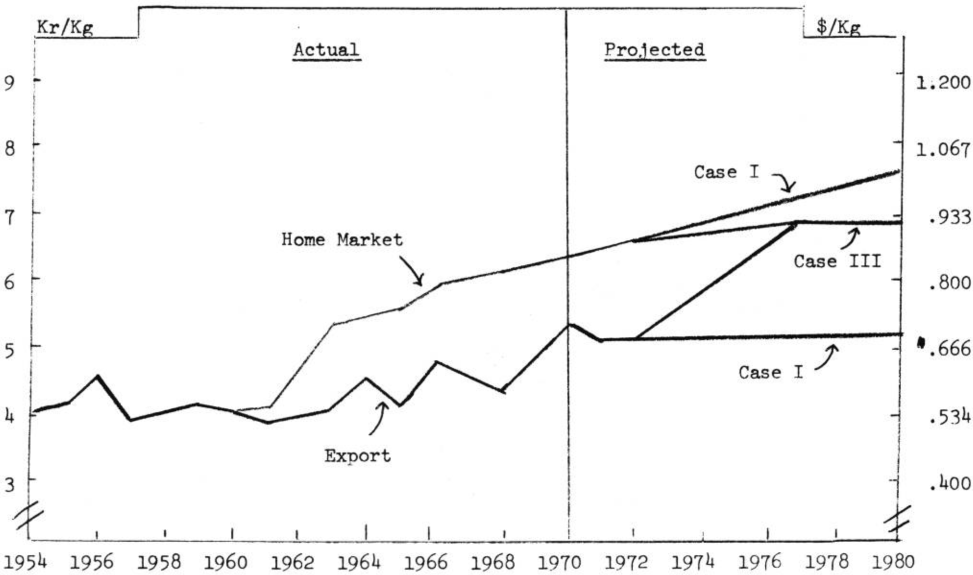
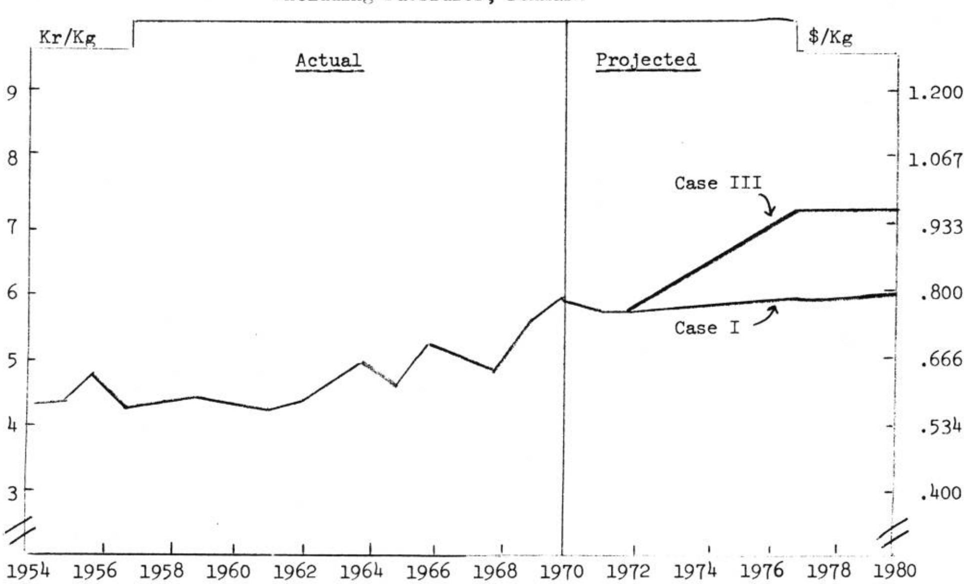


Figure 4.8 Blend Farm Prices on Pigmeat, Slaughter Weight, Including Subsidies, Denmark



Export prices on broilers have been declining, a trend not expected to continue (Figure 4.9). Instead a stable market is projected for Case I. To help maintain average farm prices, home market prices increased sharply during the 1960s. It is questionable whether subsidizing the export market to this extent can continue. High domestic prices have restrained consumption. As a matter of fact, the home market price was lowered abruptly in 1970. This was tied in with a promotional effort that succeeded in boosting consumption materially. The assumption is made that home market levies will be reduced by 1972.

Broiler prices to producers would be modestly higher if Denmark joins the EEC than if it remains outside. For consumers, broiler prices would be lower than they have experienced in recent years when large home market levies were collected, but higher than the projected "outside EEC" situation.

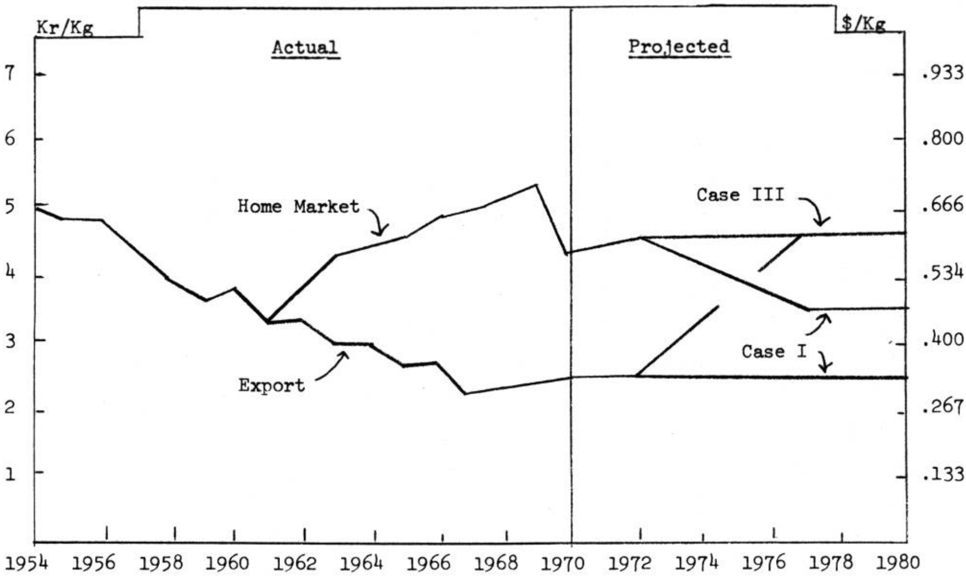
Trends and projections on egg prices are similar to those on broilers. The downward trend in export prices on eggs is expected to level off (Figure 4.11). The home market price is expected to fall if Denmark remains outside the EEC. As shown in Figure 4.12, average farm prices on eggs are projected to decline substantially in Case I. Entry into the EEC would not change the farm egg prices appreciably from 1968 levels, but would hold egg prices above levels anticipated without entry.

Market prices on barley have fluctuated between .40 kr/kg and .50 kr/kg for most of the period from 1954 to 1968 (Figure 4.13). Prices are projected to be on the high side of that range for the 1970s. Entry into the EEC would boost the level of barley and other grain prices by about 40 percent.

The price projections illustrated in Figures 4.1 to 4.13 served as a basis for projecting other prices used in the model. Cull cow prices (dressed), for example, were projected to average about 56 ore/kg under heifer prices. Fat calf prices (dressed) were projected at 16 percent over heifer prices. Prices on concentrate feeds for livestock were based on a combination of projected prices on barley and projected prices on oilcake.

Projections of Technical Coefficients--Projections were made of production rates and feed utilization per unit of output (Table 4.7). These were functions of time, except that the projections on concentrates fed per kilogram of milk were partly based on projected milk-concentrate price ratios. Data for other years back as early as 1948 are included in Tables in Appendix D.

Figure 4.9 Home Market and Export Prices on Broilers, Extra Class, Denmark 1/



1/ Prices prior to 1965 adjusted to Extra Class basis.

Figure 4.10 Blend Farm Prices on Broilers, Slaughter Weight, Extra Class, Including Subsidies, Denmark

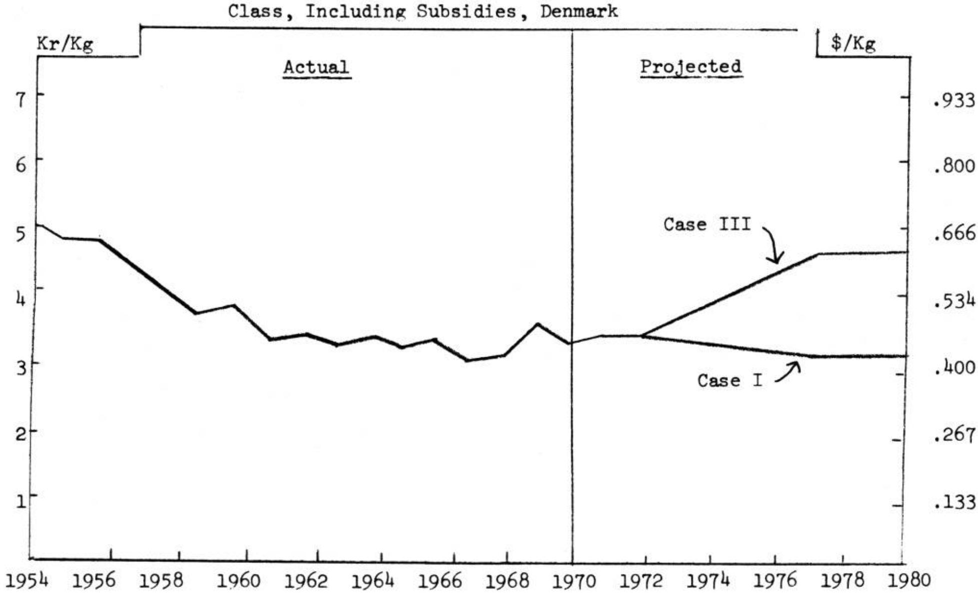


Figure 4.11 Home Market and Export Prices on Eggs, Denmark

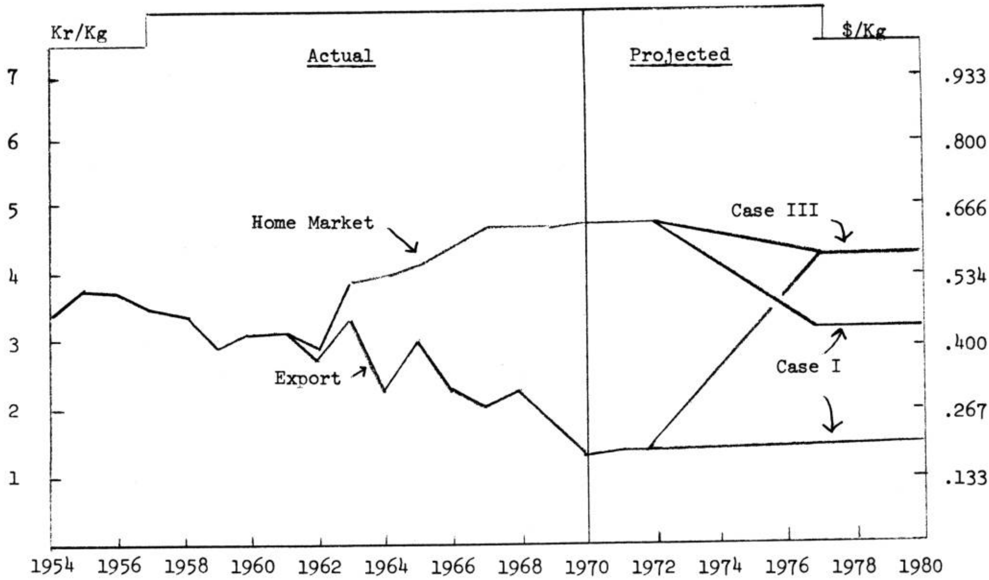


Figure 4.12 Blend Farm Prices on Eggs, Including Subsidies, Denmark

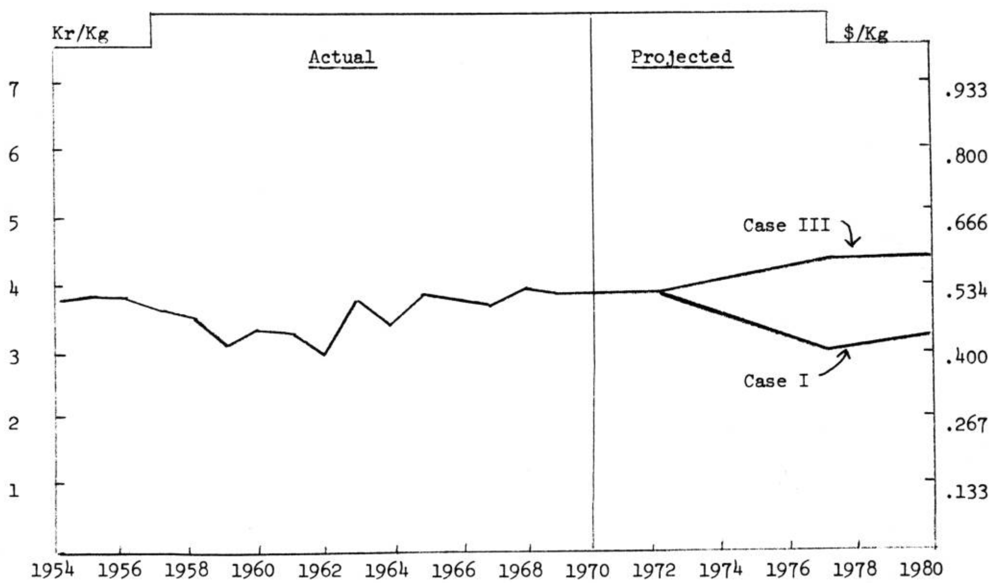


Figure 4.13 Market Prices on Barley, 112 pd. hollister, Copenhagen

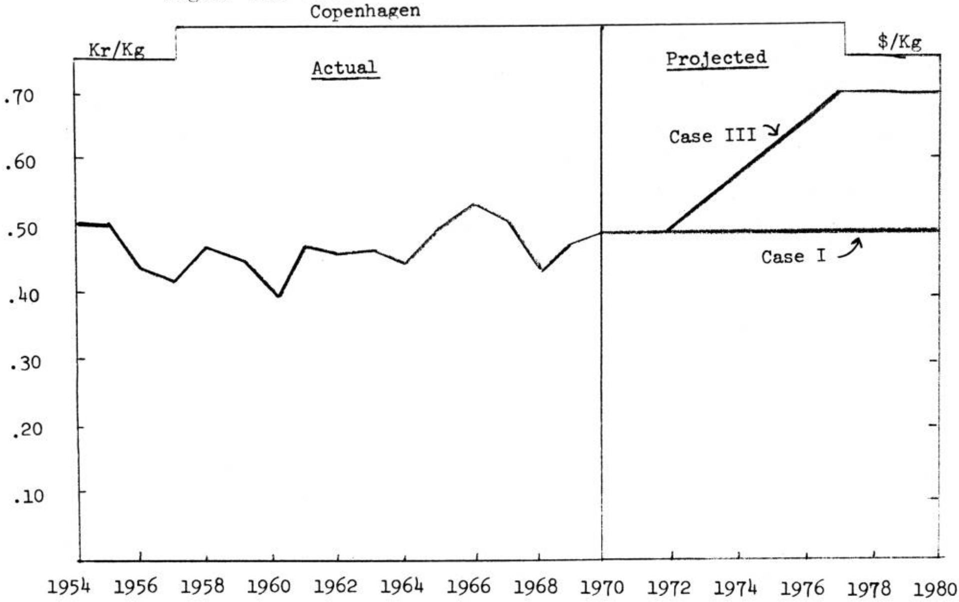


Table 4.7. Technical Coefficients on Production Rates and Concentrate Usage, Denmark.

Item	Unit	Actual				Projected 1980	
		1955	1960	1965	1967 or 1968	Case I	Case III
Milk production per cow	Kg	3455	3755	3976	3964	4373	4373
Calves saved per cow	Kg	.90 1/	.90 1/	.90 1/	.90 1/	.90	.90
Production of pigmeat per sow	Kg	987	972	857	815	863	863
Egg production per layer	Kg	14.1	14.2	13.1	13.6	14.0	14.0
Total cereal yield per ha. 2/	Kg	3632	3717	3953	3980 3/	4460	4460
Yield of grass and green feed per ha. 4/	fe	3770	3710	4740	4860	5500	5500
Kilograms of Concentrates Fed per 5/							
Kg. of milk 2/	Kg	.260	.267	.313	.290	.362	.369
Kg. of fat calves, dressed	Kg	3.24 1/	3.24 1/	3.24 1/	3.24 1/	3.24	3.24
Kg. of heifer beef, dressed 2/	Kg	.91	1.34	1.95	1.71	1.71	1.71
Kg. of young bull beef, dressed	Kg	1.91 1/	1.91 1/	1.91 1/	1.91 1/	1.91	1.91
Kg. of steer beef, dressed	Kg	.20 1/	.20 1/	.20 1/	.20 1/	.20	.20
Kg. of pigmeat, dressed 2/	Kg	4.91	4.89	5.04	5.12	5.12	5.12
Kg. of poultrymeat, except cull layers, dressed 2/	Kg	5.97	5.26	4.47	4.24	3.64	3.64
Kg. of eggs 2/	Kg	5.00	4.50	4.34	4.35	4.05	4.05

1/ Assumed.

2/ Based on farm account data.

3/ Based on 1967-69 average for entire country.

4/ Measured in "Feed Equivalent." One feed equivalent equals the value of one Kg. of barley.

5/ Includes an allowance for replacements and breeding herd.

Milk production per cow is expected to increase about in line with upward trend of recent years. No official data are published on calves saved per cow but an examination of slaughter statistics indicated a 90 percent calf crop to be a reasonable estimate. This is assumed to be constant through the 1970s.

Somewhat surprising has been the decline in the production of pigmeat per sow. The number of weaners per sow per year held close to 15 to 16 until 1967 and 1968 when estimates were raised to 17. Some decline in pigmeat produced per animal marketed was noted in the 1950s, but this leveled off in the 1960s. Projected is a reversal in the downward trend in pigmeat production per sow as more pigs are saved per litter and more litters are produced per sow.

Although official data show egg production per hen below 1955 and 1960 levels, some evidence of an upward trend has emerged since 1962. This trend is projected to continue to 1980.

Yields on barley, wheat, rye and oats all increased noticeably during the 1960s, having made only modest gains during the 1950s. Yields of wheat and rye have increased more rapidly than have yields on barley and oats. On wheat annual yield increases averaged 76 kg/ha since 1949 compared with 48 kg/ha on feed grains. Projections to 1980 are for continued gains in yields at the somewhat less rapid rate of 40 kg/ha per year.

The yield of grass and green fodder per hectare has been increasing particularly since the mid 1950s. Based on this trend and evidence of performance on the better managed farms, average yields on grass and green fodder are expected to continue upward by about 50 feed equivalents per hectare per year.

Fixed feeding rates for concentrates were projected on cattle (other than milk cows) and pigs (Table 4.7). This assumption was made on cattle because of the difficulty of obtaining data to analyze the effect of changing price relationships on feeding rates. In addition, concentrate utilization by cattle has been of relatively minor importance.

On milk, both the trend to increased feeding of concentrates and a more favorable milk-feed price ratio are expected to result in heavier feeding of concentrates in 1980, especially if Denmark is in the EEC. Even so, this level of concentrate feeding would be well below current levels in the U.S. and about equal to the feeding rate in the U.K.

Amounts of concentrates fed to pigs per kg of meat produced has been increasing even though the conversion ratio has improved on total feed fed. Concentrates have been replacing milk, whey and roughage. Opportunities for further substitution are minimal so that no change is projected on the feeding of concentrates per kg of pigmeat produced.

Improved efficiency of feed conversion is projected for egg and poultry production. Noticeable gains have been registered on demonstration farms.

These trends were projected to 1980 with some allowance for a leveling off noted in recent years.

Model Development

As in the U.K. and Irish models, the regression equations and assumptions described in previous sections in this chapter provided the basic relationships for the Denmark model. These relationships were supplemented by certain other equations to complete the model. The model, then, generated recursively annual data for 1969 to 1980.

In the first computer run on the model, the results looked reasonable except that milk cow numbers declined with entry into the EEC from 1,292,000 head in 1968 to 854,000 in 1980. This was even a sharper drop than a decline to 956,000 head generated for Case I. Such a result was thought to be unlikely since net returns over variable costs would nearly double between 1968 and 1980 in the event of entry. The reason why the model generated such a decline of milk cow numbers was the doubling in price projected for cull cows. The negative effect of cull cow prices on milk cow numbers more than offset the positive effect of higher net returns from milk.

There is some reason to question whether higher cull cow prices would depress milk cow numbers in the long run even though important in year to year changes. This was discussed in Chapter II. In addition, the changes projected for gross margins on milk cows in Case III are greater than experienced in the past 20 years. In 1948 to 1967, net returns over variable costs per cow on farm account farms ranged from a low of \$95 in 1950 to \$137 in 1964. The projected rise from \$121 in 1968 to over \$225 in 1980 would be well beyond the range during 1948-67, the period used to estimate the supply equation.

The coefficient on net returns over variable costs was not significant at the 5 percent level. A number of other formulations of the milk cow supply equation were tried but without much success in improving the statistical properties. The decision was made to retain the equation but to hold cull cow prices constant at the level for 1970 in order to neutralize the effect of cull cow prices in the long run.

Having made this change, the higher projections on milk cow numbers and the higher numbers of cattle derived from the dairy herd produced some inconsistencies with projections on cereal area. As was applied in the U.K. supply model, upper limits were established for the cereal area. These upper limits were calculated from the roughage requirements of cattle, with an allowance for utilization by other livestock, and from the projected increase in productivity of land in roughage production. The area of cereals became a residual. In the Aarhus study, cereals were also regarded as a residual.

Trends and Projections

Following is a discussion of the trends in major agricultural commodities and the projections to 1980 generated by the Danish Model.

Dairy--The enterprise cost data collected and analyzed by Det Landøkonomiske Driftsbureau have included at least 100 dairy farms with more than 150 farms involved in recent years. A gross margin per cow has been estimated each year. The gross income includes sale of milk, value of weight added to cows and a value for manure. Variable expenses represent mostly concentrates and milk fed plus labor. Pasture and roughage are not included.

The gross margin was fairly constant at about 750 kroner per cow in 1948-62, then increased to a peak of 1028 kroner in 1964 (Table D.6). In 1965-67, this gross margin dropped back to about 880 kroner per cow. Over all, gross margins did not vary enough in this period to give a clear indication of how dairy farmers respond to changing returns. Only changing cull cow prices seemed to have a significant impact on the variation in milk cow numbers.

In any case, milk cow numbers declined gradually for most of the 1954-69 period (Figure 4.14). Rising cull cow prices may have encouraged some shift of resources out of milk production.

Another explanatory factor may have been the inflation in consumer prices. In 1948-68 consumer prices more than doubled, Denmark having one of the most inflationary economies among developed countries. Consequently real gross margins in milk have actually been declining.

Also worth noting is the fact that rapid industrial growth in the 1960s had an impact on agriculture. As evidence of this, all the decline in cow numbers in 1960-68 was in the Islands where industry is more heavily concentrated. This trend to industrialization is expected to continue and may be accelerated with entry into the EEC.

If Denmark remains outside the EEC, dairy cow numbers will likely continue to decline or level off (Figure 4.14). At best, only a moderate increase in milk prices to farmers could be expected. The same factors which contributed to the decline in numbers in the 1960s will still be present in the 1970s.

Figure 4.14 Number of Cows and Heifers Calved, July 1, Denmark

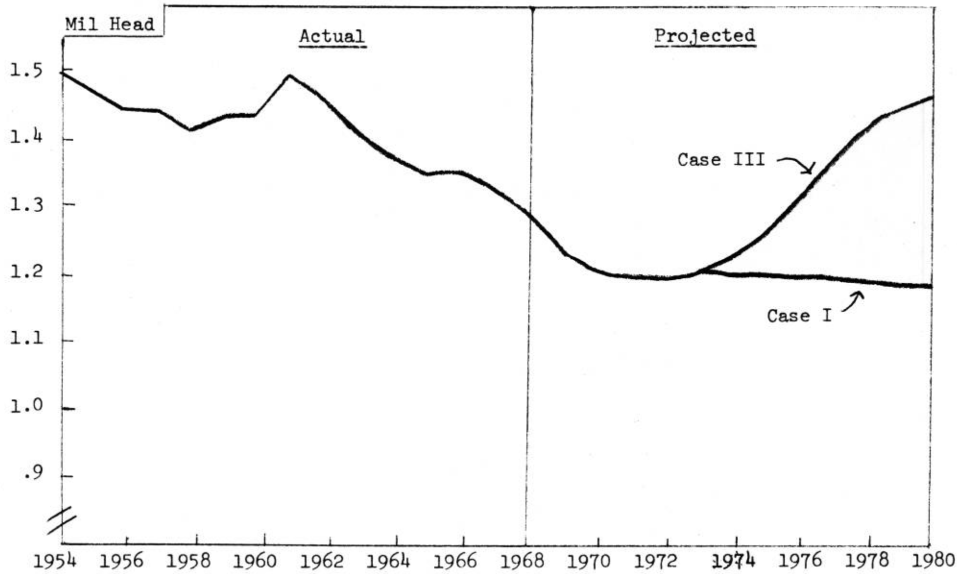
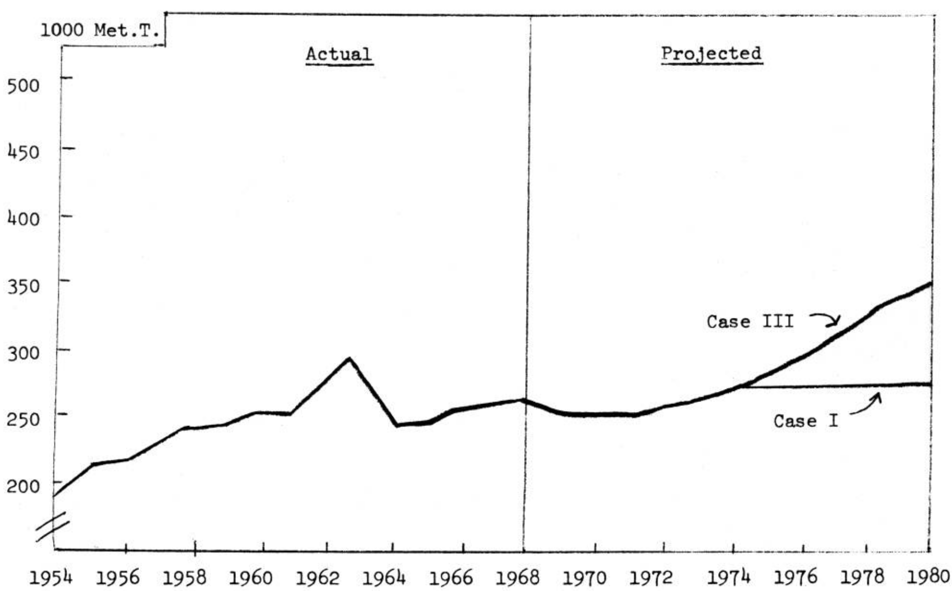


Figure 4.15 Total Production of Beef and Veal, Denmark



Should Denmark join the EEC, higher milk prices should raise gross margins enough to reverse the declining trend in milk cow numbers. Gross margins would increase from $121 per cow in 1968 to over $225 in the late 1970s. Net returns per hectare on some land now in cereals would be greater if used for roughage in milk production. Consequently some shift of cereal area to grass would be expected.

The extent of the projected declines and increases for milk cow numbers in Cases I and III respectively is difficult to establish considering what has happened in the past. Since the coefficient on gross margins in the dairy cow equation was not statistically significant, any projection on dairy cow numbers is rather arbitrary especially if a major change in gross margins is contemplated. Also difficult to measure is the extent to which assured returns under the CAP versus the uncertainties under the current program might influence decisions on milk and other products.

Using a different technique, the Aarhus study projected about 936,000 milk cows in 1980 assuming non-entry. This was about the same number as projected by the first run of the time series-recursive model discussed earlier, but below the projections of the modified model.[3/] The Aarhus projections for entry were well above those in this study.

Beef--Nearly all the beef produced in Denmark originates in the dairy herd. With dairy cattle numbers declining, there has been little expansion in total beef and veal production since 1960 (Figure 4.15). The beef and veal supply can be divided into cull cows, heifers, young bulls, steers, fat calves and newborn calves. No official data are available on the separate classes of adult cattle slaughtered, so estimates were made as indicated in Table D.7. In 1969 roughly about 35 percent of total beef and veal produced was from cull cows, about 25 percent from heifers and 30 percent from fat calves. Most of the remaining 10 percent was divided between young bulls and steers with a small output of newborn calves.

The division between cow and heifer slaughter is not clear since a sizeable number of "first calf heifers" are slaughtered and receive only modest discounts relative to other heifers, steers and bulls. In recent years nearly

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[3/] Aarhus University Economic Institute, Projections of Supply and Demand for Agricultural Products in Denmark (1970-1980), Aarhus, 1969.

20 percent of first calf heifers were slaughtered during their first lactation period. In making the estimates, some "bias" was introduced to place "first calf heifers" in the heifer slaughter category rather than in the cow classification. This was done by assuming cow slaughter to equal 25 percent of the total cow numbers plus or minus the decrease or increase in cow numbers from year to year. Farm record information indicates a somewhat more rapid replacement rate of nearer 33 percent.

Fat calves would fall more into the beef than veal category since they are slaughtered at about 140 kg., dressed. The average weight per head increased until about 1965, then leveled off. Part of the explanation for the fat calf program and the leveling off in weights is the preferential treatment given to calves in EEC import regulations. Most of the fat calf meat is also exported to the EEC.

Young bulls are typically marketed at about 1-2 years of age, weighing around 255 kg., dressed, consuming about .5 metric tons of concentrates. Steers are usually marketed at 2-3 years of age, weighing about 320 kg., dressed. This is largely a pasture and roughage feeding program.

With the prospect of continued strong beef prices in the next few years, pressures will develop to make economical use of the dairy herd for beef production. Since 1950, the production of beef and veal per dairy cow doubled, but this was largely due to the fact that the slaughter of newborn calves per 100 cows dropped from around 30 in the early 1950s to 4 in 1968 and 1969. With only 38,000 head of newborn calves slaughtered in 1969, the potential for beef production from this source is minimal. The productivity of the dairy herd for beef output could be increased by feeding out more fat calves to maturity. Some increase in productivity of the dairy herd in beef production could also be achieved by a one calf heifer type of scheme. The animal could be slaughtered as early as 2-1/2 years if it appeared that it would not turn out to be a good milk cow.

The production of heifer beef has increased both in absolute terms and relative to the number of cows on farms. The price of heifers has risen relative to the price of milk to encourage this development. In total, the production of heifer beef per cow has increased by two-thirds from around 30 kg. per cow in the mid 1950s to 50 kg. per cow in 1969. This rate of increase has leveled off in recent years, however. Some further increase in the output of heifer beef relative to milk cow numbers is projected to 1980.

According to an analysis of bull and steer production by the Aarhus University Economic Institute, if milk prices remain relatively low and if beef prices increase above 4.00 kroner per kg., liveweight, many fat calves will be used for young bull production.[4/] At prices above 4.40-4.50, the supply of young bulls could become quite elastic until the fat calf supply is exhausted. This assumes a premium on fat calves of no more than .30 kroner or so. The choice between the production of bulls and steers will depend on rental costs on land, the opportunity price for labor and the relationship between prices of fat calves and prices of bulls and steers. Rising land rents would favor calf and bull production. Rising labor costs would favor steer production.

Fat calves have commanded a much higher premium in recent years than earlier (Table D.8). In fact, the premium was about .65 kroner per kg. in 1969 with fat calves, first class, averaging 4.08 kroner and bulls, first class, averaging 3.43 kroner at Oxexport, D.A.K. and D.L.K.

On a representative fat calf feeding program, the net return over variable costs increased substantially in 1948-68. Returns did exhibit wide fluctuations from year to year, but this had only a minor effect on the trend to feeding out calves to fat calf weights.

Using data obtained from the "Krogstrup Report," net returns per head over total variable costs (including labor, management and roughage production) were calculated and projected for fat calves, young bulls and steers.[5/] For the entire period to 1980, net returns per head from fat calves remained well above net returns from young bulls and in turn net returns from young bulls remained well above steers. This was true for both Cases I and III. The assumption was made that steer beef production would be phased out and that young bull beef production would remain on a modest scale. The fat calf program would be somewhat stronger.

Production of old cow and bull beef was related directly to the level of cow numbers in the projections, assuming a 25 percent replacement rate. This tends to understate beef production from this source when cow numbers are

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4/ Aarhus University Economic Institute, Projections.

5/ Belænkning fra udvalget vedrørende landbrugsordningerne, Bilag, January 1970.

declining and overestimates beef output when cow numbers are expanding. The error would be small relative to total beef output in the longer run even though noticeable variations would develop from year to year.

As shown in Figure 4.15, total output of beef and veal (including carcass equivalent of live cattle and calf exports) would remain about steady in Case I. A rather substantial increase would result with entry into the EEC as cow numbers increase and as beef production per cow increases.

Swine--Pigs produced in Denmark have been entirely bacon-type, produced in confinement in fairly standard systems. While most pigs are raised in combination with dairy, the pig enterprise is much less dependent on skim milk and whey as a feed input than once was the case. Recent account data show that milk and whey represent only about 5 percent of their total feed. The ration consists almost entirely of concentrates. Some farmers, especially the smaller ones, specialize in feeder pig production, but most farmers both raise pigs and finish them.

An extensive research program of breeding and feeding has been a trademark of the industry for many years. The results of the program are reflected in the preference shown for Danish bacon in foreign markets and in efficiencies of gain. Quotations on Danish bacon on the London Provision Exchange generally carry premiums of 5-8 percent over bacon from the U.K. and Ireland.

Sow numbers nearly doubled in the past 20 years, but have tapered off since 1965 (Figure 4.16). Producer prices including subsidies did not change very much until 1963 when markets began to strengthen. Producer prices moved up from around 4.30 kroner per 100 kg., dressed, to around 5.00 kroner. Of more relevance, however, is the relationship between pigmeat prices and feed grain prices. There has been some upward trend in this relationship over the entire 20 year period, with considerable year to year variation. The gross margin on pig production (net returns over variable costs) according to farm accounts has not exhibited a definite trend, though year to year changes have been marked (Table D.9).

The somewhat surprising feature of the Danish swine industry over the past 20 years was the persistent rise in output through 1965, at a time when net returns per pig over variable costs were showing no trend. Net returns over all costs in farm accounts were actually declining. It was not until 1966-68 that swine producers began to respond to declining returns. One explanation may be that to offset the liquidation of dairy stock, Danish

Figure 4.16 Number of Sows and Gilts on Farms, Denmark

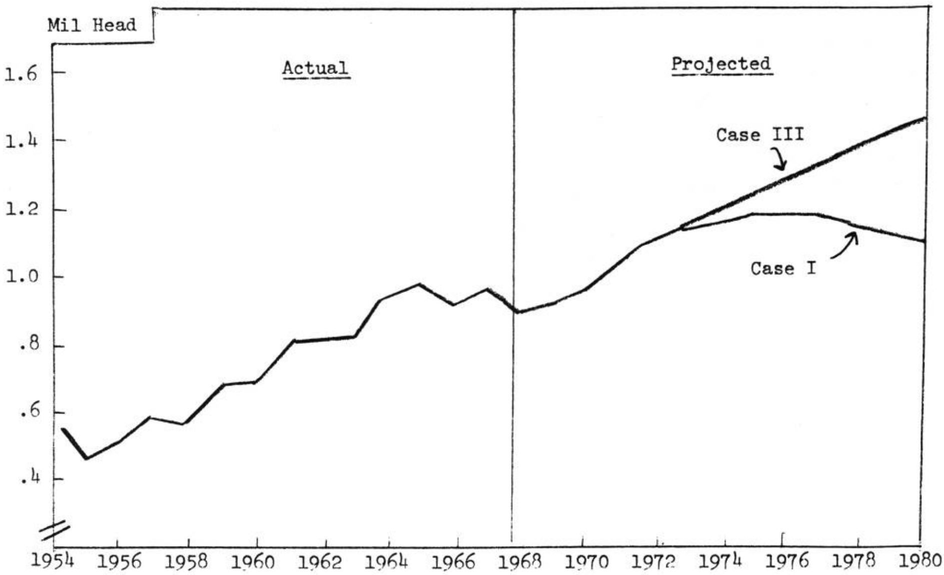
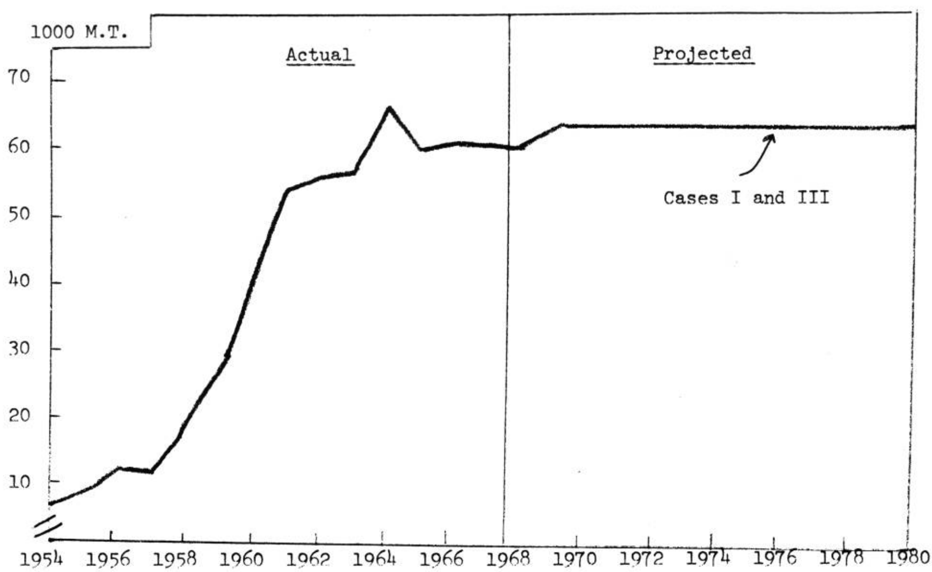


Figure 4.17 Poultrymeat Production (Except Cull Layers), Denmark



farmers turned more to swine. As the supply of labor became more limiting, swine production became more attractive. Much more progress has been made in achieving labor efficiency per unit of output in swine than in milk.

The prospect for a continued decline or leveling off in dairy cow numbers, stable grain prices, and steady to strong pigmeat prices would suggest a resumption of the long term upward trend in pigmeat production under Case I (Figure 4.16). This may also be encouraged by government policy which seeks to support those agricultural enterprises with a comparative advantage in international markets.

Should Denmark join the EEC, net returns over variable costs would be somewhat higher than the net returns being projected under Case I, and sow numbers would be about 30 percent greater in Case III than in Case I. Higher pig prices that would be obtained with entry into the EEC, however, would be largely offset by higher concentrate prices.

Poultrymeat--In 1968, poultrymeat production on a ready-to-cook basis was 64.5 million kg. (Table D.10). This amount included 51.5 million kg. of broilers, 4.7 million kg. of cull hens, 3.3 million kg. of ducks, .6 million kg. of geese and 4.2 million kg. of turkeys. Prior to 1958, most of the poultrymeat came from cull hens. Total poultrymeat output has tripled in the 20 year period since 1948, due to the rapid growth in broiler and turkey output. Production of ducks and geese has remained minor and fairly static.

The Danish broiler industry is competitive by most standards of physical efficiency, with feed required per kilogram of meat produced very close to the U.K. performance in recent years. On "demonstration farms," the kilogram of feed required per kilogram of broilers, slaughter weight, declined from 3.71 in 1959 to 2.81 in 1967.[6]

While not integrated in the U.S. pattern, there is considerable coordination of production, processing and marketing activities. Feed companies and processors approve of the breed of chicks and have a hand in recommending feeding practices. In some cases, prices are contracted in advance.

Gross margins on broilers have been declining, and since 1964 there has been a leveling off in the expansion (Table D.10). On "demonstration farms," labor income per bird was around .25-.40 kroner in 1959-61, apparently enough

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[6] Landsudvalget for Fjerkræavlen, Beretning, 1965-66, Copenhagen, various issues.

to encourage an expansion. Nationally, poultrymeat production (except cull layers) doubled between 1959 and 1962 (Figure 4.17). But as broiler prices edged lower and concentrate prices moved up in the mid 1960s, labor earnings on demonstration farms dropped to around .10 kroner per bird. Production stabilized after 1964.

The export market has been absorbing about 80 percent of Denmark's broiler output. Export prices, in recent years, have been not only below total production costs but also, now and then, below variable costs. The home market levy scheme plus supplementary payments have provided just enough support to maintain the industry. Assuming the home market levy is phased out, some further decline in broiler prices is anticipated but not much below the 3 kr./kg. level. Concentrate prices are not expected to change much in Case I while feeding efficiency is expected to improve.

Entry into the EEC would result in higher poultrymeat prices but gains in gross income would largely be offset by higher concentrate costs. Consequently, poultrymeat production for both Case I and Case III are not expected to change very much in the 1970s (Figure 4.17).

Eggs--Egg production has remained more in the small farm flock than has been the case in the U.K. The scale of operation has increased over time, but in 1968, over half the layers were still in flocks of under 300 hens. Egg production per hen has been static. Production has been declining even though egg prices have been fairly well maintained (Table D.11). Rising costs on concentrates and labor along with other inputs have resulted in negative returns to farm flocks over all costs. Even if labor costs are excluded, the returns per hen have been minimal.

On the larger "demonstration farms," averaging around 1000 layers per unit, returns have been higher.[7] On 15 farms in 1965, earnings to labor averaged about 10 kroner per hen. Net returns over the cost of feed was 22 kroner per hen compared with 12 kroner per hen on account farms.

There is some evidence of producers responding to egg prices and net returns in the short run as well as the long run but this relationship is not well established. More clear has been the longer run response to declining returns as the number of layers dropped from 10 to 11 million in the late

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7/ Landsudvalget for Fjerkræavlen , op. cit.

1950s to nearly 6 million in 1968. Unless major structural changes develop in the egg industry, further declines are in the picture for Denmark outside the EEC (Figure 4.18).

In the advent of entry into the EEC, egg prices would not increase very much from 1968 levels. The impact of higher concentrate prices on net returns per layer over concentrate costs would be about offset by increased egg production per hen and improved feed conversion. In the net, returns per layer would not change much. Consequently, little change in the number of layers on farms is projected (Figure 4.18).

<u>Cereals</u>--Most of the cereal production is on livestock farms where it is used for feed. Most of the wheat and rye crops are sold for milling, but a high percentage of the feed grain crops is retained on the farm where grown. This is in contrast with the U.K. where most of the feed grain is sold off the farm to compounders who deliver mixed feeds or "straights" to other farmers or to the cereal grower. There is, of course, some grain flowing through these marketing channels in Denmark, but the compounder plays a less important role than in the U.K. One reason is that Denmark has become about self-sufficient in cereal production. The compounding industry in the U.K. gained its stature by handling the large import requirement on concentrates.

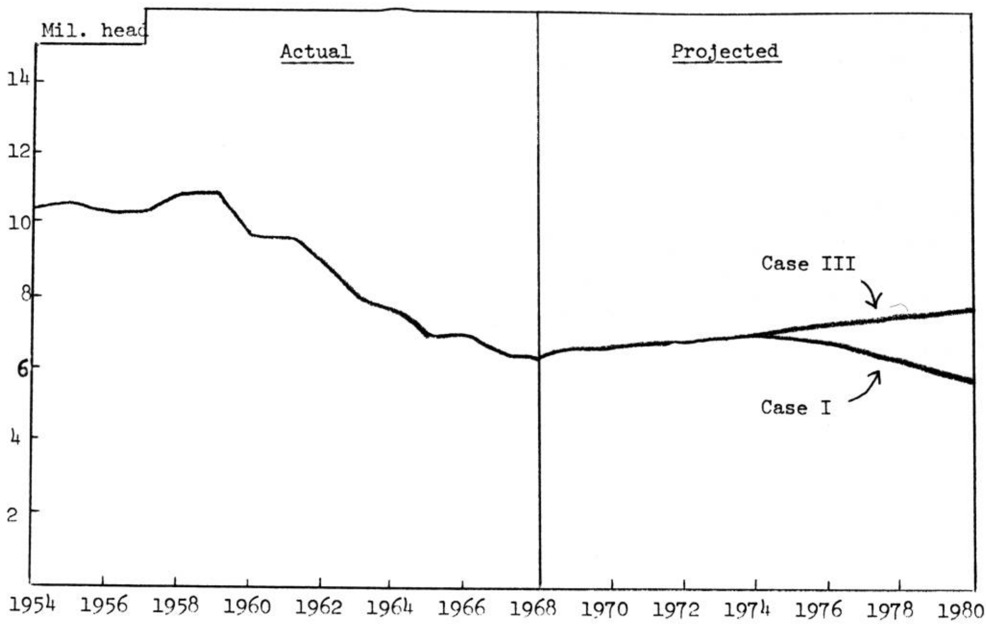
Cereal producing units in Denmark tend to be of modest size with few specialized operations. In 1968, only 20 percent of the cereal production was on farms with 60 hectares or more.

Cereal area has been increasing steadily and in 1968 reached nearly 65 percent of the total agricultural area (Table D.12). Cereals have replaced grass and green fodder and root crops in use of crop land. The explanation for this substitution of cereals for roughage crops lies in the change in relative returns.

Net returns over variable costs on cereal tended to decline over the 1948-67 period, but returns on roughage crops decline even more (Table D.13).[8/] Returns and costs on account farms were calculated on a "per feed equivalent" basis. A feed equivalent is a unit representing 1 kg. of barley wheat or rye or 1.2 kg. of oats. Cereal prices used were market prices. Value of grass and roughage was estimated from the returns to roughage consuming livestock less direct costs.

[8/] Det Landøkonomiske Driftsbureau, Undersolgelser, 2 del; <u>op. cit.</u>

Figure 4.18 Number of Layers, July 1, Denmark



Crop yields on bread grains have been close to feed grain in the past 20 years but have held a margin over feed grain in recent years (Table D.14). Prices on bread grains held a margin over feed grain prices for most of this period. Even so, there has been a shift of area from bread grains to feed grains.

Feed grain production increased by 50 percent during the 1960s (Table D.15). Year to year variations in feed produced were offset somewhat by changes in the amount of wheat fed to livestock. Feed grains produced plus wheat fed has represented well over a third of the total feed produced in Denmark in recent years (including roughage and pasture).

Further expansion in cereal area will probably be geared to what is necessary to meet Danish livestock requirements and little more. Denmark's comparative advantage lies more in livestock than cereal production. The prospects for a small further decline in milk cow numbers and higher forage yields may provide opportunities for some further expansion in cereal area in Case I--from 1.7 million hectares in 1968 to just over 1.8 million hectares in 1980 (Figure 4.19). The increased production from the expanded acreage would be only slightly more than the anticipated increase in utilization.

If Denmark were to join the EEC, net returns from milk production per hectare would exceed the net from cereals in many areas now in cereals. Consequently, there would be a shift away from cereals and to more grassland for dairy stock. Under the limitations imposed, cereal area would decline from about 1.7 million hectares in 1968 to just over 1.5 million hectares by 1980.

If the upper limits on cereal area were removed and the regression equation on cereals was used solely for projecting cereal area, an increase to 2.12 million hectares would result in 1980 under Case I. An increase to 1.87 million hectares would be generated in Case III. Production levels would be 9.4 million m.t. and 8.4 million m.t. respectively, about the same difference as in the restricted model.

Concentrate Utilization

Feeding of concentrates has increased about 50 percent in the past 15 years (Figure 4.20). Concentrates have replaced root crops, primarily through milk and whey and have also declined in relative importance. The relative importance of grass and green fodder has remained about the same during the period.

Figure 4.19 Total Area in Cereals, Denmark

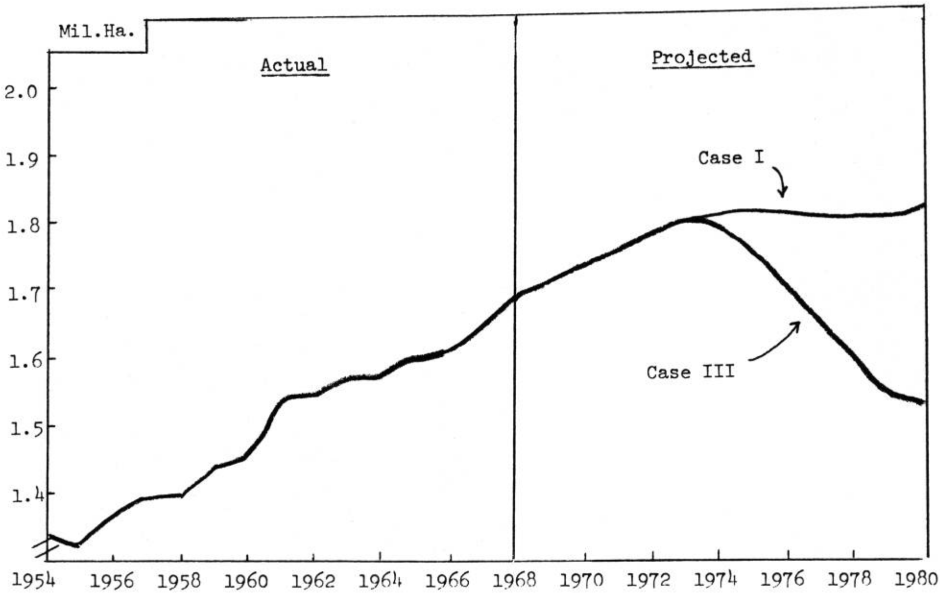
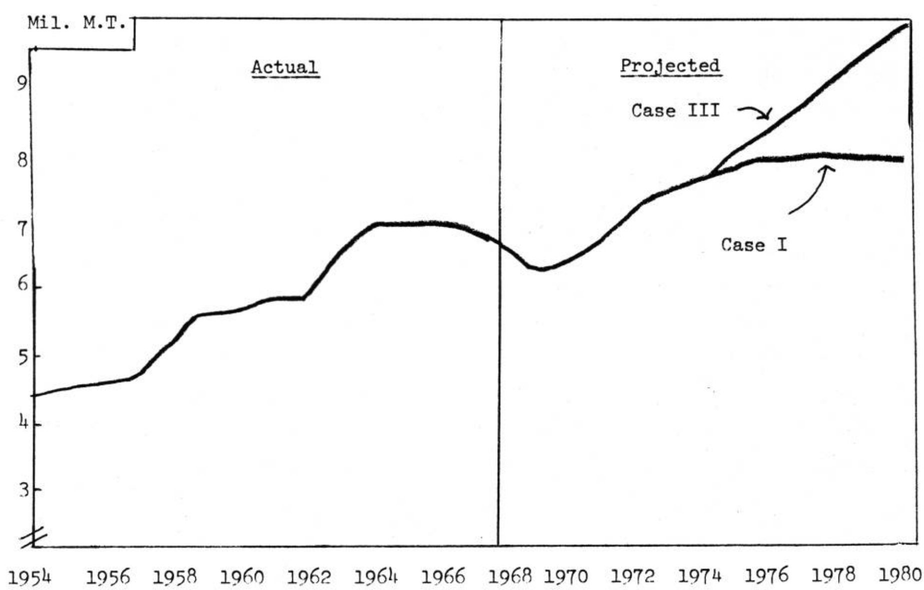


Figure 4.20 Concentrates Fed to Livestock, Denmark



In 1968-69, concentrates represented 47 percent of total consumption of feedingstuffs on a feed equivalent basis. Root crops and beet tops represented 15 percent; grass and green fodder, 28 percent straw, 6 percent; and milk and whey, 4 percent of the total consumption of feedingstuffs.

Of the total concentrate utilization in recent years, about 80 percent was from cereals, pulse and cereal by-products; the remaining 20 percent was from oilcakes and animal meals. On a tonnage basis, oilseed meals have represented about 15 percent of total concentrates fed. The proportion of oilseed meals in concentrate supplies increased during the 1950s but remained at about 46-48 percent of the digestible pure protein fed in concentrates during the 1960s.

No official estimates are published of the consumption of concentrates by various livestock classes. Drawing from data on account farms and demonstration farms estimates were made of amounts fed per unit of output in 1949-67 (Table D.16). On milk, cows, pigs, and heifers, feeding rates were calculated from annual data on account farms. On eggs and poultrymeat, annual feeding rates were obtained from demonstration farms for part of the period; extrapolations were made for the other years. Fixed rates of feeding per kg. of product were assumed for fat calves, young bulls and steers.

Applying these feeding levels per unit of product to production figures, estimates were made of total utilization by livestock classes (Table 4.8). These estimates were close to the official estimate of total utilization. As would be expected, pigs utilized about 60 percent of the total concentrates fed followed by dairy cows (including replacements) with about 25 percent.

Since pigmeat production is expected to increase, some further expansion in total concentrate feeding is projected for both Case I and Case III (Figure 4.20). A slower growth is projected for Case I because livestock numbers will be increasing less rapidly and eggs will be declining. The increase in Case I would be about 20 percent over 1967 levels and in Case III about 50 percent. The expansion in cereal production in Case I would more than keep pace with the increase in concentrate utilization but would fall behind in Case III (Table 4.8).

Subsidy Costs

If the current agricultural support program continues, subsidy costs will mount as the government attempts to improve returns to farmers. An attempt is made to raise home market prices in line with increases in costs of production.

Table 4.8. Estimated Utilization of Concentrated Feedingstuffs by Livestock Production Categories, Denmark

Item	Actual				Projected 1980	
	1955	1960	1965	1967	Case I	Case III
		1000 M.T.			1000 M.T.	
Milk	1332	1438	1671	1494	1856	2318
Net Beef	160	271	354	367	427	533
Pigs	2415	3164	4070	4063	5070	6374
Poultrymeat (exc. cull layers)	55	188	268	261	231	231
Eggs	728	577	387	375	322	432
Other	110	54	19	17	15	15
Total Utilization	4800	5692	6769	6577	7922	9903
Total Cereal Production	4343	4983	6213	6153	8113	6832

But with the prospect that export prices are not likely to be increasing at this rate, home market levies are likely to increase. Just how much increase would be acceptable must be decided by the monopoly commission. On poultry-meat and eggs, the assumption is that the levies will be reduced but on other products, increased between 1968 and 1980.

Special payments to poultry producers are assumed to continue near recent levels. Adding these special payments to the cost of the home market levies, a total of about $120 million were calculated for 1968. This is, of course, not inclusive of all government subsidies to agriculture.

If the assumed home market levies and payment rates for 1968-80 materialize, subsidy costs would increase to about $200 million. While this is a substantial increase, it would still represent a smaller share of the Gross National Product in 1980 than in 1968. These subsidies would, of course, be phased out if Denmark were to join the EEC.

Supply Elasticities

Supply elasticities were calculated for each of the years from 1969 to 1973 (Table 4.9). In computing the elasticities, the designated prices were raised by one percent over the actual or projected levels for 1968-72. The

Table 4.9. Supply Elasticities for Major Farm Products and Concentrate Utilization, Denmark 1/

Relationship		Percent Change in Quantity				
Effect of a 1 percent increase in price of:	On the Production of	Years after price change				
		1	2	3	4	5
		%	%	%	%	%
Milk	Milk	.19	.35	.46	.55	.61
Dairy concentrates	Milk	-.04	-.07	-.10	-.11	-.13
Heifer beef	Beef from heifers, steers fat calves and young bulls	.14	-.07	-.27	-.45	-.60 2/
Pigmeat	Pigmeat	0	1.20	2.32	3.22	4.07
Broilers	Poultrymeat (except cull layers)	0	0	0	0	0
Eggs	Eggs	.23	.44	.64	.85	1.04
Barley	Cereals 3/	.08	.16	.25	.34	.43
Barley	Concentrate utilization	-.01	-.29	-.59	-.84	-1.07

1/ Prices selected were those representing what farmers received (including subsidies) or paid.

2/ If effect of cull cow prices on cow numbers were neutralized as described in the section on model development, the supply elasticity on beef from heifers, steers, fat calves and young bulls would be positive and at about .20 by the fifth year. (Cow prices were tied to heifer beef prices in the model)

3/ Supply elasticities apply only if cereal area is not restricted.

resulting production or utilization levels were measured in terms of the percent over the levels predicted by the model before prices were increased.

Most responsive to price changes were pig producers followed by egg producers. Since the cereal area is related to returns from milk production, variations in cereal prices have had a relatively small effect on cereal area. In addition, beef production is also tied to milk cow numbers. Consequently, rising cattle prices would not necessarily have much effect on beef production. There are offsetting factors. Increasing cull cow prices tend to depress milk cow numbers initially while higher beef prices encourage greater productivity in beef production from the basic cow herd. From the regression equations used in this model, it would appear that the impact of cull cow prices would be greater. Neutralizing this impact, a one percent rise in beef prices would result in a .20 percent increase in production of beef from heifers, steers, fat calves and young bulls after five years.

Total Production and Utilization

Combining the projections of livestock numbers and crop areas with production rates and yields, the model generated total production figures for each of the years from 1969 to 1980. The 1980 projections are compared with trends of the past in Table 4.10. The reasons behind the projections were presented in previous sections so that only brief comments are needed at this point.

A continuation of current farm programs would apparently result in a shift of resources more toward pigmeat and cereal production. Entry into the EEC would stimulate the pig industry even more and would revive dairying. This would reduce the cereal area but production of cereals would not fall off much from levels of recent years. Beef and veal production would be tied to milk cow numbers. About the best to be expected in poultry and egg production is for a modest growth.

A growing population and small per capita consumption increases will mean a moderate expansion in total domestic consumption for most products (Table 4.11). The main exception is consumption of pigmeat which could increase as much as 20-40 percent by 1980 with the higher level of consumption projected with entry into the EEC. There is also promise of a substantial expansion in poultrymeat consumption.

Table 4.10. Total Production in Selected Years, 1955-68 and Projections to 1980 Under Alternative Policy Assumptions, Denmark

Item	Actual 1955	1960	1965	1968	1980 Projections Case I	Case III	1971
		1000 M.T.			1000 M.T.		
Milk							
Total product weight	5124	5399	5367	5121	5200	6380	4560
Fat equivalent (4.24)	217	229	228	217	220	271	
Non-fat-solids equivalent (.089)	456	481	478	456	463	568	
Beef and veal	214	254	245	265	279	349	184
Pigmeat including edible offals	532	651	807	772	990	1245	759
Poultrymeat	23	48	66	65	68	69	83
Eggs	150	138	90	86	80	107	75
Cereals							
Bread grain	444	774	829	594			
Coarse grain	3899	4209	5384	6190			
Total	4343	4983	6213	6784	8113	6832	

Table 4.11. Total Human Consumption by Specific Products in Selected Years 1955-68, and Projections to 1980 Under Alternative Policy Assumptions, Denmark

Item		Actual				1980 Projections	
		1955	1960	1965	1968	Case I	Case III
			1000 M.T.			1000 M.T.	
Milk Products:	Liquid	572	620	642	623	680	672
	Cream for coffee	19	17	12	11	12	12
	Double cream	14	17	20	25	31	30
	Butter	38	50	48	46	57	56
	Cheese	29	41	45	50	62	62
Beef and veal		76	79	85	103	117	117
Pigmeat including edible offals		163	196	187	183	224	261
Poultrymeat		14	18	22	24	33	31
Eggs		40	47	59	57	68	66
Cereals							
Wheat flour		193	196	200	191	200	200
Rye flour		24	20	18	16	17	17
Oatmeal		163	132	119	114	120	120
Margarine		67	67	65	62	59	61

Table 4.12 provides a more comprehensive picture of the utilization of milk and cereal products with milk products converted to fat equivalent and non-fat solids equivalent and with cereal products converted to grain equivalents. Use by livestock and industry was then added to consumption to humans. While a moderate increase in human consumption of milk is anticipated, less will be fed to livestock. This would be enough to reduce total utilization of non-fat solids. Total utilization of cereals is expected to increase by about 1,100,000 m.t. between 1968 and 1980 under Case I, or by 2,650,000 m.t. if Denmark joins the EEC.

As with U.K. and Ireland, projected utilization of cereals by livestock is tentative, considering the Dutch experience. Should the composition of Danish livestock rations shift as occurred in the Netherlands, say from 80 percent to 50 percent cereals, total utilization of cereals in 1980 would actually be less than in 1968.

Tables 4.10-4.12 also suggest some other modifications which one might wish to make in the underlying assumptions. Three such modifications relate to the assumptions concerning the current agricultural policy. Production of cereals is projected to increase from 6,784,000 m.t. in 1968 to 8,113,000 m.t. in 1980 under Case I. Total utilization is projected to increase somewhat more gradually, from 6,132,000 m.t. in 1968 to 7,254,000 m.t. in 1980. This would leave a net surplus of 800,000-900,000 m.t. The presumption is that Denmark regards its agriculture as having a comparative advantage in livestock production and does not wish to produce much more cereal than required domestically. If net exports of cereals were to develop and expand, some measures would likely be introduced to curb the expansions. Cereal production might also be restrained for equity purposes. The large landholders have more vested interests in cereals than in livestock and the small landholders have more vested interests in dairy and pig production than in cereals.

The rise in pigmeat production relative to consumption in Case I should also be examined, particularly since pressures in the U.K. will be toward becoming more self-sufficient in pigmeat. Denmark would no doubt restrict production by some means to stay within the quota of the Market Sharing Agreement with the U.K. If Denmark has the same share of the U.K. bacon market in 1980 as in 1970-71 (about 46.7 percent), this would be a gain of less than 100,000 m.t. Instead of increasing pigmeat production by 30 percent

Table 4.12. Total Consumption of Milk and Cereals in Selected Years, 1955-68, and Projections to 1980 Under Alternative Policy Assumptions, Denmark

Item	Actual				1980 Projections	
	1955	1960	1965	1968	Case I	Case III
	1000 M.T.				1000 M.T.	
Milk in fat equivalent						
Humans	81	100	100	101	121	120
Livestock 1/	15	12	12	12	9	9
Total	96	112	112	113	130	129
Milk in non-fat-solids equiv.						
Humans	79	91	97	99	113	115
Livestock 1/	339	337	313	286	220	220
Total	418	428	410	385	333	335
Cereals in grain equivalent						
Human food	477	424	448	425	446	446
Industry (mostly for malting) 1/	95	104	110	117	135	135
Livestock 2/	3653	4366	5379	5283	6337	7922 3/
Seed other 4/	249	279	290	307	336	283
Total	4474	5173	6227	6132	7254	8786

1/ Projections based on study by Aarhus University Economic Institute, Projections of Supply and Demand for Agricultural Products in Denmark (1970-1980), Aarhus, 1969.

2/ Projections based upon total concentrate requirements. Assumption is that cereals will represent about 80 percent of total concentrates.

3/ Alternatively, cereal consumption by livestock would be about 4,952,000 m.t., if cereals represented only 50 percent of total concentrates fed to livestock.

4/ Projections on seed and other uses based on .185 m.t. per hectare.

between 1968 and 1980, only a 20 percent increase would be feasible without development of additional export outlets.

Implications for Trade

With a continuation of current agricultural programs, pigmeat available for export would increase, while the volume of other livestock products for export would remain about the same or decline. Cereal exports would emerge unless new measures for restricting the cereal area were enacted.

Entry into the EEC would open markets to Denmark not only within the expanded EEC but outside, because of export restitutions. Consequently, the increases projected in the availability of dairy products, beef and pigmeat for export, though optimistic, would appear reasonable. At the same time, Denmark would become deficit in grain.

Demand and Supply Analysis for Norway

Government programs have played an important role in Norwegian agriculture. For this reason, the objectives of agricultural policy become major factors in projecting the future. At the same time, the severe structural and geographical restrictions on Norwegian agriculture must be kept in mind when assessing what farm programs can accomplish.

Norway's agricultural policy has had three major targets:

(1) to increase production in sectors on an import basis, such as grain, fruits and vegetables

(2) to maintain self-sufficiency in the animal products sector but avoid surpluses, and

(3) to maintain population in remote areas.

The developments in recent years indicate some success in achieving the first two objectives. Near self-sufficiency has been maintained in milk, livestock and egg production. The area in cereals increased modestly in the late 1960s and has maintained a level above the average for the 1950s. Yields have increased only about 10 percent since the early 1950s and have varied considerably from year to year. The third target has been more difficult to achieve as population in the remote areas continues to decline. About as much as could be expected of current policies is to retard this exodus. But in any case, these three policy objectives are likely to remain for the coming decade if Norway remains outside the EEC.

Table 4.13 shows OECD's estimates of the balance between production and requirements for 1961-62 to 1963-64 and projections for 1975 and 1980 (Out

Table 4.13. Balance Sheet on Production and Requirements on Cereal-Livestock, Selected Years 1961-1969 and Projections to 1980 Under Alternative Policy Assumptions, Norway.

Items	1961-62 to 1963-64 1/	1968	1969	Projections 1975 Out EEC 1/	1975 In EEC	1980 Out EEC 2/	1980 In EEC
		1000 M.T.			1000 M.T.		
Milk and Milk Products							
Production - fat equiv.	70	74	74	77	79	76	82
s.n.f. equiv.	157	166	166	172	177	170	184
Requirements - fat equiv.	62			70	70	72.5	72.5
s.n.f. equiv.	149			149	149	148	148
Net exports - fat equiv.	+7			+7	+9	+3.5	+9.5
s.n.f. equiv.	+7			+23	+28	+22	+36
Beef and Veal							
Production	57	53	56	58	62	57	64
Requirements	55			62	62	64	64
Net exports	+2			-4	0	-7	0
Mutton and Lamb							
Production	15	18	16	16	17	17	18
Requirements	16			17	17	18	18
Net exports	-1			-1	0	-1	0
Pigmeat							
Production	55	61	68	70	75	77	83
Requirements	57			73	73	80	80
Net exports	-2			-3	+2	-3	+3
Poultrymeat							
Production	3			6	6	7.5	7.5
Requirements	3			6	6	7.5	7.5
Net exports	0			0	0	0	0
Eggs							
Production	32	36	38	41	41	44.5	44.5
Requirements	32			41	41	44.5	44.5
Net exports	0			0	0	0	0
Bread grains							
Production	25	20	13	13	13	13	13
Requirements	399			455	455	456	456
Net exports	-376			-442	-442	-443	-443
Coarse Grains							
Production 3/	543	800	647	700	666	750	665
Requirements	659			1164	1212	1126	1197
Net exports	-114			-464	-546	-376	-532

1/ O.E.C.D.

2/ Average of O.E.C.D. 1975 and 1985 projections

3/ O.E.C.D. projections were revised upward.

EEC).[9] The 1980 projections represent averages of their projections for 1975 and 1985. One exception is that the OECD projections of coarse grain production was revised upward from 559,000 m.t. in 1975 and from 567,000 m.t. in 1980. Otherwise, the OECD projections appeared to be in line with recent developments as indicated by 1968 and 1969 production estimates. Recent trade data also support the projections except that egg production apparently has not kept pace with consumption.

The projections imply that a small exportable surplus of milk products on a solids-not-fat basis will likely expand to just over 10 percent of the output. Fairly close balances between production and requirements are projected on other commodities except on bread grains and coarse grains where imports are expected to increase, particularly on coarse grains.

With entry into the EEC, returns to agriculture would decline. Comparing 1969 Norwegian farm prices with EEC prices, barley prices would decline by about 25 percent, milk prices would drop 15 percent and egg prices would decline by over 20 percent. On the other hand, beef, veal and mutton prices would be somewhat higher and pork prices about steady. In addition, there would be the loss of direct subsidies for feed grain milling, supplements to marginal areas, freight subsidies, fertilizer price subsidies and feed discounts. This would have a substantial effect on net income and for this reason Norway is negotiating to retain its current farm program within the EEC.

While it is quite possible that some concessions might be granted to Norway in the event of entry, it is difficult to specify what these might be in detail. For one, the transition period for adjusting to CAP might be longer than for U.K., Ireland and Denmark. Assuming that Norway is unsuccessful in this negotiation and that the farm program adjusts to the CAP in 1972-77, some shifting in the pattern of agricultural production would likely occur. With a few exceptions, the area in the most flexible position is the eastern provinces. The impact on the remote areas would be to accelerate trends already underway. Not only would they be affected by lower milk prices, the elimination of freight subsidies and supplements to marginal areas would also be to their disadvantage.

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[9] OECD, Norway, one of a series of country studies connected with the summary publication, Agricultural Projections for 1975 and 1985, Paris, 1968.

The improved relationship between livestock prices and grain prices could stimulate some expansion in meat animal production, particularly cattle and pigmeat. Norway has been on a small import basis on these two commodities and the demand for beef and pigmeat is expected to increase. Norway could even consider exporting beef and pigmeat with assured access to markets on the continent. Some leaders in the livestock industry feel that Norway could be especially competitive in pigmeat production.

Even though average milk prices would decline in the event of entry into the EEC, some increase in milk production at the expense of grain production is possible. In the eastern provinces of Norway, there are many specialized cereal farms. With the freight subsidies now accorded to dairy producers in the remote areas eliminated and with grain prices considerably lower, grain farms near the consuming centers--around Oslo--would tend to shift to milk production. Response to such changes in price relationships would not be rapid, however.

Assuming that the net impact on milk cow numbers was at the rate of about one percent per year, entry into the EEC in 1972 would result in milk production 3 percent higher in 1975 and 8 percent higher in 1980 than otherwise projected. This is indicated in Table 4.13. Cereal area would be reduced by about 5 percent in 1975 and just over 10 percent in 1980, from the "Out EEC" projections. This assumes that one cow and replacements would require approximately one hectare of crop land.

Also assumed, if Norway joins the EEC, is that beef, veal, mutton and lamb production increases enough to meet domestic requirements. In addition, pigmeat production is assumed to increase enough to provide a small exportable surplus.

Requirements for coarse grains would also be somewhat higher. This, coupled with reduced grain output, would result in higher grain imports than if Norway remained outside of the EEC. Net imports of all grain, estimated at 726,000 metric tons in 1968 would increase by 25 percent in 1975 and 13 percent in 1980 in the "Out EEC" situation and by about 35 percent in both 1975 and 1980 if Norway enters the EEC.

CHAPTER V

AGGREGATE SUPPLY AND DEMAND BALANCES AND TRADE UNDER ALTERNATIVE POLICY ASSUMPTIONS

Introduction

A final concern in this analysis is the effect the projected economic and policy changes will have on trade patterns. The supply-demand balances, as such, indicate something of what will happen but do not provide a complete picture. Trade diversion would occur with expansion of the EEC independent of shifts in production-consumption balances. The total adjustment will be due to simultaneous changes in both economic and policy variables as time progresses. Without entry trade, policy will not likely change materially. With entry, borders between the four and the six will be open but this will not be a change that can be fully assessed in a market and comparative advantage framework for several reasons.

One reason is that internal comparative advantage will not operate fully in the livestock-grain sector of the 10-member Common Market. The existence of price supports that, for example, maintain cattle prices at the same level throughout the area, do not permit full reflection of regional production cost differences. While it can be expected that Irish output of cattle will increase in response to higher prices, the maintenance of prices in higher cost areas, such as Germany, will prevent the operation of competitive forces and mean that German output will continue in response to higher prices. EEC policy as currently developed attempts to adjust for regional differences in cost levels only in the case of grain, where back-off prices were established as distances from the principal deficit center increased. Adjustments since the policy was implemented have obscured this relationship somewhat and they may be further obscured in the determination of regional price patterns within a 10-member Common Market.

A second factor is that a range of trade relationships have been established, particularly by the United Kingdom, and some of these will figure into the negotiations for entry with an as yet undetermined outcome. Some of these arrangements derive from long standing commonwealth relationships and other arrangements have been more recently developed on response to changing market conditions, U.K. domestic price support problems, and questions on balance of payments.

A third important factor complicating the assessments of shifts in trade patterns is the nature of the market mechanism and its ability to absorb major change. In the existing EEC, trade between France and both Germany and Italy probably is inhibited because of inadequate development of a market system to move excess supplies from France to the other two countries. The transport system in France is focused toward a domestic food system and movement from ports toward the Paris area. Although a reversal of this has been achieved to the extent that grain movement out of the Paris Basin area to both these countries has increased, this movement probably could be greater if the physical market system were improved to accommodate more direct border trade. Irish cattle trade has traditionally been toward the U.K. and has included a substantial movement of store cattle. Whether the market system in Ireland can immediately handle substantial shipment of cattle or meat to the continent is not certain.

Trade Policy

Before attempting an assessment of prospective change in trade patterns we need to have in mind the existing major policies and agreements that have been entered into by applicant countries; these center around the U.K.

One agreement that will be eliminated if entry occurs is the Anglo-Irish Free Trade Area Agreement. This agreement calls for the elimination of all forms of import duties and quantitative restrictions on trade between these two countries. Agriculture receives special consideration. Provisions include permitting the regulation of agricultural products other than store cattle, store sheep, or store lambs where governments have an obligation under international commodity agreements, or where domestic support policy involves a restriction on domestic production and marketing and the regulation of imports from other sources of supply. In the case of commodity restrictions, however, the U.K. has accepted the obligation to permit Irish producers an increment of expansion equal to that available to other suppliers, including domestic U.K. producers. Thus as the U.K. market grows, Irish exports grow at least as fast as market requirements. Without entry, this arrangement will continue to be important.

Specific commodity arrangements have been established by the U.K. for dairy products, bacon and cereals. The action on dairy products was implemented in 1962 when the U.K. established an import quota system for butter as protection from the effects of dumping and subsidized supplies that were reaching world markets. The agreement initially was concluded with Denmark, Australia, and New Zealand and established import quotas for these three countries while at the same time assuring them that domestic British policy would not encourage the expansion of milk production for manufactured purposes. The agreement has since been extended to additional countries. In essence these countries are in some degree protected from unfair competition in the form of dumping by other world suppliers, and from competition through undue stimulation of domestic production through policy implemented internally within the U.K. A voluntary agreement covering cheese imports has also been instituted.

In 1964, a bacon market understanding was entered into between the U.K. and its principal suppliers--Denmark, Hungary, Ireland, Netherlands, Poland, Sweden and Yugoslavia. Under this agreement the U.K. annually determines a minimum quantity of supplies needed on the market and allocates its share between domestic producers and this group of overseas countries. This agreement is operated in conjunction with a standard quantity system within the U.K. that involves a reduction in subsidy payments when excess supplies arrive from the domestic market. This system includes some degree of long-term supply control provided it is administered on a year-to-year basis without undue increases in the specified standard quantity.

In 1964 the U.K. also entered into a grains arrangement with its four principal suppliers--Argentina, Australia, Canada, and the U.S. This arrangement provided for minimum import prices on grains and the use of levies to protect the U.K. market from suppliers willing to sell below that price. Since 1964, most other suppliers of grain have signed the agreement and its coverage is comprehensive. The agreement was designed to prevent grain imports at excessively low prices that, in turn, would require deficiency payments on domestic U.K. production. At the same time the U.K. established a standard quantity system for domestic production that would lower deficiency payments on excessively large crops and potentially to some extent influence U.K. output expansion. The standard quantity has since been dropped.

U.K. trade arrangements also include long-standing agreements for duty-free entry or preferential tariffs on imports from Commonwealth countries. In the case of Australia and New Zealand these agreements call for duty-free entry for almost all their exports to the U.K. and margins of preferences are guaranteed to them on most major commodities under specific bilateral trade arrangements. Since 1966, the U.K. has permitted entry without restriction of New Zealand beef, veal, mutton, lamb, chilled and frozen pork and dairy products, and is committed to this position until 1972. The only exceptions to this are those required under international commodity agreements or commodities on which production and marketing restrictions are instituted within the U.K., as well as on the total level of imports. This agreement is very similar to the one entered into with Ireland, but unlike the Irish agreement, will be in conflict with negotiating for entry into the Common Market.

A final major element of trade policy that will be changed if entry occurs is the European Free Trade Association. This Association was developed with primary concern for industrial products, but has resulted in the development of a rather extensive number of bilateral trade arrangements for agricultural products. As the major surplus agricultural producer within the EFTA, Denmark is the most involved and has entered into bilateral agreements with virtually all other member countries. These agreements, in general, have three kinds of provisions: (1) they usually contain a provision whereby an importing country agrees not to expand its own production at the expense of imports from other EFTA countries (essentially Denmark) and to protect imports from member countries from dumped or subsidized exports from third countries; (2) they provide for tariff relief on trade among member countries through outright abolition or suspension or by reduction according to a prescribed time table; (3) they normally have quota provisions which prescribe the amount of trade among member countries. Quotas are established usually at a level above that which existed prior to the formation of EFTA.

Ireland and Denmark have relatively restrictive import systems. In Denmark imports of poultry, eggs, milk and some other animal products are, in principle, prohibited and imports of other animal products may be restricted for health reasons. Ireland essentially excludes the imports of animal products under its phyto-sanitary and health regulations. Grains imports into Denmark are highly restricted in conjunction with a policy of self-sufficiency, while imports into Ireland are somewhat more liberal.

In total, trade policies surrounding these countries are extensive. It probably can be assumed that all preexisting trading arrangements between the U.K., Ireland and Denmark will be suspended with entry, with the exception of those based on phyto-sanitary and health arrangements. The entry of

Danish bacon and dairy products into the U.K. market will no longer be on a restricted or quota basis. But Danish products also will no longer be restricted from entry into the preexisting EEC, particularly the German market. Likewise, Dutch and French exports can move to the U.K. on an unrestricted basis. Irish cattle, in turn, can potentially be diverted from the U.K. market to other EEC member countries. The potential shifts in trading patterns, therefore, are substantial, largely involving the movement of excess grain out of France into other member countries and the movement of excess livestock production from Denmark, Ireland and Netherlands to other member countries, particularly the livestock deficit areas, namely, U.K., Germany and Italy.

Trade Patterns

Recent changes in overall trade patterns for dairy products, meat and grains for the ten-member countries of an expanded EEC are shown in Tables 5.1, 5.2, and 5.3.

Dairy Products

In dairy products, the U.K. has increased imports during the 1962-68 period. The most important increase is from Ireland probably as a result of the Anglo-Irish free trade agreement. Imports from Denmark and Norway have declined but there has been a substantial growth in British imports from the six-member EEC countries. There also has been a major increase in imports from other European countries. Imports from the Americas and other areas, primarily New Zealand and Australia, have declined. It would appear, therefore, that despite British policy which implies a measure of protection for traditional suppliers, all traditional suppliers have lost out in the British manufactured dairy product market. They have been replaced by Ireland and other European countries. EEC exports are on a subsidized basis and this may be part of the explanation. Why imports have increased from "Other Europe" is not clear though one would have to look at export policy, particularly in countries behind the Iron Curtain and the pricing relationship involved in sales to the U.K.

From the viewpoint of exports, the major shifts include the increase in Irish exports, much of it to non-European areas, the substantial decline in total Danish exports with reduced shipments to virtually all areas, and

Table 5.1. Trade in Dairy Products by West European Countries, 1962, 1968, and Difference (Metric Tons Milk Equivalent)*

1962

Exporter \ Importer	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S. Af.	Other World	Total
U. K.	0	0	2,620	0	7,870	0	0	0	4,030	11,162	0	751	559	38,249	65,241
Ireland	377,366	0	0	0	0	0	13,486	40,531	0	5	5,560	3,688	0	0	440,637
Denmark	2,948,432	0	0	0	12,900	5,070	540,889	113,280	0	221,255	66,340	54,051	8,250	121,608	4096,076
Norway	93,754	0	0	0	2,570	0	46,602	18,660	0	5,957	3,310	0	0	12,520	183,374
Belg.-Lux.	22,957	0	825	0	0	0	73,630	66,553	9,572	1,811	0	1,364	0	26,939	203,652
France	60,587	0	4,258	0	32,384	0	353,433	128,735	11,278	193,254	17,530	35,466	0	470,431	1307,357
Germany	2,760	0	0	0	20,550	27,350	0	103,550	0	8,190	3,720	0	0	0	166,120
Italy	14,640	0	0	0	6,270	32,200	9,720	0	0	53,040	124,140	5,620	6,140	9,290	261,060
Netherlands	491,881	0	2,133	0	205,564	61,034	721,203	130,902	0	134,067	32,500	76,535	3,030	377,066	2235,917
Other Europe	927,650	1,190	1,535	1,560	53,526	70,171	270,524	540,197	3,543	--1/	--	--	--	--	1869,807
North America	120,470	0	1,885	0	0	3,376	13,658	6,411	930	--	--	--	--	--	146,730
South America	201,849	0	0	0	1,290	0	0	4,497	0	--	--	--	--	--	207,626
Australia, New Zealand, So. Africa	6,752,215	0	0	0	0	0	112,689	53,755	0	--	--	--	--	--	6918,659
Other World	60,541	0	0	0	0	1,860	0	0	0	--	--	--	--	--	62,401
Total	12,075,104	1,190	13,256	1,560	342,924	201,061	2155,836	1206,974	29,353	628,741	253,100	177,475	17,979	1056103	18160,659

*Includes fluid milk and cream as reported, butter converted to milk at a ratio of 24.5 to 1 and cheese converted at a ratio of 10 to 1.

1/ Not shown and not included in total.

Table 5.1 Continued.

1968

Exporter \ Importer	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Af.	Other World	Total
U. K.	0	0	10,219	0	1,820	1,440	0	0	8,380	5,034	4,490	3,833	822	28,121	64,158
Ireland	924,258	0	0	0	0	0	0	0	0	4,050	8,130	23,491	0	1852,171	2,812,100
Denmark	2,649,199	0	0	1,280	8,070	4,790	287,882	12,300	2,690	81,895	142,921	16,718	9,770	76,991	3,294,508
Norway	58,550	0	0	0	0	0	13,570	2,080	0	11,201	11,290	0	3,510	8,143	108,344
Belg.-Lux.	59,975	0	1,200	0	0	8,151	30,080	86,799	114,289	77,691	37,571	131,192	0	39,772	586,720
France	249,283	0	5,760	0	235,827	0	517,584	849,570	54,440	340,430	52,084	163,822	1,510	409,985	2,880,296
Germany	17,570	0	9,472	0	74,961	10,929	0	461,528	89,039	36,815	113,630	107,099	2,050	89,879	1,012,975
Italy	10,710	0	680	0	90,722	10,774	14,530	0	28,146	43,740	90,910	2,030	5,230	4,190	301,633
Netherlands	682,247	0	0	0	296,852	93,729	819,455	92,205	0	236,119	100,965	176,874	6,953	480,546	2,985,946
Other Europe	1,419,108	0	7,392	420	357,418	126,271	92,571	283,078	3,720	--1/	--	--	--	--	2,289,981
North America	192,640	0	4,144	0	0	0	0	5,322	2,868	--	--	--	--	--	204,974
South America	32,563	0	0	0	0	0	0	0	0	--	--	--	--	--	32,563
Australia, New Zealand, So. Africa	6,697,946	0	0	0	0	0	4,440	628	0	--	--	--	--	--	6,703,014
Other World	18,693	0	0	0	0	0	0	0	0	--	--	--	--	--	18,693
Total	13,012,745	0	38,867	1,700	1,065,673	256,085	1780,113	1,793,512	303,573	836,979	561,991	625,059	29845	2,989,798	23,295,939

1/ Not shown and not included in total.

Table 5.1 Continued.

Difference

Importer / Exporter	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S. Af.	Other World	Total
U. K.	0	0	7,599	0	- 6,050	1,440	0	0	4,350	- 6,128	4,490	3,082	263	-10,128	- 1,082
Ireland	546,891	0	0	0	0	0	-13,486	-40,531	0	4,045	2,570	19,803	0	1852,171	2,371,436
Denmark	-299,233	0	0	1,280	- 4,830	- 280	-253,006	-100,980	2,690	-139,359	76,581	-37,333	1,520	-44,617	-797,568
Norway	-35,203	0	0	0	- 2,570	0	- 33,032	-16,580	0	5,243	7,980	0	3,510	-4,377	-75,029
Belg.-Lux	37,018	0	375	0	0	8,151	-43,550	20,246	104,717	75,880	37,571	129,828	0	12,833	383,068
France	188,695	0	1,502	0	203,443	0	164,151	720,834	43,162	147,176	34,554	128,416	1,510	-60,446	1,572,938
Germany	14,810	0	9,472	0	54,411	-16,420	0	357,978	89,039	28,625	109,910	107,099	2,050	89,879	846,855
Italy	-3,930	0	680	0	84,452	-21,425	4,810	0	28,146	-9,300	-33,230	3,590	-910	-5,100	40,603
Netherlands	190,365	0	-2,133	0	91,288	32,694	98,251	-38,697	0	102,052	1/68,465	100,339	813	103,480	750,028
Other Europe	491,458	-1190	5,857	-1140	303,892	56,100	-177,952	-257,029	177	--	--	--	--	--	420,173
North America	72,170	0	2,259	0	0	-3,376	-13,658	-1,089	1,938	--	--	--	--	--	58,244
South America	-169,286	0	0	0	-1,290	0	0	-4,487	0	--	--	--	--	--	-175,063
Australia, New Zealand, So. Africa	-54,269	0	0	0	0	0	-108,249	-53,127	0	--	--	--	--	--	-215,645
Other World	-41,848	0	0	0	0	-1,860	0	0	0	--	--	--	--	--	- 43 708
Total	937,640	-1190	25,611	140	722,749	55,023	-375,723	586,537	274,520	208,236	308,891	447,584	11866	1,933,695	5,135,280

Source: U. N. Trade Statistics.

1/ Not shown and not included in total.

the major increase in exports from other European areas, including the EEC. The most significant increase in exports from EEC countries has been France, but Germany, Belgium, Luxembourg and the Netherlands also have increased substantially. French exports to other EEC countries increased substantially and France as well as other EEC countries have developed major export outlets to non-European areas, albeit on a subsidized basis.

Meat

Total meat imports into the U.K. have declined by 71,000 metric tons or approximately 2.6 percent. Some regional shifts have occurred. The most important of these is the decline in imports from the western hemisphere along with the increase in imports from Ireland. A clear shift has occurred in the source of U.K. beef imports probably due in large part to the development of the Anglo-Irish free trade area agreement. Imports from Denmark, Belgium, Luxembourg and France have also increased. The importance of these shifts is that the kinds of changes that could be expected to occur with entry by the U.K., Ireland and Denmark into the EEC clearly have already begun. The U.K.'s imported meat supplies have increasingly come from other European countries at the expense of outside suppliers.

The total picture of change in Irish meat export trade is reflected in the changes for the U.K. Exports to other areas have declined slightly with a major increase in shipments to the U.K. Denmark's meat exports, on the other hand, have become more diversified. There have been reduced shipments to Germany, but increased shipments to other EEC member countries as well as to the Americas and the rest of the world. The expansion in Danish exports has been primarily pork, although some of the shift has involved exports of cattle, in particular, increased exports to Italy. Norway has moved from a net exporter of meat to a net importer of approximately equal amount--just over 9,000 metric tons annually. Denmark and other European countries outside the EEC are its principal source of supply.

Grains

The most important overall shift from the viewpoint from American farmers is that which has occurred in grain. Total imports of grain into the U.K. decreased in the period 1962-68 by over 2 million metric tons or approximately 20 percent. Increases in imports occurred from Netherlands,[1/]

[1/] Increases from the Netherlands are transhipments that originate elsewhere.

Table 5.2. Trade in Meat by West European Countries, 1962, 1968 and Difference (Metric Tons)*

1962

Exporter \ Importer	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Af.	Other World	Total
U. K.	0	248	0	564	0	0	96	0	209	58	358	0	182	3,699	5,414
Ireland	66,937	0	70	0	0	0	1,752	0	0	742	34,644	0	0	75	104,220
Denmark	335,239	0	0	559	0	846	53,209	20,933	0	73,816	36,710	3,879	0	10,880	536,071
Norway	408	0	0	0	292	0	1,842	336	145	6,002	0	0	0	0	9,025
Belg.-Lux.	586	0	0	0	0	1,276	17,977	5,127	2,415	2,030	0	0	0	0	29,411
France	694	0	0	0	435	0	66,277	3,834	9,297	84,446	324	92	0	29,514	194,913
Germany	2,277	0	0	0	0	1,140	0	3,571	0	5,488	668	0	0	0	13,144
Italy	461	0	0	0	241	1,337	640	0	0	3,756	662	95	0	455	7,647
Netherlands	55,518	0	0	0	3,455	10,852	94,289	16,062	0	10,161	21,756	153	0	2,642	214,888
Other Europe	149,870	9	20	611	2,075	3,279	31,425	30,332	239	--1/	--	--	-	--	217,860
North America	3,001	0	0	0	675	0	32,026	401	1,379	--	--	--	-	--	87,482
South America	244,197	0	0	236	14,201	387	30,712	53,202	15,305	--	--	--	-	--	358,543
Australia, New Zealand, So. Africa	79,328	0	0	0	0	43	1,363	378	32	--	--	--	-	--	81,144
Rest of World	23,661	0	0	0	0	2,297	588	1,814	0	--	--	--	-	--	28,360
Total	962,177	257	90	1,970	21,374	0	82,026	401	1,379	186,499	95,122	4,219	182	47,265	1,887,822

*Does not include live cattle or their meat equivalent.

1/ Not shown and not included in total.

Table 5.2 Continued.

1968

Importer / Exporter	U.K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Afr.	Other World	Total
U. K.	0	230	0	0	3,306	1,304	371	685	817	346	2,712	0	452	1,607	11,830
Ireland	139,167	0	0	0	2,138	1,175	0	0	141	636	25,617	0	0	128	169,002
Denmark	359,210	0	0	5,794	9,609	8,888	14,470	58,579	8,455	63,425	67,705	5,168	204	20,274	621,781
Norway	0	0	0	0	0	0	243	0	0	618	0	0	0	0	861
Belg.-Lux.	3,474	0	0	0	0	38,700	41,179	9,487	16,476	818	0	0	0	484	110,618
France	14,722	0	0	0	4,992	0	123,539	13,779	7,739	13,222	410	106	401	7,568	186,478
Germany	995	0	0	0	1,549	11,231	0	18,694	3,204	10,057	509	0	0	1,237	47,476
Italy	352	0	0	0	814	2,623	3,585	0	0	3,533	299	0	176	1,491	12,873
Netherlands	51,136	0	0	0	10,054	78,221	184,029	61,330	0	12,808	37,819	134	0	6,208	441,739
Other Europe	138,389	10	1,871	3,668	551	28,880	140,591	113,893	1,720	-- 1/	--	--	-	--	429,573
North America	4,950	0	0	82	950	0	16,188	755	1,068	--	--	--	-	--	23,993
South America	112,851	0	0	160	20,669	9,058	23,072	43,286	27,234	--	--	--	-	--	236,330
Australia, New Zealand, So. Africa	56,346	0	0	0	0	198	199	0	168	--	--	--	-	--	56,911
Other World	9,247	0	0	0	389	3,689	0	4,893	0	--	--	--	-	--	18,218
Total	890,839	240	1,871	9,704	55,030	183,967	547,466	325,381	67,022	105,463	135,071	5,408	1,233	38,997	2,367,692

1/ Not shown and not included in total.

Table 5.2 Continued

Difference

Importer / Exporter	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Af.	Other World	Total
U. K.	0	-18	0	-564	3,306	1,304	275	685	608	288	2,354	0	270	-2,092	6,416
Ireland	72,230	0	-70	0	2,138	1,175	-1,752	0	141	-106	-9,027	0	0	53	64,782
Denmark	23,971	0	0	5,235	9,609	8,042	-38,739	37,646	8,455	-10,391	30,995	1,289	204	9,394	85,710
Norway	- 408	0	0	0	- 292	0	-1,599	- 336	- 145	-5,384	0	0	0	0	-8,164
Belg.-Lux	2,888	0	0	0	0	37,424	23,202	4,360	14,061	-1,212	0	0	0	484	81,207
France	14,028	0	0	0	4,557	0	57,262	9,945	-1,558	-71,224	86	14	401	-21,946	-8,435
Germany	-1,282	0	0	0	1,549	10,091	0	15,123	3,204	4,569	- 159	0	0	1,237	34,332
Italy	- 109	0	0	0	573	1,286	2,945	0	0	- 223	- 363	-95	176	1,036	5,226
Netherlands	-4,382	0	0	0	6,599	67,369	89,740	45,268	0	2,647	16,063	-19	0	3,566	226,851
Other Europe	-11,481	1	1,851	3,057	-1,524	25,601	109,166	83,561	1,481	-- 1/	--	--	--	--	211,713
North America	1,949	0	0	82	275	0	-65,838	354	-311	--	--	--	--	--	-63,489
South America	-131,346	0	0	-76	6,468	8,671	-7,640	-10,219	11,929	--	--	--	--	--	-301,632
Australia, New Zealand, So. Africa	-22,982	0	0	0	0	155	-1,164	- 378	136	--	--	--	--	--	-24,233
Other World	-14,414	0	0	0	389	1,392	- 588	3,079	0	--	--	--	--	--	-10,142
Total	-71,338	-17	1,781	7,734	33,656	162,510	165,269	189,388	38,001	-81,036	39,949	1,189	1051	-8,268	479,870

Source: U. N. Trade Statistics

1/ Not shown and not included in total.

France, and moderately from other European sources, but declines have occurred from all other areas, particularly North America. Imports into Ireland have increased somewhat but this has been much more than offset by reduction in imports into Denmark and Norway. As with meat and dairy products, there has been a substantial internalization of European trade, in this case dominated by a major increase in exports from France to other European countries. Beyond this there has been a major increase in exports from the EEC to other world areas, primarily Africa and Asia, and France has increased shipments to non-EEC European countries. The principle commodity involved in EEC exports is soft wheat.

Production and Consumption Trends

Previous chapters have described in some detail and projected for the U.K., Ireland and Denmark production and consumption to 1980. In this section these projections will be looked at in total for the four countries that are applying for entry into the EEC, for the six-member EEC and for the ten-member EEC (Table 5.4). Projections for the six-member existing Common Market are based on an updating of previous work at Michigan State University and the projections for Norway are based on recent work by the OECD and discussions with Norwegian officials.

Our analysis begins with livestock products because these items are major determinants of the utilization of grain and also influence the availability of resources, particularly land, for grain production.

Dairy Products

Estimating a specific balance for dairy products is difficult because of the many products derived from milk, many of which are joint products and all of which require different base quantities of milk in production. Domestic production in the U.K. is sufficient to supply fluid milk, but a major portion of all manufactured products are imported. Ireland and Denmark have major surpluses and these will likely increase in the future. At the present time, Danish and Irish surpluses of milk are less than the total British deficit. The U.K. imports substantial quantities from other areas, particularly New Zealand and Australia.

If policies in the U.K. are adopted that substantially increase the price of butter relative to margarine, a rapid switch in consumption pattern

Table 5.3. Trade in Grain and Products by West European Countries
1962, 1968 and Difference (Metric Tons)

1962

Importer / Exporter	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N.Z. S.Af.	Other World	Total
U. K.	0	0	15,815	3,367	29,293	0	226,360	8,489	34,716	7,236	0	0	0	5,194	330,470
Ireland	38,517	0	0	0	0	0	0	0	0	0	0	0	0	0	38,517
Denmark	3,634	0	0	10,724	12,239	10,116	60,704	6,560	50,912	29,722	2,237	13,564	0	3,045	203,457
Norway	0	0	5,570	0	0	2,037	7,418	0	5,518	7,029	0	0	0	2,576	30,148
Belg.-Lux.	121,855	0	0	0	0	0	25,005	0	27,963	53,081	0	0	0	0	227,904
France	223,281	2,407	41,553	42,077	107,666	0	671,518	148,706	88,783	605,935	479	26,001	0	1,196,617	3,155,024
Germany	19,236	0	62,794	0	0	0	0	11,068	155,451	203,134	0	7,107	0	484,629	943,420
Italy	1,160	0	204	0	0	4,980	4,183	0	0	6,892	0	0	0	136,941	154,360
Netherlands	360,056	0	0	0	75,440	12,962	120,260	0	0	34,594	0	0	0	2,379	605,691
Other Europe	699,413	1,633	86,126	98,036	112,352	42,607	920,290	177,513	188,597	--	--	--	--	--	2,326,657
North America	6,553,423	277,319	560,025	339,516	1,376,102	608,134	3,304,074	959,066	2,785,555	--	--	--	--	--	16,763,214
South America	721,845	0	183,306	33,274	392,327	194,440	1,058,484	1680,482	552,630	--	--	--	--	--	4,816,788
Australia, New Zealand, S. Africa	1,293,816	47,781	25,648	73,068	36,378	67,066	373,803	481,372	103,948	--	--	--	--	--	3,002,880
Other World	201,195	0	211,167	0	96,087	213,266	272,691	281,296	31,962	--	--	--	--	--	1,307,660
Total	10,237,431	329,140	1,192,208	600,062	2,237,884	1155,608	7,544,790	3754,547	4,026,036	947,623	2,716	46,672	0	1,831,381	33906,102

Table 5.3. Continued.

1968

Exporter \ Importer	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Af.	Other World	Total
U. K.	0	8,083	135,438	2,044	25,550	0	353,778	149,246	15,087	12,575	0	0	0	7,878	709,679
Ireland	1,406	0	0	0	0	0	0	0	0	4	0	0	0	0	1,410
Denmark	1,974	3,992	0	7,657	3,326	0	77,178	19,736	0	37,140	3,000	11,493	0	0	165,496
Norway	1,712	0	0	0	0	0	0	0	0	0	0	0	0	0	1,712
Belg.-Lux	122,352	5,118	0	0	0	3,914	108,637	0	79,073	701	0	0	0	48,414	368,209
France	502,556	137,720	123,186	156,530	1,074,319	0	1,544,450	322,789	608,949	2132,624	30,625	192,984	0	3,058,660	9,885,394
Germany	17,461	0	9,404	0	4,907	3,457	0	2,845	18,961	163,315	0	3,603	0	416,937	640,890
Italy	442	0	0	0	0	2,615	12,798	0	0	4,235	0	0	0	259,143	279,233
Netherlands	1,458,895	33,224	0	12,791	98,603	0	307,321	0	7,708	15,049	0	0	0	72,132	2,005,723
Other Europe	752,982	10,743	13,925	148,685	15,472	10,978	352,436	559,402	106,892	-- 1/	--	--	--	--	1,971,515
North America	3,790,677	219,859	204,353	269,364	944,552	778,799	2,706,721	2949,286	2,572,868	--	--	--	--	--	14,436,469
South America	93,482	4,390	41,200	58,288	492,758	99,733	257,698	2961,176	394,446	--	--	--	--	--	4,403,171
Aust., N. Zealand, S.Africa	1,231,803	78,284	2,629	59,055	25,094	37,026	282,397	440,944	126,271	--	--	--	--	--	2,283,503
Other World	182,137	13,963	0	0	58,051	39,333	114,708	119,407	32,985	--	--	--	--	--	560,584
Total	8,157,880	515,376	530,135	714,414	2,742,633	975,855	6,118,122	7,524,831	3,963,240	2,365,644	33,625	208,080	0	3,863,164	37,713,000

1/ Not shown and not included in total.

Table 5.3. Continued

Difference

Importer / Exporter	U. K.	Ireland	Denmark	Norway	Belg.-Lux.	France	Germany	Italy	Netherlands	Other Europe	North America	South America	Aust. N. Z. S.Af.	Other World	Total
U. K.	0	8,083	119,623	- 1,323	- 3,743	0	127,418	140,757	-19,629	5,339	0	0	0	2,684	379,209
Ireland	-37,110	0	0	0	0	0	0	0	0	4	0	0	0	0	-37,106
Denmark	- 1,660	3,992	0	- 3,067	- 8,913	-10,116	16,474	13,176	-50,912	7,418	763	-2,071		- 3,045	-37,961
Norway	- 1,712	0	- 5,570	0	0	- 2,037	- 7,418	0	- 5,518	- 7,029	0	0	0	- 2,576	-23,436
Belg.-Lux.	496	5,118	0	0	0	3,914	83,632	0	51,110	-52,380	0	0	0	48,414	140,304
France	279,275	135,313	81,633	114,453	966,653	0	872,931	174,083	520,135	1526,689	30,146	166,983	0	1,862,043	6,730,369
Germany	- 1,774	0	-53,390	0	4,907	3,457	0	- 8,223	-136,490	-39,819	0	-3,504	0	-67,692	-302,529
Italy	- 718	0	- 204	0	0	- 2,365	8,615	0	0	- 2 657	0	0	0	122,202	124,872
Netherlands	1,098,838	33,224	0	12,791	23,163	-12,962	295,295	0	7,708	-19,545	0	0	0	69,753	1,400,832
Other Europe	53,568	9,110	-72,201	50,649	-96,880	-31,629	-567,854	381,889	-81,705	-- 1/	--	--	--	--	-355,052
North America	-2,762,746	-57,460	-355,672	-70,152	-431,580	170,665	-597,353	1990,220	-212,687	--	--	--	--	--	-2,326,745
South America	-628,363	4,390	-142,106	25,014	100,431	-94,707	-800,786	1280,694	-158,184	--	--	--	--	--	-413,617
Aust., N. Zealand, S.Africa	-62,013	30,503	-23,019	-14,013	-11,284	-30,040	-591,406	-40,428	22,323	--	--	--	--	--	-719,377
Other World	-19,058	13,963	-211,167	0	-38,036	-173,933	-157,983	-161,885	1,023	--	--	--	--	--	-747,076
Total	-2,079,551	186,236	-662,073	114,352	504,749	-179,752	-1,426,668	3970,283	-62,796	418,020	30,909	161,408	0	2,031,783	3,806,898

Source: U. N. Trade Statistics

1/ Not shown and not included in total.

Table 5.4 Production, Consumption, Net Deficit (-) or Surplus (+) of Major Grain-Livestock Products for 1968 and 1980 (1000 m.t.)[1]

				Case I			Case II			Case III		
				Out EEC, Deficiency Payment Policy in U.K.			Out EEC, Import Levy Policy in U.K.			In EEC		
	1968			1980			1980			1980		
	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.
Grains												
United Kingdom	13,363	21,724	-8,361	18,449	24,734	-6,285	20,215	23,893	-3,678	22,839	22,989	-150
Ireland	1,427	1,380	+47	1,256	1,662	-406	1,256	1,662	-406	1,296	1,639	-343
Denmark	6,784	6,132	+652	8,112	7,254	+858	8,112	7,254	+858	6,832	8,786	-1,954
Norway	820	1,170	-350	763	1,582	-819	763	1,582	-819	678	1,653	-975
Sub-total (4)	22,394	30,406	-8,012	28,580	35,232	-6,652	30,346	34,391	-4,045	31,645	35,067	-3,422
EEC-6	70,400	73,271	-2,871	89,181	87,557	+1,624	89,181	87,557	+1,624	89,181	87,557	+1,624
Total (10)	92,794	103,677	-10,883	117,761	122,789	-5,028	119,527	121,948	-2,421	120,826	122,624	-1,798
Milk (fat equivalent)												
United Kingdom	510	1,030	-520	600	1,475	-875	556	1,462	-906	486	1,248	-762
Ireland	126	72	+54	236	85	+151	236	85	+151	316	83	+233
Denmark	217	113	+104	220	130	+90	220	130	+90	271	129	+142
Norway	74	66	+8	76	72	+4	76	72	+4	82	72	+10
Sub-total (4)	927	1,281	-354	1,132	1,762	-630	1,088	1,749	-661	1,155	1,532	-377
EEC-6	2,659	2,094	+565	3,422	2,574	+848	3,422	2,574	+848	3,422	2,574	+848
Total (10)	3,586	3,375	+211	4,554	4,336	+218	4,510	4,323	+187	4,577	4,106	+471
Beef and Veal												
United Kingdom	906	1,130	-224	1,219	1,274	-55	1,151	1,222	-71	1,063	1,063	-0-
Ireland	337	52	+285	507	63	+444	507	63	+444	682	62	+620
Denmark	247	92	+155	260	106	+154	260	106	+154	325	106	+219
Norway	53	60	-7	57	64	+7	57	64	-7	64	64	-0-
Sub-total (4)	1,543	1,334	+209	2,043	1,507	+536	1,975	1,455	+520	2,134	1,295	+839
EEC-6	3,952	4,341	-389	5,053	6,001	-948	5,053	6,001	-948	5,053	6,001	-948
Total (10)	5,495	5,675	-180	7,096	7,508	-396	7,028	7,456	-428	7,187	7,296	-109

(continued)

Table 5.4. (continued)

				Case I			Case II			Case III		
				Out EEC, Deficiency Payment Policy in U.K.			Out EEC, Import Levy Policy in U.K.			In EEC		
	1968			1980			1980			1980		
	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.	Prod.	Cons.	Bal.
Pigmeat												
United Kingdom	826	1,216	-390	1,194	1,558	-364	1,121	1,475	-354	1,122	1,470	-348
Ireland	115	73	+42	108	95	+13	108	95	+13	39	88	-49
Denmark	739	159	+580	947	195	+752	947	195	+752	1,191	227	+964
Norway	61	61	-0-	77	80	-3	77	80	-3	83	80	+3
Sub-total (4)	1,741	1,509	+232	2,326	1,928	+398	2,253	1,845	+408	2,435	1,865	+570
EEC-6	4,780	4,717	+63	6,195	6,057	+138	6,195	6,057	+138	6,195	6,057	+138
Total (10)	6,521	6,226	+295	8,521	7,985	+536	8,448	7,902	+546	8,630	7,922	+708
Poultrymeat												
United Kingdom	490	509	-19	732	697	+35	730	696	+34	722	688	+34
Ireland	25	25	-0-	37	50	-13	37	50	-13	45	47	-2
Denmark	65	24	+41	68	33	+35	68	33	+35	69	31	+38
Norway	4	4	-0-	8	8	-0-	8	8	-0-	8	8	-0-
Sub-total (4)	584	562	+22	845	788	+57	843	787	+56	844	774	+70
EEC-6	1,726	1,744	-18	3,043	2,898	+145	3,043	2,898	+145	3,043	2,898	+145
Total (10)	2,310	2,306	+4	3,888	3,686	+202	3,886	3,685	+201	3,887	3,672	+215
Eggs												
United Kingdom	900	855	+45	1,101	1,049	+52	1,074	1,023	+51	1,028	1,008	+20
Ireland	41	39	+2	34	30	+4	34	30	+4	34	31	+3
Denmark	86	57	+29	79	68	+11	79	68	+11	107	66	+41
Norway	36	38	-2	44	44	-0-	44	44	-0-	44	44	-0-
Sub-total (4)	1,063	989	+74	1,258	1,191	+67	1,231	1,165	+66	1,213	1,149	+64
EEC-6	2,254	2,264	-10	3,103	2,955	+148	3,103	2,955	+148	3,103	2,955	+148
Total (10)	3,317	3,253	+64	4,361	4,146	+215	4,334	4,120	+214	4,316	4,104	+212

[1]The price assumptions used in making these projections include actual prices for 1968, 1969 and 1970, partial forecasts for 1971, and the EEC's and U.K.'s announced support levels for 1971-72. These projections represent an updated version of an original model which did not entirely account for the sharp increases in certain prices in 1970-71. The major revisions in net balances were in the U.K.

could occur and result in a substantial closing of its import gap. The kind of dairy policy that evolves under the move to higher prices and import levies even outside the EEC can, therefore, become very important in determining the import needs into the area.

With entry into the EEC, manufactured dairy product prices would increase sharply in the U.K., and Ireland and this would likely have a major effect upon consumption. Butter consumption is projected in 1980 to be reduced in the U.K. from above 630,000 metric tons to about 430,000 metric tons if this occurs. Danish and Norwegian domestic prices are relatively high and there would be little effect on human consumption on a fat equivalent basis. Reduced consumption in the U.K. along with accelerated increases in output in Ireland and Denmark could substantially shift the internal balance that currently exists for these countries.[1/] In addition, the existing six-member EEC has a major surplus in milk production that could potentially move to the U.K. market and eliminate the need for third country import. The ten-member EEC will have an overall surplus of milk.

Beef and Veal

The four applicant countries have a surplus in total beef and veal production. The U.K. has a substantial deficit balance, Norway has a small deficit while both Ireland and Denmark are major surplus producers. The projections indicate that this surplus will be at about the same level under both policy alternatives if these countries remain outside the EEC. If the U.K. continues to use levies, food costs will rise and demand expansion will be less than could have been anticipated with the continuation of deficiency payments. But, because of higher grain prices, output will expand less and the net balance will be about the same under either policy alternative.

If these countries enter the EEC, trends in production and consumption will change appreciably. Because of higher prices total consumption will increase very little or decline slightly. Output of beef and veal in the U.K. would be less than without entry due to shifts in price relationships and elimination of certain input and production subsidies. Production in Ireland would expand rapidly to more than offset the decline in the U.K. Danish production will increase because of increased profitability of milk

[1/]The consumption effect would be primarily on butter due to substitution. For other manufactured products price elasticities are relatively low and for fluid milk price changes will be small except in Ireland.

and a possible tendency to feed out more veal calves to higher average weights. The overall picture for beef and veal in these four countries with entry into the EEC is for some increase in the degree of self-sufficiency. Surplus production will be substantially greater than if they remain outside the EEC.

Viewed in the context of a ten-member EEC, an overall deficit balance is likely to exist throughout the period. Surplus production in the Netherlands, Ireland and Denmark and France will not be sufficient to overcome deficits in Germany, Italy and the U.K. An overall balance for the area can be achieved in a number of ways. (1) If prices are strong and remain above support levels, consumption will likely be held in check beyond that which is estimated in the projections which assume the EEC support levels. (2) This also could induce an expansion in output, though prices probably would have to rise considerably before any substantial increase in feeding and shift from slaughter of veal to beef is likely to occur, and (3) the deficit can be filled by imports from external sources. In the overall, though, it would appear that import requirements from external sources will be substantially reduced as a result of entry by the four countries. Ireland will be able to fill much of the deficit in other member countries. Further, Danish and French sources can increasingly be diverted into the U.K. and Germany and potentially Italy with the result that the European market for beef will decline for outside suppliers.

Mutton and Lamb

Mutton and lamb consumption is relatively most important in the U.K., although substantial amounts also are consumed in Ireland. Consumption in the two countries in 1968 was 614,000 metric tons and this is projected to increase to over 800,000 metric tons outside the EEC and to about 775,000 metric tons with entry and higher EEC prices. Production of mutton and lamb in the U.K. is projected to increase, but only moderately either in or outside the EEC. In Ireland, production is expected to increase outside the EEC if there are no major price shifts relative to cattle. With entry, however, prices will shift in favor of cattle and there will be a decline in Irish output of mutton and lamb. In total, in an expanded EEC, a continued important deficit in mutton and lamb production will exist. Denmark and the six existing member countries produce very little and though per capita consumption levels are low, most of what is consumed must be imported.

At present, the EEC maintains no support on mutton and lamb. If these are developed during or following negotiations for entry, production may be introduced in new areas and be maintained or further expanded in the U.K. and Ireland.

Bacon and Pork

In 1968 the overall picture in the applicant countries on pigmeat and pigmeat products is similar to that for other livestock. The U.K. is a major deficit producer and imports substantial quantities of bacon and ham from a number of sources. Ireland and Denmark are surplus producers and export to the U.K. Norwegian pigmeat production is approximately at a self-sufficiency level. The most important question on pigmeat production is the extent to which output in the U.K. increases relative to U.K. consumption. Unrestricted projections indicate that production could increase to exceed the projected increase in consumption under all policy alternatives. In this event the outlet for Danish supplies could be reduced and inhibit potential expansion in Danish production. The U.K. could move to a self-sufficiency and even to surplus production. In the light of British policy and international obligations it is unlikely that major surplus production would be permitted. We can conclude, however, that economic pressures would be in the direction of a reduced pigmeat deficit in the U.K. and would increase pressures on international markets.

In Ireland total production of pork and bacon would decline as a result of increased relative grain prices and an expected emphasis on the production of cattle. Pigmeat production in Denmark is expected to increase substantially and can easily absorb any market gaps that exist either in the U.K. or Ireland. Since Denmark would have access to markets in the existing EEC, expansion will not, as in the past, be inhibited by available market outlets. The projected expansion in Danish production could easily mature.

In combination with the existing six-member EEC, where an overall small surplus of pigmeat is projected, the ten-member EEC can be expected to develop full self-sufficiency or more in pigmeat and pigmeat products.

Poultry Products

The projections for the four applicant countries on both eggs and poultrymeat indicate the potential development of surpluses if they remain outside the EEC. Given past trends in the industry and the fact that production in all countries has become industrialized, this projection is not surprising. The only indicated adjustment to lower production if these countries remain outside the EEC is for eggs in Ireland and Denmark.

In the case of entry much the same kinds of trends are indicated but with reduced rates of change. Poultrymeat and egg production in the U.K. would increase less due to higher grain prices and expansion in Ireland and Denmark would also be reduced. In the case of eggs, U.K. output would increase less and Irish output would be expected to decline. In balance, the applicant countries would be essentially self-sufficient or slightly more both in eggs and poultrymeat.

In general, it can be assumed that for the 10-member EEC an approximate self-sufficiency balance will be achieved for both eggs and poultrymeat. To some extent this will also be true of each individual country though modest intercountry trade within the area could occur, particularly in response to short-run surpluses or deficit. With modern technology the output of both poultrymeat and eggs are highly responsive to price both in expansion and contraction, so that overall adjustment would be achieved at a near self-sufficiency level. Our projection is that egg and poultrymeat production and consumption will about balance with modest internal trade within the EEC providing regional adjustment in supplies.

Food and Feed Grains

Total grain production has been rising steadily in the applicant countries. In both Denmark and Ireland some shift has taken place so that there has been a decline in total food grain production and an increase in feed grain production. In the U.K. both food grain and feed grain production have increased considerably but the greatest expansion has been in feed grain. Even without entry into the EEC or any major changes in price relationships the area utilized for grain in the U.K. could expand as much as about 20 percent. Most of this expansion would be expected to occur in feed grain acreage.

Food grain production in the U.K. is at approximately 60 percent of self-sufficiency at the present time, but this gap will be reduced. Some imports of soft wheat, however, may continue to be required and in addition imports of high quality hard wheat for mixing purposes to produce desired types of flour will continue. The amount of total imported food grains required is difficult to estimate because a significant quantity of wheat is and probably will continue to be fed to livestock with variation from year to year depending on crop quality. Total grain utilization will increase less than output in the U.K. and import needs will decline under all policy assumptions but more severely as prices rise due to import levies implemented under the conservative party's program or due to entry into the EEC.

Denmark has reached a level of approximate self-sufficiency in total grain production and this level can be expected to continue through 1980 if entry does not occur. Increases in requirements will result due to expansion in livestock production with entry and a substantial deficit in feed grains could arise. Food grain imports will be related largely to quality wheat needed for mixing purposes.

In total, the deficit for grains for the four applicant countries on the assumption they do not enter the EEC and no major policy changes occur is projected to be between about 2.4 and 5.0 million metric tons by 1980 depending on whether an import levy or deficiency payment policy applies. This is based on the assumption that feeding of grains continue at approximately the historical level.

If entry into the EEC occurs, these projections will change substantially. Production in Ireland with entry would not be greatly different than if entry does not occur. In both cases acreage devoted to wheat will likely decline. Feed grain acreage will increase somewhat, but in the overall, some land will be shifted out of grain into grass for cattle production.

In the U.K., on the other hand, total grain production could be expected to increase more rapidly with entry. Total grain production in Denmark would increase without entry but is projected to remain at about the 1968 level if entry occurs. Wheat production probably would be only moderately greater than without entry, but a substantial increase would occur in feed grains over and above that which will occur without entry. Potentially total acreage of grain could increase substantially but this would require plowing up substantial amounts of land currently used for livestock grazing. The extent to which this occurs will depend on the relative quality of land at the margin; whether large amounts of good land are available for plowing or whether decreasing quality would immediately be met. A second factor is the amount of capital and investment required to convert from livestock to grain production. In some areas this is a matter of shifting acreage within farms that are capitalized for combination grain-livestock production. On these farms some shift toward grain from grass and cattle could be expected. On the other hand, in areas that are predominately livestock, based on grass, both new investment and lower quality land are a factor in estimating the rate of shift in acreage. If the shift is extensive, the U.K. can become fully self-sufficient and even surplus in grain production. In part this is because concentrate utilization under EEC prices are projected to increase less, and in fact will stabilize after about 1973 when transition to EEC prices begins. This coupled with greater economic incentives to increase output will create an important shift in the cereal balance within the U.K.

Surplus grain production could arise in the EEC-6 by 1980 and only a limited deficit will exist in the 10 countries. Even this deficit will quickly disappear if livestock feeding rates in the applicant countries decline even modestly.

Conclusions

There is a trend toward self-sufficiency in European countries in grain and livestock products. This probably would have occurred without the formation of the 6-member EEC and could continue for the four applicant countries without accession to the EEC, particularly if U.K. price policy is unchanged. In the EEC-6, the greatest impact of the common policy has been on demand, particularly the use of grain for livestock. Grain prices are high relative to livestock prices and this inhibits cattle feeding. There also has been some displacement of grain by other inputs in compounded feeds.

The estimates in this study indicate that with entry human food demand in the four applicant countries will shift somewhat largely by reducing beef and veal consumption and causing substitution of margarine for butter. Total concentrate use would be reduced somewhat but no measure of potential shift away from grain in compounded feeds has been attempted. It could be substantial.

Entry by the four countries will also have a supply effect. Output of milk, beef, pigmeat, and cereals will likely be greater than if they remain outside. Entry thus will have a negative demand effect and a positive supply effect on the three major items that have been important U.K. imports--

butter, beef and feed grain. Further, these have been supplied in important quantities by countries other than those that will be members of a ten-country EEC.

The total effect on trade of accession by the four countries is difficult to project. Some internal diversion of dairy products, meat, and grain toward the U.K. will likely occur. This, along with a projected rate of increase in output greater than utilization, will result in diminishing export opportunities for third country suppliers of each of the three commodity groups. Danish and Irish dairy products along with existing EEC surpluses are more than adequate to displace existing U.K. commonwealth imports. In the case of soft wheat, internal transfers from France can easily fill the U.K. deficit so that little if any will be imported from external sources. Imports of quality wheat for mixing purposes will continue. In feed grain, specific deficits will exist in some countries and imports from third countries, particularly of corn, will likely continue. Overall self-sufficiency and some export surpluses will exist for pork, poultry and eggs. A small deficit in beef is projected with entry, but the area likely will not be an expanding market for external suppliers.

APPENDIX A

A LINEAR PROGRAMMING ANALYSIS OF THE FEED GRAIN LIVESTOCK ECONOMY IN GREAT BRITAIN IN 1968, 1972 AND 1977

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There are a number of problems associated with an analysis of aggregate supply response for British agriculture based on historical time-series analysis alone. Due to the implementation of guaranteed prices and the long-term assurances granted to producers of the major agricultural commodities under the 1947 and 1957 Agricultural Acts, movements in farm prices in Britain over the post-war period have been relatively slight. More importantly, however, there are a number of questions associated with the impact on British agriculture of entry into E.E.C. and acceptance of the Common Agricultural Policy which are difficult to handle solely by time-series analysis. For example, the entry of Britain into the E.E.C. would probably lead to quite substantial price increases for many commodities, especially cereals and beef, and this would result in farm product prices well in excess of previous experience. In addition, there would be marked changes in relative profitability both between enterprises and between alternative production systems within enterprises. This led to the conclusion that a second line of analysis was required to complement the predictions of future supply levels based on time-series analysis, especially for the policy assumption of E.E.C. entry. It is this complementary analysis which has been undertaken by the Agricultural Adjustment Unit, the results of which are presented in this section of the report.

Method of Analysis

The method chosen by the Unit was to analyze supply at the farm-firm level, using linear programming techniques. This involved a normative approach to the estimation of supply response, using a selection of representative or modal farms and raising the results to obtain estimates of aggregate supply levels under alternative policy assumptions. Although there are a number of disadvantages associated with this technique, it has the advantage of being able to handle the effects of marked changes in absolute and relative prices such as would occur in the event of British membership of the E.E.C. It also allows for competition between enterprises for available resources.

The first stage of the study was to specify the matrix of modal farm types and sizes on which the analysis of supply response would be founded. A five-by-three type of farming/size of business framework was used, with five types of farm (Dairy, Livestock, Pig and Poultry, Cropping and Mixed) and three sizes of business groups, namely small farms (275 - 599 standard man-days[1]), medium farms (600 - 1199 s.m.d.'s), and large farms (1,200 s.m.d.'s and over). The number of farms in the fifteen cells provided the weights for raising the individual farm results to obtain estimates of aggregate farm output. Data on the number of farms by type and size for recent years were available from the farm classification statistics published regularly by the Agricultural Departments; these data were used as the basis for projections of structural change within the industry through the 1970s.

A hypothetical or "modal" farm was defined to represent each type of farming/size of business cell, with available resources and feasible enterprise activities appropriately selected. The input-output coefficients, gross margins and other data required to construct linear programming matrices appropriate to each of the fifteen farms were obtained from the farm classification data, the farm management survey, enterprise studies and other sources such as farm management handbooks.

The second stage was to make assumptions about improvements in technical performance on British farms. This was needed because the programming matrices used as a basis for predicting future supply levels must allow for a continuation in the improvement of the efficiency of the agricultural industry as new and improved techniques become available and adopted by more farmers. Assumptions were also made about input and output price levels; these prices were combined with the technical coefficients to prepare gross margins for the various enterprises.

1/ Standard man-days are used to measure the size of farm business in the U.K. In broad terms, 300 s.m.d.'s are regarded as providing full-time employment for one man over a 12-month period.

Optimal farm plans were computed for each type and size of farm in 1968, 1972 and 1977 under alternative policy assumptions. Estimates of aggregate supply levels in the three years were built up from the individual farm results. So far as possible, the assumptions underlying the analyses for 1972 and 1977 were identical with those adopted for the study as a whole in order to facilitate comparisons between the results of the linear programming study and the estimates of aggregate supply response based on time series analysis. In particular, care was taken to insure that the assumptions of prices and technical coefficients in 1972 and 1977 were common to both parts of the study.

The optimal plans in 1968 and 1972 were computed on the basis of Britain being outside the E.E.C. in these years. Within the study as a whole, it has been assumed that given the satisfactory completion of the negotiations begun in June 1970, Britain could become a member of the E.E.C. during 1972. With a five-year transitional period to allow for full adaptation to the E.E.C. agricultural system, this means that British agriculture could be fully integrated into C.A.P. by the end of 1977. Therefore two sets of computations have been undertaken for 1977; one assumes that Britain is by then a full member of the E.E.C. (the "in-E.E.C." assumption) while the other assumes that Britain remains outside the Community (the "out-E.E.C." assumption).

The Agricultural Adjustment Unit has already undertaken some work on the impact of entry into the E.E.C. on selected farming systems in Britain.[2] The present study takes the earlier work a stage further by broadening its base to include a wider range of farm types and sizes. The wider range and more representative nature of the farms now included in the analysis makes it possible to use the individual farm results as a basis for estimating the adjustments which are likely to occur within British agriculture as a whole in the event of Britain becoming a member of the E.E.C. and accepting C.A.P.

Types of Farming and the Feed Grain Livestock Economy

The first stage in the analysis was to identify the types of farming which make a significant contribution to the aggregate output of feed grain, livestock and livestock products. This involved a study of the distribution of cereal acreages and livestock numbers by type of farming. Data on this distribution are

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2/ C.S. Barnard, H. Casey and B. H. Davey. Farming Systems and the Common Market. Bulletin No. 5, Agricultural Adjustment Unit, University of Newcastle Upon Tyne, 1968.

available from the farm classification statistics, published regularly by the Agricultural Departments in England, Wales and Scotland.

Information on the distribution of the main livestock and cereal enterprises by type of farming in England and Wales at June 1968 is shown in Table A.1.

Table A.1 Percentage Distribution of the Main Enterprises Among Types of Farming in England and Wales, June 1968.

Type of Farming	Dairy Cows	Beef Cows	Breed-ing Sheep	Breed-ing Pigs	Laying Fowls	Wheat	Barley
Dairy	81	6	13	17	13	13	17
Livestock	2	61	59	4	2	6	8
Pigs and Poultry	1	1	1	28	62	2	3
Cropping	2	11	8	17	4	59	51
Horticulture	-	1	1	4	2	5	3
Mixed	9	8	10	16	8	12	13
Total Full-time	95	88	92	86	91	97	95
Part-time	5	12	8	14	9	3	5
All holdings	100	100	100	100	100	100	100

- Less than 1 percent.

Source: The Changing Structure of Agriculture, H.M.S.O. 1970. Appendix II, Table C, page 50.

It can be seen that part-time holdings, that is, holdings with less than 275 standard man-days, account for a very small proportion of the total output of cereals and livestock. In only two cases, Beef Cows and Breeding Pigs, do these very small farms account for more than 10 percent of the total output of the enterprise. Since part-time farms make only a small contribution to the output of cereals and livestock, the analysis was restricted to the full-time farming sector which is responsible for the bulk of British agricultural production.

Within the full-time farming sector, horticultural farms make only a small contribution to the total production of the feed grain livestock economy. Thus these farms were also excluded from the analysis. This left five types of farms - Dairy, Livestock, Pigs and Poultry, Cropping and Mixed - which, apart from beef cows and breeding pigs account for over 90 percent of the production of cereals and livestock products in England and Wales.

A similar picture emerges from an analysis of the Scottish data. Table A.2. shows the distribution of the main livestock and cereal enterprises by type of farming in Scotland at June 1968. As in England and Wales, the very small or part-time farms make only a small contribution to the total output of cereals and livestock. Only in the case of beef cows, sheep,laying fowls and oats do these very small farms account for more than 10 percent of total production. These farms have, therefore, been discarded from the analysis which is directed towards the full-time farms.

A comparison of Tables A.1 and A.2 shows that the types of farming used in the classification differ between England and Wales and Scotland. For the purposes of this study it was necessary to prepare a type of farming/size of business matrix for Great Britain as a whole. This presents difficulties, stemming from the different methods of classifying farms by type followed in the two countries. It was decided to base the analysis on the five broad types of farming referred to above and then to allocate the ten types in England and Wales and the eight types in Scotland into these five categories. The method adopted for this allocation was to examine the average cropping and stocking on each type of farm, as shown in the results of the annual Farm Management Surveys in the two countries, in order to identify similar production patterns. For example, this comparison revealed that there were many similarities between the cropping and stocking on Livestock Mostly Sheep farms in England and Wales and Hill Sheep farms in Scotland; these farms were, therefore, allocated to the broad Livestock group. The other types were handled in a similar manner with the results shown in Table A .3.

Table A.2. Percentage Distribution of the Main Enterprises Among Types of Farming in Scotland, June 1968.

Type of Farming	Dairy Cows	Beef Cows	Other Beef Cattle	Breeding Sheep	Other Sheep	Breeding Pigs	Other Pigs	Laying Fowls	Broilers, etc.	Wheat	Barley	Oats
Hill Sheep	0	10	4	38	32	0	0	1	0	0	0	1
Upland	2	46	28	26	28	3	2	5	0	1	3	18
Rearing with Arable	1	17	21	8	11	8	6	8	0	5	12	21
Rearing with Intensive Livestock	1	2	3	1	1	16	16	11	7	1	3	2
Arable Rearing and Feeding	0	4	7	2	3	4	3	3	0	6	8	10
Cropping	1	7	17	5	6	22	20	9	4	73	51	19
Dairy	94	4	9	7	7	11	12	17	10	11	16	16
Intensive	0	0	1	0	0	28	34	32	78	2	2	0
Total Full-time	98	89	90	87	88	91	93	85	99	99	97	87
Part-time	2	11	10	13	12	9	7	15	1	1	3	13
All holding	100	100	100	100	100	100	100	100	100	100	100	100

Source: The Changing Structure of Agriculture, H.M.S.O. 1970. Appendix III, Table C, page 57.

Table A.3. Allocation of Type of Farming Classes in England and Wales and Scotland to Broad Type of Farming Groups[1].

Type of Farming Group	Equivalent Type of Farming Classes	
	England and Wales	Scotland
Dairy	Specialist Dairy Mainly Dairy	Dairy
Livestock	Livestock Mostly Cattle Livestock Mostly Sheep General Livestock	Hill Sheep Upland
Pigs and Poultry	Predominantly Poultry Pigs and Poultry	Intensive
Cropping	Cropping Mostly Cereals General Cropping	Cropping
Mixed	Mixed	Rearing with Arable Rearing with Intensive Livestock Arable Rearing and Feeding

1/ Based on a comparison between average cropping and stocking by type and size of farm in England and Wales and Scotland. For sources of data see Farm Incomes in England and Wales 1968 (H.M.S.O. 1970) and Scottish Agricultural Economics, Vol. XX, 1970.

In this way the five broad type of farming groups which account for the bulk of the output of cereals and livestock in Great Britain were determined.

The Structure of the Feedgrain-Livestock Economy in Britain

Projections have been made of the numbers of agricultural holdings in Great Britain in 1972 and 1977 by type of farming and size of business. These projections were made in order that linear programming results for the fifteen representative farms could be aggregated to provide estimates of supply response for British agriculture as a whole. The weights for aggregating the individual farm results for 1968 are available directly from the published farm classification data.

Several problems were encountered in making these projections. Firstly, as has already been noted, different systems of classifying farms by type are used in England and Wales and Scotland. These systems are sufficiently different to preclude the possibility of making projections on a G.B. basis. Separate projections were, therefore, made for the two countries. These were then amalgamated along the lines outlined above to give a set of weights or raising factors for Britain as a whole.

Secondly, problems arose because of the method of classification used by the Ministry of Agriculture. The classification of holdings by both size of business and type of farming is based on standard man-day requirements for different enterprises and the farm as a whole. These requirements are determined to a large extent by the standard man-day weights which are used. Over the past few years these weights have been revised frequently to take account of technological change, and this has had considerable effect on the numbers of holdings in each cell. The latest revision, which took place between 1967 and 1968, caused such a large discontinuity in the series of full-time holdings that the 1967-68 change cannot be included in a base period for projection. This discontinuity applies both to Scotland and England and Wales since the same standard man-day weights are used throughout.

Data on the number of holdings by size of business and type of farming in <u>England and Wales</u> are available only from 1965 to 1968. The 1967-68 change could not be included, so an annual rate of structural change within each type and size cell was derived from the average of the changes experienced between 1965-66 and 1966-67. This average annual rate of change was then used to project forward the number of holdings in each cell from 1968 to 1972 and 1977 on a compound basis. The results obtained are shown in Table A.4.

The projected totals of 123,000 full-time holdings in 1972 and 115,000 in 1977 are reasonable by comparison with the 1968 figure of 137,369. This implies an average overall rate of decline of 2500 or 1.8 percent, per year in the number of full-time holdings over the period 1968 to 1977, assuming no more drastic changes in the standard man-day weights. This is broadly in line with the actual rate of decline since 1963, the year when the farm

Table A.4. Number of Holdings by Type of Farming and Size of Business in England and Wales, 1968, 1972 and 1977.

Type of Farming	Size of Business	Annual Change 1965-67 Percent	Number of Holdings		
			1968	1972	1977
Dairy	Small	-4.0	27503	23360	19047
	Medium	+1.25	19106	20079	21366
	Large	+5.5	6805	8431	11018
Livestock	Small	-4.0	12401	10533	8589
	Medium	-1.125	7437	7107	6717
	Large	+1.75	2170	2326	2538
Pigs and Poultry	Small	-8.5	3894	2729	1750
	Medium	+0.125	2699	2711	2726
	Large	-4.0	2310	1962	1601
Cropping	Small	-8.0	8918	6389	4211
	Medium	-2.0	8399	7747	7002
	Large	+1.0	8584	8933	9388
Mixed	Small	-24.0	4463	1489	378
	Medium	-22.0	4817	1782	515
	Large	-7.0	3560	2663	1853
Horticulture	Small	-1.5	5087	4789	4439
	Medium	-1.625	4284	4013	3698
	Large	+5.5	4932	6110	7986
Total full-time holdings			137369	123153	114822

Source: Based on farm classification statistics, 1965, 1966, 1967 and 1968.

classification statistics first became available. Peart,[3] using a different method of projection, arrived at a result of 113,000 full-time holdings in 1980, although his total for 1975 was somewhat higher than would be obtained from the method used in the present study.

There are some anomalies in the numbers of holdings projected for the individual cells. In particular, the projected decline in the number of mixed holdings of all sizes is very rapid. It should be noted, however, that the number of Mixed farms in England and Wales declined by 7600, or 44 percent, between 1965 and 1968, reflecting the increasing specialization of British agricultural production.

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[3] B. Peart. "Future Farm Structure in Britain," in A Discussion of Current Policies and the Future Structure of Agriculture. Bulletin No. 8, Agricultural Adjustment Unit, 1969.

Further difficulties arose over the data on size of business and type of farming which were available for Scotland. Although the Scottish classification was first undertaken in 1962, it was not repeated on a comparable basis until 1967, so that changes between individual years during this period could not be taken into account. Structural data are available for 1968, but again the revision of the standard man-day weights caused a discontinuity which prevented the inclusion of the 1968 statistics in the series. An annual compound rate of change was calculated for the five-year period 1962 to 1967 and the projections forward to 1972 and 1977 were made by applying this rate to the 1968 statistics. The results are shown in Table A.5.

Table A.5. Number of Holdings by Type of Farming and Size of Business in Scotland 1968, 1972 and 1977.

Type of Farming	Size of Business	Annual change 1962-67 per-cent	Number of Holdings		
			1968	1972	1977
Hill Sheep)	Small	+ 5.0	3151	3830	4889
Upland)	Medium	- 2.0	1900	1753	1585
	Large	- 0.75	959	931	896
Rearing with Arable)	Small	- 5.5	3278	2615	1971
Rearing with Intensive Livestock)	Medium	-12.0	1604	963	508
Arable Rearing and Feeding)	Large	-16.0	658	328	138
Cropping	Small	+ 7.5	1192	1591	2283
	Medium	+ 4.5	1321	1575	1963
	Large	- 1.75	1483	1382	1265
Intensive	Small	- 5.0	622	506	391
	Medium	- 0.75	376	364	349
	Large	+ 4.0	358	418	509
Dairy	Small	+ 2.25	1048	1146	1281
	Medium	- 2.0	2607	2405	2175
	Large	- 9.0	2078	1425	889
Total			22635	21232	21092

Source: Based on data supplied by the Department of Agriculture and Fisheries for Scotland.

These projections again appear to be reasonably satisfactory. The total number of full-time farms in Scotland is projected to fall from 22,635 in 1968 to 21,092 in 1977, a decline of 170 farms a year. This is not far out of line with the experience of recent years; the number of full-time farms in Scotland in 1967 was 26,519[4/] compared with 28,201 in 1962.

It was hoped to include Northern Ireland in the analysis to obtain a complete coverage for the whole United Kingdom. However, the Unit was unable to obtain comparable structural data for Northern Ireland although it is now understood that such data is, in fact, available from the Ministry of Agriculture for Northern Ireland. Due to this unfortunate misunderstanding, Northern Ireland could not be included in the study which was therefore restricted to Great Britain. In particular, the type of farming classification statistics that were available were broken down only to part-time and full-time farms, so that information on the subdivision of full-time farms into different size groups could not be obtained. Since the analysis was based on a "modal" farm matrix containing five types of full-time farm and three size groups, this meant that Northern Ireland could not be included. The study was thus restricted to Great Britain.

The final stage in the estimation of the structural weights which would be used for raising individual farm results to the national level was to prepare a set of weights for Great Britain as a whole. This was achieved by combining the separate projections for England and Wales and Scotland along the lines outlined above. The results of this amalgamation are given in Table A.6. The projections for 1972 and 1977 have been rounded to avoid the impression of pseudo-accuracy. It should also be noted that in preparing the figures for Pigs and Poultry farms in 1968, 1972 and 1977, half the number of Intensive farms in Scotland were used. According to The Structure of Agriculture (H.M.S.O. 1965) about half of these farms are classified as horticultural with the remainder being engaged on pig and poultry production or a combination of dairying with pig, poultry or soft fruit production.

The number of farms shown in Table A.6 become the weights for raising the programming results for the fifteen modal, or representative, farms to the national level to give an estimate of aggregate supply response to British agriculture. The figures imply a continuation of current trends within the structure of the industry. These include an overall reduction in the number

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[4/] The sharp discontinuity between 1967 and 1968 is the result of a major revision in the standard man-day weights.

Table A.6 Number of Full-time Farms by Type of Farming and Size of Business in Great Britain, 1968, 1972 and 1977.

Type of Farming	Size of Business	Number of Farms		
		1968	1972	1977
Dairy	Small	28551	24500	20300
	Medium	21713	22500	23500
	Large	8883	9900	11900
Livestock	Small	15552	14400	13450
	Medium	9337	8900	8300
	Large	3129	3300	3400
Pigs and Poultry	Small	4205	3200	1900
	Medium	2887	2900	2900
	Large	2489	2200	1850
Cropping	Small	10110	8000	6500
	Medium	9720	9325	8950
	Large	10067	10325	10650
Mixed	Small	7741	4100	2300
	Medium	6421	2750	1000
	Large	4218	3000	2000

of full-time farms; within this broad trend the numbers of small farms and large farms will continue to fall and rise respectively. The table also reflects, through the marked decline in the number of mixed farms of all sizes, a continuation of the trend towards greater specialization of production.

The Representative or Modal Farms

This section describes in some detail the makeup of the fifteen farms chosen to represent the feedgrain-livestock economy in Great Britain. The description is handled under a number of subheads, namely resource availability, feasible activities, price assumptions, the technical input-output coefficients, gross margins for the feasible activities and the rotational and other constraints built into the programming matrices.

(a) Resource Availability

The basic descriptions of the fifteen farms have been based primarily on information derived from the farm classification data, plus data from the Farm Management Survey. In particular, these sources yielded basic information on the availability of resources on the different types and sizes of farm in terms of land and labor.

(i) Land - Information on the physical size of the farms (acres of crops and grass) in 1968 was obtained directly from the farm classification data, which includes statistics of the distribution of the crops and grass acreage by type of farming and size of business. One of the features of British agriculture in recent years has been the trend towards increasing farm size, reflecting the consolidation and amalgamation of farms into larger units. The specification of farm sizes in 1972 and 1977 had, therefore, to allow for a continuation of this trend.

It was hoped that projections of farm size to 1972 and 1977 could be handled in the same way as the projections of the number of farms in each type/size cell. Thus an average rate of change in farm size over the period 1965 to 1967 was derived from the farm classification statistics and applied to the 1968 figures. Unfortunately, this gave unsatisfactory results, since combining the projected farm sizes with the projections of the numbers of farms shown in Table A.6 implied an increase in the total crops and grass acreage in Great Britain of around two million acres between 1968 and 1977. This is obviously unrealistic since the total crops and grass acreage has, in fact, been declining slightly from year to year as land is diverted from agriculture to alternative uses.

An alternative method was, therefore, used to project average farm size by type of farm and size of business in 1972 and 1977. This was based on information drawn from the Farm Management Survey. The F.M.S. results show, for each pair of successive years, average farm size for an identical sample of farms. A comparison of the average size of farms in one year with the average size of the same farms in the next year will thus provide information on the rate of increase in farm size by type of farming and size of business. This comparison was made for 1964-1965, 1965-1966, 1966-1967 and 1967-1968. An average annual rate of change in farm size for each of the fifteen modal farms was obtained from these four separate readings and applied to the 1968 farm sizes derived from the classification statistics to obtain the average farm sizes for 1972 and 1977 presented in Table A.7. As in the case of the projections of farm numbers, these projections of farm size to 1972 and 1977 do not appear to be unreasonable.

Table A.7. Estimates of Average Farm Size (Acres of Crops and Grass) by Type of Farming and Size of Business in 1968, 1972 and 1977.

Type of Farming	Size of Business	Average Size of Farm in Acres		
		1968	1972	1977
Dairy	Small	67	68	69
	Medium	131	137	144
	Large	310	340	360
Livestock	Small	107	109	111
	Medium	197	205	215
	Large	401	430	450
Pigs and Poultry	Small	24	32	42
	Medium	46	46	46
	Large	122	134	140
Cropping	Small	109	109	109
	Medium	209	225	240
	Large	515	570	600
Mixed	Small	89	89	89
	Medium	169	177	187
	Large	435	475	500

With three exceptions, all types and sizes of farm business are expected to experience an increase in area over the nine years from 1968 to 1977. It should be noted, however, that the projected sizes for the large farms were adjusted downwards since the original estimates implied farm sizes that seemed unlikely to be reached by 1977. The farm size projections are consistent with the projections of farm numbers in that they imply a total crops and grass acreage on full-time farms in Great Britain of approximately 24.7 million acres in all three years.

(ii) Labor - An estimate of the labor resources available on the fifteen farms was also derived from Farm Management Survey Data. The F.M.S. results include information on total labor costs by type and size of farm; these costs cover the imputed cost of manual work undertaken by the farmer and his wife as well as the expenditure actually incurred on hired agricultural workers. The figures of total labor cost provide an indication of the total labor input on each farm. An estimate of the annual number of labor hours available on each farm was calculated by dividing the total labor costs by the average cost of a man-hour (£0.375

in 1968). The number of man-hours obtained was converted into man equivalents, assuming that a man works 2,400 hours a year (i.e. 300 days at 8 hours a day). Details of these estimates are shown in Table A.8.

Table A. 8. Labor Availability by Type and Size of Farm.

Type of Farming	Size of Business	Total Annual Labor Cost	Man-Hours Available	Approximate Man-Equivalents
Dairy	Small	993	2648	1
	Medium	1660	4427	2
	Large	4056	10816	4
Livestock	Small	1088	2901	1
	Medium	1685	4493	2
	Large	2709	7224	3
Pigs and Poultry	Small	888	2368	1
	Medium	1835	4893	2
	Large	3775	10067	4
Cropping	Small	1359	3624	1.5
	Medium	2208	5888	2.5
	Large	5699	15197	6
Mixed	Small	1388	3701	1.5
	Medium	1930	5147	2
	Large	5439	14504	6

In the construction of the linear programming matrices for the modal farms, the availability of labor resources was based on the approximate man-equivalent shown in the last column of Table A.8. For the purpose of the matrices, labor availability was specified on a monthly basis throughout the year. The annual man-equivalents were broken down to monthly labor availability figures using standard information derived from farm management data handbooks.[5]

The labor available on each farm was assumed to be the same in 1972 and 1977 as in 1968. Although some further reduction in the agricultural labor force in Britain is to be expected during the 1970's, this was picked

[5] See, for instance: J. Nix. Farm Management Pocket Book, Department of Agricultural Economics, Wye College, 3rd edition, August 1969, page 55.

up by the decline in the number of full-time farms projected for 1972 and 1977. Combining the schedule of man-equivalents per farm in Table A.8. with the projected numbers of farms in 1972 and 1977 (Table A.6) implies a reduction of approximately 12,500 man-equivalents per annum over the period from 1968 to 1977. This is rather lower than the annual rate of labor outflow from U.K. agriculture in recent years, but it must be recalled that this analysis relates only to Great Britain and excludes horticultural and part-time farms. In general, therefore, the reduction in the labor force implied by the estimates of man-equivalents per farm and the projections of the number of farms seem reasonable.

(b) Feasible Activities

The activities or enterprises that might be undertaken on the modal farms were specified after a study of average cropping and stocking patterns by type of farming and size of business as indicated in the F.M.S. results for 1967. The underlying purpose of this study was to limit the range of feasible activities for each type and size of farm to those which made a significant contribution to its output.

The method of identifying the activities can be illustrated by reference to Dairy farms. While these farms produce pigs and eggs, the average size of pig and poultry enterprise found on them is very small indeed. For instance, in 1967 the medium size Specialist Dairy farms in the F.M.S. had on average 1 sow and 3 other pigs, and 80 hens and pullets. (Sales of pig and poultry products formed a negligible proportion of the total gross output from these farms.) Pigs and poultry were not, therefore, included in the list of feasible activities for Dairy farms; nor were potatoes and sugar beets, since the F.M.S. results suggested that very few acres of these crops are grown on the average Dairy farm. The feasible activities for Dairy farms were restricted to dairy cattle, beef cattle, sheep, cereals, grassland and forage crops.

The other types of farming were handled in a similar way. The enterprise opportunities shown in Table A.9 for each type and size of farm are limited to those which occupy a significant place in the economy of the farm and small marginal or subsidiary enterprises have been excluded. This specification of enterprise opportunities applies to all three years.

Table A.9. Specification of Enterprise Opportunities by Type of Farm and Size of Business.

Enterprise	Dairy			Live-stock			Pigs and Poultry			Cropping			Mixed		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Dairy cows (self-contained)	x	x	x									x	x	x	x
Dairy cows (purchased replacements)	x												x		
Beef, Spring born, own cows															
12 month fat	x	x	x	x	x	x				x	x	x	x	x	x
18 month fat	x	x	x	x	x	x				x	x	x	x	x	x
24 month fat	x	x	x	x	x	x				x	x	x	x	x	x
Beef, Autumn born, own cows															
12 month fat	x	x	x	x	x	x				x	x	x	x	x	x
18 month fat	x	x	x	x	x	x				x	x	x	x	x	x
24 month fat	x	x	x	x	x	x				x	x	x	x	x	x
Sheep, self-contained ewe flock	x	x	x	x	x	x				x	x	x	x	x	x
Sheep, purchased stores				x	x	x				x	x	x	x	x	x
Pigs, own sows															
Porker							x	x	x	x	x	x	x	x	x
Cutter							x	x	x	x	x	x	x	x	x
Baconer							x	x	x	x	x	x	x	x	x
Heavy pig							x	x	x	x	x	x	x	x	x
Pigs, purchased weaners,															
Porker							x	x	x	x	x	x	x	x	x
Cutter							x	x	x	x	x	x	x	x	x
Baconer							x	x	x	x	x	x	x	x	x
Heavy pig							x	x	x	x	x	x	x	x	x
Laying hens							x	x	x						
Broilers							x	x	x						
Turkeys							x	x	x						
Pullets									x						
Permanent grass	x	x	x	x	x	x				x	x	x	x	x	x
Rough grazing					x	x									
1 year ley (undersown)	x	x	x	x	x	x				x	x	x	x	x	x
Do. (direct seeding)	x	x	x	x	x	x				x	x	x	x	x	x
3 year ley (undersown)	x	x	x	x	x	x				x	x	x	x	x	x
Do. (direct seeding)	x	x	x	x	x	x				x	x	x	x	x	x
Hay conservation	x	x	x	x	x	x				x	x	x	x	x	x
Silage conservation	x	x	x	x	x	x				x	x	x	x	x	x
Hay purchasing	x	x	x	x	x	x				x			x	x	x
Kale	x	x	x	x	x	x				x	x	x	x	x	x
Fodder Roots (swedes, etc.)	x	x	x	x	x	x				x	x	x	x	x	x
Spring Barley	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Winter Wheat	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Spring Wheat	x	x	x	x	x	x				x	x	x	x	x	x
Oats	x	x	x	x	x	x				x	x	x	x	x	x
Potatoes, 1st earlies										x	x	x			
Potatoes, Main crop										x	x	x			
Sugar Beets										x	x	x			
Hay selling										x	x	x			

It will be seen that within each broad enterprise group, e.g. beef, pigs and so on, there is a range of production possibilities open to farmers.

(c) Price Assumptions

The objective function of the linear programming model was to maximize the aggregate gross margin for each modal farm within the restraints imposed by the availability of resources, the rotational requirements to meet the conditions of sound husbandry practice and the nutritional requirements of livestock. In constructing gross margins for each of the feasible enterprises, assumptions had to be made about product and input prices and also the technical coefficients of yields, feeding rates, etc.

Actual price data for crop and livestock products were available for 1968 from the material assembled for the time-series analysis of supply response in U.K. agriculture. Information on the prices of variable inputs was obtained from a variety of sources, including the price statistics published by the Ministry of Agriculture and the farm management handbooks mentioned earlier, which present standard information on an enterprise basis. Thus the prices used in the preparation of gross margins for 1968 were those actually received or paid by farmers.

For 1972 and 1977 best estimates were made of the prices likely to be received by farmers and incurred by them in purchasing variable inputs. Separate estimates were made for each of the alternative policy assumptions, that is, prices in 1972 and 1977 in an out-EEC situation and prices in 1977 in an in-EEC situation. Estimates of producer prices in 1972 and 1977 are shown in Table A.10. Actual prices for 1968 are also shown for purposes of comparison.

The estimated prices for 1972 and 1977 (out-EEC) assume a continuation of the British government's present policy towards agriculture with its emphasis on import-saving and the selective expansion of agricultural production. The selective expansion program places considerable emphasis on an increase in the production of cereals, beef and pigmeat, and thus increases in the prices of these products can be expected as the government attempts to induce an expansion of output. Any encouragement given to an expansion of beef production is also likely to affect milk prices, bearing in mind that the government is looking to the dairy herd to provide an

Table A.10. Estimates of Producer Prices for Selected Commodities in G.B. Under Alternative Policy Assumptions, 1972 and 1977.

Commodity	Actual Prices 1968	Out-EEC		In-EEC 1977
		1972	1977	
Wheat (s.d./cwt)	27.5	31.0	35.0	42.0
Barley (s.d./cwt)	25.2	27.6	30.0	37.0
Oats (s.d./cwt)	27.10	27.10	29.0	32.0
Eggs (s.d./dozen)	3.1	2.10	2.9	2.10
Broilers (s.d./lb lw)	1.5	1.6	1.8	1.9
Milk (s.d./gal)	3.3	3.5	3.7	4.0
Beef (s/cwt lw)	205	240	280	350
Lamb (s.d./lb dw)	3.6	4.2	4.8	5.0
Pigmeat (s/sc. dw)	48.0	52.0	54.0	59.0
Potatoes (£/ton)	15.0	16.0	18.0	18.0
Sugar Beets (£/ton)	6.8	7.0	7.5	7.5

increasing number of calves for rearing. Lamb prices may also rise to prevent a deterioration in the profitability of sheepmeat production relative to beef. These price increases also reflect the changeover that will be taking place during the 1970s from the existing deficiency payments system of agricultural support to a system based on variable import levies, even if Britain remains outside the E.E.C. This is a major component of the Conservative Government's agricultural policy and party spokesmen have suggested that target prices would be fixed at levels slightly in excess of the present guaranteed prices. Some downward movement in egg prices is expected, coinciding with the removal of eggs from the guarantee system, but broiler prices will probably show some recovery from the low levels experienced in 1968.

In both the in- and out-EEC situations, prices of variable inputs from within the agricultural sector have been adjusted pro rata with the changes in the appropriate final product prices. This affects primarily the intermediate products such as seeds and store livestock. Similarly feeding-stuff prices have been adjusted to reflect the higher prices assumed for cereals, especially feedgrains. Some upward movement in the prices of fertilizers and other agricultural chemicals has been assumed in the out-EEC situation to allow for the effects of inflation.

The estimated prices for the 1977 in-EEC policy assumption are little different from the prevailing 1970 farm prices in EEC. Broadly speaking it has been assumed that existing money prices will be maintained by the EEC up to 1977. Certainly no marked increase in real prices can be expected in view of the current difficulties in the agricultural markets of the Common Market. On the contrary, real prices can be expected to fall due to the effects of inflation acting on an unchanged set of money prices. Equally, it is unlikely that, due to political pressures, any sizable reductions will be made in money prices over the period. The one major exception to this general assumption of near-constant money prices for farm products concerns beef. EEC is far from self-sufficient in beef and some upward movement of beef prices is likely in an effort not only to expand production of beef but also to divert resources away from the over-supplied dairy sector.

Quite apart from the direct effects of product price changes, enterprise profitability in an in-EEC environment will be affected by what happens to the various direct subsidies and grants currently paid to British farmers. At present, it seems probable that subsidies like those paid on calves, hill cows, beef cows and hill sheep will be ineligible under EEC regulations relating to fair competition between member states. It has been assumed, therefore, that these subsidies would be terminated if Britain became a member of EEC. Similarly the fertilizer subsidy would be in jeopardy and fertilizer prices in an in-EEC situation have thus been increased by one-third to allow for the effects of its cessation. A sharp increase in feeding-stuff prices is also to be expected in response to the much higher cereal prices ruling in EEC.

An examination of Table A.10 shows that, in general, farm prices in EEC are substantially higher than those currently received by British producers. This is particularly true in the case of cereals, beef and, to a lesser degree, pigmeat. This suggests that entry into EEC could lead to a substantial boost in British agricultural production. It should be noted, however, that the effect of the respective estimates of farm prices in 1977 under the in-EEC and out-EEC policy assumptions is to reduce the differential between the two sets of prices. Although the in-EEC prices in 1977 remain somewhat higher than the out-EEC prices assumed for that year, the differential between them has narrowed sufficiently to indicate a dampening of the anticipated expansion in agricultural production in the event of British acceding to C.A.P.

(d) Technical Coefficients

An outstanding feature of British agriculture during the post-war period has been the steady and continuing improvement in the productivity of the industry. Much of this growth in productivity has been the result of technological improvements in production methods. These improvements have included the development of new, higher yielding varieties of crops, the use of more fertilizers and the introduction of chemical methods of weed, pest and disease control in crop production. Similar developments have been taking place in animal production where genetic improvements and new means of controlling and preventing animal diseases have contributed to the rise in productivity. At the same time, there has been considerable success in breeding for improved feed conversion in pig, poultry and egg production and feeding rates have declined. The effect has been a substantial increase in average yields of crops and livestock.

Improvements in yields and feeding rates will continue throughout the 1970s. Two main factors will be at work; the development of new and improved techniques by the agricultural scientists and better management by farmers, reflected in the adoption of the new methods. In passing, it can be noted that substantial improvements in technical efficiency could be made as the result of improved management alone as more and more producers approached the level of performance currently being achieved by the best farmers. Table A.11 shows the estimates of average yields and feeding rates for 1968, 1972 and 1977. The estimates for 1972 and 1977 have been based primarily on an historical analysis of technological improvement over the last decade. This provided a trend basis for improving the coefficients in the future.

There has also been a decrease in average labor requirements for crop and livestock enterprises. This has been the result of a number of factors

Table A.11. Yields and Feeding Rates for Selected Crop and Livestock Enterprises in 1968, 1972 and 1977.

Enterprise	1968	1972	1977
Wheat: yield (cwts/acre)	30.0	33.0	35.5
Barley: yield (cwts/acre)	28.0	30.0	32.5
Oats: yield (cwts/acre)	25.4	28.0	30.5
Potatoes: yield (tons/acre)	10.5[1/]	11.0	12.0
Sugar Beets: yield (tons/acre)	15.5[1/]	16.5	17.5
Dairying			
Milk production per cow (gallons)	815	835	860
Concentrates per gallon (lb)	3.1	3.0	2.9
Pigs			
Pigs reared per sow per year	14.6	15.4	16.4
Feed conversion ratio (lb feed per pound of pigmeat dressed wt. incl. weaners)[2/]	5.50	5.30	5.05
Egg Production			
Egg yield per hen (dozen)	17.4	18.2	20.0
Feed rate (lb feed per bird incl. replacements)	110	108	105
Poultrymeat			
Broilers: Average slaughter weight (lb lw)	3.10	3.20	3.30
Feed per bird (lb)	9.55	9.40	9.20
Batches per year	4.90	5.10	5.35
Turkeys: Average slaughter weight (lb lw)	14.0	13.6	13.1
Feed per bird (lb)	63.5	62.0	60.5

[1/] 1967.

[2/] Assuming improvement of feeding efficiency of 1 percent per year.

including the increasing scale and specialization of production, improved methods of labor organization on farms and the growing mechanization of farm work. Once again this is a trend that will continue into the future and allowances were made for improvements in the labor coefficients used in the model.

Information on the amount of labor required by the activities specified for each of the modal farms was drawn almost entirely from the farm management data compiled by Nix.[6/] In his pocketbook Nix presents figures of labor requirements for a range of crop and livestock enterprises; these figures are expressed in terms of man-hours per unit and the annual figures are broken down to show monthly labor requirements throughout the year. Two sets of figures are presented, labor requirements on "average" farms and on "premium" or above-average farms. For the purposes of this study it was assumed that the labor performance of premium farmers in 1968 approximated to the performance that would be achieved by the average farmer nine years hence in 1977. Thus the average labor requirements shown by Nix were incorporated into the programming matrices for 1968, while the premium figures formed the basis of the labor coefficients used in the 1977 matrices. The labor coefficients in 1972 are the mid-point between Nix's average and premium requirements.

The basic labor requirements published in Nix do not make an allowance for the effects of scale in production. Some attempt was made to distinguish between labor requirements on small, average and large farms to allow for the effects of scale in those cases where it was judged to be of some importance. The labor coefficients used in the model are summarized in Table A.12.

(e) Gross Margins

The product and input prices, yields, feeding rates, etc. discussed in the preceding sections were used to construct gross margins for the list of feasible activities in 1968, 1972 and 1977. These gross margins are summarized in Table A.13.

The generally higher level of profitability of cash crops, dairy cows, beef, sheep and pigs in 1972 and 1977 (out-EEC) is primarily a reflection of the assumptions that were made regarding product prices and the technical efficiency of production. Product prices are expected to rise with the continuing emphasis in policy on an expansion of domestic agricultural production (Table A.10), while a further improvement in average yields

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[6/] *Op. cit.*

Table A.12. Labor Coefficients, 1968, 1972 and 1977.

Enterprise	Unit	1968			1972			1977		
		S	M	L	S	M	L	S	M	L
Dairy Cows (self-contained)	M/h/cow/year	123.5	107.6	96.0	106.4	92.7	80.0	95.0	64.5	58.0
Dairy Cows (purchased replacements)	M/h/cow/year	90.0			66.0			42.0		
Beef, Spring born, 12 month fat	M/h/head/year	24.0	24.0	24.0	21.6	21.6	21.6	19.2	19.2	19.2
18 month fat	M/h/head/year	30.0	30.0	30.0	27.0	27.0	27.0	24.3	24.3	24.3
24 month fat	M/h/head/year	36.7	36.7	36.7	33.1	33.1	33.1	29.4	29.4	29.4
Beef, Autumn born, 12 month fat	M/h/head/year	24.0	24.0	24.0	21.6	21.6	21.6	19.2	19.2	19.2
18 month fat	M/h/head/year	23.4	23.4	23.4	22.1	22.1	22.1	20.0	20.0	20.0
24 month fat	M/h/head/year	34.3	34.3	34.3	31.5	31.5	31.5	28.4	28.4	28.4
Sheep, self-contained ewe flock	M/h/ewe/year	5.4	5.4	5.4	4.7	4.7	4.7	4.0	4.0	4.0
Sheep, purchased stores	M/h/head/year	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Pigs, own sows, Porker	M/h/sow unit/month	5.8	5.8	5.8	4.8	4.8	4.7	3.7	3.7	3.5
Cutter	M/h/sow unit/month	6.0	6.0	6.0	5.0	5.0	4.9	3.9	3.9	3.7
Baconer	M/h/sow unit/month	6.2	6.2	6.2	5.2	5.2	5.1	4.1	4.1	3.9
Heavy pig	M/h/sow unit/month	6.4	6.4	6.4	5.4	5.4	5.3	4.3	4.3	4.1
Pigs, purchased weaners										
Porker	M/h/pig/month	0.25	0.25	0.25	0.21	0.21	0.20	0.17	0.17	0.15
Cutter	M/h/pig/month	0.26	0.26	0.26	0.22	0.22	0.21	0.18	0.18	0.16
Baconer	M/h/pig/month	0.27	0.27	0.27	0.23	0.23	0.22	0.19	0.19	0.17
Heavy pig	M/h/pig/month	0.28	0.28	0.28	0.24	0.24	0.23	0.20	0.20	0.18
Laying hens	M/h/1000 birds/month	37.5	32.5	22.5	30.0	20.0	17.0	18.75	16.75	11.25
Broilers	M/h/1000 birds/month	7.5	5.0	3.2	6.0	3.8	2.5	3.75	2.5	1.6
Turkeys	M/h/ 100 birds/month	1.0	1.0	1.0	0.9	0.8	0.7	0.8	0.5	0.4
Pullets	M/h/1000 birds/year		33.0	33.0		27.6	25.3		21.8	17.5
Permanent grass	M/h/acre/year	1.3	1.3	1.3	1.6	1.6	1.6	1.3	1.3	1.3
One year ley (under sown)	M/h/acre/year	5.3	5.3	5.3	4.8	4.8	4.8	4.3	4.3	4.3
One year ley (direct seeding)	M/h/acre/year	4.6	4.6	4.6	4.15	4.15	4.15	3.6	3.6	3.6
Three year ley (under sown)	M/h/acre/year	2.1	2.1	2.1	1.75	1.75	1.75	1.4	1.4	1.4
Three year ley (direct seeding)	M/h/acre/year	3.7	3.7	3.7	3.2	3.2	3.2	2.7	2.7	2.7
Hay conservation	M/h/acre/year	7.4	7.4	7.4	6.5	6.5	6.5	4.8	4.8	4.8
Silage conservation	M/h/acre/year	6.6	6.6	6.6	6.0	6.0	6.0	4.8	4.8	4.8
Kale	M/h/acre/year	14.7	14.7	14.7	10.6	10.6	10.6	6.1	6.1	6.1
Fodder roots	M/h/acre/year	55.2	55.2	55.2	44.2	44.2	44.2	32.7	32.7	32.7

(continued)

Table A.12. (continued)

Enterprise	Unit	1968			1972			1977		
		S	M	L	S	M	L	S	M	L
Winter wheat	M/h/acre/year	7.1	7.1	7.1	5.8	5.8	5.8	4.5	4.5	4.5
Spring wheat	M/h/acre/year	8.5	8.5	8.5	6.9	6.9	6.9	5.3	5.3	5.3
Barley, oats	M/h/acre/year	8.5	8.5	8.5	6.75	6.75	6.75	4.9	4.9	4.9
Potatoes, earlies	M/h/acre/year	38.1	38.1	38.1	29.3	29.3	29.3	20.6	20.6	20.6
Potatoes, main crop	M/h/acre/year	60.9	60.9	60.9	51.2	51.2	51.2	40.8	40.8	40.8
Sugar Beets	M/h/acre/year	42.3	42.3	42.3	39.55	39.55	39.55	36.5	36.5	36.5

and feed conversion ratios is predicted through to 1977 (Table A.11). It should be noted, however, that part of the increase in the gross margins of these enterprises will be offset by higher fixed costs, and particularly higher charges for land, labor and machinery.

So far as the gross margins for 1977 (in-EEC) are concerned, a comparison with the out-EEC margins suggests that quite substantial increases in the profitability of cereals production can be expected. This is due primarily to the higher EEC prices for grain which more than offset the increases in fertilizer costs that will follow the termination of the fertilizer subsidy. Similarly, higher EEC prices for beef will lead to sharp increases in the profitability of semi-intensive and traditional systems of production, but higher feed costs bear heavily on intensive beef systems so that their gross margins are expected to fall. A small improvement in the gross margin of dairy cows is expected, especially for systems of summer milk production based on the production of milk off grass from herds of spring-calving cows; these herds consume less concentrates than the more usual dairy systems based on autumn calving herds. On the other hand, some contraction of gross margins for pigs and poultry is expected. It is these intensive livestock enterprises that will suffer from higher feed costs in the EEC, which, in turn, are a direct consequence of the high grain prices. As Table A.13 indicates, increases in both product prices and technical efficiency are unlikely to be large enough to compensate fully for the increased feed costs and thus the gross margins of the intensive feed-using livestock enterprises inevitably decline.

(f) Rotational Constraints

So far as possible, the model was kept free from "artificial" constraints in order to pick up the effects of changing prices and profitability on the optimal organization of the modal farms. It was necessary, however, to introduce some rotational constraints to comply with principles of good husbandry.

These constraints are related mainly to cereals. Thus, following a break crop, cereals may be grown for no more than two years in succession. This means that two successive wheat crops can be grown or, alternatively, barley may follow wheat. Any extension of this rotation would result in a reduction in cereal yields. The break crops specified in the model include

Table A.13. Gross Margins of Crops and Livestock in 1968, 1972 and 1977.

Enterprise	Unit	1968	1972	1977	
				Out-EEC	In-EEC
Cash Crops:					
Winter wheat	£ per acre	32.15	40.9	51.1	60.7
Spring wheat	£ per acre	29.2	36.6	46.0	55.0
Barley	£ per acre	27.4	32.45	38.75	48.4
Oats	£ per acre	26.9	29.7	33.9	36.4
Early potatoes	£ per acre	67.0	73.7	84.0	74.0
Main crop potatoes	£ per acre	88.0	99.2	131.5	127.2
Sugar beets	£ per acre	59.0	70.3	78.0	78.0
Forage Crops:					
Fodder roots	£ per acre	-11.7	-13.0	-14.0	-15.0
Kale	£ per acre	-11.0	-13.2	-15.0	-17.5
Permanent grass	£ per acre	-5.0	-5.6	-7.0	-11.9
3 year ley under sown	£ per acre	-6.5	-7.3	-10.5	-14.1
3 year ley direct seeded	£ per acre	-6.5	-7.3	-10.5	-14.1
1 year ley under sown	£ per acre	-8.0	-9.0	-12.5	-16.4
1 year ley direct seeded	£ per acre	-8.0	-9.0	-12.5	-16.4
Dairy Cows:					
Self-contained herd - S	£ per cow	88.0	93.2	104.0	108.2
M	£ per cow	88.0	103.2	110.0	114.2
L	£ per cow	98.0	110.0	116.0	120.0
Purchased replacements	£ per cow	85.0			
Summer milk production-S	£ per cow			103.0	110.0
M	£ per cow			109.0	118.0
L	£ per cow			115.0	122.0
Beef:					
Spring born: Intensive (12 mo)	£ per head	22.0	28.5	30.75	24.5
Semi-intensive (18 mo)	£ per head	30.6	41.8	46.1	59.45
Traditional (24 mo)	£ per head	57.1	66.6	79.0	97.6
Autumn born: Intensive (12 mo)	£ per head	14.0	24.5	16.5	10.25
Semi-intensive (18 mo)	£ per head	31.8	38.5	49.5	58.2
Traditional (24 mo)	£ per head	35.8	42.4	64.8	86.9
Sheep:					
Lamb production	£ per ewe	6.8	9.05	9.9	11.4
Pigs:					
Rearing weaners: Porkers	£ per sow/unit/year	51.5	58.8	66.4	53.8
Cutters	"	59.75	68.5	77.4	60.7
Bacon	"	82.25	93.8	107.4	91.7
Heavy	"	76.25	86.24	94.8	71.3
Purchased weaners: Porkers	£ per pig	1.75	1.95	1.54	1.475
Cutters	£ per pig	2.30	2.59	2.22	1.904
Bacon	£ per pig	3.95	4.23	4.40	3.82
Heavy	£ per pig	3.40	3.74	3.28	2.55

(continued)

Table A.13(continued)

Enterprise	Unit	1968	1972	1977	
				Out-EEC	In-EEC
Poultry:					
Laying hens	£ per 1000 layers	350	200	305	75
Broilers	£ per 1000 birds	35.25	29.2	25.0	23.9
Turkeys	£ per 100 birds	40.5	39.2	32.5	30.0
Pullets	£ per 1000 birds	296	250	225	200

temporary grassland, kale, fodder roots, sugar beets and potatoes. There is an institutional constraint for sugar beets and potatoes in that they are limited by the acreage quota available on the farm. Since the harvesting of main crop potatoes and sugar beets runs concurrently with the sowing of winter wheat for some of the autumn, only half the acreage of these two break crops was allowed to be sown with winter wheat.

(g) Working Capital

One further constraint was related to the availability of working capital on the modal farms. Some systems, such as dairy farming, have only a small working capital requirement because the continuous flow of receipts from the sale of milk can be used to finance the business. But with other enterprises, such as beef production and potatoes, there is a substantial working capital requirement since a considerable amount of expenditure may be incurred before any revenue is received. It was necessary, therefore, to take account of the different working capital requirements of the various enterprises.

The availability of working capital on each type and size of farm in 1968 was based on the working capital requirements of the different enterprises and average cropping and stocking patterns on these farms as indicated by the farm classification data. For 1972 and 1977, the 1968 figures were increased by 25 percent and 50 percent respectively. The basis for this adjustment was the trend in bank advances to agriculture in recent years. Since bank advances account for the bulk of agriculture's short-term capital needs - other than that obtained from income - it was assumed that a simple extrapolation of the trend would give a good indication of the increased volume of working capital likely to be available to the industry through to 1977. Bank advances to agriculture in 1968 amounted to £532.9 millions compared with £410.6 millions in 1963.[7] This is equivalent to an annual increase of 6 percent. The demand for working capital by enterprises was assumed to be their variable costs per unit of production. Allowance was made within the model for the generation of working capital by these enterprises, such as dairying and pigs, with a steady flow of receipts throughout the year.

The Results

The preceding sections have described in some detail the various components of the model and the assumptions on which the computation of optimal programs for the modal farms in 1968, 1972 and 1977 was based. In this final section the results of the analysis are presented. Firstly, the optimal organizations of the fifteen representative farms are given, together with a brief commentary on the development of the farms through to 1977. These individual farm results were aggregated to obtain the estimates of crop acreages and livestock populations described in the second part of this section. Finally, the estimated acreages and livestock numbers have been converted into estimates of the production of crop and livestock products and the requirements for concentrate feedingstuffs by livestock in the three years.

It is necessary at the outset to record a word of caution about the interpretation of these results. The estimates of aggregate supply response have been built up from a number of assumptions regarding the rate and direction of structural change in British agriculture, the rate of technological improvement in the industry, the availability of labor and capital resources, the level of prices under alternative policy assumptions and so on. While these assumptions may be quite reasonable when considered

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[7] Source: Capital Adjustment in Agriculture. Bulletin No. 7, Agricultural Adjustment Unit, 1968; Annual Abstract of Statistics, 1969, H.M.S.O.

individually, in combination one with the other they may lead to errors in the final estimates. Moreover, it is readily apparent that different assumptions would result in different estimates of aggregate supply response. In particular, different assumptions about the rate of structural change would have a marked effect on the results since the weights used for raising the individual farm results to the aggregate level would be changed. In view of this, it would seem unwise to place undue reliance on the absolute figures which have been obtained. Rather, the results should be regarded as an indication of the directions of change and development within British agriculture and particularly as a guide to the likely changes in the event of Britain becoming a full member of EEC by 1977.

With this caveat in mind, one can proceed to a discussion of both the individual farm and aggregate results.

(a) Programming Results for the Representative Farms

(i) Dairy Farms - The programming results for small, medium and large dairy farms are given in Tables A.14, A.15 and A.16.

So far as the main activity on Dairy farms is concerned, namely milk production, a similar pattern emerges on all three sizes of farm. Outside EEC dairy herds show some expansion in size through to 1977. Inside EEC, however, some contraction in the size of dairy herds is indicated, compared with the out-situation, especially on medium dairy farms. It has been argued from time to time that changing price relationships for milk and feeding-stuffs in EEC would encourage a shift towards summer milk production off grass from spring calving herds. An interesting aspect of the results is that summer milk production featured in both programs for 1977.

Dairy farms were given the opportunity of having a beef enterprise to supplement the main dairying activity. In order to emphasize the supplementary nature of a beef enterprise on dairy farms, where typically the offspring of the dairy cows are reared for beef, beef cattle were "tied" to the dairy cows on a one-for-one basis. And it was at this level that they featured in the solutions. The emphasis was on intensive beef production except in the 1977 in-EEC programs on medium and large farms where there was a switch to more traditional systems which rely more heavily on the use of grassland and less on concentrate feeding-stuffs. The beef enterprise was also smaller in the 1977 in-EEC program, coinciding with

Table A.14. Programming Results: Small Dairy Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Dairy cows (purchased replacements)	16.29	24.7	31.9	31.7
Beef: Intensive, spring born	12.22	24.7	31.1	30.9
Traditional, spring born	4.07	--	--	0.8
Semi-intensive, autumn born	--	--	0.8	--
			Acres	
Winter wheat	6.7	6.8	3.2	3.1
Barley	--	--	3.7	3.8
Kale	1.29	1.7	1.9	1.9
Permanent grass	45.3	48.3	49.7	49.8
Three year ley (direct seeded)	13.74	11.2	10.5	10.5
Total	67.03	68.0	69.0	69.1
Hay	11.89	3.8	14.5	14.5
Silage	9.2	12.6	12.9	12.9

Table A.15. Programming Results: Medium Dairy Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Dairy cows: self-contained herd	26.3	29.0	--	--
summer milk production	--	--	35.3	27.2
Beef: Intensive, spring born	26.3	29.0	26.7	--
Traditional, spring born	--	--	8.6	27.2
			Acres	
Winter wheat	26.2	27.4	20.3	20.6
Barley	--	--	8.5	8.2
Kale	3.7	4.0	4.3	4.1
Permanent grass	38.3	40.7	43.3	42.4
Three year ley (direct seeded)	62.8	--	67.6	68.7
under sown	--	65.0	--	--
Total	131.0	137.1	144.0	144.0
Hay	28.4	29.0	34.4	32.9
Silage	24.7	27.0	30.2	28.1

Table A.16. Programming Results: Large Dairy Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Dairy cows: self-contained herd	56.4	65.2	--	--
summer milk production	--	--	76.0	65.8
Beef: Intensive, spring born	56.4	65.2	65.6	--
Traditional, spring born	--	--	10.4	65.8
			Acres	
Winter wheat	89.0	112.3	130.1	127.6
Spring wheat	15.5	2.9	--	--
Barley	--	20.8	13.9	16.4
Oats	19.5	--	--	--
Kale	5.6	7.2	6.9	8.2
Three year ley (direct seeded)	180.3	196.8	112.8	114.6
One year ley (under sown)	--	--	96.3	93.2
Total	309.9	340.0	360.0	360.0
Hay	63.2	67.6	71.3	32.5
Silage	56.4	64.4	67.0	71.0

the contraction in dairy cow numbers.

On the crops side, there was a tendency for the acreage of cereals to increase along with the increase in farm size. The emphasis generally was on winter wheat. Dairy farms are, however, basically grassland farms, not only because of the needs of the livestock but also because of their location in the wetter, western part of Britain which is less suitable for grain production than the drier eastern areas.

The 1968 programs for small, medium and large dairy farms were constrained by working capital, land and October labor respectively. Land was the constraining resource in 1972, with the addition of March labor for small farms and October labor for large farms. The 1977 in-EEC program for large farms was constrained by a shortage of working capital.

(ii) Livestock Farms - The results for the three sizes of livestock farms are presented in Tables A.17-A.19.

The pattern of development on small and medium livestock farms is very similar. So far as beef production is concerned, the emphasis is on the more extensive production of two-year old beef. Some contraction

Table A.17. Programming Results: Small Livestock Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born traditional	28.0	35.2	--	--
autumn born traditional	--	--	24.0	24.0
spring born intensive	--	2.3	--	--
Sheep: self-contained ewe flock	81.3	35.0	154.4	154.4
fattening purchased stores	107.7	110.7	47.6	47.6
			Acres	
Winter wheat	3.3	10.9	7.4	7.4
Barley	7.4	--	3.6	3.6
Kale	2.0	2.1	--	--
Fodder roots	--	--	1.8	1.8
Three year ley direct seeded	--	22.1	--	--
One year ley direct seeded	3.3	--	7.4	7.4
Permanent grass	90.9	73.9	90.6	90.6
Total	106.9	109.0	110.8	110.8
Hay	18.8	18.5	15.2	15.2
Silage	8.0	9.9	7.0	7.0

Table A.18. Programming Results: Medium Livestock Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born traditional	59.6	64.4	10.0	10.0
spring born intensive	--	4.5	--	--
autumn born traditional	--	--	60.2	60.2
Sheep: self-contained ewe flock	163.1	100.0	250.4	250.4
fattening purchased stores	228.3	304.7	--	--
			Acres	
Winter wheat	20.9	30.8	24.1	24.1
Barley	8.6	--	8.2	8.2
Kale	4.3	4.3	--	--
Fodder roots	--	--	4.1	4.1
Three year direct seeded	64.8	73.5	--	--
One year ley, under sown	--	--	24.1	24.1
Permanent grassland	93.5	96.4	154.5	154.5
Total	192.1	205.0	215.0	215.0
Hay	39.5	39.0	32.8	32.8
Silage	16.9	18.5	18.6	18.6

Table A.19. Programming Results: Large Livestock Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born traditional	61.0	11.7	--	--
autumn born semi-intensive	42.8	115.7	--	--
autumn born traditional	--	--	93.3	93.3
spring born semi-intensive	--	11.1	37.6	37.6
Sheep: self-contained ewe flock	172.0	200.0	200.0	200.0
fattening purchased stores	1000.0	1000.0	1000.0	1000.0
			Acres	
Winter wheat	43.2	44.6	68.2	68.2
Spring wheat	--	41.4	5.9	5.9
Barley	36.8	--	--	--
Oats	--	--	15.9	15.9
Kale	7.7	6.4	7.9	7.9
Three year ley direct seeded	72.6	152.4	--	--
One year ley, under sown	21.4	13.8	74.1	74.1
Permanent grass	219.0	171.5	261.0	261.0
Total	400.7	430.1	433.0	433.0
Hay	85.0	85.5	81.3	81.3
Silage	25.4	30.3	29.8	29.8

of the beef enterprise is indicated on small livestock farms in 1977; this stems from a constraint imposed by working capital. If more capital were available to these farms, the result would probably be a larger beef enterprise. The sheep flock, on the other hand, shows some expansion in 1977 with a greater emphasis on self-contained flocks of ewes. A small contraction in the size of the beef enterprise is also indicated for large livestock farms in 1977, but the more interesting feature of the 1977 program for these farms is the suggested shift away from intensive and semi-intensive systems of beef production towards the traditional system of fattening beef cattle off grass, with limited use of concentrates.

As with dairy farms, land on the livestock farms is used primarily for growing grass to feed livestock. Many livestock farms are located in hill and upland areas which are inherently unsuitable for cereal production due to such factors as high rainfall, poor soils and topography. Thus, a relatively small acreage of cereals can be expected on livestock farms. It seems that a small increase in the cereal acreage per farm is likely, through 1977 corresponding to the assumed increase in farm size, with the emphasis again on wheat production.

Working capital was a major constraint on all sizes of livestock farms in all three years, along with labor in the February-April period. This is the time of year when sheep make their major demands on the farms' labor resources for lambing. The program for large livestock farms in 1977 highlights this labor problem. In the final iteration, approximately 17 acres of land were unused while April, March and October labor had become constraints. This is a pointer to the more general labor problem which could affect British agriculture if, either because of wage differentials or for other reasons, the drift of workers away from the land continues at its present rate, namely a shortage of labor which could inhibit agriculture from attaining the expansion of output that might otherwise be expected. The solution obtained, however, was acceptable in that it met all the constraints except that some land was unused.

(iii) Pig and Poultry Farms - Programming results for pig and poultry farms are presented in Tables A.20-A.22. Extreme caution is needed in interpreting these results. In an outside EEC environment, production of pig and poultry products in Britain is likely to be governed largely by demand conditions. This is because Britain has either entered into international commitments, such as the bacon market-sharing understanding to limit imports, or imposed an almost total ban on imports in the interests of preserving animal health standards. This means that either a stated proportion of the home market is reserved for the domestic producer or else he has the market to himself. The programming results are, therefore, no more than broad indicators of the likely directions of change within the intensive livestock sector as a consequence of changing profitability, not only in absolute terms but also in the relativities between enterprises.

So far as egg and poultry production were concerned, provision was made in the model for increased specialization and improved labor productivity, manifested in larger minimum flock sizes. There is some evidence to suggest some retrenchment in egg production by 1977, especially if Britain is by then a member of EEC. This is hardly surprising since any

Table A.20. Programming Results: Small Pig and Poultry Farms.

Enterprise		1968	1972	1977 Out-EEC	1977 In-EEC
Laying hens		750	1,250	2,500	2,500
Turkeys		1,000	1,200	1,200	1,200
Bacon pigs:	weaners purchased	692	768	--	--
	own sows	--	--	674	674

Table A.21. Programming Results: Medium Pig and Poultry Farms.

Enterprise		1968	1972	1977 Out-EEC	1977 In-EEC
Broilers		1,000	--	--	--
Laying hens		4,000	6,000	2,500	2,500
Turkeys		4,500	5,500	--	3,780
Bacon pigs:	weaners purchased	1,000	1,243	561	2,049
	own sows	--	--	1,205	--

Table A.22. Programming Results: Large Pig and Poultry Farms.

Enterprise		1968	1972	1977 Out-EEC	1977 In-EEC
Broilers		10,000	--	--	--
Laying hens		35,100	50,000	93,300	50,000
Turkeys		8,830	11,000	8,400	3,770
Pullets		35,100	50,000	93,300	50,000
Bacon pigs:	weaners purchased	2,000	2,786	2,200	6,014

improvements in egg yields or feed conversion ratios are unlikely to be sufficient to offset substantially higher feed prices, hence margins from egg production are likely to be reduced considerably (Table A.13).

Similarly, there could be some cut-back in the production of poultry-meat as flock sizes were generally lower in 1977 than in the other years. These results also suggest that by 1977 more emphasis could be given to the production of turkeys at the expense of broilers. This stems from a shift in the relative profitability of broilers and turkeys in favor of the latter. With this general contraction in the size of laying and table flocks, there could be some diversion of resources into pig production on these intensive farms by 1977. In particular, EEC entry could result in a marked expansion in the size of pig herds on medium and large pig and poultry farms.

(iv) Cropping Farms - The results for small, medium and large cropping farms are presented in Tables A.23-A.25. respectively. The major land-using activities are cash crops - cereals, sugar beets and potatoes. A beef or sheep enterprise may be introduced to utilize that area of grassland which forms part of the break from cereals. In addition, a grain-using livestock enterprise, such as pigs, may feature in the system of farming. Thus providing, in effect, an alternative outlet for the grain produced on the farm.

So far as grain production is concerned, the main feature is the growing emphasis on wheat. A marked boost in the acreage of wheat is indicated for 1977, especially under the in-EEC policy assumption. This would take place primarily at the expense of a contraction in the acreage of barley. The total acreage of cereals on medium and large farms is higher in 1972 compared with 1968, but what is surprising is the contraction in the cereal acreage on these farms in 1977, notwithstanding an increase in farm size over the earlier year. Moreover, the acreage of cereals is lower in the 1977 in-EEC program than in the 1977 out-EEC program despite the boost to the profitability of cereal production that would stem from the higher EEC grain prices. This could be the result of a shortage of working capital - the costs of growing cereals will also be higher or, more importantly, a greater concentration of resources on the supplementary beef and sheep enterprises which would also receive a boost in profitability from the application of EEC price levels. In other words, a shift in the relative profitability of cereal and livestock - especially beef - production in favor of livestock could encourage even arable farmers to divert resources away from crop production into the land-using livestock enterprises. This leads to a concomitant increase in the acreage of grassland on these farms to support the larger beef and sheep numbers in 1977.

Table A.23. Programming Results: Small Cropping Farms.

Enterprise	1968	1972	1977	
			Out-EEC	In-EEC
		Numbers		
Beef: spring born traditional	15.6	17.9	--	13.7
Sheep: self-contained ewe flock	--	--	72.0	64.4
Pigs: Baconers, own sows	36.5	38.5	41.0	41.0
Baconers, purchased weaners	35.0	35.0	35.0	35.0
		Acres		
Winter wheat	28.5	27.7	40.2	42.3
Barley	44.2	41.6	22.7	18.1
Sugar beets	9.5	5.4	10.9	10.9
Potatoes: earlies	0.9	2.3	5.4	--
main crop	4.6	8.6	--	--
Kale	0.8	0.9	--	--
Fodder roots	--	--	0.5	0.8
Three year ley under sown	--	5.9	--	--
One year ley under sown	20.5	16.6	--	--
direct seeded	--	--	29.3	36.9
Total	109.0	109.0	109.0	109.0
Hay	6.2	6.6	4.2	6.9
Silage	3.9	4.8	2.0	4.0

Table A.24. Programming Results: Medium Cropping Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born traditional	6.2	14.8	--	8.3
spring born intensive	--	8.6	--	--
autumn born semi-intensive	29.9	--	--	--
autumn born traditional	8.3	--	--	--
Sheep: self-contained ewe flock	--	61.5	230.5	223.2
Pigs: Baconers, own sows	32.1	77.0	82.0	82.0
Baconers, purchased weaners	65.0	65.0	65.0	65.0
			Acres	
Winter wheat	58.2	59.7	92.2	94.3
Barley	81.1	90.3	42.7	38.3
Sugar beets	20.5	22.5	24.0	24.0
Potatoes: earlies	--	5.0	5.2	--
main crop	--	6.2	--	--
Kale	1.2	0.9	--	--
Fodder roots	--	--	0.8	1.1
One year ley: under sown	47.9	--	--	--
direct seeded	--	40.4	75.0	82.3
Total	208.9	225.0	239.9	240.0
Hay	15.4	7.2	7.9	10.6
Silage	9.2	4.2	2.3	4.1

Table A.25. Programming Results: Large Cropping Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born traditional	22.5	--	84.0	131.1
autumn born semi-intensive	91.9	--	--	--
spring born intensive	--	88.1	--	--
Sheep: self-contained ewe flock	--	359.8	186.6	152.7
Pigs: Baconers, purchased weaners	159.0	200.0	200.0	200.0
Baconers, own sows	--	231.0	246.0	246.0
			Acres	
Winter wheat	145.0	158.6	218.2	216.6
Spring wheat	--	--	--	15.2
Barley	198.3	221.4	129.1	101.0
Sugar beets	47.5	57.0	60.0	60.0
Potatoes: earlies	--	--	30.0	--
main crop	--	3.5	--	--
Kale	2.9	1.1	--	5.5
Fodder roots	--	--	4.5	--
One year ley: under sown	121.2	--	--	201.7
direct seeded	--	128.3	158.2	--
Total	514.9	569.9	600.0	600.0
Hay	40.8	16.6	35.4	50.5
Silage	24.8	4.4	21.2	31.7

Within the beef enterprise, emphasis is generally on the more extensive systems of 24-month beef, particularly in 1977. But by 1977, in an out-EEC situation, it would seem more profitable for small and medium cropping farms to use the grass break for sheep husbandry rather than for beef production. In EEC, on the other hand, an expansion in beef production at the expense of sheep could be expected on all sizes of farms.

In all three years a supplementary pig enterprise featured in the optimal program for these cropping farms, usually at the maximum level specified for this supplementary activity. Little growth in pig numbers on cropping farms is indicated by 1977, except as the result of improvements in technology and particularly improved rearing rates in breeding herds.

The program for cropping farms was invariably constrained by working capital. This is to be expected in a system of farming where the flow of revenue into the business tends to be concentrated into the spring and autumn months.

(v) Mixed Farms - The optimal programs for this final group of farms are set out in Tables A.26-A.28. Mixed farms are, in a way, representative of the whole agricultural sector in that, with the exception of poultry, the whole range of enterprise activities was available to them. But there is an important qualification that must be noted, namely the increase in average farm size that has been assumed through to 1977. Nevertheless, as will be seen later, the development of mixed farms has much in common with the estimates that have been made of the trends in crop acreages and livestock populations for the whole of the agricultural sector on the basis of optimal programs for the fifteen representative farms.

On the livestock side, the main features include an increase in dairy cow numbers through to 1977 in an out-EEC situation. Entry into EEC would lead to a contraction of dairy cow numbers especially on large mixed farms. An interesting feature of the program for medium mixed farms is the switch into summer milk production in the 1977 in-EEC solution; this was the only one of the six farms with dairy cows where this change in system occurred as a direct consequence of the changeover to EEC price relationships. Some expansion in beef cattle numbers is indicated, with EEC entry giving a substantial boost to the beef enterprise on medium and large farms. Moreover, there was a switch away from intensive beef production to traditional methods on large farms. All farms featured a supplementary pig enterprise with increased pig numbers stemming only from improvements in efficiency.

Some increase in the acreage of cereals is indicated for small and medium mixed farms by 1977 as compared with 1968. EEC entry would not result in any further expansion in cereals on these farms, although it would give additional encouragement to wheat at the expense of a further contraction in the barley acreage. Some substitution of wheat for barley is also a feature of the 1977 in-EEC program for large mixed farms; but the total cereal acreage on these farms is actually lower in 1977 than in 1968 due to the competition for land from the cattle enterprises. In particular, a larger grassland acreage is included in the 1977 in-EEC programs for medium and large farms to support the grazing livestock activities. The increased grass acreage took place at the expense of a reduction in the acreage of potatoes.

Table A.26. Programming Results: Small Mixed Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Beef: spring born intensive	13.2	10.3	0.1	--
spring born traditional	27.3	35.7	32.0	31.2
Dairy cows: self-contained herd	10.0	10.0	10.0	10.0
Pigs: Baconers, own sows	36.5	38.5	41.0	41.0
Purchased weaners	--	35.0	35.0	35.0
			Acres	
Winter wheat	21.1	18.8	31.9	31.7
Barley	10.6	4.8	3.7	3.7
Kale	2.0	2.4	1.8	1.8
Three year ley: direct seeded	48.7	62.9	28.0	28.7
One year ley: under sown	6.5	--	23.5	23.1
Total	88.9	88.9	88.9	89.0
Hay	17.4	19.1	15.2	15.2
Silage	11.8	14.7	11.3	11.4

Table A.27. Programming Results: Medium Mixed Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Dairy cows: self-contained herd	5.4	3.2	16.5	--
summer milk production	--	--	--	15.1
Beef: spring born traditional	38.1	45.5	52.0	45.8
autumn born traditional	--	--	--	13.3
Sheep: purchased stores	211.3	85.7	7.9	--
self-contained ewe flock (ewes)	--	64.3	--	--
Pigs: Baconers, own sows	73.0	77.0	82.0	82.0
Purchased weaners	--	65.0	65.0	65.0
			Acres	
Winter wheat	40.6	43.1	61.9	67.1
Barley	26.9	27.9	13.1	7.9
Main crop potatoes	3.4	3.5	2.7	--
Early potatoes	--	--	1.1	--
Kale	3.4	3.1	4.0	4.0
Three year ley: direct seeded	79.7	82.9	64.0	58.5
One year ley: under sown	15.0	16.4	40.3	49.5
Total	169.0	176.9	187.1	187.0
Hay	29.3	25.5	32.4	33.4
Silage	14.6	15.9	24.8	25.7

Table A.28. Programming Results: Large Mixed Farms.

Enterprise	1968	1972	1977 Out-EEC	1977 In-EEC
			Numbers	
Dairy cows: self-contained herd	14.9	42.4	--	--
summer milk production	--	--	65.0	35.9
Beef: spring born intensive	34.1	85.7	60.6	--
spring born traditional	69.9	44.2	42.3	120.7
Sheep: fattening purchased stores	--	200.0	--	--
Pigs: Bacon pigs, own sows	219.0	231.0	246.0	246.0
Purchased weaners	--	200.0	200.0	200.0
			Acres	
Winter wheat	123.8	121.8	201.1	219.4
Barley	143.7	115.2	48.9	30.6
Sugar Beets	8.7	14.2	10.0	10.0
Potatoes: earlies	--	2.2	6.2	--
main crop	13.1	7.3	8.8	--
Kale	5.0	7.4	7.2	7.8
3 year ley, direct seeded	39.7	143.2	46.1	25.4
1 year ley, under sown	101.0	65.8	171.7	206.8
Total	435.0	477.1	500.0	500.0
Hay	45.3	69.4	72.7	72.6
Silage	32.4	53.7	65.0	58.3

As with cropping farms, the main constraint on the mixed farm programs was working capital. March and October labor was a further constraint on the 1977 out-EEC program for mixed farms, while large farms were constrained by October labor. The 1977 in-EEC program for medium farms was constrained by March labor.

(b) Estimates of Crop Acreages and Livestock Populations in Great Britain in 1968, 1972 and 1977

The individual farm results presented in Tables A.14-A.28 provide the raw material for the estimation of total crop acreages and livestock populations in 1968, 1972 and 1977. The method used to obtain these estimates was firstly to multiply the crop acreages and livestock numbers computed for the representative farms by the appropriate structural weights; these weights have already been discussed in Table A.6. The summation of these figures gave the aggregate estimates of acreages and livestock numbers set out in Tables A.29 & A.30 respectively.

Table A.29. Estimated Crop Acreages in Great Britain, 1968, 1972 and 1977.

	1968	1972	1977 Out-EEC	1977 In-EEC
		Million Acres		
Winter wheat	5.2	5.4	6.6	6.6
Spring wheat	0.2	0.2	--	0.2
Barley	4.4	4.1	2.6	2.2
Oats	0.2	--	0.1	0.1
Total Cereals	10.0	9.7	9.3	9.1
Cash roots (potatoes and sugar beets)	0.9	1.2	1.4	0.9
Forage roots	0.4	0.4	0.4	0.4
Temporary grassland	7.9	8.2	8.0	8.7
Permanent grassland	5.1	4.6	5.4	5.4
Total crops and grass	24.3	24.1	24.5	24.5
Hay and silage	5.9	5.3	6.0	5.8

Table A.30. Estimated Livestock Populations in Great Britain, 1968, 1972 and 1977.

		1968	1972	1977 Out-EEC	1977 In-EEC
			Thousands		
Dairy cows		1712	2080	2551	2176
Beef cattle:	intensive	1667	3265	2161	627
	semi-intensive	1253	418	144	128
	traditional	2575	1804	2154	4096
	Total	5495	5487	4459	4851
			Millions		
Total Sheep		12.9	18.2	19.0	17.0
Total Pigs		15.3	20.5	18.3	26.2
Laying Hens		102.1	131.4	184.6	104.5
Table Birds		44.6	44.0	17.8	20.2
Total Poultry (excl. pullets)		146.7	175.4	202.4	124.7

(i) Crop Acreages - The estimates shown in Table A.29 suggest that little increase in the total cereal acreage on full-time farms in Great Britain can be expected by 1977. On the contrary, it would seem that some contraction in the cereal acreage may occur. Moreover, there is no indication of any increase in acreage occurring if Britain were, by 1977, a member of the EEC. This conclusion conflicts with the normal, and generally accepted, expectation that British farmers would respond to the substantially higher profitability of cereal production in EEC by increasing the acreage of cereals grown.

While some increase in the cereal acreage was indicated for some but not all of the fifteen farms through to 1977, the increase was generally no more than in proportion to the assumed increase in total farm size. In other words, the total cereal acreage on the farms was constrained by rotational factors, and it would seem that some modification to rotational programs would be needed before any marked increase in cereal acreages could occur. On the other hand, those farmers who have indulged in intensive systems of cereal production have often run into disease problems, leading to a reduction in yields; these farmers are more likely to be thinking of reducing the cereal acreage on their farms - by the introduction of appropriate break crops in an effort to maintain yields - than they are to increasing it. As Cracknell has pointed out, "The intensive cereal-growing counties of eastern England and Scotland have been running into problems of continuous cropping and they are short of additional land suitable for cereals production."[8/] It is in these counties that the bulk of the cropping farms in the country are to be found. It is, of course, true that there is scope for an increase in the cereal acreage in other areas of the country. But it is these areas which have a comparative advantage in land-using livestock production (cattle and sheep) and the profitability of these enterprises will also show some improvement in an EEC environment.

Secondly, as will be shown later, one effect of EEC entry would be to encourage a shift into systems of livestock production which make relatively more use of land, and especially grassland for grazing. Thus the 1977

[8/] Basil E. Cracknell. Past and Future Cereals Production in the United Kingdom - A Regional Analysis, Home-Grown Cereals Authority, 1970.

in-EEC estimate shows some increase in the acreage of temporary grassland at the expense of a small contraction in the cereal acreage and a rather larger reduction in the combined acreage of potatoes and sugar beets. It has often been argued that EEC entry would result in an increase in the cereal acreage in Britain, presumably through a contraction in the area of grassland, while at the same time the higher feed costs that would flow from the high EEC grain prices would encourage livestock producers to move towards systems of production that made more use of grass and grass products. Under these circumstances it is apparent that the maintenance of, let alone an increase in, livestock production would call for a very considerable improvement in the standard of grassland management on farms, yet such an improvement has generally been beyond the reach of the generality of farmers in the past. It would seem, therefore, that one could not expect EEC entry to lead both to an increase in the cereal acreage and grazing livestock numbers, given the probable shift in livestock production methods towards greater use of grassland, even with the improved stocking rates assumed in this study. It comes to a choice between more cereals and more livestock - and the results of this study would seem to indicate that the advantage, in terms of profit maximization, lies with grazing livestock.

Within the estimated trend in the total acreage of cereals, it would seem that the 1970s could see a growing emphasis on wheat at the expense of barley. EEC entry would give an additional boost to wheat production. The estimated 1977 in-EEC wheat acreage totalled 6.8 million acres compared with 6.6 million acres in 1977 out-EEC and only 5.6 million acres in 1968. The results indicate an increasing rate of decline in the acreage of feed grains to 1977. The absolute estimates of the acreages of the individual cereal crops must, however, be treated with caution. In particular, the estimated winter wheat acreages are undoubtedly far too high, bearing in mind that the acreage of winter wheat is largely governed by planting conditions in the autumn. On the other hand, the increasing proportion of wheat within the total would seem to be a logical consequence of changes in the relative profitability of wheat and barley by 1977 in favor of wheat.

(ii) Livestock Populations - Estimated livestock populations in Great Britain in 1968, 1972 and 1977 are shown in Table A.30. A small increase in the total cattle population is indicated for 1972, but thereafter stability in total cattle numbers is suggested, although EEC entry could lead to a marginal increase in the population. Within this total, dairy cow numbers increase steadily to 1977 assuming Britain remains outside EEC, but some cutback in the size of the national dairy herd could be expected to result from British membership of the community.

This increase in dairy cow numbers outside EEC would take place largely at the expense of a reduction in the number of beef cattle on farms. However, EEC entry could lead to some diversion of resources out of dairying into beef production in the 1977 in-EEC situation, compared with the out-EEC estimates. Estimated dairy cow numbers are 375,000 lower in 1977 in-EEC while beef cattle numbers are estimated to increase by almost 400,000. The most interesting point about beef cattle is not so much the increase in numbers in the 1977 in-EEC estimates, but the very marked change in the distribution of the cattle between the three production systems. The percentage distribution of beef cattle by system of production in all three years is summarized below:

	1968	1972	1977	
			Out-EEC	In-EEC
	%	%	%	%
Intensive	30.3	59.5	43.6	11.7
Semi-intensive	22.8	7.6	2.9	2.4
Traditional	46.9	32.9	53.5	85.9
Total	100.0	100.0	100.0	100.0

It is clearly apparent that EEC entry, and more particularly the higher feed costs stemming therefrom, could lead to a switch away from the intensive and heavy feed-using systems of producing 12-month beef towards the more extensive systems of 24-month beef. The traditional systems have a requirement for concentrate feeding-stuffs of only 15 cwt. per animal compared with 34.5 cwt. for the intensively fed cattle. On the other hand, they do have a higher requirement for land and it is here that the conflict between cereals, grassland and livestock referred to above mainly arises.

For not only do the results indicate some expansion in total cattle numbers in the event of EEC entry, but they also suggest that it would be profitable for farmers to shift to beef production systems that rely more heavily on the direct use of land. Some land would be available for beef through the reduction in dairy cow numbers, but assuming that intensive beef cattle have no direct requirement for land, the number of land-using cattle rises to 6,900,000 in 1977 in-EEC compared with only 5,349,000 in 1977 out-EEC. To accommodate this expansion the grassland acreage increases by 0.7 million acres (Table A.29), although it should be noted that a reduction in the sheep flock could release land for cattle production.

Turning to sheep, the estimates indicate that some expansion in the size of the national sheep flock may occur during the 1970s if Britain remains outside EEC. However, sheep numbers may fall if Britain becomes a member of the community to release resources for an expansion in cattle, and more particularly in the number of beef cattle.

Within the intensive pig and poultry sector, the estimates point to a sizable expansion in the total number of poultry on farms by 1977, providing Britain remains outside EEC. Within the total flock, laying hens become relatively more important as their numbers show a rapid increase while numbers of table birds fall. EEC entry could, however, lead to very substantial adjustments in the poultry sector. As was shown in Table A.13 the profitability of egg production is expected to be cut drastically in EEC, primarily as a consequence of higher feed costs. The gross margin per 1000 layers falls to £75 in the EEC compared with £305 outside. It is hardly surprising, therefore, that the 1977 in-EEC estimates should indicate a reduction of over 40 percent in total hen numbers compared with the out-EEC situation. With EEC entry giving but little stimulus to table bird numbers, the size of the poultry flock could fall very considerably if Britain was to join the Community.

The profitability of pig production would also be deleteriously affected by EEC membership, although the fall in the gross margins for pig production would be relatively less than the reduction in the profitability of egg production (Table A.13). It is probably this change in the relative profitability of pig and poultry production that accounts for the large increase in pig numbers in the 1977 in-EEC estimates over the out-EEC figures. With the change in profit relationships between the two enterprises, intensive livestock producers could diversify out of eggs into pigs, provided sufficient resources were available to establish larger pig enterprises on their farms. Outside EEC the results point to a smaller increase in pig numbers in 1977 over 1968.

(c) Estimates of Grain and Livestock Production and Concentrate Feeding-stuff Requirements by Livestock in 1968, 1972 and 1977

The final step in the analysis, to complete the link between optimal programs for the fifteen representative farms and estimates of aggregate supply response, was to convert the estimates of crop acreages and livestock populations just discussed into estimates of the level of crop and livestock production in 1968, 1972 and 1977 on the one hand and estimates of the requirements by livestock for concentrate feeding-stuffs on the other. This was accomplished by taking the figures of acreages and livestock numbers shown in Tables A.29 & A.30 and multiplying them by the appropriate factors of yields and feeding rates shown in Table A.11. The results of these calculations are set out in Tables A.31 and A.32.

(i) Production Estimates - The estimates in Table A.31 suggest that production of cereals can be expected to increase to 1977, notwithstanding the estimated contraction in acreage noted earlier. There are two main reasons underlying this production increase. The first is that yields of wheat, barley and oats can all be expected to rise as a result of the adoption of new, higher-yielding varieties and improved cultivation practices by farmers. Secondly, the increase in wheat acreage at the expense of barley and oats would of itself lead to a greater volume of grain production because wheat yields are, on average, some 3 cwt. per acre higher than yields of barley. Within the total increase in grain production, the estimates point to some expansion in wheat production at the expense of a contraction of feed-grains. In these circumstances, an increasing proportion of the wheat crop would be used for livestock feed. EEC entry could lead to a marginal increase in cereal production, largely as a result of an increase in wheat acreage.

With a further increase in average yields per cow, the estimated increase in the size of the national dairy herd would lead to a substantial increase in milk production by 1977 provided Britain remained outside EEC. In an

Table A.31. Estimates of Production of Cereals and Livestock Products in Great Britain in 1968, 1972 and 1977.

	1968	1972	1977 Out-EEC	1977 In-EEC
Cereals (million tons):				
Wheat	8.1	9.2	11.7	12.5
Barley	6.2	6.2	4.2	3.6
Oats	0.2	--	0.1	0.1
Total	14.5	15.4	16.0	16.2
Livestock Products:				
Milk (million gallons)	1395	1737	2082	1780
Beef (thousand tons l.w.)	2455	2375	2224	2575
Pigmeat (million score* d.w.)	114.7	154.0	141.2	201.8
Eggs (million dozen)	1777	2392	3692	2090
Poultrymeat (thousand tons)	252	267	104	118

*One score = 20 lb.

Table A.32. Estimates of Concentrate Feeding-stuff Requirements by Livestock in Great Britain in 1968, 1972 and 1977.

	1968	1972	1977 Out-EEC	1977 In-EEC
	Million Tons			
Dairy cattle	1.9	2.3	1.7	1.5
Beef cattle	5.8	7.3	5.7	4.5
Total Cattle	7.7	9.6	7.4	6.0
Sheep	0.2	0.25	0.35	0.3
Pigs	4.0	5.2	4.5	6.4
Poultry	6.1	7.6	9.1	5.4
Total All Livestock	18.0	22.65	21.35	18.1

EEC environment, on the other hand, the level of milk production in 1977 could be but marginally higher than in 1972 - an estimated 1780 million gallons in 1977 in-EEC compared with 2082 million gallons in 1977 out-EEC and 1737 million gallons in 1972. The reduced level of milk production in EEC is due to the estimated cutback in the number of dairy cows noted earlier following the diversion of resources into beef production.

Turning to beef, a gradual decline in production is estimated to 1977 out-EEC corresponding to the fall in beef cattle numbers (Table A.30). However, entry into EEC would give a stimulus to beef production and some expansion could be expected. The estimated production of beef in 1977 in-EEC, at 2575 thousand tons (liveweight), is some 16 percent higher than the estimate for 1977 out-EEC. As with the estimated increase in the production of cereals, two factors are at work. The first is the estimated increase in beef cattle numbers at the expense of a decline in the size of both the national dairy herd and national sheep flock; beef cattle numbers are up by almost 400,000 in 1977 in-EEC. The second factor is the shift within the beef sector towards the more extensive systems of 24-month beef and away from the intensive 12-month systems. This would lead to an increase in production - even if total cattle numbers remained constant - because of the tendency for the older cattle to be slaughtered at higher weights. For the purposes of this study, the average slaughter weight of traditionally reared cattle was assumed to be 10 cwt. liveweight compared with 8 cwt. for the intensive and semi-intensive systems.

The estimates in Table A.31 point to a large increase in the production of pigmeat by 1977, particularly if Britain is by then a member of EEC. This is largely a consequence of the estimated expansion in pig numbers, although a marginal increase in average slaughter weights has been assumed.

Similarly the estimated trend in the production of eggs and poultrymeat follows the trend in numbers noted earlier. In the case of eggs, improvements in average yields per bird would also contribute to the expansion in production. It has already been emphasized that these figures should be interpreted very carefully. In particular they should be regarded only as indicators of the likely trends in the poultry sector, rather than as a precise guide to the absolute levels of production. In this connection the most interesting feature of the estimates is the indicated reduction in egg production in the 1977 in-EEC estimates. It is also suggested that poultrymeat production could be under severe pressure by 1977, whether Britain is by then a member of the EEC or not.

(ii) Feed Requirements - Estimates of concentrate feeding-stuff requirements by livestock in Great Britain in 1968, 1972 and 1977 are presented in Table A.32. Allowance was made in the calculations for an improvement in the efficiency of feed use over the period 1968 to 1977.

It would seem that some increase in total feed requirements can be expected by 1977 provided Britain remains outside EEC. The total requirements are estimated at 21.35 million tons in 1977 out-EEC compared with 18 million tons in 1968. This is entirely due to an expansion in the requirements of pigs and poultry, the principal feeding-stuff users; the demand for pig and poultry feeds is estimated to increase from 10.1 million tons in 1968 to 12.8 million tons in 1972 and 14.6 million tons in 1977 out-EEC.

The estimates for 1972 probably overstate the requirements for feeding-stuffs by cattle. In particular, the estimate of feed requirements by beef cattle at 7.3 million tons, may be rather wide of the mark. This is a consequence of the estimated doubling in the proportion of cattle being reared under intensive conditions in 1972 compared with 1968. This is barely realistic. If the distribution of cattle between systems in 1972 was similar to that of 1968, the effect would be to reduce beef cattle requirements to approximately 5.7 million tons, total cattle requirements to 8 million tons and the total all livestock figure to just over 22 million tons.

On the other hand, the estimates of cattle feed requirements in 1977 may be understated. In this case, however, the difficulty lies with dairy cattle. It has already been pointed out, in the discussion of the programming results for dairy farms, that a switch to summer milk production could be profitable in 1977 in both the out-EEC and in-EEC situations. In the estimates of dairy cow numbers in 1977, approximately 70 percent of the cows in both estimates were in summer milk production. However, farmers may be reluctant to make the switch to summer milk production because of the many technical problems involved; these are mainly related to changes in calving patterns with consequential production losses. Assuming, therefore, that the indicated switch to summer milk production does not take place, the requirements of dairy cattle for feed would rise to 2.3 million tons in 1977 out-EEC and 2.0 million tons in 1977 in-EEC. This is because the feed requirement for winter milk systems is 22 cwt. per cow compared with only 10 cwt. per cow in summer milk systems. Total feed requirements for all livestock on this basis would rise to almost 22 million tons in

1977 out-EEC and 18.6 million tons in 1977 in-EEC.[9] These adjustments do not affect the conclusion that a considerable increase in total feed requirements can be expected by 1977 if Britain remains outside the EEC.

On the other hand, if Britain is in EEC by 1977, total feed requirements may be little higher than they were in 1968. The estimated reductions in the populations of dairy cattle and, more especially, pigs and poultry would lead to a fall in feed requirements by these enterprises. A decline in the feed required by beef cattle can also be expected even though beef cattle numbers are estimated to increase. This is a reflection of the change in production systems away from intensive beef production with a higher feed requirement (34.5 cwt. per head) towards the traditional systems with a much lower requirement for concentrate feeding-stuffs (15 cwt. per head).

If these estimates of feed requirements are viewed against the estimates of cereal production, some indication of the likely trend in the size of the market for imported feed grains can be obtained. According to the Ministry of Agriculture's statistics on the production and utilization of the domestic cereal crop, about 4 million tons per annum is currently for human and industrial use. Assuming no increase in this figure, the following table shows the estimated production of feed-grains in Britain in 1968, 1972 and 1977, together with an estimate of the size of the market for imported feedgrains:

	1968	1972	1977	
			Out-EEC	In-EEC
		Million Tons		
Total cereal production	14.5	15.4	16.0	16.2
Human and industrial use	4.0	4.0	4.0	4.0
Available for livestock feed	10.5	11.4	12.0	12.2
Total feed requirements	18.0	21.0	22.0	18.6
Market for imports	7.5	9.6	10.0	6.4

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[9] It should be noted that, for similar reasons, the estimated level of milk production in 1977 may also be understated as yields per cow are rather lower in summer milk systems.

From this it would appear that some growth in the market for imported feedgrains may be expected between 1968 and 1972. But little growth seems likely thereafter. On the contrary, entry by Britain into EEC would lead to a substantial contraction in the size of the market in the face of a marginal increase in the availability of domestically produced feed on the one hand and a sharp reduction in total feed requirements on the other.

APPENDIX B

SELECTED DATA AND PROJECTIONS ON THE U.K.

Table B.1. Per Capita Household Consumption of Selected Products in the United Kingdom, 1955-1968.

Year	Beef and Veal	Mutton and Lamb	Pork	Bacon and Ham	Poultry	Milk	Cream	Butter	Cheese
	oz./wk.	oz./wk.	oz./wk.	oz./wk.	oz./wk.	pts./wk.	pts./wk.	oz./wk.	oz./wk.
1955	9.36	6.55	2.32	5.35	.48	4.81	.01	4.47	2.46
1956	10.00	7.16	1.90	5.11	.59	4.83	.01	4.70	2.45
1957	10.54	6.28	1.98	5.08	.80	4.84	.02	5.37	2.52
1958	9.57	6.04	2.13	5.16	.97	4.83	.02	6.10	2.60
1959	8.55	6.97	2.01	5.14	1.35	4.76	.02	5.74	2.52
1960	8.74	6.63	2.02	5.32	1.68	4.84	.02	5.68	2.64
1961	9.10	6.75	1.95	5.24	2.32	4.90	.02	6.20	2.70
1962	9.01	6.72	2.29	5.56	2.29	4.95	.02	6.20	2.76
1963	9.47	6.36	2.48	5.35	2.50	4.98	.03	5.98	2.81
1964	8.53	6.30	2.33	5.32	2.71	4.85	.02	5.98	2.71
1965	8.08	5.90	2.80	5.43	3.38	4.85	.03	6.10	2.84
1966	8.13	6.28	2.76	5.30	3.62	4.93	.03	6.09	2.77
1967	8.61	6.06	2.29	5.17	3.47	4.59	.03	6.19	3.00
1968	7.76	5.71	2.53	5.15	4.10	4.82	.03	6.14	3.08

(continued)

Table B.1.(continued)

Year	Dry Whole Milk	Condensed Milk	Margarine	Eggs	Wheat Flour	Bread	Oatmeal
	pt. eq./wk.	pt. eq./wk.	oz./wk.	no./wk.	oz./wk.	oz./wk.	oz./wk.
1955	.03	.12	4.68	4.19	8.57	55.13	.86
1956	.04	.12	4.48	4.35	7.14	51.18	.85
1957	.04	.12	4.02	4.41	7.81	48.00	1.04
1958	.07	.13	3.46	4.42	7.75	47.21	1.15
1959	.06	.15	3.74	4.54	6.75	47.29	1.02
1960	.06	.14	3.66	4.64	6.76	44.47	.94
1961	.08	.14	3.30	4.66	6.37	45.17	.78
1962	.09	.15	3.45	4.68	6.22	43.57	.60
1963	.09	.16	3.32	4.58	6.51	43.26	.96
1964	.08	.15	3.35	4.73	6.07	41.97	.96
1965	.10	.15	3.04	4.78	5.90	40.60	.99
1966	.11	.15	2.79	4.77	5.95	38.64	.67
1967	.10	.15	3.00	4.72	5.79	40.02	.67
1968	.10	.15	2.81	4.66	5.38	38.31	.58

Source: Household Food Consumption and Expenditure (Annual Report of the National Food Survey Committee), H.M.S.O., London (various years). This publication is usually referred to as the National Food Survey (NFS).

Table B.2. Retail Product Prices in the United Kingdom, 1955-1968.

Year	Product Prices at Retail							
	Beef and Veal	Mutton and Lamb	Pork	Bacon and Ham	Poultry	Liquid Milk	Cream	Butter
	Pence/lb.	Pence/lb.	Pence/lb.	Pence/lb.	Pence/lb.	Pence/pt.	Pence/pt.	Pence/lb.
1955	41.38	36.60	38.55	42.98	55.02	7.19	71.43	46.39
1956	42.08	37.19	43.72	47.40	60.31	7.48	74.11	44.63
1957	43.19	39.98	45.05	45.98	56.46	8.08	72.08	38.14
1958	45.90	40.63	45.19	46.86	54.60	8.04	69.39	32.41
1959	48.70	39.00	47.80	48.30	49.20	8.10	68.70	44.30
1960	50.00	40.70	49.80	47.60	47.40	8.20	69.00	40.80
1961	50.30	39.90	50.50	47.30	44.00	8.30	66.90	35.20
1962	51.60	41.00	49.60	46.80	43.90	8.50	63.80	38.90
1963	51.90	41.80	49.30	48.50	41.90	8.60	64.10	43.10
1964	57.60	45.50	52.40	52.30	44.80	9.10	66.20	44.70
1965	61.80	48.40	53.10	52.40	42.50	9.50	68.10	44.50
1966	61.20	49.90	56.20	55.60	43.00	9.80	70.10	42.00
1967	66.90	49.40	60.40	57.90	41.00	9.20	71.90	41.60
1968	73.40	53.40	62.40	58.80	40.90	9.70	72.70	40.60

(continued)

Table B.2. (continued)

Year	Product Prices at Retail							
	Cheese	Dry Whole Milk	Condensed Milk	Margarine	Eggs	Wheat Flour	Bread	Oatmeal
	Pence/lb.	Pence/ pt. eq.	Pence/ pt. eq.	Pence/lb.	Pence/egg	Pence/lb.	Pence/lb.	Pence/lb.
1955	30.28	7.31	7.73	20.71	4.64	6.53	6.87	12.19
1956	37.72	7.69	8.08	21.55	4.45	6.87	6.37	12.59
1957	32.33	7.91	8.81	22.69	3.92	7.12	6.45	13.37
1958	30.09	8.10	8.83	21.87	4.21	7.19	6.34	14.43
1959	42.20	8.10	8.80	22.10	3.90	7.30	6.40	15.00
1960	32.20	8.00	8.80	22.40	4.20	7.10	6.60	14.80
1961	38.20	8.10	8.90	22.40	4.20	7.30	7.10	14.60
1962	38.70	7.90	8.70	22.30	3.80	7.60	7.60	14.60
1963	39.90	8.10	8.60	22.50	4.40	7.40	7.80	14.70
1964	41.80	8.00	8.60	22.60	3.70	7.80	8.30	15.50
1965	43.70	8.30	9.20	24.40	4.00	7.70	8.80	15.00
1966	44.90	8.80	8.40	24.70	4.00	7.50	9.50	14.40
1967	45.60	8.60	8.40	23.80	3.90	7.80	10.00	15.70
1968	45.80	8.70	8.90	23.80	4.10	7.80	10.80	17.00

Source: Household Food Consumption and Expenditure (Annual Report of the National Food Survey Committee), H.M.S.O., London (various years). This publication is usually referred to as the National Food Survey (NFS).

Table B.3. Selected Economic Variables in the United Kingdom, 1955-1968.

Year	Consumption Expenditure as a Percent of GNP	Government Expenditure	Investment	Exports	Imports	Consumer Price Index	Consumption Expenditure
		Bil. £	Bil. £	Bil. £	Bil. £	1958=100	Bil. £
1955	76.7	3.25	2.83	5.05	5.18	88	13.09
1956	74.5	3.52	3.10	5.56	5.29	94	13.80
1957	74.2	3.67	3.38	5.86	5.55	97	14.56
1958	74.6	3.75	3.49	5.84	5.43	100	15.34
1959	75.2	4.01	3.74	6.02	5.79	101	16.14
1960	74.1	4.25	4.12	6.31	6.48	102	16.94
1961	73.0	4.59	4.62	6.59	6.48	105	17.83
1962	73.9	4.92	4.73	6.84	6.61	110	18.84
1963	73.9	5.18	4.92	7.23	6.96	112	19.97
1964	73.1	5.51	5.85	7.69	7.89	115	21.49
1965	72.9	6.04	6.30	8.31	8.15	121	22.87
1966	73.4	6.57	6.71	8.75	8.46	125	24.24
1967	72.8	7.25	7.26	8.89	8.93	128	25.34
1968	73.7	7.70	7.80	10.67	10.68	133	27.07

(continued)

Table B.3. (continued)

Year	Consumption Expenditure Deflated	Food Expenditure	Food Expenditure Deflated	Population	Gross National Expenditure	Gross National Product	Farm Price Index
	Bil. ₤	Bil. ₤	Bil. ₤	Million	Bil. ₤	Bil. ₤	1968=100
1955	14.52	4.09	4.42	50.97	19.42	16.98	90
1956	14.65	4.32	4.48	51.21	20.62	18.43	96
1957	14.96	4.49	4.55	51.46	21.80	19.54	99
1958	15.34	4.58	4.58	51.68	22.65	20.41	100
1959	16.06	4.73	4.68	51.96	24.02	21.41	102
1960	16.70	4.81	4.78	52.35	25.87	22.79	101
1961	17.08	4.97	4.87	52.82	27.34	24.39	103
1962	17.41	5.20	4.92	53.34	28.63	25.56	106
1963	18.22	5.36	4.99	53.68	30.44	27.22	108
1964	19.08	5.59	5.07	54.07	33.51	29.37	111
1965	19.42	5.80	5.08	54.44	35.63	31.36	115
1966	19.81	6.09	5.16	54.74	37.77	33.01	119
1967	20.21	6.27	5.20	55.07	40.05	34.81	122
1968	20.70	6.47	5.23	55.28	42.77	36.69	126

Table B.4. Size Distribution of Main Types of Full-time Farming (by Holdings) for England and Wales in 1967 1/

Type of Farming	Size of Business: (smd's) 275-599	600-1199	1200 or more	Total	No. of Holdings
	%	%	%	%	
Specialist Dairy	51	37	12	100	34,784
Mainly Dairy	37	40	23	100	25,477
Livestock, rearing & fattening, mostly cattle	69	23	8	100	2,845
Livestock, rearing & fattening, mostly sheep	45	39	16	100	4,820
Livestock, rearing & fattening, cattle & sheep	51	37	12	100	16,011
Predominantly poultry	35	29	36	100	3,547
Pigs and poultry	49	30	21	100	5,265
Cropping - mostly cereals	37	38	25	100	8,651
General cropping	31	29	40	100	17,200
Horticulture	33	29	38	100	15,271
Mixed	32	38	30	100	13,464
Total holdings 275 s.m.d. and over	42	35	23	100	147,335

1/ M.A.F.F. Farm Classification. The total number of holdings with less than 275 smds. represented 51 percent of all holdings.

Table B.5. Size Distribution of Main Types of Full-time Holdings (by smd Requirements) for England & Wales, 1967 1/

Type of Farming	Size of Business: (smd's)				
	275-599	600-1199	1200 or more	Total	Total smds.
	%	%	%	%	(millions)
Specialist Dairy	30	41	29	100	25.6
Mainly Dairy	18	35	47	100	24.0
Livestock rearing & fattening, mostly cattle	46	31	23	100	1.7
Livestock rearing & fattening, mostly sheep	23	41	36	100	3.9
Livestock rearing & fattening, cattle & sheep	29	41	30	100	11.9
Predominantly poultry	9	16	75	100	5.8
Pigs and poultry	21	26	53	100	5.1
Cropping - mostly cereals	16	31	53	100	8.8
General cropping	8	16	76	100	26.9
Horticulture	8	12	79	100	28.8
Mixed	11	27	62	100	16.3
Total holdings 275 s.m.d. and over	16	28	56	100	158.9

1/ M.A.F.F. Farm Classification. Type of farming data for holdings with less than 275 smds were not available. In total, 7 percent of all smds were on such holdings.

Table B.6. Percentage Distribution of the Main Enterprises Among Types of Holdings in England and Wales, 1967 1/

Type of Farming	Enterprises										
	Wheat Acreage	Barley & Oat Acreage	Dairy Cows	Beef Cows	Male Cattle Over 1 Year	Male Cattle Under 1 Year	Breeding Sheep	Breeding Pigs	Hens & Pullets	Broilers	Turkeys
	%	%	%	%	%	%	%	%	%	%	%
Specialist Dairy	3	5	47	1	4	7	3	6	5	-	1
Mainly Dairy	11	13	32	4	11	16	11	11	10	2	3
Livestock rearing and fattening: cattle	1	2	-	8	9	7	-	1	-	-	-
Livestock rearing and fattening: sheep	1	1	1	5	1	2	23	1	-	-	-
Livestock rearing and fattening: cattle & sheep	4	6	1	46	23	22	34	3	2	-	-
Predominantly poultry	2	1	-	-	1	1	-	1	41	76	55
Pigs and poultry	1	2	1	1	2	2	-	25	15	12	13
Cropping: mostly cereals	24	25	1	5	8	6	4	5	2	1	3
General cropping	34	24	2	7	12	11	5	13	3	1	8
Horticulture	4	2	-	1	1	1	1	4	2	2	5
Mixed	12	14	10	9	13	15	11	16	9	5	9
Total holdings 275 smds. and over	97	95	96	87	84	90	92	85	89	99	97
Holdings under 275 smds.	3	5	4	13	16	10	8	15	11	1	3
All Holdings	100	100	100	100	100	100	100	100	100	100	100

1/ M.A.F.F. Farm Classifications.

Table B.7. Size Distribution of Main Types of Full-time Farms (by Holdings) in Scotland, 1969 1/

Type of Farming	Size of Business: (smd's)				
	250-599	600-1199	1200 or more	Total	No. of Holdings
	%	%	%	%	
Hill Sheep	50	39	16	100	1308
Upland	56	32	12	100	4685
Rearing with arable	58	29	13	100	3616
Rearing with intensive livestock	51	32	17	100	634
Arable rearing and feeding	58	30	12	100	1255
Cropping	29	33	38	100	3753
Dairy	17	40	37	100	5484
Intensive	46	27	27	100	1406
Total					22141

1/ Department of Agriculture & Fisheries for Scotland.

Table B.8. Distribution of Holdings by Man Day Size Groups for Northern Ireland, 1969 1/

	No. of Farms		
	Under 200 smds	200 smds and over	All farms
Dairying	3,434	5,692	9,126
Pigs and poultry	4,504	1,366	5,870
Crops	3,345	979	4,324
Beef cattle and sheep	14,958	3,247	18,205
Dairying, pigs and poultry	799	2,780	3,579
Beef cattle, sheep and pigs	1,974	1,625	3,599
Mixed farms	16,097	3,024	19,121
All types	45,111	18,713	63,824

1/ Source: Ministry of Agriculture, Northern Ireland.

Table B.9. Selected Annual Data on Milk Production, U.K.

June-May Year beginning	Number of Dairy cows on farms June 1 1/	Milk Prod. per Cow 2/	Gross Milk Prod. 3/	Net Price, ex-farm, received for milk by wholesale producers 4/	Net Returns from milk and calf per cow less cost of concentrates	Price of cull cows 6/	Percent Friesians in national herd 7/
Code for Model	N(10)	T(10)		P(10)	L(10)	P(22)	T(11)
	1000 hd.	gals.	Mil.gals.	d/gal.	£	s/live cwt.	%
1954	3123	674	2306	36.25 5/	70.70	98.21	40.34
1955	2992	685	2374	36.88	74.74	94.95	42.40
1956	3022	715	2455	35.59	71.97	85.84	44.46
1957	3085	742	2497	34.60	77.79	87.51	46.52
1958	3094	720	2373	35.35	78.30	109.37	48.58
1959	3045	735	2463	35.33	79.41	105.83	50.64
1960	3165	762	2616	33.47	77.16	97.37	52.70
1961	3246	774	2714	33.34	77.05	84.72	55.30
1962	3290	779	2726	32.97	75.79	87.83	57.90
1963	3247	765	2645	34.59	77.63	107.50	60.50
1964	3144	775	2669	37.38	88.83	125.50	63.10
1965	3186	795	2720	37.73	92.86	123.83	65.70
1966	3162	790	2718	38.83	94.66	109.42	67.74
1967	3214	810	2837	39.26	96.41	120.42	69.78
1968	3225	815		39.40	97.93	124.75	71.82
1969	3275						
1970							

Source: MAFF and The Federation of U.K. Milk Marketing Boards.

1/ Data for Northern Ireland prior to 1960 were estimated.

2/ Estimates for 1954-1960 were based on England and Wales data adjusted to the normal relationship in subsequent years with U.K. averages.

3/ Includes production from cows not in dairy herd (approximately 5% of gross production).

4/ April-March.

5/ Estimated.

6/ Constructed from official price indices applied to known price levels.

7/ Actual data for 1955, 1960 and 1965; other years are interpolated.

Table B.10. Selected Annual Data on Cattle Numbers, Marketings, and Profitability, U.K.

June-May Year Beginning	Total Number Marketed 1/ Steers and Heifers	Cows and Bulls	Calves	Number of Beef Cows on Farms June 2/	Net Returns per Beef Cow over cost of concentrates 3/	Dairy Calves Reared for Slaughter as a Percent of those Surviving Birth in t	Price of Rearing Calves ÷ Price of Veal Calves Calendar Year
Code for Model	N(25)	N(26)	N(27)	N(20)	L(20)	N(21)	P(27)
	----thousand head ----			thou. hd.	£	%	£/head
1954	2020	754	1052	606	24.99	34.5	
1955	1763	645	983	714	28.99	36.1	14.3
1956	2227	666	1175	770	25.54	34.7	13.7
1957	2328	705	877	806	30.05	41.9	15.1
1958	2110	775	642	790	33.45	50.4	17.9
1959	2004	721	693	804	34.37	50.0	17.5
1960	2175	709	917	848	31.97	44.7	16.7
1961	2671	742	910	908	34.70	47.5	17.8
1962	2689	816	821	978	37.68	47.8	19.1
1963	2861	904	614	1013	36.73	55.6	19.3
1964	2641	755	407	982	43.33	64.9	19.5
1965	2640	784	415	1018	46.04	62.4	19.8
1966	2741	745	570	1106	46.03	56.6	17.5
1967	3061	766	568	1141	47.17	57.3	15.2
1968	2728	692	472	1164	56.85	61.0	17.7
1969				1226			
1970							

1/ Home fed slaughter plus exports. Slaughter includes fat cattle imported as stores.
2/ Data for Northern Ireland prior to 1960 were estimated.
3/ Includes calf subsidy, beef cow and hill cow subsidy and winter keep subsidy.

Table B.11. Estimates of Cattle Fed Under Major Systems and Net Returns Over Cost of Store and Concentrates, U.K.

June-May year Beginning	Number of Cattle Finished				Net Returns Over Cost of Store and Concentrates			
	Beef (suckler) Calves 1/	Dairy Calves: Semi-Intensive 2/	Dairy Calves: Intensive 3/ 5/	Irish Stores 4/	Beef (suckler) Calves 1/	Dairy Calves: Semi-Intensive 2/	Dairy Calves: Intensive 3/	Irish Stores 4/
Code for Model	N(23)	N(22)	N(22)	N(24)				
		1000 head				£/head		
1954	403	849	--	537	13.69	33.15	3.34	11.32
1955	447	1125	--	412	10.47	32.36	3.12	7.19
1956	467	960	--	617	18.53	37.70	7.42	20.73
1957	550	962	--	757	17.06	39.89	12.04	16.89
1958	593	970	--	514	13.16	36.14	8.06	11.32
1959	621	1141	--	385	14.00	35.73	8.08	9.43
1960	608	1354	--	341	18.20	39.71	12.89	13.59
1961	619	1370	25	458	18.54	44.53	16.95	18.86
1962	653	1252	47	415	14.11	42.72	14.84	13.87
1963	699	1292	110	642	14.90	40.82	10.95	16.87
1964	753	1216	163	584	12.96	43.38	14.15	16.32
1965	780	1328	220	416	12.43	43.12	12.96	14.15
1966	756	1632	243	411	16.63	47.49	17.67	17.17
1967	784	1571	256	584	21.91	54.16	23.85	26.02
1968	852	1399	250	621	18.26	56.85	25.07	11.67
1969								
1970								

1/ Assumes 550 pound store fed to 950 lbs.; Number = 77% of beef cows in t-2
2/ Assumes 100 pound calf fed to 1000 lbs.; Numbers based on estimates of calves saved from dairy
3/ Assumes 100 pound calf fed to 900 lbs.; cows in t-2 minus replacements and calf slaughter.
4/ Assumes 950 pound store fed to 1120 lbs.; Number = imports March-February
5/ Estimates for intensive system are based on judgement. See Barfield, Arnold, "The Pattern of Beef Production in the United Kingdom." Feeding for Beef Production, U.S. Feed Grains Council, 1966, pp. 20-21.

Table B.12. Actual and Derived Prices on Cattle and Calves, U.K.

June-May year beginning	Fat cattle (clean) 1/			Store cattle 3/			Veal
	Market	Total Return Under Fatstock Guarantee Scheme	Cull 2/ cows	First Quality Yearling Steers (calendar year)	First Quality Male Rearing Calves, Friesian (calendar year)	Two year old Irish Steers (calendar year)	Calves, Dressed Carcass 2/ Weight Basis (calendar year)
Code for model	P(21)	P(20)	P(22)	P(26)	P(23)	P(25)	P(24)
	£/cwt.	£/cwt.	£/cwt.	£/head	£/head	£/head	s/lb.
1954	6.74	7.10	4.91	38.49	11.70	55.80	
1955	6.47	7.00	4.75	41.40	14.60	60.05	2.89
1956	5.64	7.49	4.29	36.54	13.40	51.25	2.77
1957	6.08	7.69	4.38	41.62	15.80	57.56	2.98
1958	7.22	7.72	5.47	46.12	19.60	63.39	3.11
1959	7.12	7.65	5.29	45.30	20.00	64.60	3.24
1960	6.51	7.69	4.87	40.80	17.30	60.70	2.93
1961	6.24	8.18	4.24	44.85	16.50	61.15	2.63
1962	6.40	8.15	4.39	49.35	17.80	65.75	2.64
1963	7.09	8.28	5.38	48.60	18.90	64.25	2.77
1964	8.22	8.67	6.28	54.95	21.10	68.00	3.07
1965	8.46	8.89	6.19	57.20	23.10	72.55	3.31
1966	7.50	9.00	5.47	53.85	20.20	70.60	3.28
1967	8.11	9.45	6.02	51.90	18.00	66.23	3.35
1968	9.21	10.22	6.24	62.83	21.50	89.68	3.46
1969							
1970							

1/ Estimates from the Fatstock Guarantee Scheme for 1967-68 were used as a base and MAFF indices for 1954 to 1966 (1954-56=100) and 1968 (1964-1966=100) were used to derive prices. These prices approximate published prices in the Annual Reviews, but are more comparable over time.

2/ Calculated similarly to fat cattle prices, using average of markets in England and Wales as a base.

3/ Averages for markets in England and Wales compiled by MAFF. On yearling steers, prices in 1954-58 were estimated at 91% of non-attested store price. Rearing calf prices for 1954-64 were based on 1st quality male price adjusted to Friesian level. Irish steer price estimated for 1954-58.

Table B.13. Selected Annual Data on Sheep and Lambs, U.K.

June-May Year Beginning	Number of Ewes on Farms, June 1	Number Marketed 1/		Fat Lamb Prices 2/		Net Returns Over Cost of Concentrates per Ewe	
		Clean Sheep and Lambs	Ewes and Rams	Market	Total Return Under Fatstock Guarantee Scheme	Lowland Ewes 3/	Hill Ewes 4/
Code for Model	N(30)			P(31)	P(30)		
	1000 head	1000 head	1000 head	d/lb. dressed	estimated carcass wt.	Ŀ/head	Ŀ/head
1954	8,908	7,750	757	34.78	40.05	8.60	2.94
1955	9,202	8,274	808	33.86	36.92	7.99	2.80
1956	9,596	8,880	868	33.35	39.16	8.33	2.62
1957	9,840	9,294	908	33.80	40.21	8.71	2.72
1958	10,322	9,357	844	33.52	39.98	8.52	2.55
1959	10,735	11,230	983	25.64	39.32	8.39	2.30
1960	11,232	11,263	1,123	31.31	39.67	8.52	2.70
1961	11,505	12,254	1,009	24.62	39.20	8.37	2.94
1962	11,829	12,085	1,179	28.87	38.12	8.07	3.10
1963	11,832	11,971	1,339	32.23	38.39	8.16	3.09
1964	11,918	11,925	1,274	36.72	39.16	8.53	4.30
1965	11,946	11,834	1,364	36.75	38.93	8.49	3.91
1966	12,019	12,374	1,614	34.34	38.94	8.46	3.86
1967	11,760	11,987	1,419	34.00	39.85	8.58	4.05
1968	11,415			40.27	43.05	9.31	4.43
1969	11,038						
1970							

1/ Home fed slaughter plus exports. Data for 1954-1957 estimated from total slaughter, assuming clean sheep and lambs represent 91.1% of total (as in 1958-60).

2/ See footnote 1/ of Table B.12.

3/ Assumes 1.4 40-pound lamb (dressed), 6 1/3 lb. of wool per ewe and an allowance for cull ewes and rams.

4/ Assumes .8 store lambs sold per ewe, allowance for wool and cull animals and includes hill sheep and winter keep subsidies.

Table B.14. Selected Annual Data On Pigs, U.K.

June-May Year Beginning	Number of Sows and Gilts for Breeding June 1	Number of Pigs Marketed: Total Clean Pigs	Number of Pigs Marketed: Pigs Wholly for Bacon (calendar year)	Number of Pigs Marketed: Pigs Partly for Bacon 1/ (calendar year)	Number of Pigs Marketed: Other Clean Pigs 2/ (calendar year)	Number of Sows and Boars Marketed	Pigs Saved Per Sow Per Year 3/
Code for Model	N(40)						
		1000 head					No.
1954	814	11,393				396	14.5
1955	683	10,006				339	15.0
1956	685	9,866	3,842		5,822	298	14.5
1957	743	10,793	4,035		5,973	316	14.0
1958	802	11,555	4,328		6,684	390	15.1
1959	705	10,615	4,312		6,518	335	15.5
1960	725	10,450	3,227	767	6,279	321	14.5
1961	774	11,450	3,307	1,165	6,257	306	14.6
1962	857	12,436	3,533	1,429	7,119	329	14.5
1963	876	12,316	3,371	1,648	7,183	396	14.3
1964	903	13,237	3,274	1,763	7,765	366	14.5
1965	945	14,222	3,549	1,895	8,885	434	15.5
1966	822	12,705	2,914	2,050	8,534	369	15.8
1967	824	12,544	2,539	2,616	7,202	317	15.1
1968	887	13,043	2,685	3,034	7,259	353	14.6
1969	916						
1970							

Source: MAFF and Meat and Livestock Commission.

1/ Mostly heavy hogs.

2/ Mostly porkers and cutters.

3/ (Marketings of clean pigs in June-May plus gilts in pig in June t+1) ÷ (Average number of sows on farms in June and December t).

Table B.15. Actual and Derived Prices on Pigs, U.K.

June-May Year Beginning	Fat Pigs 1/		Total Return On Fat Pigs by Type 1/2/			Net Returns From Pigs Over the Cost of Concentrates 3/	
	Market	Total Return Under Fatstock Guarantee Scheme	Pigs Wholly for Bacon	Pigs Partly for Bacon (mostly heavy)	Other Clean Pigs (porkers and cutters)	Per Pig	Per Hour of Labor
Code for Model	P(41)	P(40)				L(40)	L(41)
	s/score	deadweight	s/score	deadweight		Ł/pig	Ł/hour
1954	33.86	52.06	52.43	45.33	53.30	4.47	.287
1955	42.84	51.95	53.38	46.15	52.08	4.82	.317
1956	42.52	52.47	53.70	46.43	52.93	4.77	.322
1957	37.67	46.68	47.50	41.10	47.28	4.48	.311
1958	39.34	46.27	47.75	41.28	46.23	4.22	.301
1959	41.09	46.01	46.10	39.86	47.39	4.50	.331
1960	40.61	45.64	45.09	38.98	47.60	4.94	.374
1961	34.41	45.85	45.46	39.30	47.65	4.91	.384
1962	33.86	44.91	44.61	38.57	46.60	4.41	.356
1963	39.54	44.13	43.81	37.88	45.80	3.96	.330
1964	37.45	44.26	43.81	37.88	46.07	3.85	.332
1965	39.18	44.36	44.02	38.06	46.07	3.65	.326
1966	46.56	47.18	46.36	40.09	49.45	4.74	.439
1967	44.81	47.88	47.00	40.64	50.24	5.10	.490
1968	45.30	47.93	47.67	41.22	49.68	5.02	.502
1969							
1970							

1/ See footnote 1/ of Table B.12.
2/ Prices for 1967-68 as reported from the Cambridge Pig Management Scheme.
3/ Includes an allowance for feed cost for sows.

Table B.16. Red Meat Production in the United Kingdom 1/

June-May Year Beginning	Steer and Heifer Beef	Cow and Bull Beef	Veal	Clean Sheep and Lambs	Ewes and Rams	Pork 2/	Bacon and Ham 2/
Code for Model	Q(20)	Q(21)	Q(22)	Q(30)		Q(40)	
			1000 Tons (long)				
1954	566	204	23	182		606	
1955	490	178	22	191		757	
1956	592	180	26	197		660	
1957	629	185	20	208		410	214
1958	555	204	14	177	24	440	228
1959	531	189	15	208	28	430	191
1960	566	186	20	212	31	434	189
1961	686	194	20	236	28	471	208
1962	689	214	18	231	33	517	224
1963	721	236	14	227	37	536	216
1964	671	198	9	225	35	582	225
1965	667	205	9	220	38	628	229
1966	687	195	13	227	45	572	199
1967	757	200	13	221	40	555	210
1968 (forecast)						593	220
1969							
1970							

1/ Source: Output and Utilization of Farm Produce in the United Kingdom, M.A.F.F.

2/ Annual Review and Determination of Guarantees, various issues.

Table B.17. Selected Annual Data on Poultry Meat Production, U.K.

June-May Year Beginning	Production of Poultry Meat					Percent of Broilers in Flocks of 20,000 Birds and Over 2/	Percent of Turkeys in Flocks of 10,000 Birds and Over 2/
	Fowls, Over 6 months 1/	Fowls, Under 6 months 1/	Ducks and Geese	Turkeys	Total		
Code for Model	Q(52)	Q(50)		Q(51)	Q(56)		
	1000 Tons					%	%
1954	52.1	51.2	7.6	8.9	119.8		
1955	49.1	72.6	6.9	10.0	138.6		
1956	52.8	80.5	7.2	16.6	157.1		
1957	60.2	95.2	8.3	15.2	178.9		
1958	66.6	138.9	7.7	15.5	228.7		
1959	65.9	165.0	7.3	19.8	257.9		
1960	75.3	200.8	10.0	21.4	307.5	42.2	21.4
1961	77.7	228.2	10.2	29.9	346.0	55.8	
1962	77.5	230.4	8.4	25.2	341.5	59.6	29.9
1963	81.3	235.9	9.1	29.9	356.2	66.4	51.9
1964	86.1	247.9	10.4	32.2	376.7		58.7
1965	77.0	279.0	10.8	39.1	406.0	70.9	61.7
1966	79.6	302.2	12.1	41.4	435.3	73.0	
1967	81.2	334.4	12.7	45.8	474.2	77.9	59.4
1968 (est.)	82.0	341.1	12.9	46.0	482.0	78.5	63.2
1969							
1970							

1/ Data for 1954-62 available only for total fowls. Estimates of meat from fowls over 6 months were based on normal culling rates on laying hens; balance was meat from fowls under 6 months.
2/ England and Wales.

Table B.18. Derived Prices and Net Returns on Poultry, U.K.[1]

June-May Year Beginning	Prices			Net Returns Over Cost of Concentrates					
	Eggs	Broilers, England and Wales[2]	Turkeys, England and Wales[3]	Layers[4]		Broilers		Turkeys	
				Per Layer	Per Hour[5]	Per Broiler	Per Hour[5]	Per Turkey	Per Hour[5]
Code for Model	P(60)	P(50)	P(51)	L(60)	L(61)	L(50)	L(51)	L(52)	L(53)
	s/doz.	d/lb.	d/lb.	s	s	s	s	s	s
1954	4.22	26.71	40.51	18.01	7.50	4.29	36.36	19.34	17.58
1955	4.26	28.11	43.86	19.31	8.11	4.82	41.55	24.32	22.11
1956	4.23	26.27	27.36	19.14	8.11	4.19	31.62	5.67	5.15
1957	4.22	26.84	32.50	25.27	10.80	5.02	44.82	16.01	14.55
1958	3.78	25.44	38.31	20.55	8.86	4.60	41.82	23.91	24.15
1959	3.69	24.65	33.69	20.98	9.20	4.40	40.74	19.50	22.16
1960	3.33	22.27	32.24	18.42	8.22	3.79	35.75	19.46	25.60
1961	3.33	19.49	29.52	20.35	9.33	2.89	27.79	17.09	26.29
1962	3.52	20.41	32.50	23.85	11.25	3.12	30.59	21.10	36.38
1963	3.11	19.89	29.00	16.97	8.48	2.96	30.59	17.04	33.41
1964	2.95	19.65	31.42	14.56	8.09	2.92	38.42	20.13	43.76
1965	3.29	18.52	29.00	20.03	12.84	2.64	40.00	17.79	42.36
1966	2.78	18.49	31.01	11.87	8.99	2.47	41.17	20.99	55.24
1967	2.83	17.00	33.69	12.34	12.34	2.39	39.18	24.47	71.97
1968	3.06	16.81	31.28					22.12	73.73
1969									
1970									

1/ Estimates of prices were made of representative producer prices in 1967. Earlier figures were derived from M.A.F.F. indices (1954-56=100). Prices for 1968 were derived from M.A.F.F. indices (1964-66=100).

2/ Prices based on indices of fowl prices.

3/ Prices based on indices of turkey prices.

4/ Does not include returns from cull layers.

5/ Net return over concentrate cost per hour is not net of all costs and should be used only for comparisons over time and not between enterprises.

Table B.19. Selected Annual Data on Hen Eggs, U.K.

June-May Year Beginning	Average Number of Laying Fowls on Holdings During the Year	Annual Production Per Layer	Gross Production	Percent of Layers in Flocks of 1000 Birds or More 1/	Percent of Layers in Battery System 2/	Percent of Layers Which are Hybrids 2/	Percent of Layers Which are Light Breeds 2/	Percent of First Year Birds in Laying Flock 2/
Code for Model	N(60)	T(60)	Q(60)					
	mil.head	dozen	mil. doz.	%	%	%	%	%
1954	58.9	13.75	809.4	5.0				
1955	60.6	14.00	848.6	11.6				
1956	65.4	14.25	929.7					
1957	66.7	14.50	967.7	13.6				
1958	70.3	14.91	1048.2	17.4				
1959	72.0	15.29	1099.9					
1960	68.9	15.67	1080.0	25.2	17.0			
1961	71.2	15.90	1131.7	31.2	16.6			63.2
1962	70.2	16.11	1130.9	39.0	25.4			65.5
1963	72.9	16.42	1197.4	45.8	27.0	59.0	16.0	66.6
1964	75.6	16.77	1267.8	54.6	50.0	76.0	25.0	
1965	72.3	16.81	1214.8	61.7	53.0	81.0	41.0	65.9
1966	73.6	17.03	1253.9	66.5	67.0	87.0	55.0	76.0
1967	75.0	17.31	1299.2	71.6	73.0	91.0	62.0	78.9
1968	75.9	17.42	1322.2	77.1				
1969								
1970								

1/ Percent of adult fowls in 1954-63; Percent of fowls producing eggs for eating in 1964 to date, England and Wales.

2/ British Egg Marketing Board Producer Surveys (commercial flocks).

Table B.20. Acreage of Cereal Crops, U.K. and August to November Rainfall, England and Wales

June-May Year Beginning	Acreage						Acreage of Winter Wheat England & Wales December	August-November Rainfall in England and Wales
	Wheat	Barley	Oats	Mixed Corn	Total Feed Grain	Total Cereals		
Code for Model	N(71)	N(70)	N(72)		N(73)	N(80)	N(74)	T(74)
			1000 Acres				1000 Acres	mm
1954	2457	2063	2588	602	5253	7710	739	495
1955	1948	2296	2581	463	5342	7290	1556	218
1956	2293	2323	2564	418	5305	7598	1313	340
1957	2113	2622	2398	336	5306	7419	1502	371
1958	2208	2755	2217	281	5253	7461	1139	276
1959	1929	3059	2032	232	5323	7252	1430	249
1960	2102	3372	1974	203	5549	7651	510	552
1961	1827	3828	1733	147	5708	7535	1526	180
1962	2256	3987	1519	125	5631	7887	1251	320
1963	1928	4713	1295	99	6107	8035	1398	388
1964	2206	5032	1125	80	6237	8443	1969	200
1965	2535	5395	1014	73	6482	9017	1499	354
1966	2238	6130	907	73	7110	9348	1345	267
1967	2305	6027	1012	88	7127	9432	1677	413
1968	2417	5933	945	112	6990	9407	1367	387
1969	2058	5963	944	157	7104	9161		
1970	2528	5560	944					

1971

Table B.21. Yields Per Acre on Cereal Crops, June-August Rainfall in England and Wales and Production of Wheat, Feed Grain and Total Cereals, U.K.

June-May Year Beginning	Yield Per Acre			June-August Rainfall in E & W	Production		
	Wheat	Barley	Oats		Wheat	Feed Grain	Total
Code for Model	T(71)	T(70)	T(72)	T(75)	Q(71)	Q(73)	Q(80)
	cwt. (112 lbs.)	cwt. (112 lbs.)	cwt. (112 lbs.)	m.m.	1000 T (long)	1000 T (long)	1000 T (long)
1954	22.7	21.7	18.9		2783	5239	8022
1955	26.7	25.6	21.0	145	2599	6155	8754
1956	24.8	24.1	19.4	325	2845	5693	8538
1957	25.4	22.6	18.3	256	2683	5427	8110
1958	24.6	23.0	19.3	306	2711	5583	8294
1959	28.9	26.3	21.6	148	2785	6462	9247
1960	28.5	25.2	20.9	272	2992	6518	9510
1961	28.2	26.0	21.1	185	2573	6965	9538
1962	34.7	29.0	23.1	188	3911	7674	11585
1963	31.1	28.0	22.3	243	2998	8155	11153
1964	33.8	29.4	23.6	179	3733	8830	12563
1965	32.4	29.9	24.0	240	4105	9366	13471
1966	30.5	28.0	24.4	266	3420	9781	13201
1967	33.1	30.1	27.0	180	3841	10550	14391
1968	28.0	27.9	25.6	264	3515	9637	13152
1969	32.3	28.7	27.5				
1970							

Table B.22. Derived Prices and Net Returns on Cereals, U.K.

June-May Year Beginning	Wheat 1/		Barley 1/		Oats 1/		Net Returns on Cereals Over Fertilizer Cost		
	Market	Total Return Under Cereal Deficiency Payments Scheme	Market	Total Return Under Cereal Deficiency Payments Scheme	Market	Total Return Under Cereal Deficiency Payments Scheme	Wheat	Barley	Wheat and Barley 2/
Code for Model	P(73)	P(72)	P(71)	P(70)	P(75)	P(74)	P(71)	P(70)	P(80)
	Ŀ/ton		Ŀ/ton		Ŀ/ton		Ŀ/A.	Ŀ/A.	Ŀ/A.
1954	21.64	31.74	24.74	28.52	24.23	23.83	31.19	27.17	29.36
1955	22.80	30.30	22.87	25.95	21.86	21.94	35.43	29.31	32.12
1956	22.76	30.08	24.09	27.73	22.16	23.39	32.33	29.55	30.93
1957	19.73	28.40	21.24	28.41	21.63	26.22	31.34	28.41	29.72
1958	20.52	27.97	22.13	28.47	21.77	25.90	29.80	29.25	29.49
1959	20.43	27.32	20.51	27.45	21.09	25.51	35.07	32.67	33.60
1960	18.93	27.02	19.53	27.73	18.22	24.61	34.22	31.60	32.61
1961	21.55	26.77	20.03	26.52	19.29	25.28	33.42	31.12	31.86
1962	18.03	27.45	19.69	25.87	20.18	25.23	43.38	34.20	37.52
1963	21.32	26.77	20.48	26.63	19.79	26.87	37.28	33.90	34.88
1964	21.28	25.94	20.74	26.00	20.20	26.75	39.43	34.79	36.20
1965	21.01	24.68	21.80	24.80	21.22	26.91	35.44	33.54	34.15
1966	22.48	24.93	21.01	24.55	21.50	26.96	33.44	30.71	31.44
1967	21.54	25.88	20.83	24.40	19.54	27.42	37.74	32.55	33.99
1968	22.87	27.65	21.73	24.99	20.27	27.78	34.77	30.60	31.81
1969									
1970									

1/ Estimates from the Cereal Deficiency Payments Scheme for 1967-68 were used as a base and MAFF indices for 1954 to 1966 (1954-56=100) and 1968(1964-1966=100) were used to derive prices. These prices approximate published prices in the Annual Reviews, but are more comparable over time.

2/ Net returns on wheat and barley averaged by using acreages as weights.

Table B.23 Estimated Concentrate Requirements Per Head for Principle Livestock Classes, All Holdings, United Kingdom[1/]

Item	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
						June-May Years Beginning									
						Hundredweight (112 lbs.)									
Dairy cows and heifers in milk plus cows in calf	20.5	20.9	21.8	22.6	22.9	23.2	23.6	23.9	24.4	24.4	24.5	24.7	24.7	24.8	25.0
Dairy heifers in calf	3.7	3.7	3.8	3.8	3.9	3.9	4.0	4.0	4.1	4.1	4.2	4.3	4.3	4.4	4.4
Dairy replacement calves	5.4	5.4	5.5	5.5	5.6	5.6	5.7	5.7	5.8	5.8	5.9	5.9	6.0	6.0	6.1
Beef cows and heifers in milk plus beef cows in calf	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.4	4.5	4.6
Beef heifers in calf	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.7	2.7	2.7	2.8
Single suckled calves in beef cow herd	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.4	3.4	3.4
Bulls for service and young bulls reared	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Single suckled calves at fattening stage	4.49	4.87	5.24	5.61	5.98	6.36	6.73	7.10	7.48	7.85	8.22	8.60	8.97	9.34	9.71
Fattening Irish Stores	1.50	1.62	1.75	1.87	1.99	2.12	2.24	2.37	2.49	2.62	2.74	2.87	2.99	3.11	3.24
Fattening dairy calves in a semi-intensive system	8.98	9.73	10.48	11.22	11.97	12.71	13.46	14.21	14.95	15.70	16.44	17.19	17.94	18.68	19.43
Fattening dairy calves in an intensive system	--	--	--	--	--	24.72	26.17	27.62	29.07	30.52	31.98	33.43	34.88	36.33	37.78

Table B.23 Continued

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
	June-May Years Beginning														
	Hundredweight (112 lbs.)														
Upland ewes, shearlings and rams (including lambs wintered for fattening)	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Lowland ewes, shearling and rams	.8	.8	.7	.7	.8	.8	.8	.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1
Weaner pigs	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.18	2.12	2.06	2.00
Baconers (fattening)	6.00	5.86	5.74	5.60	5.53	5.46	5.39	5.34	5.31	5.29	5.26	5.24	5.23	5.21	5.20
Heavy pigs (fattening)	8.88	8.69	8.54	8.35	8.25	8.16	8.06	8.01	7.97	7.93	7.89	7.87	7.86	7.84	7.82
Porkers and cutters (fattening)	3.69	3.59	3.52	3.43	3.38	3.33	3.29	3.26	3.24	3.22	3.20	3.19	3.18	3.18	3.17
Laying hens	1.031	1.038	1.037	1.036	1.038	1.024	1.007	.960	.935	.925	.918	.914	.904	.907	.902
Growing pullets	.272	.270	.267	.264	.261	.257	.255	.245	.239	.239	.236	.230	.223	.216	.212
Broilers and table birds	.1180	.1160	.1140	.1120	.1110	.1090	.1070	.1050	.1040	.0993	.0950	.0907	.0864	.0821	.0779
Ducks and geese	.70	.66	.64	.59	.58	.57	.55	.54	.52	.51	.50	.50	.52	.52	.53
Turkeys	.715	.685	.655	.625	.595	.565	.535	.505	.475	.454	.432	.412	.391	.371	.350
Laying ducks	1.32	1.33	1.33	1.33	1.33	1.31	1.29	1.24	1.21	1.20	1.19	1.19	1.18	1.18	1.17
Horses	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

1/ Sources include M.A.F.F. ("Developments in the feedingstuffs manufacturing industry and the production and utilization of concentrated feedingstuffs since 1953", Economic Trends, August, 1964), Paul W.H. Weightman (Concentrated feedingstuffs for livestock in the U.K., 1960-61 to 1965-66, A.E. Res. 225, Cornell Univ. 1967) and various costing studies and farm management handbooks.

Table B.24. Estimated Amount of Concentrates Fed Per Unit of Output by Principle Products, All Holdings, United Kingdom 1/

Pounds of Concentrates Fed Per:

June-May Year Beginning	Gallon of Milk	Pound of Beef Dressed	Pound of Mutton and Lamb Dressed	Pound of Pigmeat Dressed	Dozen Eggs (hen and duck)	Pound of Poultry Meat, Dressed (except cull layers)
	lb.	lb.	lb.	lb.	lb.	lb.
1954	3.75	2.24	1.98	5.94	9.83	5.67
1955	3.78	3.58	1.90	6.14	9.68	5.26
1956	3.77	1.93	1.74	6.08	9.52	5.22
1957	3.72	1.19	1.73	6.30	9.32	5.09
1958	3.47	3.05	2.04	5.98	9.05	4.77
1959	3.87	4.24	1.81	5.84	8.71	4.60
1960	3.78	4.16	1.97	5.90	8.38	4.54
1961	3.76	3.71	1.94	5.85	7.86	4.43
1962	3.79	3.75	2.03	5.60	7.59	4.28
1963	3.87	4.11	2.22	5.79	7.21	4.15
1964	3.84	4.58	2.25	5.81	7.17	4.01
1965	3.76	4.78	2.31	5.38	7.10	3.78
1966	3.80	4.07	2.03	5.42	7.08	3.64
1967	3.74	4.76	2.07	5.50	6.99	3.46
1968	3.74					3.30

1/ See footnote to Table B.23.

Table B.25. Estimated Utilization of Concentrated Feedingstuffs by Livestock Production Categories, All Holdings, United Kingdom, As Compiled from Several Data Sources. 1/

June-May Year Beginning	Milk	Net Beef Production*	Sheep and Lambs	Pigmeat	Eggs (hen and duck)	Poultry Meat (except cull layers)	Other	Total
				Thousand Tons (long)				
1954	3524	931	361	4500	3628	384	153	13481
1955	3460	1325	362	4050	3734	471	153	13555
1956	3638	817	342	3900	4010	544	153	13404
1957	3803	817	360	4350	4077	604	153	14164
1958	3867	1248	410	4500	4286	773	153	15237
1959	3863	1747	427	4050	4326	884	153	15450
1960	4074	1887	479	4054	4082	1054	154	15784
1961	4217	2022	511	4354	4007	1189	154	16454
1962	4342	2102	536	4505	3861	1129	154	16629
1963	4292	2210	586	4697	3879	1140	157	16961
1964	4178	2291	584	5000	4082	1164	163	17462
1965	4247	2545	595	4950	3875	1243	170	17625
1966	4241	2217	552	4500	3975	1293	177	16955
1967	4344	2744	539	4500	4065	1360	184	17736
1968	4387		525		4080	1320	191	

*Beef slaughter less weight of imported cattle and weight of dairy rearing calves.

1/ See footnote to Table B.23.

PROJECTIONS UNDER THREE VERSIONS OF THE U.K. MODEL

This addendum is attached to provide a comparison of the 1980 estimates that were obtained for the U.K. under three sets of conditions. The original estimates used a 1968 and 1969 price base and no restrictions were placed on the model except those relating to land use for livestock and grain production (Table B.26). The "revised unrestricted" estimates primarily reflect (1) certain changes in farm prices that occurred in 1970 and 1971 and (2) higher marketing margins. The "revised restricted" estimates have upper limits imposed on the production of pigmeat, poultrymeat and eggs and a lower limit on beef consumption.

In the original model for the U.K., the projected grain production for 1980 in Case III (In EEC) was nearly 5 million metric tons higher than for Case I (Out EEC, deficiency payments) and over 3 million metric tons higher than for Case II (Out EEC, variable levies). On the other hand, utilization of grain in Case III was about 4 million tons less than for Case I and 2.3 million tons less than for Case II. The impact of entry was to change the U.K. from a grain deficit nation to a surplus grain producer. The difference between Case I and Case III in the 1980 net balance in grain amounted to 8.9 million tons and between Case II and Case III the difference was 5.5 million tons.

These differences were due in part to changes in price relationships. With entry, gross prices on grain would increase substantially and market prices would increase even more. Dairy cows are the major competitors for grain land, and milk prices would increase only moderately. With upper limits on grain acreage established by the projected land requirements for ruminant animals, entry into the EEC had the combined effect of reducing dairy cow numbers and increasing the cereal area. Higher prices on concentrate feeds that resulted from higher market prices on grain not only reduced dairy cow numbers but also restricted other livestock production, thereby lowering total concentrate utilization.

A few months after the computer run on the original model, new levels of price supports and production payments were announced by the U.K. in their 1971 Annual Review; new price information was available on other products; the

Table B.26 Alternative 1980 Projections of Production, Consumption and Net Balances in the U.K.[1]

	Case I			Case II			Case III		
	Prod.	Cons.	Net Balance	Prod.	Cons.	Net Balance	Prod.	Cons.	Net Balance
					1,000 MT				
			Original Model (Unrestricted except on land use)						
Grain	19,621	27,458	-7,837	21,281	25,720	-4,439	24,514	23,421	+1,093
Milk, fat equiv.	561	1,506	-945	521	1,493	-972	451	1,276	-825
Beef and veal	1,174	1,476	-302	1,110	1,317	-207	1,002	1,011	-9
Pigmeat	1,756	1,731	+25	1,511	1,713	-202	1,289	1,761	-472
Poultrymeat	1,042	702	+340	953	703	+250	861	702	+159
Eggs	1,239	1,087	+152	1,154	1,074	+80	966	1,065	-99
			Revised Model (Unrestricted except on land use)						
Grain	18,449	27,265	-8,816	20,215	26,477	-6,262	22,839	24,970	-2,131
Milk, fat equiv.	600	1,475	-875	556	1,462	-906	486	1,248	-762
Beef and veal	1,219	1,274	-55	1,151	1,222	-71	1,063	933	+130
Pigmeat	1,818	1,558	+260	1,807	1,475	+332	1,631	1,470	+161
Poultrymeat	822	697	+125	816	696	+120	833	688	+145
Eggs	1,172	1,049	+123	1,091	1,023	+68	1,028	1,008	+20
				Revised Model (Restricted)					
Grain	18,449	24,734	-6,285	20,215	23,893	-3,678	22,839	22,989	-150
Milk, fat equiv.	600	1,475	-875	556	1,462	-906	486	1,248	-762
Beef and veal	1,219	1,274	-55	1,151	1,222	-71	1,063	1,063	-0-
Pigmeat	1,194	1,558	-364	1,121	1,475	-354	1,122	1,470	-348
Poultrymeat	732	697	+35	730	696	+34	722	688	+34
Eggs	1,101	1,049	+52	1,074	1,023	+51	1,028	1,008	+20

[1]Case I refers to the Labor Party's deficiency payments program outside of the EEC; Case II refers to the Conservative Party's variable levy-minimum import price program outside of the EEC; and Case III refers to entry into the EEC.

EEC announced their 1971-72 price support program. These prices tended to be above the levels assumed in the computer run of the original model.

This new price information was then incorporated in the model. In addition, the projected increase in marketing margins on food was adjusted upward to improve the internal consistency of the model. Also the projected price level on poultrymeat was lowered somewhat from the original model for Cases I and II because the projected surplus level was felt to be untenable.

The 1980 projections from the revised model are shown in the center section of Table B.26. The higher milk and cattle prices raised milk and beef production at the expense of grain. Pigmeat production also tended to be higher. As a result grain utilization was well maintained. Compared with the original model, grain deficits increased in Cases I and II and the grain surplus in Case III of the original model turned into a deficit. Entry into the EEC cut the 1980 deficit on grain by 6.7 million tons relative to Case I and by 4.1 million tons relative to Case II. Since the same comparisons in the original model were 8.9 million tons and 5.5 million tons, respectively, the revisions attenuated the impact that entry would have on net grain balances--by about 2.2 million tons compared with Case I and about 1.4 million tons compared with Case II.

The higher retail prices in the revised model reduced levels of consumption on the major food products, particularly beef and pigmeat. Coupled with the higher levels of production, net surpluses emerged on pigmeat in all cases and on beef in Case III. Surpluses also remained on poultrymeat and eggs.

While the U.K. could become an exporter of these products, domestic policies and trade commitments would likely preclude this, particularly in Cases I and II. Therefore, poultrymeat and egg production were restricted to levels no higher than 5 percent over consumption. Pigmeat production was restricted to 5 percent over the total of pork consumption plus 45 percent of bacon and ham consumption (to protect about half of the U.K. market for countries supplying bacon and ham). Beef consumption was restricted to fall no lower than beef production, a limit reached only in Case III.

The results of these restrictions are presented in the lower section of Table B.26. Because of lower levels of pigmeat, poultrymeat and egg production in the restricted version of the revised model, grain utilization is also lower. The impact of entry on the net grain balances, however, is about the same as in the unrestricted revised model.

APPENDIX C

SELECTED DATA ON IRELAND

Table C.1. Per Capita Consumption of Selected Commodities, Ireland 1954-68

Year	Per Capita Consumption										
	Beef and Veal	Mutton and Lamb	Pork	Poultry	Milk	Butter	Cheese	Margarine	Eggs	Bread	Wheat Flour
	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Lb.	Kg.	Lb.	Lb.
1954	13.6	6.1	22.2	4.7	190.5	14.0	0.8	4.57	17.1	172	102
1955	14.4	7.2	23.0	4.8	196.7	14.3	1.0	4.87	17.9	170	106
1956	14.9	8.3	21.8	5.5	196.7	14.4	0.9	4.79	17.9	166	102
1957	15.0	8.4	22.1	4.8	200.6	13.5	1.0	5.20	17.5	158	99
1958	14.7	9.0	21.1	4.8	201.6	13.4	0.9	5.81	17.7	154	91
1959	14.3	10.5	22.3	4.9	205.5	14.0	1.2	6.30	17.7	153	87
1960	14.7	10.6	21.6	5.1	210.4	13.2	1.2	6.92	16.7	149	88
1961	15.2	10.6	22.8	5.2	215.3	13.0	1.4	6.65	16.5	147	86
1962	15.8	11.2	23.3	5.3	214.7	13.2	1.5	6.70	16.3	148	82
1963	16.8	11.3	23.7	6.1	214.6	13.0	1.6	6.86	16.1	144	81
1964	16.3	11.2	25.7	6.8	215.0	12.6	1.7	7.55	15.8	141	73
1965	15.8	10.6	28.3	7.3	216.5	15.2	1.8	7.17	15.6	139	70
1966	16.6	10.8	27.3	8.5	215.1	14.2	1.9	7.53	15.1	137	70
1967	17.6	11.0	25.6	8.3	214.6	13.6	2.0	8.00	14.2	133	68
1968	18.0	11.2	25.0	8.5	214.0	13.0	2.1	8.10	13.6	130	66

Source: Irish Statistical Bulletin.

Table C.2. Retail Prices of Selected Commodities, Ireland, 1954-68

	Beef price by quarters & ave. d/lb.					Mutton and lamb price by quarters & ave. d/lb.				
	1st	2nd	3rd	4th	ave.	1st	2nd	3rd	4th	ave.
1954	38.75	39.25	38.25	38.25	38.63	43.25	43.50	43.75	43.25	43.43
1955	43.50	45.50	45.00	44.50	44.62	46.25	46.25	46.25	46.50	46.31
1956	44.00	43.75	43.50	40.50	42.94	45.50	45.75	44.50	43.00	44.68
1957	41.25	43.50	43.75	44.25	43.19	44.00	45.50	45.50	45.75	45.18
1958	44.50	45.50	47.00	47.50	46.13	46.25	46.00	47.25	47.00	46.62
1959	49.00	51.75	50.75	48.75	50.06	47.50	47.75	47.25	44.00	46.75
1960	49.75	50.75	49.75	49.50	49.94	45.00	46.75	46.25	46.25	46.06
1961	49.50	50.00	49.50	49.25	49.56	46.50	47.50	46.50	46.25	46.68
1962	50.50	50.75	51.00	51.25	50.86	46.25	46.75	47.75	47.75	46.68
1963	51.25	52.00	52.25	55.25	52.69	47.50	49.00	49.50	51.25	49.31
1964	56.00	64.50	65.75	66.25	63.13	50.50	55.00	55.50	56.50	54.37
1965	72.75	73.50	73.25	71.25	72.69	59.75	60.50	60.25	59.25	59.93
1966	71.25	75.00	72.75	70.00	72.25	58.50	61.00	60.50	57.75	59.43
1967	60.25	71.50	71.25	71.00	68.44	60.50	60.50	59.75	58.25	59.75
1968	78.00	81.50	82.75	82.25	81.13	64.00	66.75	67.50	68.00	66.56

Source: Irish Statistical Bulletin.

Table C.2. Continued.

	Pork price by quarters and ave. d/lb.					Milk price by quarters and ave. d/qt.				
	1st	2nd	3rd	4th	ave.	1st	2nd	3rd	4th	ave.
1954	40.50	40.25	40.00	40.00	40.19	11.00	9.75	9.75	11.25	10.44
1955	39.75	39.75	40.25	41.50	40.31	11.50	10.00	10.25	11.25	10.75
1956	41.00	41.00	41.25	41.00	40.81	11.75	10.25	10.50	11.50	11.00
1957	41.00	41.00	41.00	41.00	41.00	11.75	11.00	10.75	11.75	11.31
1958	41.25	41.50	41.75	41.25	41.44	11.75	11.00	11.00	12.00	11.44
1959	41.25	41.00	41.50	41.50	41.31	12.00	11.00	11.50	12.00	11.63
1960	41.50	42.50	43.00	43.00	42.50	12.00	11.75	11.75	12.00	11.88
1961	43.25	43.25	43.00	43.25	43.19	12.00	11.75	11.75	12.50	12.00
1962	43.25	43.25	43.00	42.75	43.06	12.50	12.00	12.00	12.75	12.31
1963	42.75	43.25	44.00	45.25	43.81	12.75	12.50	13.75	13.25	13.06
1964	46.00	47.00	47.25	48.00	47.06	13.25	13.75	13.75	14.00	13.69
1965	48.50	48.50	48.25	48.00	48.31	16.00	14.00	14.00	14.50	14.63
1966	49.00	49.25	49.50	50.25	49.50	15.00	14.25	15.00	15.25	14.88
1967	51.00	51.00	51.50	52.00	51.37	15.75	15.25	15.25	16.00	15.56
1968	52.75	53.75	54.25	55.00	53.93	16.00	16.00	16.00	16.00	16.00

Table C.2. Continued.

	Butter price by quarters and ave. d/lb.					Cheese price by quarters and ave. d/lb.				
	1st	2nd	3rd	4th	ave.	1st	2nd	3rd	4th	ave.
1954	50.00	50.00	50.00	45.00	48.75	33.75	33.75	33.75	34.00	33.81
1955	45.00	45.00	45.00	45.00	45.00	34.00	34.25	34.50	34.25	34.25
1956	45.00	45.00	45.00	45.00	45.00	34.50	34.25	34.25	34.50	34.38
1957	44.75	51.50	51.75	52.00	50.00	34.50	34.50	34.50	34.50	34.50
1958	52.00	52.00	51.75	51.75	51.88	34.75	34.75	34.50	34.50	34.63
1959	51.75	51.75	51.50	51.50	51.63	34.50	34.50	34.50	34.50	34.50
1960	51.50	54.50	54.50	54.75	53.81	34.50	36.75	37.50	35.25	36.00
1961	54.75	54.75	54.50	54.50	54.63	38.75	38.75	38.50	38.50	38.63
1962	54.50	54.50	54.50	54.50	54.50	38.75	39.00	39.00	39.00	38.94
1963	54.50	54.75	54.50	56.25	55.00	39.00	39.00	40.25	40.25	39.63
1964	56.26	56.50	56.25	56.25	56.31	40.50	40.75	40.75	40.75	40.69
1965	56.25	56.25	56.25	56.25	56.25	41.00	41.75	42.25	42.25	41.81
1966	56.00	56.00	59.00	59.00	57.50	42.25	42.00	42.50	42.50	42.31
1967	59.00	59.00	59.00	59.00	59.00	42.75	43.00	42.50	42.75	42.75
1968	59.00	59.00	59.00	59.00	59.00	42.75	43.00	43.25	42.75	42.94

Table C.2.Continued.

	Margarine price by quarters and ave. d/lb.					Eggs price by quarters and ave. d/doz.				
	1st	2nd	3rd	4th	ave.	1st	2nd	3rd	4th	ave.
1954	19.00	19.00	19.00	19.00	19.00	34.75	30.75	51.50	75.50	48.13
1955	19.00	19.00	19.00	19.00	19.00	40.25	34.50	53.50	84.50	53.19
1956	19.00	19.00	19.00	19.00	19.00	45.00	35.25	53.00	66.75	50.00
1957	19.75	19.75	19.75	20.00	19.81	32.25	30.00	54.75	60.50	44.38
1958	20.00	19.75	19.75	19.75	19.81	47.50	33.50	52.50	65.75	49.81
1959	19.75	19.75	19.75	19.75	19.75	42.25	33.00	50.25	71.25	49.19
1960	19.75	19.75	19.75	19.75	19.75	41.00	33.25	49.75	67.25	47.81
1961	19.75	19.75	19.75	19.75	19.75	43.00	32.50	52.25	72.25	50.00
1962	20.75	20.75	20.75	20.75	20.75	42.75	33.25	51.00	63.50	47.63
1963	20.75	20.50	20.50	21.25	20.75	64.75	38.75	52.50	66.25	55.63
1964	21.50	21.50	21.75	21.75	21.62	42.50	33.50	50.00	69.50	49.13
1965	23.50	23.75	23.75	23.75	23.69	50.75	37.50	54.00	66.50	52.19
1966	23.75	23.75	23.75	23.75	23.75	44.75	39.25	54.25	65.75	51.00
1967	24.00	24.00	24.00	24.00	24.00	43.00	37.75	51.75	66.50	49.75
1968	23.75	24.00	24.00	24.00		49.50	46.75	58.00	62.25	54.13

Table C.2.Continued.

	Bread price by quarters and ave. d/2 lb. loaf					Wheat flour price by quarters and ave. d/14 lbs.				
	1st	2nd	3rd	4th	ave.	1st	2nd	3rd	4th	ave.
1954	9.50	9.00	9.00	9.00	9.13	54.25	50.50	50.50	50.25	51.37
1955	9.00	9.00	9.00	9.00	9.00	50.25	50.50	50.50	50.50	50.43
1956	9.00	9.00	9.00	9.00	9.00	50.50	50.50	50.50	50.50	50.50
1957	9.00	9.25	13.25	13.50	12.50	50.50	60.50	88.00	87.50	71.62
1958	14.25	14.50	14.50	14.50	14.50	89.50	90.25	90.50	90.50	90.43
1959	14.50	14.50	14.50	14.50	14.50	89.50	89.50	88.25	93.00	90.06
1960	14.50	15.00	15.00	15.25	14.94	93.00	93.00	93.00	98.00	94.25
1961	15.25	15.25	15.25	15.25	15.25	98.00	98.00	98.00	98.00	98.00
1962	16.00	16.00	16.00	16.00	16.00	99.00	99.00	100.00	100.00	99.50
1963	16.00	16.00	16.00	16.75	16.19	100.00	100.00	100.00	100.00	100.00
1964	17.00	17.75	17.75	17.75	17.56	104.00	111.00	110.00	110.00	108.75
1965	17.75	18.25	18.25	18.25	18.13	110.00	110.00	109.00	110.00	109.75
1966	18.25	18.25	18.25	18.25	18.25	110.00	111.00	111.00	110.00	110.50
1967	18.25	20.25	20.25	20.25	19.75	110.00	117.00	117.00	116.00	115.00
1968	22.50	22.50	22.50	22.50	22.50	132.00	136.00	136.00	137.00	136.25

Table C.3. Basic Economic Data for Demand Analysis, Ireland, 1954-68

	Farm Price Index by quarters and ave.					Consumer Price Index	Population in Millions
	1st	2nd	3rd	4th	ave.		
1954	97.9	98.0	102.3	100.1	99.5	100.1	2.94
1955	101.5	102.7	104.0	106.0	103.5	102.7	2.92
1956	105.6	106.5	104.6	102.3	104.7	107.1	2.90
1957	102.1	106.4	114.7	113.4	109.1	111.5	2.89
1958	116.7	119.0	119.2	119.4	118.6	116.5	2.85
1959	112.7	121.4	115.7	113.6	115.8	116.5	2.85
1960	114.2	117.1	116.6	118.0	116.5	117.0	2.93
1961	119.8	121.7	120.3	120.5	121.0	120.0	2.82
1962	122.5	126.1	123.1	121.1	123.2	125.3	2.83
1963	126.1	124.6	123.2	126.1	125.0	128.4	2.85
1964	126.7	132.8	134.7	137.1	132.8	137.0	2.86
1965	140.4	143.8	140.2	139.0	140.8	143.9	2.88
1966	139.5	142.2	143.6	141.5	141.7	148.2	2.88
1967	141.4	145.0	145.9	145.2	144.4	152.9	2.90
1968	150.8	154.2	153.3	152.6	152.7	160.1	2.91

Source: Irish Statistical Bulletin.

Table C.4. Selected Data on Pig Production, Ireland

Year / Code for Model	Total no. pigs (June)	Breeding herd (June) Sows & Gilts	No. pigs less than 3 months (June)	No. pigs over 3 months (June)	Price of young pigs under 12 wks. 1st 6 mos.	Price of young pigs under 12 wks. 2nd 6 mos.
		N(41)				
	(1000)	(1000)	(1000)	(1000)	s/head	s/head
1954	958	100	459	397	105	89
1955	799	80	378	339	91	110
1956	747	82	357	307	111	112
1957	900	105	420	376	114	N.A.
1958	948	97	431	418	89	102
1959	852	92	395	463	109	116
1960	951	109	414	425	100	99
1961	1,056	121	447	486	102	101
1962	1,111	124	488	496	119	104
1963	1,102	123	482	494	99	104
1964	1,108	134	490	482	116	121
1965	1,269	139	571	552	108	N.A.
1966	1,014	103	433	475	100 1/	111 1/
1967	985	110	427	445	120 1/	117 1/
1968	1,063	118	469	474	129 1/	123 1/
1969	1,109	120	--	--	--	--
1970						

Source: Irish Statistical Bulletin.

Table C.4. Continued.

Year	No. of pigs received at bacon factories			Price of bacon pigs			Average deadweight of pigs	Price of barley meal	
	1st 6 mos.	2nd 6 mos.	Annual	1st 6 mos.	2nd 6 mos.	Annual	for curing	1st 6 mos	2nd 6 mos.
Code for Model	N(43)	N(44)	N(45)			P(41)			
	(1000)	(1000)	(1000)	s/cwt.	s/cwt.	s/cwt.	lb.	s/cwt.	s/cwt.
1954	543	713	1247	237	216	256	152	--	--
1955	551	517	1068	227	224	226	150	--	--
1956	414	489	903	229	232	231	147	30.40	31.04
1957	447	668	1115	229	220	224	146	32.13	31.50
1958	652	715	1367	226	230	228	144	31.60	31.66
1959	560	618	1178	235	235	236	148	30.66	29.00
1960	573	725	1298	229	229	229	145	28.16	28.37
1961	674	788	1462	233	227	230	146	28.25	28.12
1962	752	819	1571	226	229	227	145	28.50	28.41
1963	704	850	1554	228	230	229	146	27.90	28.08
1964	728	839	1567	231	240	236	149	28.25	28.75
1965	810	987	1797	238	240	239	147	29.60	30.66
1966	833	811	1644	246	258	252	147	31.80	32.41
1967	706	743	1449	262	263	263	149	32.67	32.75
1968	746	904	1650	267	276	272	156	33.46	32.80
1969			1936			276			
1970									

1/ Average price per head of young pigs 30-59 lbs.

Source: Irish Statistical Bulletin

Table C.5. Selected Annual Data on Sheep and Lamb Production, Ireland

Year	No. of ewes for breeding in June	No. of ewes for breeding in Jan.	Output of sheep and lamb, number	Return per unit of output	Mutton and lamb production per head output
Code for Model		N(30)	N(32)	P(35)	T(32)
	(1000)	(1000)	(1000)	£	lbs.
1953	1,209	1,209	947		
1954	1,281	1,340	976	6.40	
1955	1,356	1,382	1,084	6.86	
1956	1,446	1,498	1,093	6.15	
1957	1,583	1,597	1,028	6.91	
1958	1,772	1,798	1,304	6.56	
1959	1,864	1,920	1,364	5.90	27.12
1960	1,837	2,018	1,583	5.90	25.26
1961	1,927	1,997	1,379	5.65	34.08
1962	2,041	2,132	1,825	5.48	31.23
1963	2,085	2,188	1,848	5.93	30.30
1964	2,200	2,246	1,908	6.39	28.82
1965	2,199	2,344	1,853	6.48	27.52
1966	2,084	2,343	2,015	6.01	26.79
1967	1,936	2,114	1,753	6.64	27.95
1968	1,882	1,977	1,692	7.66	
1969	1,853	1,929	1,581	8.47	
1970					

Source: Irish Statistical Bulletin.

Table C.5. Continued.

Year	No. of sheep 1 yr. and over in June	No. of sheep under 1 yr. on June 1	Price of fat lamb at Dublin market	Price of wool at places outside Dublin	$(X)_8$ Annual Average price of milk per gallon
Code for Model			P(31)		
	(1000)	(1000)	s/live cwt.	d/lb.	d/gal.
1953	451	1,231	169	49	18.75
1954	457	1,331	162	54	18.66
1955	471	1,397	162	54	18.55
1956	460	1,484	148	45	18.54
1957	441	1,653	168	53	18.52
1958	501	1,835	160	35	17.75
1959	554	1,934	138	43	17.93
1960	591	1,828	150	47	19.44
1961	511	2,027	130	44	19.63
1962	520	2,045	141	40	19.58
1963	457	2,084	162	45	20.30
1964	477	2,206	182	51	22.12
1965	482	2,270	167	36	22.65
1966	444	2,073	169	40	23.73
1967	357	1,888	176	25	25.10
1968	339	1,801	--	--	--
1969					
1970					

Source: Irish Statistical Bulletin.

Table C.6. Selected Annual Data on Cattle Production, Ireland

Year / Code for Model	Number of cattle produced	Output of cattle and calves Total value	Return per unit of output	Breeding herd June (no. of cows & heifer in calf)	No. of cattle 1-2 years in June	Annual av. price of bullocks 8-9 cwts. at livestock auction marts (excluding Dublin)	No. of cattle 2-3 years June
	N(214)			N(11)			
	(1000)	Ŀ(100)	Ŀ	(1000)	(1000)	(Ŀ/head)	(1000)
1954	1,038	49,651	47.83	1,303	989		800
1955	961	49,790	51.81	1,285	1,013		788
1956	994	45,330	45.60	1,296	1,021		875
1957	1,110	54,075	48.72	1,351	973		761
1958	959	50,141	52.28	1,411	1,040		703
1959	901	49,571	55.02	1,409	1,095		792
1960	1,046	55,028	52.61	1,403	1,098		843
1961	1,208	68,368	56.60	1,418	1,077		838
1962	1,065	58,654	55.07	1,451	1,078		799
1963	1,127	61,921	54.94	1,482	1,139	53.9	828
1964	1,137	70,002	61.57	1,602	1,120	62.25	792
1965	987	64,078	64.92	1,768	1,216	66.55	808
1966	1,169	69,064	59.08	1,748	1,325	60.20	896
1967	1,468	88,666	60.40	1,745	1,349	60.80	922
1968	1,308	94,152	71.98	1,794	1,295	73.30	897
1969	1,257	93,200	77.33	1,831	1,332	77.25	884
1970							

Source: Irish Statistical Bulletin.

Table C.6. Continued.

Year / Code for Model	No. of cattle 3 yr. & over June	No. of cattle under 1 yr.	Milk yld. per cow	Annual av. price of store cattle (2-3 yr.) at livestock fairs	Price of fat cattle live	Annual av. price of milk
			T(10)		P(21)	
	(1000)	(1000)	gal.	£/head	s/cwt.	d/gal.
1954	355	1,037	450	45.69	115	18.66
1955	302	1,048	455	50.16	131	18.55
1956	318	1,007	486	41.43	105	18.54
1957	271	1,063	499	48.25	122	18.52
1958	207	1,108	479	53.93	132	17.75
1959	229	1,142	457	53.00	136	17.93
1960	273	1,103	477	48.35	125	19.44
1961	263	1,101	492	50.55	124	19.65
1962	238	1,160	504	53.13	129	19.58
1963	228	1,168	505	52.11	126	20.30
1964	201	1,233	503	58.63	148	22.12
1965	221	1,359	493	60.46	160	22.65
1966	224	1,382	493	53.85	148	23.73
1967	219	1,337	520	55.26 1/	152	25.10
1968	213	1,364	529	66.50	182	25.71
1969	207	1,404	---	70.10	189	---
1970						

1/ Based on small number of quotations.

Source: Irish Statistical Bulletin.

Table C.7. Selected Annual Data on Poultry Production, Ireland

Year / Code for Model	No. of turkeys in June	Output of Turkeys	Price of turkeys	Annual average price of chickens	Price of eggs (hen)	Egg production 1/	No. of ordinary fowl June	Number of broilers produced	Annual fowl Output exc. turkeys
		(51)	P(51)	P(60)	N(52)	Q(60)		N(52)	N(50)
	(1000)	(1000)	s/head)	s/pair	s/120	1000 M.T.	(1000)	1000)	1000)
1954	1,220	1,073	56.75	20.75	32.50		13,462		8,302
1955	1,256	1,116	--	18.45	32.50		13,511		7,012
1956	1,527	1,293	20.16	17.25	30.83		13,527		7,001
1957	1,286	1,095	--	16.16	28.33		12,407		7,153
1958	1,193	1,010	--	18.25	31.66		11,804	983	6,572
1959	1,236	1,033	--	15.66	29.16		11,590	1,237	5,922
1960	978	821	--	15.08	28.25	46.1	11,163	1,496	6,151
1961	978	790	--	13.98	28.33	45.8	11,024	1,792	5,958
1962	822	676	--	14.33	30.83	44.7	10,324	2,973	6,484
1963	716	585	--	15.58	31.66	44.9	10,638	4,526	8,337
1964	633	518	46.00	15.58	30.00	43.9	10,353	6,483	10,110
1965	560	519	43.58	15.83	32.50	44.0	11,008	7,481	11,489
1966	507	485	46.00	15.45	30.00	43.9	9,814	10,073	14,363
1967	526	458	45.00	14.00	30.00	42.1	96,334	11,000	14,607
1968	566	465	39.58	14.00	35.83		9,534		16,686
1969	519		42.83	---	35.83		9,474		---
1970									

Source: Irish Statistical Bulletin.

Table C.8. Production and Price Data for Wheat, Ireland

Year	Acreage	Yield per acre	Production	Sales off farms	Sale Off farms as percent of production	Realized price per ton	Realized price deflated by livestock price index	Realized price deflated by Agriculture price index
Code for Model	N(71)	T(71)	Q(71)			P(73)		
	1000 A.	1000	1000 tons	1000 T.		£	£	£
1954	486	20.1	489	448	91.74	29.68	30.13	30.01
1955	358	22.3	399	364	91.12	27.40	25.63	26.58
1956	340	25.1	426	391	91.63	26.80	29.71	28.66
1957	406	25.3	512	456	88.62	29.00	28.54	29.06
1958	419	16.5	345	308	89.21	24.88	23.23	24.27
1959	282	25.8	364	324	89.11	31.20	29.19	30.47
1960	366	25.2	461	429	93.02	25.80	25.42	25.90
1961	345	26.8	462	436	94.40	26.28	26.28	26.28
1962	314	27.5	432	416	96.47	25.29	24.65	24.87
1963	233	25.4	296	267	90.51	27.17	26.43	26.59
1964	214	24.9	267	243	91.20	28.86	24.62	25.52
1965	182	25.2	229	200	87.03	26.45	21.68	22.47
1966	131	27.8	182	170	93.24	33.78	29.17	29.15
1967	189	31.1	293	280	95.47	32.17	27.31	27.19
1968	224	36.3	406	402		33.86	24.54	25.95
1969	200	31.7						
1970		30.3						

Source: Irish Statistical Bulletin.

Table C.9. Production and Price Data for Barley, Ireland

Year	Acreage	Yield per acre	Production	Sales of farms	Sale Off farms as percent of production	Realized price per ton	Realized price deflated by livestock price index	Realized price deflated by Agriculture price index
Code for Model						P(71)		
	1000 A.	cwt.	1000 tons	1000 T.		£	£	£
1954	163	21.7	176	116	65.62	26.66	27.07	27.01
1955	213	23.1	246	181	73.46	26.25	24.56	25.46
1956	236	26.6	314	223	70.90	24.91	27.62	26.64
1957	305	25.1	387	253	66.10	23.34	22.97	23.39
1958	310	21.3	330	165	50.05	23.37	21.82	22.80
1959	333	27.2	452	268	59.20	21.98	20.56	21.46
1960	328	26.5	435	266	61.21	21.84	21.52	21.93
1961	362	28.1	507	334	65.73	21.58	21.58	21.58
1962	406	29.3	594	430	72.32	20.31	19.80	19.97
1963	429	27.0	580	414	71.44	20.31	19.76	19.87
1964	454	23.9	542	400	73.72	22.20	18.94	19.63
1965	464	26.1	606	412	68.05	23.50	19.26	19.97
1966	461	27.2	628	431	68.71	24.00	20.73	20.71
1967	451	29.7	666	452	67.41	23.76	20.17	20.08
1968	454	32.6	740	523		23.95	17.36	18.35
1969	490							
1970								

Source: Irish Statistical Bulletin.

Table C.10. Production and Price Data for Oats, Ireland

Year	Acreage	Yield per acre	Production '000 tons	Sales of farms	Sale off farms as percent of production	Realized price per ton	Realized price deflated by livestock price index	Realized price deflated by Agriculture price index
Code for						P(75)		
	1000 A.	cwt.	1000 tons	1000 T.		£	£	£
1954	533	17.8	475	80	16.91	22.83	23.18	23.13
1955	545	20.8	567	76	13.37	22.01	20.59	21.35
1956	525	20.4	536	81	15.15	21.09	23.38	22.56
1957	460	18.7	430	78	18.18	20.75	20.42	20.80
1958	457	19.6	448	57	12.76	22.15	20.68	21.61
1959	462	20.6	475	67	14.03	18.59	17.39	18.15
1960	426	19.7	419	64	15.13	21.57	21.25	21.66
1961	368	20.4	375	53	14.22	21.59	21.59	21.59
1962	346	22.5	390	49	12.71	20.51	19.99	20.17
1963	332	21.9	362	77	21.28	20.25	19.70	19.81
1964	289	21.3	308	75	24.55	20.99	17.91	18.56
1965	284	22.4	319	40	12.63	22.76	18.63	19.34
1966	243	22.9	279	37	13.45	22.33	19.28	19.27
1967	238	24.3	289	40	13.83	21.83	18.53	18.45
1968	218	25.7	281	38		22.66	16.42	17.36
1969	188							
1970								

Source: Irish Statistical Bulletin

Table C.11. Production and Price Data for All Grain,[1/] Ireland

Year	Acreage	Yield per Acre	Output	Weighted Realized Price of grain per ton	Realized price deflated by livestock Price Index	Realized price deflated by livestock price index	Percent of Grain Acreage Under		
							Wheat	Oats	Barley
Code for Model	N(80)	T(90)	Q(80)	P(80)	P(82)				
	1000 A.	cwt.	1000 T.	£	£	£			
1954	1,182	19.3	1,140	28.29	28.72	28.66	41.14	45.10	13.76
1955	1,116	21.7	1,212	26.41	24.71	25.62	32.20	49.04	19.18
1956	1,101	23.2	1,276	25.53	28.30	27.30	30.85	47.70	20.55
1957	1,172	22.7	1,329	26.36	25.94	26.41	34.67	39.26	26.06
1958	1,186	18.9	1,123	24.12	22.52	23.53	35.29	38.57	26.15
1959	1,077	24.0	1,291	26.18	24.49	25.57	26.20	42.89	30.91
1960	1,121	23.5	1,315	24.06	23.70	24.16	32.68	37.99	29.32
1961	1,074	25.0	1,344	24.06	24.06	24.06	32.10	34.24	33.67
1962	1,066	26.6	1,416	22.64	22.07	22.26	29.46	32.46	38.07
1963	993	24.9	1,238	22.72	22.10	22.23	23.42	33.39	43.18
1964	957	23.3	1,117	24.33	20.76	21.51	22.41	30.15	47.43
1965	931	24.8	1,154	24.36	19.97	20.70	19.58	30.56	49.86
1966	836	26.1	1,089	26.51	22.89	22.87	15.71	29.05	55.23
1967	878	24.8	1,248	26.72	22.68	22.59	21.51	27.09	51.39
1968	896	31.9	1,427	28.04	20.32	21.49	24.96	24.37	50.68
1969	879	28.8	1,262						
1970		28.0	1,338						

1/ Includes wheat, oats and barley.

Source: Irish Statistical Bulletin.

APPENDIX D

SELECTED DATA ON DENMARK

Table D.1. Per Capita Consumption, Selected Commodities, 1954-68, Denmark

Year	Beef and Veal	Pigmeat	Poultry	Milk	Coffee Cream	Double Cream	Butter	Cheese	Margarine	Eggs	Wheat Flour	Rye Flour	Oatmeal
	Per Capita Consumption in Kg.												
	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.
1954	15.3	37.8	3.0	133.4	4.5	3.1	8.7	5.2	14.9	8.0	44.9	39.6	6.4
1955	17.2	36.8	3.2	128.9	4.3	3.2	8.6	6.6	15.2	9.0	43.4	36.8	5.3
1956	18.6	36.8	3.8	125.8	4.0	3.1	9.0	6.7	16.1	9.4	45.8	34.6	5.3
1957	16.2	40.2	3.1	126.1	4.0	3.3	10.0	7.1	15.8	9.6	45.1	31.7	5.1
1958	16.4	41.5	3.6	137.3	4.0	3.5	13.6	7.6	13.4	9.8	42.9	30.7	5.2
1959	17.9	43.2	3.8	137.5	3.7	3.7	11.0	7.9	14.5	10.4	44.6	29.8	5.0
1960	17.3	42.7	3.9	135.3	3.7	3.7	11.0	9.0	14.6	10.3	42.7	28.9	4.3
1961	18.1	42.0	4.1	133.4	3.5	3.8	10.7	8.5	14.4	10.9	43.1	28.3	4.5
1962	20.5	38.7	4.3	133.8	3.3	4.1	10.6	8.9	14.1	11.4	43.0	27.4	4.1
1963	19.1	38.1	4.1	134.3	2.9	4.1	10.5	9.0	13.8	12.4	43.5	27.0	3.9
1964	18.1	39.1	4.5	135.4	2.8	4.3	10.6	9.1	13.9	12.5	43.4	25.7	3.9
1965	17.9	39.4	4.6	134.9	2.6	4.3	10.1	9.5	13.6	12.4	42.1	25.1	3.8
1966	20.8	38.0	4.8	134.3	2.5	4.6	9.8	9.8	13.2	12.3	41.5	24.7	3.5
1967	21.0	37.4	4.9	133.9	2.4	4.9	9.6	9.5	13.0	12.0	41.2	23.8	3.4
1968	21.1	37.5	4.9	127.9	2.3	5.2	9.5	10.2	12.8	11.7	39.3	23.4	3.3

Source: Danske Landbrugsvarer på Hjemmemarkedet, Landbrugsradet og de Samvirkende danske Landboforeninger, Copenhagen, 1966--updated to 1968 in the annual report of the Landboforeninger.

Table D.2. Retail Prices of Selected Commodities, 1954-68, Denmark

Year	Beef and Veal	Pigmeat	Poultry	Liquid Milk	Coffee Cream (18%)	Butter	Cheese	Eggs	Wheat Flour	Double Cream (36%)
	Product Prices in Kroner Per Kg. at Retail									
	Kr/Kg	Kr/Kg	Kr/Kg	Kr/1	Kr/Kg	Kr/Kg	Kr/Kg	Kr/Kg	Kr/Kg	Kr/Kg
1954	5.69	6.58	6.97	.67	4.70	7.33	5.43	4.55	.95	3.40
1955	5.84	6.68	6.89	.71	4.53	7.43	5.73	4.89	.98	3.50
1956	6.28	7.40	7.61	.74	4.93	7.84	5.71	5.03	1.00	3.70
1957	6.47	7.21	7.16	.72	4.83	6.49	5.72	4.53	1.13	3.60
1958	6.60	7.04	6.79	.67	4.34	5.34	5.53	4.78	1.25	3.30
1959	6.83	7.59	6.32	.79	5.24	7.26	5.84	4.04	1.35	3.70
1960	6.95	7.63	6.14	.82	5.44	7.17	5.87	4.27	1.41	3.80
1961	7.06	8.03	5.82	.89	5.70	7.67	6.30	4.41	1.48	4.00
1962	6.99	8.71	5.98	.92	6.14	8.44	6.38	4.28	1.55	4.50
1963	7.93	9.69	6.72	.96	6.44	9.02	7.12	5.66	1.55	4.80
1964	9.14	10.30	7.07	1.02	6.54	9.07	7.42	5.86	1.52	4.80
1965	9.86	10.80	7.16	1.11	6.94	9.74	7.69	6.14	1.52	5.10
1966	9.47	11.33	7.19	1.20	7.20	10.39	8.15	6.75	1.49	5.20
1967	10.03	12.09	7.20	1.27	7.40	10.92	8.83	6.98	1.47	5.20
1968	10.30	12.37	7.25	1.28	7.60	11.24	9.02	7.25	1.50	5.30

Source: Danske Landbrugsvarer på Hjemmemarkedet, Landbrugsradet og de Samvirkende danske Landboforeninger, Copenhagen, 1966--updated to 1968 in the annual report of the Landboforeninger.

Table D.3. Basic Data for Demand Analysis 1954-68, Denmark

Year	Personal Expenditures Current Prices	Personal Expenditures Constant Prices	GNP Current Prices	GNP Constant Prices	Population	Farm Income Current Prices	Farm Income Constant Prices
	Bil Kr.	Bil Kr.	Bil Kr.	Bil Kr.	(000)	Bil Kr.	Bil Kr.
1954	19.40	20.29	29.9	31.2	4,466	5.32	5.57
1955	20.28	20.42	31.4	31.4	4,439	6.76	5.76
1956	21.46	20.82	33.6	32.1	4,466	6.15	5.96
1957	22.01	20.78	35.5	33.5	4,488	5.71	5.74
1958	23.15	21.81	37.1	34.4	4,515	5.87	6.02
1959	25.02	23.03	41.1	36.6	4,547	6.19	5.92
1960	26.93	24.11	44.5	39.0	4,581	6.29	5.89
1961	29.94	25.98	49.4	41.2	4,610	6.71	6.20
1962	33.65	27.61	55.7	43.5	4,647	7.38	6.37
1963	35.54	27.53	59.2	43.7	4,684	7.99	6.45
1964	39.87	29.89	67.7	47.7	4,720	8.83	6.88
1965	43.75	30.99	76.1	49.9	4,758	9.37	6.88
1966	48.56	32.24	83.9	51.1	4,797	10.30	7.22
1967	53.30	33.40	92.0	53.1	4,839	11.63	7.68
1968	58.56	33.90	101.2	55.0	4,870	13.08	7.86

Table D.4. Cereal and Total Area by Size of Farm, 1969, Denmark

Size of Farm (ha)	Cereal Area	Total Area	Percent Cereals
	ha	ha	ha
.55 - 5	29,580	47,971	61.7
5 - 10	129,518	230,181	56.3
10 - 15	175,440	319,349	54.9
15 - 30	529,255	943,468	56.1
30 - 60	497,979	858,610	58.0
60 - 120	196,574	323,672	60.7
120 and over	145,823	233,770	62.4
Total	1,704,169	2,957,021	57.6

Source: Denmark's Statistik, Landbrugsstatistik 1969.

Table D.5. Number of Farms by Size of Stock of Cows and Number of Pigs, 1969, Denmark

Number of Swine	Number of Cows: 0	1-9	10-19	20-29	30-39	40-49	50-74	75 and over	Total
0	15,092	4,349	1,720	589	320	193	106	65	22,434
1-9	4,157	7,802	1,412	234	61	23	19	9	13,717
10-19	3,076	9,371	2,809	220	48	2	10	1	15,537
20-49	5,687	17,423	13,966	1,049	214	61	4	-	38,404
50-99	4,668	6,878	17,048	3,327	569	98	51	5	32,644
100-149	2,804	1,912	4,994	2,168	627	185	50	7	12,747
150-199	1,533	878	1,249	943	435	96	64	6	5,204
200-299	1,464	560	478	582	304	160	75	27	3,650
300-399	603	174	83	101	123	45	37	26	1,192
400-499	209	34	17	7	20	9	29	17	342
500 & over	163	76	20	11	25	9	14	22	340
Total	39,456	49,457	43,796	9,231	2,746	881	459	185	146,211

Source: Denmark's Statistik, Landbrugsstatistik 1969.

Table D.6. Selected Annual Data on Milk Production, Denmark [1]

Year	Number of cows & heifers halving calved, July 1, t	Milk production per cow	Total milk production	Producer prices for whole milk, 3.65% b.f., all utilizations, including subsidies	Records from Farm Accounts, year beginning in July: Income per cow	Cost of concentrates & milk fed per cow	Net over variable cost (exc. roughage) per cow	Price of cull cows, 1st class
	1000	Kg	Mil. Kg.	Kr/100Kg	Kr	Kr	Kr	Kr/Kg
1948	1472	2757	4058	38.3	1372	315	729	1.18 [2]
1949	1535	3181	4883	37.3	1445	346	762	1.33 [2]
1950	1577	3426	5403	34.6	1444	380	711	1.57 [2]
1951	1584	3304	5233	34.4	1497	402	717	1.85 [2]
1952	1476	3386	4998	38.1	1623	455	734	1.92 [2]
1953	1486	3619	5378	38.2	1614	420	774	1.77 [2]
1954	1505	3584	5394	38.0	1670	484	759	1.97 [2]
1955	1483	3455	5124	40.4	1710	540	733	1.89 [2]
1956	1448	3500	5068	38.9	1679	526	714	2.02 [2]
1957	1449	3688	5344	34.6	1551	418	690	2.10 [2]
1958	1415	3637	5147	31.7	1655	427	764	2.06 [2]
1959	1433	3786	5426	40.0	2013	647	880	2.29
1960	1438	3755	5399	36.5	1887	538	861	2.15
1961	1493	3700	5524	35.4	1816	524	769	1.87
1962	1463	3660	5355	35.7	1985	632	798	1.93
1963	1408	3612	5086	41.9	2268	657	978	1.97
1964	1370	3820	5233	41.9	2384	710	1028	2.70
1965	1350	3976	5367	41.5	2399	772	942	2.82
1966	1350	3930	5306	43.1	2453	788	874	2.55
1967	1329	3907	5193	44.0	2576	753	884	2.28
1968	1292	3964	5122	42.7				2.42
1969	1233	3955	4877	44.7 [2]				2.85
1970								

1/ Sources of data in Table D.6 and subsequent tables were primarily from various publications of Denmark Statistics, unless otherwise noted.

2/ Estimate.

Table D.7. Beef and Veal Production by Livestock Classes, Denmark

Year	Estimated Commercial Beef and Veal Production by Livestock Classes 1/						Home slaughter of beef and veal	Actual total production of beef and veal
	Cows	Heifers	Bulls	Steers	Fat Calves	New Born Calves		
	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg
1948	51.0	26.0	5.1	3.7	16.4	9.1	5.0	116.3
1949	56.8	31.4	5.9	5.0	16.3	10.4	5.0	130.8
1950	88.2	32.3	7.0	5.1	17.9	12.2	5.0	167.7
1951	120.5	38.1	7.0	5.1	18.5	12.4	5.0	206.6
1952	88.6	36.2	5.5	4.6	24.2	11.3	5.0	175.4
1953	81.8	47.7	5.3	5.3	28.1	11.7	3.0	182.9
1954	88.8	45.6	4.3	5.7	32.6	10.7	3.0	190.7
1955	107.1	48.6	3.8	6.1	36.5	9.4	3.0	214.5
1956	97.9	55.7	3.4	6.7	41.7	8.3	3.0	216.7
1957	100.3	57.0	3.3	7.4	53.8	5.4	3.0	230.2
1958	110.8	58.5	3.4	7.7	56.5	2.8	3.0	242.7
1959	101.1	67.2	7.4	7.7	57.3	2.6	3.0	246.3
1960	107.1	62.4	9.1	7.5	62.3	2.4	3.0	253.8
1961	97.4	72.9	10.7	9.0	56.1	2.9	2.0	251.0
1962	112.8	71.5	19.2	9.4	58.7	3.5	2.0	277.1
1963	122.4	68.4	14.9	14.0	68.9	3.0	2.0	293.6
1964	90.2	61.4	8.6	10.4	69.5	1.6	2.0	243.7
1965	90.1	66.3	8.1	8.8	68.7	1.0	2.0	245.0
1966	90.3	67.0	10.4	8.7	78.0	1.1	2.0	257.5
1967	89.3	69.5	11.5	8.7	80.7	1.3	2.0	263.0
1968	93.9	67.3	6.8	8.0	86.2	1.2	2.0	265.4
1969	97.8	63.9	4.4	6.2	82.2	1.2	2.0	257.7
1970								

1/ Cow slaughter was estimated at 25 percent of cows on farms, Jan. 1., plus or minus the decrease or increase in cow numbers from Jan.t to Jan. t+1. Heifer slaughter was estimated as the difference between the number of heifers not halving calved, Jan. 1, and 25 percent of the cow inventory. Bull slaughter was estimated at 80 percent of the Jan. 1 bull inventory and steer slaughter was estimated at 50 percent of the Jan. 1 steer inventory. These slaughter figures were adjusted to the official statistics on total adult cattle slaughter. The adjusted slaughter figures were multiplied by assumed dressed slaughter weights (cows, 260 kg; heifers, 225 kg; bulls 255 kg; steers, 320 kg) and totaled. These figures were then adjusted to the official statistics on total beef and veal production less estimates of fat calf and new born calf production and home slaughter. Fat calf production was estimated from official data on slaughter by assuming for 1948-1964 (for which slaughter weights were not available) that average slaughter weights were 90 kg for 1958-54, increasing linearly to 132.7 kg in 1964. New born calf production was estimated from official slaughter data assuming an average dressed slaughter weight of 25 kg.

Table D.8. Prices and Returns on Beef Production, Denmark

Year	Price of heifers, 1st class liveweight, Oxexport, DLK's and DAK's	Price of fat calves, 1st class liveweight, Oxexport, DLK's and DAK's 2/	Returns from Hypothetical Feeding Program on a 259 Kg Fat Calf 3/				Gross from 500 Kg Steer or Bull minus gross from 259 Kg fat calf
			Gross	Cost of Cereals & High Protein Feed	Total Feed Cost (ex. roughage)	Net over Feed Costs (ex. roughage)	
	Kr/Kg	Kr/Kg	Kr/head	Kr/head	Kr/head	Kr/head	Kr/head
1948	1.26 1/	1.60	414	152	352	62	316
1949	1.36 1/	1.68	435	159	358	77	345
1950	1.91 1/	2.15	557	189	380	177	498
1951	2.35 1/	2.36	611	237	436	175	664
1952	2.21 1/	2.27	588	246	467	121	617
1953	2.14 1/	2.15	557	212	406	151	613
1954	2.28 1/	2.25	583	207	407	176	657
1955	2.41	2.32	601	211	433	168	704
1956	2.54	2.58	668	215	422	246	697
1957	2.50	2.63	681	182	384	297	669
1958	2.47	2.57	666	182	404	262	674
1959	2.67	2.61	676	198	429	247	744
1960	2.57	2.71	702	191	416	286	688
1961	2.31	2.27	588	179	403	185	732
1962	2.17	2.54	658	205	418	240	582
1963	2.32	2.87	738	207	446	292	582
1964	3.24	3.64	943	202	421	522	737
1965	3.41	3.62	938	212	440	498	862
1966	3.10	3.37	873	225	472	401	697
1967	2.69	3.28	850	225	477	373	550
1968	2.82	3.54	917	221	456	461	543
1969	3.43	4.08	1057				678
1970							

1/ Estimated at .08 Kr/Kg under quotations in Landburg Priser on bullocks and heifers.

2/ For 1954-61 2nd class. For 1948-53 steers for export price - 20 Kr/Kg.

3/ Based on data presented in the Krogstrup Report and from Danish farm account data.

Table D.9. Selected Annual Data on Pig Production, Denmark

Year	Production of Pigmeat, including edible offals	Number of sows for Breeding, July 1	Number of Weaners per sow per year	Producer prices, slaughter weight, including payments	Farm Account data per 90 Kg Liveweight, year beginning July		
					Gross Income	Cost of Concentrates	Net over Variable Costs
	Mil Kg	1000 head	No.	Kr/Kg	Kr	Kr	Kr
1948	178.7	199	13.4	4.24 1/	275	98	85
1949	275.1	348	13.6	4.32 1/	269	119	65
1950	362.6	399	14.5	4.13 1/	273	142	53
1951	404.5	339	16.3	4.49 1/	308	176	48
1952	389.9	434	15.7	4.71 1/	290	161	48
1953	478.4	485	15.8	4.37 1/	267	135	57
1954	524.4	539	15.6	4.27 1/	273	151	48
1955	531.8	453	16.2	4.33	285	161	51
1956	500.2	503	15.8	4.77	291	157	59
1957	545.4	582	15.8	4.15	246	131	45
1958	552.2	562	15.6	4.22	274	153	54
1959	614.1	670	15.2	4.33	259	158	43
1960	651.2	681	16.0	4.27	266	149	55
1961	670.1	799	15.6	4.12	255	154	43
1962	682.3	801	15.5	4.27	266	171	39
1963	694.8	807	15.6	4.55	307	171	79
1964	738.4	941	15.6	4.89	286	173	55
1965	806.8	970	16.6	4.46	298	192	51
1966	792.5	904	16.0	5.17	318	203	56
1967	790.4	947	17.0	4.98	307	206	39
1968	772.2	892	17.0	4.78			
1969	741.9	943		5.34 1/			
1970							

1/ Estimated.

Table D.10. Selected Annual Data on Egg Production, Denmark

Year	Egg Production	Hens 6 months old and over, on farms July 1	Egg production per hen	Producer price on eggs, plus payments 1/	Farm Account Data year beginning July, per hen: Gross income	Cost of concentrates	Net over concentrate cost
	Mil Kg	1000 head	Kg/hen	Kr/Kg	Kr	Kr	Kr
1948	87.1	8923	9.8	3.31	26.00	15.02	10.98
1949	118.0	10409	11.3	3.16	24.00	16.35	7.65
1950	132.5	11508	11.5	2.98	27.00	19.19	7.81
1951	122.6	9766	12.6	3.42	34.00	25.09	8.91
1952	123.9	9724	12.7	3.83	35.50	25.03	10.47
1953	135.6	10021	13.5	3.74	32.75	21.61	11.14
1954	142.4	10424	13.7	3.40	33.50	23.10	10.40
1955	149.9	10595	14.1	3.80	38.00	26.73	11.27
1956	146.9	10349	14.2	3.73	40.84	26.03	14.81
1957	148.4	10409	14.3	3.50	41.41	24.13	17.28
1958	157.0	10792	14.5	3.40	40.18	26.64	13.54
1959	160.4	10822	14.8	2.96	37.68	26.47	11.21
1960	138.2	9735	14.2	3.17	41.40	26.45	14.95
1961	126.6	9744	13.0	3.17	33.83	25.08	8.75
1962	113.2	9007	12.6	2.82	39.72	27.80	11.92
1963	106.8	7949	13.4	3.68	38.80	27.52	11.28
1964	99.8	7733	12.9	3.27	40.42	28.03	12.39
1965	90.0	6870	13.1	3.79	43.11	30.99	12.12
1966	90.0	6917	13.0	3.67	44.86	32.84	12.02
1967	86.9	6521	13.6	3.67	48.21	32.98	15.23
1968	85.9	6330	13.6	3.86			
1969	89.8	6634	13.5	3.53			
1970							

1/ Danish Egg Export Cooperative; from October 1962 including supplements for domestic consumption.

Table D.11. Selected Annual Data on Poultry Meat Production, Denmark

Year	Total poultry meat production, ready to cook wt. 1/	Estimated production of hen meat ready to cook wt. 2/	Total poultry meat production - production of hen meat, ready to cook wt.	Producer prices on chicken, extra class, including payments 3/	Accounts from Demonstration Farms, per kg. slaughter average, year beginning July: Gross income	Cost of concentrates	Net over cost of concentrates
	Mil Kg	Mil Kg	Mil Kg	Kr/Kg	Kr/Kg	Kr/Kg	Kr/Kg
1948	17.5	13.3	4.2	5.08			
1949	21.2	15.7	5.5	4.78			
1950	22.0	20.7	1.3	4.42			
1951	18.6	14.6	4.0	6.31			
1952	19.5	14.1	5.4	5.48			
1953	20.3	14.0	6.3	5.00			
1954	21.2	14.1	7.1	4.92			
1955	23.0	13.8	9.2	4.82			
1956	25.0	12.9	12.1	4.80			
1957	24.3	12.5	11.8	4.37			
1958	29.7	12.4	17.3	4.05	3.98 4/	2.03 4/	1.95 4/
1959	38.1	13.0	25.1	3.66	3.78	2.08	1.70
1960	47.5	11.7	35.8	3.66	3.50	2.16	1.34
1961	64.8	10.7	54.1	3.14	3.51	2.16	1.35
1962	71.2	15.2	56.0	3.22	3.30	2.24	1.06
1963	65.8	9.5	56.3	3.10	3.46	2.07	1.39
1964	76.4	9.6	66.8	3.14	3.04	2.00	1.04
1965	66.2	6.2	60.0	3.16	3.31	2.12	1.19
1966	67.6	6.5	61.1	3.31	3.09	2.09	1.00
1967	66.2	5.5	60.7	3.05	3.14	2.08	1.06
1968	64.6	4.7	59.9	3.11	3.17 4/	1.91 4/	1.26 4/
1969	68.5	5.0	63.5	3.15			
1970							

1/ Estimated for 1948-64 at 84.7% of liveweight (excluding blood and feathers).
2/ Data for 1948-61 estimated from hen numbers on farms and year to year change in hen numbers. Estimates for 1962-64 were based on official slaughter figures assuming 1.8 kg. of meat per bird slaughtered.
3/ Prices for 1948-59 estimated by adding .40 kr./kg. to prices on 1st class chicken.
4/ Estimated.

Table D.12. Agricultural Land Utilization, Denmark

Crop Year Beginning	Cereals and pulse	Root crops	Grass and green fodder	Total crop area	Seeds and crops for industrial use	Fallow areas etc.	Total agricultural area
	1000 ha	1000 ha	1000 ha	1000 ha	1000 ha	1000 ha	1000 ha
1948	1303	575	1122	3000	97	23	3120
1949	1338	563	1155	3056	86	15	3157
1950	1289	584	1164	3037	95	14	3146
1951	1270	589	1163	3022	103	14	3139
1952	1333	585	1103	3021	89	13	3123
1953	1359	579	1079	3017	79	10	3106
1954	1350	566	1078	2994	87	11	3092
1955	1333	570	1087	2990	91	13	3094
1956	1374	584	1059	3017	77	11	3105
1957	1404	590	1033	3027	82	8	3117
1958	1399	588	1035	3022	85	9	3116
1959	1435	559	1015	3009	90	9	3108
1960	1453	567	977	2997	91	6	3094
1961	1547	505	966	3018	102	8	3128
1962	1551	469	969	2989	116	5	3110
1963	1577	464	921	2962	93	3	3058
1964	1573	458	898	2929	105	4	3038
1965	1600	410	879	2889	109	3	3001
1966	1608	392	886	2886	106	3	2995
1967	1643	357	881	2881	105	3	2989
1968	1698	337	855	2890	92	2	2984
1969	1730	310	828			2	2957
1970							

Table D.13. Selected Annual Data on Cereal Production, Denmark 1/

Crop year beginning	Area of total cereals	Price of cereals	Variable costs of production on cereals	Net over variable costs on cereals	Net value of grass and green fodder over variable costs 2/	Net over variable costs on cereals - net value of grass and green fodder over variable costs	Net value of fodder roots over variable costs 2/
	1000 ha	Kr/100 fe	Kr/100 fe	Kr/100 fe	Kr/100 fe	Kr/100 fe	Kr/100 fe
1948	1291	33.6	17.8	15.8	9.1	6.7	-2.0
1949	1325	38.8	19.2	19.6	9.6	10.0	- .9
1950	1277	48.6	21.4	27.2	7.0	20.2	-2.6
1951	1261	56.3	22.9	33.4	6.0	27.4	-3.9
1952	1326	50.1	22.6	27.5	6.5	21.0	-6.3
1953	1352	41.2	23.9	17.3	6.3	11.0	-4.0
1954	1340	46.3	25.9	20.4	5.8	14.6	-7.3
1955	1326	46.1	23.2	22.9	5.9	19.0	-9.2
1956	1366	44.7	22.8	21.9	4.1	17.8	-7.9
1957	1395	39.7	21.5	18.2	3.3	14.9	-7.4
1958	1392	45.2	24.3	20.9	3.7	17.2	-6.2
1959	1429	44.6	26.4	18.2	5.1	13.1	-10.1
1960	1445	40.2	25.0	15.2	2.0	13.2	-8.6
1961	1537	43.3	26.9	16.4	-3.0	19.4	-15.2
1962	1542	45.5	26.2	19.3	-1.6	20.9	-16.9
1963	1570	44.9	30.5	14.4	6.5	7.9	-8.8
1964	1568	44.6	27.2	17.4	6.1	11.3	-8.6
1965	1597	49.1	28.7	20.4	-1.8	22.2	-23.9
1966	1605	50.8	23.3	18.5	-6.1	24.6	-27.7
1967	1638	50.2	32.6	17.6	-6.0	23.6	-27.9
1968	1685						
1969	1703						
1970							

1/ f.e. means "feed equivalent" and one unit is equal to 1 kilogram of barley, wheat, or rye. For oats, 1.2 kilogram is equal to 1 f.e.

2/ Value assigned to grass and green fodder and fodder roots is based on net returns from livestock over variable costs other than roughage.

Table D.14. Comparison of Feed Grains Relative to Bread Grains, Denmark 1/

Crop year beginning	Percent of total cereal area in feed grains	Price of barley, Copenhagen, 112 pd. holl.	Price of wheat, Copenhagen, 128 pd. holl.	Crop Yield: Barley, oats, and mixed cereals, weighted ave.	Crop Yield: Wheat & rye weighted ave.	Gross returns per ha from barley & oats weighted ave. 2/	Gross returns per ha from wheat & rye, weighted ave. 2/	Ratio of gross returns from feed grain relative to bread grains
	%	Kr/100 Kg	Kr/100 Kg	100 fe/ha	100 fe/ha	Kr/ha	Kr/ha	
1948	81.7	44.2	36.2	27.8	27.6	1374	1016	1.353
1949	79.0	48.6	45.5	29.4	27.7	1539	1221	1.261
1950	81.3	59.1	62.1	28.2	26.2	1845	1587	1.163
1951	84.1	63.8	51.8	29.2	27.1	2035	1406	1.447
1952	84.1	53.2	53.8	33.0	31.1	1848	1674	1.104
1953	85.1	43.4	49.5	31.3	30.4	1491	1323	1.127
1954	85.2	50.6	46.7	28.6	28.7	1677	1331	1.259
1955	89.2	49.8	48.9	31.1	30.9	1709	1459	1.171
1956	87.3	43.4	48.5	32.6	31.9	1550	1458	1.063
1957	87.1	41.6	47.5	32.7	32.5	1478	1432	1.032
1958	85.6	46.9	55.0	31.1	29.2	1572	1559	1.008
1959	85.4	45.0	55.5	27.5	31.2	1375	1703	.807
1960	83.5	39.4	56.3	33.4	32.4	1425	1788	.797
1961	81.2	46.6	56.6	32.6	32.9	1593	1825	.873
1962	78.8	45.6	57.4	36.7	35.3	1799	1993	.903
1963	84.0	45.9	57.1	34.3	32.4	1646	1827	.901
1964	85.9	44.5	56.9	38.5	37.7	1789	2120	.844
1965	86.5	50.0	58.3	37.7	38.8	1965	2247	.874
1966	91.3	53.4	54.0	35.8	38.3	1973	2073	.951
1967	92.2	51.1	51.8	36.0	42.5	1881	2215	.849
1968	92.0	41.5	50.7	38.8	44.1	1663	2242	.742
1969	92.3							
1970								

1/ Feed grains consist of barley, oats and mixed cereals. Bread grains include wheat and rye.
2/ Gross returns are equivalent to prices times weighted average (weighted by hectares) of yields.

Table D.15. Feed Production by Type, Denmark

Crop year beginning	Production of barley, oats and mixed cereals	Production of wheat and rye	Wheat and rye fed to livestock	Production of feed grain plus wheat and rye fed	Production of fodder roots	Production of grass crops and tops	Straw fed	Total feed production
	Mil. f.e.	Mil. f.e.	Mil. f.e.	Mil. f.e.	Mil. f.e.	Mil. f.e.	Mil. f.e	Mil. f.e.
1948	2934	652	--	2934	3289	3807	700	11687
1949	3083	769	278	3361	3408	2827	640	13248
1950	2930	628	160	3090	3681	4724	650	12922
1951	3098	543	--	3098	3690	4591	648	12895
1952	3678	659	--	3678	3388	4613	679	13520
1953	3605	615	312	3917	4030	4904	787	14312
1954	3265	540	626	3891	3357	4353	695	12548
1955	3679	445	332	4011	3083	4535	848	12808
1956	3888	557	355	4243	4201	4057	855	13788
1957	3968	586	254	4222	3871	4440	796	13870
1958	3709	580	362	4071	3898	4705	800	13895
1959	3358	653	371	3729	2976	4133	653	11939
1960	4030	774	385	4415	3992	4175	864	14057
1961	4068	948	442	4510	3379	4707	950	14299
1962	4460	1157	479	4939	2987	4667	991	14508
1963	4521	814	470	4991	3255	4427	918	14165
1964	5183	833	369	5552	3526	4870	888	15600
1965	5210	829	447	5657	2644	4815	827	14601
1966	5244	536	330	5574	2986	4948	799	14779
1967	5433	539	242	5675	2595	4817	769	14423
1968	6020	595	--		2555	4862		15111
1969	6074	555	--		2105	3707		
1970								

Table D.16. Estimated Amount of Concentrates Fed per Unit of Output, Denmark 1/

Year	Kilograms of Concentrates Fed per:							
	Kilogram of 2/ milk	Kilogram of 2/ pigmeat, dressed weight	Kilogram of 2/ eggs	Kilogram of poultry meat exc. cull layers, ready 2/ to cook	Kilogram of fat calves produced, dressed weight 3/	Kilogram of heifer beef produced, dressed weight 4/	Kilogram of young bull beef produced, dressed weight 3/	Kilogram of steer beef produced, dressed weight
	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Kg
1948	.225	4.59						
1949	.217	4.77	5.38	6.43	3.24	.74	1.91	.20
1950	.199	4.59	5.25	6.35	3.24	.65	1.91	.20
1951	.182	4.44	5.25	6.27	3.24	.59	1.91	.20
1952	.223	4.54	5.13	6.20	3.24	.73	1.91	.20
1953	.210	4.56	5.13	6.12	3.24	.72	1.91	.20
1954	.232	4.72	4.75	6.04	3.24	.71	1.91	.20
1955	.260	4.91	5.00	5.97	3.24	.91	1.91	.20
1956	.250	4.79	5.00	5.89	3.24	.90	1.91	.20
1957	.236	4.67	4.88	5.81	3.24	1.09	1.91	.20
1958	.228	4.81	4.63	5.74	3.24	1.19	1.91	.20
1959	.302	4.88	4.50	5.68	3.24	1.53	1.91	.20
1960	.267	4.89	4.50	5.26	3.24	1.34	1.91	.20
1961	.255	4.86	4.43	5.20	3.24	1.35	1.91	.20
1962	.278	4.98	4.38	4.99	3.24	1.25	1.91	.20
1963	.283	4.91	4.40	4.74	3.24	1.48	1.91	.20
1964	.305	4.91	4.21	4.56	3.24	1.63	1.91	.20
1965	.313	5.04	4.34	4.47	3.24	1.95	1.91	.20
1966	.319	5.09	4.35	4.38	3.24	1.92	1.91	.20
1967	.290	5.12	4.35	4.30	3.24	1.71	1.91	.20
1968			4.35	4.24	3.24		1.91	.20
1969					3.24			
1970								

1/ Excludes whole milk, skimmed milk and whey fed. Data based on farm accounts.
2/ Includes amounts fed to replacements and breeding stock.
3/ Based on net gain over new born calf weight.
4/ Based on feeding rates for replacement heifers given in farm account records.

Table D.17. Estimated Utilization of Concentrates by Principle Livestock Classes, Denmark [1/]

Year	Amounts of Concentrates Fed to Livestock Estimated from Farm Account Data								Official estimate of concentrates fed to all livestock
	Milk cows and replacements	Pigs	Laying hens and replacements	Other poultry	Fat calves	Heifers	Bulls and steers	Total, including allowance for horses and sheep	
	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Kg	Mil Fe
1948									
1949	1131	1597	691	22	46	23	12	3700	3609
1950	1075	1864	650	22	49	21	13	3860	3787
1951	912	1646	367	25	57	20	12	3466	3329
1952	1176	1978	650	33	71	29	11	4092	3718
1953	1143	2258	708	39	82	31	9	4402	4410
1954	1214	2612	698	43	94	31	8	4824	4405
1955	1332	2415	728	55	107	45	8	4800	4494
1956	1295	2476	750	71	132	47	7	4874	4613
1957	1245	2632	723	69	153	58	7	4975	4594
1958	1205	2716	763	99	159	70	11	5097	5051
1959	1656	3210	677	143	169	92	16	6030	5613
1960	1438	3164	577	188	167	85	19	5692	5592
1961	1397	3323	550	281	162	91	28	5871	5845
1962	1441	3394	471	279	183	82	32	5914	5749
1963	1459	3493	458	267	199	89	23	6014	6399
1964	1623	3828	394	305	198	97	16	6483	6925
1965	1671	4070	387	268	215	121	18	6769	6893
1966	1685	3981	388	268	232	122	21	6715	6924
1967	1494	4063	375	261	240	109	18	6577	6797
1968			371	254	245		11		6578
1969									
1970									

1/ Excludes whole milk, skimmed milk and whey.

APPENDIX E

EEC: SUMMARY STATEMENT OF RECENT CHANGE AND UPDATED PROJECTIONS 1975 AND 1980

EEC: SUMMARY STATEMENT OF RECENT CHANGE AND UPDATED PROJECTIONS 1975 AND 1980

The most important changes that appear to have occurred in EEC production and consumption from 1964 to 1968 are as follows:

1. The beef and veal deficit was reduced from over 430,000 metric tons to about 390,000 metric tons.
2. A slight surplus in pork production arose. A deficit balance of 76,000 metric tons in 1964 has shifted to a surplus of 63,000 metric tons.
3. The deficit in poultry meat production was reduced from 159,000 metric tons to 18,000 metric tons. Egg production remained at approximately self sufficiency.
4. The milk surplus approximately doubled from about 8.5 million metric tons to over 16 million metric tons.
5. The food grain surplus increased from approximately 10.5 million metric tons to nearly 13.5 million metric tons.
6. The feed grain deficit was reduced from 17.7 million metric tons to 16.3 million metric tons.
7. The deficit in total grain production was reduced from 7 million to about 2.9 million metric tons.

Beef and Veal. Since the early 1960s (1962/63 - 1967/68) per capital consumption of beef and veal has increased at an average rate of 1.4 percent per year but with variation from a slight decline in the Netherlands to an increase of 5.9 percent per year in Italy. Production has increased at an average rate of 4.1 percent per year varying from a high of 6.6 percent in Italy to a low of 2.3 percent in Germany. As of 1968 Italy, Germany and Belgium -Luxembourg were deficit producers, while France and Netherlands were surplus producers. The reduction in per capital consumption in the Netherlands probably was caused by rising prices. Prices of cows for slaughter, for example, increased from below 300 guilder per 100 kilogram in 1962 to well over 400 guilder in 1968. Steady consumption in Belgium-Luxembourg and slow rates of increase in consumption in France (0.7 percent) and Germany (0.5 percent) also can probably be attributed to rising prices. The revised projections indicate a widening of the gap between production and consumption by 1975. The widening to 1975 can be justified only by assuming continued growth in per capita incomes and stability in meat prices.

Pork. Pork consumption has increased at a more rapid rate than beef. The average rate for the 6 countries (1962/63 - 1967/68) was 4.3 percent per year with variation from 9.0 percent in ~~Italy~~ Belgium - Luxembourg to 2.9 percent in Germany. Production has expanded rapidly with an average for the 6 countries of 4.7 percent per year during the period 1964-68. The annual rates by country were Belgium-Luxembourg 11 percent, Netherlands 11.2 percent, Germany 5.8 percent, Italy 4.2 percent, France 20.1 percent. Excess production relative to the size of the domestic market is greatest in Belgium-Luxembourg and the Netherlands.

The projections are based on a reduced rate of increase in consumption from 1970 to 1980. Any substantial reduction in beef prices,given existing relatively high levels of pork consumption in all countries except Italy could slow the rates of increase in pork consumption and possibly even reverse the trend. Production is also projected to increase at a slower average rate from 1970 to 1980.

Poultry Meat and Eggs. Egg production and consumption for the EEC seems to have reached a stable (equilibrium) position. Consumption recently has increased at 1.4 percent per year for the area as a whole with variations from -1.3 percent per year in the Netherlands to +3.1 percent per year in Belgium-Luxembourg. Production has increased at a slightly faster rate of 2.1 percent per year to result in some decrease in the small deficit that existed in 1964. Changes in production were largely in Germany +6.7 percent per year, France +2.7 percent per year and Netherlands -6.9 percent per year. The projections to 1975 and 1980 suggest a continuation of the near stable equilibrium position with the emergence of a small surplus. Burdensome surpluses relative to the size of the domestic market could arise in the Netherlands and Belgium.

Poultry meat consumption and production have increased rapidly with wide variation among countries. The average annual increase in consumption (1962/63-1967/68) was 9.4 percent with rates by country as follows: Italy 20.8 percent, Netherlands 17.1 percent, France 6.6 percent, Germany 6.3 percent and Belgium-Luxembourg -3.8 percent. Average increase in production (1964-68) was 10.4 percent, with 17.9 percent in Italy, 16.6 percent in Netherlands, 12.0 percent in Germany, 5.9 percent in France and 0.6 percent in Belgium-Luxembourg. Projections indicate a continuation of the overall equilibrium for the area with small surpluses arising in the 1970s. The industry cannot be considered stable. The rates of increase in both consumption and production in some countries probably will have to change from their recent levels. Poultry prices have dropped since the mid-1960s. This has stimulated rates of increase in consumption that cannot be maintained over time. Consumption still is low relative to the United States, but with relatively high EEC grain price levels poultry prices, even with efficient production, will remain relatively high and consumption should stabilize at a lower level. When a point of equilibrium will arise is difficult to project but short of a major reduction in grain prices it probably can be expected to occur soon. The projected rates of increase for the 1970s thus are well below those that occurred during the 1960s.

Milk. The projections for 1975 and 1980 suggest a continued increase in the milk surplus largely due to improvement in yield per cow. The most rapid rate of increase in output has been in France (5.2 percent per year) and this could continue. No account has been taken of revised EEC policy and slaughter premiums for cows in making these projections.

Grain. Per capita consumption of food grain has declined at an annual average rate of 1.5 percent per year with variation from -0.5 in Italy to -3.2 in France. Average per capita consumption is still high relative to United States levels and gradual declines can be expected to continue. Population increases have not fully offset lower levels of per capita consumption with the result that total consumption has declined slightly. This can be expected to continue.

Grain production has increased rapidly despite a small decline in total acreage. Average yields increased 4.9 percent per year to result in a 4.6 percent per year increase in output.

The story on grain is complex. The annual rate of increase in output (1964-68) was greatest in Germany (6.5 percent per year) despite the fact that prices declined, and despite the fact that the basis for shifting from lower yield grains to corn is more limited than in France and Italy. Germany achieved the most rapid rate of increase in yield and also expanded acreage of grain at the rate of 0.6 percent per year. Annual yield increases in Germany were wheat 6.3 percent, barley 5.5 percent, oats 5.3 percent, rye 4.9 percent and other grain 3.5 percent.

The next most rapid increase in output occurred in France where the annual rate of increase was 5.6 percent. This resulted from a very slight increase in acreage (0.2 percent per year) and an increase in yield of 5.3 percent per year. Substantial shifts in acreage occurred as follows: Wheat -1.1 percent per year, barley +3.8 percent per year, corn +4.5 percent per year, oats -4.3 percent per year. The increase in corn yield of 9.1 percent per year was particularly large.

In Italy total grain output increased at a rate of 2.2 percent per year. This reflects a decline in acreage of 1.1 percent per year and an average yield increase of 3.3 percent per year. Wheat and oat acreage declined while corn and barley acreage increased.

Grain production in Belgium-Luxembourg remained about steady and declined somewhat in the Netherlands.

Utilization of grain for livestock feed is one of the most uncertain elements in estimating past trends and making future projections. The estimates for total feed grain utilization shown in Table 4 includes livestock feed, industrial use, seed and waste. The data for 1964 are taken directly from previous work at Michigan State University.[1] The estimates of feed use for 1968 represent OECD data on utilization by livestock and for seed and industrial use are an interpolation of the Michigan State University study 1964 data and estimates for 1970. Feed utilization in 1970 and 1975 represent Michigan State University study estimates of industrial and seed use plus a re-projection of feed use by livestock with 1968 as the base year. The 1964 estimates can now be checked against a series published by the OECD. The comparison is shown in Table 1.

The grain utilization rates used for pork, poultry and eggs in making these computations in Table 2 are shown below. Changes in these rates reflect both changes in technical efficiency and replacement of other feeds by grain, hence

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[1] V. Sorenson and D. Hathaway, The Grain Livestock Economic and Trade Patterns of the European Economic Community with Projections to 1970 and 1975. Research Report No.5. East Lansing: Institute of International Agriculture, 1968.

Table E.1 Estimates of Feed Grain Utilization in 1964 OECD Agricultural Statistics 1965-68 and MSU Study (000 metric tons)		
Germany	Industrial and Other	Livestock
OECD	n.a.	11,485
Study	3,001	11,490
France		
OECD	n.a.	12,921
Study	1,697	12,500
Italy		
OECD	n.a.	8,196
Study	1,447	8,293
Belgium-Luxembourg		
OECD	n.a.	2,159
Study	431	2,157
Netherlands		
OECD	n.a.	3,711
Study	434	3,644

Table E.2 Grain Use Rates for Pork, Poultry and Eggs

Country and Product	1964	1968	1975 and 1980
Pork[1/]			
Belgium-Luxembourg			
Germany and Netherlands	3.22	3.31	3.13
France	3.47	3.35	3.14
Italy	5.92	5.15	5.25
Poultry[1/]			
Belgium-Luxembourg			
Germany and Netherlands	2.97	2.79	2.43
France	2.97	2.84	2.50
Italy	3.00	2.85	2.50
Eggs			
Belgium-Luxembourg			
Germany and Netherlands	3.70	3.44	3.10
France	3.50	3.37	3.10
Italy	3.02	3.16	3.39

[1/] Dressed weight basis.

in some cases increase through time.

In total the estimates on grain production and utilization indicate a continued closing of the gap between production and needs. A second rapid jump in yields such as occurred in the late 1960s could quickly result in a surplus overall balance. With self-sufficiency or more in poultry and eggs and pork, expansion of feed use for these products will be limited as compared with recent changes. Imports will be closely related to amounts exported and to cattle feeding. But as shown in Table 3, the amounts available from internal production for these two uses will increase.

Table E.3 EEC: Grain Utilization and Balance (000 metric tons)

Year	Pork, Poultry and Eggs	Industrial and Seed	Human Consumption	Total Prod.	Remaining for Livestock and Export
1964	25,691	6,084	22,729	61,160	8,230
1968	29,379	7,866	22,239	70,400	10,916
1975	34,434	8,096	21,212	78,969	15,227
1980	37,380	8,500	20,722	89,181	22,579

Table E.4 EEC: Production of Main Cereal and Livestock Products, 1964 and 1968 with Projections

	1964	1968	1975	1980
	Beef and Veal (000 m.t.)			
Belgium-Luxembourg	217	227	254	268
France	1,428	1,648	1,980	2.178
Germany	1,077	1,192	1,381	1,533
Italy	541	590	654	660
Netherlands	257	295	371	414
Total	3,520	3,952	4,640	5,053
	Pork (000 m.t.)			
Belgium-Luxembourg	213	350	436	466
France	1,102	1,220	1,327	1,426
Germany	1,862	2,150	2,625	2,887
Italy	454	432	533	608
Netherlands	433	628	774	805
Total	4,064	4,780	5,695	6,195
	Poultry (000 m.t.)			
Belgium-Luxembourg	89	91	112	128
France	550	680	853	936
Germany	146	210	413	496
Italy	340	532	890	1,068
Netherlands	128	213	346	415
Total	1,253	1,726	2,614	3,043
	Eggs (000 m.t.)			
Belgium-Luxembourg	182	193	210	224
France	560	621	757	874
Germany	628	809	1,043	1,183
Italy	458	408	605	641
Netherlands	290	223	225	244
Total	2,118	2,254	2,840	3,103
	Milk (000 m.t.)			
Belgium-Luxembourg	4,004	4,134	4,458	4,658
France	24,500	31,585	39,737	43,710
Germany	20,840	22,171	25,854	27,146
Italy	8,971	10,280	12,301	12,916
Netherlands	6,956	7,800	8,772	9,342
Total	65,271	75,970	91,123	97,772

(continued)

	1964	1968	1975	1980
	Food Grain (000 m.t.)			
Belgium-Luxembourg	950	866	903	952
France	13,980	14,705	15,708	17,828
Germany	8,705	9,234	9,417	10,170
Italy	9,198	10,193	11,263	11,826
Netherlands	712	706	749	794
Total	33,545	35,704	38,040	41,570
	Feed Grain (000 m.t.)			
Belgium-Luxembourg	1,086	1,126	930	946
France	13,384	18,153	25,171	27,351
Germany	7,111	9,441	12,574	13,139
Italy	4,757	4,964	5,172	5,110
Netherlands	1,277	1,011	1,038	1,065
Total	27,615	34,696	44,885	47,611
	Total Grain (000 m.t.)			
Belgium-Luxembourg	2,036	1,992	1,745	1,898
France	27,364	32,858	38,937	45,179
Germany	15,816	18,675	20,938	23,309
Italy	13,955	15,157	15,648	16,936
Netherlands	1,989	1,717	1,701	1,859
Total	61,160	70,400	78,969	89,181

Table E.5 EEC: Consumption of Main Cereal and Livestock Products, 1964 and 1968 with Projections

	1964	1968	1975	1980
	Beef and Veal (000 m.t.)			
Belgium-Luxembourg	270	236	294	352
France	1,395	1,383	1,558	1,708
Germany	1,220	1,318	1,610	1,913
Italy	839	1,139	1,531	1,665
Netherlands	228	240	299	363
Total	3,952	4,341	5,292	6,001
	Pork (000 m.t.)			
Belgium-Luxembourg	217	310	344	392
France	1,195	1,349	1,558	1,692
Germany	1,916	2,210	2,490	2,680
Italy	465	491	605	689
Netherlands	274	357	507	604
Total	4,067	4,717	5,504	6,057
	Poultry (000 m.t.)			
Belgium-Luxembourg	85	68	79	94
France	572	624	821	930
Germany	350	427	599	735
Italy	358	538	849	964
Netherlands	47	66	142	175
Total	1,412	1,744	2,490	2,898
	Eggs (000 m.t.)			
Belgium-Luxembourg	123	141	168	178
France	557	609	721	777
Germany	785	878	1,067	1,145
Italy	514	491	582	654
Netherlands	158	145	178	201
Total	2,137	2,264	2,716	2,955
	Milk (000 m.t.)			
Belgium-Luxembourg	4,160	3,852	4,313	4,597
France	18,553	21,021	24,780	26,411
Germany	19,189	21,178	22,804	24,308
Italy	8,985	10,191	12,070	13,738
Netherlands	5,896	3,740	4,086	4,504
Total	56,783	59,853	68,053	73,558

(continued)

	1964	1968	1975	1980
	Food Grain (000 m.t.)			
Belgium-Luxembourg	1,066	1,108	1,012	938
France	5,975	5,587	5,185	5,018
Germany	6,057	5,537	5,064	4,981
Italy	8,853	8,962	8,797	8,597
Netherlands	1,166	1,185	1,154	1,184
Total	23,117	22,239	21,212	20,718
	Feed Grain (000 m.t.)			
Belgium-Luxembourg	2,588	3,066	3,568	3,901
France	14,197	16,640	21,112	22,023
Germany	14,491	16,860	21,106	23,011
Italy	9,740	10,110	12,066	13,223
Netherlands	4,078	4,475	4,280	4,681
Total	45,094	51,032	61,132	66,839
	Total Grain (000 m.t.)			
Belgium-Luxembourg	3,654	4,174	4,580	4,839
France	20,172	22,227	25,297	27,041
Germany	20,548	22,397	26,170	27,992
Italy	18,593	19,072	20,863	21,820
Netherlands	5,244	5,660	5,434	5,865
Total	68,211	73,271	82,344	87,557

APPENDIX F

METHODOLOGY FOR DEMAND AND SUPPLY ANALYSIS

Methodology For Supply and Demand Analysis

Method For Estimating Future Demand For Food at the Retail Level

The general procedure was to establish demand relationships linking per capita consumption of each food good with its own retail price, the price of each of the other food goods, non-food prices, and money income level. The prices of all goods were then specified along with money income for the period 1968-1980 under the various policy 'case' assumptions. Prices were not estimated by the demand model; they were established in a separate routine in the computer program from assumptions about farm prices and about the behavior over time of retail-farm margins.

It was decided to work with percentage changes in price and quantity variables. Each demand relationship comprised a set of elasticities. These were allowed to change from year to year, except where constant elasticities were imposed after examination of past data. For each commodity the relationship between per capita consumption in one year and the value in the next was:

$$\frac{D(I)_t - D(I)_{t-1}}{D(I)_{t-1}} = \sum_{J=1}^{N} E(I,J)_{t-1} \cdot U(J)_t + E(I,Y)_{t-1}\, U(Y)_t$$

$$\therefore \quad D(I)_t = D(I)_{t-1} \left[1 + \sum_{J=1}^{N} E(I,J)_{t-1} \cdot U(J)_t + E(I,Y)_{t-1} \cdot U(Y)_t\right]$$

where $D(I)_t$ refers to the per capita consumption of good I in time period t; $E(I,J)$ refers to the elasticity of the quantity of good I and the price of good J (J=I for the direct price elasticity, and J=N for the elasticity of consumption with respect to non-food prices); $E(I,Y)$ is the income elasticity of good I; $U(J)_t$, $U(Y)_t$ are the proportionate changes in prices and income from year t-1 to year t.

The elasticity values were computed in three ways: a) time series regression analysis, b) implicit cross elasticities from budget constraints, and c) implied cross elasticities with non-food prices from an assumption of zero-degree homogeneity. For each commodity, regression analysis on the quantities and non-deflated prices and income were used to derive the elasticities of the consumption of each good with its own price, the price of _a priori_ substitutes and complements (i.e. those goods for which it was expected in advance that the cross elasticity would be either positive or negative), and with income. For those pairs of goods where no _a priori_ relationship was established, the cross elasticity was derived from the implicit effect on expenditure of a price change. If the price of good I rises by U(I) percent, then expenditure on that good increases by $[1 + E(I,I)] \cdot U(I)$ percent, where E(I,I) is the direct price elasticity (usually negative). The effect on total expenditure is:

$$A(I)\,[1 + E(I,I)] \cdot U(I)$$

where A(I) is the proportion of total expenditure accounted for by that commodity. The effect on consumption of good J is thus:

$$- E(J,Y) \cdot A(I)\,[1 + E(I,I)] \cdot U(I)$$

and the cross elasticity between goods J, and I is:

$$E(J,I) = - E(J,Y) \cdot A(I)\,[1 + E(I,I)]$$

This relationship only holds where A(I) is small so there is no appreciable effect on the marginal utility of money arising from the change in I's price. The change in the price of non-food prices could not be handled this way; instead it was decided after examination of other methods to derive the cross elasticities of foods with non-food prices by restricting the demand relationship to be homogeneous of degree zero. This implies that general inflation throughout the economy does not change the relationship between the quantities of the various food goods. In other words 'money illusion' is absent from food purchases; a 10 percent change in _all_ prices and money income leaves the consumption pattern unchanged. This meant that the cross elasticity with respect to non-food goods was:

$$E(I,N) = \sum_{J=1}^{N-1} (I,J) - E(I,Y)$$

In this way, all the elasticities and cross elasticities were established and used to compute demand changes corresponding to assumed price and income shifts.

The resulting demands are presented as both per capita and total figures, the latter from an assumption on future population growth.

Supply

As in the development of the demand section, basic relationships were estimated from time series using traditional least squares procedures. In most cases, "reasonable" supply equations were obtained with statistically significant coefficients (at the 5 percent level) and expected signs. Equations with "wrong" signs were not used and projections of the dependent variable were made directly using past trends and judgement. The number of such equations, however, was relatively small.

For the U.K. and Denmark, gross margin type variables were used in the basic supply equations. The rationale for their use is explained in Chapter II. Also employed in most of the basic supply equations was a distributed lag expectation - adjustment model. This involved using the dependent variable lagged one year as an independent variable. The gross margin or price variable was also lagged by one year.

There are convincing arguments that a response to a change in profits or price will not take place once and for all within a year but may be distributed over several years. The separate steps in the sequence from a profit or price change to a change in expectations to an adjustment in output cannot be measured, but the price change - output change relationship can. One such means is to use the lagged dependent variable as an independent variable.

The coefficient on the lagged dependent variable is indicative of the impact of gross margins or prices (and other independent variables in the equation) in earlier years on the dependent variable for next year. A value close to one would suggest that the independent variables of earlier years were of major importance while a value of near zero would mean that the independent variables of earlier years were of minor importance. If the value were near zero on the lagged dependent variable, then a change in the profit or price variable would be registered in the dependent variable in the forthcoming year but no further response to this change would develop in ensuing years. Equations in which no lagged dependent variable was used would give the same results, of course.

Total Model

The regression equations provided the basic supply relationships used in the models. Additional equations were required to complete the models. Such equations were for projecting yields, production rates, marketing margins, etc. and were not necessarily obtained by statistical methods. Basic farm prices were projected a 'priori for the "Outside EEC" cases and current EEC prices were the principal basis for projecting 1980 prices for the "In EEC" cases.

When completed, the models generated recursively annual data for 1969-80, once the initial conditions for 1968 were specified. Such models can be used to describe the time path of the endogenous variables over the projection period -- and consequently, the models project ahead for both the short and long term. The models, however, are more suitable for projecting one to five years ahead than five to ten years ahead. Errors in projecting into the near future would tend to become cumulative and widen into the more distant future.

Another advantage of a model of this type is its flexibility in allowing an analyst to simulate alternative future conditions. Farm programs phasing in or out at alternative times can be tested. Crop yields can be generated randomly to simulate the effects of weather and disease. Other examples can be cited.

Related to this is the ease of updating the model. Initial conditions can be easily changed as well as any of the coefficients incorporated in the model if new information dictates some alterations.

APPENDIX G

FARM PRICES 1968-70 AND PROJECTED TO 1980

Table G.1 U.K. Prices, 1968-1972 (Partially Forecast)

Code	Item			Years		
				t = 0 = 1968		
		0	1	2	3	4
Code	Item	1968	1969	1970	1971	1972
				$/kg. or $		
P(11)	Liquid Milk	.1069	.1078	.1158	.1274	.1284
P(12)	Manufacturing Milk	.0437	.0433	.0462	.0508	.0508
P(13)	Butter and skim	.0267	.0267	.0300	.0300	.0300
P(14)	Cheese	.0477	.0478	.0510	.0561	.0561
P(15)	Cream	.0569	.0569	.0607	.0630	.0630
W(10)	N.Z. Skim Milk Powder	.2057	.2057	.2670	.2670	.2670
	Fat Cattle					
P(21)	Market	.4490	.4597	.4838	.5070	.5070
P(20)	Gross	.4857	.5107	.5490	.5834	.5900
	Lambs					
P(31)	Market	.8677	.9365	.9101	.9331	.9762
P(30)	Gross	.9418	.9841	1.0635	1.1800	1.2000
	Pigs					
P(41)	Market	.5873	.6164	.6879	.6879	.6879
P(40)	Gross	.6323	.6667	.7090	.7752	.7462
P(60)	Eggs	.5397	.5397	.5613	.5400	.5079
P(50)	Broilers	.3706	.3687	.4000	.4000	.4000
P(51)	Turkeys	.6896	.7206	.7540	.7540	.7000
	Barley					
P(71)	Market	.0515	.0510	.0685	.0685	.0615
P(70)	Gross	.0595	.0614	.0685	.0685	.0685
	Wheat					
P(73)	Market	.0536	.0557	.0661	.0661	.0615
P(72)	Gross	.0647	.0685	.0737	.0770	.0770
	Oats					
P(75)	Market	.0482	.0477	.0609	.0609	.0554
P(74)	Gross	.0657	.0657	.0657	.0680	.0680
Z(21)	Beef Calf Subsidy/Calf ($)	24.3	24.3	24.3	24.3	24.3
Z(22)	Beef Cow, Hill Subsidy/Cow($)	35.9	35.2	41.5	42.6	44.5
Z(31)	Hill Sheep, Winter Keep Subsidy/Ewe	2.952	2.952	3.552	4.152	4.152
P(32)	Wool, Guaranteed Price	1.1382	1.1382	1.1382	1.1382	1.1639
F(72)	Maize Imported, C.i.f.	.0573	.0618	.0756	.0756	.0684
F(70)	Fertilizer Cost on Barley/ha. ($)	25.25	25.40	26.60	27.60	28.60
F(71)	Fertilizer Cost on Wheat/ha. (4)	32.37	32.57	34.00	35.33	36.65
F(73)	Price of Imported Oilcakes, c.i.f.	.0921	.0974	.0974	.0974	.0974

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Table G.2 U.K. Prices, 1973-1980, Case I[1/]

Code	Item	5	6	7	8	9	10	11	12
		1973	1974	1975	1976	1977	1978	1979	1980
					$/kg. or $				
P(11)	Liquid Milk	.1294	.1304	.1314	.1324	.1334	.1344	.1354	.1364
P(12)	Manufacturing Milk	.0512	.0516	.0520	.0524	.0528	.0532	.0536	.0540
P(13)	Butter and Skim	.0304	.0308	.0312	.0316	.0320	.0324	.0328	.0332
P(14)	Cheese	.0565	.0569	.0573	.0517	.0581	.0585	.0589	.0593
P(15)	Cream	.0634	.0638	.0642	.0646	.0650	.0654	.0658	.0662
W(10)	N.Z. Skim Milk Powder	.2690	.2710	.2730	.2750	.2770	.2790	.2810	.2830
	Fat Cattle								
P(21)	Market	.5176	.5282	.5388	.5494	.5600	.5600	.5600	.5600
P(20)	Gross	.6043	.6186	.6329	.6472	.6615	.6615	.6615	.6615
	Lambs								
P(31)	Market	.9962	1.0162	1.0362	1.0562	1.0762	1.0762	1.0762	1.0762
P(30)	Gross	1.2200	1.2400	1.2600	1.2800	1.3000	1.3000	1.3000	1.3000
	Pigs								
P(41)	Market	.6465	.6465	.6465	.6465	.6465	.6465	.6465	.6465
P(40)	Gross	.7537	.7612	.7687	.7762	.7837	.7837	.7837	.7837
P(60)	Eggs	.5079	.5079	.5079	.5079	.5079	.5079	.5079	.5079
P(50)	Broilers	.4000	.4000	.4000	.4000	.4000	.4000	.4000	.4000
P(51)	Turkeys	.6800	.6800	.6800	.6800	.6800	.6800	.6800	.6800
	Barley								
P(71)	Market	.0615	.0615	.0615	.0615	.0615	.0615	.0615	.0615
P(70)	Gross	.0691	.0697	.0703	.0709	.0715	.0715	.0715	.0715
	Wheat								
P(73)	Market	.0615	.0615	.0615	.0615	.0615	.0615	.0615	.0615
P(72)	Gross	.0776	.0782	.0788	.0794	.0800	.0800	.0800	.0800
	Oats								
P(75)	Market	.0554	.0554	.0554	.0554	.0554	.0554	.0554	.0554
P(74)	Gross	.0682	.0684	.0686	.0688	.0690	.0690	.0690	.0690
Z(21)	Beef Calf Subsidy/Calf ($)	25.14	25.98	26.82	27.66	28.50	28.50	28.50	28.50
Z(22)	Beef Cow, Hill Subsidy/Cow ($)	46.9	49.3	51.7	54.1	56.5	56.5	56.5	56.5
Z(31)	Hill Sheep, Winter Keep Subsidy/Ewe ($)	4.322	4.492	4.662	4.832	5.000	5.000	5.000	5.000

Years: t = 0 = 1968

Table G.2 U.K. Prices, 1973-1980, Case I[1/] (Continued)

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years (t = 0 = 1968)							
		$/kg. or $							
P(32)	Wool, Guaranteed Price								
F(72)	Maize Imported, c.i.f.	.0684	.0684	.0684	.0684	.0684	.0684	.0684	.0684
F(70)	Fertilizer Cost on Barley/ha. ($)	28.80	29.00	29.20	29.40	29.60	29.80	30.00	30.20
F(71)	Fertilizer Cost on Wheat/ha. ($)	36.90	37.15	37.40	37.65	37.90	38.15	38.40	38.65
F(73)	Price of Imported Oilcakes, c.i.f.	.1004	.1034	.1064	.1094	.1124	.1154	.1184	.1214

1/ Out EEC, deficiency payment program, 2.9 percent real economic growth, 4.0 percent inflation, cereal and livestock prices stabilizing, 1977-1980.

Table G.3 U.K. Prices, 1973-1980, Case II[1/]

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years, t = 0 = 1968							
					$/kg. or $				
P(11)	Liquid Milk	.1294	.1304	.1314	.1324	.1334	.1344	.1354	.1364
P(12)	Manufacturing Milk	.0512	.0516	.0520	.0524	.0528	.0532	.0536	.0540
P(13)	Butter and Skim	.0304	.0308	.0312	.0316	.0320	.0324	.0328	.0332
P(14)	Cheese	.0565	.0569	.0573	.0577	.0581	.0585	.0589	.0593
P(15)	Cream	.0634	.0638	.0642	.0646	.0650	.0654	.0658	.0662
W(10)	N.Z. Skim Milk Powder	.2690	.2710	.2730	.2750	.2770	.2790	.2810	.2830
	Fat Cattle								
P(21)	Market	.5490	.5910	.6329	.6472	.6615	.6615	.6615	.6615
P(20)	Gross	.6043	.6186	.6329	.6472	.6615	.6615	.6615	.6615
	Lambs								
P(31)	Market	1.0708	1.1654	1.2600	1.2800	1.3000	1.3000	1.3000	1.3000
P(30)	Gross	1.2200	1.2400	1.2600	1.2800	1.3000	1.3000	1.3000	1.3000
	Pigs								
P(41)	Market	.7333	.7787	.8242	.8268	.8294	.8294	.8294	.8294
P(40)	Gross	.7722	.7982	.8242	.8268	.8294	.8294	.8294	.8294
P(60)	Eggs	.5186	.5293	.5400	.5400	.5400	.5400	.5400	.5400
P(50)	Broilers	.4055	.4110	.4165	.4165	.4165	.4165	.4165	.4165
P(51)	Turkeys	.7000	.7000	.7000	.7000	.7000	.7000	.7000	.7000
	Barley								
P(71)	Market	.0644	.0673	.0703	.0709	.0715	.0715	.0715	.0715
P(70)	Gross	.0691	.0697	.0703	.0709	.0715	.0715	.0715	.0715
	Wheat								
P(73)	Market	.0673	.0731	.0788	.0794	.0800	.0800	.0800	.0800
P(72)	Gross	.0776	.0782	.0788	.0794	.0800	.0800	.0800	.0800
	Oats								
P(75)	Market	.0598	.0642	.0686	.0688	.0690	.0690	.0690	.0690
P(74)	Gross	.0682	.0684	.0686	.0688	.0690	.0690	.0690	.0690
Z(21)	Beef Calf Subsidy/Calf ($)	25.14	25.98	26.82	27.66	28.50	28.50	28.50	28.50
Z(22)	Beef Cow, Hill Subsidy/ Cow ($)	46.9	49.3	51.7	54.1	56.5	56.5	56.5	56.5

Table G.3 U.K. Prices, 1973-1980, Case II[1/] (Continued)

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years t = 0 = 1968							
		$/kg. or $							
Z(31)	Hill Sheep, Winter Keep Subsidy/Ewe ($)	4.322	4.492	4.662	4.832	5.000	5.000	5.000	5.000
P(32)	Wood, Guaranteed Price								
F(72)	Maize Imported, c.i.f.	.0728	.0772	.0816	.0822	.0828	.0828	.0828	.0828
F(70)	Fertilizer Cost on Barley/ha. ($)	28.80	29.00	29.20	29.40	29.60	29.80	30.00	30.20
F(71)	Fertilizer Cost on Wheat/ha. ($)	36.90	37.15	37.40	37.65	37.90	38.15	38.40	38.65
F(73)	Price of Imported Oilcakes, c.i.f.	.1004	.1034	.1064	.1094	.1124	.1154	.1184	.1214

1/ Out EEC, variable levy-minimum import price program of Conservative government, 2.9 percent real economic growth, 4.0 percent inflation, cereal and livestock prices stabilizing, 1977-1980.

Table G.4 U.K. Prices, 1973-1980, Cases III and IV[1/]

		Years							
		t = 0 = 1968							
Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		$/kg. or $							
P(11)	Liquid Milk	.1245	.1206	.1167	.1128	.1090	.1090	.1090	.1090
P(12)	Manufacturing Milk	.0624	.0740	.0856	.0972	.1090	.1090	.1090	.1090
P(13)	Butter and Skim	.0438	.0576	.0714	.0852	.0989	.0989	.0989	.0989
P(14)	Cheese	.0668	.0775	.0882	.0989	.1098	.1098	.1098	.1098
P(15)	Cream	.0722	.0814	.0906	.0998	.1090	.1090	.1090	.1090
W(10)	N.Z. Skim Milk Powder	.3076	.3482	.3888	.4294	.4700	.4700	.4700	.4700
	Fat Cattle								
P(21)	Market	.5709	.6348	.6987	.7626	.8265	.8265	.8265	.8265
P(20)	Gross	.6373	.6846	.7319	.7792	.8265	.8265	.8265	.8265
	Lambs								
P(31)	Market	1.0456	1.1115	1.1844	1.2538	1.3230	1.3230	1.3230	1.3230
P(30)	Gross	1.2246	1.2492	1.2738	1.2984	1.3230	1.3230	1.3230	1.3230
	Pigs								
P(41)	Market	.7303	.7727	.8151	.8575	.9000	.9000	.9000	.9000
P(40)	Gross	.7770	.8078	.8386	.8694	.9000	.9000	.9000	.9000
P(60)	Eggs	.5223	.5367	.5511	.5655	.5800	.5800	.5800	.5800
P(50)	Broilers	.4126	.4252	.4378	.4504	.4631	.4631	.4631	.4631
P(51)	Turkeys	.7055	.7110	.7165	.7220	.7277	.7277	.7277	.7277
	Barley								
P(71)	Market	.0678	.0741	.0804	.0867	.0928	.0928	.0928	.0928
P(70)	Gross	.0734	.0783	.0832	.0881	.0928	.0928	.0928	.0928
	Wheat								
P(73)	Market	.0693	.0771	.0849	.0927	.1007	.1007	.1007	.1007
P(72)	Gross	.0817	.0864	.0911	.0958	.1007	.1007	.1007	.1007
	Oats								
P(75)	Market	.0617	.0680	.0743	.0806	.0867	.0867	.0867	.0867
P(74)	Gross	.0717	.0754	.0791	.0828	.0867	.0867	.0867	.0867
Z(21)	Beef Calf Subsidy/Calf ($)	19.4	14.5	9.6	4.7	0	0	0	0

Table G.4 U.K. Prices, 1973-1980, Cases III and IV[1/] (Continued)

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years, t = 0 = 1968							
					$/kg. or $				
Z(22)	Beef Cow, Hill Subsidy/Cow ($)	43.9	43.3	42.7	42.1	41.5	41.5	41.5	41.5
Z(31)	Hill Sheep, Winter Keep Subsidy/Ewe ($)	4.322	4.492	4.662	4.832	5.000	5.000	5.000	5.000
P(32)	Wool, Guaranteed Price								
F(72)	Maize Imported, c.i.f.	.0742	.0800	.0858	.0916	.0976	.0976	.0976	.0976
F(70)	Fertilizer Cost on Barley/ha. ($)	30.46	32.32	34.18	36.04	37.90	38.10	38.30	38.50
F(71)	Fertilizer Cost on Wheat/ha. ($)	39.05	41.45	43.85	46.25	48.65	48.90	49.15	49.40
F(73)	Price of Imported Oilcakes, c.i.f.	.1004	.1034	.1064	.1094	.1124	.1154	.1184	.1214

[1/] Case III: In EEC, transition period from 1972-1977, 2.9 percent real economic growth, 4.0 percent inflation.

Case IV: In EEC, transition period from 1972-1977, 3.4 percent real economic growth, 5.0 percent inflation.

Table G.5 Ireland Prices, 1968-1972 (Partially Forecast)

		Years				
		t = 0 = 1968				
Code	Item	0 1968	1 1969	2 1970	3 1971	4 1972
		$/kg. or $				
P(11)	Milk, Net of Subsidies	.0409	.0409	.0409	.0439	.0452
P(13)	Butter, Export	.6314	.5379	.6393	.7072	.7072
P(14)	Cheese, Export	.6898	.6843	.6689	.7360	.7700
W(10)	N.Z. Skim Milk Powder	.2057	.2057	.2670	.2670	.2670
Z(10)	Direct Milk Subsidies	.0140	.0150	.0160	.0170	.0180
P(21)	Fat Cattle, Live	.4299	.4464	.4865	.5121	.5121
Z(21)	Direct Cattle Subsidies	.0240	.0300	.0300	.0330	.0360
P(31)	Fat Lambs, Live	.5008	.5617	.5461	.5599	.5857
P(41)	Bacon Pigs, d.w.	.6425	.6496	.7086	.7181	.7181
P(51)	Turkeys, $/head	4.750	5.140	5.376	5.376	5.000
P(60)	Eggs	.6319	.6319	.6319	.6319	.6319
P(71)	Barley	.0566	.0600	.0650	.0650	.0615
P(73)	Wheat	.0800	.0722	.0722	.0722	.0722
P(75)	Oats	.0535	.0535	.0575	.0575	.0554

Table G. 6 Ireland Prices, 1973-1980, Case I[1/]

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
					$/kg. or $				
P(11)	Milk, Net of Subsidies	.0456	.0460	.0464	.0468	.0472	.0476	.0480	.0484
P(13)	Butter, Export	.7107	.7142	.7177	.7212	.7247	.7282	.7317	.7355
P(14)	Cheese, Export	.7800	.7900	.8000	.8100	.8200	.8300	.8400	.8500
W(10)	N.Z. Skim Milk Powder	.2690	.2710	.2730	.2750	.2770	.2790	.2810	.2830
Z(10)	Direct Milk Subsidies	.0190	.0200	.0210	.0220	.0230	.0240	.0250	.0260
P(21)	Fat Cattle, Live	.5228	.5335	.5442	.5549	.5656	.5656	.5656	.5656
Z(21)	Direct Cattle Subsidies	.0390	.0420	.0450	.0480	.0510	.0510	.0510	.0510
P(31)	Fat Lambs, Live	.5977	.6097	.6217	.6337	.6457	.6457	.6457	.6457
P(41)	Bacon Pigs, d.w.	.6840	.6840	.6840	.6840	.6840	.6840	.6840	.6840
P(51)	Turkeys, $/head	4.850	4.850	4.850	4.850	4.850	4.850	4.850	4.850
P(60)	Eggs	.6319	.6319	.6319	.6319	.6319	.6319	.6319	.6319
P(71)	Barley	.0615	.0615	.0615	.0615	.0615	.0615	.0615	.0615
P(73)	Wheat	.0722	.0722	.0722	.0722	.0722	.0722	.0722	.0722
P(75)	Oats	.0554	.0554	.0554	.0554	.0554	.0554	.0554	.0554

Years: t = 0 = 1968

[1/] Out EEC, continuation of current program, 4.2 percent real economic growth, 4.0 percent inflation.

Table G. 7 Ireland Prices, 1973-1980, Case III[1/]

Code	Item	1 1973	2 1974	3 1975	4 1976	5 1977	6 1978	7 1979	8 1980
		Years t = 0 = 1968							
		$/kg. or $							
P(11)	Milk, Net of Subsidies	.0580	.0708	.0836	.0964	.1090	.1090	.1090	.1090
P(13)	Butter, Export	.9217	1.1362	1.3507	1.5652	1.7800	1.7800	1.7800	1.7800
P(14)	Cheese, Export	.9310	1.0920	1.2530	1.4140	1.5750	1.5750	1.5750	1.5750
W(10)	N.Z. Skim Milk Powder	.3076	.3482	.3888	.4294	.4700	.4700	.4700	.4700
Z(10)	Direct Milk Subsidies	.0144	.0108	.0072	.0036	0	0	0	0
P(21)	Fat Cattle, Live	.5750	.6379	.7008	.7637	.7637	.7637	.7637	.7637
Z(21)	Direct Cattle Subsidies	.0288	.0216	.0144	.0072	0	0	0	0
P(31)	Fat Lambs, Live	.6224	.6591	.6958	.7325	.7692	.7692	.7692	.7692
P(41)	Bacon Pigs, d.w.	.7545	.7909	.8273	.8637	.9000	.9000	.9000	.9000
P(51)	Turkeys, $/head	5.455	5.910	6.365	6.820	7.277	7.277	7.277	7.277
P(60)	Eggs	.6215	.6111	.6007	.5903	.5800	.5800	.5800	.5800
P(71)	Barley	.0678	.0741	.0804	.0867	.0928	.0928	.0928	.0928
P(73)	Wheat	.0779	.0836	.0893	.0950	.1007	.1007	.1007	.1007
P(75)	Oats	.0617	.0680	.0743	.0806	.0867	.0867	.0867	.0867

[1/] In EEC, transition period from 1972-1977, 4.2 percent real economic growth, 4.0 percent inflation.

Table G.8 Denmark Prices, 1968-1972 (Partially Forecast)

Code	Item	0 1968	1 1969	2 1970	3 1971	4 1972
		Years, t = 0 = 1968				
				$/kg.		
P(13)	Butter Price, Export	.7851	.8118	.9024	.8834	.8834
P(14)	Cheese Price, Export	.4932	.5305	.5772	.6185	.6185
P(18)	Skim Milk Price, Export	.0158	.0172	.0176	.0193	.0193
P(21)	Heifer Beef Price, Market	.6265	.7620	.8175	.8500	.8500
P(41)	Pigmeat, Nationwide Quote	.5707	.6372	.6945	.6653	.6653
P(52)	Broiler Price, Export	.3145	.3186	.3306	.3306	.3306
P(61)	Egg Price, Export	.3067	.2347	.1907	.2000	.2000
P(71)	Barley Price, Market, Crop Year	.0564	.0637	.0665	.0665	.0665
W(11)	Oilcake Price, Wholesale	.1030	.1030	.1075	.1090	.1090
P(111)	Liquid Milk, H.M. Price	.0719	.0752	.0781	.0820	.0840
P(131)	Butter, H.M. Price	1.3333	1.3810	1.4423	1.5063	1.5213
P(141)	Cheese, H.M. Price	.6465	.7105	.7446	.8287	.8517
P(211)	Heifer Beef, H.M. Price	.6625	.7620	.8175	.8500	.8691
P(42)	Pigmeat, H.M. Price	.8105	.8186	.8345	.8500	.8655
P(53)	Broilers, H.M. Price	.6958	.6998	.5853	.5946	.6034
P(62)	Eggs, H.M. Price	.6332	.6373	.6413	.6430	.6447

Table G.9 Denmark Prices, 1973-1980, Case I 1/

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years t = 0 = 1968							
		$/kg.							
P(13)	Butter Price, Export	.8874	.8914	.8954	.8994	.9034	.9074	.9114	.9154
P(14)	Cheese Price, Export	.6285	.6385	.6485	.6585	.6685	.6785	.6885	.6985
P(18)	Skim Milk Price, Export	.0195	.0197	.0199	.0201	.0203	.0205	.0207	.0209
P(21)	Heifer Beef Price, Market	.8665	..8830	.8995	.9160	.9325	.9325	.9325	.9325
P(41)	Pigmeat, Nationwide Quote	.6653	.6653	.6653	.6653	.6653	.6653	.6653	.6653
P(52)	Broiler Price, Export	.3306	.3306	.3306	.3306	.3306	.3306	.3306	.3306
P(61)	Egg Price, Export	.2000	.2000	.2000	.2000	.2000	.2000	.2000	.2000
P(71)	Barley Price, Market, Crop Year	.0665	.0665	.0665	.0665	.0665	.0665	.0665	.0665
W(11)	Oilcake Price, Wholesale	.1120	.1150	.1180	.1210	.1240	.1270	.1300	.1330
P(111)	Liquid Milk, H.M. Price	.0860	.0880	.0900	.0920	.0940	.0960	.0980	.1000
P(131)	Butter, H.M. Price	1.5363	1.5513	1.5663	1.5813	1.5963	1.6113	1.6263	1.6413
P(141)	Cheese, H.M. Price	.8747	.8977	.9207	.9437	.9667	.9897	1.0127	1.0357
P(211)	Heifer Beef, H.M. Price	.8882	.9073	.9264	.9455	.9646	.9837	1.0028	1.0219
P(42)	Pigmeat, H.M. Price	.8823	.8991	.9159	.9327	.9495	.9663	.9831	1.0000
P(53)	Broilers, H.M. Price	.5771	.5508	.5245	.4982	.4720	.4720	.4720	.4720
P(62)	Eggs, H.M. Price	.6002	.5557	.5112	.4667	.4223	.4223	.4223	.4223

1/ Out EEC, current domestic program, 3.0 percent real economic growth, 4.0 percent inflation.

Table G.10 Denmark Prices, 1973-1980, Case III[1/]

Code	Item	5 1973	6 1974	7 1975	8 1976	9 1977	10 1978	11 1979	12 1980
		Years t = 0 = 1968							
		$/kg.							
P(13)	Butter Price, Export	1.0627	1.2420	1.4213	1.6006	1.7800	1.7800	1.7800	1.7800
P(14)	Cheese Price, Export	.8098	1.0011	1.1924	1.3837	1.5750	1.5750	1.5750	1.5750
P(18)	Skim Milk Price, Export	.0195	.0197	.0199	.0201	.0203	.0205	.0207	.0209
P(21)	Heifer Beef Price, Market	.9555	1.0610	1.1665	1.2720	1.3775	1.3775	1.3775	1.3775
P(41)	Pigmeat, Nationwide Quote	.7122	.7591	.8060	.8529	.9000	.9000	.9000	.9000
P(52)	Broiler Price, Export	.3880	.4454	.5028	.5602	.6175	.6175	.6175	.6175
P(61)	Egg Price, Export	.2760	.3520	.4280	.5040	.5800	.5800	.5800	.5800
P(71)	Barley Price, Market, Crop Year	.0718	.0771	.0824	.0877	.0928	.0928	.0928	.0928
W(11)	Oilcake Price, Wholesale	.1120	.1150	.1180	.1210	.1240	.1270	.1300	.1330
P(111)	Liquid Milk, H.M. Price	.0890	.0940	.0990	.1040	.1090	.1090	.1090	.1090
P(131)	Butter, H.M. Price	1.5730	1.6247	1.6764	1.7281	1.7800	1.7800	1.7800	1.7800
P(141)	Cheese, H.M. Price	.9964	1.1411	1.2858	1.4305	1.5750	1.5750	1.5750	1.5750
P(211)	Heifer Beef, H.M. Price	.9708	1.0725	1.1742	1.2759	1.3775	1.3775	1.3775	1.3775
P(42)	Pigmeat, H.M. Price	.8724	.8793	.8862	.8931	.9000	.9000	.9000	.9000
P(53)	Broilers, H.M. Price	.6062	.6090	.6118	.6146	.6175	.6175	.6175	.6175
P(62)	Eggs, H.M. Price	.6318	.6189	.6060	.5931	.5800	.5800	.5800	.5800

[1/] In EEC, transition period of 1972-1977, 3.0 percent real economic growth, 4.0 percent inflation.

The following research reports were published under the U.S.D.A.-Michigan State University study entitled: Effects of Changing Price and Production Conditions in the European Economic Community on Agricultural Output and Imports of the Community and on U. S. Exports of Grain, Livestock and Livestock Products:

Research Report No. 1, The Grain-Livestock Economy of West Germany with Projections to 1970 and 1975 by George E. Rossmiller.

Research Report No. 2, The Grain-Livestock Economy of Italy with Projections to 1970 and 1975 by Fred A. Mangum, Jr.

Research Report No. 3, The Grain-Livestock Economy of France with Projections to 1970 and 1975 by Michel J. Petit and Jean-Baptiste Viallon.

Research Report No. 4, Changes in Regional Grain and Livestock Prices Under the European Economic Community Policies by Donald J. Epp.

Research Report No. 5, The Grain-Livestock Economy and Trade Patterns of the European Economic Community with Projections to 1970 and 1975 by Vernon L. Sorenson and Dale E. Hathaway.

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