PRIME MINISTER

Attached is a note from Sir Robert Armstrong (Flag A) covering ACARD's latest Report on the Food Industry and Technology, together with a minute from Robin Nicholson (Flag B) which summarises the Report. The conclusions of the Report are set out in Chapter 6 (Flag C) but I do not think you need look any further than Robin Nicholson's minute. Do you agree to the publication of the Report and that Peter Walker should take the lead in preparing the Government's response?

SPGeary (Duty Clerk)
pp Tim Flesher

Yes [illegible].

30 July, 1982

(N.B.) I note that there on the committee was no-one that has actual experience of managing a food company other than Mr. Shore. All the [illegible]

010

Ref: A09161

PRIME MINISTER

ACARD Report: The Food Industry and Technology

I have received from Sir Henry Chilver the attached letter with ACARD's latest report "The Food Industry and Technology".

2. The report describes the movement towards integration of agriculture with food manufacture and food distribution, concluding that the Government should recognise not just the significance of agriculture but the food chain as a whole.

3. ACARD's main theme is that the food manufacturing industry is facing increasing competition from overseas companies. A central conclusion is that both industry and Government should take steps to underpin the industry by respectively making effective use of technology and supporting basic research. There are several recommendations which bear on the arrangements for Government supported research and development in food. Chapter 6 in effect summarises the report and contains the conclusions and recommendations.

4. In preparing the Government's response the Minister of Agriculture, Fisheries and Food should be in the lead and I therefore attach a draft letter for your Private Secretary to send to the Ministry of Agriculture, Fisheries and Food inviting Mr. Walker to do so.

5. ACARD have, as usual, requested permission for the report to be published. I see no difficulty with this and suggest that permission be granted.

Robert Armstrong
(approved by Sir Robert Armstrong and signed in his absence)

30th July 1982

W.0472 29 July 1982

PRIME MINISTER

cc: Mr Sparrow
Sir Robert Armstrong
Mr Mackenzie
Dr Miles/Mr King

ACARD REPORT ON THE FOOD INDUSTRY AND TECHNOLOGY

1. The ACARD report on the Food Industry and Technology (which you have recently received) demonstrates the extent to which advances in technology and changes in consumer taste have changed the land → consumer food cycle from:
raw agricultural produce → wholesaler → retailer → consumer
to
raw agricultural produce → food processing company → retailer → consumer.

2. Now three-quarters of the food we eat has been processed from agricultural feedstock and there can be little doubt that this proportion will continue to increase.

3. Biotechnology promises to provide a major increase in land productivity for food production (by a factor of 10 according to some estimates) which, at least in industrialised countries, will far outstrip increase in demand for food. Additionally, biotechnology will allow the use of other feedstocks, eg natural gas, for food production.

4. Land which is surplus for food production purposes may either be used to produce agricultural products for use in other industries, eg energy, chemicals, or be converted to non-agricultural use.

5. Agricultural produce is therefore becoming a semi-finished product which may be processed in a variety of industries including, of course, the food industry. The market for agricultural produce will

depend on the market for the products of the end-user industries.

6. National and international policies which take agricultural produce as the key product will become increasingly out of step with market forces and will therefore need to be thought through afresh. For example in food itself, there would be more sense in a Common Food Policy than a Common Agricultural Policy.

RBN

ROBIN B NICHOLSON
Chief Scientist

ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT
70 Whitehall, London SW1A 2AS Telephone: 01-233

26 July 1982

Dear Sir Robert

I am writing to submit formally to the Prime Minister the Council's latest report, of which a copy is enclosed, and to request permission to publish it.

The report "The Food Industry and Technology" clearly shows the movement towards integration of agriculture with food manufacture and food distribution. Government should recognise this and extend its emphasis beyond agriculture to include the food chain as a whole.

In particular the report recommends that MAFF adopts an approach to management of food R & D reflecting the needs of industry in addition to departmental priorities and policy. A further main recommendation is that the ARC together with the ABRC should pursue a proposal for a Food Directorate within a retitled Agriculture and Food Research Council.

Recommendations are also directed to industry to recognise the role of technology in improving the industry's performance. While industry must set its own house in order the Government can do much to support the strategically important industry which has a workforce similar in size to agriculture.

An important theme of the report is that there are worrying signs that this major UK industry is facing increasing threat from overseas competitors both in the domestic and export markets. The long term health of the industry will depend on its ability to improve productivity, innovation and marketing. The report concludes that there must be a closer working relationship between the industry and Government. While the industry must improve its technical base the Government should underpin this particularly with basic scientific research.

The Working Group which prepared the report considers that the implementation of the recommendations is essential to the well-being of the food industry and the Council has endorsed this view.

The Council looks forward to receiving the Government's reply in due course.

Yours sincerely
Henry Chilver
SIR HENRY CHILVER

Sir Robert Armstrong KCB
Secretary to the Cabinet
Cabinet Office
70 Whitehall
London
SW1A 2AS

Agriculture

Ref. A09654

MR FLESHER

5/10

ACARD Report: 'Food Industry and Technology'

Your letter to me of 2nd August 1982 conveyed the Prime Minister's agreement that the report by the Advisory Council for Applied Research and Development (ACARD) should be published. Publication took place on 5th October. I enclose a printed copy for information.

2. I am copying this letter, and the report, to the private secretaries to other members of the Cabinet.

R P HATFIELD

5th October 1982

Agriculture

MR FLESHER

ACARD Report: The Food Industry and Technology

Sir Robert Armstrong wrote to the Prime Minister on 30 July 1982 (ref. A 09161) about this report, enclosing a draft letter for you to send to the Ministry of Agriculture, Fisheries and Food.

I now enclose 20 copies of the ACARD report to accompany your letter to Departments.

RTK.

R T KING

Cabinet Office
2 August 1982

THE FOOD INDUSTRY AND TECHNOLOGY

FOREWORD

The manufacture of food products accounts for about 8% of the total added value per head of UK manufacturing output. Overall, non-food manufacturing has suffered a long-term decline in both output and international competitiveness. So far, the amount of food manufacturing in Britain has been relatively stable. However, consumer preferences are broadening as life-styles change. New technologies in food preservation, packaging and distribution are rapidly making processed food more important in international trade. Overall labour productivity in the food manufacturing industry has increased far more slowly in the UK than in other European countries; France and Germany, in particular, are actively expanding their food industries and their export potential in food and agricultural produce.

Against this background, ACARD has studied the threats and opportunities facing the UK food manufacturing industry, concentrating on those threats and opportunities having technical implications. In December 1980 the Council approved the formation of a Working Group on Food Technology with the following terms of reference -

> To consider the impact of social and technological change on the production, processing and distribution of food.

To identify -

i. constraints to the application of new technology in the food industry;

ii. new market opportunities that might be exploited with the aid of new technology;

iii. R and D implications.

To make recommendations.

The members of the Working Group were -

*Dr D L Georgala (Chairman)	Head of Laboratory, Unilever Research, Colworth Laboratory
Sir Kenneth Blaxter FRS	Director, Rowett Research Institute
Professor D M Conning	Director, British Industrial Biological Research Association
Professor R F Curtis	Director, Food Research Institute
Dr J Edelman	Director of Research, The Lord Rank Research Laboratory
Mr S A Free OBE	Formerly Director, Rowntree Mackintosh Ltd
Professor A W Holmes	Director, British Food Manufacturing Industries Research Association
Mr D T Shore OBE	Managing Director, APV Co Ltd

* ACARD member

The report of the Working Group was considered by the Council in June 1982 and has been submitted to the Government for their consideration. Like previous ACARD reports it is intended to provide a non-technical guide to the subject and the issues raised; it does not aim to be a comprehensive account of food technology.

The Council is grateful to the Working Group for their contribution to ACARD's work and wish to acknowledge also the support provided by the Ministry of Agriculture, Fisheries and Food, the Central Policy Review Staff and the ACARD Secretariat at the Cabinet Office.

CONTENTS

(The opening paragraph number of each subsection is shown in brackets)

CHAPTER 1: INTRODUCTION

1.01 The food industry in Britain is responsible for meeting a considerable part of the UK's needs for food. About one fifth of the food bought by the consumer is fresh with simple packaging; the rest is processed and packaged in more complex ways to meet particular consumer needs. Over the years, the food industry has transformed eating habits and brought real advantages to the consumer. For example, the availability of preserved food on a large scale helps to insulate the consumer from seasonal variations and occasional poor harvests. The packaging of food to preserve and protect it from damage in handling allows it to be transported over long distances, so greatly increasing the variety available in the shops. Indeed, present urban life, in which most consumers live a long way from the point at which their food is produced, is dependent absolutely on the presence of a modern food processing and distribution system.

1.02 The UK food and drinks industry itself depends on the domestic agricultural sector and on imports for its raw materials, and on the distributive sector for access to the retail and catering markets. Together, these sectors, along with the catering industry, accounted for £27 billion of consumer spending in 1980, or one-fifth of total consumer spending, excluding alcoholic drinks (Table 1). The food industry also depends on research in, for example, food processing techniques, packaging materials, nutrition, toxicology, and methods of assessing the quality of raw materials and consumer tastes. It operates within a prescriptive set of UK and EC regulations relating to food composition, hygienic practices for the preparation of food, the use of additives, labelling and advertising. There is a substantial technical dimension here also, for both regulatory work and research and development activities draw on the same knowledge base.

TABLE 1 UK CONSUMER EXPENDITURE AT CURRENT PRICES 1975-1980

(£ million)

	1975	1976	1977	1978	1979	1980
Food - domestic	12,000	14,100	16,200	17,900	20,500	23,300
Food - catering	1,800	2,100	2,400	2,700	3,100	3,400
All Food	13,800	16,200	18,600	20,600	23,600	26,700
All consumer expenditure	64,200	74,800	85,500	98,400	115,700	134,500
All food as % of all expenditure	21.5%	21.7%	21.7%	20.9%	20.4%	19.9%
Domestic food as % of all expenditure	18.7%	18.8%	18.9%	18.2%	17.7%	17.3%

Source: Central Statistical Office/Euromonitor

1.03 This ACARD study has concentrated on recent trends in the food industry and on other factors related to food provision together with their technical and R and D implications. Chapter 2 briefly reviews the evolution of the food industry to its present structure and scale. Chapter 3 describes the organisation of UK R and D activities related to food, in both the public and private sectors, and takes a brief look at some changes in food technology which are now becoming possible. Chapter 4 deals with changes in the nature of the food supply situation and the effects on the industry of Government policies towards agriculture and international trade. Chapter 5 describes

changes in social needs and attitudes over the past few years and how these seem to be affecting the demand for food. It also deals briefly with the changing pattern of food distribution and the regulatory framework governing the processing and sale of food. In all these areas changes are taking place and these have implications both for Government and the food industry. Our concluding recommendations in Chapter 6 are therefore directed at both.

CHAPTER 2: THE EVOLUTION OF THE UK FOOD INDUSTRY

Historical Background

2.01 The food industry can trace its ancestry back to Roman times. Butchers prepared hams and meat products which today's consumer would find familiar. By 1000 AD, London had several abattoirs and regulations for the handling of meat were in force. Until the end of the last century cattle, sheep and pigs were driven on the hoof to abattoirs near the centres of population. With the changes brought about in the technology of refrigeration at the turn of the century and more recently from an understanding of meat microbiology and a higher standard of hygiene, it has become possible for a carcass to be handled, transported and displayed for sale without deteriorating or causing any hazard to health.

2.02 The processing of cereals also has a long history, the first recorded windmill in the UK dates from 1119 though the milling of cereals to make them palatable and suitable for baking goes back many thousands of years. Milling requires a relatively high energy input and so the development of efficient process technology and machinery has long been important to cereals. The sweet biscuit, developed from the ship's biscuit, was a UK innovation, and English biscuits are still popular the world over. The earliest proprietary biscuits were made by hand and sold as medicinal goods. In the last century, Carr mechanised cutting and stamping and Palmer the baking process. Ready-to-eat breakfast cereals were developed in America to meet the requirements of vegetarian groups. Dr John Harvey Kellogg researching into "dietary problems" developed "natural foods" leading to several well-known products surviving today, including the first ready-cooked breakfast cereal, the first flaked cereal food and in 1899 the cornflake. Around this time the basic types of manufacturing processes such as flaking, toasting, puffing and extrusion were developed. Within the United Kingdom the convenience of these foods assured their survival and those breakfast cereals established early in the century have retained their popularity despite many challenges. R and D was the basis for new processes such as are now found in large scale bread making. The Chorleywood process, now almost universal in

large scale bakeries, has replaced a three-hour fermentation stage for dough development by a few minutes of intense mechanical working. Apart from the saving in time, yield is increased and a wider range of flours may be used for bread.

2.03 The invention of the steam engine set the scene for modern sugar refining. Hitherto lump sugar was a luxury item because of the high cost and time taken to produce it. The use of bone charcoal as a de-colourising agent, the vacuum pan for speeding up the recrystallization and the suspended centrifugal machine enabled granulated white sugar to be made cheaply and easily so that it became a serious competitor for lump sugar. By the 1850s sugar was processed in days instead of weeks and became widely available as the price fell rapidly. Similarly cocoa was an expensive luxury item until the late 18th century when innovative technology began to change the nature of the product. The first development, from Holland, enabled some of the fat content, cocoa butter, to be removed fron the cocoa bean. This was an advance on the cocoa compound which contained starch to counteract the fat. Change was very slow however as the cocoa compound was believed to possess medicinal qualities. Milk chocolate was introduced by the Swiss in the 1870s but it was not until the turn of the century that British manufacturers were able to produce milk chocolate commercially.

2.04 The advent of the railways revolutionised the distribution of fish and milk. Fresh milk could be drawn into the cities from a wide radius, though souring remained a problem until combatted by cooling and pasteurisation, which were becoming established by about 1925. The production of butter and cheese became established in the West Country, an area well suited to dairy farming.

2.05 Preservation techniques such as salting, drying and chilling have been used for hundreds of years, long before they were understood. The canning and bottling of food stemmed from the need to feed armies on the move and were technically established around 1800. In the first 20 years of this century United Kingdom canners were hampered by a lack of men skilled in the canning process and of

suitable machinery, and the high costs associated with a high failure rate. The technical problems were alleviated by intense research in several food institutions in the United Kingdom and by technology imported from the USA. The Fruit and Vegetable Research Station at Chipping Camden investigated corrosion in cans and also developed the "processed pea", which became the most popular of all canned vegetables. Although before 1930 all canning machinery was imported from the USA, British engineers soon turned out a wide range of machinery. Today, preservation technology is underpinned increasingly by scientific knowledge of how enzymes and micro-organisms cause spoilage in food. In devising an appropriate preservation technique, the aim now is to achieve the necessary level of preservation by temperature control, packaging and a minimal use of added chemicals.

2.06 Research has been vital to the development of many other new products, such as modern margarine, "instant" soups, complete meals and a variety of confectionery items, drinks and snacks. All reflect the major aims of the food manufacturing industry: to make agricultural produce more palatable; to preserve it without loss of nutritive value and without risk to the consumer; and to package it in a convenient and hygienic form for distribution.

Present Scale of the Food Industry

2.07 This section describes: the present structure and scale of the UK food industry; the numbers it employs, including comparison with the agriculture and food distribution sectors; its trading performance and productivity compared with overseas counterparts; and the declining trend in R and D effort.

2.08 Within the food sector there is an interdependence between agriculture, food processing and distribution. Taking the food provision industry as a whole, in terms of number of people employed, all three sectors are about the same size (Table 2).

TABLE 2 THE DISTRIBUTION OF LABOUR WITHIN AGRICULTURE, FOOD PROCESSING AND FOOD DISTRIBUTION.

	(Thousands) Workforce	Total
The Farming Sector		
Farmers	296	
Farm workers	355	651
The Food Processing Sector		
Milling, baking and biscuits	151	
Bacon, meat, poultry and fish	129	
Milk and milk products	50	
Sugar, chocolate and confectionery	80	
Fruit and vegetable products	54	
Edible fats	8	
Brewing and malting	64	
Soft and other drinks	65	
Other	34	635
The Food Distribution Sector		
Wholesale distribution	222	
Retail distribution	621	843

Source: Annual Abstract of Statistics, No 118, 1982

Although concentration has occurred in the manufacturing sector, there is still a great diversity in the size of company. Compared with other European countries, the UK has more large food manufacturing companies (that is companies with more than 500 employees). Such companies account for more than 80% of the total work-force. But some 90% of all companies employ less than 100 people. The industry in many European countries is more fragmented than in the UK and yet, as we indicate later, productivity and innovation in those countries is higher than in the UK.

2.09 In terms of share of the UK market, for certain items of food the top five manufacturers now account for 60-90% of the market and one-third of all food sales arise from 10 manufacturing companies

Similar concentration has occurred in the food distribution sector. Supermarkets account for 75% of all packaged food sales and the three largest supermarket chains now account for 35%of the packaged foods normally associated with the grocer's shop. The distinctions between the different sectors of the food industry are becoming less sharp, with the agricultural industry looking for ways of raising profits by adding value to its products on the farm and with retailers, through developing their own brands, becoming more identified with food manufacture.

2.10 During the 1970s, while the overseas performance of the UK manufacturing industry weakened overall, the food and drink industry increased its exports. For example, between 1975 and 1980 the export to import ratio of food and drink products traded with the EC increased from 24% to 49%. This pattern was reflected in many of the industries covered by the sector; the dairy products, chocolate and sugar confectionery, and biscuit industries were particularly successful in exporting. Exports of food and soft drinks to the EC countries in recent years have steadily increased, while there has been a slow decline to the rest of the world. In 1980, the UK food exports amounted to £2,061 million, of which 61% were to EC countries. But on the import side, although the food industry has maintained or increased its share of the home market, this has been due, in part, to the operation of the Common Agricultural Policy (CAP) and to regulations which initially supported established practices, such as the "doorstep" delivery of milk. Nevertheless, it must be noted that individual foreign products have increasingly penetrated the UK market. German food exports, particularly butter, instant coffee and fruit juice, to the United Kingdom have increased, in 1980 values, from around £50 M in 1971 to £152M in 1980.

2.11 The Food and Drink Manufacturing Economic Development Council (EDC) reported earlier this year that the United Kingdom food industry displayed a lower level of overall (labour and capital) productivity than most major competing countries.* In the UK there was, per head, a

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* Improving productivity in the food and drinks manufacturing industry: the case for a joint approach, NEDO, 1982

much lower level of value added and investment, a slower growth of value added and a lower degree of efficiency in use of capital. In 1979 value added per worker in the UK was two thirds that of West Germany, and less than half that of France. The profitability of the large food companies is currently at a level of about 5% (pre-tax profits as a percentage of sales) compared with about 10% in the USA.

2.12 The Working Group conducted an informal survey among most of the large food companies to determine the extent by which R and D had declined within the food industry in recent years. Although there were exceptions, there was clear evidence of an overall reduction in both R and D expenditure and staff numbers engaged in R and D activities since 1970 of between 15 and 20%. Even more worrying was the considerable staff reduction in R and D which had occurred in several companies during the last two years. As in other sectors of the economy, financial pressures have led to companies not looking so far ahead and there has been an erosion of effort allocated to fundamental research for future needs. Most R and D in the food industry is devoted to short term product or process improvement, and only a few companies have any basic research support for the company's operation. There are many small food manufacturers who lack any technical support staff whatsoever.

CHAPTER 3: RESEARCH AND DEVELOPMENT AND TECHNOLOGICAL CHANGE

Research and Development

3.01 Food R and D in the UK is carried out in four different types of establishment: private sector laboratories, research associations, research institutes and academic institutions. This section briefly describes their roles, methods of funding, and ways in which their research programmes are influenced.

3.02 The role of the larger private sector laboratories, of which there are about 10, mostly operated by the large food manufacturers, is to support the development by them of new products, processes and packaging techniques. In the immediate post-war years, the UK food industry possessed a stronger technical base than existed in most other countries, but, as we have already seen, during the 1970s the resources allocated by the industry to R and D declined sharply. Nevetheless the industry (both UK and overseas) does provide the major part of the funding for the Research Associations. (See Annex A).

3.03 Government R and D objectives* are more diverse than those of the food industry. They are -

- to protect the safety of food
- to protect the high quality and nutritive value of food
- to promote the productivity and efficiency of the industry
- to reduce wastage
- to reduce imports and increase exports and
- to carry out basic research in support of the other objectives.

3.04 The Government funds R and D activities in a variety of ways (Table 3). Of the total funding for food science (£9.7 M) ARC receives two thirds, half of which comes directly from the DES (Science Vote) and the remainder through commissions from MAFF. Of the rest, all from MAFF, there is support for in-house activities and work

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* Second Reports of the Boards of the Joint Consultative Organisation for R and D in Agriculture and Food, 1975, HMSO

commissioned at RAs and elsewhere. The ABRC advises the Secretary of State for Education and Science on the allocation of funds to the Research Councils, including the ARC and the MRC. The ARC, which has had responsibility for food research as well as agriculture since 1959, allocated £3.2M of its budget of £34M from DES to food science in 1980/81. The ARC spends its money mostly on promoting research in its own research institutes, and only to a small extent on supporting university research (unlike the SERC). The MRC receives no "commissioned" funds from the DHSS, and determines its own research programmes. The MRC carries out comparatively little work on nutrition and on the links between nutrition and health.

TABLE 3 GOVERNMENT EXPENDITURE ON R AND D FOR AGRICULTURE, FOOD AND FISHERIES 1980/81

(£ million)

	Food Science	Total
MAFF		
in house	0.5	40.1
commissioned with ARC	3.4	37.4
commissioned with RAs	1.9	1.9
other external R and D	0.7	3.6
DES (Science Vote)		
ARC	3.2	34.0
NERC	-	0.5
DAFS		
institutes and colleges	-	21.4
in house	-	7.0
TOTAL	9.7	145.9

Source: Report on R and D 1980-81, MAFF

3.05 MAFF spent £83M in 1980/1 commissioning research in agriculture and food with various establishments, of which £6.5M was spent on food science. £37M of this was spent through the ARC and ARC institutes as described above; but of this sum, only £3.4M was spent on food science. £40M was spent through its own laboratories and ADAS, of which £0.5M was on food science. Some £5.5M was spent through other contractors, such as the Research Associations and universities, and, of this, £2.6M was on food science.

3.06 The Minister of Agriculture Fisheries and Food is responsible for allocating MAFF research funds and is advised in this by the Joint Consultative Organisation (JCO). The JCO was set up in 1973 as a direct consequence of the Rothschild Report on the organisation of publicly funded R and D. Its purpose was to advise MAFF and the Department of Agriculture and Fisheries for Scotland (DAFS) and the ARC on R and D requirements. A complex system of consultative boards, committees and working parties was developed by the JCO to provide advice. Each year the JCO produced a report to which Departments responded. Although it had some influence on food R and D the system proved to be too unwieldy and in 1979 the JCO was reorganised to consist of a sponsors Panel comprising senior officials of MAFF, ARC and DAFS which is assisted by a Consultative Board of non-government experts. The Board advises on matters of R and D policy common to the three sponsors. A small number of ad-hoc Committees, set up for a limited period, advise on specific topics. Final decisions on research are taken by the sponsors, and the new Consultative Board of the JCO has no funds or powers to direct funding. In our view the JCO does not at present provide a mechanism for ensuring that Government sponsored research is relevant to the needs of the food industry.

3.07 A brief description of the Research Associations and Research Institutes is in Annex A. It is not clear how their activities are co-ordinated in relation to the national objectives identified earlier. The significant level of Government funding going to the RAs is concerned more with regulations and safety than stimulating innovation. Although the Department of Agriculture and Fisheries for Scotland (DAFS) is not enabled under its statutes to fund food research, part of the research areas covered by the Scottish Institutes and Colleges is concerned with food. The ARC advises DAFS on the management of research carried out in the Institutes for which the Department is responsible.

3.08 Financial support for university departments of nutrition and food science is almost entirely from the Department of Education and Science through the University Grants Committee; polytechnics are funded through the local authorities. Under the "dual support" system, the Research Councils can, in addition, grant funds for particular research projects in the universities. In the case of the ARC very little money flows in this way. This is in contrast to the Science and Engineering Research Council (SERC) which directs a considerable part of its budget to projects in universities. Of particular interest are the three SERC Directorates (Marine Technology, Polymer Engineering and Biotechnology) which represent major investments in technologies where academic activity had previously been on a modest scale. Universities and polytechnics are built up to a stage where they are recognised by the relevant industries as capable of providing centres of technological expertise if not excellence. Close involvement of industry and the Department of Industry directs the work to areas of industrial relevance and enables a progressive increase in funding provided by industry while SERC funds are reduced. The low level of support for food research in universities has not encouraged "pure science" departments to show interest in work of relevance to the food industry alongside the food science departments which, consequently, have failed to become the centres of excellence which the industry needs. While the food science departments are able to provide a worthy supply of graduates for some parts of the food industry they are not able to supply the full range of high scientific calibre manpower required by the industry.

3.09 In summary, food research is a broad and multi-disciplinary area of activity embracing a variety of skills both in the pure and applied sciences. But it seems to us that the structure and management of Government R and D activities in food science are needlessly complex, and especially so when compared with the arrangements for agricultural research. The result is that responsibility for some important and complex topics, such as nutrition, is unclear. And the division of responsibility for food process development between MAFF and DoI, which takes the lead on machinery and process plant, is unsatisfactory. Innovations in food manufacturing go hand in hand with developments in food processing machinery. Of work in the food area there is relatively little support for innovation in food processing technology. It also seems to us that the overall balance of research effort needs examination in the light of the relative rates of innovation in food as opposed to agriculture. Although the means exist to stimulate university research in science underpinning food processing, by funding specific programmes, MAFF and the Research Councils have so far devoted little effort to this. And we do not think that even with the benefit of its recent re-organisation that the JCO places sufficient emphasis on supporting food topics in universities.

3.10 We support the national R and D objectives cited earlier, and would like to see an examination of the ways in which effort and funds could be articulated in their support, particularly to underpin and strengthen innovation related to productivity, efficiency and presentation of food quality in the food industry. It should be possible both to achieve a better balance than at present and to do so more effectively and simply.

Future Technological Change

3.11 Innovations can arise from many directions in the food industry. Application of existing or new technical know-how will be an essential feature in meeting consumer tastes, perhaps arising from a more informed nutritional understanding, in improving product quality and in improving productivity. In this section we simply point to a few examples arising from -

- the growing understanding of the chemistry, physics and biology of food raw materials and complex food molecules and their interactions during processing;

- the impact of micro-electronics and advanced process control;

- the need for new methods of packaging and preservation;

- the impact of biotechnology;

- innovation in food processing machinery.

3.12 Raw materials account for about 50 per cent of the total costs of manufactured food. Each of these raw materials is a complex system of fats, proteins, carbohydrates, water and so on. There is considerable scope for increasing our chemical, physical and biological knowledge of their molecular and structural make-up. In the future there will be both more opportunity and more need to treat food materials as simple sources of these basic components, valued for their nutritional properties or functional behaviour of which an understanding should greatly improve processing techniques and productivity. Developments of this type are already visible in today's food industry, for example the use of linear programming to determine the optimum mix of individual components for margarine or meat products. This approach could be applied to a wider range of food materials. The ability to fractionate and recombine food components will create more opportunity for the fashioning of food products in novel ways. It will also be one way of meeting particular consumer demands, for example, for foods with specific nutritional characteristics. Greater understanding of flavour perception and performance will lead to better use of flavour components to create attractive and stable products. The behaviour of new food components in processing and on the shelf will be more predictable. Much research has been done already on food components based, for example on soya protein, and these will improve in quality and variety. Food components will increasingly be made by non-agricultural processes, such as fermentation. However these will have to compete on attractiveness, price, and specific functional characteristics. The nutritional implications of these recombinations may be profound.

3.13 Current techniques of processing food and drinks vary substantially across the different food sectors, but continuing technical change will bring new flexibility in processing, and improvements in efficiency and productivity. Micro-electronics and other forms of advanced process control offer prospects of improved handling via control of raw material specifications, automatic weight monitoring, controlled mixing and new ways to monitor the behaviour of ingredients during processing. Closer control of process parameters, in operations such as sterilizing and freezing, will make it easier for delicate ingredients to remain attractive and wholesome whilst allowing adequate safety margins. Systems are currently being installed in major breweries to control the whole process from grain and liquor preparation to fermentation and filling. TV monitoring is used to measure fat/lean variation in supplies of meat for processing. Looking to the future, advanced laboratory techniques such as nuclear magnetic resonance spectroscopy and high pressure liquid chromatography show promise for monitoring the behaviour of food during processing.

3.14 Convenience in packaging has been an important part of the industry's capability to provide products in handy sizes across the nation and round the seasons. Superior packaging is also an important factor in export success. With the growing complexity of food and drinks products in terms of shape, weight and delicacy, packaging demands are technically very varied and the proliferation of microprocessor sensing and monitoring coupled with robotics is likely to have a major effect on efficiency and flexibility in the packaging stage. New packaging formats could offer new product opportunities, for example the use of flexible foil pouches as an alternative to rigid metal cans has been looked at for some time but the potential has not yet been realised.

3.15 Basic understanding of preservation via the processes of chilling, freezing, heating, dehydration or the use of chemicals was established fairly early in the development of the food industry. However, with increasing understanding of the biological changes in food materials, the behaviour of enzymes and the inhibition of micro-organisms, there will be growing opportunities for modified or

alternative routes to preservation. The spur for this could well be the search for processes with low energy requirements, extended shelf life or milder processing techniques. A major new approach to preservation would also have a marked affect on the industry, and for several decades now the potential for irradiation treatment of foods has been under examination. Once all the issues of quality and safety have been resolved, irradiation could well be an important alternative mode of preservation which could have significant impact in certain sectors of the industry. Growing knowledge of preservation will also play a role in reducing microbiological spoilage and wastage of foods, and also, indirectly, in reducing the risks of food poisoning from mishandling, in the home and in catering and institutional establishments.

3.16 There are opportunities for wider application of biotechnology, but at present these are limited by four types of constraint: economic, regulatory, technical and matters related to acceptability of the final product to the consumer. Taking a wide definition - the application of biological organisms, systems or processes to manufacturing industries - biotechnology has been at the heart of many food processes since long before the term was coined. Examples are brewing, bread-making and the production of cheese and yoghurt. Current and recent applications of biotechnology include the use of enzymes for various purposes; for example, the breakdown of starch or protein, the modification of sugars, tenderising meat, and for laboratory analysis. Fermentation methods have been devised for the production of human food protein from starch and these developments in processing have necessitated considerable advances in engineering and process control.

3.17 As to the future possibilities, we see few fundamental barriers of a scientific nature, but several practical and economic ones. In many cases the production and processing of bulk raw materials such as fats, proteins or plant material for use in food production is no cheaper using biotechnology than conventional means. So there is no economic incentive favouring biotechnology for general food manufacture, though there may be some incentive in the case of those

raw materials which are relatively expensive or in short supply - such as certain oils and fats, or in specific improvements where bioprocessing is already established as, for example, in brewing or the dairy industry.

3.18 The most significant applications of biotechnology in the food industry are likely to arise in food processing but it may take a long time and require considerable expense to obtain safety clearance for foods and additives produced by a novel route. Even when approved they may not be acceptable to the consumer. For innovation to be encouraged, the safety requirements need to be clearly defined in advance and subject to the minimum of change. The benefits to the consumer need to be carefully understood and presented.

3.19 When a new application of biotechnology reaches the stage of commercial exploitation, then there will be technical difficulties to be overcome in gearing up to full-scale production as exemplified by the development of instrumentation to control and monitor processes to the required tolerance limits.

3.20 Among the more speculative but very significant longer-term possibilities is that of using genetic engineering techniques to transfer specific characteristics from one organism to another. This could have value in "tailoring" plant or animal strains directly to particular requirements rather than using conventional breeding techniques, and could have a major long term impact on the food industry. Biotechnology is also generally applicable to the treatment of organic wastes, either animal or vegetable, with the aim of reducing pollution, producing energy or producing biomass as an animal feedstock, or some combination of these.

3.21 Innovation in new food products, processes and packaging techniques will, in many cases, depend on the ability of the food machinery industry to develop new equipment and methods of operation and control. Any nation having a food manufacturing industry

supported by a strong machinery industry must profit from early exploitation in its own market. We emphasise the importance of the UK food machinery industry to the efficiency, productivity and innovation of the UK food manufacturing industry. More awareness and use could be made of the Department of Industry support for research, development and demonstration of new machinery processes and packaging materials. (These include the Product and Process Development Schemes, Pre-production Order Scheme, Research Requirements Boards and the awareness schemes for microelectronics, flexible manufacturing etc.) In particular sectors of the industry where plant or machinery is subject to regulation there may be scope for a certification scheme which assures the buyer that the product conforms to the regulation and is of good design. A certification scheme of sufficient standing could assist the industry in commanding respect for its products, both in domestic and overseas markets. The impact of regulations and certification on product design is developed further in the recent ACARD report "Facing International Competition".

3.22 In summary, the food supply chain is based upon biological processes and the handling of delicate food materials. The enormous growth in understanding of the chemistry and physics of living systems, the genetic control of biological systems and the nature and interactions of complex food molecules is certain to lead to innovation in the industry as a whole in unpredictable as well as predictable ways. These innovations will offer opportunities to increase the efficiency of manufacture and improve the quality and variety of products reaching the consumer. The latter will benefit exports as well as the home market.

CHAPTER 4: AGRICULTURE, TRADE AND THE FOOD INDUSTRY

Agriculture and the Food Industry

4.01 The food industry obtains almost all its raw materials from agriculture. The trading relationship between the two sectors is therefore worth exploring in some detail.

4.02 The consumer and shopper are free to choose the products they will buy; the food industry, which caters for 75% of their requirements via processed and packaged products, must produce what their customers want. But the laws of supply and demand do not operate freely in all parts of the food chain. The farmer is insulated from the shorter term effects for much of his production by the operation of the Common Agricultural Policy (CAP).

4.03 It is beyond the scope of this paper to analyse or challenge the CAP. The food industry has to regard it as one of the major constraints within which it operates. The principal effect on the food industry is that, for many commodities, a farmer's choice of what to produce is heavily influenced by the price regime established under the CAP, and the assurance that he can, if necessary, sell his product into intervention stocks. A food processing company therefore has little influence over the price or indeed the nature of its raw material supplies originating in the EC. For example, the wheat variety "Maris Huntsman" became popular with British farmers because it cropped well and gave a high yield per acre although it was unsuitable for bread-making. It had to be exported or used for animal feed, and bread wheats continued to be imported from North America. The food industry responded to some extent by increasing its efforts in developing the technology which would allow the use of more home-grown wheat in breadmaking. In the future, CAP pricing is likely to continue to dictate the balance of commodities produced by UK farmers and no great change is foreseen. A decline in the milk industry and an increase in the coarse grain (animal feed) industry, with export in mind, are likely trends. All farming is likely to become increasingly competitive in a European context. In the next ten years production in agriculture will probably grow less fast than hitherto though it may be greater than in other industries. Larger production units and co-operation between smaller ones should reduce variability in raw product supply to the food industry.

4.04 We are of the opinion that the UK is past the point where farmers and food producers can act independently of each other, importing and exporting farm produce to meet their particular needs. Whilst UK farmers may still be more productive than their European counterparts, they are less well versed in marketing. UK Governments pay close attention to food pricing policy, but regard the farmer as responsible for the sale of his crops. Farming co-operatives are far more developed and powerful in other member states of the EC and indeed dominate production of certain products in some countries. Such organisations provide inputs of capital, management ability and marketing skills. Our partners in the EC increasingly treat agriculture and food as a single industrial complex, for market development, R and D and for various support purposes. We must do likewise to ensure the long-term survival of both farming and food manufacture in this country. In practice this will mean change and adaptation by both.

4.05 We would like to see a number of developments. First, a greater communication between farmer and processor. In some areas, for example, the harvesting of peas for freezing, where the condition of the end product depends on harvesting at the right time, communications are already good. But more generally, the quality and consistency of the harvest are vitally important to the processor just as the choice of new genetic varieties, their resistance to disease and their cropping characteristics are important to the farmer. Second, the food manufacturer should develop processes with greater resilience and ability to tolerate a wider range of type and quality of raw materials. Third, research scientists should develop a wider array of reliable and rapid analytical techniques for assessing the quality of farm produce, for example, all the bread-making characteristics, many as yet unknown, of wheat. Fourth, geneticists and breeders should consider the needs and characteristics of the food processing industry when "designing" new strains of plants and animals for the farmer.

4.06 In order to bring about these changes, the overall effort spent on R and D will need to shift away from the improvement of farming efficiency, seen in isolation, and towards the needs of the agri-food industry as a whole: that is the characterisation of raw materials, improved processes, faster analytical techniques, better understanding of nutrition and improved product design.

The UK Balance of Trade in Food Products

4.07 Since 1974, total domestic expenditure on food products has risen by about 3% at constant prices. The total volume of imports has remained static at about 18% of the domestic market. During the 1970s there has been a gradual increase in exports from about 4% to 6% of manufacturers sales. The tendency for imports to decrease and exports to increase, illustrated in Table 4, is the basis for an overall stability which, nevertheless, conceals large changes in particular sectors, which are worth exploring. At present the reasons for the changes are more to do with international trading policy than technology based issues of quality, labour productivity and efficiency. Thus the CAP has a major influence while there is a tendency to base commercial decisions on the desirability of preserving traditional markets. We are of the opinion that technological developments within the UK will become increasingly important in securing a favourable trading position, by helping industry to resist commercial and international pressures from competitors.

4.08 We have looked at some examples of existing and potential import penetration. Imported refined vegetable oils took about 2% of the UK market in 1970 and about 17% in 1979. Holland and Belgium have been the principal new sources of supply. International companies dominate the trade in this commodity and there has been a concentration of production within those countries where costs of energy and distribution are minimised. During the same period imports of soluble coffee have risen from virtually nothing to about 13,000 tons per annum but to date the cause has been commercial and trading issues, notably subsidised exports by Brazil.

TABLE 4 OVERSEAS TRADE IN FOOD AND FOOD PRODUCTS

(£ Million, 1980 values)

Products based on	Exports			Imports		
	1970	1975	1980	1970	1975	1980
Meat	76	255	327	1594	1277	1226
Milk and eggs	52	94	299	675	951	500
Cereals	123	308	456	1021	1114	604
Vegetables and fruit	80	123	153	1377	1257	1240
Sugar and honey	112	295	112	426	1150	403
Coffee, tea, cocoa and spices	151	184	263	760	586	677
Miscellaneous	75	90	95	114	154	149

(Annual Abstract of Statistics)

4.09 Liquid whole milk cannot be imported into the UK and all milk must be packaged in premises registered by local authorities. The UK justification for retaining these restrictions is currently being tested in the European Court. Should the UK have to relax its controls the supermarkets are likely to look for supplies at a lower cost which might lead to the demise of the doorstep delivery. Milk from the Continent, particularly UHT longer life milk from France, sold below intervention prices would worry home producers. However the development by the Milk Marketing Board of Extended Life milk (produced, handled and packaged under aseptic conditions) enables pasteurised milk to be kept longer than a week and so compete with the UHT product.

4.10 Bacon and Ham imports, although static at about 60% of domestic demand for the past five years, may start to decline. The United Kingdom industry is capable of substantially increasing its output, but in our view will have to market its products aggressively, and improve their quality, if it is to achieve this.

4.11 In summary, within a fairly static volume of imports, there is a slow trend in favour of EC countries, whose share of UK food imports rose from 49% in 1975 to 54% in 1980. This would have been even more marked but for an increase in imports from Canada, mainly of fish and wheat. During the same period there has been a similar trend in UK exports with the EC increasing its share from 51 to 62% of the total.

4.12 An important factor, exemplified by Brazilian coffee, is the financial incentive, in developing countries, to export crops in semi-processed form rather than as raw materials. This could have important effects not only on UK import values but also on processing techniques, the quality and variety of the products and eventually on employment in the UK. There will be a requirement for some R & D to help keep up with the changing imports to the food industry. Our overall trade balance in food products will also be profoundly affected by other countries' policies on trade and especially by the way EC Member States support and encourage their national food industries.

4.13 The general trade policy of the EC is to promote an open trading system, with fair competition among other member states. There are a few grounds (eg safety and hygiene) on which countries may act unilaterally to restrict trade. The UK food manufacturing industry operates within the overall framework established by the EC and by the ways in which the UK Government chooses to implement EC policy. But, as the House of Lords Select Committee on the European Communities has found, open trading runs counter to the objectives of the Common Agricultural Policy, which are, in practice, protectionist.

4.14 We have discussed some effects of the CAP. Our concern is that the food manufacturing industry in the EC sits awkwardly between the protected agricultural sector and the manufacture of goods for the open market. We describe next the policies adopted by France, Germany and Italy to deal with this situation and their implications for this country.

Overseas comparisons

4.15 In France, the support and promotion of both the agriculture and food industries is a single policy objective. Food R and D is channelled through the French Agricultural Research Institutes. In 1980, a new funding body was formed to channel both state and private finance into agriculture and the food industries. In the 1982 budget, Government investment aids for agri-food have been increased by 33% and R and D by 19½%. A strong central agency, SOPEXA (Societe pour l'Expansion des Ventes des Produits Agricoles et Alimentaires) undertakes the promotion of agricultural produce and food. The clear policy objective is to increase exports and improve food technology; and to achieve this France is bringing coherent policies to bear on the food chain from farmer to consumer.

4.16 In West Germany, there are several schemes for support of R and D within the joint agri-food industry while the CMA (Centrale Marketing gesellschaft der deutschen Agrawirtschaft) acts as a central marketing agency in a way parallel to SOPEXA. CMA has an office in the UK and operates advertising campaigns, training schemes, and establishes contacts with retail buyers in the UK. CMA started with Government funding and now has a budget of £25M provided by the West German food and drinks industries. The CMA has been instrumental in assisting West German food and drink product sales from UK outlets totalling £750M in 1980.

4.17 In Italy, as in France and Germany, Government support for R and D in food and agriculture is seen as a single objective, however the food marketing organisations are more oriented to primary agricultural produce than in France and Germany. Wholesalers purchase farm output for sale to retailers through large central markets, much the same as in this country. Producers also contract directly with consumer co-operatives, supermarkets and food freezing or processing companies. The three main farming organisations have recently formed a marketing organisation CONVAGRI (Consorzio Nazionale di Valorizzazione dei Prodotti Agro-Alimentari Italiani), whose aims are to control the marketing of produce from the growing

stage onwards, channeling goods to appropriate markets. Technical and economic advice on marketing situations both at home and abroad is available to members and CONVAGRI is also able to store goods to obtain higher prices.

4.18 In all three countries there is coherent government support for the agri-food industries. Because of this integrated approach we have been unable to obtain satisfactory data on the relative levels of support for food. Each country also has a coherent agri-food marketing policy for both the domestic and overseas markets. Within the EC which is nearly self sufficient in temperate foods vigorous marketing initiatives will undoubtably lead to fierce competition for any growth. The competition will be made tougher and less "gentlemanly" by the absence of the open trading system to which the EC aspires. To achieve open trading, the long-term aim of the EC should be complete harmonisation of all hygiene and food safety regulations, coupled with EC schemes for the inspection and certification of slaughterhouses, food machinery and processing plants where food safety and hygiene are of concern. The important precedent set by the "Cassis de Dijon" judgment in the European Court of Justice also needs to be studied. (This was a test case of Articles 30-36 of the Treaty of Rome, which state that any product legitimately sold in one member state may not be banned from another; the Court upheld this principle.) In the interim, national governments cannot help becoming involved in questions of agricultural trade policy, if only to fill the vacuum left by the absence of the Community Policy on agricultural trade. Their motives may vary. One government may see promotion of its food industry as a deliberate strategy to become a food supplier to a wider market while another wishes to protect an interest or industry under threat. But in all cases, collaboration between government and industry is essential, as is agreement on the policy aims to be pursued.

CHAPTER 5: THE CHANGING PATTERN OF UK FOOD CONSUMPTION

Consumer Buying Patterns

5.01 UK consumer food supply, excluding alcoholic beverages, can be roughly subdivided into three classes -

- Those marketed fresh with simple packaging (for example; fruit, vegetables, milk, fish) - about 21% by value.

- Those foods marketed after some processing which does not involve cooking but may involve preservation by freezing or chilling (for example; packed meat, cheese) - about 37% by value.

- Those foods which are marketed after cooking or other relatively sophisticated process (for example; bread, cereals, tinned produce, dehydrated products, frozen meals) - about 42% by value.

Within each class there has been considerable movement, for example the consumption of bread has declined while breakfast cereals have increased. Since 1978, convenience foods (that is those products of the food processing industry which are labour saving versions of less highly processed products) have increased by 1½% to 26½% of total food consumption* The national food consumption by commodity is given in Table 5.

* National Food Survey, MAFF

Table 5

UK DOMESTIC FOOD EXPENDITURE BREAKDOWN 1980

	%
Meat, poultry, bacon	28
Dairy products	15
Bread, cereals	13
Vegetables	11
Sugar, preserves, confectionery	10
Beverages	7
Fruit	5
Oils, fats	4
Fish	3
Miscellaneous manufactured food	4
TOTAL	100

Source: Central Statistical Office/Euromonitor

5.02 In real terms, per capita expenditure on food grew slightly (4%) between 1970 and 1980, but by very much less than real disposable incomes, which grew by 32%. Between 1955 and 1980, UK expenditure on food fell from 27.5% of the household budget to 17.3%. People are consuming fewer calories (down 5% between 1970 and 1980) but buying foods with higher added value and at a more advanced stage of processing and preparation. In 1978, approximately 80% of consumer expenditure was on foods which had been processed. Along with the trend towards more packaged food, consumers are now looking for food which is both fresh and "natural", and food items prepared by traditional techniques such as canning have declined relatively. The increasing ownership of domestic refrigerators (96% of households) and freezers (49% of households) has encouraged the manufacture of chilled and frozen foods. For the future, increasing ownership of microwave ovens (already in about 2.5% of households) may increase the demand for single or double portion meals, packaged for the microwave oven.

5.03 The total population of the UK is almost static. In the 1970s it grew at only 0.1% per annum, and is forecast to grow just a little faster than this for most of the 1980s. But this picture conceals two opposing trends. During the 1980s the number of children of compulsory school age will decline while by the end of the century the number of people of 75 and over will increase by 18% in contrast to those aged 65 to 74 whose numbers are expected to decline by 13% over the same period. Energy requirements decline with age, by about 7½% per decade after middle age, so that the ageing population will require less energy per capita although it may need more of other nutrients. Also, the number of single households, already 25% of all households, is growing at a rate of 2% a year, this is higher than the growth in population. Likely consequences of these trends are a continuing decline in average energy intake per capita, a decline in sales of some food products favoured by children, and an increase in demand for single portion and convenience foods and new opportunities for catering and fast foods.

Nutrition

5.04 Although food energy consumption is falling, there is no evidence in recent years that this is leading to general problems of undernutrition in the UK. There is increasing evidence that diet and disease are linked, but in the past most research has been on diseases associated with deficiency rather than with excess of food. The diet probably affects prima facie certain metabolic diseases. There is a lot more to be understood on the complex relationship between diet and disease before the public can be provided with well-founded advice. For example, even now the roles of trace elements, fats and fibre are not well understood.

5.05 Growing interest among some consumers in nutrition and health is leading to demands for food with special characteristics, whether or not their views are based on scientific evidence: for example, the demand for foods with lower fat, higher fibre and lower salt contents. There is some evidence of a link between salt intake and blood pressure in certain individuals, and the significance of this, if

any, in hypertensive disease should become understood in the next few years. Similarly, there is general concern that a connection between high blood pressure and obesity is associated with diet. We think that nutritional understanding in the general public should take a significant leap forward in the next decade; if so, then food manufacturers will have to respond to this by evolving their product formulations accordingly.

Food Distribution and Retailing

5.06 Food reaches the consumer through distribution and retailing. Competition and, more recently, recession have squeezed profit margins generally, and forced small independent groceries to close or merge into larger units. Throughout the sector there have been pressures to increase the return on capital employed and to increase efficiency generally. As a consequence, multiple groceries have increased their market share from 42% in 1970 to 54% in 1980, while reducing the number of buying departments, from 202 to 44 over the same period. Co-operative societies and small groups of independent retailers have also concentrated their buying power.

5.07 These pressures have been partly absorbed within the distribution and retailing sectors and partly transmitted to the manufacturers. The Monopolies and Mergers Commission* examined some aspects of the trading relationship between the food manufacturing and distribution sectors, and found that, in general, current practices were not against the public interest. Our worry is that this conclusion may be too short term. Generally, the best known brands can retain their profit margins and hold their share of the market against supermarket "own name" brands. The secondary brands, however, are often faced with the choice between conceding large discounts which may make them uneconomic or losing sales outlets and volume. In either event, the finances of the manufacturing industry are squeezed to the extent that investment in productivity improvements and R and D expenditure suffer, thereby affecting the

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* Discounts to Retailers, Monopolies and Mergers Commission, 1981 HMSO

industry's innovative capacity both in home and export markets. Taken to extremes, consumer choice would be narrowed and the UK market will become vulnerable to imported products with their own strong domestic markets making it possible to price exports on a marginal cost basis (ie recovery of direct production costs but not fixed overheads).

5.08 There are both threats and opportunities here which extend throughout the food chain. By ignoring the threats, employment, market share and national self-sufficiency could be steadily eroded as imported products take a greater share of the UK market. In turn, farmers will find fewer outlets in this country for their produce. But by seizing on the possibilities for innovation the food industry will be better placed to serve both domestic and European markets. The food machinery industry, in particular, has a great opportunity to develop new processes with better controls, greater energy efficiency and reduced labour requirements, to aid in the rationalisation and innovation which we see as essential.

Food Safety and Health

5.09 Since the passage of the 1875 Sale of Food and Drugs Act, Government and local authorities have seen it as part of their function to protect the consumer from risks associated with food. At that time, adulteration of food was the main problem, with the additives to food identified as having either no nutritive value at all, or being overtly toxic. The appointment of public analysts and the development of analytical chemistry eliminated such harmful adulteration of most foods by the early 1900s. Since then the main concern of legislators has became the composition and labelling of foods. Regulations have been made requiring ingredients to be declared on the package, banning the use of preservatives except in certain cases, and introducing penalties for misleading advertising.

5.10 Today, the 1955 Food and Drugs Act is the basic legislative instrument. The Minister of Agriculture, Fisheries and Food is empowered to make regulations governing the composition of food, its labelling, claims made for it, and the processes used in manufacturing.

He is advised by specialist committees such as the Food Standards Committee and the Food Additives and Contaminants Committee. Legislation in the control of food safety is no longer just concerned with the prevention of adulteration but now covers the control of food composition, particularly in respect of additives. The procedure used is based on the concept of a list of permitted materials that have been tested and accepted for specified uses.

5.11 The permitted level of use of a new food chemical is related to a small fraction (typically one-hundreth or one-thousandth) of the "no-effect" dosage level - the dose which is just below that which produces a detectable effect in the experimental animal. When the test procedures were devised some sixty years ago, the "effects" being observed were gross and easily detectable, such as illness or death. But today, advanced analytical techniques are available, capable of detecting even minor effects at small doses. Indeed they are capable of detecting subtle effects in animals due to natural food components which have long been an accepted part of the diet, and may be consumed in relatively large amounts. A double standard thus arises, whereby a proposed new additive to be used in small amounts fails to gain acceptance because it has a detectable effect, but an established, naturally-occurring food ingredient perhaps consumed in larger quantities and with greater harmful effects could remain in the diet.

5.12 Present safety evaluation based on the "no-effect" level is extremely costly in time, the use of skilled resources and expensive equipment. It may cost £0.5M to satisfy the regulatory requirements for a new additive, several million pounds to evaluate a protein food from a novel source. Further, the current approach is not based on a fundamental understanding of the way in which a new substance might perturb biological processes at the dosage level likely to be encountered, and whether such perturbation constitutes a hazard. We therefore suggest that the current approach to safety evaluation is not cost-effective.

5.13 In many areas, the biological basis for a more fundamental approach to toxicity testing exists - MAFF has taken the initiative in commissioning some valuable work - but the insights gained need to be carried over into regulatory practice. We should like to see other departments such as DHSS lend their support to this, and the United Kingdom initiate discussions in international meetings such as the WHO, the OECD and the EC. There is already a substantial international consensus on toxicological practice and it is important that any new approach should be accepted internationally. It is also important that any new tests devised should, where possible, replace and be more cost-effective than existing procedures so as not to constitute a barrier to innovation.

5.14 Given the increasing range of available chemicals, the increasing concern over the possible role of qualitative nutrition in human disease, and the cost of the toxicology studies we believe that much more effort should be directed towards the development of better investigative techniques in toxicology related to defining important hazards in man. In addition, we believe that the consumer must be better informed about the dietary hazards that result as much from nutrititonal imbalance and natural foodstuffs as from possibly toxic additives.

5.15 In this country, responsibility for research on nutrition falls uneasily between the Medical Research Council and the Agricultural Research Council. In 1974, a joint ARC/MRC report on Food and Nutrition Research (the Neuberger report) highlighted the multi - disciplinary nature of nutrition research, its difficulty as a field of enquiry and its importance in the national context. But seven years later, very little has changed, and the problem remains. The ARC has made moves to strengthen its commitment to research on nutrition. We are however concerned at the apparent disinterest shown by the MRC in this area and the failure to respond to the Neuberger Report. We have already stated our worry that there is no clear focus in Government R and D for research on food as distinct from agricultural produce. The situation is even worse in relation to research on nutrition. In our view the importance of sound nutritional

understanding to public well-being, and as a base for product innovation, requires that research in nutrition, particularly its relation to general health, be given more attention and better national direction. There is a requirement for reliable statistics, international as well as national, on such things as demographic trends, food consumption patterns and domestic methods of food preparation. The National Food Survey is valuable, though the high refusal rate almost certainly makes it a biased sample, and it does not include all food purchases (it excludes confectionery, alcohol and catering). Without reliable and accessible information the food industry can neither understand nor respond to increasing consumer motivation based on nutritional issues.

5.16 There are other health problems (obesity; atherosclerosis) traceable to food which are not due to harmful additives but to poor handling and storage in the home or, over the longer term, consuming too much of certain foods. There is a balance to be struck between the more immediate and longer term problems. We suggest greater attention be given to the measurement and treatment of those health problems associated with food in the home, in catering and in institutions. In practice this may mean spending less on testing additives and more on educating consumers and food handlers about food hazards.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.01 The previous chapters have described briefly some of the changes being experienced by the food processing industry. Consumer preferences and tastes are evolving in ways which favour convenience, nutritional value, variety, and an increasing demand for fresh and "natural" products. The food industries in other countries of the EC enjoy direct government support for investment, marketing and R and D. They are taking steps to increase their share of UK food markets, while in the UK, the purchasing power of the distributive sector is being concentrated in fewer hands, bringing pressure to bear on the finances of our food processing industry. Throughout these changes, the UK food processing industry has so far stood up well, compared with other manufacturing industry, at least in terms of its share of the home and export market. But conditions are changing and there are worrying signs that the industry is facing increasing threat. Real return on capital has fallen during the seventies. Overall productivity in the UK is low in comparison with European competitors and is improving at a slower rate. Expenditure on R and D is declining. In our opinion these signs are sufficient warning that steps need to be taken now, both within the industry and in Government, to ensure that the food manufacturing industry maintains its position as a major UK industry.

6.02 We believe that the food industry is and should continue to be regarded as strategically important to the United Kingdom economy, because of its contribution to GDP, employment, national self-sufficiency in food, and the overall well-being of the consumer. In the face of increasing competition from aggressive, well-organised agri-food industries in France and Germany, its long-term health will depend on an ability to improve productivity, innovation and marketing. This will require a closer working relationship between the industry and Government. The industry must improve its technical capability and the Government should underpin this with basic scientific research. This will help innovation and efficiency, and increase the supply of skilled researchers into the food sector. The Government should also devote more effort in other specific areas,

for example, regulatory policy, sponsoring the development of improved methods of testing the safety of food ingredients, taking action to overcome non-tariff barriers, improving the understanding of human dietary requirements and dangers, and statistical services, such as the National Food Survey. In formulating its policies towards agriculture and tradeable food products in the EC, the Government should recognise the interdependance between the food and agriculture sectors and adopt a stance consistent with the domestic policies we advocate in this report.

A Strategy for Food

6.03 Some of the industry's problems may be due to its structure but it is beyond the scope of this report to discuss the kind of rationalisation which may be desirable. However, to become more competitive, the industry will need to build up and make better use of new ideas and its technical manpower. In several major companies, research and development effort has declined over the past decade. We believe that the industry should take action to reverse this trend. But we should like to see this taken a few steps further. R and D of itself is valueless unless linked to a sense of purpose and to medium-term objectives such as the improvement of productivity, the development of new products, and the movement of existing products into new markets in other countries. To make the most rapid use of new ideas, new approaches to technology transfer should be developed, to bridge the information gap between the many research institutes and associations on the one hand and food manufacturers and machinery makers on the other. Innovation in food machinery is particularly important to the development of new products and processes. To exploit new markets successfully, a different approach to food marketing will be necessary, integrated more along the lines of our EC competitors than of our present commodity-based marketing boards. Indeed "Food for Britain" the new marketing initiative recently launched by the Minister for Agriculture, Fisheries and Food, is an ideal opportunity to develop an integrated approach. In short, these add up to a requirement for a strategy for food and we are of the opinion that the relevant NEDO Committees should take the lead in

preparing and pursuing such a strategy. We recognise that the Food and Drink Manufacturing EDC has focussed its attention on productivity but it has concentrated on manpower and related issues rather than product innovation and the introduction of new and existing process technology. There is considerable scope for the Food and Drink Manufacturing EDC and the Food and Drink Machinery Sector Working Party (SWP) jointly to review, stimulate and co-ordinate research and development in support of the food industry and to express the views of the industry strongly to Government.

We recommend that the Foods and Drinks Manufacturing EDC and the Food and Drink Machinery SWP should develop a strategy for the food industry which recognises the role that new and existing technology could play in improving the industry's performance and putting it in a better position to exploit new and changing markets. We also recommend that the Department of Industry should stimulate innovation in the food machinery sector, perhaps in the first instance by publicising its existing process industry support schemes more widely. One specific measure to help exports of food machinery would be a nationally recognised certification or approval scheme; we recommend that the DoI together with the industry consider the establishment of such a scheme.

Management of Government R and D

6.04 Agricultural R and D funded by Government has achieved spectacular results in improving yields and disease-resistance in plants and animals. By contrast, research relating to food has been both insufficient in scale and inadequately linked to the national objectives described earlier. "Customer" responsibilities are split between the MAFF, DHSS, and DoI; nutrition research is split between the ARC and the MRC; R and D is carried out among a wide spread of research institutes, research associations and to a limited extent

universities and polytechnics. This results in unnecessary duplication in some areas while leaving gaps in others. Resources are thinly spread and the universities and polytechnics, in particular, receive inadequate funds to build up centres of excellence or train sufficient numbers of technical, engineering and research staff for the food industry.

6.05 MAFF carries the main Government responsibility for food but the Joint Consultative Organisation has not been a satisfactory approach to the management of MAFF's R and D programme for food. We see several reasons for this; the independent advisory function of the JCO is not closely coupled with the allocation of resources and it is not clear whether it has had a real effect on the direction of research programmes. In addition, MAFF has allocated only a small proportion of its funds to food research to stimulate innovation in food processing technology and has concentrated on its main departmental responsibilities such as food safety where it has tended to establish its own priorities. We should like to see R and D directed towards support of the food manufacturing industry given equal priority within MAFF to that of agriculture. More funds should be made available for food research, and a different approach taken to its management. We do not think the recent reorganisation of the JCO will change matters. Food R and D bears much more resemblance to R and D for manufacturing industry than it does to agriculture and we therefore think that the Research Requirements Boards used by the DoI are a more appropriate model for taking outside advice than is the present JCO. Although formally the Requirements Boards advise the Secretary of State, by custom and practice their advice is almost always taken, so they effectively take on an executive role in the allocation of departmental R and D funds to specific projects. Their membership is drawn mostly from relevant industries, with minority participation by departmental officials and representatives from research establishments. The chairmen are usually independent of Government. The industrial members can assess the relevance of R and D proposals to the needs of industry, while the officials can do so in the light of departmental priorities and policy. The eventual aim is to formulate a programme of R and D which meets the needs of both.

We therefore recommend that the MAFF adopt an approach to management of food R and D which gives the new JCO a stronger "proxy customer" role along the lines of the DoI Requirements Boards. For those aspects of food research which involve or interest other departments, we should like to see appropriate links with the DHSS and the DoI, perhaps through cross-membership. We recommend that MAFF consider strengthening the role of the JCO in this way.

6.06 Although the main responsibility for the sponsoring of research in the food sciences falls to the ARC, there are important overlaps with the MRC, in nutrition and toxicology research and the SERC, in process machinery research. This fragmentation is unsatisfactory. The failure of the ARC and the MRC to create an effective focus for nutrition research in the wake of the 1974 Neuberger report on Food and Nutrition Research demonstrates this point. We also think it desirable that the ARC should spend more on food science. But we recognise that the inbuilt momentum of its existing agricultural research programmes will make it hard to do so at the expense of agriculture, even if this were considered desirable. To overcome what we see as institutional barriers the Group considered the desirability of a separate Food Research Council but concluded that its formation would be a departure from the trend towards more integration between the supply, manufacture and distribution stages of the food chain. We believe however that there should be a positive move towards giving food research and its related topics a much clearer focus and stronger direction than at present. We see advantages in the formation of a Food Directorate within the ARC modelled along the lines of Directorates in SERC, and having a close relationship with MAFF and DAFS as well as links with other research councils (MRC and SERC) and Departments (DHSS and DoI). This would provide a focus for directing a co-ordinated R and D support for the food industry in a way which was responsive both to Government and external opinion.

6.07 We see a need for some further changes in direction for food research and its management. Over time, more Research Council funds should be used to encourage basic research in the universities and polytechnics, so that both legs of the "dual support" system contribute equally and effectively in this sector. At present they do not; and university research suffers. Correcting this may mean reducing the Research Council funding of work in the Research Institutes; a price worth paying if necessary for, given time, they can develop other sources of funds. Among the more basic topics we should like to see investigated are the physical and chemical behaviour of primary food ingredients in processing and preservation systems and the development of new methods of routine toxicological testing which are internationally acceptable for regulatory purposes; such methods should be based more on understanding of biological processes than the traditional toxicological tests. We should also like to see more focussed and co-ordinated work carried out on the links between dietary factors and "western ailments" such as high blood pressure, cardiovascular disease and obesity. In the selection of particular research topics for Research Council support, we think it is important that a Food Directorate includes scientists working in the food industry and having a broad experience of current research and development. Related groups of research topics should be placed by the Directorate with universities and polytechnics in such a way as to encourage the emergence of centres of excellence. Such centres should then also become a magnet to attract research contract funds direct from industry and a training ground for scientists and engineers some of whom could be expected to enter the food industry where they would not only be able to increase the rate of introduction of new technology but, more generally, underpin the industry technically.

We therefore recommend that the ARC together with the ABRC should pursue the proposal for a Food Directorate within a retitled Agriculture and Food Research Council for the stimulation of training and the funding of research in universities and Research Council Institutes into food-related topics, including nutrition, and food processing and machinery, and advise the Secretary of State accordingly.

Technology Transfer

6.08 Knowledge gained through R and D will not generate wealth unless communicated to companies who need it and are in a position to exploit it. There is considerable scope for the food industry to use existing technology for productivity improvement and product and process development besides that which might arise from further research. We should like to see more effort and expenditure devoted by the Government to technology transfer for the food industry, particularly small firms. This could include manufacturing techniques and processing, energy conservation, materials handling, automatic control, quality assurance, and machinery selection and management. The ADAS has served farmers well in transferring to them the benefits of laboratory research, but it is expensive to operate, relying as it does on a countrywide network of local officers. ADAS may therefore not be the most appropriate model to adopt, given that the food industry is concentrated into far fewer units than farming. But we should see this principle followed; that technology transfer is seen as the role of those who have knowledge and ideas to offer. Since April this year the DoI Manufacturing Advisory Service (MAS) for small and medium firms of between 60 and 1000 employees has been extended to include the food and drinks sectors and in June a Small Firms Technical Enquiry Service, covering the same sectors, was set up for smaller firms not covered by MAS. We welcome these initiatives by DoI.

We recommend that MAFF, as part of its sponsorship of the food industry, reviews these schemes to ensure that the food based research associations and other bodies are effective in transferring existing and developing technologies into the food industry. We further recommend that, as part of its strategy for food, the Food and Drink Manufacturers EDC and the Food and Drink Machinery SWP should consider how industry could become more receptive to technology.

Information

6.09 Successful innovation requires comprehensive statistical information; much of which can only be gathered on a statutory basis, or if needed for government. The National Food Survey is particularly important to the food industry, but is incomplete. Its deficiencies can probably only be remedied by additional expenditure. We think it desirable that the Government continue to fund it; but should this not be possible then a basis for joint Government/industry funding should be sought in preference to the NFS being cut further or abandoned.

We recommend that the Central Statistical Office together with MAFF investigate ways of attracting industrial funds for an improved NFS, which in our view should embrace a complete food consumption survey and a nutritional survey.

Concluding Remarks

6.10 We have deliberately limited our recommendations to four groups: a strategy for food, the management of Government R and D, technology transfer and information. There are doubtless other problems beyond the scope of this report such as the need for rationalisation in parts of the food industry. In summary, we believe that survival and success for the food industry depends largely on greater efficiency and innovation, within a framework of regulatory, trade and agricultural policy set by the Government and underpinned by research and development. The Government, the food processing industry and agriculture have equal stakes in the future.

ANNEX A

RESEARCH ASSOCIATIONS AND RESEARCH INSTITUTES

1. Traditionally the Research Associations have concentrated on shorter-term problems such as production trials of raw materials, safety evaluation and routine analyses, and the practical application of the results of longer term research for the benefit of the industry. More recently the Research Associations have, under the sponsorship of MAFF, carried out a greater proportion of fundamental work previously regarded as the province of the Research Institutes. The functions of the RA's and RI's are directly complementary and there is co-operation between them. Although the RA's are open to direction from industry their support from industry relative to that from Government is falling. In recent years financial support from MAFF has increased by 50% in real terms whilst that from industry has been static.

Research Associations

2. The four RA's directly concerned with food are -

The British Industrial Biological Research Association (BIBRA)
The Campden Food Preservation Research Association (CFPRA)
The Flour Milling and Baking Research Association (FMBRA)
The British Food Manufacturing Industry Research Association (BFMIRA)

Each provides information and training services for members in addition to R & D and technical services.

3. The work of BIBRA includes toxicological testing of both intentional food additives and those derived from packaging materials, processing aids, insecticides and herbicides used in agriculture, etc. Long-term research is also undertaken on developing more direct testing methods, such as carcinogenicity, and understanding the significance of testing methods such as the extrapolation of animal feeding tests to man. Its main source of support is MAFF which provides 50% of the total budget amounting to £1.82M in 1982/83.

4. The CFPRA carries out research and development for the canning and freezing industries. Membership includes food manufacturers and distributors, makers of food packaging and processing machinery, suppliers of raw materials, growers and manufacturers of agri-chemicals. The main areas of work include microbiology, food processing quality of agricultural crops, chemistry and engineering and compilation of trade and production statistics. The largest part of its revenue is provided by MAFF accounting for 36% of the total budget, £1.72M in 1982/83.

5. The FMBRA undertakes research on behalf of the flour milling and baking industries in the United Kingdom into all aspects of the production and use of wheat flour and into the materials and methods used in the making of bread, flour confectionery and biscuits. Its work includes studies in the fields of nutrition, microbiology, hygiene and preservation of the industries' products specialising in cereal technology. Companies outside the United Kingdom which produce baked products or mill flour are eligible to apply for associate membership. Some 40% of its total budget, £1.8M in 1982/83, is financed by MAFF.

6. The BFMIRA at Leatherhead promotes improvements in the food industry by applications from the scientific and technical fields. It is an international organisation employing about 240 staff, with a current membership of 650 companies of which about 150 are overseas. The RA is supported mainly by private industry but is also a major contractor to MAFF and other Government departments. In the present financial year MAFF will provide 28% of the total budget amounting to £3.25M.

Research Institutes

7. The two RIs which undertake work on food R & D are -

The Meat Research Institute (MRI)
The Food Research Institute (FRI)

8. The MRI was set up under ARC auspices as a result of a re-organisation of food research that involved the closure of the Low Temperature Research Station at Cambridge. This had a section concerned with the preservation and refrigeration of fresh red meat. The Institute is on the site of the University of Bristol Veterinary School and is concerned with research on all aspects of meat production from slaughter to consumer. The total staff in post in 1981 was 196 and recurrent expenditure for 1980/81 was £2.05M. Some 50% of funding was contributed by MAFF via the ARC and the rest from the DES grant to the ARC.

9. The FRI is another ARC Institute and was also set up at the time of the closure of the Low Temperature Research Station. The objectives of the Institute are to carry out medium and long term research "to support the broad national interest of consumers in quality eg safety, nutritive value and acceptability, of the food supply in the United Kingdom" and "in collaboration with the Research Associations to assist the food manufacturing industry in maximising its efficiency and effectiveness". The Institute is financed by the ARC which in turn receives its funds in approximately equal amounts from the MAFF and the DES. In 1981 the staff complement was 200 and recurrent budget £1.92M.

10. There are other Research Insitutes where the ARC has a limited number of programmes under its interests in food and nutrition research. Those institutes include the Hannah Research Institute, the Rowett Institute, the Long Ashton Research Station, the East Malling Research Station and the National Institute for Research in Dairying. The percentage of the programme of each Institute which can be regarded as directly supporting the food manufacturing industry is not easily determined. The MRC supports research on nutrition principally at the Dunn Nutritional Research Laboratory. Although MRC programmes totalling £4M in 1980-81 have some nutritional spin-off the immediate objectives may be different. Approximately £2.5M provided equally by MAFF and the DES is spent by the ARC in grants to support research in universities but less than £0.1M goes to food research.

ANNEX B

LIST OF ABBREVIATIONS

ABRC	Advisory Board for the Research Councils
ACARD	Advisory Council for Applied Research and Development
ADAS	Agricultural Development and Advisory Service
ARC	Agricultural Research Council
CAP	Common Agricultural Policy
DAFS	Department of Agriculture and Fisheries for Scotland
DES	Department of Education and Science
DHSS	Department of Health and Social Security
DoI	Department of industry
EC	European Community
EDC	Economic Development Council
JCO	Joint Consultative Organisation
MAFF	Ministry of Agriculture, Fisheries and Food
MRC	Medical Research Council
NEDO	National Economic Development Office
NERC	Natural Environment Research Council
NFS	National Food Survey
OECD	Organisation for Economic Co-operation and Development
RA	Research Association
RI	Research Institute
SERC	Science and Engineering Research Council
SWP	Sector Working Party
UGC	University Grants Committee

10 DOWNING STREET

From the Private Secretary

MR. HATFIELD

The Prime Minister has seen Sir Robert Armstrong's minute (reference A09161) about the ACARD report on the Food Industry and Technology. She has also seen Mr. Nicholson's minute (reference W0472) of 29 July on the same subject. She has agreed that the report should be published and that the Ministry of Agriculture, Fisheries and Food should take the lead in preparing the Government's response. I have written accordingly.

I have sent a copy of this minute to Dr. Nicholson.

Tim Flesher.

2 August 1982

JR

Cabinet

DTde DTrans
CDL MOD
DEmp NIO
DEngy DES
LPS FCO
CS-HMT HMT
DHSS LCO
DEnv HO
SO (MAFF)
WO
DI
LPO

10 DOWNING STREET

From the Private Secretary

2 August 1982

Dear Robert,

ACARD REPORT: THE FOOD INDUSTRY AND TECHNOLOGY

The Prime Minsiter has approved publication of the enclosed report on the Food Industry and Technology from the Advisory Council for Applied Research and Development (ACARD). She would be grateful if your Minister would take the lead in preparing the Government's response.

I am copying this letter, and the report, with its covering letter from the Chairman of ACARD, to the Private Secretaries to other members of the Cabinet and to Richard Hatfield (Cabinet Office).

Yours ever,

Tim Flesher

Robert Lowson, Esq.,
Ministry of Agriculture, Fisheries and Food.

DRAFT LETTER FOR THE PRIME MINISTER'S PRIVATE SECRETARY TO SEND TO THE PRIVATE SECRETARY TO THE MINISTER OF AGRICULTURE, FISHERIES AND FOOD

ACARD Report: The Food Industry and Technology

The Prime Minister has approved publication of the enclosed report on the Food Industry and Technology from the Advisory Council for Applied Research and Development (ACARD). She would be grateful if your Minister would take the lead in preparing the Government's response.

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