Report

The European food system: results from the EC FAST programme

The food industry is becoming more science based and consumers are becoming more conscious of relations between diet and health. The approach of 1992 will require changes in attitudes and in industry structures. This report of some of the findings of the European Community's FAST programme asks how the food system will develop to the turn of the century, and whether there are new Community-level actions which might help it develop in a more balanced and efficient manner. Actions which promote consumer confidence and those which provide technological support to small agro-food firms are suggested.

FAST (Forecasting and Assessment in Science and Technology) is an EC research programme whose main objective is to highlight *long-term* implications and consequences of developments at the interface of technological and socioeconomic change for the Community's R & D programmes and for other policies affected by or affecting technological development. The FAST II programme (1984–87) studied change in five major areas, one of which was food.

Food was studied because of its economic and social significance in Europe and because there was a feeling that new technologies, particularly biotechnologies, could revolutionize the food system in the coming years.

Economically, even narrowly defined, the food system:

- involves 320 million consumers spending almost one in four ECU on food;
- employs 20% of the EC workforce, or 24 million employees (around 10 million farmers, 4 million in food processing and a further 10 million in catering and distribution);
- contributes 10% to Community GDP and represents around 10% of imports and 8% of all exports;
- is a component of an increasingly global food market from which it imports 20% of its food requirements and to whom it exports 16% of its production.

For social reasons, the food system additionally plays a vital role in the promotion of good health, contributes to the quality and diversity of European life through the social conditions of eating and drinking, and creates rural employment and wealth and interacts with the natural rural environment to determine the opportunities for leisure and recreation increasingly demanded of the countryside by city dwellers.

Scope of food studies

A broad view of the food system encompasses: the food chain (farmer–primary processor–secondary processor–retailer or caterer–consumer); industries supplying inputs to the agricultural, manufacturing and distribution sectors; and the food system of other countries (given the increasing importance of food multinationals). While adhering to this broad view, research of the FAST programme primarily focused on the food-processing sector, but linkages to the consumer/distributor/agricultural and other related sectors were always highlighted. The results which follow were based on a number of reports which were supported by cross-disciplinary, cross-sectoral meetings and workshops.[1]

The methods of analysis used in the individual research reports were relatively conventional, ranging through literature reviews, interviews, surveys of expert opinion, a Delphi study and an aborted bibliometric analysis. There were no formal quantitative studies.

Consumption

Over the next 15 years European food demand – as measured by calorie consumption – will be static or even fall as a result of only small increases in total population, increases in the proportion of elderly (with lower food needs), and decreases in muscular activity due to labour saving technology (less walking, less housework and less industrial work).

In terms of expenditure, reasonable assumptions about income growth and elasticities imply a relatively small increase of around 0.5% per annum, or 6% in total by the year 2000.

As incomes in Spain, Portugal and Greece approach those in northern Europe, eating patterns will continue to converge as meat and meat products substitute for vegetable products (particularly cereals). In the North this process is more or less complete.

Paradoxically, as rising incomes bring a convergence among diets in different countries, they are one of a number of factors which might lead to greater diversity in eating habits *within* countries. The affluent are looking for new qualitative features (eg additive-free foods, regional and artisanal products, organically produced vegetables, free-range eggs and meat)[2] and are prepared to pay for them. Producers are prepared to provide them, even to a small market, if the price differential is sufficient to ensure a profit. Thus new and diverse high-value niches are appearing.

Although market prospects outside the EC were not analysed, one might anticipate similar growth at the high-value end of the EC's main markets for processed food products – North America, Switzerland, etc. Europe's reputation is based on high quality, so there is some cause for optimism that export markets will allow some growth.

The healthy eating trend is expected to continue, but what will be considered healthy by the end of the century is less certain. Views about

food and health have been subject to wide swings, but nutritionists claim to be more certain now about the first-order effects and are moving on to the second-order effects.

The limited available evidence suggests that consumers have adjusted their consumption patterns in a manner generally consistent with current nutritional advice. In the UK they have increased their consumption of high-fibre breakfast cereals, brown bread (1.6% of total bread sales in 1973 to 6.7% in 1983), low-fat milk (4% of total liquid milk in 1983, 13% in 1984, projected to 40% by 1990) and low-fat cheeses. In the Community as a whole they have increased consumption of white meat (chicken and fish) relative to red meat,[3] though this was partly in response to relative price changes.

A survey of 1200 Belgians also shows that consumers' perceptions of healthy foods are in approximate accord with nutritional advice,[4] though the slightly dubious quality of freshness is ranked highest in terms of association with healthiness.

To date, most nutritional concern has been with the harmful effects of overeating certain foods. If nutritional and medical understanding really develops as anticipated (and is it reasonable to imagine that we will be able to map completely the human genome but not be able to understand why some people who eat a lot stay thin, while others who eat much less are fat?), attention in the future should focus more on the positive benefits of some foods. This is not new of course (we might mention honey, cod-liver oil, garlic . . .), but may in future be based on scientific evidence. Current trends suggest that rather than leading to the refinement or synthesis of the relevant active ingredient and its incorporation into the diet as a supplement (like vitamins), the concept of 'natural complexity' will gain scientific acceptance and will promote consumption of the whole food.[5] There is, however, hope that dieting may become a thing of the past, with the increased sophistication of thermogenic drugs for weight control.

Non-nutritional food hazards are much less appreciated by consumers. While scientists rank food risks in order of decreasing importance – microbial contamination, nutritional imbalance, environmental contaminants, natural toxicants, pesticide residues and lastly food additives – consumers rate them in almost reverse order: food additives,[6] pesticide residues, environmental contaminants, nutrition, microbial contamination and natural toxicants.

Scientifically based or not, these developments are a real factor in the market place and food distributors and manufacturers have responded to consumer wishes by introducing food labelling and developing additive-free foods. Consumer perceptions of healthiness and safety will evidently determine the success of many new scientific applications: irradiation and biotechnology (eg growth hormones at farm level, genetically altered microbes in food processing) are the most obvious.

While the demand for freshness will boost technologies producing near-fresh products (controlled and modified atmosphere packaging, chilling, etc), nutritional labelling will focus attention on components of food. This would favour the manufactured product composed of a healthy blend of nutrients which could originate from any one of a number of agricultural or non-agricultural raw materials.

To summarize: in the face of stagnant quantitive demand, growth will be in 'quality', diversity and 'healthy' products. This will have implications for agriculture and food-processing sectors.

Production

The production system's development has been assessed by surveying expert opinion into structural developments, by studies of individual sectors or technologies,[7] and through a Delphi study of probable technological development. Among the conclusions are that:

1. Food manufacturing, distribution and catering will become more concentrated, a process accelerated by the 1992 initiatives. Nevertheless, some growth can be expected in the number of small manufacturers of high-quality foods, often linked to the larger supermarket chains.

2. Employment levels in the EC food-processing industry are forecast to decline 25% by the year 2000 as a direct result of scientific and technical development (largely as a result of the continuing trend to automation – improved sensors, microelectronics, process design, mathematical modelling, etc). Information technology which enables home shopping or electronic check-out from supermarkets, and new catering systems based on vending machines and centralized working under contract will be the major cause of perhaps even greater job losses in the catering and retailing sectors.

3. The food system will continue to become more multinational both as a result of the increasing importance of international trade and as a result of the continuing emergence of multinational food companies. This is happening both within Europe and between Europe and the rest of the world, and at the retailing as well as manufacturing levels.

4. Technological developments in food technology will aim to satisfy the growth areas of consumer demand – freshness, perceived healthiness, etc. As a result: (a) there will be a continuing and sharp decline in the usage of synthetic colours and flavours and, to a lesser extent, preservatives. In contrast, the use of natural materials, including synthetic nature-identical materials, is forecast to rise; (b) consumption of what can be termed fresh/chilled foods will nearly double by the year 2000, while consumption of frozen foods will rise some 25%. In contrast, canned foods are forecast to decline some 25%.

5. In the long term, biotechnology will be increasingly important and should be accorded high priority in R & D, as should nutritional and health properties of foods.

It is worth pointing out that the food industry has become more science based (and the trend is expected to continue). According to OECD statistics food increased its R & D expenditure to output ratio from 0.2 in 1970 to 0.8 in 1980.[8] This is the standard OECD measure of the technological intensity of an industry, and it moves

food from next to bottom (equal) to next to top of the 'low-tech' category. By now it should probably be considered as a 'medium-tech' industry. Of course, food has always been a great borrower of technologies from other sectors (chemical, engineering, textile, etc) so these figures in any case underestimate the level of scientific sophistication of the industry.

Despite its increasing scientific intensity, the food industry faces serious constraints to innovation. Perhaps most important of these is consumer resistance to change and distrust of some of the changes taking place in the name of scientific advance – the front ranking by consumers of freshness as a health factor is hardly a vote of confidence in food processors. Of course, change does take place and many of the products on display in today's supermarkets would have been unimaginable 30 or 40 years ago. Doubtless other, currently unimaginable, products will emerge in future. Nevertheless, it remains true that it is difficult to persuade consumers that a new high-tech food is better than the old low-tech one it displaces – whereas by contrast, this is relatively easy for cars, television sets, etc. Revolutionary, technology-based change in food consumption habits cannot be expected.[9]

Issues for the EC

A great number of recommendations to the Commission were made in the FAST report. These covered a range of issues from research needs relating to diet and health to modifications in policy-making procedures, to methodologies for evaluation of research with multiple objectives. Below, two broad issues are highlighted which emerged repeatedly in the research reports as well as in workshops/conferences as major sources of conflict between technological development and the wishes of European society for the development and operation of the food system. Since FAST wishes to promote Community action which contributes to an efficient industry responding to the needs of the population, implications of these two issues for the Commission are analysed more deeply. The first relates to consumer confidence in food manufacturing which is at a low ebb. Fears over the increasingly complex technical processes applied to something so fundamental to health as food, and doubts in consumers' minds about whose interests are put first by processors and regulators, have given rise to the crisis. The second, very different, issue relates to small agro-food firms which are valued particularly for their contributions to preserving the enormous regional diversity of foods in Europe and to the maintenance of rural employment and income. Such firms are being driven out of business in large numbers and although technology is by no means the only problem it is without doubt that technological modernization is, for most, a prerequisite to survival.

Consumer confidence

Lack of consumer confidence is an important constraint to innovation. Although scientists and administrators are often perplexed at what they see as irrational behaviour by consumers, it is not really so difficult to understand: information is expensive (or at least time-consuming to obtain) and demands on consumers' time for making informed choices (not just on food) are increasing as (a) they spend more, (b) the choices facing them become more numerous, and (c) the products they buy are more technically sophisticated. Faced with uncertainty, consumers obtain partially synthesized information from newspapers, television, magazines, etc, and then adopt simple, widely applicable decision rules, such as selecting products with the minimum possible number of additives.

The important question is, can the European Commission do anything to improve consumer confidence? It is going to be particularly important for the success of the single market of 1992 that there is trust between European countries and their consumers. It will be equally important for our export success.

Three areas in which the Community can contribute to consumer trust are: openness (transparency) of its policy-making procedures; appropriate research; and monitoring of its own regulations. These should be seen as additional but complementary to national actions of regulation, monitoring, research and nutritional education.

1. Community decision making often gives the impression of being *ad hoc* and influenced by political pressures, even when it is not. The oft-cited movement towards a 'food policy approach' to Community decision making in all areas which impinge on food production and consumption would better balance the various interests in the food system, resolve conflicts (eg between agricultural and nutritional objectives) and, if sufficiently open, give consumers confidence that decisions were being taken in their best interest.

2. Research is needed to improve understanding of food/nutrition/safety/quality relationships, particularly as affected by agricultural and food-processing methods. In this area, two new Community programmes are under preparation. The Community Bureau of Reference (BCR) programme aims to improve methods of measurement and their accuracy in areas where these could give rise to problems/disputes.[10] An extensive new programme being discussed includes veterinary and plant health controls, as well as processed foods (additives, nutritional labelling, dietetic foods, bacterial contamination). The Food Linked Agro–Industrial Research (FLAIR) programme[11] will promote research into: the assessment and enhancement of food quality; food hygiene, safety and toxicology; and nutrition and wholesomeness. Such research should in the long term create greater understanding and lead to greater confidence that methods used in the European food sector are safe and wholesome.

3. In setting Community regulations governing agricultural and food-processing methods, health aspects are considered by scientific committees comprising top scientists from all over the Community. To the best of existing knowledge (and with a considerable margin of error) accepted treatments are safe when properly

adhered to. The types of scandals which undermine confidence in the industry as a whole are almost always the result of deliberate fraud. The effectiveness of monitoring systems to catch such abuses varies widely in Europe at the moment, yet, looking beyond 1992, trust between countries will be vital. Visible, effective, Community monitoring could contribute a great deal in this respect. A first step has been taken in the form of a Control Directive, currently before Council, aimed at improving the coordination and effectiveness of monitoring in all countries through the establishment of a network of controllers and the promotion of exchanges of controllers among member states.

Small firms

Official statistics are usually oriented to providing information on Small and Medium Enterprises (SMEs), a relevant category for the economy as a whole, but inadequate for food where perhaps 90% of firms employ less than 20 people.[12] There are several reasons why such *small* agro-food firms might be considered worthy of attention:[13]

Rural base. Small agro-food firms have a tendency to be rurally based. Basic processing activities have traditionally taken place in the rural areas in order to minimize the cost of transportation of bulky products and/or maximize freshness. Production of final foods has historically also been a rural activity as enterprises manufacturing cheeses, wines, breads, salamis and beers grew up to sustain their local populations. Different climates, soils, topographies and traditions combined with relative isolation to produce the remarkable regional diversity of foodstuffs still available in Europe today. Data are not generally available on the importance of agro-food firms in rural employment or the importance or direction of their links with agriculture. However, the synergy between agriculture and small agro-food firms is widely accepted as a qualitative fact and a Commission study of the Mediterranean areas suggests that agro-food industries represent as much as 29% of non-agricultural employment in areas of Italy and 17% in Greece.[14] Already almost one in three farmers has outside gainful employment and the proportion of part-time farmers is forecast to grow provided that there is non-farm work to do.[15] Rural agro-food firms could be important components of future rural development plans.

Innovation. Despite their size and technological difficulties, small firms are often the most responsive to new consumer demand patterns and to new technologies – they can be more entrepreneurial. Examples from FAST studies would include computerized bakery planning systems, development of the smoked and chilled salmon industries and biotechnology products in yoghurts.

Regional diversity of foods. Food is central to many of the social and cultural traditions of European societies and there is considerable reluctance to see the great regional diversity of foods that this has fostered being lost. Much of the diversity is vested in the hands of small food firms and will be diminished by their diminution in number.

Small food firms have some advantages over large ones – their ability to exploit newly emerging market niches being an important one. They also face disadvantages. At a time when the food industry as a whole is becoming more science based, they lack the capacity for research and technology transfer, and have difficulties with promotion and market intelligence (particularly those firms in remote rural areas). These difficulties are *not* generally related to the existence of economies of scale in processing itself.

These problems are strikingly familiar to those faced by farmers, and suggest a clear public sector role, at least in the areas of research and extension. It would be unwise to suggest that the mistakes as well as the successes of the agricultural sector are mimicked, so FAST stops short of recommending broader intervention.

As for the specific Community role, it should, as usual, be complementary to national and local initiatives. Three areas might briefly be mentioned.

(1) Better data are urgently needed, and here the Community role lies in stimulating their collection and ensuring their comparability across countries. Notable is the paucity of agro-food data in comparison with agricultural data – a situation which is evidently unsatisfactory as attention in rural areas turns from agriculture to rural development. Better understanding of the quantitative significance of the various linkages in rural economies will be important and could be obtained through comparable analyses (eg input–output studies) in a number of regions.

(2) Intercountry sharing of experiences in the areas of technology development and transfer for small agro-food firms should be encouraged. There is currently considerable rivalry (not necessarily harmful) between organizations set up for this purpose, even within countries. A sharing of the diverse experiences through Europe of the needs, organization and potential for technology development and transfer could only be beneficial, and might lead to the establishment of a permanent network of communication.

(3) Community research programmes in the agro-food sector could consider as one of their themes research oriented specifically to the needs of the small food firms. Specific subjects are best left to proposers of projects, but might include products and processes for which markets are small, equipment for small-scale and short runs, and data needs of small food processors.

Conclusions

This report has limited itself to the food-processing sector, but has taken the view that in assessing its development, a balance of interests must be taken into account, eg producer, consumer, rural dweller, city dweller. A more comprehensive analysis would likewise take greater account of interactions backwards to agriculture and outwards to the related non-food sectors and the input supply industries. Such a broad view is important as policy makers' interest in food develops from a narrow agricultural orientation to a consideration of its

connections with, for example, rural development, health and the consumer, and agro-industrial competitiveness.

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[1]A full list of the food studies may be obtained from the author, as may the programme synthesis and recommendations. A book of readings on the future of the European food system based on the main reports of the programme will be shortly published by Elsevier. An extended report is also published in the *British Food Journal*, Vol 91, No 1, 1989.
[2]For example, it is estimated by the UK Meat and Livestock Commission that the demand for 'alternative' meat in the UK could reach 5% of the market in the 1990s, while 'label rouge' poultry meat in France already accounts for 15%, with a predicted growth rate in market share of 15% p.a.
[3]Beef and veal consumption in the Community of ten fell by 8% between 1980 and 1983.
[4]Research Programme FAST Belgium, survey coordinated by professors Huyghebaert and Viaene, University of Ghent.
[5]The natural complexity proponents argue that many food constituents occur in nature as subtle co-enzymes, parts of complex molecules, salts or esters, or as substances loosely bonded to other molecules which render them more available for absorption by the human digestive system (which is genetically geared to obtaining nutrients in such a format).
[6]The Belgian survey found that of the 40% of consumers who understood the meaning of the Community's 'E' numbers to identify food additives, 31% thought all E number products to be toxic!
[7]It is not possible to do justice in this short summary to all of the studies, which covered biotechnology, irradiation, vegetable proteins, catering industries and food and health. Interested readers should request the original publications.
[8]OECD Science and Technology Indicators: No 2, *R and D, Invention and competitiveness*, Paris, 1986.
[9]Other constraints to innovation are: the still inadequate understanding of the complex biological processes involved in producing, say, a particular flavour or aroma in beer or cheese; the difficulty of making sufficient cost savings by a new process to make it worth risking upsetting an established and accepted production formula, regulations which can impose a considerable cost and time delay in obtaining approval for a new food product; and agricultural policies which may affect the level of prices and their ability to reflect desirable quality characteristics required by processors. See Institut de Gestion Internationale Agro-Alimentaire (IGIA) and CEAS Consultants (WYE) Ltd, *The Implications of Biotechnology on the Food Industry*, Report prepared for DG III of the CEC, Brussels, Belgium, 1987.
[10]'Council Decision adopting a research and development programme of the European Economic Community in the field of applied metrology and chemical analysis (1987–1992), (Community Bureau of Reference, BCR)', COM(87)444, Brussels, Belgium, 1987.
[11]Commission of the European Communities, 'Proposal for a Council decision to adopt a multiannual research and development programme in food science and technology (1988 to mid–1993) "FLAIR" ', COM(88)351, Brussels, Belgium, 1988.
[12]D. Van Den Bulke and H. Keeris, 'De Belgische voedingsnijverheid: economische tendensen en technologische perspectieven', *Actions Nationales de Recherche en Soutien à FAST*, Rue de la Science 8, Brussels, Belgium, 1987.
[13]The small food problem is discussed more fully in Bruce Traill, *Small Firms in Europe's Agro-Food Sectors: If They Matter, What Role for Research and Technological Development*?, FAST Strategic Dossier 7, Brussels, Belgium, 1988.
[14]Commission of the European Communities, *Development Strategy for the Agro-Food Industries in the Mediterranean Regions of the European Community*, Luxembourg, 1985.
[15]J. Herinckx, *Les Nouveaux Paysans*, FAST Occasional Paper 129, Brussels, Belgium, 1986.

Book reviews

Factors in famine prevention

PREVENTING FAMINE: POLICIES AND PROSPECTS FOR AFRICA

by Donald Curtis, Michael Hubbard and Andrew Shepherd

Routledge, London, UK, 1988, 250 pp, £30.00

This is an exceedingly useful book with only a few of the flaws of a book written in the heat of very complex events. It is easier to look back at the Bengal famine of 1943 and be wise. With all due respect for the brilliance of Sen's pioneering work, *Poverty and Famines*,[1] it was easier for him to write with some distance from the events he considered. This book treats famine in general, but is clearly inspired by the need for clarification of issues *now*, even as the United Nations' list of country food emergencies still includes Ethiopia, Sudan, Angola and Mozambique.

The heart of Part I of the book contains case studies of Ethiopia and Sudan. These are bracketed on one side by two brief introductory chapters treating 'the famine process' which provide an overview of half a dozen 'macro' factors that seem associated with national food insecurity in Africa. On the other side of the core cases are brief but clear discussions of famine prevention in Botswana, Bangladesh and Gujarat.

The Ethiopian case study by Hugh and Catherine Goyder is excellent. There is a map (not a minor detail); historical background – conjunctural processes locking first the population of Shoa and then other regions into the highly vulnerable situation of facing drought when they have already sold off assets – is carefully, but concisely described. The argument is systematic and lucid. Treatment of Sudan, by contrast, while rich in detail and insight, is less structured, assumes too much background knowledge on the part of the reader and – alas – provides no map. It reads like the first draft of a harrowing experience dashed off in the midst of (or just after) a visit to famine camps themselves.

The introductory chapter begs a number of questions by jumping into the subject with a presentation of 'the' famine process. There is no attempt to define 'famine'. While I am on record as stating that attempts to distinguish finely between 'epidemic hunger' (de