

INTERNATIONAL DEVELOPMENTS IN THE FOOD INDUSTRY

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by

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## Preface

In developing a strategy for the food industry in Jamaica, UNIDO and the Agro Industry Division at Jampro have followed a three fold approach. First they have provided direct assistance to firms in the food processing industry through the newly established Food Processing Department in Jampro, supported by a number of productivity missions from Massachusetts based consultants. This programme of work is now well advanced. To date the intensive productivity programme has been focussed on two enterprises, and a group of canning companies. There is now a core group of six firms in this part of the programme. The strategic purpose of working with firms in this way was to show how the principles of product quality and Just in Time production work in practise in Jamaican conditions.

Secondly, there were to be economic studies on critical areas of the Jamaican food economy as and when required. The first of these was on the pricing of food commodities, and it identified problems of transport and imperfect information as being at the root of the large variations in prices in different areas of the island.

Thirdly, a broader strategic programme of work was initiated. It was to be in two parts, the first on trends in the international food industry; the second on key strategic issues for the food industry, looking at food processing within the context of the wider food chain, from primary production through to distribution and catering.

The present study is the first stage of this strategic process. It does not aim to provide market forecasts, of which a large number have already been undertaken on Jampro's behalf. Rather it aims to identify the main currents that are affecting the way the international food industry is likely to develop over the next decade, in order to provide a context for national and enterprise strategy, as well as to report on

the differing ways in which the food industry has been organised in developed countries.

The study was undertaken on behalf of Jampro and UNIDO by Robin Murray of the Institute of Development Studies, University of Sussex, and was based on discussions and material gathered during field trips to Canada, the UK and Italy in the first three months of 1992.

## International Developments in the Food Industry

### Introduction

There are two major forces that are reshaping the international food industry in the 1990's, one driving the supply side, the other transforming demand. On the supply side the key developments are in biotechnology, process flexibility, and the industrialisation of domestic food preparation. The main actors are the large companies dominating the chemical, farming, processing, catering and retail trades. Their aim has been to increase resource yields and improve process flow at each point of the food chain, and the results to date, quite apart from the promises for the future, already suggest that the world is entering into a third agricultural and food processing revolution.

Side by side with these changes has emerged a growing consumer movement which has challenged many of the tenets of the mass food economy. At first it focussed primarily on the impact on health of industrialised food - the degree of its processing, the methods used to preserve food, and the dangers of high fat/low fibre diets. But in the second half of the eighties these concerns widened out to embrace the environmental consequences of the modern food system, and most recently the broader developmental consequences as well.

One of the features of these changes has been their international character. Not only have international companies dominated many branches of the food and beverage industry, but consumption patterns across countries have been increasingly converging. The control of world brands has become a key strategic focus for the major firms, supported by international advertising, and catering systems. Even the consumer movements, although of relatively recent origin, are

now building international networks of information and action. Similarly the new hard and soft technologies are conceived and diffused on a world basis, as is the search for genetic inputs to the biotechnology industry. The sector in short can no longer be analysed simply in a national framework. Many of its current points of conflict are the result of tensions between the tendencies towards globalisation and the distributional effects of this globalisation. Globalisation does not mean the end of nation states and national interests, but a redefinition of those interests, and of the means of pursuing them.

If this is the case for developed countries in the North, it is doubly so for island economies like Jamaica. Jamaica now exports half of the food it produces, either directly or through sales to foreign tourists. It imports half the food that is consumed on the island, either as inputs to domestic processing or as final goods. There is no way the island can insulate itself from the massive changes that are now taking place in the world economy. An appreciation of these changes must therefore be the starting point for any national strategy.

## Consumption

As far as consumption in the North is concerned, there are two dominant and in part conflicting trends. The first is the expansion of convenience foods, the second a growing interest in healthy and green foods. It is in terms of these trends that the major processors and retailers are now planning.

## Convenience

The expansion of convenience foods amounts to an industrialisation of domestic food preparation. This is not new, but its extent is. In 1960 90% of food products sold in the United States involved the household taking time in their preparation. Only 10% saved time. By 1988 the ratio had shifted to 40:60, and by 2,000 it is forecast to shift still further to 10:90. In other words the proportion of convenience food in the total food budget will have moved from 10% to 90% in the course of 40 years.

In part the convenience takes the form of prepared food, breakfast cereals rather than porridge, vegetables that have been cleaned, pastry that only needs to be rolled out and cooked. More recently there has been a striking growth in ready prepared meals which can be eaten directly (like sandwiches or take away pizzas) or heated up.

The invention of the microwave has been particularly important here. In 1983 only 7% of UK households had microwaves. By 1987 it had risen to 35%, as against 57% in Japan and 70% in the US, and although the proportion of microwaveable food expenditure is still low (only 2% in the US in the late eighties) it is forecast to be up to 20% by the year 2,000. In the US microwaveable food grew by 68% in 1988 alone to \$1 billion, and was expected to continue to grow at or near this rate well into the 90's.

Alongside these changes in the home has been the growth of eating out. North America has been a world leader in this, with the average US citizen devoting 35% of their food income to eating out. Fast food outlets have been one of the fastest growing parts of the catering industry with the US having nearly 80,000 fast food outlets (60 times more than France and Germany), a figure that is expected to grow rapidly in the 1990's. In Japan, where over 50% of the people eat out at least once a week, the number of catering outlets has tripled in the last 20 years.

There are a number of factors lying behind these trends:

- the rise of single person households, (which are expected to amount to 30 - 35% of all households in Northern countries by the year 2,000)
- the proportion of women at work (55% of US women were in paid work at the end of the eighties and this figure is forecast to rise to 62% within a decade)
- the use of extra income to save time in food preparation as in other areas of the domestic economy
- the tendency for eating out to be part of discretionary leisure expenditure, on a par with going to a cultural event. Tourism is an extended example of this.

All reflect a shift in the mode of consumption, the increased marketisation of domestic production, and the incorporation of much family life into what have come to be known as the cultural industries.

Convenience and post modern eating.

One result of the industrialisation of cooking has been the fragmenting and mingling of what were previously distinct food



cultures. Marketing surveys report the breaking up of national markets by age and ethnicity. Regional network TV and the rise of a speciality press at the expense of mass magazines have contributed to this fragmentation.

One rapidly growing segment is ethnic foods. This reflects in part changing demographic patterns (with the Hispanic population now constituting 25% of the US population according to some estimates) and in part what has become a different kind of hunger in the North, the search for novelty and variety in prepared food.

What is striking is the similarity of the changes affecting food, and those observed in clothing, furniture and other consumer durables. Product life cycles are getting shorter, and change more rapid. In the USA in 1989 10,000 new food and drink products appeared on the market. In Britain the figure was 3,000, and in Japan 20,000. Among the main categories of innovation were microwaveable foods, convenience foods and 'easy eating', a wide range of snacks, and of niche products such as special meals for drivers, pregnant women and athletes.

These changes have significantly gone further in Britain, North America and Japan than in continental Europe, where there remains strong regional food economies and patterns of family cooking and eating.

### **Healthy Eating**

The second decisive change in consumption has been prompted by the connection between food and ill health. This has taken different forms according to country, with the USA and Canada more concerned about diet, and Europeans also questioning the wider effects of mass produced food and intensive farming. But on both continents the quality of food and its implications for health and the environment is becoming the key force

challenging the food industry from the side of demand. As a recent major marketing report on Healthy Foods and Healthy Eating in the UK concluded "The trend to healthier foods both in terms of nutritional quality and food hygiene issues, will dominate the UK food market in the first half of the 1990's." (Euromonitor 1990)

There have been three main points of concern:

i) Diet

The two most common killers in the North, heart disease and cancer, as well as the recent growth of ailments linked to a weakening in the auto immune system, have all been linked to diet and the nutritional composition of modern industrialised food. In the UK, two major reports in the first half of the eighties, named NACNE and COMA after the committees that produced them in the surveyed the British diet and its health related effects and reached broadly similar conclusions, namely that:

- energy intakes and fat consumption were too high
- the ratio of polyunsaturated to saturated fat in diet was too low
- the intake of complex carbohydrate and dietary fibre was too low
- salt was too high
- some minerals and vitamins may be deficient.

The two reports laid down dietary guidelines which have now become benchmarks for the industry. They encouraged a reduction of sugar, salt, red meat, saturated fats and oils, and highly processed foods, and an increase in fresh or

lightly processed foods, particularly green vegetables, and whole grain foods.

The debate that has followed these reports has been less on their recommendations, than on the extent to which prepared food fails to match up to these guidelines, in ways which are often unclear to the consumer. Thus studies have shown the high sugar content in breakfast cereals (between 32% and 57% in cereals aimed at children), in baby drinks and rusks, in fruit juices and sparkling drinks (with Coco Cola having the equivalent of 14 sugar lumps in a 330 ml can), and in products not normally associated with sugar (baked beans, and tomato ketchup, for example). Other studies have highlighted the high salt levels in breakfast cereals, and the high fat content in meat (rising to 78% in the case of sausages).

One result has been a speed up in the trends already visible before, in particular the spread of the Mediterranean diet in Northern Europe and North America, with less meat, and more fresh fruit and vegetables. Within animal products, beef and veal have tended to decline relative to pork and poultry, skimmed milk and milk products like yoghurt and cheese have risen while whole milk has in many cases declined, though no country has followed the US trend in eggs, a fall of 25% in the last 30 years.

Packet sugar is one of the products to show sharp falls (in Britain down 50% between 1968 and 1984) but this has been compensated by increased sugar in processed foods which in the US has meant that total sugar intake has actually risen.

Britain has been one of the countries in which diet changes have been sharpest. In addition to those already mentioned there have been increases in polyunsaturated margarine, fruit, particularly fruit juice, high fibre bread and breakfast cereals, and lightly processed food more generally (the last of these now constituting a market of £2 billion per annum). Many of the spectacular growth products of the last

decade, such as yoghurt, fromage frais, and bottled water for example, are associated with the broad concern for a healthy diet.

**ii) Chemicals and Additives.**

A second concern has been with the effects of chemicals and additives applied in agriculture and in food processing. A study by the US National Research Council for the Environmental Protection Agency concluded that 30% of insecticides, 60% of herbicides and 90% of fungicides could cause tumours. They noted that the 15 products most at risk from pesticides were : tomatoes, beef, potatoes, oranges, lettuce, apples, peaches, pork, wheat , soya beans, carrots, chickens, corn and grapes, (all of them save the meat products, acceptable elements of the NACNE and COMA diets). The same body further produced a large study in 1989, following earlier work by the Environmental Protection Agency and the US military, which expressed alarm at the at the effects of daminozide, a cosmetic chemical applied to apples and pears, and in particular at the metabolite UDMH in processed apple products, such as apple juice.

There has been parallel alarm at the quantity and range of artificial additives used in processed food. One estimate puts the number of additives in use at 3,800, of which the great bulk are flavours, followed by texture modifiers (70), colours (50) and preservatives (43).

**c) Transmitted Disease and Food Poisoning**

The issue which has brought food safety into the centre of politics has been a series of scandals surrounding deaths and illness from food poisoning. In Britain, deaths occurred from listeria traced to yoghurt. In another case members of the House of Lords were taken seriously ill after eating mayonnaise that was found to contain salmonella from eggs. A

British Minister was forced to resign after she acknowledged that many eggs contained salmonella and egg sales fell by 50% in a week, while a further scandal centred on the presence of salmonella in a majority of food processing plants surveyed. The meat industry was also hit by the discovery of BSE or Mad Cow's Disease in British beef. This was a disease which causes degeneration of the brain and appears to have been transferred as the result of feeding cows the products of rendering plants, that is plants that process slaughtered animals and supply concentrates called protein supplements or bone meal. The possibility that BSE could be transferred to humans led to a decline in beef sales and the refusal of a consignment of British beef by the Russian authorities.

There are two factors at work in these cases. The first is problems arising from the way in which animals are raised and processing carried out, the second from the failure of processing and preservation to kill or control these agents. The move to fresh or lightly cooked products means that poisons originating in methods of rearing, for example, are less likely to be destroyed by heating (BSE is resistant to temperatures of up to 360 degrees). Those within the food industry expect a sharp increase in the incidence of food poisoning during the 1990's.

#### **The Health Food Market**

The overall results of these three types of concern over food safety have been evident in the current and expected future pattern of sales. In addition to the shift towards healthier types of food, the following trends have taken place:

- a continuing fall in the quantity of tinned food
- a fall in the use of artificial additives and preservatives.

- a sharp increase in the sales of organic food, that is food grown without chemical fertilisers (in the US organic food sales have risen from \$174m in 1980 to \$1.25 b. in 1989)

- the rise of vegetarianism

- more stringent labelling requirements

- the appearance of 'functional foods', that is foods which are marketed as contributing to health. They include foods that help:

- \* the bodies defence mechanism; hypoallergenic foods; immunoactivating foods, and foods which stimulate the lymphatic system

- \* prevent diseases like hypertension, diabetes, congenital metabolic disorders and antineoplastic foods

- \* recovery from disease, by controlling cholesterol, preventing platelet agglutination, and regulating absorption functions

- \* slow down ageing, by suppressing the formation of lipid peroxide

Functional foods have been a phenomenon of Japan , where the industry grew from nothing to \$1 billion in the late 1980's and is forecast to rise to \$3.5 billion by 1993. But there are already indications of its emergence in Europe, principally in Germany.

All these trends are forecast to continue during the 90's with fresh/chilled food doubling in sales by 2,000.

## Green food

By the end of the 1980's the concern with healthy food had widened out to include the impact of the food industry on the environment. As the Director of Marketing at Sainsbury's, the largest grocery supermarket chain in the UK, said recently, if the 1980's was the decade of healthy eating, the 1990's will be the green decade. Green in this case means bio degradable detergents, fewer beefburgers, more vegetarians and more organic products which use only natural fertilisers and pesticides. Major supermarkets now have substantial organic food sections. Some have introduced special green labels and biodegradable packaging. They are seeing themselves as responsible not merely for the selling of food but the supervising and guaranteeing of the source and quality of its ingredients.

In the case of vegetarianism and organic foods, the green concern reinforces the health one. Beef is seen as contributing to the destruction of the rain forests, while fertilisers and pesticides are criticised on ecological grounds as weakening organic processes. In the US for example increasing quantities of artificial fertiliser are now required to maintain a given crop yield, while a tenfold increase in insecticides has not prevented a near doubling of annual crop losses to insects.

The campaigns around packaging are producing quite new effects for the food industry. France and Italy have both introduced compulsory charging for plastic bottles. Germany has recently passed legislation which makes distributors responsible for waste packaging, while the Dutch have been discussing proposals which are even more advanced. They aim to reduce the volume of packaging by 10% by the year 2,000, make 60% of packaging reusable and incinerate the remainder in order to produce energy. The EEC is preparing legislation of a similar kind

Retailers and the packaging industry have both responded to these moves. The former have instructed suppliers to come up with alternatives to PVC and PVdC in packaging and less bulky materials, and are threatening to charge for the extra shelf space required for excess packaging. The industry itself is developing new materials (some low tech like fillings made from straw and banana tree leaves, others high tech like monofilm plastics), and recognising that there will be an inevitable decline in laminates and conventional packaging over the coming decade.

The green character of products is also beginning to appear as part of labelling. Packages now contain information about where and how products are grown and processed. This covers not only the impact of the production on the environment but also on people. The international cosmetics chain, the Body Shop, has made a point of seeking natural ingredients from third world communities, (as well as rejecting animal testing), and there are an increasing number of food products of this kind.

### Health and Convenience

These two broad developments, towards convenience foods on the one hand, and healthy/green foods on the other, will dominate consumer developments in developed country markets until the end of the century. Each is, of course closely linked to the other. The increase of industrialised food growing, rearing and preparation has led to the adoption of techniques which have been contested by the consumer movements. Their demands in turn have become a point of competition, with producers and retailers seeking to develop new health/green products. The drive for food innovations includes many new products directed at the 'health food' market.

But the connection goes farther than this. The industrialisation of domestic food production removes from the



home one of the corner stones of traditional culture. It threatens, in the words of the Frankfurt school of social scientists, the 'lifeworld'. One result is the simultaneous globalisation and fragmentation of taste. Another is the reaction against industrialism reflected in the food and environmental movements. This affirmation of a non industrial value system has taken the food industry by surprise, at the very moment when it was itself undergoing major changes on the supply side. What is already clear is that the way these supply side changes take place will be heavily influenced by the new consumer trends and the movements which have helped to shape them.

## Production

In other sectors of the Jamaican economy, strategy studies have observed a double movement: first attempts to establish the economies of mass production, centred round the application of the principles of single product flow; and second, scattered efforts to break through the limits of the mass production system, by introducing multiproduct flow, or what has become known as flexible specialisation. Instead of a small number of standardised products, flexible specialisation can produce small batches of many products without losing the benefits of flow. It does this by cutting changeover times, and introducing cellular manufacture as a way of managing the complicated scheduling required for different products. It also improves flow and improves resource use by cutting stocks and reducing defects,

## Mass production food

Mass production and flexible specialisation are both present in the international food industry. In food, as in chemicals, the principle of flow has always been a central goal of production coupled with the improvement in material yields. The industrialisation of agriculture and food processing was closely bound to the development of mass production and petroleum based chemicals as a way of raising yield since the early part of the twentieth century. Henry Ford was celebrated as much for the Fordson tractor as for the Model T. Nitrogen fixation - which was the critical step in the development of artificial fertiliser - was achieved through ammonia synthesis in the 1920's. though the depletion of the natural fertility of the soil through mechanised cultivation did not end until the late 1930's. Resource yields were also increased through biotechnology, notably the development of hybrid seeds in the 1930's. Although they produced crops that were less resistant to predators and required more pesticides, they contributed to the doubling of corn yields in the US that took place between 1940 and 1960. For similar reasons there

were parallel yield increases in other major crops in the post war period, sorghum, oats, wheat, barley and soya.

For livestock, there was some mechanisation. The carcass conveyors in the early twentieth century stockyards of Chicago were the inspiration for Ford's assembly line, and the same principles have since been applied to the slaughter of chickens and pigs. But the key changes have been elsewhere: in genetic innovation - which did for poultry what hybridisation did for corn; in feeding science which moved animals from the land to batteries and feedlots; and in veterinary medicine which helped stop the spread of disease of animals that were now reared in confined and intensive conditions. The rows of battery cages, served by mechanical feeders, certainly had similarities with the industrial factories of the mass production era, but it was bio chemistry as much as engineering that was a condition for mass production and that underpinned the explosive productivity growth of stockrearing as of crops.

There was no clearer connection between the changes in crops and livestock production than in the corn-soya-livestock complex that emerged in the greatest agricultural power, the United States. Soya beans had been developed in the US in the 1920's and 30's, under heavy import protection, first as a source of oil, and then, as a byproduct, as animal feed protein. By the 1980's soyabean oil accounted for 75% of all human consumption of fats and oils and of high protein animal feeds, with US exports accounting for 60% of all soya oil and meal consumption in the rest of the world. When mixed with corn, soya provided the feed for the intensive stock rearing of the post war period: the 3.7 billion chickens consumed annually in the US, pigs, and the beef, 75% of which was produced on feedlots by the early 1970's.

Instead of the mixed farm, subject to the seasons, farming became increasingly specialised, with livestock rearing timed to supply a continuous flow of product to the market. The food

processing and catering industries have for many years focussed on volume production of standardised products, from Mars bars to baked beans and Kentucky fried chicken. This requires a flow of standard inputs of guaranteed quality. Steaks have to be of a certain size, peas of a certain colour and flavour. This feeds back into the demand for particular breeds on the part of the rearer and standardised seeds on the part of the grower, . When a chain of production becomes finely tuned around single product flow, what is critical is predictability and guaranteed supply.

Historically, it was the food processors who made the key breakthroughs in continuous, volume production. Heinz, Unilever and United Biscuits were as much a part of the mass production revolution as was Henry Ford. For some items like corn and flour they could rely on commodity markets. For others, like vegetables or tropical products, they developed their own estates or made contracts with farmers. Until the 1960's they remained the dominant forces in the food chain. The post war changes in agriculture extended this logic of flow back into primary production, with the revolution in international transport allowing processors to sidestep the seasons by scheduling their inputs from different climatic regions round the world.

This process is far from spent. The industrialisation of cooking and the ever expanding demand for convenience foods, has led to the growth of the international fast food chains and catering giants. With limited market growth in advanced countries the international food companies are expanding into third world markets. Large retail chains have developed to organise the final link in the flow between the consumer and the factory. For many developing countries, it is the logic of single product flow which is still working itself through in their domestic as in their export markets.

## Flexible Specialisation

The first agricultural revolution of the 18th and 19th centuries was based on new forms of property and an empirical improvement of yields. Mass production food applied engineering and chemical techniques to agriculture and processing and constituted a second agrarian revolution. Even as this model of mass produced food extends geographically and throughout the food chain, so a further revolution is taking root, one which is both agricultural and industrial, and which is already changing the economic and spatial contours of the food industry. It can be understood as breaking through certain limits of the earlier model, both in terms of science and the organisation of production and distribution.

### i) Retailing

Its starting point is food retailing. As a production process, food retailing consists of a large number of single batch assemblies. Each shopper makes up their own particular basket of commodities, either from a single shop or a group of shops or market stalls. In traditional shops the shopkeeper made up the basket according to the customer's requests. In a supermarket, the customer makes up his or her own basket from the modular components which comprise the shop's stock. On a modern auto assembly line flexible machinery and rapid changeover times allows the customisation of cars on a single line. In some factories flexibility is achieved through running parallel lines or rapid changeover times. In a supermarket, it is as though customers form their own assembly lines, which are interwoven along the supermarket's aisles. The task of the retailer is to design the shop so that multiple assembly can proceed smoothly, and to provide quality components 'just in time'. The shop's concern is to minimise the stocks held in the shop, and to ensure the freshness of perishable commodities.

The innovations in retailing have focussed on these problems. Bar codes permit the electronic monitoring of stock and increase check out speeds. Electronic point of sales systems register the products sold, and the new stock requirements. Retailers are able to monitor daily product sales and re-order from suppliers for immediate delivery. Centralised warehousing has quickened the flow of products from the suppliers to the multiple retail outlets. Through logistic and electronic systems of this kind large grocery supermarkets are able to handle between 6,000-12,000 products, many of them involving daily re-ordering, and regular repricing.

The most celebrated practitioners of multi product flow have been the Japanese auto manufacturers, above all Toyota. But the grocery supermarkets - because of the range and perishability of their products - were the earliest pioneers of this new flexibility. Indeed it was a visit to an American supermarket in 1937 that first sparked Toyoda's vision of flexible car assembly.

With retailing and distribution typically accounting for 33-40% of final product costs under traditional systems, the transformation of retailing has led to a shift in balance within the food chain. Economies of scope have meant a rapid concentration in wholesale and retail food distribution. In the UK five retailers account for two thirds of all grocery sales. In Canada the top four account for 66%. To ensure their product quality and prompt delivery they have established contractual links with food processors, to set quality standards and provide technical advice. They are now spreading their influence further down the chain, examining the inputs used by the suppliers, and looking into the conditions under which they were produced. 60% of the products handled by the major supermarkets now appear under their own label, and this has squeezed the traditional mass food processors. In the contest between the multinational food processors and the largely national food retailers, it is the retailers who have won. They are the planners and controllers

of the modern food chain. This is the first, decisive feature of the new food system.

## ii) Flexible Manufacturing

A second is the increased flexibility of processing. The need to supply the retailers 'just in time' means that there is a premium in producing shorter runs without losing the economies of volume. As in other industries modern food processors are concentrating on cutting the wastage rates, instituting through quality programmes, and reducing the quantity of stock held on a just in case basis. A recent assessment of the broiler industry identified carcass reprocessing, poor chick quality, excess inventory, broken bones and torn skin, and variations in carcass size as examples of hidden costs which in effect interrupt the flow of good quality output to the consumer.

Many of these can be addressed by new types of management and organisation. The investment required is in software (management techniques, training, new forms of labour organisation). But in the food industry hardware such as robots, sensors and computer control systems more generally have also been important. They have allowed:

- production batches to be ordered so that cleaning is minimised,
- scheduling of different batches to be co-ordinated
- a cut in manual operations and batch time
- enhanced consistency, from batch to batch
- improved product quality testing
- warning to be given if valves stick or sensors fail

- plant to operate at maximum values of reactant conditions

These are only some of the examples which, taken together with Just in Time re-organisation, have enabled food processors to make their lines more flexible, to cut their stocks and improve their quality. Taking stock turns as one index of these changes, we find that the leading UK soft drinks manufacturers improved their stock turns from 8.5 to 11 times a year during the second half of the eighties, and there were similar improvements among makers of confectionary (from 7 to 10), poultry processors (9 to 12.5) and bakers (from 14 to 25).

### iii) Biotechnology

Along with electronics and the science of new materials, biotechnology is one of the three key technologies of the modern industrial era. It has two aspects: mutation and multiplication. The first involves the ability to design new cells, geared to specific functions, the second to produce cells in volume.

As far as mutation is concerned, there has been a long history of attempts at genetic engineering: crossing animals was one of the oldest forms; the development of the green revolution hybrids were another. But these earlier forms were all essentially random, a process of trial and error. In 1973 the key paper on recombinant DNA was published, providing the basis for a technology which enabled scientists to introduce a specific foreign gene into a bacterium, and thus change the function of a cell. It allowed cells to be designed in much the same way as the new materials technology allows materials to be designed. Both were based on earlier theoretical science, made practical by the new scientific instruments and powerful computers of the past two decades. Cell fusion is another form of mutation, lying half way between the random



and the designed, less powerful than recombinant DNA, and capable of being enhanced by it.

Mutation is concerned with producing different cells, multiplication with producing more of the same. Multiplication techniques allow genes to be introduced which will enable cells to produce more of the same substance than previously existed, increasing the supply of a great range of materials, including those which only exist in small quantities in nature, or which are themselves the result of engineered mutation. One branch of multiplication is cell and tissue culture, another fermentation in which one raw material is changed into different products, through the intervention of enzymes.

Together these bio-technologies promise to transform agriculture. They offer large increases in yields. They cut waste, through developing seeds with pest resistance for example, or arresting the enzymes which lead to rotting. They improve quality in the sense of gearing the product to intermediate or final requirements, and extend the scope for mass production. The term mass customisation which is used to describe the advances in flexible production more generally can equally be applied now to food. Mutation provides the customisation, multiplication the capacity for mass production. They open up the possibility for a major step forward in realising multiproduct flow.

The excitement generated by biotechnology among scientists and industrialists is that it offers a way to go beyond the limits of particular products, and climates, and the material awkwardness of nature. Products become feedstocks, which can be substituted for one another. Sugars for example can be extracted from corn, energy from biomass, with Brazil now producing petrol from bagasse.

Primary processes, like growing tomatoes, can be separated from the land, as plants are nourished by computer controlled

nutrients. Propagation takes place not on the farm but the in the chemical plant. Some oils can now be produced industrially, as can artificial sweeteners. Suddenly horizons are extended, old forms of production, and organisation are thrown into question.

To date we are still in the foothills of this revolution. Technological revolutions take longer to realise than to forecast. But its importance and potential scope is already clear. A recent study reported that already 20 out of 2,000 enzymes had so far proved commercially significant, and that to date the most significant impact had been in disease diagnosis in plants and animals, quality control in food, disease and pest resistance in plants, bioinsecticides, and the development of single cell protein through the fermentation of starch from cereals. Cell fusion is still difficult in plants because of the hard cell walls. It is in animals that the study saw the fastest progress being made over the next ten years, with the use of animals for pharmaceuticals becoming the norm, the cloning of foetuses from a single embryo, and a major role being played by transgenic animals in the pig and poultry business. It estimated that the market for biotech food products will rise to \$2 billion by the year 2,000, principally in the form of additives and supplements. (Smith and Lewis 1991) Calgene, the Californian bio-tech firm which has invested \$175 million in bio-engineered food in the past few years, and which hopes to be making \$500 million p.a. from its delayed ripening tomato, puts the figure higher at \$3.5 billion by the end of the decade. (Financial Times 8.5.92)

Another study of Japanese biotechnology reported that 20 government agencies were supporting a budgetary programme of \$604 million in bio technological research, and that there are now 244 bio technology companies geared primarily to pharmaceuticals. The main food applications are as yet limited to the production of ginseng, and wine. (Yuan and Dibner 1990)

Whatever the pace of these developments, what is clear is that the shape of the food industry is already being drastically altered. Just as the balance of economic power has shifted from processors to retailers over the past twenty years, so now there is a new challenge from the primary sector. What can be observed is the growing subordination of primary processors and traders to the chemical and pharmaceutical companies. Previously the latter supplied inputs to agriculture. Now agriculture is one source of inputs to the chemical industry and to an emergent intermediate materials sector. We can trace the emergence of a new agro-energy-chemicals complex centred on bio technology.

One of the key areas of control is the seed industry. Seeds have become the software programmes of the food system, which can be engineered according to the needs of processing and consumption. They can be made pest resistant, or redesigned in order to increase productivity growth (as with palm oil) or to control the process of ripening. Between the early 1960's and the early 1980's chemicals, oil and pharmaceutical companies took over more than 120 seed companies, and it is forecast that 12-20 companies will dominate the seed trade by the turn of the century.

What is now at issue is not just the development of new seeds, but the control and patenting of existing ones, since the key to the new sciences is the quality of the bioenergetic resources. 70% of the earth's biodiversity is in the developing countries, and there is currently a drive to establish 'ownership' over existing seed-stock similar to the drive for raw materials and land at the end of the 19th century. Patent law has been developed for this purpose just as land rights were a century ago, with patents being allowed not only for genetically engineered whole plants, but, since the Hibberd decision. for genes, gene complexes and highly specific characteristics as well.

The major industrial countries are now searching the world for these genes. Japan has built up a gene bank of 100,000 different varieties, with the government investing 700 million yen in the Fermentation Research Institute to store over 12,000 microbes and plant and animal cells for industrial use. The Institute of Fermentation in Osaka alone has 11,568 strains of microbes, which have patents on them. The United States government for its part has recently announced a patenting of all genes, a form of nationalisation to prevent, the government suggested, the private control of genes. But as with an earlier period of colonialism, such national control is determined above all by a concern to exclude foreign competition, and it affects developing countries from which these genes originated as much as the USA's industrial competitors.

A further development, the growing interchangeability of feedstocks, has weakened the control that key agri-processors and traders have on particular products. Previously agro industry was organised around oligopolies in particular sectors, Cargill in grains, Unilever in oils and so on. Now bio technology is forcing these companies to restructure, both by investing in what are now competitor materials, as well as developing backwards into seeds and chemicals themselves. Tate and Lyle, the UK sugar company, has bought Staley, the second largest producer of isoglucose in the US for example. Staleys itself has moved into chemicals like detergents and paints, as well as taking a 40% share in Biotechnical Resources, a company specialising in fermentation.

Feruzzi, also traditionally centred on sugar, has similarly taken over Cerestar, the largest European producer of starch, Olii Risi (the Italian vegetable oil refinery) and Central Soya, which means that Feruzzi is now the largest producer in Europe of soya based protein concentrates, as well as flours and oils. Equally significant, it has taken over Montedison, the leading private chemical and pharmaceutical company in Italy. The result is that Ferruzzi has been transformed into

an organic material company, in much the same way as the major metal firms have diversified to become inorganic materials companies.

Another feature of this transformation of food is the emergence of new sectors, one specialising in intermediate products, another of service oriented high tech firms. Both these new sectors are dominated by chemical and pharmaceutical firms. Japan is particularly strong in the new intermediates, notably amino acids and vitamins, while the US are dominant in the emerging agro-chemco-energy complex, as well as in the control of seeds. The strength of Europe is in oils, protein technology and industrial enzymes.

In the new system the primary processors become in a sense sub contractors to the chemical-pharmaceutical companies, part of a new putting out system which receives seeds and embryos on the one hand and provides standardised feedstocks on the other. This is what has caused the major primary processing firms to integrate backwards. What is noticeable is that firms like Unilever have been problem or product specific in their strategic development, attempting to use the new technologies to defend their traditional areas of control, whereas the chemical companies have sought to master a family of scientific and technical skills which they then develop into multiple applications.

Both farmers and food manufacturers are thus caught in a pincer movement between the retailers on the one hand and the bio chemical complex on the other. It is the retailers who act as 'editors' between the final market and the chain of supply. It is the bio chemical complex which is becoming the key point of value added in the chain. The commanding heights in the sector are shifting from the means of production and distribution to the means of reproduction.

## Points of Tension

In some instances these developments on the supply side have run in parallel with the trends in demand. The large retailers have now taken up the demands for healthy and organic food, and have been a major force in the industry for upgrading production facilities. Bio technology can be seen as a means of avoiding the need for pesticides and herbicides, which have been so criticised on health grounds, and for detecting food poisons like salmonella and lysteria at an early stage.

But there remain points of tension between the consumer and environmental movements on the one hand and the new forms of production and reproduction on the other. There has been strong criticism of the concentration of retailing in superstores, for example, because it involves the increased use of car transport and entails a loss of access for the less mobile and those without cars.

There has been equally strong criticism of modern processing and preservation techniques. The consumer movement has recently forced a retreat on the use of food irradiation for example, because of its unexplored potential consequences for human health.

Suspicion remains, too, about the developments in bio technology. It is argued that bio technologies involve hazards which are not immediately detectable, that they will tend to limit bio diversity, and that they will commonly imply a capital intensive form of production which will further the concentration of agriculture. In the case of genetically engineered seeds, for example, it is feared that:

- the use of herbicide tolerant seeds will result in the need for more and stronger herbicides, as herbicide resistance is transferred to the weeds themselves.

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- insects similarly are likely to develop resistance to insecticides as has happened in the US, and the mutations of diseases will sooner or later break through the defences of genetically engineered seeds.
  - it will never be possible to control the releases into the environment of untried and unauthorised organisms. There have been many examples of such unauthorised releases over the past five years.
  - genetic engineering will produce mono cultures, as did the seed technology of the green revolution, which make crop more vulnerable (as with corn leaf blight in the US in the 1960's and the Russian wheat epidemic of the 1970's) Whereas monocultures can produce more in the short run, polycultures are healthier and produce more in the long run.
  - genetically engineered seeds will have been developed to respond to particular fertilisers, which further increases farmer dependence on chemical companies.

In the words of Sir James Goldsmith, the former owner of a conglomerate which included major pharmaceutical and food companies, who has himself become concerned at the technologies for which his companies were responsible:

"Can we understand the longer term effects, direct and indirect of these new and partially explored products? Can we obtain their benefits without terrible consequences? Do we really believe that new regulations will be sufficient to stop uncontrolled releases into the biosphere of these new forms of life? How can we avoid new forms of life, such as genetically engineered microbes, from causing unlimited damage? Their very 'newness' means that existing life on earth, both animal and vegetable, has never been exposed to them and therefore has no immunity to protect them. Do we understand that by creating instantaneous unexplored new

forms of life we have thrown away the vital protection of being able to learn by our own mistakes?."

The tone of this warning is one that has become increasingly heard over the past five years in the North. The immediate dangers to health and the environment of the new food technologies, and their potential uncontrollability, are issues that are now part of the mainstream debate. They are already being reflected in legislation, on additives, labelling, food safety, and new product licensing, and are acknowledged as being one of the major forces affecting the way the food industry develops over the next decade.



## Food, GATT and Development

Most recently, the criticisms have widened to include the implication of the modern food system on development. The current negotiations in the Uruguay Round of GATT and over the future of the European Common Agricultural Policy have brought these issues to a head. The fear is that the supply-led trajectory of the food industry will damage the rural economies of the North, and devastate both the urban and rural economies of the South.

There are two parts of the argument. First the large northern farmers have been increasing their productivity at twice the rate of domestic demand. What normally happens in these circumstances is that the large firms take over the small, and also expand their sales to areas of lower productivity. But in the case of agriculture, political and environmental reasons have meant that governments have wished to protect small farmers, and domestic supply. They have erected systems of tariffs and quotas to protect their farmers against large scale, intensive production. This, says the critics of the food system, is all to the good, since there are hidden costs to allowing the large northern farmers to continue their expansion. It is not only a question of the quality of the food and the effects of the environment of intensive farming, it is the threat to the lives of millions of small farmers, particularly those in the South. To quote Goldsmith again:

"Competition is a form of controlled warfare. In the case of agriculture, on the one side you have farming based on industrialised monocultures, intensive methods, direct and indirect subsidies and an agricultural community which has already been reduced to the needs of intensive agriculture. On the other side, you have traditional agriculture. In such a contest, communities, in which small and medium sized farms still predominate, would be washed away as if by a catastrophic flood; whole populations would be uprooted and swept into urban slums.

Those who remained to try and compete against industrialised and subsidised agricultural imports, by necessity would be pressed into adopting the short term solutions of intensive methods."

The more the productivity differential increases, the greater is the pressure of the high productivity countries to open up the markets of the world, as is clear from the current Uruguay round where the US and the Cairns Group are arguing for the removal of protection, in the South as much as the North.

This is the underlying pressure within world agriculture. But there is a second argument against the current world food system which is that the development implications of growing productivity differentials are made even more threatening by the regime of US and European subsidies. For in both areas governments have been reluctant to allow the large scale farmers to destroy the medium and small within their domestic boundaries.

In Europe there is a system of guaranteed prices which are set at a level that will provide a living for the smaller, marginal farmers. The result is a hyper incentive for larger, more productive farmers to expand output, and this in turn has led to the celebrated surpluses. Some of these are stored. But much of the surplus is exported at subsidised prices. In the EC 39% of the cost of the Common Agricultural Policy goes on export support, and this helps explain why Europe is now the world's largest exporter of sugar (5 million tons a year), and why it shifted from being a net importer of cereals of 25 million tons a year to a net exporter of 19 million tons in less than ten years (1976-85). It should be noted that the bulk of the CAP subsidy was going to the larger farmers, with 20% of the farmers receiving 80% of the subsidy.

The US has operated a system of farmer income support plus export subsidies, which has not escaped the results of the European Common Agricultural Policy. The export subsidy -

which by the mid 1980's was taking 60% of the \$30 billion US farm budget - served to maintain prices within the US, and allowed the ever expanding output coming from the more productive farms to be sold on the world market. What would anyway be low prices became, as a result of this system, even lower, with the value of the US subsidies for wheat, rice, feedgrains and cotton, being twice the value of the goods themselves (1986 figures).

This situation is not new. The US had sought to use food aid since the 1950's as a way of opening up export markets in developing countries. Between 1954 and 1973, PL 480 exports totalled \$22.3 billion, or 20% of US agricultural exports over this period. They exported large quantities of cereals to the Communist countries in the 1970's as a way of getting rid of surpluses without cutting world prices. What was new in the 1980's was that the debt crisis and recession cut demand in both the South and the North, and the resultant fall in demand coincided with further productivity and output growth.

The principle consequences for developing countries have been three fold. First, there has been a growth in food imports. For many countries it has been almost impossible to compete with subsidised imports, with the result that they have moved into an overall food trade deficit. For example, from being broadly self sufficient in wheat in the immediate post war period, developing countries moved to becoming major wheat consumers (53% of world consumption in 1985) and major importers ( 57 million tons in 1985, which was 63% of world wheat trade). Similar deficits occurred in rice, feedgrains and cotton.

Second new intensive food economies have emerged within the developing countries geared partly to export, and partly to the urban middle class.

Cattle, poultry, pork and the accompanying feedstuffs is one sub-system.

In Central America, livestock ranching has expanded to cover two thirds of arable land, 25% of it being exported, particularly for hamburger and meat processing companies in the US. Cattle have been the cause of the loss of two thirds of the Central American lowland and lower montane rain forest since 1950, and there have been similar consequences from the expansion of cattle farming in Brazil, though in this case the destruction of the rain forest has been also bound up with the movement of land hungry peasants from the Centre South, which has been the main locus of intensive agricultural development.

Brazil has also become a major exporter of chicken and frozen orange juice concentrate to the US, and of oil seeds and feed grains to Europe. Argentina and Thailand are other large exporters of oil seeds and feed grains, Mexico has specialised in winter vegetables. The point in all these cases, as with the green revolution crops more generally, is that they are highly dependent on first world seeds fertiliser and irrigation, and much takes place under long term contract with purchasers in the north, or under multinational management and ownership.

The third consequence is that there has been a 'disarticulation' within local economies between the small farmers and those on low incomes on the one hand, and those with higher salaries and involved with exporting or higher value domestic consumption on the other. In Central America for example, in spite of the major expansion of the meat industry, beef consumption per capita has fallen. In Mexico, few in the lowest income group eats poultry, eggs or any other animal protein on a regular basis. At the same time imported food forms the cheap core of much of the urban diet, as consumption patterns shift away from domestic staples. Research in Jamaica found that rural migrants to Kingston had significantly increased their consumption of rice, wheat bread, chicken and eggs, and cut down on the traditional diet of yams, bananas and sweet potatoes.

The case in favour of this restructuring of the international food economy is that the imports from the North have provided cheap inputs for the basic domestic urban diet, and for feedstuffs for the domestic meat industry. Primary and processed exports have reflected the comparative advantage of developing economies, as determined by climate, land values and labour costs. Both have expanded the surplus available for accumulation, indeed the food economy in these countries has been a primary engine of growth.

The case against is that the growth that has taken place has been at the expense of small peasant households, the destruction of whose livelihood is not compensated by a shift to new forms of employment, but rather serves to expand the numbers of the urban and rural unemployed. According to this argument the quantity of employment in an economy is not decisively determined by the real wage. What is critical is the amount of surplus that is re-invested. The intensive food economy has increased the surplus in two ways: first by reducing the level of wages because of cheap food, and secondly through the expansion of higher productivity commercial agriculture and related processing. But in Latin America and Africa, in particular, the portion of this surplus which is reinvested within the local economy is insufficient to provide employment for those displaced in the countryside, however low the real wage actually falls.

This is not an argument confined to the food industry, since capital from the growth of the commercial food sector could be re-invested and provide employment in non food sectors. But the food industry plays a central part in the structural crisis of unemployment in the developing world because of the role of the intensive food complex in displacing rural households from the land and from the sustainable means of subsistence.

Furthermore, from the national viewpoint, this pattern of food development has for many countries increased import

dependence, and their vulnerability to sudden increases in the cost of the commodities on which they are dependent. The liberalisation envisaged under GATT is particularly threatening in this respect when coupled with continued first world dumping.

This is the economic heart of the Goldsmith case, added to which are the nutritional and environmental considerations discussed earlier. What they imply is the need for any national strategy for the food industry to take a broad view of the wider implications of any liberalisation proposals or investment projects which may be justified on micro economic grounds. They also suggest that one of the central issues for any strategy is how to strengthen the small farmer economy, and re-integrate it with the domestic and even export markets. Put another way, a strategy cannot fail to be heavily determined by its starting point. The expansion of surplus and/or exports are two common criteria. Raising the nutritional level of the whole population is quite another, throwing up different questions about technology, crop type, farming methods and so forth.

As far as the immediate future is concerned, much hangs on the outcome of the Uruguay Round. The so called zero-option advanced by the US envisages the removal of all agricultural subsidies influencing production within ten years, and the removal of trade barriers. The EC advocates a series of commodity agreements whose effect would be to raise world prices, cut the need for budget support, and ensure existing levels of market share procured through the practice of subsidising exports. The EC has sought to rebalance, by trading subsidy cuts in surplus sectors (cereals and dairy) for higher protection in oil seeds and animal feeds. Japan and the Nordic countries, like the EC, were opposed to the complete elimination of import restrictions and domestic subsidies, the Japanese distinguishing between income subsidies designed to maintain food reliance and trade distorting export subsidies.

The likelihood of some compromise has been markedly increased by the May 1992 agreement to reduce the level of price support within Europe's Common Agricultural Policy. Over the coming three years cereal prices paid to farmers are due to fall by 29%, beef prices by 15%, while the medium and large scale farmers are being required to take 15% of their land out of use. The dairy farmers are having their production quotas cut by an annual 1%. This agreement releases some of the pressure that has built up in Europe (even though the CAP budget will have to increase to pay farmers compensation for the new arrangements), but it does not eliminate the continuing threat to developing countries. This is because the 15% cut in cultivated area will not lower production by anything like the same amount, as the large farmers concentrate on their most fertile land and are likely to raise productivity through innovation. The result will be to further lower cost, so that even with reduced or zero subsidy, the tendency to undercut developing country production will remain.

What is striking is that the European Commission, because of the threat of intensive agriculture to its own small farmers, coupled with the consumer campaign, has itself funded a policy to promote extensive farming using more organic methods. If as seems probable the surplus problem continues, then the case for extending this programme can be expected to strengthen.

Neither the CAP agreement nor a GATT compromise between Europe and the US will halt the developments on the supply side which were discussed above. But they will determine the way in which their effects are distributed, internationally and between different size farmers internally. One of the critical issues will be the extent to which developing countries will be forced to open up their agriculture as part of any GATT agreement coupled with structural adjustment programmes. In Costa Rica where this happened as part of a World Bank package, cuts in restrictions on food imports led to a 10% per annum increase in US wheat and maize imports between 1986 and

1989, and a sharp decline in the area under maize cultivation. In the Phillipines, the process of liberalisation was the chief cause of the change from national self sufficiency in rice and coarse grains in the mid 1980's to a deficit position where, by 1990, the country was importing 600,000 tons of rice, equivalent to 16% of national consumption. Many developing countries have seen their domestic producers undercut by northern surpluses at dumped prices. The removal of restrictions makes the position that much more serious.

The general international situation can be stated as follows. Food has always been the subject of government intervention, because of the political importance of farmers, its prime position in consumption, and the need for food security on the part of the national economy. The current transformation of food production, differentially affecting large and small farmers, has raised the cost of subsidy, at the same time as expanding surplus. It has thus put the traditional basis of food policy under increasing strain. The yield and productivity increases promised by the third food revolution is a further force of such weight that it is highly unlikely the existing food regimes will remain in place by the end of the 90's. What direction they will take will depend, however, on political as much as economic forces.



## Alternative Structures Of The Food Industry

One of the economic factors which will determine these directions is the organisational structure of the food industry. At present there are two contrasting models. There is an Anglo-American model, which is that described earlier in this section. It is centred round a small number of independent retailers, who play the central role in planning production in the food system. They provide technical advice and specifications to suppliers. Over the past twenty years the primary producers and processors have increasingly become subcontractors to the retailers as far as groceries are concerned. This includes multinational processors who have seen the supermarkets' own label goods steadily replacing international brands, The processors have responded by integrating into the expanding catering conglomerates, on the both food and beverage side. Superimposed on these trends is the growing influence of the chemical-energy-pharmaceutical complex, which, as we have seen, has close product design and corporate links with the major processors.

The overall picture then in North America and the UK is of a food industry centred round a core of large national and international companies, with a periphery of small scale, sub contractors, or franchisees. The trend towards concentration is continuous, not only in retail groceries, but in processing and on the agricultural input side as well. In the US, for example, the share of the top four firms in the sectors producing differentiated (branded) goods rose from 39.5% in 1963 to 49.5% in the mid 1980's, with the fastest concentration occurring in the brewing industry. (Connor 1988). In distribution the share of the top four retailers in metropolitan areas (which is the appropriate level to assess retail structures) rose from 49% in 1958 to 58% in 1982, and among grocery wholesalers the top four accounted for 73% in 1986. (Connor 41).

There is a second model, to be found in the old world - particularly in Europe - in countries which have different agrarian and political histories to North America. The second model is distinguished by the importance of co-operatives and of small and medium sized enterprises, which instead of acting as satellites to large firms, have developed their own forms of collaboration and specialist institutions.

In Northern Europe, retail co-operatives still play an important role. In Germany on the eve of unification, the largest West German retailer in terms of number of outlets was Edeka, which is owned by 35 co-ops and 346 other small and medium retailers. The associated Spar group is also important. In Sweden, of the top 13 retailers 2 are buying groups, and 7 are co-ops. One of these, the largest retail organisation in the country, is ICA. It started as a joint buying group, but now offers a range of services to its members, finance, consultancy, marketing. It has also bought the largest mail order company. A second major company is KF Konsum, a federation of 134 retail co-ops, with 1687 retail outlets. Co-ops of this kind are also have a substantial presence in the other Scandinavian countries.

What is significant about this kind of associated organisation is that it provides the benefits of size and inter industry linkages. Konsum for example has 15 computerised warehouses, and a chain of hotels, restaurants and travel agents. At the same time it maintains a relatively dispersed consumer network, with the interests of its member organisations paramount. (Euromonitor 1991)

Some of these distribution co-operatives have their own production facilities. But in Scandinavia, Germany and France there is also a tradition of production co-operatives, both for marketing and processing. In Denmark the co-operative movement was decisive in modernising the food industry in response to the agrarian crisis of the 1880's. Within 20 years there arose a network of over 1500 producer owned co-

operatives, dairies, bacon factories, egg exporters, and feedstuff purchasers, covering every area of the country, whose influence is still present today. In Germany, it was co-operative banking which was and remains an important support for farmers. In France, one in four farmers were members of a co-op by the time of the second world war, and they remain important, particularly in the wine industry.

It is in Italy that these twin streams, of consumer and producer co-operatives, have come together most decisively, particularly in the regions known as the Third Italy, between the industrial North and the Mezzogiorno. Here the co-ops have originated primarily with small and medium sized farmers, who have set up their own processing plants, marketing networks and purchasing organisations. But they have also integrated forward through so called second level co-ops to control wholesale and retailing networks.

In the region of Emilia Romagna for example, the food industry is organised around agro-food districts, which specialise in the production of particular commodities. Through an extensive network of quality control laboratories and technology institutions, the region has established a number of branded products that sell on world markets - parmesan cheese, parma ham, wine, and a range of fruits. Their production is predominantly by small and medium processors, many of them co-operative. The annual production of two and a half million parmesan cheeses for example come from 900 cheese factories, 85% of which are co-operatives, and the same proportion holds for the rest of the milk and milk products sector. 65% of the wine comes from co-operative wineries, while the 95 co-operative fruit processing plants alone account for 15% of the national output. For parma ham the co-operatives have less significance. Instead the industry which comprises small and medium firms have formed consortia, most notably the Consortium for the Protection of Prosciutto di Parma, with 200 producers, which controls quality and administers the Parma

trademark. Overall, co-operatives dominate retailing and a food processing sector that is a substantial exporter.

The development of processing co-ops was originally designed to provide employment for those leaving the land, and a market for the products of the small and medium farms. During the 1970's the economic crisis forced the processing co-ops to re-organise themselves on a more commercial basis, and the same was true of the retail co-ops more recently. What is significant, however, is that the structure that has been built provides a framework for small farmers and processors to continue as specialised producers connected to national and world markets. This is nowhere more striking than in the case of prosciutto ham, one of whose main centres is Langhirano, a small town of some 15,000 inhabitants, which has nearly 100 firms specialising in different parts of the production process, linked by a consortia, and highly competitive on the world market.

Each major food subsector in Emilia Romagna is supported by a service centre, funded by enterprises and the regional government. The centre for wine for example not only analyses the content of wine samples, but undertakes training courses and studies of wine technology, circulating the results to all winegrowers in the region through a monthly newspaper. The Universities of Bologna and Piacenza are linked in to the twin processes of quality analysis and technical development, indeed the universities have been a key source for considering how the demands of health oriented consumers can be met at the same time as introducing safe forms of bio-technology.

The contrast between the organisation of food production in the Third Italy as against the Anglo-American model is not so much one of small versus big firms. Rather it is how a food system is organised. In the centralised model, there is the tendency for large firms to deal with other large firms, whereas the decentralised model has found mechanisms which allow small firms and farmers to relate to each other at each

stage of the food chain, yet with access to the critical services which are normally associated with scale. One of the results for the Italians is that they have deepened their local food economies, improving what they have traditionally produced rather than diversifying to new crops or areas on the basis of short term price movements. Such regional food economies producing for world markets are also characteristic of France, with its wines, cheeses and meat products. They reflect the political and economic power of the small farmers, but, as in Italy, they have produced items which in the current period have been among the growth products of world markets.

## Alternative Strategies

These alternative structures of the food industry have gone hand in hand with alternative strategies. In Europe and North America, the most innovative attempts to develop a strategy for the whole food industry have come not from national governments but from local and regional ones. National governments have traditionally focussed their policy on agriculture. Ministries of Agriculture, Fisheries and Food, have by and large been dominated by the interests of agricultural producers. Local and regional governments have had different balances of interests, and this variety of conditions (what systems theorists call 'requisite variety') has thrown up initiatives which have sought to co-ordinate all parts of the food chain around a common strategy.

A good example is that of Ontario, in Canada, a region which employs 74,000 people in food processing in over 1200 enterprises, with an extensive agricultural and distributional industry as well. For some years it has been drawing a wide range of bodies together in advisory committees and sub sector working groups. From this has emerged a strategy which has so far survived a sharp change of political power in 1991 when the Liberal Government was replaced by the left NDP.

The key points of emphasis in the strategy are as follows:

a) cost competitiveness. The documents highlight a number of ways in which Ontarian industry has higher costs than US competitors: raw materials (because of the operations of marketing boards set up to stabilise prices and support small and medium farmers); labour (occupational health and safety provisions are stronger in Canada, and there has been a sustained programme to equalise women's pay); tax is higher in Ontario than the US, (in part because of the larger social programmes in the former); standards for food quality, labelling and packaging are also higher.

b) scale of production and modern equipment; the Government has instituted programmes which have committed \$15 million over 5 years, as well as sponsoring new technology acquisition missions, and backing a project for a shop of the future called Smart Store 2,000.

c) research and development, is considered quantitatively (only 10% of food industry research funds are directed to processing as against 90% for agriculture) and in terms of strengthening the key features of the intensive food chain; the strategy proposes that consumer worries about modern food technology should be addressed by education rather than any modification of the technology (food irradiation has been supported for example)

d) collective services; the government seeks to strengthening education and training, export services and food testing through state organised institutions,

Although all interest have been brought into the advisory process, the two key institutions in framing the strategy have been the Ministries of Agriculture and of Industry and Trade. It thus reflects the perspectives of intensive agriculture and the larger processors, and the priorities of the mass production model. The limitations of this perspective are that it is drawn necessarily into cutting wages, working conditions, social services and product quality to the lower levels of the US and Mexico, (as the other partners in NAFTA) without guarenteeing competitiveness at the end. Furthermore, little account is taken of the forces now opposing an extension of this food economy model, forces which have their impact in the market place. Because it is following in the slipstream of North American technological change rather than leading it, it stands little prospect of both maintaining a thriving food industry and meeting the broader social and environmental goals of the NDP government currently in power.

Alternative perspectives are emerging, however, but from outside the government. Recently an influential report has appeared from the Ontario Round Table on Environment and Economy, which argues for:

- sustainable agriculture, (through such techniques as Integrated Pest Management, through improved crop rotation, the use of organic materials as fertilisers, expanded tree planting and conservation-tillage techniques)
- land/environmental conservation policies, including the transfer of land to land trusts
- improved labelling, reduction of packaging, and of wastes from food processes.
- the direction of research and development funds towards the goal of food safety and nutrition, reduced use of chemicals, the efficiency use of energy and materials, reduction/reuse/recycling of wastes.

The Ontarian government has been among international leaders in environmental policy, and has appointed leading figures from the environmental movement to senior positions in the government. In spite of this the priorities reflected in the Round Table paper have yet to influence what is still a producer dominated food industry strategy.

The Round Table's strategic perspectives are, however, echoed in an increasing number of city and regional governments around the world. The Greater London Council's Food Industry Strategy set up a 14 person Food Commission, which has had an impact on food industry and retailing practise out of all proportion to its size, principally through research and campaigning around a number of food safety issues. The Council also supported the development of new products (such as low fat sausages, health and ethnic foods) and a change in the curriculum of catering training courses. (see GLC, 1985)



New York and Melbourne City Councils used the school meal service as a means of leverage on the food industry, introducing new products and improving food quality, in ways that soon had an influence well beyond the school children themselves. In the UK, Oxford City Council circulate a quarterly newspaper on diet and food safety to all householders, and also run a certification scheme for restaurants, which requires particular standards of hygiene and food quality from the caterers receiving the certificate.

All these examples illustrate the policy impact of entering the food chain via consumer interests. From a broader economic point of view, consumer pressure to raise quality encourages firms to innovate in ways which improve competitiveness in a market where health has become so important a factor in demand. It demonstrates a quite different approach to that of Ontario, where instead of running marketing programmes to persuade consumers that modern food technology is safe, it starts from the other end and considers how to use technology to make healthy food economic.

This is the strategy in Emilia Romagna. The regional government's strategy documents are striking in not talking about exports, costs, and scale. Rather their goals are set in terms of the environment, product quality, and the interests of the small and medium producers who comprise the industry. Their environmental radicalism is such that their massive 'Green Plan' for the region envisages a run down of pig production along the River Po because of its polluting effects, and its relocation in less environmentally damaging areas.

Environmental policy is in part an aspect of the broader quality strategy, whose other key feature is the use of ambitious legal standards for food as a means of 'continuous improvement' in the Japanese manner. The network of collective research laboratories and university joint

programmes provide the enabling support and means of testing, while the collective trade mark acts as the guarantee which counts more in the market than price.

## Conclusion

This report has focussed on developments in the international food industry, with respect to the trends in supply and demand in the North. These are the principle external forces shaping the Jamaican food industry. Jamaica's customers - as tourists at home or export markets abroad - are primarily from the North, above all North America. The bearers of new technology - whether the sellers of machinery, fertilisers, seeds or know how - come from the North, and from an industry undergoing a decisive historical transformation.

What emerges from a review of current developments in the North, is that there are considerable tensions surrounding the course of food industry development. The food industry itself has no one model of organisation, nor of strategic focus. There are a range too of government policies towards food , particularly at the urban and regional level.

Jamaica has its own problems and priorities, its own climatic and economic conditions. In developing a food strategy it is necessary to take account of these external forces, without being determined by them. What is critical is that Jamaica is clear about its own goals and what it wants from its food industry. It will then be in a position to determine which markets to aim for, which technologies to develop, and what broader stance to adopt to an international food regime which is caught in its own crisis. This crisis is only one reflection of the gathering pace of change in the industry. What is clear is that this pace shows no signs of slackening in the 1990's and that if Jamaica is not to be swamped by its effects, its policy must run ahead of events. This will be the subject of a second working paper.

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