

Changes in the food chain since the time of the great Irish Famine



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Changes in the Food Chain since the time of the Great Irish Famine

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National Nutrition Surveillance Centre
University College Galway, 1995.

Changes in the Food Chain since the time of the Great Irish Famine

**National Nutrition Surveillance Centre
University College Galway**

**Centre for Health Promotion Studies
University College Galway
Ireland**

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Foreword

The anniversary years of the Irish Famine have prompted much media attention. To commemorate its 150th anniversary this report starts with a brief description of the diet in Ireland during that period and focuses particularly on the changes in food production, processing, retail and supply sector in Ireland since. We present information derived from a variety of sources; some industrial, academic and public sector organisations.

The National Nutrition Surveillance Centre is concerned with all aspects of food and nutrition. Our first and second reports focused particularly on consumer and health impact of diet and food, this one examines in more detail how food comes to be available, appropriate we think, to the age we live in and the period we are commemorating. While food choices undoubtedly rest with the individual, availability and access are major influences in that decision making process. It is for this reason we give special attention to the food chain in this report.

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Summary

Food Production and Processing

There have been many changes in food production and processing technology since the time of the famine. Much has been learned to ensure such devastation as that of 1845 does not reoccur. Agricultural techniques, mainly farming methods, gradually developed over the latter half of the nineteenth and early twentieth centuries. The agricultural output in the nineteenth century was mainly from tillage but this has declined over the years with a subsequent increase in livestock farming. In present day Ireland the largest commercial output in the food industry is from livestock with the meat industry leading followed closely by the dairy sector. Substantial monetary and trading changes have taken place in the twentieth century not only at a national level but in Europe and world wide. Ireland has operated under the Common Agricultural Policy (CAP) since 1973 and has seen the industry move away from intensive farming towards more extensive type production. The trade figures have risen substantially since the sixties with imports now worth £17,191 million and exports valued at £22,790 million. Food production has experienced radical change. Today's foods now undergo some form of processing whether they are marketed as processed or fresh. There is a variety of techniques used in the processing of food, ranging from genetic engineering to food additives. Ready prepared foods have now become commonplace since their introduction at the time of the industrial revolution in the late fifties. Consumer concern has developed parallel with the fast moving production and processing technology. With the strict legislation governing foodstuffs and the widely used safety surveillance these fears should be alleviated.

Diet and Preparation

The diet of the Irish population has changed quite substantially over the last 150 years. There is now a wide range of foods accessible to many people which did not exist on the market even fifty years ago. We report food consumption based on a variety of sources, mainly the Irish food balance sheets and acknowledge that these are most likely to over estimate the actual food intake of the population. To help maintain a healthy lifestyle, the diet recommended by the dietary guidelines from the Health Promotion Unit of the Department of Health suggests we should eat a diet high in potatoes, breads, cereals, vegetables, fruits and fish but with significant amounts of red and white meat and dairy products. High fat cheese, spreads, alcohol, sugar and salt should be used sparingly. In the last century it appears that the regular diet of the lower classes consisted mainly of potatoes and milk and that in fact the average labourer had a nutritionally adequate diet except for vitamins A and D. As livestock farming became more commonplace meat was introduced to the average person's diet. Around the mid-30s the Irish diet was still relatively low in fat and high in carbohydrate. Nowadays food consumption patterns have changed. Trends were observed since the time of the

sixties which suggest that dietary guidelines are not being met for food items such as sugar, of which there is a high level of intake and cereal consumption which is declining. Although our fruit and vegetable intake is increasing it is still comparatively low in European terms. The nutrient intake per capita expressed as a percentage of total energy shows a 300% increase in terms of fat contribution and a 40% decrease from carbohydrate between 1863 and 1990. The importance of food preparation is widely recognised with regards to losing and gaining nutritional value. As a nation we continue to prepare food in such a manner not conducive to extracting the most nutritional value.

Food Retail

The food retail business has changed enormously since the famine years. The commercial revolution in the second half of the nineteenth century opened up Ireland to all sorts of economic and social change. The introduction of electricity paved the way for 'white goods' such as fridges and freezers and as food production moved towards frozen and chilled foodstuffs so the appropriate appliances moved into the shops and homes. Commercial forces has seen the grocery trade move away from the country shop to the large all encompassing supermarket. At the start of the seventies the distribution of control lay in the hands of a small number of outlets but this has changed slightly over the past two decades. The dominance of the supermarkets can be seen by the 50% market share of the national turnover held by the Multiples in 1991. Own label products are a thing of the seventies and have made great inroads to the market share. In the early nineties 80% of housepersons bought own label products. Other foodstuffs such as frozen and snackfoods have shown major growth rates since the sixties as have low calorie and potato products. Expenditure on groceries looked to have increased substantially since 1979 but in 'real cost' of food the actual expenditure has remained unchanged for the past 10 years.

Food Production & Processing

19th CENTURY - THE FAMINE YEARS

Potato blight, caused by the fungus *Phytophthora infestans* broke out in Belgium in June 1845. It spread through the Low Countries such as Switzerland and by mid-August 1845 had crossed the channel into the south of England. No signs of the disease were noted in Ireland until September of 1845. Digging of the main crop began early in October, and while there were many rotten potatoes, the bulk of the crop was salvaged and put into storage.

The Prime Minister of the day, Robert Peel appointed a scientific commission to review the ravages of blight in Ireland and to suggest countermeasures. The commissioners reported that the situation was 'melancholy' in the extreme. They were unable to suggest any effective countermeasures (Technology Ireland July 1990).

By the end of the nineteenth century fungicidal sprays were available which slowed down the rate at which the growing plants were destroyed.

Nowadays research is carried out on *Phytophthora* strains by the plant pathology department at Teagasc Oakpark Research Centre in Co. Carlow. The main focus of the research is into strains which are resistant to chemical fungicides. Researchers elsewhere are studying other aspects of the fungus, and some are using genetic engineering to understand how the fungus mutates. The rapid mutation of the fungus means that it becomes resistant to new fungicides. The methods of processing will be discussed in more detail later in the report.

Farm size

In 1800 the Irish countryside was divided into large estates which could be tens of thousands of acres in area. The landlords who owned these estates opted for the security of a fixed rent and granted long leases to a small number of large tenants. Some of these initially farmed these large holdings directly as grazing farms with the help of a small number of herdsman. Some found the portions too large to stock and too difficult to control and tended to rent portions of the land to smaller independent farmers.

In the West of Ireland groups of families would combine to lease land and divide it among themselves in a system known as rundale (Bell 1992). Decisions on amounts of grazing, the movement of livestock, and the allocation of strips of arable land were all made communally. Farmers in a rundale settlement were allocated a number of strips for cultivation each year. Table 1 below shows the farm size in pre famine Ireland. Ulster and Connaught had the highest percentage of farms which were less than 20 acres.

Table 1 : Farm Sizes in Pre - Famine Ireland (percentages)

Acreage	Ulster	Leinster	Munster	Connaught	Ireland
< 1	12.6	22.5	16.2	9.2	14.8
1-5	18.6	21.5	16.5	23.1	19.7
5-10	24.0	14.8	13.9	28.3	20.5
10-20	30.4	15.9	17.4	20.8	20.2
Total < 20	85.6	74.7	64.0	81.4	75.2

Source : Daly 1986

During the nineteenth century a great mass movement developed, aimed at changing the system of land ownership. The Land League, founded in 1879, was the best known group which agitated for change. By the end of the century almost half of the farms were owner occupied.

In 1845 the population of Ireland was eight and a half million. By 1900 it had fallen to less than four and a half million. Between the famine and 1911 the number of holdings of between 1-5 acres had fallen from 182,000 to 62,000. Farms of 15-30 acres were becoming typical. The change in the land system led to a withdrawal of manpower from the cultivation of the soil (Salaman 1985).

Table 2 : Changes in Manpower on the Soil from 1841 to 1861

Year	Number of men employed / 1000 acres
1841	523
1851	370
1861	301

Source : Salaman 1985

Development of farming methods

The earliest attempt to study and change Irish farming began with the foundation of the Dublin Society in 1731. The aim of the society was to improve farming, manufacturing, and 'useful arts and sciences'.

The Farming Society of Ireland was founded in 1800 and the Agricultural Improvement society founded in 1841, which went on to become the Royal Agricultural Society in 1860. These societies gave information about new implements and methods of farming. They organised ploughing matches and other shows (Bell 1992).

During the 19th century several societies opened agricultural schools e.g. Glasnevin, County Dublin and Templemoyle in County Derry. Other bodies, some grant aided by

government, aimed to change farming practices. In 1894, the Irish Agriculture Organisation Society was founded to represent the interest of Irish producers. By the end of the 19th century government grants meant that even small farmers could erect purpose built outhouses such as hay sheds.

Implements used in farming

There were more types of spade used in Ireland than any other implement, and as a result one spade mill was producing 230 types in 1830. There were definite regional patterns in spade design. For example in the West of Ireland one sided spades known as loys were used. In other parts of the country two sided spades were common, but blades tended to become longer and narrower further west (Bell 1992).

Heavy wooden ploughs were in use in many areas until well into the 19th century. They required four or sometimes six horses to pull them and up to three men to operate them, and were quite inefficient. By 1830 the old wooden ploughs were being replaced by metal ploughs. The ploughs could be operated by one man and two horses, and required great skill from the plough man.

Steam ploughs appeared on very large farms in the mid 19th century. However there were probably only about seven steam ploughing complexes in the whole of Ireland (Bell 1992).

Types of farming practiced in Ireland

Irish agriculture on the eve of the famine remained predominantly a tillage agriculture. Estimates by O'Grada suggest that tillage products accounted for over 63%, almost two-thirds of the volume of agricultural output at this time. Potatoes accounted for 24% of total output, cattle and milk combined for less than 23%. Excluding the potato, which was primarily a subsistence crop, the bulk of Irish agriculture on the eve of the famine was devoted to crops with a potential cash sale. At this time Ireland was feeding its own farm population and a large population in Irish towns and cities and exporting one-quarter of its output to Britain (Daly 1986).

By 1845 the landscape of Ireland was densely populated and intensely cultivated. When poor people had upgraded their land by digging, liming, manuring and cropping with potato and oats, the rent would often be increased. The arrival of the potato blight led to the destruction of the staple food of these people, and decimated the population. Pigs were fed almost entirely on potatoes and with pig and bacon exports rising sharply in the years before the famine they were a great source of income.

The overall decline in tillage between 1855 and 1901 can be seen clearly in the following figures of crop acreages.

Table 3 : Crop Acreages in 1855 and 1901

Year	Oats	Meadow	Wheat	Barley	Flax	Potatoes
1855	2,118,858	1,314,807	455,775	226,629	97,075	982,301
1901	1,099,335	2,178,592	42,924	161,534	55,442	635,321

Source : Ireland, Industrial and Agricultural 1902

The table above shows that apart from an increase in meadow (presumably for grazing) there was a decline in all crop acreages between 1855 and 1901. Thus a swing away from arable farming began around the time of the famine and could be seen in the increasing numbers of almost all kinds of livestock.

The number of livestock increased between 1855 and 1900 as shown in Table 4 below.

Table 4 : Numbers of Livestock kept per 1000 acres in 1855 and 1900

Year	Cattle	Sheep	Pigs
1851	143	102	52
1900	230	215	60

Source : Ireland, Industrial and Agricultural, pp. 320, 1902

By 1900 even small farms usually had purpose built outbuildings for livestock. The increase in livestock numbers was particularly dramatic for poultry. In 1900 the number of poultry had multiplied to over 18.5 million, more than 3 times their number in 1850 (Bell 1992).

Fertilisers

Seaweed has a long history as a fertiliser in Ireland. Due to their close proximity to the sea, coastal farms were able to command higher rents in the late 18th century. Sea weed was often spread over potato ground where its effects lasted for about one year. Cow manure heaps were often placed outside (and sometimes inside) cottage doors, while other types of fertiliser used were limestone and even seashells (Bell 1992).

Throughout the 19th century most small Irish farmers continued to sow seed by hand. Since it is very difficult to sow seed so that it spreads out evenly over the surface, people skilled at this were much in demand when crops were sown in spring. Sometimes farmers found it worthwhile to invest in a horse drawn seed drill if they had a large acreage of grain crops.

A spray for killing the fungus *Phytophthora infestans* was developed in France in 1882. It was made up of copper sulphate and washing soda. By the 1890s there was a major drive to introduce spraying throughout Ireland.

Potato in Post famine Ireland

The main crops grown in Ireland during the 19th century were potatoes, oat, barley and hay. Other crops such as wheat, turnips and flax were regionally important.

After such a collapse it might have been expected that the position of the potato in domestic economy of the people could never be quite the same. However, after the famine the supremacy of the potato was scarcely shaken for another 30 years.

Table 5 : Potato Crop from around the time of the Famine

Year of Production	Acres (000)	Produce (000)
1844	2378	14,862
1845	2516	10,063
1846	1999	2,999
1847	284	2,046
1848	810	3,077
1849	719	4,024

Source : Daly 1986

An attempt to displace the potato in the affections of the poor, was made by the Poor Law Unions. In 1852 no potatoes were being served in any workhouse, in order to increase consumption of cereal foods. The turnip gained popularity as did oats.

In 1894 the potato crop failed once more but by then the potato crop was but 5% of all the agricultural produce of Ireland. Today the potato is eaten in Ireland because it is liked, not because it is necessary.

TURN OF THE 20th CENTURY

Between 1851 and the first world war there was little change in the numbers of farms and their sizes. Production techniques remained similar to those in the late nineteenth century. With two wars in the first three decades, provisions were not readily available for food production development and the situation remained somewhat stagnant whilst traditional techniques continued to be used.

Processes such as hybridisation and crossing were initiated around the time of the Second World War. Technology has progressed steadily since then, resulting in very few sources of food escaping some sort of alteration (Technology Ireland May 1981).

FOOD INDUSTRY - 1960s UNTIL NOW

Things have changed quite substantially in the food industry over the last forty years. The food system in Europe is now responsible for a large section of the economy where food production and processing are among the most important activities in many rural areas such as Ireland.

The food-chain (farmer-processor-retailer-consumer) employs almost 20% of the European Community workforce and produces more than 10% of its Gross Domestic Produce, GDP (Traill 1989). In Ireland, the food and drink industry, one of the most vibrant industrial sectors, provides about 20% of manufacturing employment and contributed 39% of the gross output of all manufacturing industries in recent years. The industry has an estimated annual output of about £7.6bn. (Department of Agriculture, Food and Forestry 1993) and for example An Bord Baine, Irelands single biggest exporter, has annual sales exceeding £1 billion. The Household Budget Survey of 1987 suggests that in Ireland 35% of disposable income is spent on food. This is higher than the European average of approximately 25% but it must be remembered that food prices are higher in Ireland.

The largest commercial output comes from the meat industry followed closely by the dairy business. As seen in Table 6 both are responsible for the employment of a large number of people.

Table 6 : Structure of Irish Food Industry 1992

Sector	No. of Establishments	No. of Companies	Output (£m) 1992	Employment 1992
Meat	153	107	2,417	11,700
• Beef & Sheep	86	54		6,000
• Pigs	44	32		4,000
• Poultry	23	21		1,700
Dairy	216	88	2,195	7,100
Grain milling etc.	113	81	639	2,700
Bread, biscuits & flour confectionery	176	165	204	5,300
Sugar, cocoa and sugar confectionery	35	29	434	4,400
Fruit and vegetable	50	41	87	1,200
Fish processing	114	110	189	2,300
Other food	80	70	1,183	3,200
Total Food	937	691	7,348	37,900

Sources : FAS/PA Consulting Group Database and PA analysis Quarterly Industrial Employment, Sept. 1992

Food Production

Agricultural Sector

Since the formulation of the Common Agriculture Policy (CAP) with the signing of the Treaty of Rome at the start of the sixties the number of farmers in the European Community has decreased by over 60% to 10 million.

Ireland has traditionally been a large producer of primary products with much of the main market outside the country. The country has operated under the price and market support policy of CAP since 1973, which means that market forces and/or consumer demand do not necessarily dictate supply.

One of the EC product management procedures was intervention which meant that as a country produced various commodities the EC intervention board, which is the Department of Agriculture in Ireland's case, bought the products and stored them for a preset time period. Until recently these EC support schemes encouraged the seasonal production in Ireland of commodities such as beef and milk which often resulted in the products being sold into intervention and has implications for the creation of excesses such as the butter mountain. The Department of Agriculture estimated that in 1990, 55% of butter was sold into intervention (NNSC 1993). The CAP reform agreement of 1992 aims to address this. In the case of milk for example, there will continue to be relatively high support levels but somewhat lower quota levels.

Consumer pressure for more extensive type production has seen the Common Agricultural Policy moving away from systems which support maximum output towards those supporting small farmers (Gormley 1991). Changes supporting this are for example movement away from high intensity farming such as is required for pigmeat production to lower volume livestock farming. The European regulations and stiffer competition has seen food processors now making use of not only the primary commodities such as beef, dairy and pork but also their by-products which takes the industry into a new realm of 'whole' food ingredients (O'Beirne 1987).

The General Agreement on Tariffs and Trade (GATT) is a treaty subscribed to by over 100 governments which account for over 90% of all world trade. The aim of this agreement is to contribute to economic growth through reduction in tariffs and barriers to trade. The agriculture section within the context of GATT finalised a six-year plan at the end of 1993 which was due to commence in 1995. Export and import arrangements were made which will create a more competitive environment in the agri-food industry.

The estimated agricultural output for Ireland in 1989, 1991 and 1993 is shown below in Table 7. (This does not include output of commodities such as horses, turf or wool). Very slight changes in percentage output are observed over these years with a small reduction in the milk output and an increase in the meat output.

Table 7: Estimated Agricultural Output in Ireland in £millions
with percentages of total in brackets

Commodity	1989		1991		1993	
	(£m)	(%)	(£m)	(%)	(£m)	(%)
Meat	1,637.8	51	1615.9	53	1831.5	55
Milk	1,195.5	37	993.8	33	1146.3	34
Eggs	26.1	1	28.0	1	23.2	1
Cereals	162.1	5	172.2	6	130.5	4
Root Crops*	99.8	3	106.00	3	97.7	3
Fresh Vegetables	77.3	2	96.3	3	92.6	3
Fresh Fruit	10.3	<1	11.1	<1	7.9	<1
Other Crops	20.2	1	23.2	1	22.8	1
Total	3229.1		3046.5		3352.5	

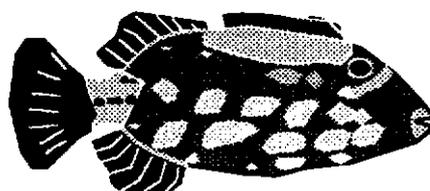
* includes potatoes and sugar beet

Potato production has fallen substantially since the mid-nineteenth century. The actual quantity of potatoes produced in 1993 was less than 4% of that produced in 1844 before the famine and 26% of that in the years just after the famine.

Acreage has followed the same trend as production. In 1844 there were 2378 thousand acres of potato compared to 51 thousand in 1993. The county of Donegal is currently the country's main potato seed producing area. Conventional seed production passes through six field generations before the seed can finally be planted for ware, although with newly developed techniques, this figure is reduced to three. This so-called 'reduced generation' system of seed production controls more effectively the build up of disease and viruses.

Fish Sector

The fishing industry in Ireland has been traditionally buoyant and in the past decade has been making a growing contribution to the economy in terms of increased output, employment and exports. In 1994, exports to Spain accounted for 15% (16,636 tonnes) of the market and were worth £38.4 million. Spain is the second biggest market for Irish seafood exports next to France which is worth £47 million. Due to the quota imposed by the European Union, fish landings are limited and so quality has to be of the utmost in order to command the price. This has led to an increase in processing and development of techniques and there are now about 120 firms in the processing sector (An Bord Iascaigh Mhara 1993).



Aquaculture, in particular the shellfish sector, expanded rapidly throughout the eighties into a thriving industry with a fourfold increase in output from 5,753 tonnes in 1980 to 24,020 tonnes in 1990 (Department of the Marine 1992). The industry has seen a huge success with its 'Donegal Catch' range of pre-packed fish products. Over 50% of expenditure of frozen fish in 1994 was on this label (BIM communication).

Exports / Imports

Irish trade figures have risen substantially since 1960. In 1961 imports were worth £261.4 million compared to £17,191.1 million in 1994 and exports were £180.5 million compared with £22,789.6 million in 1994. Export figures for fruit and vegetables amounted to £268.9 million in 1994 with 26% of the output value going to the UK. This is a similar figure of that in the time of the famine where 25% of potato exports went to the UK. Note however that it is not only potatoes which are exported to the United Kingdom in present times.

Production of fruit and vegetables began to increase in nearly all Western European countries at the start of the sixties due to increased demand, changes in production techniques and growing awareness of the value of such horticultural crops. However, the trend was to salad type vegetables such as tomatoes and lettuce and away from the cheaper vegetables such as cabbage (O'Neill 1964). At a time when the market was not governed by the common market regulations, big differences existed between producer and consumer prices due to there being no realistic price structure for producers. Apart from the Netherlands where a well organised marketing system was in place, regulations were concerned with exports and protecting the home market and this sometimes led to surpluses in the producing areas, development of production in unsuitable areas and greater price instability.

In the early sixties the European countries responsible for the majority of fruit and vegetable exports were Italy and the Netherlands. Output of fruit and vegetables in Ireland was insignificant compared with the EEC; vegetable acreage was less than one per cent of that in Europe. Irish export of vegetables was very small and consisted of fresh, frozen or dried products. Although at that time Ireland was a net exporter of fruit and vegetables, there was a large import of these foods, more so for fruits. As suggested in Table 8, Irish involvement in fruit and vegetable production has changed substantially over the past 30 years.

Table 8 : Irish Trade in Fruit and Vegetables

	Imports (£,000)	Exports (£,000)	Ratio
1962*	8,150	2,936	2.78
1994	268,947	90,680	2.97

Source : Central Statistics Office, Trade Statistics, Dublin December 1994; *O.E.C.D., Statistical Bulletin, Series C, Foreign Trade - Trade by Commodity, Vols. I and II, January-December 1962.

In order that food producers receive monetary gains and be a market force alongside their national competitors and other worldwide traders, it would appear important that they are aware of consumer desires and available technologies. Consumer trend towards more convenient food, prepared food and specialised ingredients appear to be a driving force in the pace of change with Irish companies amongst the leaders in the area of food technology and ingredients (Technology Ireland, August 1995).

Since the sixties prepared foods have become more and more common on the retail outlet shelves. Their development is following the same pace as that of food ingredients and both areas have been targeted for development in the food industry in the coming years (Technology Ireland, August 1995). Ready-meals, chilled foods and pizzas accounted for 12% of Irish food and drink output in 1992 (Department of Agriculture, Food and Forestry 1993). Producers also realise that they will have to engage in innovatory processes to allow for the expected increase in demand for convenience foods and the ageing population requirements (Euronews Networked Reports November 1995). Already specially fortified foods such as custard are being developed which intend to reach the nutritional needs of the elderly (Euronews Networked Reports October 1995). Growth markets have been observed in the fast food pizza sector and also cheese, especially cheeses such as mozzarella, due to changing eating habits and influences. Growth of the flour sector is expected to continue due to the increasing needs of the pizza sector and also development in frozen dough which will replace imports of bread products (Technology Ireland, August 1995).

Edible fat is a substance which has received, and is continuing to receive, a vast amount of media attention on the relative merits of butter or various types of margarine. Margarine was invented by a Frenchman H. Mouries in 1869 and Irish production was carried out in Limerick from as early as 1876. In those early days it was not enthusiastically received; apart from it not being particularly palatable, its low price became associated with poverty (Murray 1977). It has permeated the Irish market through its use in baking and from the sixties there has been a marked change in attitudes towards its use as a spread. Consumers seem to have grown used to replacing animal products with alternatives usually high in polyunsaturated fatty acids from vegetable sources (Technology Ireland October 1994). Many different varieties can be seen on the shelves of corner shops and large supermarkets alike. Apart from its use as a spread, edible fat has become widely used as an ingredient for ice cream, fried foods, sweets, bread and commercial baking.

Food Processing

Most foods today in the affluent northern hemisphere undergo some form of technology regardless of whether they are fresh or processed. Chilled and frozen products are now commonplace and have been for many years with the introduction of 'white goods' such as fridges and freezers. Pre-pack foodstuffs are nothing new to children of the sixties. Modified atmosphere packaging (MAP) is a more recent technology which is usually combined with chilling in order to extend the shelf life of

fresh foods. Such foods can be recognised in supermarkets as trays with a sealed-on film which are deeper than conventional prepacks, e.g. meat cuts (Nychas 1992). New products come on to the shelves of the supermarkets frequently. In 1995 a potato product was introduced which is peeled, washed and steam cooked and sold fresh with a shelf life of twelve days (Euronews Networked Reports November 1995). Processed foods constitute a huge portion of the market and are a result of the application of an individual or combination of technologies (Gormley 1991).

Many modern trends in food processing have resulted from biotechnological research but applications of biotechnology have existed for centuries albeit without the realisation of the processes involved. Biotechnology can be defined as the use of microbial, animal or plant cells or enzymes to synthesise, breakdown, transform or improve materials (Huis J. *et al* 1990). It was in the nineteenth century when Louis Pasteur understood the role of yeasts in the fermentation process of grapes to wine that the old art was given a new name and a bright future. The discovery by Watson and Crick in 1953 of the structure of deoxyribonucleic acid (DNA) resulted in a biotechnology boom. Biological molecules recognise each other and combine in very precise arrangements. Biotechnologists, using this fact, developed the regulatory action of hormones on animals and plants, the reproduction of genetic traits and the defence mechanisms of living things against invasion and infection by bacteria, fungi and viruses (Law 1994).

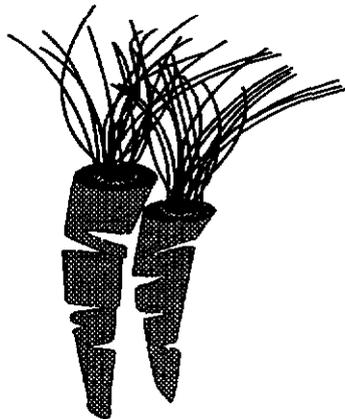
The food industry makes use of micro-organisms as starter cultures in a variety of products, e.g. fermented dairy products, fermented vegetables, meat and bread. One such fermented dairy product, which results from the addition of starter cultures to sterilised milk, is yoghurt. This was introduced into the Western European market as recently as the late sixties but originates in fact from ancient Eastern Europe. Ireland, perhaps unknowingly, was using forms of processed milk in ancient and medieval times. Sour milk, ropy milk and curds played a central role in the diet of the Irish people (Technology Ireland October 1987). In recent years there has been huge commercial success for yoghurt, with an annual consumption of 11,600 tonnes in 1989 (NDC 1994). Changes have also occurred in the production of traditional foods such as bread. Work is in process to investigate the use of starter cultures as a means of improving quality and shelf-life of wheat breads.

Fermented meats such as salamis, although not hugely popular in Ireland, are consumed extensively in mainland Europe. Biotechnological research has also been ongoing into animal breeds. Competitive entry into the European market has dictated that Irish farmers produce leaner animals with improved fat status. The beef production research carried out at Teagasc's Grange Research Centre in Co. Meath aim to improve the quality of livestock and to improve efficiency thus lowering the cost of production (Technology Ireland February 1991).

Genetic Engineering

A sub-division of biotechnology that has received increased interest from a variety of groups is that of genetically engineered foods. Although work has been going on in this area since the seventies, the first of such a transgenic product only appeared on the shelves in the United states in 1994 and as yet is not available for sale in Ireland.

Commercially funded projects have produced vegetables such as tomatoes and melons with longer shelf lives and lettuce, celery and carrots have been genetically engineered to stay crisp for pre-cut snacks. Presently work is being carried out in Trinity College Dublin which is concerned with making potatoes resistant to a virus by adding the actual potato virus to the potato (Technology Ireland February 1995). Ireland, after being exposed to such a severe attack by potato virus on a crop that is one of our staple foods, has reason for concern that a repeat will not occur. On-going research into areas such as these is also being carried out through the Flair - Flow Europe programme which embraces 16 European countries research work aimed at the food industry and consumers.



Like farmyard animals, fish can be improved by traditional scientific breeding programmes such as artificial selection, line breeding and line crossing. These are slow and often expensive methods. Problems arose in the early eighties that hindered the expansion of salmon farming. Commercially available genetic technology, based on the unique features of fish reproduction, was used which produces bigger fish that can be marketed all year round thus helping fish farmers profitability (Technology Ireland February 1986).

Food Additives

Enzymic catalysis has been developed within the biotechnology world, which allows the synthesis of food emulsifiers and flavours and also modification of the nutritional value of food fats (Law 1994). Use of food additives to enhance flavour, extend shelf life and protect the nutritional value of food is not as new a process as is generally thought - people have added substances to their food since the start of recorded history. Ancient Egyptians used colours to enhance the appearance of food and the Chinese burned kerosene to ripen bananas and peas. In recent times however, it is the number of such additives put into food that has caused public concern (Technology Ireland September 1992).

Food additives have many functions in today's food industry. Preservation of food is one of these and is important for improving the world's food supply. Any food in

storage undergoes some form of degradation: The World Health Organization estimates that 20 per cent of world food production is lost in food spoilage concern (Technology Ireland September 1992).

Preservatives such as salt, vinegar and sugar have been used throughout the centuries in both home and food industry but with the developments in technology, synthetically produced preservatives are now used more regularly. Different foods need different types of preservatives, e.g. sulphur dioxide is used in wine and fruit juices whereas sorbic acid is used to preserve cheese and confectionery.

Foods that are high in fat suffer degradation principally due to oxidation of the fat components which leads to development of off-flavour or rancidity. When this happens the nutritional value of the product is decreased due to the destruction of vitamins (Langan 1977). Shallow or deep fat frying processes such as chip-making have become common practice and cause oxidation of the oils and fats. Regular consumption of such materials may have health implications. Antioxidants are a class of food additives that are used to prevent this rancidity and can be found in margarine, cooking oils, biscuits, cereals and pre-cooked meat, poultry or fish meals. Quantity-wise however, emulsifiers and stabilisers are the more important class of additives. These are used to make a smooth mixture between ingredients which normally separate and have allowed production of dairy products which contain both butter and vegetable oils (Technology Ireland September 1992).

From a consumer and marketing point of view, the flavour of food is of course a very important aspect. Thousands of flavouring materials exist both naturally and synthetically. In developing a product, industry usually consults with a flavourist in order to design a flavour for a specific process. This is done because certain food processing techniques, such as deep freezing, cause flavour to be lost in the cooking of the food and therefore need to be identified and replaced. At the end of the seventies consumers complained about bland, tasteless foods. With export advertising based on the 'tasty Irish food' the implications for the Irish food industry were substantial. The trend in industry seems to be towards the use of natural flavours as opposed to nature identical ones. As suggested in the eighties, due to increased sales of these naturally flavoured foods, changes have been seen in food marketing towards healthier foodstuffs such as reduced fat yoghurt, sugar-free drinks and de-caffeinated coffee (Technology Ireland December 1985). Saccharin is probably the best known and most widely used sweetener although other new alternatives such as aspartame are now available.

There has been confusion within the general public as to what E numbers actually are. These are not new additives or chemicals but international codes which denote additives which have passed strict tests laid down by the European Scientific Committee for Food (Department of Health 1995). There are four categories of additives which have been assigned E numbers and are as follows:

- colours (E100 E199)
- preservatives (E200 to E299)
- antioxidants (E300 to E399)
- emulsifiers and stabilisers (E400 to E499)

Irradiation

A recent development is the use of ionising radiation to destroy organisms and insects which spoil food. This concept, which can help extend food shelf life and eliminate such things as salmonellosis, first came about in the 1950s but has only recently become accepted practice. Indications are that irradiated foods will eventually become as acceptable as frozen, dried or heat preserved foods. Japan is the largest producer of irradiated foods with 20,000 tons of potatoes being irradiated annually since 1973 (Technology Ireland June 1984).

Food Fortification

The fortification of foodstuffs has become more prevalent in the marketplace in recent years and involves the addition of nutrients to basic foods. Examples of such products include cornflakes, margarine and soft drinks. Some of the processing techniques described previously deplete the levels of nutrients in foods and must therefore be restored, using external fortification, in order to be accepted in the market. Acceptance by the consumer of new products can be helped if they have similar nutritional status as already used foods, e.g. margarines are fortified with vitamins A and D to be similar to butter. There are health implications for fortification and further developments in this area should be closely monitored as directed by the Irish Food Safety Advisory Committee (Food Safety Advisory Report No. 16, 1994).

Labelling

Food labels have changed considerably since the 1870s. The original Food and Drugs Act (1875) required that the mixing of food with 'any matter not injurious to health, and not intended to fraudulently increase its bulk weight or conceal its inferior quality' must have a label to that effect but nothing more specific (Technology Ireland December 1985). At the start of the eighties, following EEC directive 79/112/EEC, Ireland brought in legislation SI 205 of 1982, which required labels contain the following information:

1. Name of Food
2. List of ingredients in descending order of weight
3. Net quantity in metric
4. Date of minimum durability when less than 18 months. Stated as day, month and year
5. Any special storage conditions or conditions of use
6. Name and address of manufacturer, packer or seller in the EEC
7. Place of origin if its absence might mislead
8. Instructions for use where applicable

Nutritional content is also now part of a nutrition label but the introduction, by law, of the name of the specific E number used in any additives did not occur until the start of the nineties. Irradiated foods now also require declaration on labels under the updated

European Union directive 89/395/EEC and restaurant and other catering outlets must inform customers if irradiated food is offered (Food Safety Advisory Committee Report No. 19, 1994).

Consumer concerns

With all these advances in food technology there are implications for its safety. Consumers have expressed reservations on many occasions about the safety and quality of the newly emerging processed foodstuffs and techniques involved (O'Beirne 1987), e.g. production of new chemical compounds, bacterial survival in MAP and the fate of nutrients in irradiated foods. People's perceptions of quality are now constantly monitored by food technologists with the result that as views change, so to do products. It is believed within the food industry that consumer preferences will continue to change in the coming years and could be quite different in five years time. An indication of consumer trends which is used in the US is the number of new foods launched each year: in 1994 over 15,000 new products compared to 9,000 in 1989. This may be used only as a rough indication of the situation in Europe but the extent of this belief is apparent from the amount of money put into research and development of the previously mentioned technologies (Euronews Networked Reports November 1995).

Parallel developments in analytical techniques, international quality systems, e.g. ISO 9000, and food regulations have improved safety surveillance. Toxicological studies have been carried out on a large number of foods and produced no evidence of adverse effects as a result of irradiation (Technology Ireland June 1984). Techniques have been developed over recent years that detect and identify the presence of pathogenic microorganisms, toxins and foreign proteins in food (Law 1994).

Diet and Preparation

The consumption of a wide variety of foodstuffs not only helps to promote health but can and should provide people with pleasure and enjoyment. Diet is one of the factors contributing to the high death rates from modern day diseases but other lifestyle factors such as smoking and exercise play an important role. A balanced diet and all things in moderation will help to ensure optimum well-being.

The recent Food and Nutrition Policy document (Nutrition Advisory Group 1995) identifies the aim of any national food and nutrition policy as facilitating the development and maintenance of good health through appropriate food consumption. Appropriate dietary recommendations are written in terms of nutrient balances and are necessary to encourage the population to maintain a balanced and healthy diet. The existing guidelines for the general Irish population, which are modifiable for population subgroups, are:

- * eat plenty of fruit and vegetables (at least four servings per day)
- * starchy foods such as bread and cereals should be eaten daily
- * avoid frequent consumption throughout the day of sugar foods
- * reduce total fat intake, especially saturated fats
- * increase physical activity levels

These recommendations are meaningless unless people know which foods to eat to fulfil them. Therefore, a recommended diet by the Health Promotion unit is one high in potatoes, bread, cereals, vegetables, fruits and fish but also containing significant amounts of red and white meat and dairy products. High fat cheeses, spreads, alcohol, sugar and salt should be used sparingly.

It is recognised that the majority of the Irish population now has access to a wide range of foods compared with even fifty years ago. The following changes, which were observed by Downey in 1987, and an explanation for these changes will be shown in more detail throughout this chapter.

Dietary Changes:

- * a decrease in total energy consumption
- * an increase in the percentage energy consumed as fat
- * a decrease in the intake of complex carbohydrates
- * an increase in the intake of simple carbohydrates
- * an increase in the intake of protein from animal sources

IRISH EATING PATTERNS

So what in fact are Irish people eating at present times and how does that compare with consumption during the past hundred odd years. Are the guidelines being followed and recommended dietary intakes achieved?

Dietary Structure

Ireland and many other countries have experienced significant changes in the structure of the national diet. Here in Ireland introduction to convenience foods, processed foods and overseas foodstuffs has also been accompanied by shifts in the balance of basic food consumption. Changes in food consumption patterns and subsequent nutritional intake have occurred since the time of the famine. Our first two reports dealt with evidence from food and nutrition surveys. In this chapter we discuss other sources of such information in more detail.

Dietary Surveillance

Acquiring information on national population dietary intakes is often difficult when regular and expensive national nutrition surveys are not carried out. There are a number of possible sources of indirect assessment of intake.

Food balance sheets are recorded in all European countries and give the total supply for a particular commodity. Total supply can be broken down into total domestic usable production plus imports and within the usable production this is further broken down to consumption, exports, animal feed, industrial uses etc. The food supply data refers to per capita consumption which is an average supply available to the population as a whole. Although the figures are discussed as kg per person it is not truly representative of the individual person since it does not take into account population subgroups. However, using the Food Balance Sheets data provided by each member country to the European Union central statistical office, Eurostat, the World Health Organisation in collaboration with the Food and Agricultural Organisation compiled a comprehensive database of trends in food 'availability' over time (WHO/FAO Database). It should be noted that food balance sheet data is reflective not directly of consumption but more of availability of the foodstuff for consumption and partly explains why the calculated intakes do not compare directly with data from nutritional surveys such as the National Nutrition Survey of 1990. This report will discuss the food balance sheet data using the term consumption. Food balance sheet data has however been found in other countries such as the UK, Greece and Luxembourg, to follow the same trends as that of national nutrition surveys but with a higher level of recorded intake.

Household budget surveys are routinely carried out every 7 years in Ireland, to determine the expenditure by household on all categories of consumables. Work is

presently underway to standardise household budget survey data across ten European countries in order to compile a database of food item consumption. Again, validation of such data has found trends of consumption similar to that of nutrition surveys and food balance sheet data.

It is therefore proposed that comparing consumption of food items across time is a valid way of determining trends in overall intake assuming the same data sources are used.

FAMINE YEARS

A famous agriculturist Arthur Young toured Ireland from 1776-1779. One of the things he observed was the prevalence of the potato as the food of the people. Young reported that 'the poor live on potatoes and milk, it is their regular diet, very little oat bread being used, and no flesh meat at all except on Easter Sunday and Christmas Day'. The potato was the main item in the diet, except in areas close to the sea or river, where fish was consumed (Salaman 1985).

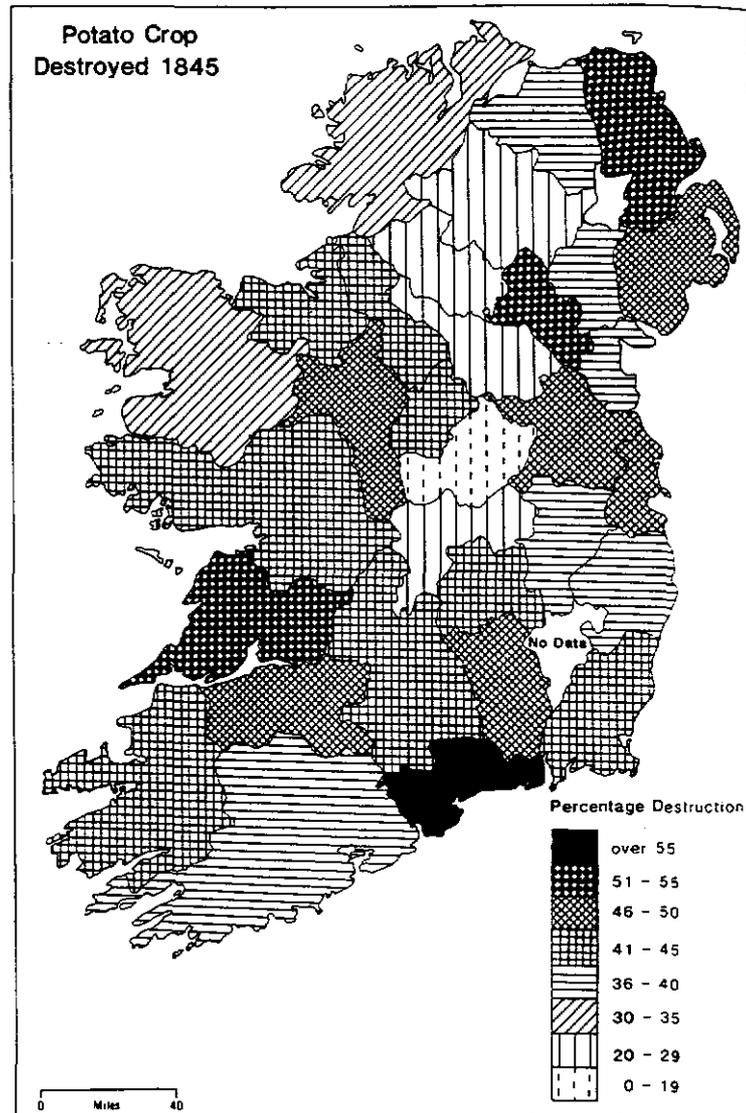
In the nineteenth century, if necessity made the potato the food of the masses, the habit it created was certainly not confined to them. The middle class, though free to choose a more varied diet, consumed huge quantities of potatoes. In 1839 the diet of a typical Irish labourer was in fact one of adequate nutritional value except for Vitamins A and D, although it consisted mainly of potatoes and buttermilk. A survey carried out by the Poor Law Commissioners in 1839 found that an average daily consumption of potatoes was 13 lb. for labourers (Crawford 1984)

On several occasions prior to 1845, the potato crop had failed, but such failures had been more or less local. In 1845 and 1846 Ireland was confronted with a failure which was universal. Farmers on higher land, and those in drier districts suffered less than others, but very few escaped the effects of the blight. Partly because of the terrible stench associated with the rotting plants, many regarded it as a form of cholera which had spread to the potato. The damage in 1845 in Ireland alone, was estimated to be about half the crop (Salaman 1985).

The small farmers and cottiers who together accounted for about four and a half million persons consumed what they could from their harvest. There were no potatoes to feed the pig, so instead of it providing cash with which they paid the rent, it had now become a liability.

There was more distress in the West and South of the country, where the small farmers lived only on the potato. In Ulster, oatmeal was consumed in every home, and thus the effects of the potato failure were not as great (Salaman 1985). The regional destruction of the potato crop can be seen in the picture below.

PICTURE 1



Source: Daly 1986

Although there was plenty of corn in Ireland the poor had no money to buy it. They depended on the potatoes they grew as their only source of nourishment. If they owned a cow or pig it was sold to pay the rent. When the potato blight struck, many were obsessed by the dread of eviction from their homes.

The London based government formulated a plan whereby the ports should be closed immediately against export of grain, that public granaries be erected throughout the country, and the corn sold direct to the people at moderate prices (Salaman 1985).

In 1846, the potato crop failed again. The demand for corn was imperative. Wheat prices rocketed. When the potato crop of 1847 was found to have escaped disease, the prices crashed and the majority of the heaviest casualties were amongst the corn trade.

The most disastrous effects of the potato blight occurred in the West of Ireland. Easy access to fisheries in coastal areas one might have thought should have gone far to make good the loss of potatoes. The commissioners of public works reported that no industry had suffered so severely through the famine as the fishery, partly because there was a prejudice among the country people against the use of fish unless they could obtain potatoes to eat with it, and partly because the fishermen had been compelled to pawn or sell their tackle to meet their immediate needs. Regulations regarding Poor Relief dictated that relief would only be given to people if they gave up their holdings.

Mortality and Morbidity in the Famine years

There was a high mortality level over the years of the famine. The population of Ireland in 1841 was 8,175,124. This declined dramatically in the years just after the famine by 20% to 6,552,385 people in 1851.

Famine was followed by disease. A person who had lived in the main on the potato obtained Vitamin C and subsequently the loss of the potato led to a large section of the population developing scurvy. The commissioners of health attributed scurvy to absence of potato but also due to use of so-called potato flour, made from blighted tubers.

Dysentery accounted for 25,446 recorded deaths in 1847 and cholera was to blame for the 30,000 recorded deaths in 1848 (Salaman 1985).

The most devastating disease as a result of the famine was typhus fever and as seen in Table 9 below, the numbers increased quite dramatically immediately after the famine.

Table 9 : Deaths from Typhus in Pre and Post Famine Years

Year of Death	Number of Deaths from Typhus
Pre-famine	7249
1846	17,145
1847	57,095
1848	45,948
1849	39,316
1850	23,545

Source : Salaman 1985

In 1847 soup kitchens were established. There were 3,504 of them in total and cooked food which was given to 3 million people each day. The ration given to the people coming to the kitchens consisted of one or other of the following:

- 1.5 lbs of bread
- 1 lb. of biscuits, meal or flour
- 1 quart of soup thickened with meal, with a quarter ration of bread, biscuit or meal

As shown in the earlier section on food production and processing, the production of potatoes declined somewhat in the years after the famine although it remained the common food.

EARLY 20th CENTURY

Around the turn of the century, the infrastructure in Ireland began to improve. Rail, road and water systems opened which facilitated access to new foods in many parts of rural and urban Ireland. Rural people started to have access to 'shop' goods which were often regarded as superior to their home produce (Haslett 1988). The consumption of Indian meal, which had become commonplace after the Great Famine, now started to decrease but little else is reported of the consumption around that time. It is assumed the diet was more varied than milk and potatoes since there is little record of starvation or malnutrition (Doyle 1975).

The first world war greatly influenced the Irish diet, especially in the urban areas. Rising food prices and insufficient supplies of goods caused people to have a very meagre diet. For example, between 1914 and 1917 the price of mutton increased by 103% in large towns and 83% in small towns and villages and potatoes by 132% and 103% respectively (Haslett 1988).

Between the first and second world war there is difficulty in determining the diet of people. Agricultural produce consumption was distributed across the following communities : 35% agricultural community, 17% others living in Ireland and 43% exported (Haslett 1988). In 1936, a dietary profile appears to be one of 32% dairy, 26% potatoes, 17% cereals, 7% meat & fish and 18% other sources (Kelly 1985). At this stage, mid-30s, the Irish diet was still relatively low in fat and high in carbohydrate but not as markedly so as in the mid 19th century, as shown below in Table 10.

Table 10 : The percentage of energy derived from Protein, Fat and Carbohydrate

	Protein	Fat	Carbohydrate
1863	11	9	79
1904	11	24	66
1936	12	29	59

Source: Haslett 1988

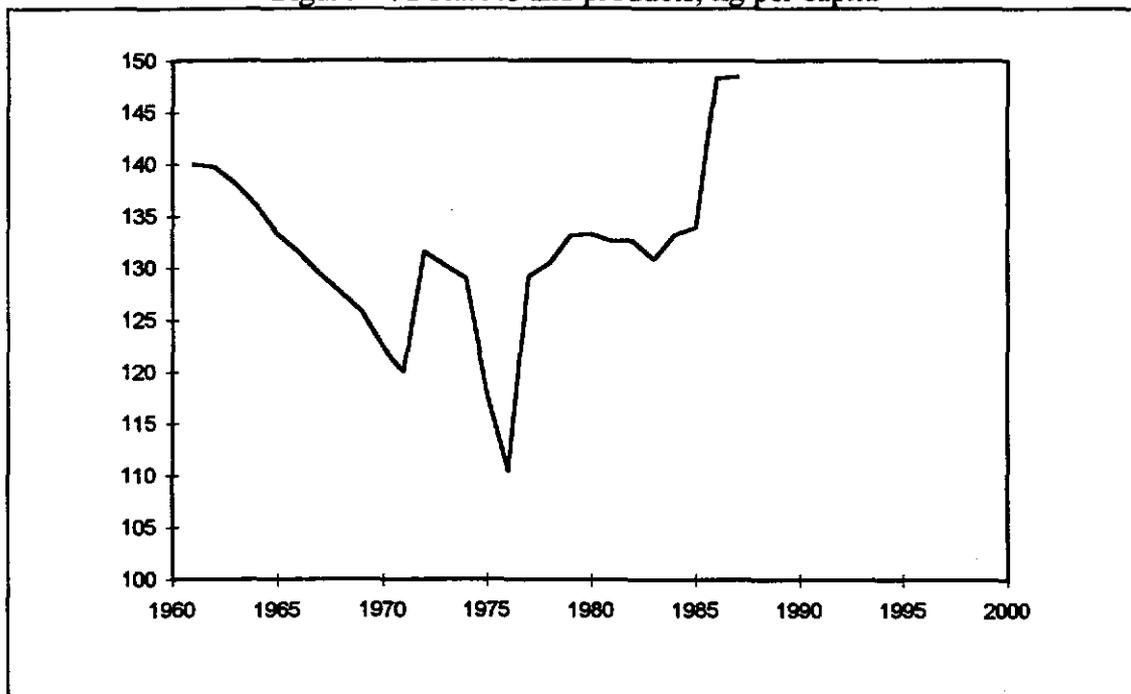
POST SECOND WORLD WAR - PRESENT DAY

Food availability remained somewhat scarce immediately after the last world war. It was not until 1946/48, when the first Irish national nutrition survey was carried out, that a true indication of the dietary status of the population was really known. Food balance sheet data also started to become available in usable format from the start of the fifties. Consumption patterns using these types of data are shown below for various food items.

Potatoes and Cereals:

Figure 1 below shows the consumption trends for potatoes and products as derived from Irish food balance sheets between the years 1960 and 1988.

Figure 1 : Potatoes and products, kg per capita



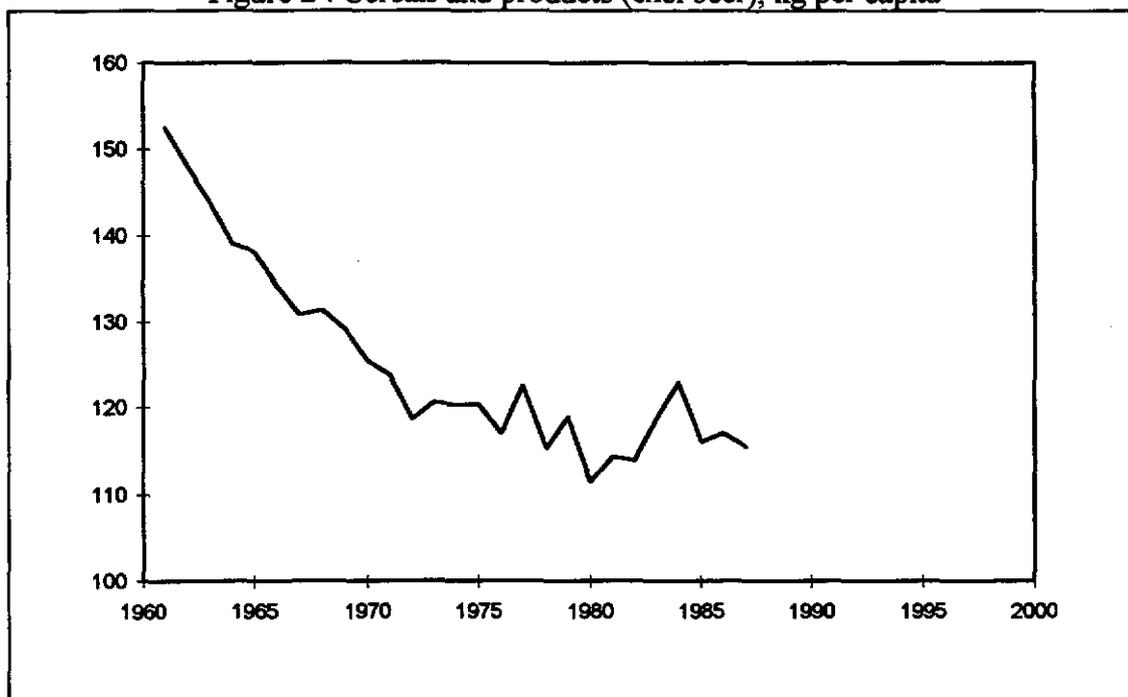
Source : WHO Nutrition & Health database Version 1.0, 1992

Ireland has one of the highest levels of potato consumption in Europe. In 1948-51 potato consumption accounted for over 10% of the total diet. This decreased to 7.8% in 1961 but grew again to 18% in 1984 (FAO Production Yearbook). As seen from the food balance sheet data above, between the years 1960 and 1975 the consumption of potatoes and products per capita per year decreased by approximately 14%. A study of food consumption trends using data from the statistical bulletin of 1971 reinforces this downward trend from 1961 to 1971 (Morrissey and Cremin 1976). From 1975 until the start of the nineties there has been a steady increase in the consumption of potatoes.

According to the data from the national nutrition surveys we are certainly eating fewer potatoes compared to the earlier half of the century. The first Irish national nutrition survey of 1946/48 found mean intakes per capita per day of 549g but in the 1990 nutrition survey a 60% decline to 225 g per day was observed (Department of Health 1948, INDI 1990). However as Figure 1 above shows, Irish people are gradually increasing their consumption of potatoes. It should be noted that from the mid-1970s until now there has also been an increase in the amount of processed potato products consumed, from 13% in 1980 to 26% in 1990 (Central Statistics Office, Agriculture Production Section 1995). The Happy Heart national survey carried out in 1992 found that 27% of people are now eating chips or roast potatoes at least twice per week (Irish Heart Foundation 1994).

Figure 2 below shows the trends in cereal consumption in Ireland between the years 1960 and 1988.

Figure 2 : Cereals and products (excl beer), kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Cereal consumption in the form of breads and flours steadily decreased in the years 1961 to 1971 (see Table 11 below) and has continued to do so until the nineties with an overall reduction of 25% as observed from the data in figure 2 above. Breakfast cereal consumption in Ireland, at 7.3 kg per capita per annum is much greater than either the UK (5.7kg) or the USA (4.3kg) and is a fast growing market at a rate of 4% per annum

Table 11 : Trends in the per capita consumption of Cereals & Potatoes

	1961 grams/day	1966 grams/day	1971 grams/day
Potatoes	423	400	366
Bread & Household Flour	290	258	233

Source : Irish Statistical Bulletin, 1972

Fruit and Vegetables

The consumption of fruit and vegetables fluctuates from year to year and can be easily influenced by factors such as the weather which may affect supply and demand.

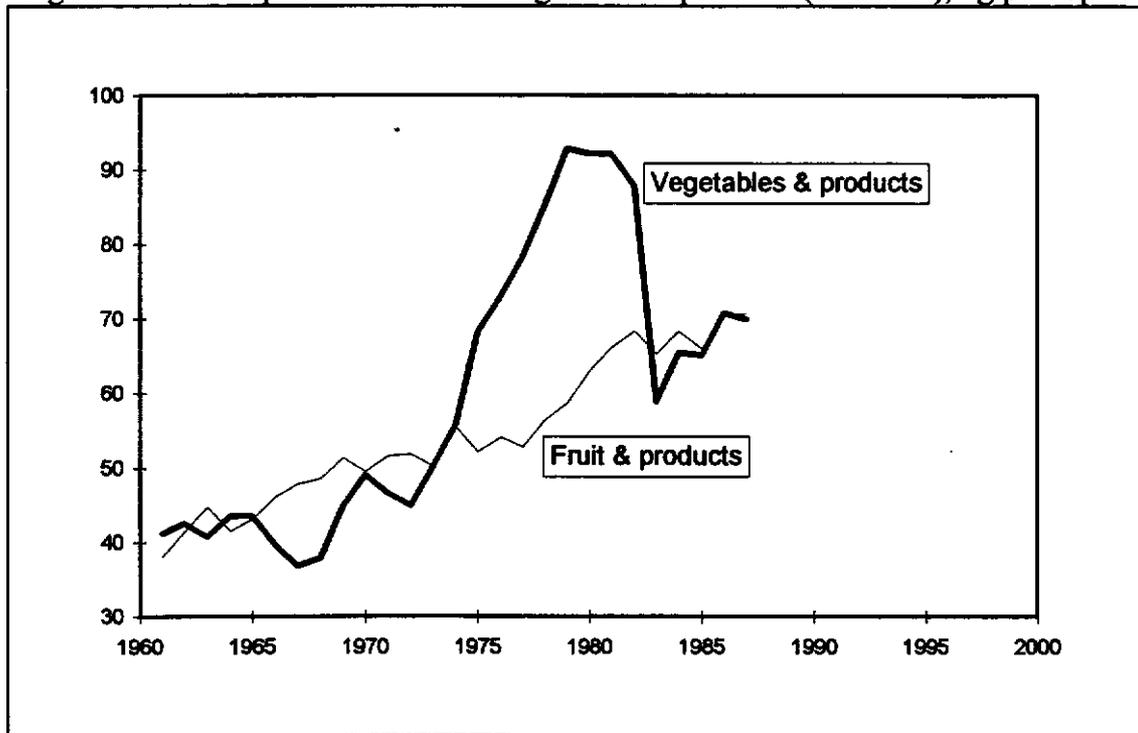
In the mid-1930s the intake of vegetables was 145 grams per capita per day. In the twelve year period, 1948 to 1960, diets of the European countries underwent considerable modification due to increased prosperity and technical development in processing (O'Neill 1964).

After increasing intake between the mid-30s until mid-40s, the contribution of fruit and vegetables to the Irish diet however remained constant at 2.5% of the total dietary intake in the years 1948 and 1961 (FAO Production Yearbook 1992). Consumption of vegetables dramatically increased from the start of the sixties and grew to a high at the beginning of the eighties. The demand for common field vegetables such as potatoes dropped between the early sixties and mid-70s (see Figure 3) and it would appear from the increasing intake shown in the figure below that the Irish consumer may have turned toward vegetables which were processed, frozen or prepacked or towards the wider varieties which were now available from other countries.

After the drastic fall in vegetable consumption in the early half of the eighties, there has been a resurrection in intake but Ireland still continues to be one of the lowest fruit and vegetable consumers in the European Union. The national nutrition survey of 1990 found the vegetable consumption intake to be 59 gram/capita/day, a 53% reduction on the intake of 1948. In 1992 only 13% of Irish people ate the recommended level of four or more portions of fruit and vegetables (Irish Heart Foundation 1994).

Fruit consumption in Ireland, although on the increase, leaves much to be desired in health terms with an annual consumption of about half the European average of 35 kg.

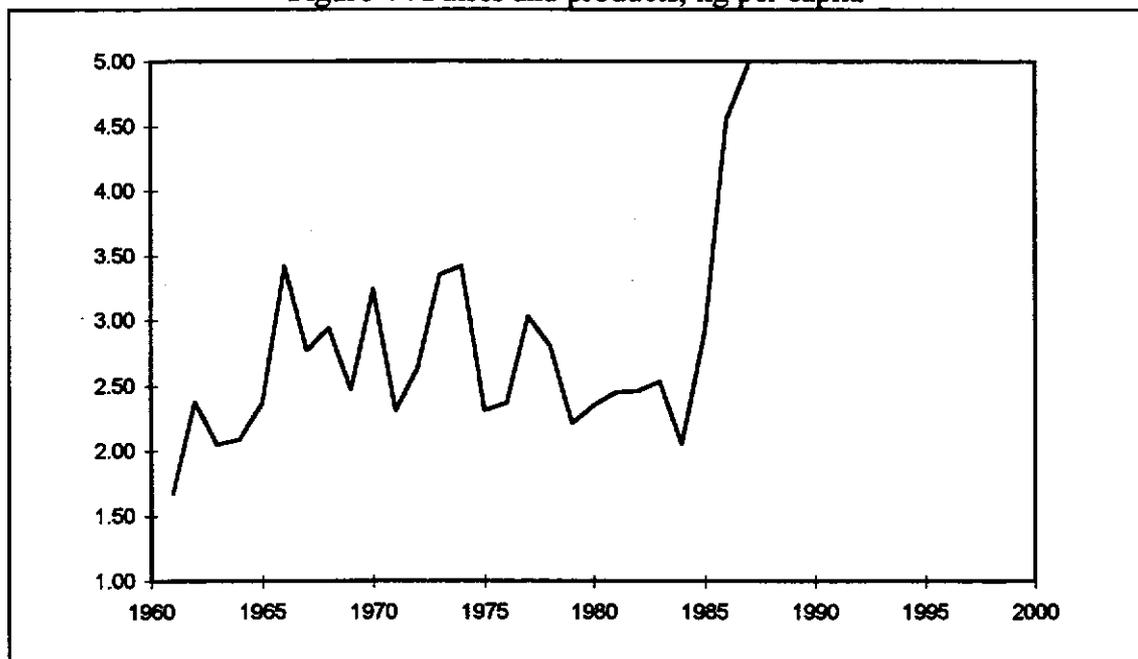
Figure 3 : Consumption of Fruit and Vegetables & products (excl wine), kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Figure 4 below shows the variation in pulse consumption in Ireland between the years 1960 and 1988.

Figure 4 : Pulses and products, kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

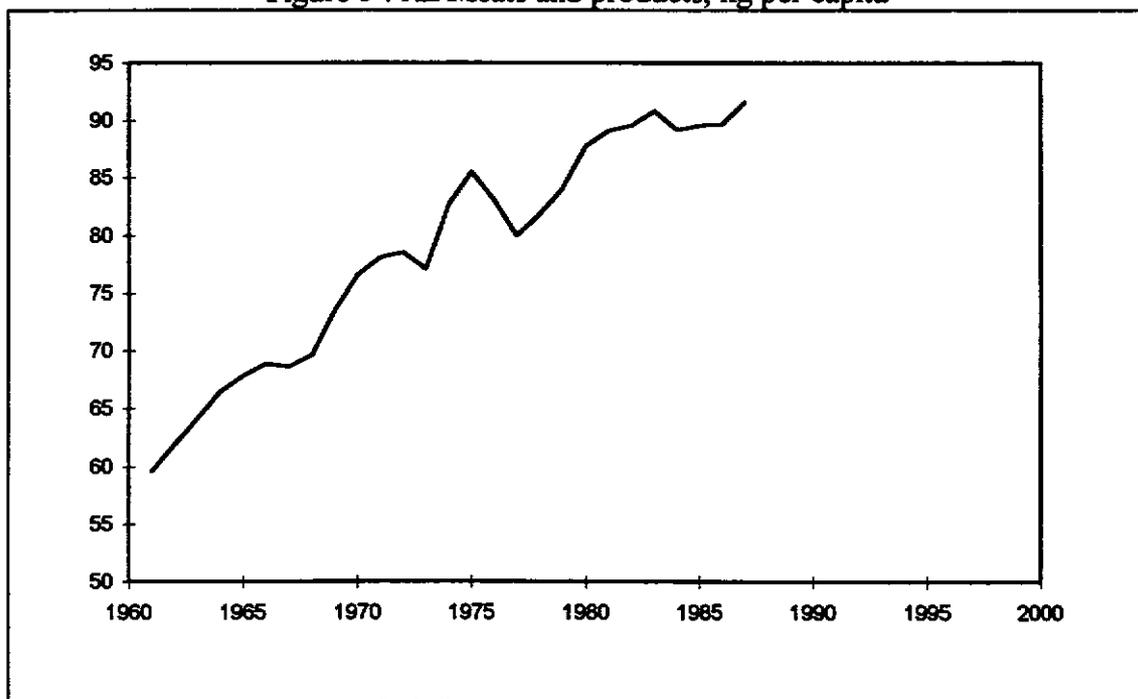
Although a great source of carbohydrate and protein, the consumption of pulses has traditionally been low in Ireland. Towards the start of the sixties Ireland was introduced to diets from other parts of the world and perhaps their influence was responsible for the pulses enjoying a 200% increase in consumption as shown above in Figure 4.

Beef, Pork and Poultry

By 1993, total meat consumption in Ireland had increased by 74% compared to the mid 1930s when the intake per capita per day was 133.6 grams (Eurostat 1993).

Figure 5 shows the total meat consumption between the years 1961 and 1988 as derived from the Irish food balance sheets. A steady increase is observed over the last three decades.

Figure 5 : All Meats and products, kg per capita



Source : WHO Nutrition & Health database

Cremin and Morrissey found a steady increase in consumption for both red meat and poultry between 1961 and 1971 although red meat was by far the more popular as seen in Table 12 below.

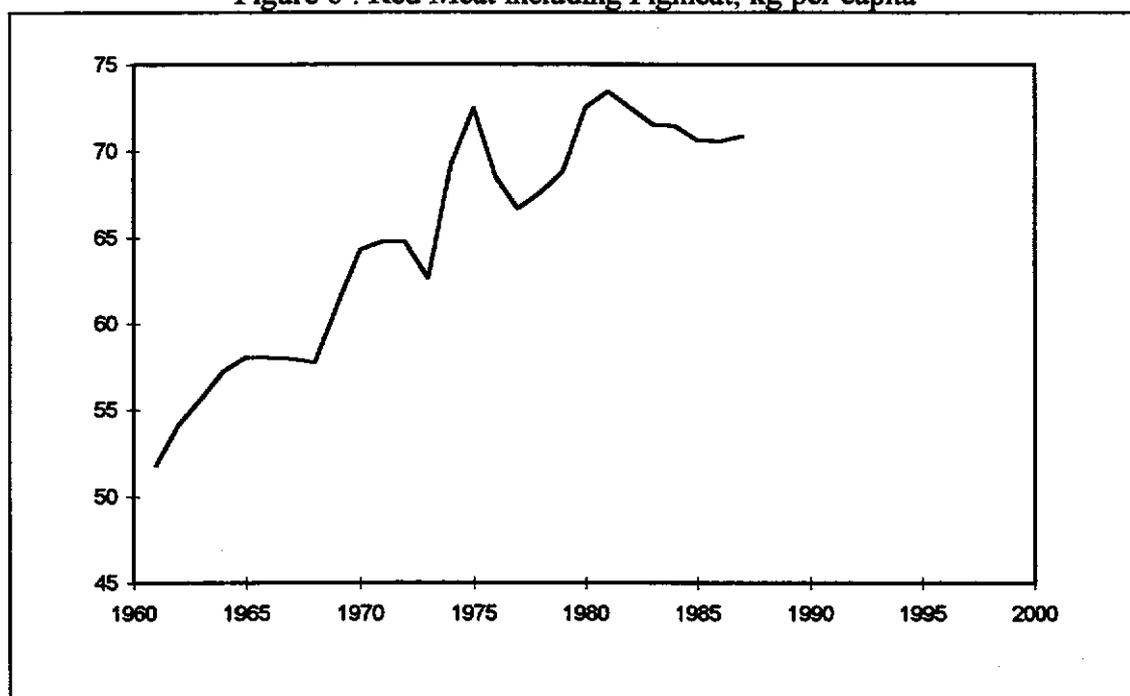
Table 12 : Red Meat and Poultry per capita consumption in 1961, 1966 and 1971

	1961 gram / day	1966 gram / day	1971 gram / day
Red Meat	133	150	169
Poultry	14	23	29

Source : Morrisey and Cremin 1976

Within the red meat category, pork was the dominant food followed by beef and then mutton. Levels of mutton consumption did not vary significantly between those years. The increasing trend in red meat consumption can also be observed in the food balance sheet data. Levelling out appears to have occurred since the start of the eighties and in fact food balance sheet data from 1993 shows red meat including pigmeat intake substantially lower at 59.8 kg per capita.

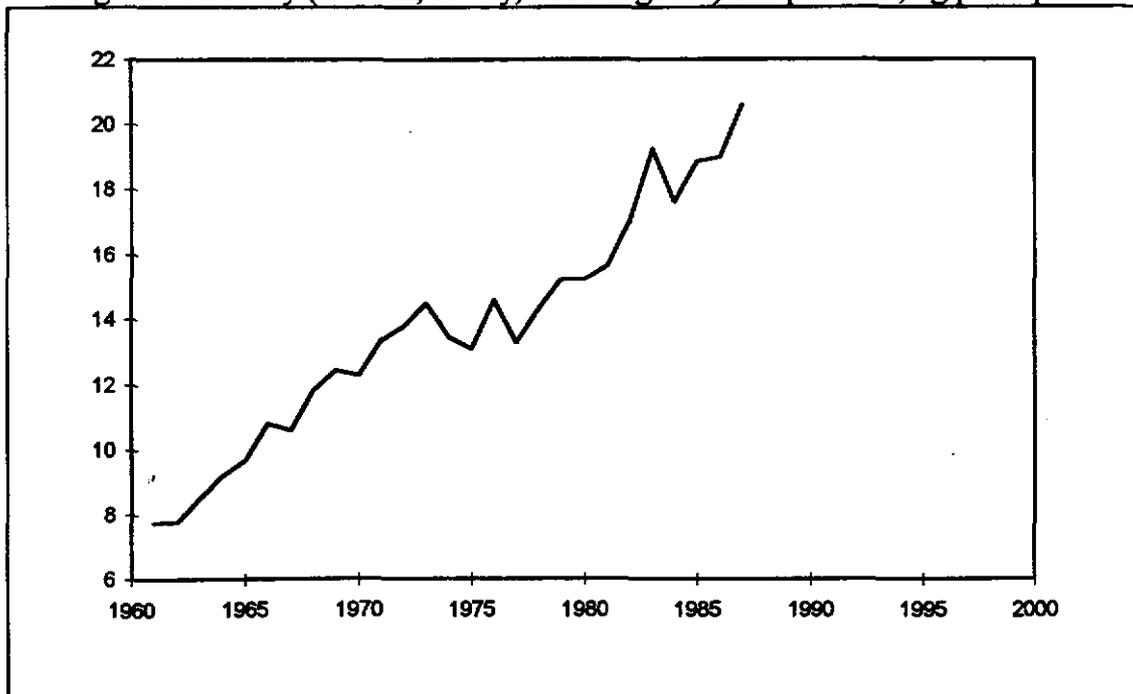
Figure 6 : Red Meat including Pigmeat, kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Poultry consumption has been on the increase over the past four decades. The increasing trend in the food balance sheet data shown below in Figure 7 was also observed by Morrisey and Cremin using the Irish Statistical Bulletin 1972 information as seen previously in Table 12. Data from the 1993 food balance sheets show a consumption of 25.3 kg per capita per year and there would appear to be nothing indicating that this positive move towards poultry intake will decline.

Figure 7 : Poultry (chicken, turkey, duck & goose) and products, kg per capita



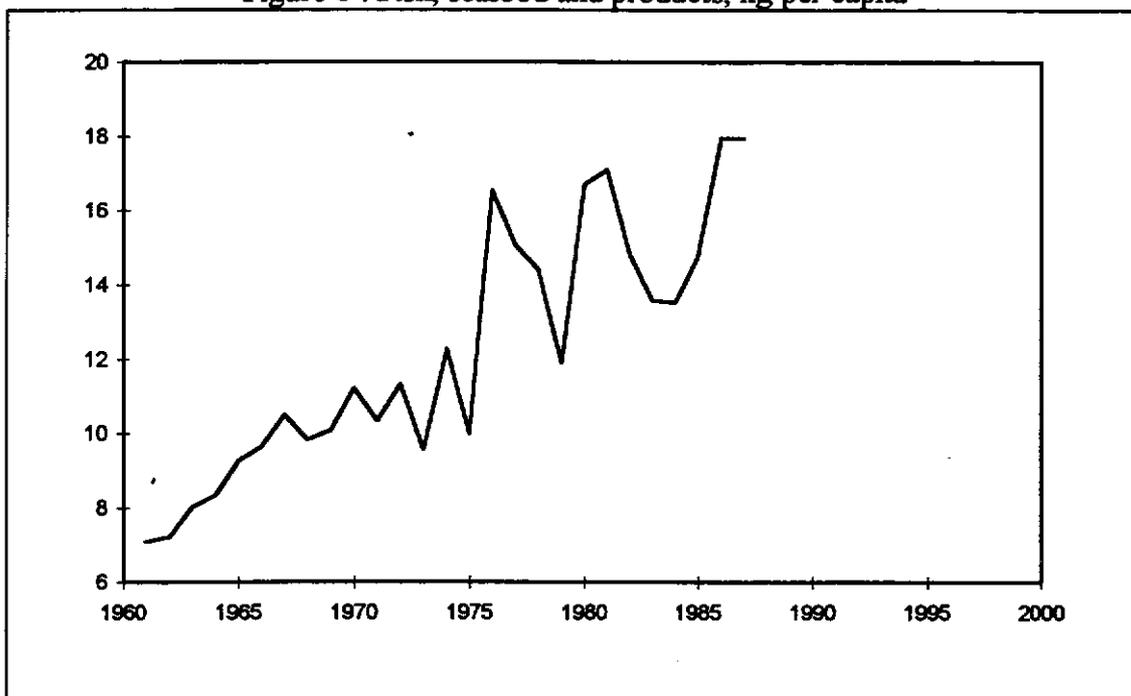
Source : WHO Nutrition & Health database Version 1.0, 1992

Fish

Although surrounded by coastal fishing waters, Ireland has a low consumption of fish compared with our European neighbours. Exports are 4 times greater than that of the imported fish commodities (Central Statistics Office 1994) and it would seem the majority of fish caught in Ireland makes its way to foreign dinner plates.

Daily per capita intake of fish in 1936 was very low at 8.2g but appeared to increase substantially just after the second world war to 14g according to the first national nutrition survey. A steady increase in consumption has been observed since then as the food balance sheet data in Figure 8 below indicates. Even today, although significantly higher compared to earlier years, Irish people have a low intake of fish at 23.3 g per capita per day (Bord Iascaigh Mhara 1994). Bord Iascaigh Mhara are currently engaged in a home market promotion with the aim of increasing annual individual consumption by 15% to at least 9.5 kg by the end of the century.

Figure 8 : Fish, seafood and products, kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

In recent years the consumption of meat, poultry and fish alone has provided the daily recommended protein intake for 50% of the Irish population.

Dairy Products

Figures from the 1948 national nutrition survey show milk consumption at 569 ml per person per day. The intake of milk and other dairy products does not seem to have varied considerably over the twelve year period between 1948 and 1960. However, around the start of the fifties consumption of fresh milk and cheese was slightly lower than at either end of the time period as shown in Table 13 below.

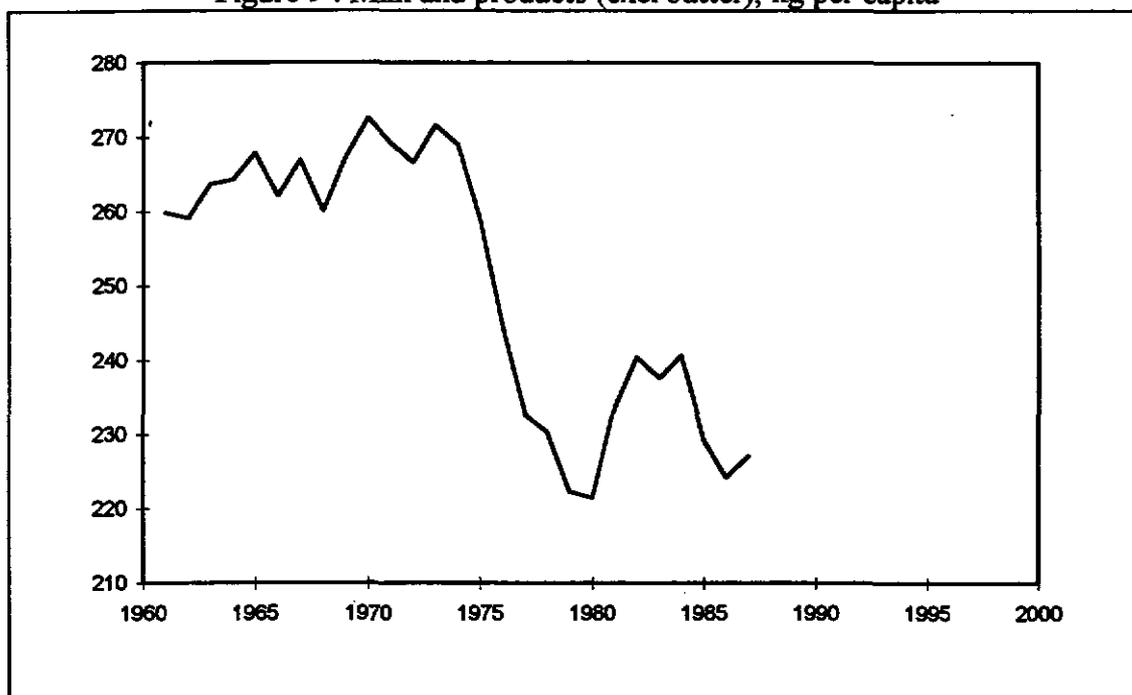
Table 13 : Consumption of Milk, Cheese and Eggs, per capita per day in 1948, 1954 and 1960

	Fresh Milk (ml)	Cheese (g)	Eggs (g)
1948	569	3.3	43
1954	506	2.5	38.2
1960	560	3.4	37.8

Source: Irish Food Balance Sheets 1948, 1954 and 1960, Central Statistics Office, Dublin 1996

From 1960 to 1988 food balance sheet data indicates a decline in the consumption of all dairy produce excluding butter and eggs as shown in Figure 9 below. In 1994 the daily intake of dairy produce excluding butter and eggs had continued to fall to 564 gram/capita (206 kg per capita per year) (Central Statistics Office 1994). The dietary guidelines advise reducing the intake of fats, especially saturated, thus this trend over time is a positive change with implications for coronary heart health benefits.

Figure 9 : Milk and products (excl butter), kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Prior to the sixties margarine was not readily used as a spread due to its social unacceptability and lack of palatability. There was a gradual increase in its usage but butter remained the more popular fat for consumption.

Table 14 : Consumption of Butter and Margarine per capita per day in 1948, 1954 and 1960

	Butter (g)	Margarine (g)
1948	46.4	5.7
1954	45.5	6.5
1960	44.5	8.6

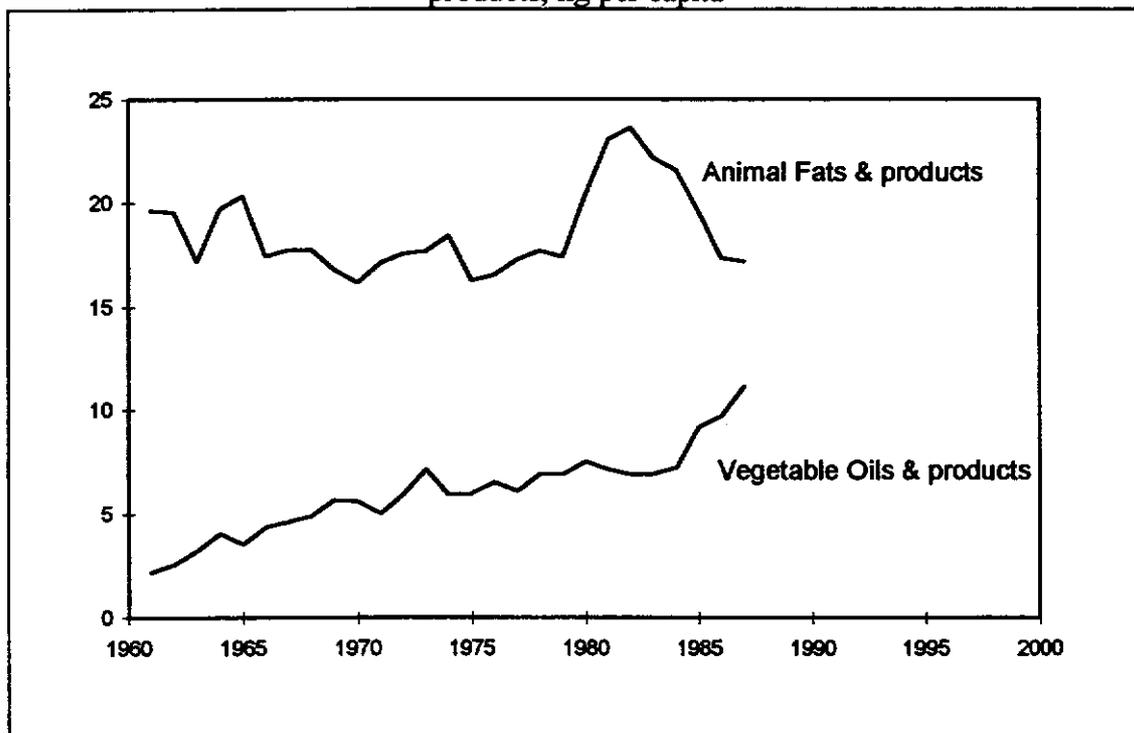
Source: Irish Food Balance Sheets 1948, 1954 and 1960 Central Statistics Office, Dublin 1996

There has subsequently been much consumer interest in the benefits of margarine versus butter since the start of the seventies. As seen in Figure 10 below, although somewhat lower than the previous two decades, animal fat consumption remained more or less steady from 1960 to 1988 except for a peak between 1977 and 1982 when consumption increased by approximately 35%. The National Dairy Council 1994 report showed butter consumption since the start of the nineties to be relatively stable at on average 10.3 grams per person per day (National Dairy Council 1994).

Although lower than animal fat intake levels, the consumption of vegetable oil and related products steadily grew over the twenty-five plus years between 1960 and 1988, to 30.1 grams/capita/day.

Almost half of the people surveyed in the 1992 Happy Heart study used a butter or dairy spread and only 16% said they used a polyunsaturated margarine (Irish Heart Foundation 1994).

Figure 10 : Animal Fats (include butter, tallow and fish oils) / Vegetable oils and products, kg per capita

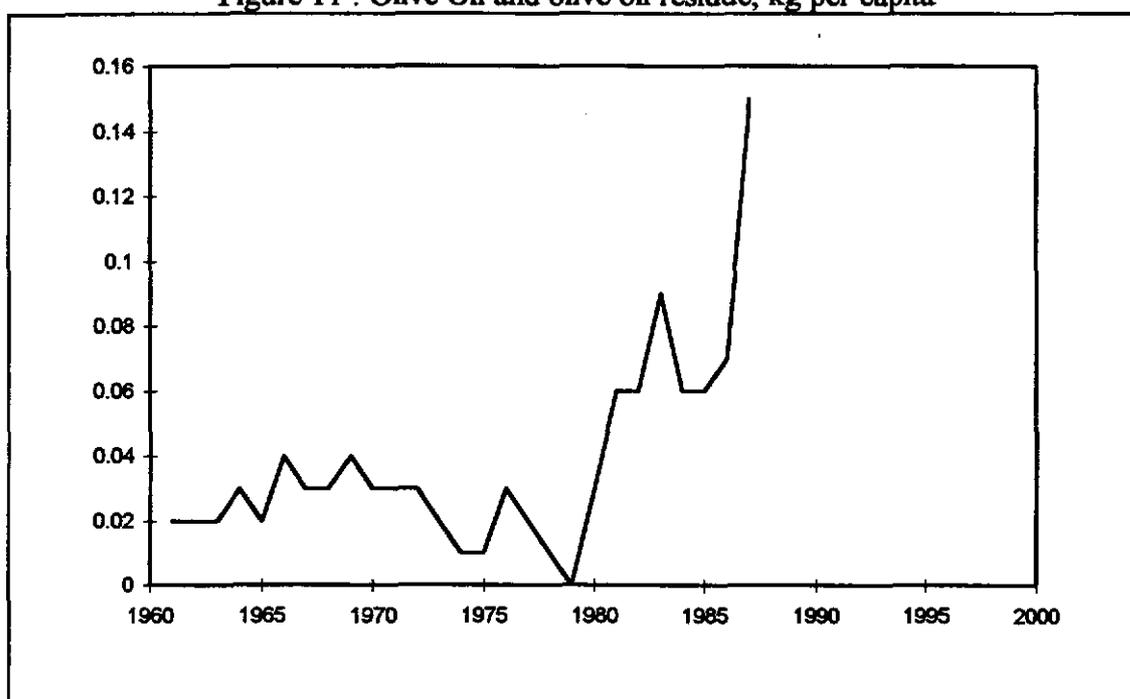


Source : WHO Nutrition & Health database Version 1.0, 1992

The benefits of monounsaturated oils have come to the forefront in the past number of years. High levels of olive oil consumption in the Mediterranean diet have been positively associated with reduced risk from cardiovascular disease.

In Ireland olive oil is not an oil which is widely consumed. It remains one of the most expensive oils in the country which may contribute to the low level usage. However in recent years there has been a sharp rise in its consumption. Between the 1960s and 1980s there was not much fluctuation with levels staying around 0.2 kg per capita (less than 1 gram per person per day). In 1988 these levels had increased sevenfold to over 0.14 kg per capita.

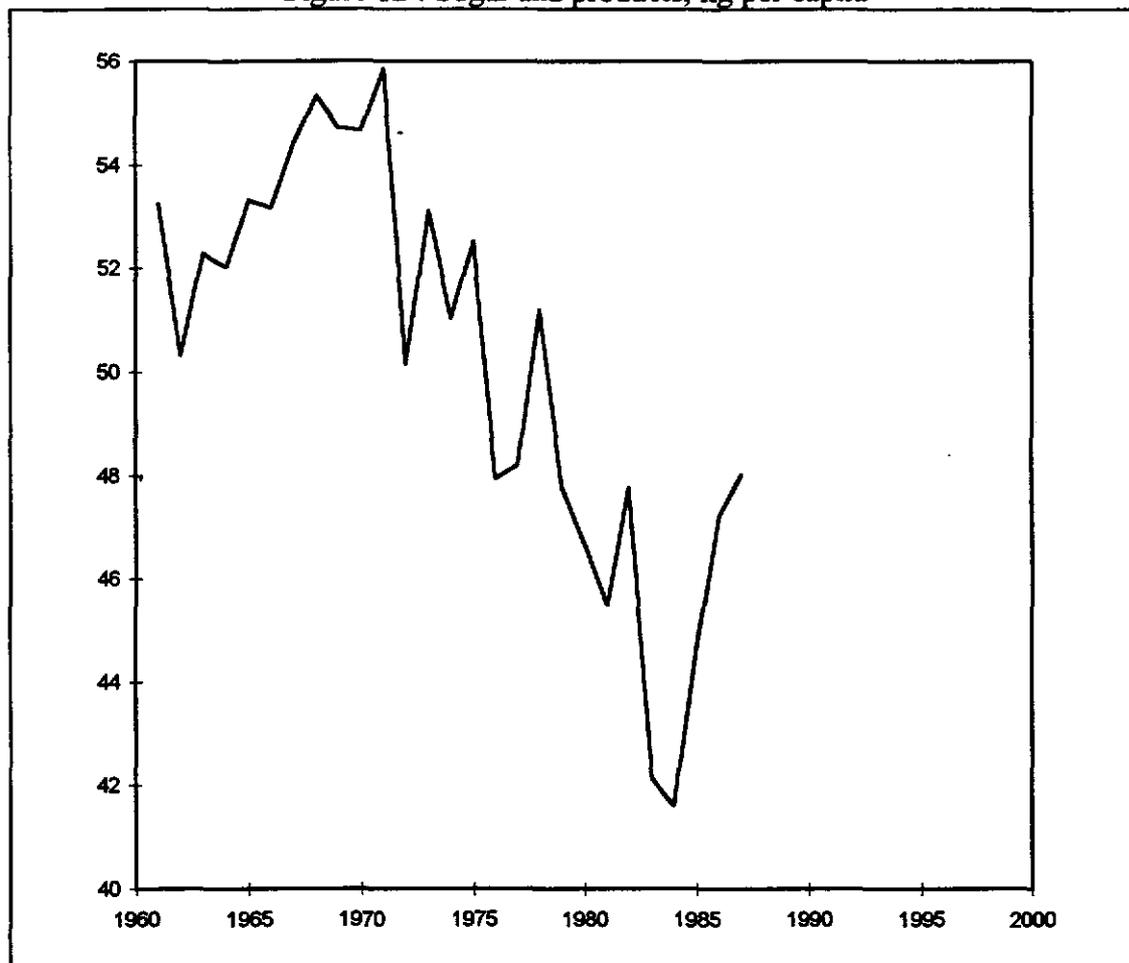
Figure 11 : Olive Oil and olive oil residue, kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Irish people have a high level of sugar consumption, one of the highest in Europe (Haslett 1988). In the mid-30s the daily per capita intake was 104.3g. This increased by about 30% over forty years and reached a peak in the mid-70s. Today we are eating approximately 37.8 kg per head in a year or 103.6 gram per person per day (Central Statistics Office 1994) which is not dissimilar to that of our grandfathers.

Figure 12 : Sugar and products, kg per capita



Source : WHO Nutrition & Health database Version 1.0, 1992

Like sugar, salt is another foodstuff which is recommended that we reduce its intake. Figures are difficult to obtain for this item probably due to its ubiquitous nature. Many processed foods still use salt and sugar as preservatives. Food preparation is another time when salt is added, as is the eating stage.

Nutritional Intake

As shown in the previous pages, substantial changes in diet and subsequent nutritional intake have been found since the time of the famine. In Table 15 below, we can see from the diet just after the famine that fat contributed only 9% of the total energy intake. The contributor to the diet was the carbohydrate levels which supplied almost 80% of the total energy. These proportions have gradually changed and as can be seen in the national nutrition survey of 1948, the total energy derived from fat was less than 30% whereas now, the sources of dietary energy have changed such that the energy level from fat is 36% (Technology Ireland January 1984). Levels of carbohydrate have

unfortunately continued to drop and it appears that our diet now contains foodstuffs low in carbohydrate and high in fat which is contrary to the nutrition guidelines.

Table 15 : Average daily nutrient intake expressed as % of total energy intake

	Fat	Protein	Carbohydrate
1863	9	11	79
1904	24	11	66
1936	29	12	59
1948	29	13	58
1961	30	16	54
1990	36	15	49

Source : NNSC 93, Haslett 88

FOOD PREPARATION

The preparation of food is a very important stage in the food chain. There are several reasons why food is cooked but the main ones are to make food attractive in taste, colour and texture, and safer by destroying pathogenic organisms and toxic substances, as well as making nutrients more available (Bergstrom 1994). Cooking techniques have changed substantially since the time of the great famine and we now take for granted methods such as microwaving. Nutrients may be lost or gained in the cooking of foods, and depends upon a wide variety of factors. Some of these factors are:

- * Cooking method - e.g. steaming, boiling
- * Cooking time
- * Cooking temperature
- * Cooking utensils - e.g. volume of cooking vessel used

- * Food quality
- * Physical shape of food
- * Amount of food cooked
- * Temperature of liquid added
- * Volume of liquid added
- * Amount of fat added
- * Type of fat added

For nutrient changes in vitamins and minerals the following are some factors of special importance:

- * Catalysts such as iron or copper in the metal of the cooking utensils
- * Temperature
- * Time
- * Water
- * Oxygen

Throughout the whole food chain there are many opportunities to alter the nutritional value of foodstuffs. As well as in processing treatments which many foods experience, there are stages in the preparation and cooking of foods at which nutrients may also be lost or changed.

Before cooking there may be handling losses, protein and fat losses in the trimming of foods, and carbohydrates and fibre can be lost in the peeling of potatoes for example. During cooking, nutrient changes occur and are reported using a method called the true retention of nutrients (Bergstrom L. 1994). A large percentage of the nutrients found in everyday foods are affected by the cooking process.

In Ireland it is suggested that we cook for too long and in too much water thus denaturing vitamins (Technology Ireland May 1981). Therefore, when we come to eat our prepared dish we may not actually ingest those nutrients which were thought to be there in the first place. It is therefore very important if we are to follow dietary guidelines that food preparation is treated with the respect it deserves.

Food Retail

19th CENTURY IRELAND - SECOND WORLD WAR

From the time of the famine until the start of the twentieth century Irish people sustained themselves primarily through home grown produce and a small amount of imported goods mainly from the UK. Country shops existed which dealt in the trade of local farmers ware and were sometimes situated in the front part of someone's house. Refrigeration before the time of electricity involved the use of a cold larder usually in the kitchen of a house. The peat bogs were often also used to preserve foods such as butter and milk.

A commercial revolution was in the making when the railways were introduced to Ireland in the second half of the nineteenth century. The arrival of electricity to Ireland in the 1930s and early 1950s in rural areas was also a landmark for change in many aspects of life. These factors and also the increasing literacy and Anglicization opened up Ireland to economic and social changes which were to be found not only in the food retail business.

POST WAR - PRESENT DAY

In 1992 the Irish food industry had an estimated output of about £7.6 billion. Within the industry, Ireland has followed similar trends as the UK and has seen food manufacturing and technology develop rapidly over the last hundred years. Food technology and innovation have had a large impact on the food retail industry. With the increasing availability of processed longer life foods, competition between these and fresh goods arose for shelf space in many outlets.

Retail Environments

Advances in technology have had a major influence on the lives of residents in most developed countries. There have been many changes in grocery trade and it looks certain that there will more to come (Checkout Ireland 1996).

In retail terms concentration has moved towards bigger stores and centralised distribution systems. The type and number of retail outlets has changed substantially since the fifties as seen in Table 16 below. Grocers, which were large town or city food shops have been replaced by modern day supermarkets which are much bigger and stock a much wider variety of items. The number of country general shops, which

could range from selling food in the front of someone's house to a country village shop, has declined by over 90% in this forty year period.

Table 16: Type and number of Retail Outlets 1951 and 1991

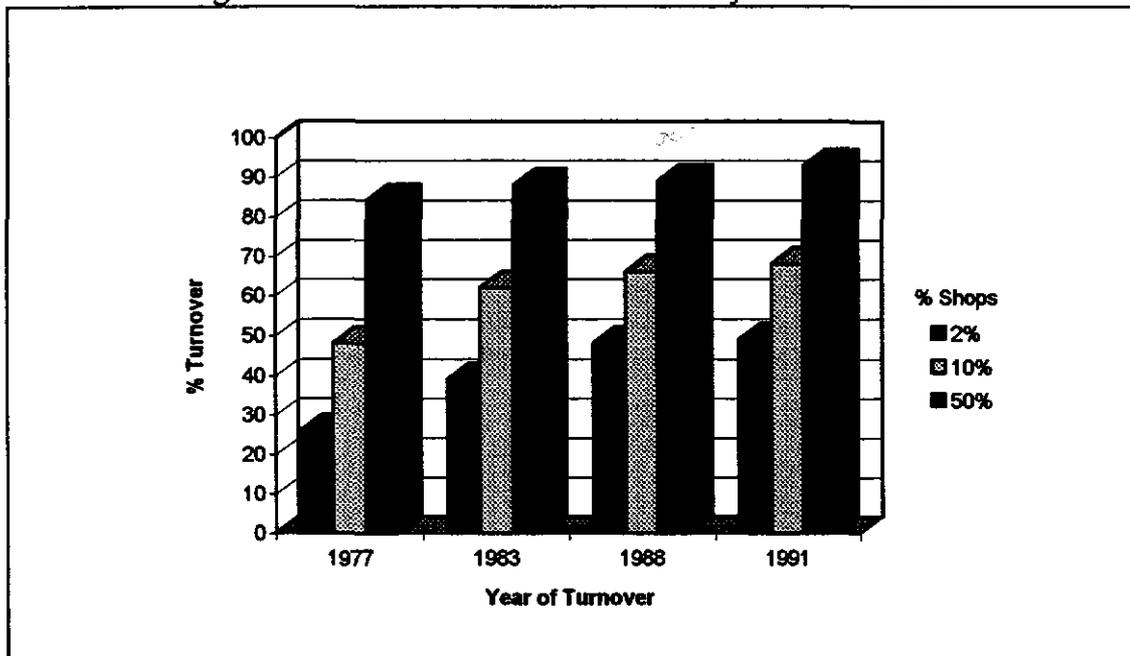
Shop Type	1951	1991
Grocers	9387	5909*
Grocery with Public House	3526	615
Butchers	1262	1930
Fishmongers	108	147
Greengrocers	400	544
Bakers/Confectioners	194	419
Country General shop	1025	N/A

Source: Central Statistics Office Census of Distribution 1958, Neilsen 1991

* includes supermarkets and delicatessens

At the start of the seventies the grocery trade moved towards a significant concentration of the grocery market being controlled by a very small number of outlets. This trend however did seem to slow down at the beginning of the nineties as seen in Figure 13 below. Despite that in 1977 2% of shops accounted for 26% of the total turnover and in 1991 this figure had risen to 50%, there was a change in the distribution of the control.

Figure 13 : Concentration of Total Grocery Trade in Ireland



Source : A.C. Neilson Retail Census 1983 & 1991.

There exists in Ireland three different types of grocery outlet; Multiples (e.g. Dunnes stores), Symbol Groups (e.g. Spar) and Others. Around the start of the sixties Multiples started to capture an increasing share of the market. As seen in Table 17, in 1983 they accounted for 56% of the national market, 60% in 1984 and 64% in 1986. In the late eighties this trend began to fall with a reported national market of 50% in 1991. Whilst the Multiples increased their market share in the early eighties, correspondingly the Symbol Groups share and Other categories fell.

Table 17 : Average % Market Share of National Turnover

	Multiples (% of Total Turnover)	Symbols (% of Total Turnover)	Other (% of Total Turnover)
1983	56	21	22
1986	64	17	19
1988	60	21	19
1991	50	25	23

Source : Wilson Hartnell 1993

It is expected that as the UK multiples arrive in both the north and south of this island the pressure exerted by them will have a big effect on marketing, sales and distribution in Ireland causing some smaller companies to become unviable. Changes like these are inevitable as Ireland becomes more like any of the other developed European countries.

Own Labels

Own label products have made great inroads since the seventies. The role of manufacturing brands versus that of private labels has had much debate. In 1979 over 50% of housewives said they never bought own label brands. However this figure dropped dramatically to 10% by 1983 but there has been a leveling in the own label purchasing at around 80% in recent years (Wilson Hartnell 1993). According to a survey carried out in 1995 by Lansdowne Market Research, 44% of Irish grocery shoppers disliked the idea that by the year 2000 shops own brands will become more popular than brands such as Kelloggs or Heinz (Checkout Ireland 1996).

Grocery Trade

As we move towards the millennium Irish food and drink industry is expected to undergo monumental change, as it has done over the preceding century (Checkout Ireland 1996). Some influencing factors may be the reduction in CAP support for farmers and the changing demographics of the country. There is a significant decrease

in household sizes and an ageing population. Changing lifestyles and a rise in the level of personal disposable income has demanded and will continue to demand appropriate varieties and types of foodstuffs.

Irish import trade figures have been rising since the mid-80s. Food and live animal imports increased by over 70% since 1985 to £1,396.1 million in 1994. Market opportunities have been identified from Irish import figures. With the improvements in technology, Irish manufacturers have the ability to compete with overseas exporters. Below are some selected relevant retail and trade figures for a variety of foodstuffs which identifies the growing opportunities in Ireland. These figures were compiled by Checkout Ireland Publications 1996.

Frozen Foods

This is a heavily branded grocery sector which has grown in recent years. The estimated market value is thought to be approximately £125 million. The different sectors which make up this market are frozen fish products (£30 million), burgers and meat products (£25 million), chips and potato products (£25 million), frozen pizza (£20 million), vegetables (£15 million) and prepared meals (£10 million). Most frozen products are imported by a small group of companies who then distribute the main brands across Ireland. The non-meat ready meals have grown in popularity showing an annual growth rate of 67%. Other real growth areas over the past two decades has been the low calorie products and potato products.

Snackfoods

The snackfood market is growing at a rate of over 20% per annum and was worth £80 million in 1995. It is estimated that £24 per capita is spent annually and the move is towards multipack and more adventurous tastes. The crisps sector remains the largest and is worth over £45 million but both popcorn and nuts are growing steadily valued at £2.5 million and £5.5 million respectively.

Potatoes and Cereals

From a retail perspective, potatoes are the most important vegetable product accounting for up to 41% of the total fruit and vegetable retail of £150 million in 1995. Imports accounted for 18% of the total market and come mainly from the Netherlands and the UK (An Bord Glas). Retailers sell about 60% of all potatoes with 20% going to the catering and processing sector and much of the latter ends up in retail as frozen chips. Imports of processed potato products have risen sharply to £10.3 million in 1991 and snack foods have followed the same trend. If indigenous produce is unfeasible then perhaps invitations to larger foreign manufacturers would help control

our import market (An Bord Trachtala 1993). Multiples sell 34% of the retail sales of potatoes, greengrocers 25% and other outlets 41%.

Even in Ireland there is threat to the potato from the increased interest in pastas and pizza. In 1995 the market value of total pasta was valued at £18 million and comprises of four sectors; dried pasta, canned pasta, fresh pasta and pasta sauces.

In Ireland it has been identified that breakfast cereals are worth £65 million and growing at a rate of 4% per annum. Imported breakfast cereals were worth £38 million in 1991. Cold cereals account for over 90% of the market with hot, oat-based varieties worth only £4 million. There has been a major trend in recent years for manufacturers to market their foods as snackfoods as opposed to just breakfast products.

On the continent it is common to select your own breakfast mix, choosing from a variety of muesli ingredients in retail 'bins' or small packs. Similar ventures to increase the range and availability are in the process of being tried and tested here.

Bread is a staple common to all walks of life. In Ireland it is valued at £200 million with only three major companies effectively controlling the market. Although white bread is the biggest seller, there has been growth in the brown and specialties in recent years with a market distribution of 70% white to 30% brown. Industry forecasts that the standard 800g pan will remain market leader because competition in recent years has ensured that it is the cheapest of any other bread product.

Fruit and Vegetables

Fruit and vegetables are among the major growth food areas in Ireland with more and more shop space being allocated to them. The present market value is estimated to be in excess of £300 million with consumer expenditure on fresh vegetables increasing by 16% between 1993 and 1995 to £150.7 million (Checkout Ireland 1996). In 1995 multiples accounted for over 40% of the vegetable sales, greengrocers for 20%, and symbols for 17%. Consumers can expect year-round availability of fruit and vegetables which was unthinkable two decades ago. The trend is towards more prepackaged vegetables, with 49% already sold in pre-packs, an increase of 10% since the start of the nineties.

Besides the potato, carrots and tomatoes are important vegetables with over 10% of the retail market each. Ireland is 45% self sufficient in tomatoes with imported produce sold early in the season before domestic produce is available.

In the past decade, mushrooms have been the major growth sector with a retail value of £8.6 million in 1995. Other vegetables which have important retail shares are shown below in Table 18.

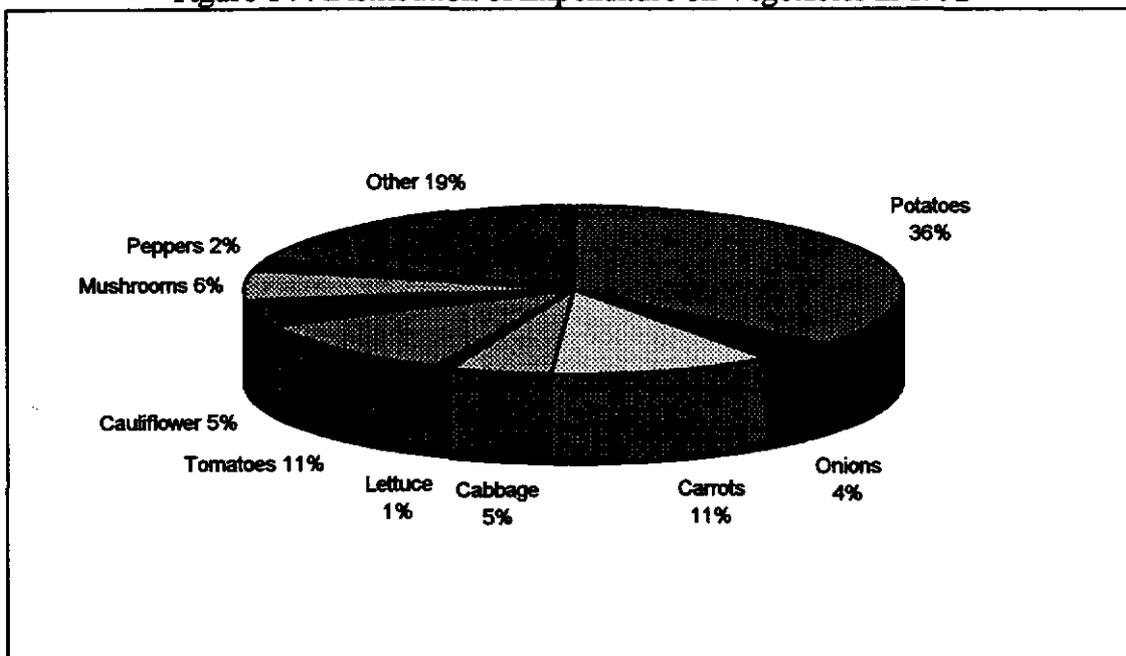
Table 18 : Vegetable Share of Retail Market

	% Share of the Total Retail Market
Mushrooms	5.7
Broccoli	4.5
Cabbage	4.2
Onions	4.0
Cauliflower	3.3

Source : An Bord Glas 1995

In 1992 a study was carried out to investigate the fresh vegetable market which was worth £113 million. In this time Ireland produced 76% of fresh vegetables bought and is an increase of 24% compared with the previous year. The money was spent on a variety of different types of vegetables, as listed below in Figure 14. Of this trade the major share went to multiples (35.1%) and the rest distributed across Symbols (17.1%), Greengrocers (25.4%) and Others (22.4%) (AGB Attwood 1992).

Figure 14 : Distribution of Expenditure on Vegetables in 1992



Source : AGB Attwood 1992

There are two areas in the fruit market; fruits like apples, bananas and oranges and soft fruits like strawberries and other berries. The biggest selling fruit is the banana followed by the apple. Only 14% of the Irish apple market is supplied by domestic producers with an annual import of over £20 million needed to satisfy annual consumption.

Meat and Fish

The total meat market in Ireland is worth over £1 billion and meat for household consumption accounts for 82% of this. Within total meat sales, beef and poultry account for about a quarter, pigmeat has the biggest share at 40% and sheepmeat around 10%. In 1990 processed meat accounted for 17% of the total market and of this, products like sausages and burgers accounted for 57%. The multiples are increasing their market share in meat at the expense of independent butchers. Approximately half of all meat is now sold through multiples.

The current retail fish market is worth about £75 million annually. With more than 74 different types of species found off the Irish coast, a key element in increasing the consumption of seafood is to encourage people to be more adventurous. At present the most popular species is cod, followed by salmon, whiting and plaice. Fresh fish accounts for the largest slice of the market with 50% of the sales whereas frozen products constitute about one third of sales. Ready to cook fish, e.g. fish packed in a sauce and products such as roulades, pates and fish cakes have become popular in recent years and are readily available in multiples. Most fish is purchased in supermarkets, 53% in 1995, and may explain why those who eat fish several times a week come from a town or city environment.

Dairy Products

Milk consumption has maintained a steady growth in the past few decades and had a market value of almost £300 million in 1995. The main contributors to this growth has been the low fat and skimmed milk sectors which are increasing by 10% each year and now account for 15% of the total market. The whole milk market share appears to be declining by 1% each year. Perhaps surprisingly, doorstep delivery still claims 40% of all sales.

The Irish cheese market is worth £65 million annually and has seen increasing consumption over the past number of years. The main increase has come from natural cheeses, at the expense of processed varieties which showed an 8% decline in consumption between 1989 and 1991. The processed cheese market is worth £17 million and has observed a shift towards slices (singles) and away from block cheese. The biggest growth in the total cheese market has been in foreign cheeses with the French ones tending to be most popular.

Butter / Margarine : the yellow fats market has been estimated to be currently worth £104 million, a much rejuvenated market compared to the eighties. Butter accounts for a quarter of the market but spreads continue to dominate. In 1995, 51% of the market was dairy and low fat spreads which translated to £51 million in sales. Within this the dairy spreads tend to dominate and are worth £34 million. There is a huge range of different types of spreads available and one which has enjoyed popularity is the low-fat butter.

The Past and Future of Supermarkets and Foods

The grocery shopping public feel that the quality of fresh food, the range of foreign foods and the nutritional information on food packs is good in supermarkets. However as regards the perception of the amount of preservatives and additives in foods they are evenly divided between those who think the situation has got better and those who think it has got worse.

There are two complaints by grocery shoppers about supermarkets - queues at checkouts and value for money. The majority of shoppers expect the queues to get shorter. There have been a number of initiatives by outlets to minimise queues. For example Superquinn's have guaranteed that as soon as a certain number of people join one queue they will open another checkout. Price is the second determining factor when it comes to choice of supermarket (second to location). Value for money is thought to have improved over the past 10 years and shoppers believe that this will continue (Checkout Ireland 1996).

The least desired technological change in supermarkets is the move away from cash to plastic. Although a cashless supermarket is not unrealistic the Irish do not want it. As a nation we still have one of the highest levels of dependence on cash, for all types of consumer spending, of any developed country.

Grocery Expenditure

In 1979, the average weekly expenditure on groceries amounted to £22.40. This jumped to over £50.00 per week in 1984 and in 1993 housewives said they spent about £54.00 weekly. The household budget survey of 1987 found that the average weekly household expenditure on food constituted 25% of the total weekly outlay of £223.08. This total weekly expenditure had increased by 75% compared to 1980 (Central Statistics Office 1987). In terms of 'real' cost of food, when adjusted for inflation, consumers actual expenditure on food has remained unchanged for the past 10 years (Checkout Ireland 1996).

The percentage distribution of expenditure on food in 1987 was found to be less in urban areas than in rural with 23.9% and 27.7% respectively. Table 19 shows the distribution of expenditure for various food items in 1980 and 1987, converted to quantities based on the retail price index. Average weekly quantities consumed were greater in rural households than in urban and also on the whole state figures. Although the total number of persons was slightly greater in the rural households it was not sufficiently more to account for the extra expenditure in those areas (Central Statistics Office 1987).

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