

# Food product innovation

## A background paper

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by

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# Foreword

Innovation through the creation, diffusion and use of knowledge has been recognised as a key driver of economic growth. Trends in agrifood systems are challenging farmers, produce traders, processors and other stakeholders to improve the efficiency of their operations and to be more responsive to consumer demands as well as regulatory frameworks.

In the case of high income countries their agrifood systems exhibit a high level of sophistication, but competitive pressures threaten family farm units and rural communities. Conventional wisdom suggests that their agrifood systems should focus on high-value products and not try to compete in commodity markets on the basis of price. In the case of low and middle-income countries a variety of circumstances exist. On one hand some 1.2 billion people survive on less than \$1 per day and 800 million are undernourished. Seventy percent of these people live in rural areas and either directly or indirectly rely on agriculture. On the other hand there exist agrifood systems that effectively meet the requirements of national and international markets and successfully apply technical and business processes.

It is obvious that all countries face challenges in the evolution of their agriculture. In each case the focus must be on fostering competitive agrifood systems that can provide income, meaningful employment, and food and agricultural products that meet the demands of the intended consumer or user. The Agricultural Support Systems Division is launching work to build the capacity of stakeholders to lead the development of policies and institutions that can foster competitive agrifood systems within their constituency. This is expected to have two primary foci: supply chain management and commercial farming is one, the other is fostering product and agro-industry innovation. This working document on Food Product Innovation is the first element of work related to the focus on innovation.

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## Executive summary

Major changes in demand for agricultural and food products are being fueled by growing populations, rising incomes, and changing lifestyles. These alter where and how food products are grown, processed and distributed; furthermore, new social and environmental concerns are bringing pressure for more change. Demand, not supply, drives product offerings with technology tailoring products to meet consumer needs and sophisticated business models delivering them to the customer in a secure manner.

In the food industry, just as any other industry, product and process development is considered a vital part – indeed the lifeblood – of smart business strategy. Failure to develop new and improved products relegates firms to competing solely on price which favours the players with access to the lowest cost inputs (land, labour etc).

The purpose of this paper is to provide a background context to discussions that will define further work in the area of agrifood system innovation. The paper defines Product Development as systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need. There are four basic stages in every product development process. These are: product strategy development; product design and development; product commercialization; and, product launch and post-launch.

There are several systems for classifying food products on their newness. They define the innovation spectrum using terms such as “new to the world”, “product improvements” and “cost reductions”. Innovations can also be described as leading to incremental, major and radical changes. Product platforms can be used to group similar products.

The ultimate test of product development occurs in the market and a new product can only be considered successful if it is a market and financial success.

In terms of product development, this paper has described the food industry as being one in which there are a large number of new products offered to retailers each year and inclusion of a new product almost always leads to discontinuation of another product. However, only a very small proportion of new products were radical changes, the majority were incremental changes. Even then, of the order of 75% of new products were considered to be failures. It was noted that in comparison to other industries (e.g. electronics, bio-technology) there is a very low level of R&D undertaken.

When the economic impact of the food industry was examined, it was determined that, in the USA, the food manufacturing sector is influential on the domestic economy, but was not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector. In the case of Greece, data from 1980 when the economy was heavily reliant on agriculture, showed that expansion of the food sector greatly expanded all sectors of the economy. The analysis also showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.

Exports of processed foods as a proportion of total agricultural exports grew markedly in a wide range of countries up to the mid 1990's. But it was noted that there was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.

It is clear that the food industry is an important economic actor in every country and that product development is a key feature of companies' strategies to remain competitive and to grow. However, it is equally clear that the product development process is dominated by incremental change (the me-too product syndrome) and a very high failure rate for new products.

It was noted that countries are seeking to capture value-added locally and implement trade regulations that encourage imports of relatively less-processed agricultural commodities. While this has undoubtedly contributed to slower growth in trade of processed food products, trade flows are also shaped to a growing extent by the changing

dimensions of the global food industry. More integrated supply chains that locally customize products to meet regional consumer preferences may encourage trade of less-processed agricultural commodities over trade in processed food products. Therefore, even as the food industry becomes more global with the same multinational retailers and manufacturers operating across the world, food demand is being increasingly satisfied at the local level where food suppliers are better able to meet specific demands of local consumers.

The paper concludes by raising three questions in relation to innovation in the food industry and specifically in the area of food product development: first, what actions can individual companies, or the private sector as a whole, take to improve food product development? Second, what can the public sector within countries do to create an environment that might engender more successful product development and can it obtain better leverage from existing investments in food sector R&D? Third, what can multilateral organizations do to assist individual countries or geographical regions to add value to agricultural products through food product development?



# Chapter 1

## Introduction

If economic returns are to be realised from agricultural production, the development of the agro-industry sector as well as commercial farming and related agricultural enterprises is important in all countries. Although many of the challenges differ between highly sophisticated agrifood systems and those of less sophistication, it is notable that the need to innovate is common to all. Recent trends in agrifood systems are demanding that farmers, produce traders, agro-processors, and other stakeholders improve the efficiency of their operations and be more responsive to consumer demands as well as regulatory frameworks.

In the food industry, just as any other industry, product and process development is considered a vital part – indeed the lifeblood – of smart business strategy. Failure to develop new and improved products relegates firms to competing solely on price which favours the players with access to the lowest cost inputs (land, labour etc). Adopting a low cost strategy can have unexpected consequences for the economy as a whole when another country, which has a lower cost structure, enters the market.

Consumers' demands keep changing over time. These changes range from basic considerations such as improving food safety, shelf life, and reducing wastage, to demands for increasingly sophisticated foods having special characteristics in terms of nutritional value, palatability, and convenience. The actual product development process is determined by the interaction between consumer expectations and demand, the technical capacity of the food producer, and emerging knowledge from food science research.

### **OUTLINE OF THIS PAPER**

The purpose of this paper is to provide a background context to discussions that will define further work in the area of agrifood system innovation. It has been developed through literature searches and informal discussion with individuals experienced in the food industry. The paper is presented in three parts. It begins by looking at product and process development in the food industry, then moves to examining the economic impact of food product innovation, then a number of case studies are presented and briefly discussed.

A discussion on innovation, in particular food product innovation, and its place in business and society mandates a clear understanding of its meaning. Therefore the paper begins by defining innovation in the food industry and recognising that there is a need to classify new food products based on the degree of innovation present. The benefit of applying a managerial approach to product development at a company level is then considered and the different systematic processes used to develop products and processes satisfying a consumer need are described.

The economic impact of food product innovation and increased food processing, or adding value, is then described in a small number of countries. A sample of case studies is presented to highlight the benefits of successful food product innovation. The paper concludes with a discussion of food product innovation in an attempt to identify the key thrusts of future work.



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## Chapter 2

# Product and process development

### DEFINITIONS

Product and Process Development (commonly referred to as Product Development) is systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need. Product development is a method of industrial research in its own right. It is a combination and application of natural sciences with the social sciences – of food science and processing with marketing and consumer science – into one type of integrated research whose aim is the development of new products.

The most widely referenced normative product development models are those of Booz, Allen and Hamilton Inc. (1982) and that of Cooper and Kleinschmidt (1986). There are essentially four basic stages in these models for every product development process. These are:

- product strategy development;
- product design and development;
- product commercialization;
- product launch and post-launch.

Each stage has activities which produce outcomes (information) upon which management decisions are made (Figure 1). In practice, some of the activities performed in the product development process can be truncated, or some stages can be omitted or avoided based on a company's accumulated knowledge and experience.

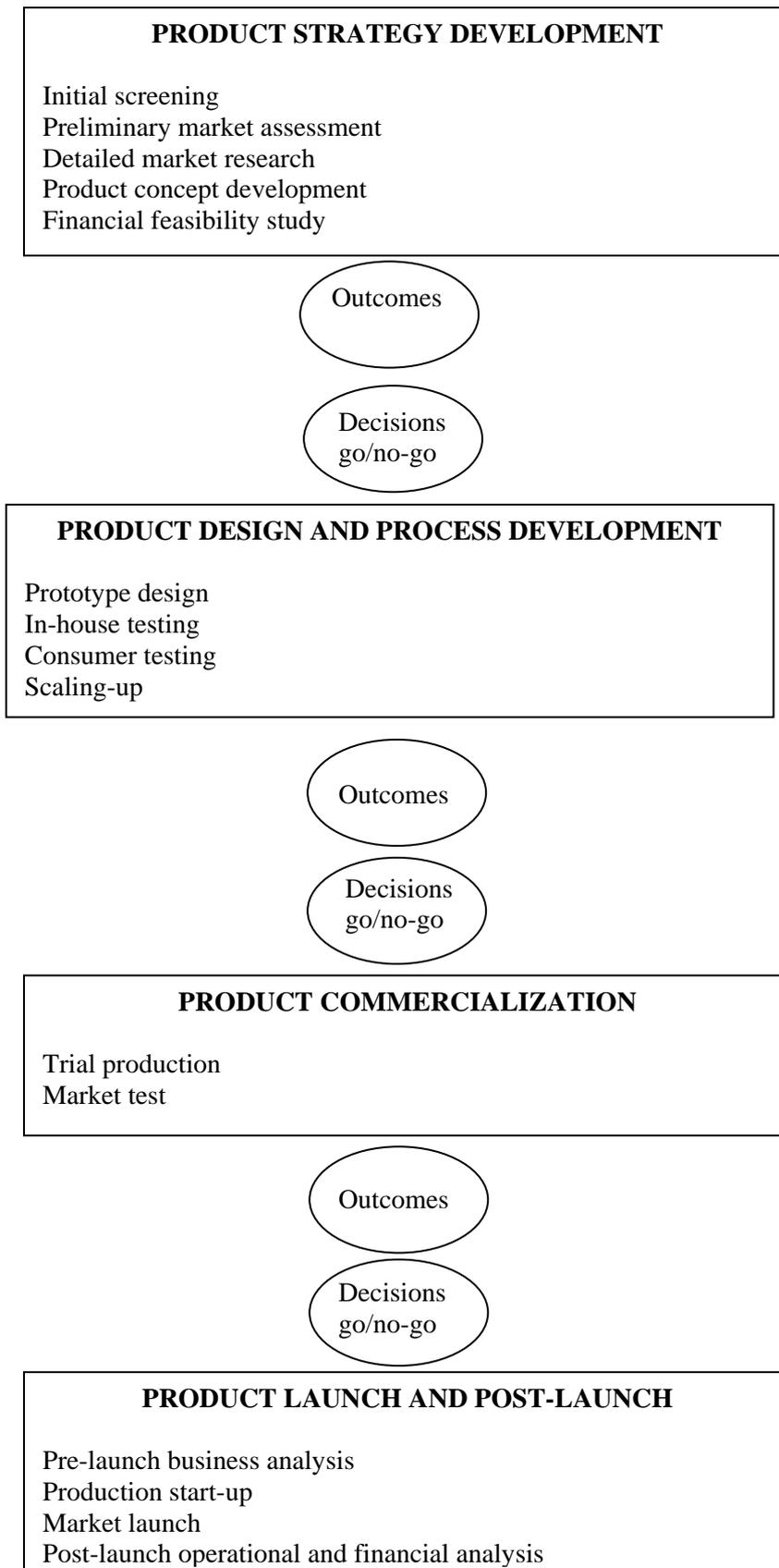
Having defined product development it is now necessary to examine the issue of what constitutes a new or innovative product. Newness of a product may be judged differently according to those who perceive it. In the context of consumer goods such as food products, there are three groups of actors: consumers, distributors, and producers. Each may have a different view of whether or not a product is new.

There are many ways to classify the degree of newness of a product. One useful example uses seven categories:

- creative products;
- innovative products;
- new packaging of existing products;
- reformulation of existing products;
- new forms of existing products;
- repositioned existing products;
- line extensions.

A more technical assessment has been given by Earle and Earle (2000). They defined the innovation spectrum as “new to the world”, “product improvements” and “cost reductions”. They then defined three broad levels of innovations: incremental, major and radical. Product platforms were then used to group similar products. Changes to products made within a platform are “derivative” changes. It is also possible through radical changes to form new platforms of products.

FIGURE 1  
Schematic of the overall product development process



Source: Siriwongwilaichat (2001); adapted from Earle and Earle (2000).

Crucial to the discussion of product development is to recognise that “innovation” is contextual. The consumers’ perception of product newness depends on the location of the consumer and the types of food products currently or recently on the market. For example, Asian food products were new products in Western supermarkets in the early 1990’s, but they were well-established and traditional products in Asia. The distributors’ views on product newness will depend on the product range of the producers that they interact with and their knowledge of local and other markets. Similarly, food producers will perceive the newness of a product in the context of their product range.

The fact that a food product is not ‘new to the world’, does not diminish its potential importance to a consumer, distributor or producer. Using the example of Asian food products referred to above. The development processes used, the investments required, the challenge of introducing the Asian food products to a Western market, and the potential financial impact were no less important just because Asian foods had previously existed in Asia. A particular consumer, distributor, or producer will approach new products differently depending on whether they are either completely new to both the market and the producer (never-seen-before-products), or already exist in either the market or the producer (copying of or change from known products). This aspect was included in the classifications system of Earle and Earle (2000), given above. Siriwongwilaichat (2001) also captured this when classifying new products as “Innovative products – completely new to the market (ICNP)”, “Products – new to the company (PNC)”, “Value added products (VA)” and “line extensions (LE)”.

The challenge for product development is to develop a product which is acceptable to the target consumer. In the example of Asian food products given above, the specific flavours, ingredients and levels of spiciness used in Asian foods sold in western countries are normally significantly different to that found traditionally in Asia. Similarly, ice cream flavours found in Asia (e.g. coconut, mango, durian, corn) are not popular in western countries which normally feature chocolate, vanilla and strawberry flavours. Even countries of seemingly similar culture can have major differences. For example, Australians prefer mango flavours in their foods (such as cereals and muesli bars) whereas New Zealand consumers prefer berry fruits in similar products. A recent launch of coloured ketchup in USA was a tremendous success for Heinz, whereas the same launch in Australia and New Zealand was a major failure.

The key principle in product development, which differentiates this research from all other natural science research, is the mandatory need to ensure the development meets a consumer demand. Without a market, no matter how innovative a change, there will be no sales and the product is worthless.

A major feature which distinguishes food product development is the ethical considerations of producing a large volume of safe food for human consumption. This is coupled to the fact that food raw materials are labile, unstable and must be stored for prolonged periods of time prior to consumption.

### **Key points**

1. Product development is systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need.
2. There are essentially four basic stages in these models for every product development process. These are:
  - a) product strategy development;
  - b) product design and development;
  - c) product commercialization;
  - d) product launch and post-launch.
3. There are several systems for classifying food products on their newness. A comprehensive model is defined by Earle & Earle (2000). They defined the Innovation spectrum as “new to the world”, “product improvements” and “cost

reductions". They defined three broad levels of innovations, incremental, major and radical changes. Product platforms can be used to group similar products. Changes to products made within a platform are derivative changes. It is also possible, through radical innovations, to form a new platform of products.

4. The ultimate test of product development occurs in the market and a new product can only be considered successful if it is a market and financial success.

## PRODUCT DEVELOPMENT IN THE FOOD INDUSTRY

The definition of product development emphasised that, no matter how innovative a change, without sales the product is worthless. To consider food product sales it is necessary to look to the retail sector; this sector is characterised by intense competition and the dominant position held by supermarkets in many regions of the world. There is competition not only for sales between retailers, but competition between food product suppliers to gain access to retail space. Supermarkets in Australia (population 19 million) and New Zealand (population 4 million) have around 12,000 to 25,000 food and beverage stock keeping units (SKUs) on their shelves. In the USA (population 283 million) and Europe (population 729 million), this number may extend to as high as 40,000. Typically in Australia / New Zealand, there are between 5,000 and 10,000 "new" products offered to these supermarkets each year (about 18,000 a year in the USA) and about 10% are chosen to be displayed on the shelves. New introductions to the shelves are almost always linked to the discontinuation of another product. Of the 500 – 1000 new products introduced by the supermarkets each year, less than 1% will still be on the shelves in 5 years' time (Baker 2002).

Even with the degree of competition to enter retail space described above, product failure rates are alarmingly high. A study by Hoban (1998) reviewed the degree of newness of products introduced in the USA food markets. It was estimated that over a prolonged period only 1 in 100 or 1 in 200 products were really new. They identified 1100 – 1200 products introduced a year that were innovative, equity transfer products (product with a strong franchise brand name) or line extensions. The majority (about 75%) were line extensions. The retailer would see around 20,000 new bar codes each year. After 39 weeks of launch, 33% were successful, 42% were still in distribution but declining and 25% had failed. Line extensions had a 28% success rate, whereas the other two types of "new" products had a 47% success rate.

Siriwongwilaichat (2001) found that in Thailand between 1996 and 1999 new food products launched could be classified as 9% "Innovative products – completely new to the market (ICNP)", 25% "Products – new to the company (PNC)", 25% "Value added products (VA)" and 40% "line extensions (LE)".

In a review article in Food Technology in May, 2005, Watzke and Saguy provided the following commentary about new products. Out of 24,543 new products that Ernst & Young and AC Nielsen researched in the USA, only 539 were innovative and just 33 were real market successes. Other sources show that failure rates range from 48% (Dornblaser, 1997), 67 - 72% (Prime Consulting Group, 1997; Theodore, 2000) and 99% (Morris, 1993; Sloan, 1994).

The food retail sector places a vast array of products before consumers, but household purchasing patterns appear to be relatively stable. In the USA an average supermarket has about 40,000 SKUs, yet an average family gets 80-85% of its needs from just 150 items. A supermarket shopping exercise takes on average 24 minutes and the buyer would scan 910 SKUs. A survey in the USA last year revealed the majority of shoppers prepared a list prior to shopping and 72% indicated they would always, or often purchase the same items every time they go shopping for food. Only 26% would buy a wide variety of foods and brands.

Another factor related to supermarkets is that of 'own-labels'. Originally, own-labels were considered to be an alternative choice based on lower prices than branded products.

Nowadays, supermarkets' own-label products compete on quality, technology and packaging with manufacturers' leading brands and they take an increasing share of the market (Martinez & Briz, 2000). The competition from own-labels has caused food manufacturers to focus on specific product lines where they have inherent advantages. Firm concentration is particularly evident for those products where the manufacturer's brands are popular, such as in soup, breakfast cereal, and baby food. High-value brands have often been built on the basis of an innovative product, or range of products, that was particularly successful.

Major supermarkets make extensive use of customer loyalty schemes in which they reward customers for their patronage. However, these schemes also enable supermarkets to record what people are buying, which in turn gives them the capacity to do two other things. First, they can adjust the stock on the shelves to suit the buying preferences of the location of each store. Second, they have a database of consumers that is several orders of magnitude larger than can be managed by an individual company undertaking product development. If they choose to, the supermarkets can influence the food product development process by closing the information loop back to food product developers, such that products are refined according to customers' tastes.

A trend towards smaller, more frequent shopping trips and increased sales of instantly gratifying things such as ready meals has been noted by many commentators. This has often been attributed to the increasing number of consumers who are professionals with little time and plenty of money. But the shift is too marked to be explained by demographics alone. Thus, the range of products on sale is driving a change in consumption habits (Economist, 2005).

It is notable that the efforts of supermarkets tend to support incremental change innovation. Development of radical products is, by definition, based on an anticipated consumer need rather than a present defined need. Therefore, information on existing consumption patterns and tastes does not give direct assistance to the development of radical products.

In spite of food industry efforts to create a more exciting and interesting food culture and new food experiences, there seem to be ever-longer periods between great innovations in the food industry. One simple reason could be that the food industry is low-tech<sup>1</sup>; it is an industry in which it is difficult to distinguish between products. There are few barriers to market entry and it is hard (though not impossible) to use patents or other forms of intellectual property rights in the food sector. So, product characteristics are copied by competitors, who produce me-too products (Tetra Pak, 2004). This low rate of radical change, coupled with the high failure rate of food products following market launch implies that the methodology for new food product development urgently needs to become more focused, quantitative, rapid and knowledge based. Many analyses have focused on developing models for industrial product outcomes, but food products have been neglected (Stewart-Knox & Mitchell, 2003). Reviews of literature and discussions with industry staff indicate that no one company remains a bench mark of "best practice" in product innovation in the food industry. One conclusion that might be drawn from this is that success is highly dependent upon the calibre of staff and the serendipity of the consumer.

An article in the May 2005 issue of *The Economist* spoke of a "crisis of creativity". The article reported that food firms should invest more in research and development (R&D) according to the head of a North American consumer-products practice. Personal-care companies spend an average of 2.6 percent of sales on R&D, while food and beverage companies only spend 1.6 percent. It was argued that this is a reason for the low number of real innovations, besides the fact that there is less money available for upgrading this low-tech industry into a more high-tech industry. Yet opportunities do exist; currently functional foods and drinks are seen as the greatest opportunity to differentiate and protect

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<sup>1</sup> Low-tech industries are usually defined as industries with a low R&D component [Dietrichs, 1995]

products and ingredients with patents in high income countries. In the future, it may even be possible to visualise ingredients and foods that can be tailored to consumers' individual genetic properties, with the charting of the human genome in 2001.

One important view of innovation relates to the degree of innovation that is expected. Previously this has been discussed by the authors in terms of "newness" of a product. The majority of food innovations in the last 20 years have been incremental changes; in other industry sectors this is called "continuous innovation". Such innovation takes place within existing infrastructures and builds on knowledge in existing markets without challenging the underlying strategies and assumptions. It is worth noting that some published literature describes true innovation in the food industry as being in its hey-day during the 1960s and 1970s. This was when really novel food products were introduced and companies (such as McDonalds, Proctor & Gamble, General Foods, etc.) were regarded as the leading innovators of all industries at the time. Since then, the industry has become more introverted and the rate of truly novel foods has greatly declined. So has the profitability and corporate stability of these food organizations. McDonalds hold that they have not had a really novel food introduction since the burger in the 1970s. In the eyes of many, the novel innovators of today are the information technology companies and biotechnology groups.

In the last 5 years, some of the major food corporations have begun a new corporate strategy which has been termed "discontinuous" innovation (Miller & Morris, 1998). Discontinuous innovation involves a strategic jump to a totally new paradigm. This may involve novel technologies or ingredients, or the application of knowledge generated in one discontinuous area to another. A good example was the introduction of the MARS confectionary bar as an ice cream confectionary. MARS Corporation at the time had no skills in ice cream and the key ice cream manufacturers (Unilever and Nestle) had no skills in confectionary.

This sort of innovation may extend beyond specific food product identification in order to capture the value that the customer places on the product. In some cases food products can embody services and intangible benefits that complement the food product itself and add to its value. For example, in some markets, useful food storage regimes might involve drying foods, which need to be re-hydrated prior to use. This may be excluded in these markets because of the lack of availability of a safe and reliable water supply. The opportunity for a food company may be to provide the water supply for a community (market niche) and thereby gain the market opportunity and brand support for their dry foods. The key to discontinuous innovation is to identify the limits of knowledge or capability and extend the realm of possibilities beyond the obvious.

### Key points

1. The retail sector ultimately determines the food products that are placed before the consumer. Within this sector supermarkets are particularly influential and have the capacity to change tastes and habits through the placement of products on shelves.
2. Reports of the newness of food products introduced and their success vary. In general terms only a very small proportion (1% to 2%) was radical changes and the majority (75%) were incremental changes ('me-too' products). Of the order of 75% of new food products were considered to be failures.
3. The strategy of supermarkets in introducing own-labels and in their ability to mine information from customer loyalty schemes is influencing product development in the food sector.
4. The food industry has a low R&D intensity as a % of turnover.

### IMPORTANT FACTORS IN THE PRODUCT DEVELOPMENT PROCESS

The food industry appears to be populated with companies that prefer to re-develop existing products (incremental change), rather than create new products (radical change). Because food product development is considered a highly risky venture, the incremental

change strategy may be an attempt to increase success rates. Ironically, this apparently 'safe' approach perpetuates the problem of high food product failure, since truly innovative products are often more successful for a company (Stewart-Knox & Mitchell, 2003). However, there are some indications that certain factors may improve the number of the success rate in product development.

Three important factors that contribute to new product success were cited by Ilori *et al.* (2000). They were: marketing and managerial synergy, strength of marketing communications and launch effort, and market need, growth and size. These factors emphasize the role of marketing in the product development process. Other authors mentioned different factors, for instance market need satisfaction, unique and superior product, technological and production synergy and efficient development [Ilori *et al.*, 2000].

Tetra Pak (2004) found one or more of the following features typical of new products that succeed in the marketplace. Therefore, these could be used as criteria while screening ideas in the product development process:

- noticeable advantages for the consumer; the more the better;
- distinctive details that are important to the consumer;
- satisfy the consumers' need for convenience, youth, better diet, less stress, perfect taste and variation;
- reliable brand;
- advertising breakthrough.

Ground breaking research during the late 1970s by Calatone and Cooper [Stewart-Knox & Mitchell, 2003] established that product success is dependent upon several factors during the product development process. The following factors were drawn from De Brentani & Kleinschmidt, 2004; and Stewart-Knox & Mitchell, 2003:

- the product being unique and superior;
- good understanding of consumer wants, needs and preferences;
- an open and innovative global NPD culture;
- commitment of sufficient resources to the NPD program;
- cross-functional teams;
- effective communication between product development team personnel;
- careful planning at the concept stage of product development;
- top management support;
- involvement of senior personnel;
- thorough market research;
- effective product marketing and launch.

Stewart-Knox & Mitchell (2003) found that understanding consumer needs and expectations and retailer involvement in product development were associated with product success. The involvement of outside agencies and technical expertise appeared important as well. However, there was disagreement on the degree to which the involvement of senior management determines product outcome. This apparent contradiction could reflect differences between the industry structure in each country, management culture, and the marketing environment. Although these factors seem consistent across different industrial sectors, there is evidence of cross-sector variation in the degree to which various practices impact on product outcome. For food product development, it appears that wide consultation with agencies and the involvement of expertise beyond the company has a positive impact on the success of food products. A

model that specifically considers food is the House of Quality approach, which is the first of four phases within quality function deployment (QFD). It also takes into consideration the sensory attributes of food. More information can be found in Costa *et al.* (2001). That food, not only the type of foods eaten, but also how food is produced, prepared and used, is deeply rooted in many cultures, implies that there is likely to be cross-cultural differences in terms of factors for success in food product development (Stewart-Knox & Mitchell, 2003). Therefore, success factors from one country do not necessarily translate well in another country (De Brentani & Kleinschmidt, 2004; Stewart-Knox & Mitchell, 2003).

On the other hand, factors that are associated with product failure were reported as:

- lack of market knowledge, e.g. due to poor market research;
- misdirected marketing efforts;
- dynamic and competitive markets;
- inadequate market size;
- resistance by marketing staff;
- technical problems;
- high prices;
- distribution problems;
- internal conflicts.

It seems that product failure is most closely linked to inadequacies within predevelopment activities (Stewart-Knox & Mitchell, 2003; Ilori *et al.*, 2000).

## Chapter 3

# Economic impact of food product innovation

Agricultural production has become progressively more mechanised, efficient and cost-effective over the last 80 years (Hennessy, 2004). One of the key economic drivers is the relative impact of cost seasonality of production – regions with strong seasonal cost advantages will tend to produce lower value products. An increase in demand for more processed food products induces a shift towards non-seasonal production.

The impact of increased agricultural efficiency is the lowering of food raw material costs. The impact of this on the USA food manufacturing sector (comparing 1975 to 1997) has been reviewed by Huang (2003). Over that period,

- gross output from the food sector increased by 1.88% per annum;
- net output increased by 3.58% per annum;
- on average around 60% of the cost of food was the raw material cost;
- multi-factor productivity index increased by 0.45% per annum (compared to the manufacturing sector productivity of 1.25%);
- capital investments increased by 2.25% per annum;
- the decline in processed food price was almost totally accounted for by the cost of raw materials;
- food manufacturing private R&D expenditure increased 2.22% per annum, compared to agricultural inputs R&D (4.04%) and all U.S.A. industries (5.78%);
- R&D expenditure represents 0.23% of sales.

In summary, these results provide a picture of an industry which is influential on the domestic economy, but not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector. Modelling the various interrelationships, Huang (2003) concluded that:

- overall real processed food prices declined by 2.13% per annum;
- improvements in food industry productivity contributed little (less than 0.14% for a 1% increase in productivity);
- the key driver for reduced processed food prices was a decrease in raw material prices (a 1% decrease in raw materials produced a 0.59% decline in processed food cost);
- real producer prices for “crude” food declined 3.6% per annum;
- mergers and acquisitions over the 1991 – 1998 period had little effect on productivity;
- production worker productivity increased by 1.33% per annum;
- a 10% increase in capital and labour inputs would increase net output of the food sector by \$4.3 billion.

While this is a useful guide to the food industry impacts and drivers in a high income economy, Mattas & Shrestha (1989) described the impact of the food sector in Greece – an economy heavily dependent upon its natural abundance of food. They emphasised the

interdependence of economic sectors. As background for this discussion, in Greece in 1980:

- agriculture constituted roughly 21% of output;
- food sector comprised 10% of value of exports;
- agriculture employed 33.6% of the labour force;
- raw and processed foods constituted 21.4% of the national economy's demand.

These authors reviewed the potential for the food sector to stimulate economic growth and development. The output multiplier (or total effect) of stimulating output for the national economy (average across all sectors) was 1.30. This means that a \$US1 million expansion of the whole economy's final demand would generate an additional output of \$US1.3 million.

A comparison across all the key economic sectors for the Greek economy in 1980 is shown in Table 1.

While the overall output multiplier was high for the processed food sector, the absolute impact in terms of income and employment was not as high as the agriculture sector. This reflects the relative size of these two sectors (Agriculture was nearly six times the value of the processed food sector). However, the interdependence of many different sectors with the food sector results in a major impact on the overall economy (as displayed by the multiplier). For example, a \$US1 million increase in income from the processed food sector would generate \$US4.26 million of income in the economy and an analogous increase in employment. This was the highest multiplier of any sector, including agriculture.

This output multiplier was explained in terms of the impact on non-food activities. For the output activity of the processed food industry in 1980, 62% was made up of direct outputs and 38% was from indirect activities. The authors also calculated that non-food outputs equivalent to 108% of the value of the processed food industry were used to support the food industry in Greece. It was estimated that 25 non-food sectors benefited by supporting the inputs required for the food sector. These included oil, banking, machinery, transportation, clothing and trade. Some of these sectors (including agriculture) that were important for the Greek economy were heavily reliant upon producing for the food industry. For example, the inputs purchased by the food industry from machinery, banking, chemicals and plastics sectors were almost 20% of the value of the output from each sector. More importantly, the analysis showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.

TABLE 1

**Potential of sectors to stimulate final demand and economic growth in Greece (1980). (Modified from Mattas and Shrestha, 1989).**

Sector	Output	Income		Employment	
	Multiplier or total effect	Total effect	Multiplier	Total effect	Multiplier
Raw Food	1.27	0.64	1.12	2.87	1.11
Processed Food (including beverages)	1.79	0.34	4.26	1.53	4.65
Tobacco	1.31	0.14	2.54	0.67	2.94
Mining	1.17	0.54	1.07	0.83	1.16
Textiles	1.45	0.30	1.62	1.33	1.79
Furniture	1.79	0.24	1.68	1.12	1.58
Machinery	1.29	0.24	1.32	0.95	1.32
Construction	1.39	0.34	1.39	1.47	1.22
Trade	1.18	0.28	1.11	2.06	1.08
National Economy	1.30	0.40	1.36	1.72	1.33

To define this in numbers: a 19% expansion of the food sector would result in an expansion of non-food output that was 62 times the expansion achieved by a 19% expansion in non-food output. Thus expansion of the food sector greatly expanded all sectors of the economy, whereas the converse was not true.

This paper exemplifies the critical economic impact of the processed food industry on a small economy that is based on agriculture. The leverage for the economy as a whole, from stimulating the expansion of the food sector, was clearly seen.

Whereas agricultural production is captured by the region or country where it is grown, other sectors (such as equipment/machinery, banking, biotechnology, etc.) represent portable opportunities and ideas. Agricultural production, with the exception of fresh fruit and vegetables, is generally processed where it is produced and cannot be readily relocated to another country or region.

The expansion into international markets is invariably driven by the food processing sector, not the traditional agricultural or commodity based raw materials (Athukorala and Sen, 1998; Martin, 2001; Rae and Josling, 2003). Commodity producers are finding that an increasingly difficult and competitive environment is driving down commodity prices, especially where products are not differentiated (Barone and DeCarlo, 2003).

Using Chile as the example, Athukorala & Sen (1998) studied the relative importance of market-oriented policy reforms and industrial restructuring on economic development. One of the key factors to the spectacular Chilean growth in the 1980s was the expansion of exports. While many reports have focused this success on the “primary sector”, these authors evaluated the International Industry Classification codes of exports from Chile and concluded that the impetus for export expansion had clearly come from “agro-based manufacturing activities” – not the traditional primary goods. These results were compared to 37 countries where data were available and complete for years 1970 to 1994. Results included:

- manufacturing exports increased from 66% to 81% of total exports;
- manufacturing share in developing countries increased from 27 to 79%;
- developing countries share of manufacturing exports increased from 6 to 24%;
- processed food as a % of manufacturing exports increased from 26.2 to 36.7%.

These data are similar to those by Rae & Josling (2003). Between 1975 and 1985, the global processed food trade increased by 5% per annum. This increased to 9.4% per annum from 1985 to 1995. In 1985, processed foods accounted for 55% of the total value of agricultural exports from developed countries, but only 40% of developing countries. By 1995, processed foods represented 66% of the agricultural exports from developed countries and 56% of that from developing countries.

The reasons for the growth of processed foods in world trade are complex, but Athukorala & Sen (1998) suggested the “internationalization of food habits”, increased importance and consumer demand for processed food, international migration, tourism and others may have provided a strong demand for growth in developing countries. Improvements in food technology, refrigeration facilities, transportation and supply chain management have made processed food items readily tradable across national boundaries.

Countries with processed food growths greater than 15% per annum included Bangladesh, Bolivia, Chile, Indonesia, Korea, Malaysia and Thailand. There is convincing evidence that domestic policy regime is the key determinant of the expansion of manufacturing exports from developing countries. There was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.

Athukorala & Sen (1998) emphasised the “spread effects” of the processed food industries in developing countries. Processed food industries have a large domestic resource content (as indicated above by Mattas and Shrestha, 1989). By contrast, the

production of conventionally manufactured non-food exports from developing countries is generally highly import dependent.

In a more recent study, Regmi et al (2005) report that, contrary to initial expectations, the phenomenon of a growth in export of processed foods has not led to significant growth in global trade. Only 6 percent of processed food sales are traded compared with 16 percent of major bulk agricultural commodities. Although consumer demand for processed foods continues to grow globally, growth in trade has generally stalled since the mid-1990s. Global trade in processed food grew rapidly during the 1970s and 1980s, as consumers in high-income countries demanded more foreign food products. Through the mid-1990s, these products accounted for a bigger share of growth in U.S. agricultural exports, with expanding exports to Japan, Canada, and Mexico. However, since the mid-1990s, growth in both global and U.S. processed food trade has slowed, and bulk agricultural commodities account for more of the recent growth in U.S. agricultural exports.

The slow growth in trade of processed food products has often been attributed to existing multilateral trade rules that favour trade in raw commodities at the expense of processed products. But trade policy is not the whole story, many other factors affect the choice of locations to produce and sell food products. Patterns of food trade are strongly influenced by the changing nature of competition in the global food industry which is influenced by factors such as shifting consumer preferences and the growth in multinational food retailers and the ways they manage their global supply chains. Consumer-driven changes are increasingly pushing food suppliers to meet consumer demand and preferences at a local level, even as the food industry becomes more global. The product life cycle for processed foods has become progressively shorter – most products show a cycle of 6–12 months. International distribution pathways and supply chains are therefore too long for companies to risk final product preparation unless it is close to market. Local processing allows manufacturers to strategically tailor both manufacturing and packaging to suit local tastes, preferences, and retailer needs. The result of this trend has been an acceleration of foreign direct investment (FDI), often at the expense of trade. As a case in point, U.S. food companies sell five times (\$150 billion) more through FDI sales than through U.S. export sales (\$30 billion).

It is also worth noting that food companies such as Nestle, Unilever, Kraft (etc) are truly global – having manufacturing sites all around the world. Retail giants, however, such as Carrefour (etc) are only regional. There are no truly global retailers.

The dynamic nature of added value food exports on an economy which is heavily dependent upon agricultural inputs has been defined by Winger (2004). Using the Harmonised System Classification of exports, food and agricultural products exported from New Zealand were assessed in terms of commodities and added value products. Given these products represent 50% of New Zealand's manufacturing income; their importance can be compared to developing countries with a strong agricultural base. An annual comparison was made from 2000 to 2004 (the only years with consistent export classification) (Table 2).

Clearly the importance of innovation and adding value to food products at a country level is important in export marketing. While there were fluctuations in export earnings from commodities (eg from 2002 to 2003), the income returns from added value products kept increasing every year. The proportion of added value products has increased from 44.5% of exports in 2000 to 54% of exports in 2004.

TABLE 2

**Freight on board value of New Zealand food exports**

Food type	Value (NZ\$ billion) for years ending June 30				
	2000	2001	2002	2003	2004
Value-added	5.28	6.71	7.41	7.60	8.11
commodity	6.57	8.80	8.68	6.67	6.92
<b>TOTAL</b>	<b>11.85</b>	<b>15.51</b>	<b>16.09</b>	<b>14.27</b>	<b>15.03</b>

**Key points**

1. In the USA, a study found that the food manufacturing sector is influential on the domestic economy, but not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector.
2. A study in Greece, at the time when its economy was heavily reliant on agriculture, found that expansion of the food sector greatly expanded all sectors of the economy. The analysis also showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.
3. Exports of processed foods as a proportion of total agricultural exports grew markedly in a wide range of countries up to the mid 1990's.
4. There was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.



## Chapter 4

# Case studies

The following case studies are intended to exemplify the contribution that food product innovations can make to the financial well-being of a business. They are also intended to exemplify critical success factors for innovation and the impact that the innovation might have to the particular firm, industry or country.

### FLAVOURED FRUIT PIECES<sup>2</sup>

Cranberries gained popularity when the American navy used them as a good source of vitamin C against scurvy. However, the suppliers had to depend on wild cranberries. Cranberries require unusual soil: a poorly drained, highly acid combination of peat and clay. This type of soil is found where glaciers have scoured the earth. The wild cranberry was eventually tamed by spreading sand over cultivated plants, after it was observed that the biggest and juiciest wild cranberries grew where the wind blew layers of sand over the plants.

Thanks to a series of more and more efficient mechanical harvesters, cranberry production became increasingly automated. Two main process innovations, however, came from studying the natural properties of the fruit. First, good cranberries bounce and float due to internal air pockets. This bounce property is used for the automatic sorting of the fruit.

Cranberry sauce is mostly consumed at Thanksgiving and Christmas. To spread demand for their production capacity Ocean Spray looked for other products to make from cranberries that could be sold all year. Juice was one; however, there was a challenge to get people to buy the product. Ocean Spray focussed on the newness of the drink in bars and on how cranberries can help to cure bladder and other infections. This type of demand-building efforts encouraged people to taste the product; brand-building held them to loyal to Ocean Spray. Dried cranberries were also sold to bakers and cereal producers.

In their search for diversified food products Ocean Spray determined that cranberry hulls, which were normally smashed when juice was made, could be emptied and re-filled with juice from blueberries, mangoes, raspberries or any other juice using the principle of osmosis. Distilled water was forced into the hulls and cranberry juice was removed. The result was a whole, water-filled hull. Next, the process is reversed; the hull is filled with another fruit juice. This gave Ocean Spray their 'flavoured fruit pieces', which are cranberries with the taste of orange, cherry or any other fruit taste. The advantages of this product are that it is durable, with a shelf-life of two years, while keeping a chewy texture when baked, unlike the fruits whose flavours they mimic. Another recent product innovation is gelatine-treated fruit pieces that stay soft and chewy for two years. This is perfect for breakfast cereals.

The dynamic that is relevant in this case is behind many mass-produced goods. Growing demand provides the incentive to create cheaper and more reliable supply. Cheaper and more reliable supply, in turn, creates incentives to find new markets, which requires new products. Success in new markets increases demand again. This helps to maintain growth and profitability.

### Lessons

- The ability to conceive an idea for a new product is crucial; creative genius was required to recognise the role that cranberry hulls could play.

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<sup>2</sup> This case study is drawn from an article in *The Economist*, 28 April 2005.

- Existing technologies were able to be used for the processing, thus reinforcing the importance of the concept for the new product.
- Processing waste can be a valuable source of raw material for new products.
- Ingredients for food products also form an area of business that can benefit from innovations. The flavoured fruit pieces can be used as an ingredient in bakery products or breakfast cereals, for instance.

### CASSAVA PROCESSING

Cassava is an important staple food in tropical Africa and is also a cash crop in many African countries. Traditional products, such as *udaga*, *ugali* and *makopa* can be produced relatively cheaply using simple equipment. However, the processing methods are too labour intensive for commercial use and the quality of the flour does not meet market expectations Oirschot *et al.* (2004).

The Lake Zone in Tanzania is poor and many people earn less than US\$1 per day. It was anticipated that a market for cheaper, locally produced cassava flour might exist since approximately 70,000 tonnes of wheat flour were imported each year to the Lake Zone. Many farmers were also interested in cassava processing.

First, manual chippers with equivalent cost to a bicycle (\$100) were assessed and deemed to be appropriate. Farmers received information about the chipping technology via the local research institute. Second, improved product quality was attained when new elevated drying tables were introduced. This replaced the use of canvas sheets placed on the ground, thereby reducing contamination from sand and animals.

In pilot trials, customers in urban markets came back for more the next day. In a rural market it took longer to sell the chips. In one case, the chips were sold to a supermarket that milled them into flour. The branch manager commented that the flour was of good quality because of its white colour.

It was noted that some farmers were restricted by their lack of access to transport to bring the cassava chips to the market. In addition, better results were obtained when farmers were organized in groups.

### Lessons

- In the context of The Lake Zone, it seemed to be useful to start being innovative with processed foods that were similar to the products the people are familiar with. Customers at urban markets are more likely to buy new products than customers at rural markets.
- Transport can be a problem when markets need to be reached.
- Simple processing techniques can be the basis for incremental change innovations.

### MILK FOR LACTOSE-INTOLERANT<sup>3</sup>

Valio (*best* in Finnish) is Finland's biggest dairy company. The company seeks to develop innovative products for consumers who are interested in food that increases health and well-being. For instance, Valio has acquired the global commercial rights to the bacterium *Lactobacillus GG* (LGG<sup>TM</sup>). Now, the company has licensed dairy products containing LGG to markets in more than 25 countries and this is seen as an innovative procedure in the industry [Tetra Pak, 2004].

Between 15 and 20 percent of the Finnish population is lactose intolerant. In Mediterranean countries the proportion is closer to 50 percent, while in parts of Asia the entire populations are lactose intolerant. Individuals who are lactose intolerant find that their stomachs do not accept any milk, so most of them have stopped drinking milk.

<sup>3</sup> This case study is drawn from Tetra Pak, 2004

Today, Valio produces and sells more than 100 different products that are lactose-reduced dairy products. However, Fins have never liked the sweet-tasting low-lactose milk.

The challenge to Valio was to produce milk that could be tolerated by the lactose intolerant, but which was also acceptable in terms of taste. After a long period of research and development, Valio was able to perfect a unique process to produce lactose-free milk (< 0.01 percent) that tasted just as milk should. They use, among things, chromatographic separation.

At first, Valio was not allowed to call the product ‘milk’, as one of its natural constituents had been removed. Finally, it was launched as ‘light milk drink’. Even though the price is twice as high as normal milk, consumers were not deterred. The desire for milk among lactose intolerant was obviously far higher than expected. In 2004, sales of 40 million litres were expected. The milk was to be supplemented by a fat-free version in 2004 [Tetra Pak, 2004].

### Lessons

- The case underlines the importance of taste preferences. Lactose-free milk with a sweet taste was not appreciated in Finland and therefore it was unsuccessful. Consumers were willing to pay a price premium for a unique product that met their needs.
- Processing innovations may be required to develop a new food product. In which case investment in research and development was necessary.

### NEW ZEALAND KIWIFRUIT INDUSTRY<sup>4</sup>

The following timeline shows the evolution of the industry and the innovations that supported its growth and development.

TABLE 3

Date	Happening	Comment
1904	In 1903, Isabel Fraser, a school headmistress in New Zealand, sailed for Japan. In Japan, Isabel met her sister Katie, and the pair left for the mission in Yichang, China a month later. (Ichang or Yichang as it is now known, lies on the northern bank of the Yangtze River about 1600km upstream from Shanghai.) Isabel returned to New Zealand in January 1904, bringing with her the seeds of the Ichang gooseberry.	Recognition of a fruit that might be of interest to consumers and hence growers.
1910	Then called "Chinese gooseberries" New Zealand's first kiwifruit vines were recorded as bearing fruit on Alexander Allison's property, south of Wanganui.	
1920	Chinese gooseberry plants were offered for sale by a number of nurserymen, including Duncan and Davies, Bruno Just, Hortons of Hastings, Frank Mason and Hayward Wright. Plantings were recorded in Auckland, Fielding, Wanganui and Tauranga.	Private sector recognises commercial potential of the fruit.
1924	Auckland nurseryman Hayward Wright developed the green-fleshed kiwifruit variety that bears his name and has become the most commonly grown around the world.	Investment in product improvement (although the absence of plant variety rights at the time precluded Mr Hayward from reaping significant rewards from his development).
1934	Jim MacLoughlin planted his first seven acres of Chinese Gooseberries on his property in the Bay of Plenty region	Investment in commercial production for domestic consumption.
1952	Jim MacLoughlin and Graham Bayliss exported the first commercial shipment, 13 tonnes of Chinese Gooseberries to England	First efforts at export.
1959	Auckland-based fruit packers Turners and Growers briefly named the fruit "melonette," but changed it to the Maori word "kiwi" when they learned of import tariffs applied to melons.	A new market is tried.

<sup>4</sup> This case study developed on the basis of information presented at [http://www.zesprikiwi.com/history\\_flash.htm](http://www.zesprikiwi.com/history_flash.htm)

	The first 100 cases of New Zealand-grown kiwifruit arrived in San Francisco, California.	
1962	Frieda Caplan of Frieda's Inc. and The Oppenheimer Group began developing markets for kiwifruit in the US and Canada.	Partners investing in market development.
1964	Harry and David's Fruit of the Month Club featured a special offer on "kiwi berries." The catalogue warned, "You had better order now; they are scarcer than screen doors on submarines."	Partners investing in market development.
1970	The first successful California kiwifruit crop was harvested. Kiwifruit became a global culinary craze as the signature garnish of nouvelle cuisine.	But now there is competition from US growers.
1977	The New Zealand Kiwifruit Marketing Licensing Authority was created. This organization developed to be a single desk operational and marketing organization, the New Zealand Kiwifruit Marketing Board (NZKMB), in 1988.	Significant investment in market development and R&D to develop improved post-harvest systems to assure fruit quality. As market demand grew, the area planted in kiwifruit grew in NZ and countries such as Chile, Italy and USA. Prices declined over time.
1991	Taste testing took place on an intriguing new gold kiwifruit variety -- then called "Hort16A," the new variety was naturally bred from a vine at the HortResearch orchard in Te Puke. The taste and flesh colour were unique and appealing; rapid multiplication of the single vine was requested for further evaluation.	Investment in R&D produces a new product that, this time, can be protected by plant variety rights. The industry now has a potential new product for the market.
1992	Bio-Gro certified organic kiwifruit was exported by the NZKMB for the first time. The first pack house dedicated solely to handling organic kiwifruit was established in 1994.	Investment in developing growing and handling systems to meet Bio-Gro requirements creates the ability to compete in a niche market.
1997	The NZKMB created the "Zespri" brand name for New Zealand kiwifruit and established "ZESPRI International Ltd." as its marketing subsidiary.	Investment in developing a brand for the NZ fruit to improve competitiveness.
1999	ZESPRI International introduced the tropical-sweet, yellow-fleshed ZESPRI™ GOLD Kiwifruit variety to the world and re-branded Hayward fruit as ZESPRI™ GREEN Kiwifruit	Further investment in product development for the gold kiwifruit refined the product and built knowledge on post-harvest handling. Significant investment in market development followed to establish the product.

## Lessons

The case shows how an industry can grow, slowly at first, and then boom when market demand increases rapidly. The key lessons are:

- to introduce a new fruit to a market requires significant investment and the ability to align the product to market needs. In the case of kiwifruit, the nouvelle cuisine practiced by leading chefs represented a market opening for an exotic fruit that could garnish desserts. Broader domestic consumption followed once consumers were aware of the fruit through restaurant dining and use of the fruit was explained in cuisine magazines.
- Success attracts imitators who, in this case, could initially access the plant material because of a lack of intellectual property rights.
- The NZ kiwifruit industry experienced declining returns when competitors entered markets it had developed. The response was to invest in new product development.
- The presence of plant variety rights (intellectual property rights) enabled the industry to realise a return on the investment in R&D.
- New product development for horticultural crops not only requires new or improved crops, it also requires development of post-harvest systems to assure quality and development of market demand for the new fruit or vegetable.

## Chapter 5

# Discussion

The food industry is present in each and every country and the food share of total household expenditures amounts to 10 to 14% in high-income countries and 40 to 50% in low-income countries. The global food industry is therefore one of the largest, if not the largest, industries in the world. Global retail food sales (for which data exist) exceed US\$2 trillion per annum. In terms of product development, this paper has described the food industry as being one in which:

- there are a large number of new products offered to retailers each year and inclusion of a new product almost always leads to discontinuation of another product.
- Only a very small proportion of new products were radical changes, the majority were incremental changes.
- Of the order of 75% of new products were considered to be failures.
- In comparison to other industries (e.g. electronics, bio-technology) there is a very low level of R&D undertaken.

When the economic impact of the food industry was examined, it was determined that:

- In the USA, the food manufacturing sector is influential on the domestic economy, but not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector.
- In the case of Greece, data from 1980 when the economy was heavily reliant on agriculture, showed that expansion of the food sector greatly expanded all sectors of the economy. The analysis also showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.
- Exports of processed foods as a proportion of total agricultural exports grew markedly in a wide range of countries up to the mid 1990's.
- There was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.

It is clear that the food industry is an important economic actor in every country and that product development is a key feature of companies' strategies to remain competitive and to grow. However, it is equally clear that the product development process is dominated by incremental change (the me-too product syndrome) and a very high failure rate for new products.

A further dimension, hitherto not mentioned in this paper, is the link between diet, exercise and health and in particular the link between poor diet, inadequate exercise and non-communicable diseases such as diabetes, cardiovascular diseases, cancer, osteoporosis and dental diseases. In an economic sense, the food market has an externality in terms of the health of a population that dictates that many governments will pay very close attention to it.

To take the discussion of food product development forward, it is appropriate to take a snapshot of the current global food industry and the trends and factors driving change. The following has been taken directly from Regmi and Gehlhar (2005) with minor editing. Food suppliers are increasingly tailoring their marketing strategies to the unique characteristics of consumer demands in each market that they serve and the choice of strategy can either stimulate or discourage trade. At the broadest level, there are significant

differences between developed- and developing-country markets, and suppliers have very different strategies in serving these two types of markets.

Market size, as indicated by retail sales value, is much larger for developed countries. The United States, the European Union, and Japan together account for over 60 percent of total retail processed food sales in the world. However, market growth has generally been faster among developing countries, particularly lower-middle-income countries such as China, Morocco, the Philippines, and many Eastern European countries. The transitioning Eastern European countries, such as Bulgaria, Romania, and Ukraine, experienced double-digit growth in retail sales of many food and beverage products during the late 1990s. While sales in these markets have stabilized, Asian markets have picked up in the past few years and processed food product sales are expected to continue to significantly increase.

Consumer preferences, shaped primarily by incomes, changing lifestyles, and evolving cultural preferences, largely determine the items available in grocery stores in different markets. In developing country markets, higher incomes result in diet upgrades, with increased demand for meats, dairy products, and other higher value food products. These include packaged cereals, pasta, oils, and other items used in meal preparations. In the developed country market, where consumers already consume sufficient quantities of these items, sales growth is noted for labour-saving products, such as prepared meals. Food sales in developed country markets are also being influenced by consumer preferences for greater product variety and food products possessing specific attributes, for example, products perceived to be safer or more healthy or products produced in ways that are more beneficial to the environment and take animal welfare and equitable labour concerns into consideration.

In developed country markets, where the volume of food consumed increases largely with population growth, food suppliers can increase returns mainly by adding value to their products. This is achieved either by increasing the production of ready-to-eat food products or through producing foods with special attributes desired by consumers, such as organic foods or foods with special health properties. In contrast, in developing countries, where incomes are rising and lifestyles are rapidly changing with urbanization, growth in retail sales results largely from increased volume and, to some extent, increased sales value. As the signals from different markets are transmitted back through the supply chain, food producers, processors, and traders adapt to meet the evolving retail demand in each market. The differing adaptations ultimately contribute to changes in food trade patterns by influencing the import demand for processed food products and the inputs used in their manufacture.

Recognizing the large potential in developing country markets, food manufacturers are expanding their operations in those markets. But they have several options for selling their products; exporting is just one option and, in many cases, not the preferred one. Most foreign food sales are generated by investing abroad and processing in foreign markets. The choice between exports and FDI depends on the type of products sold. Products that do not undergo major changes from their basic commodity forms through processing (known as land-based products<sup>5</sup>), such as rice, wheat flour, meats, and fruits and vegetables, are less suited for FDI because their production is limited by specific growing conditions. For these products, processing generally takes place close to the location of primary production. Processed land-based products, such as fresh or frozen meat, frozen and canned fruit and vegetables, and dry milk powder, can be exported to foreign markets. Production of manufactured foods is less location specific because technology and capital are mobile in the world food economy. Through FDI, food manufacturing can expand to another country to satisfy the demand there. Therefore, land-based products tend to be traded far more than manufactured packaged products, and account for over 75 percent of the total value of U.S. processed food trade.

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<sup>5</sup> Products for which production largely depends on land and other geo-climatic factors

The largest firms, based in Western Europe and the United States, are expanding their sales in numerous foreign markets to maintain growth, while growth in the home markets stagnate. Some firms, such as Nestlé, Kraft, and Unilever, already operate in over 140 countries. With young, growing populations in Asia and Latin America driving sales in baby foods, milk-based products, bakery products, and confectionery, it is no surprise that manufacturing firms are expanding to supply the emerging large-scale supermarket chains in these regions.

Growth in large-scale retailing in the developing countries has coincided with new investments by foreign food manufacturers. In 2002, Heinz expanded its plant capacity by 15 percent in China and opened a new plant in the Philippines. The Kellogg Company now has manufacturing plants in China, India, Japan, South Korea, and Thailand for supplying retail chains in Asia. PepsiCo, the second-largest U.S.-based food company, is continuously extending its geographical reach with its extensive international marketing arm in snack foods, currently focusing on Latin America and Asia-Pacific. The French-based Danone Group is developing a stronger presence in Africa and the Middle East through investments in fresh dairy and bakery products.

Smaller companies with a narrower focus are also looking for new markets across national boundaries. Italy's popular confectionery company, Ferrero, is expanding operations in Asia-Pacific and Eastern Europe. Confectionery manufacturer, Wrigley Jr. Company, and the Fonterra Group of New Zealand, a dairy company, have also expanded operations and currently sell their products in over 140 countries.

Whether multinationals' operations in foreign markets promote or inhibit food trade depends on the individual products sold in these markets. Depending on transportation cost savings and the ease in customizing to suit consumer needs and provide quality assurance, consumer-ready food products may be manufactured in local markets through FDI. This in turn can generate trade growth in the raw commodities used to manufacture the final food products. Ultimately, however, suppliers' decisions whether to locally source or import products is also influenced by the rules governing trade in these products. One of the main accomplishments of the 1994 World Trade Organization (WTO) Agreement on Agriculture was to subject agricultural trade to stronger international disciplines, leading to a general reduction in agricultural tariffs. However, tariffs on agricultural products remain relatively high and vary considerably across both countries and products. Many countries impose low or no duty on many products, but maintain very high tariffs, often in excess of 100 percent, on import-sensitive products. Barriers to trade in processed products are often more restrictive than on raw commodities. Tariffs on average are greater on processed products than on their less-processed forms, a phenomenon known as *tariff escalation*. Analysis of tariff data from 22 countries indicate that the average tariffs on fully processed products exceed those on primary products, with differentials ranging from 2 percent for the United States to over 40 percent for Turkey. Over the entire group, the average tariffs range from 30 percent on fully processed goods, dropping to 20 percent on horticultural products, 18 percent on semi-processed items, to 17 percent on primary products. As an example, most countries have no tariff on raw cocoa beans, with the exception of Australia, which has an *ad valorem* tariff equivalent of 1 percent. However, as one moves up the processing chain, *ad valorem* tariff equivalents tend to increase, with tariffs on chocolates and other cocoa products ranging between 15 and 57 percent. Similar examples of tariff escalations exist among many other commodity sectors, including coffee and oilseeds.

In addition to tariffs, countries have numerous other instruments at their disposal to regulate the flow of imports, such as the various trade remedy measures. For example, imports can be reduced for limited periods through *antidumping* and *countervailing* duties and *safeguard* measures that allow temporary actions when imports surge. Available data show that WTO member use of trade remedy measures on agricultural products has risen, especially on processed food products. Of the total 76 antidumping and countervailing duties present worldwide on agricultural products in 2002, 43 were on processed food

products and only one was on a basic agricultural commodity, the remaining consisting of semi-processed and horticultural products. Similarly, safeguard measures have also been used predominantly on processed food products. The presence of tariff escalation and increased use of trade remedy measures on processed foods suggest that countries are seeking to capture value-added locally and implement trade regulations that encourage imports of relatively less-processed agricultural commodities. While this has undoubtedly contributed to slower growth in trade of processed food products, trade flows are also shaped to a growing extent by the changing dimensions of the global food industry. More integrated supply chains that locally customize products to meet regional consumer preferences may encourage trade of less-processed agricultural commodities over trade in processed food products. Therefore, even as the food industry becomes more global with the same multinational retailers and manufacturers operating across the world, food demand is being increasingly satisfied at the local level where food suppliers are better able to meet specific demands of local consumers.

The foregoing further emphasises the importance of food product development as the food industry adapts to the changing global environment in which it operates. It also stresses that food product development is not a concern only for high-income markets as the focus on meeting specific market needs is encouraging the manufacture of food products closer to the market. If food product development continues to be important for individual companies and economies as a whole, yet new food products have a high failure rate, it suggests a need for action.

The importance of the development of value-added food products was further highlighted by the OECD-FAO outlook on agriculture (OECD 2005) in which it was reported that World agricultural production is projected to continue to grow to 2014 but at a slower pace than in the last decade. Broad-based economic growth in both OECD and non-member economies and moderate population growth will lead to higher per capita incomes and consumption gains world-wide, but particularly in developing countries. Rising demand will provide the foundation for an increase in agricultural trade over the projection period. However, competition in global commodity markets is expected to intensify as production expands in many countries.

To advance work in relation to innovation in the food industry and specifically in the area of food product development three questions arise: first, what actions can individual companies, or the private sector as a whole, take to improve food product development? Second, what can the public sector within countries do to create an environment that might engender more successful product development and can it better leverage from existing investments in food sector R&D? Third, what can multilateral organizations do to assist individual countries or geographical regions to add value to agricultural products through food product development?

It is anticipated that the formulation of answers to the questions above will raise many other questions. Consideration of the following, *inter alia*, may contribute to the answers:

- can the research and academic communities contribute to programmes that can build the capacity of the food industry to achieve higher success rates in food product innovation?
- What national policies support the food industry in its efforts to develop new food products? At the micro-level, how important is the linkage between public sector research and individual company food product development? Do awards and prizes for food industry innovation play a role in providing a profile for successful small companies?
- How does the movement of financial capital, knowledge and personnel complement the role of international standards in the capacity of multi-national and national food companies to innovate?

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