2.2 Seafood Processing Research Programme

2.2.1 Introduction

In the last 50 years, fish consumption per person has doubled on a worldwide basis. Japan, the US and the EU are major seafood markets and depend on imports for approximately half of their consumption.

The global value of processed seafood products in 2004 was €79.6 billion. This is predicted to increase into the future due a combination of factors, e.g. higher disposable incomes, sophistication of tastes, and declining cooking skills. These factors have resulted in an increase in value-added seafood sales, creating more opportunities for the processing industry.

2.2.2 Sector Profile

Ireland's 140 seafood processing companies operate in an industry that was worth €670m in 2004. Retail sales accounted for €520m (home market €143m, exports €377m) and food service accounted for €150m. Value-added product from the Irish industry accounted for €292m, which, when taken in the context of the world market (€79.6 billion), accounts for 0.37%.

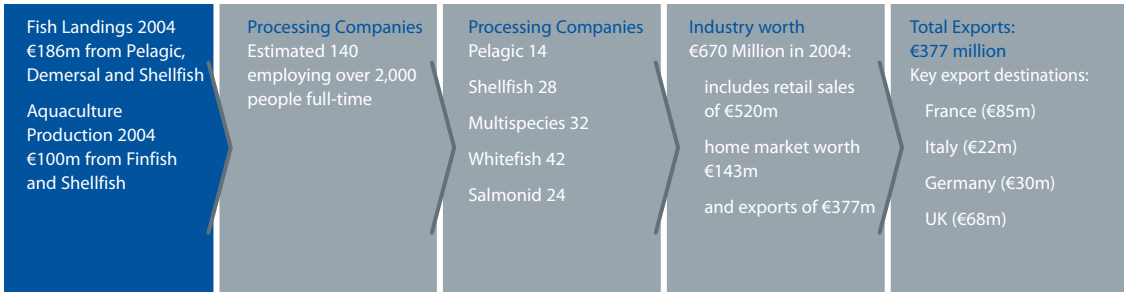

Figure 2.2 Key Components of the Irish Seafood Processing Sector

2.2.3 Key Opportunities & Challenges

Raw Material Supply

A key driver of future success is the issue of raw material supply. This affects the sector by impacting on capacity utilisation, which adversely affects profitability and long-term viability. The key issues are overall volume and continuity of supply.

The sources of wild raw material are limited in quantity (especially whitefish) and are extremely seasonal (especially pelagic, where the season can be as short as 8–10 weeks). Aquaculture is an important future source of raw material for processing; however, the ability to achieve continuity and quality of supply is a key factor.

Growth within the whitefish processing sector has been curtailed due to continuity of supply from Irish landings. This has led to processors within the sector sourcing raw material from countries such as the Faeroes and Iceland. Imports of whitefish are likely to increase as processors develop more value-added products to meet market demands.

Growth within the salmon processing sector has been curtailed due to lack of Irish raw material. In 2004, only 15% of salmon aquaculture output went towards value-added processing and this resulted in processors sourcing most of their raw material from Scotland.

Raw material supply within the shellfish processing sector has grown as a combined result of continued investment within the aquaculture sector and an emerging trend towards strong imports of wild shellfish species for processing. The prospects for further growth are positive and Irish shellfish processing companies are now selling in global markets.

The overall development of the seafood processing sector towards critical additional scale/scope will be hindered by raw material availability and may have to be facilitated by the tertiary processing of (farmed) primary products sourced in third countries.

Competitiveness

The Irish seafood processing sector is comprised of small firms whose plant size and economies of scale are perceived as low in comparison with international competition. Rationalisation of the sector will be necessary to underpin future competitiveness.

Low capacity utilisation and constraints on raw material supply have already led to consolidation within the sector. Within the past few years, the pelagic sector has rationalised from 38 to 14 plants. Rationalisation has also taken place in the whitefish and aquaculture sectors, resulting in some companies widening their product range and introducing value-added shellfish and salmon products.

The challenge for the finfish aquaculture sector, as a minor player compared to Norway, Chile and Scotland, is to position Irish salmon in markets that will generate a premium compared to the average market price. The Irish industry enjoys a reputation for the production of high quality product. A small, but increasing, portion of this is organic salmon. Industry consolidation may result in the sector becoming branded, with prices more stable.

As within other sectors, the need to build scale through initiatives towards mergers and acquisitions is key to growth within the sector. The synergies of a joint marketing programme for a 'family' of complementary products under a strong single brand and produced to an objectively assessed quality

standard should also be evaluated as a model for addressing consolidation and scale/scope economies in this sector.

Growth in the sector is very dependant on development in the aquaculture sector. There is likely to be a trend towards vertical integration between the processing sector and the production sector. There are already examples of this; Bantry Bay Seafoods in the mussel sector and Marine Harvest Ireland in the salmon sector.

Consumer Patterns

Consumer patterns are changing rapidly and increasingly reflect individual needs and quality. There is a high demand for variety in 'ready to heat' and 'ready to eat' products and this leads to major challenges in areas such as food safety, hygiene and packaging. In the coming 15-20 years, there will be increasing international attention to public health, with obesity and malnutrition becoming major concerns. The reputation of seafood products as healthy and nutritious has risen significantly in recent years. Those that can master food quality where safety is an intrinsic part will enjoy commercial success.

Quality

Attention to the nutritional and health aspects of seafood brings increasing demands for food quality monitoring and assurance. Therefore, more accurate and rapid screening methods for chemical and pathogenic contaminants will be required. Demands will increase for quality tracking and consumer information related to the entire production, processing and transport chain. Added-value approaches to upgrading and utilisation of by-products will be required.

New Products

The ability of the sector to develop new higher added-value products to international quality standards has been identified as key to the future of the industry. There is a new niche opening up in the so-called 'Functional Foods' sector, through the development of products using fish as a carrier for pro-biotics or health supplements, thus providing a health benefit beyond the purely nutritional content of the fish. The focus of functional foods is based on the identification of biologically active compounds in food that have the potential to optimise physical/mental well-being and even reduce the risk of disease. Substantial research and development funds will be required to fully optimise the opportunities that can be generated from new, highly profitable products in this area. **A stand-alone research programme for Marine Functional Foods is outlined in the Discovery Research Measure of this document.**

2.2.4 2020 Scenario

2020 SCENARIO

By 2020, Irish seafood products will be perceived as high quality and high value with a strong 'Blue/Green' seafood brand. The sector will have evolved through rationalisation and will be characterised by:

> A mix of small and large companies;

> Automation in larger-scale operations;

> Close working ties with the aquaculture sector and the third-level research sector;

> Niche products and niche markets, e.g. functional foods, with an identified health benefit;

> High value-added processing activity, with a focus on export markets; and

> Processing carried out to EN45011 or ISO65 quality standards.

The need for rationalisation of the Irish processing sector will be clearly recognised. The number of companies in the sector will be reduced to around 70 (from 140 companies in 2005), with resulting efficiencies and economies of scale. These companies will have become the largest producers within the seafood processing sector, having grown through mergers, acquisitions and new product development.

Given increased fuel costs and its proximity to the fishing grounds of the North East Atlantic, Ireland will have developed specialised fish handling facilities for European fleets. All landings will receive added value in specialist processing and packing facilities. Facilities in the major Fishery Harbour Centres (Killybegs, Rossaveal, Castletownbere, Dunmore East and Howth) will encourage increased international landings. The home market will account for 25% of seafood production via direct consumption. The remaining 75% will be exported (mainly to EU countries).

2.2.5 2013 Objectives

The following objectives have been identified as critical milestones to be achieved by 2013:

2013 OBJECTIVES

1 Support Irish companies to enable them to produce a large variety of value-added, convenient, functional seafood for the home and export markets[7].

2 Improve production efficiencies with the introduction of the latest technology, world-class manufacturing processes, to underpin our international reputation for quality and safety.

3 Enhance quality, shelf life and traceability through the application of smart packaging and labelling technologies.

4 Ensure waste is minimized and by-products recycled into alternative value-added products.

5 Maximise raw material supply from Ireland and other countries and ensure its optimal utilisation.

6 Co-ordinate the expertise in food/seafood processing within state agencies and third-level institutes.

[7] A stand-alone research programme for Marine Functional Foods is outlined in the Discovery Research Measure of this document.

2.2.6 RTDI Requirements & Key Outputs

The identified RTDI requirements and key outputs for delivering on the 2013 Objectives of the research programme are presented below.

Table 2.4 Research Requirements & Key Outputs for the Seafood Processing Sector to 2013

Objectives 2013	RTDI Requirements	Key Outputs
1 Support Irish companies to enable them to produce a large variety of value-added, convenient, functional seafood for the home and export markets.	> Develop nutritional research opportunities for seafood products that target the expanding demand for functional foods > Develop new value-added products based on supplies of pelagic species	> A range of functional seafood products that take advantage of the trend and demand for food to promote healthy eating > New value-added pelagic products range
2 Improve production efficiencies with the introduction of the latest technology, world-class manufacturing processes, to underpin our international reputation for quality and safety.	> Develop or adapt state-of-the-art technology to increase and optimise processing output > Develop Supply Chain Management systems with industry to maximise product quality > Benchmark the quality assurance and seafood safety programmes against global best practice	> High degree of automation of raw product and processing lines > Operational Supply Chain Management systems in place > Improved quality assurance and food safety
3 Enhance quality, shelf life and traceability through the application of smart packaging and labelling technologies.	> Develop and apply smart consumer packaging as required for indication of seafood safety and quality, and to facilitate consumer awareness	> Growing percentage of product shipped with smart packaging/labelling to assist consumer confidence and provide more choice
4 Ensure waste is minimized and by-products recycled into alternative value-added products.	> Investigate or adapt technology for better fish waste management > Continue efforts to identify options for extraction of novel products from fish and shellfish waste	> Improved management practice and reduced waste tonnage to landfill > Series of new products developed based on by-products of fish processing lines
5 Maximise raw material supply from Ireland and other countries and ensure its optimal utilisation.	> Promote opportunities and design customised facilities & services for the landing and handling of fish at Irish ports > Undertake common research with aquaculture industry on optimising supply of farmed fish and shellfish to the domestic processing sector > Conduct feasibility study on economics of new species > Identify high margin products (e.g. abalone, nori) as potential raw material sources for Irish production	> Improved port infrastructure will assist with maximisation of product quality and range > Contract production of aquaculture species to agreed specifications and timelines a feature of the sector > Additional raw material supply > Increased production for Irish suppliers to develop their market range of products
6 Co-ordinate the expertise in food/seafood processing within state agencies and third-level institutes	Not applicable.	

2.2.7 RTDI Capacity/Capabilities

This section reviews the RTDI capacity and capability available to support the Seafood Processing Sector. Research effort focused on seafood processing is a small subset of the total food processing research effort within the state and third-level sectors and draws on such disciplines as chemistry, biochemistry, food science, human nutrition and dietetics. Although the number of research groups and researchers working specifically on seafood related research is low, they are, in many cases, part of larger institutions/departments/companies with considerable expertise in the relevant disciplines.

Current Research Capacity

Third-level Sector

Within the third-level sector, five research groups are currently carrying out seafood processing research. Together, these research groups comprise approximately 17 researchers in seafood processing related research (Table 2.5). Current research topics within these groups include food safety, the role of seafood in human nutrition, utilisation of fishery waste products for novel applications and seafood pathogen diagnostics.

In addition, a further 5-6 research groups and many individual researchers have skills/technologies with direct application to identified, future RTDI requirements. These encompass areas such as smart packaging and labelling systems, food chain traceability, fish quality, novel methods for assessment of seafood quality and safety, and market research.

Table 2.5 Overview of Current Seafood Processing Research in the Third-level Sector

Institutes	No. Research Groups	No. Researchers*	Research Focus
UCC DCU LYIT DIT	2 Large Groups 3 Medium Groups	17	> Role of seafood in human nutrition > Seafood sensory quality > Utilisation of fishery waste products for novel application > Novel seafood and marine product development > Assessment of aquaculture activities on composition, quality and shelf-life issues associated with seafood products > High pressure processing of shellfish > Colorimetric indicators of fish spoilage/quality > Autonomous temperature logging for the fishing industry > Modified atmospheric mussel packaging > Marine waste processing > Seafood pathogen diagnostics > Novel optical methods for assessment of seafood quality and safety

Large: >10 researchers; Medium: 5–10 researchers; Small: <5 researchers

* In some cases, research groups may focus on more than one theme and the total number of researchers in these groups is greater than indicated here. The total number of researchers in the groups identified is approximately 45-50.

State Sector

Researchers at the National Food Centre (Teagasc) carry out research on food quality and safety, and product and process innovations; with obvious applications to the future RTDI requirements of the seafood processing sector, e.g. functional foods, safe seafood, etc. Teagasc is one of three Irish partners, along with UCC and UCD, in a large FP6-funded integrated research programme (SEAFOODplus). The overall objective of the programme is to *"reduce health problems and to increase well-being among European consumers by applying the benefits obtained through consumption of health promoting and safe seafood products of high eating quality".*

BIM provide marketing support to Irish seafood companies to assist in identifying and securing market advantage for Irish seafood products. The BIM Seafood Development Centre carries out new product development and testing.

Industry

A number of seafood processing companies are involved in developing innovative seafood products and packaging methods. For example, frozen oyster products, and an innovative method for processing and packaging mussels, making them available 12 months of the year, have been developed. Convenient, organic, ready-to-cook meals have been developed for sale on world markets.

Identification of Research Skills/Competencies to Meet Future RTDI Requirements

A summary, based on the identified future RTDI requirements, of the competencies required to meet the 2013 Objectives is presented in Table 2.6. Also included in Table 2.6 is an assessment of whether there are current strengths (S), areas that require strengthening (R), or gap areas (G), in relation to the identified requirements, within the existing research community.

Table 2.6 Competencies Required to Meet Future Research & Innovation Requirements for the Seafood Processing Sector

Objectives 2013	Competencies Required	Assessment
1 Support Irish companies to enable them to produce a large variety of value-added, convenient, functional seafood for the home and export market.	> Food technology > Human nutrition > Fish nutrition > New product development (pelagics)	S S R G
2 Improve production efficiencies with the introduction of the latest technology, world-class manufacturing processes, to underpin our international reputation for quality and safety.	> Processing and packaging technology > Supply chain management systems	R R
3 Enhance quality, shelf life and traceability through the application of smart packaging and labelling technologies.	> Advanced technologies (sensors etc.)	R
4 Ensure waste is minimized and by-products recycled into alternative value-added products.	> Waste management > Applied biotechnology > Development of novel waste products	R R R
5 Maximise raw material supply from Ireland and other countries and ensure its optimal utilisation.	> Market research > Farm/production management	R R

* **S** – Current Strength; **R** – Requires Strengthening; **G** – Gap Area.

Although research strengths exist in both the public and third-level research community in the areas of human nutrition and food technology, these strengths need to be applied to the specific area of the development of functional seafood. In support of this objective, the development of appropriate finfish diets is an area that requires strengthening.

Other competencies that require strengthening include the development of processing and packaging technology (including smart labelling); market research; supply chain management; and fish waste management and utilisation. Existing research groups are currently addressing many of these areas but are doing so on an ad-hoc basis without the benefit of structured research programmes.

A major challenge and research gap exists in the development of value added products based on supplies of pelagic species (e.g. horse mackerel).

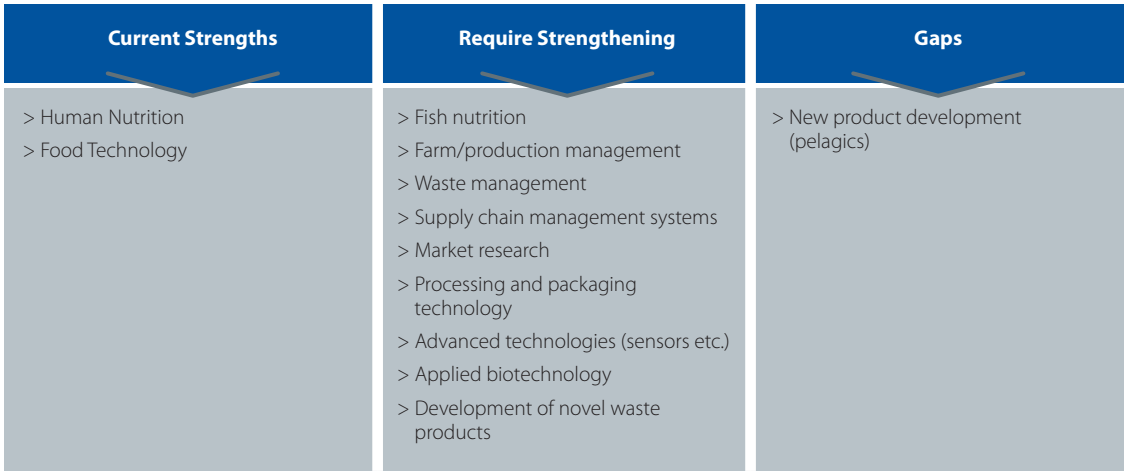

Figure 2.3 Research Competencies Required to Meet 2013 Objectives for Seafood Processing

2.2.8 Prerequisites for Achieving Objectives

The following are considered as prerequisites for the successful delivery of the objectives for the seafood processing research programme:

> Appropriate rationalisation and consolidation in the processing sector;

> Access to new sources of raw material to meet industry growth potential—the development of supplies from aquaculture will be of increasing importance;

> The development of a strong, international brand and a reputation for safe, high quality, organic seafood—this will require market research and segmentation to support companies in identifying new product development and marketing opportunities;

> The development of seafood processing clusters or hubs;

> The requirement to increase and foster collaboration and build scale between companies for service needs of major supermarket chains and international markets;

> New approaches to increase R&D intensity within the seafood sector to enable companies to develop or gain access to significant R&D capabilities, targeted on new product development;

> The need to strengthen management capabilities through participation in the Enterprise Ireland Seafood Processing Strategic Management Development Programme and recruitment of key managers under the Enterprise Ireland Key Worker Programme; and

> Stronger collaboration and communication amongst fishermen, fish farmers, processors, state agencies, research institutions, third-level institutions and industry associations.