

**LMC INTERNATIONAL**

**FEEDING THE GROWTH IN  
AQUACULTURE TO 2015**

**The Scope for Novel Nutritional Products**

*A Brochure Describing a Multi-Client Study*

**LMC International Ltd**  
14-16 George Street  
Oxford OX1 2AF  
England  
Tel: +44 1865 791737  
Fax: +44 1865 791739  
E-mail: [analysis@lmc.co.uk](mailto:analysis@lmc.co.uk)  
Website: [www.lmc.co.uk](http://www.lmc.co.uk)

**LMC International Ltd**  
1841 Broadway  
New York, NY 10023  
USA  
Tel: +1 (212) 586-2427  
Fax: +1 (212) 397-4756  
Email: [analysis@lmc-ny.com](mailto:analysis@lmc-ny.com)  
Website: [www.lmc.co.uk](http://www.lmc.co.uk)

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## The Study in Brief

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Aquaculture is becoming an increasingly sophisticated and valuable agribusiness. It is now a major force in the global supply of seafood, especially that of high value species. Rapid growth in farmed fish output (averaging 9% per annum recently) is set to continue, as wild stocks are fully utilised, or overexploited, while consumer demand for seafood expands steadily. The growing reliance upon aquaculture, notably intensive aquaculture, to meet the extra demand for seafood presents exciting opportunities for suppliers to this industry.

The interest of suppliers is focused above all on higher value species, especially those enjoying rapid market growth and critical mass in economic terms, and on their feed requirements. For these species that are reared intensively on protein-rich feeds, feed demand dominates production economics, with both fishmeal and fish oil underpinning development of the industry, especially in the key salmonid and crustacean segments.

This dependence on rendered fishmeal and fish oil products must change in future. Aquaculture already uses a substantial proportion of global fishmeal output and, more critically, the majority of world fish oil supplies. For the mid-term to long-term, the predicted growth in aquaculture production can occur only with substantial substitution of both fishmeal and fish oil. As a result, the need for alternative sources of protein and lipid feeds, as well as for specialty feed ingredients, is expected to grow rapidly.

Against this background, there is an urgent need for an assessment of the nature, extent and timing of the market opportunities for feed ingredient suppliers.

### LMC'S NEW STUDY

The new multi-client study, *Feeding the Growth in Aquaculture to 2015: The Scope for Novel Nutritional Products*, meets this need. Undertaken by LMC International in association with Napfisheries, the study defines the future scope of these opportunities in vegetable meal and oil substitution and in several classes of novel feed additives. It provides the detailed assessment of opportunities in this rapidly changing market that is required in order to make strategic decisions about investments in feeds and feed ingredients for high value fish species. The study includes:

#### Analysis and Forecasts to 2015 of:

- Key **production parameters** and international **trade flows** of high value farmed species, together with key economic factors, including **production costs**
- Growth in per capita **supply and demand** of major fish groups in different regions and countries, and projections of the production of **key species groups**
- Growth in **supply and demand of fishmeal and fish oil** as aquaculture feed ingredients
- Opportunities for **fishmeal substitutes** (focusing on vegetable protein alternatives), and **fish oil substitutes** (including vegetable and animal lipids), as well as for specialised feed ingredients, such as amino acids, feed attractants, enzymes and lipid derivatives, that the use of these substitutes will require
- Opportunities for other **speciality feed additives**, including immune stimulants, colourants, vitamins and others, that are required for farmed species

**With strategic conclusions for existing and potential industry participants**

## **LMC INTERNATIONAL**

LMC is exceptionally well qualified to assess the opportunities for suppliers of feed for the aquaculture industry. For over 20 years it has undertaken research and consultancy on global markets for agricultural products, including feed. It has unrivalled skills in identifying, assessing and forecasting agricultural commodity and food markets, including evaluating the prospects for novel foods and ingredients.

This study has benefited greatly from the key role played by Nigel Peacock, of Napfisheries, in the study's research and analysis. He has been a highly informed analyst of the global aquaculture sector for 25 years, carrying out research in all significant segments of the sector, and working in every major global arena. He has particular expertise in modelling the economics of aquaculture industries and forecasting growth.

## **WHO WILL BENEFIT FROM THE STUDY?**

This study details the specific opportunities for producers of protein and lipid feed substitutes and specialised feed additives that either have been, or could be, adapted to aquaculture. In the study, such opportunities have been quantified, with forecasts of growth, to help potential suppliers assess investment opportunities and plan their research and development programmes and marketing plans. Accordingly, the study is designed to appeal to the major players in the following areas:

- Animal feeds
- Vegetable protein feeds
- Vegetable oils
- Lipid derivatives
- Amino acids
- Feed attractants
- Animal health
- Speciality feed additives, including enzymes and vitamins
- Feed binders
- Colourants and carotenoids

The study offers assistance to planners responsible for directing the sector's development, as well as organisations interested in financing aquaculture ventures. More broadly, the study provides critical market information for:

- Fishmeal and fish oil producers
- Financial institutions
- Policymakers and planners
- Seafood suppliers, traders and processors

## **Scope and Coverage of the Study**

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LMC's and Napfisheries' study, *Feeding the Growth in Aquaculture to 2015: The Scope for Novel Nutritional Products*, comprises two volumes: the Executive Summary and the Main Report of some 370 pages plus appendices.

### **Executive Summary**

#### **Main Report**

Chapter 1:	The Nature of the Aquaculture Industry — The Broad Technical Parameters
Chapter 2:	The Evolution of Production and Trade
Chapter 3:	Production Economics – Unit Costs and Prices
Chapter 4:	Consumption and Production – Trend Analysis and Forecasts
Chapter 5:	The Key Inputs – Availability of Fishmeal and Fish Oil
Chapter 6:	The Outlook for the Supply of Novel Nutritional Products
Chapter 7:	Strategic Conclusions

Each volume is described briefly in the following pages, which also provide a detailed Table of Contents and a list of the tables and diagrams that appear in the study.

### **EXECUTIVE SUMMARY**

This volume provides a synopsis of the key findings of the study in 26 pages, including the most significant tables and diagrams from the Main Report. It serves as an excellent introduction and guide to the rest of the study.

### **MAIN REPORT**

#### **CHAPTER 1: THE NATURE OF THE AQUACULTURE INDUSTRY – THE BROAD TECHNICAL PARAMETERS**

The study begins by introducing the key sectors in the aquaculture industry, including those that were instrumental in its establishment, such as salmon, shrimp and catfish; those representing the new wave of market players, for example, tilapia; as well as the novel species now occupying a niche role, but whose output is expected to grow significantly. Table 1 provides a list of the species covered in this study and their major regions of production; aquaculture is now well represented in all major regions except Africa, the Middle East and Oceania.

This chapter describes the emergence within the industry of large blocks of producers who increasingly control both feed inputs and processing in two major sectors, pointing toward vertical integration following the model of the poultry industry.

Trends in costs of production are examined for each species. Together with trends in the growth of output, they allow an assessment to be made of the future competitiveness of species in specific markets. As an example, Atlantic salmon production has grown impressively since 1980, while its production costs have declined and real prices have fallen sharply. By expanding supply and cutting costs, it has been able to move out of the luxury market into the mainstream market.

The chapter also describes the evolution of carp production in China toward the 80:20 model, whereby 80% of the farmed carp are high value species that are fed formulated feeds, while the remaining 20% are filter feeders that serve to cleanse the pond and are therefore a “bonus” crop. This shift from extensive production of carp to intensive farming has strong positive implications for feed demand in China.

A new category of bulk whitefish, tilapia and catfish, is emerging as a substitute for wild catch whitefish and becoming competitive in the export market. Novel species that are new to aquaculture are also discussed with a view toward their future position in either the exclusive, high value market, or in the bulk whitefish market. The implications of the emergence of these groups are explored in depth in Chapters 2 and 3.

**Table 1: Key Species and Countries Covered in the Study**

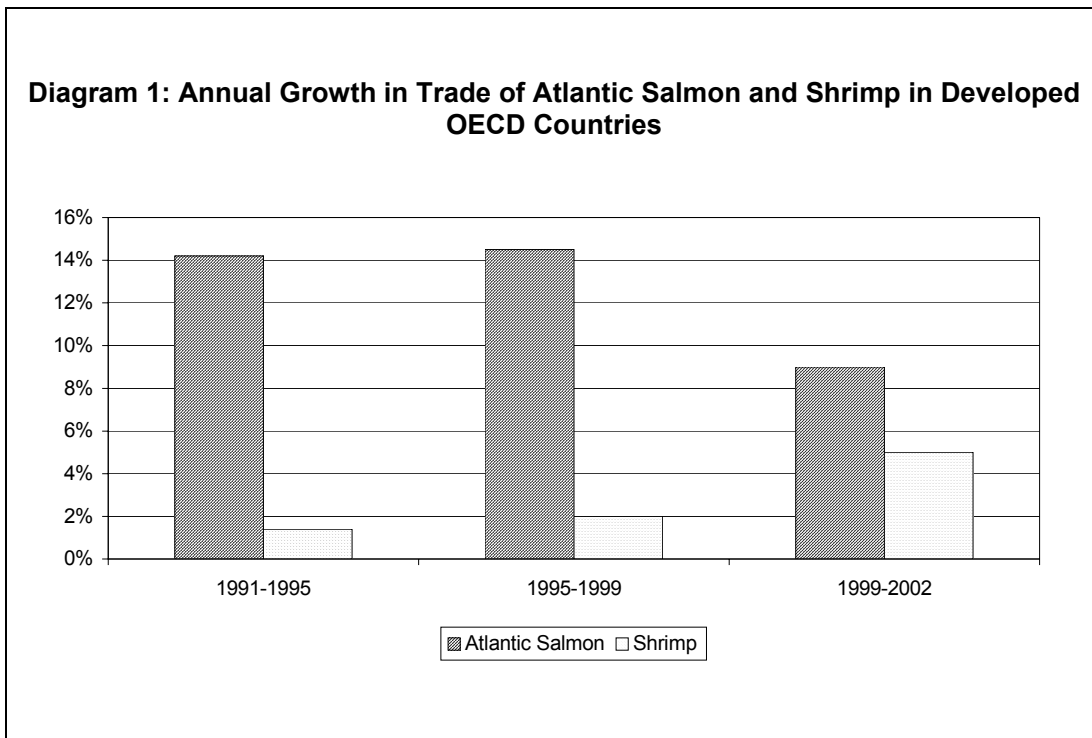
	Europe	East Asia	South East Asia	North America	Latin America
<b>CARNIVOROUS SPECIES</b>					
<b>Salmonids</b>					
Atlantic Salmon	✓			✓	✓
Pacific Salmon		✓		✓	✓
Rainbow Trout	✓	✓		✓	✓
<b>Mediterranean Species</b>					
Seabass	✓				
Seabream	✓				
<b>Japanese Species</b>					
Yellowtail		✓			
Eels	✓	✓			
Silver Bream		✓			
<b>Novel Species</b>	✓	✓	✓	✓	✓
<b>OMNIVOROUS SPECIES</b>					
<b>Catfish</b>					
Channel Catfish				✓	
Asian Catfish			✓		
African Catfish			✓		
<b>Tilapia</b>		✓	✓		✓
<b>Carp</b>	✓	✓	✓		✓
<b>Novel Species</b>	✓	✓	✓	✓	✓
<b>Crustacean Species</b>					
Black tiger		✓	✓		
White shrimp		✓			✓

## CHAPTER 2: THE EVOLUTION OF PRODUCTION AND TRADE

The second chapter presents the historical production and growth rates for each species group by region until 2003. This provides the background upon which the production forecasts of Chapter 4 are built, and upon which the feed and feed ingredients forecasts in Chapter 6 are structured.

Key differences are highlighted between intensive and extensive production in species such as shrimp, tilapia and others; as well as between aquaculture and fisheries production.

Because international trade is the key driver of growth in the intensively produced sectors that require feed, this chapter also presents the relative importance of trade to each species. Diagram 1 compares the rates of growth in salmon and shrimp exports to the high income markets that are members of the OECD. The growing importance of international trade in new bulk whitefish species, such as tilapia and catfish, is also explored in detail.



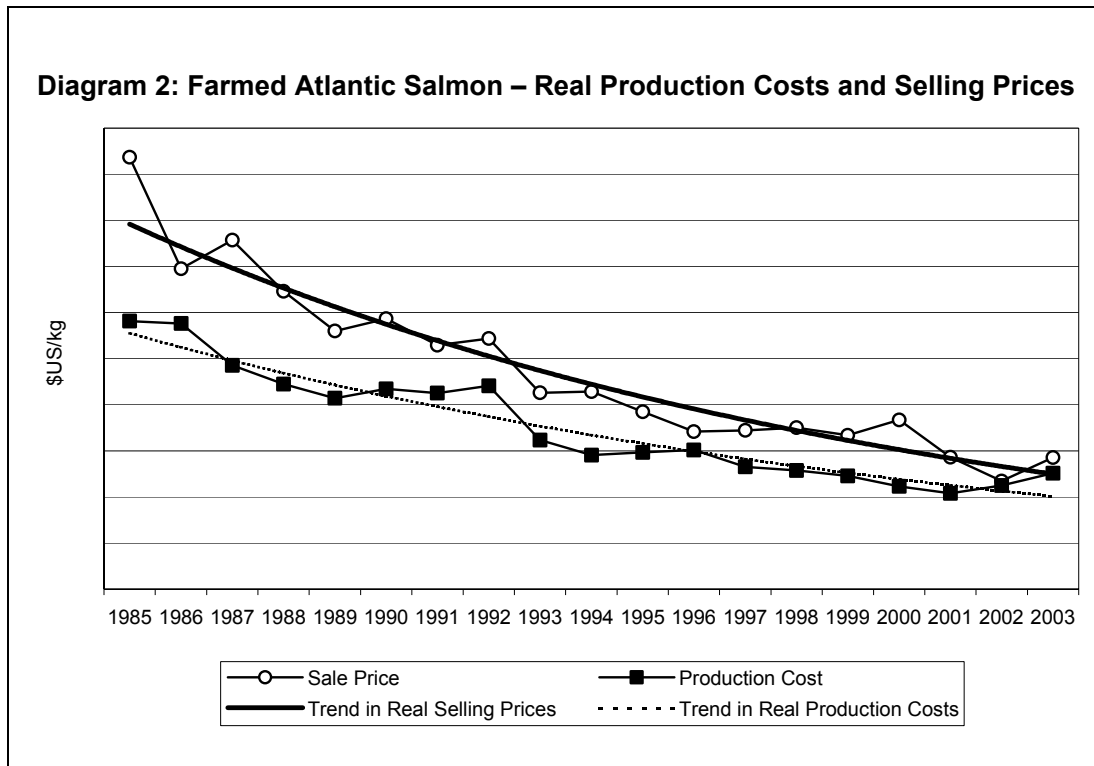
This chapter also addresses some important specific questions concerning the high-value industry segments, for example, whether prime protein feeders such as snakehead (*Channa*) or catfish (*Clarias*, *Pangasius*), will generate major new markets for feeds in freshwater culture in the wealthier tropical areas, especially in South East Asia. It also answers the question of whether Japan will diversify from its pioneering fish culture in yellowtail and eel, and move toward less demanding species.

## CHAPTER 3: PRODUCTION ECONOMICS – UNIT COSTS AND PRICES

The economic status of each aquaculture sector is presented in this chapter. Both the price history (using real, inflation-adjusted, and nominal prices) and the production costs of each key species are compared.

Rapidly falling real prices have been a feature of the culture of each species as it becomes established. Diagram 2 compares real production costs and selling prices for Atlantic salmon. Cost reductions driven by technical improvements have helped to maintain margins, and the study determines the scope for future price reductions through further technical improvements.

This chapter also defines the major structural revolution occurring within the aquaculture industry, highlighting the emergence of intensive aquaculture as a commodity agribusiness. It also describes the two-tier quality and pricing structure that is operating in this new market model, between prime seafood and bulk whitefish, which will influence a fundamental change throughout the industry.



#### CHAPTER 4: CONSUMPTION AND PRODUCTION – TREND ANALYSIS AND FORECASTS

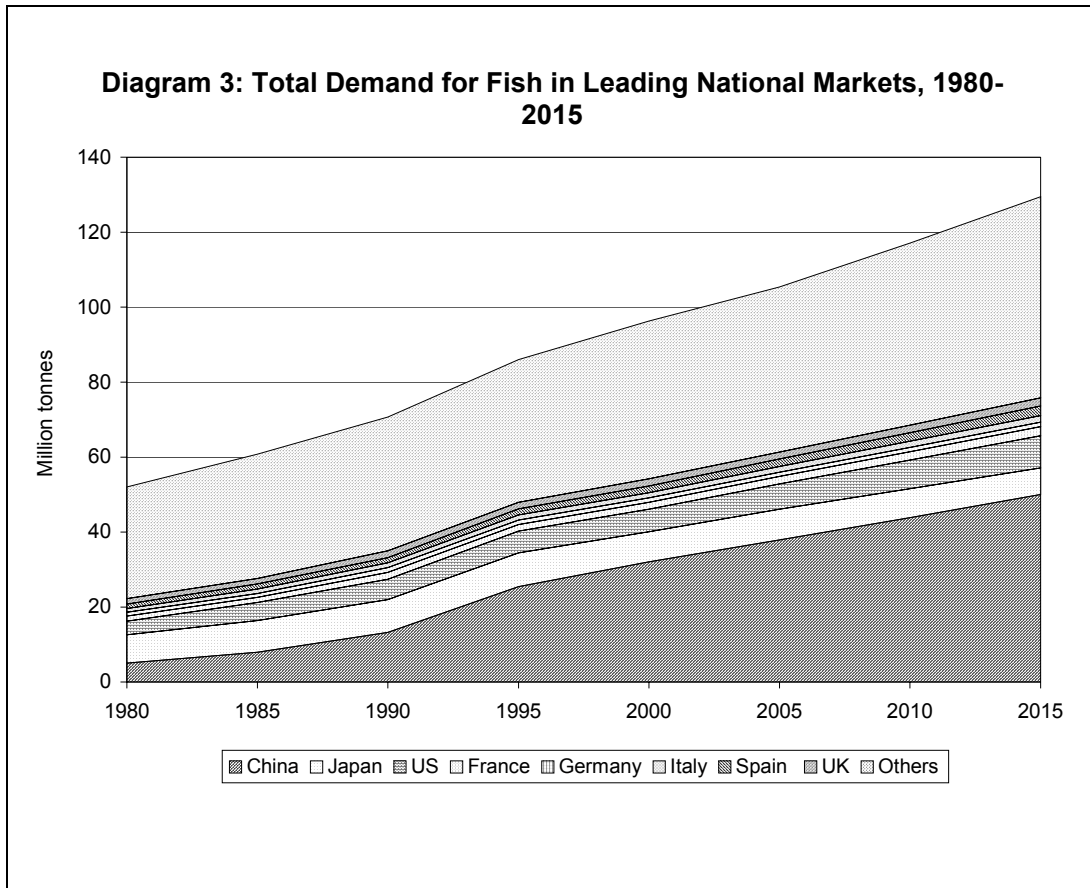
In this chapter, the study examines the outlook for the supply and demand for fish and crustaceans to 2005, 2010 and 2015. The forecasts are based upon econometric analysis of production trends, qualified by an understanding of fundamental change occurring within the industry, using modelling techniques developed by LMC for a wide range of food and feed sectors, and designed to relate projections of income growth to the rates of increase in luxury seafood demand.

Chapter 4 provides projections of per capita fish demand in the major consuming countries, together with forecasts of national and global demand for each major type of fish (demonstrated in Diagram 3). The growth in per capita demand for fish is driven by population growth and rising per capita calorie consumption, translating into a total fish and crustacean requirement of 129 million tonnes by 2015, of which China will consume two-fifths by 2015. The chapter concludes with forecasts of growth in output of each of the major farmed species that are the focus of the study, and these in turn



form the basis of the projections of demand for feed, fishmeal, fish oil and novel feed ingredients in Chapter 6.

Changing trends in the worldwide composition of fish consumption are discussed at length, illustrating the shifts toward freshwater species away from the major marine species, and revealing that the burden of keeping pace with rising demand will fall upon the intensive production of farmed freshwater fish and crustaceans.



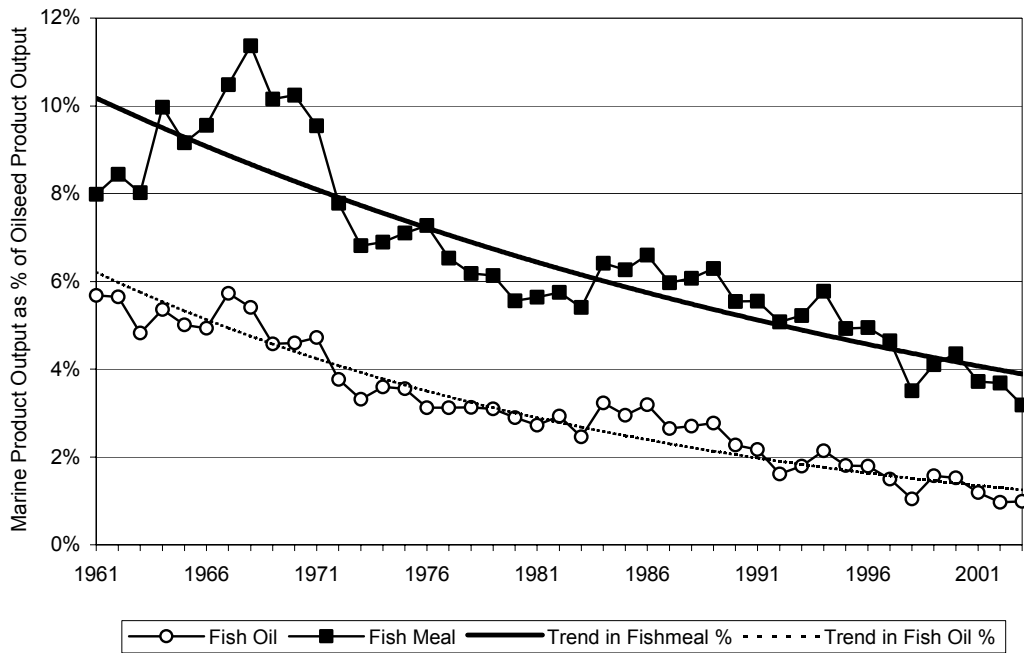
## CHAPTER 5: THE KEY INPUTS – AVAILABILITY OF FISHMEAL AND FISH OIL

Chapter 5 addresses the single most important issue in the aquaculture industry today: how to sustain its rapid rates of growth when the output of fishmeal and fish oil, its main sources of protein and lipids, is stagnant or declining.

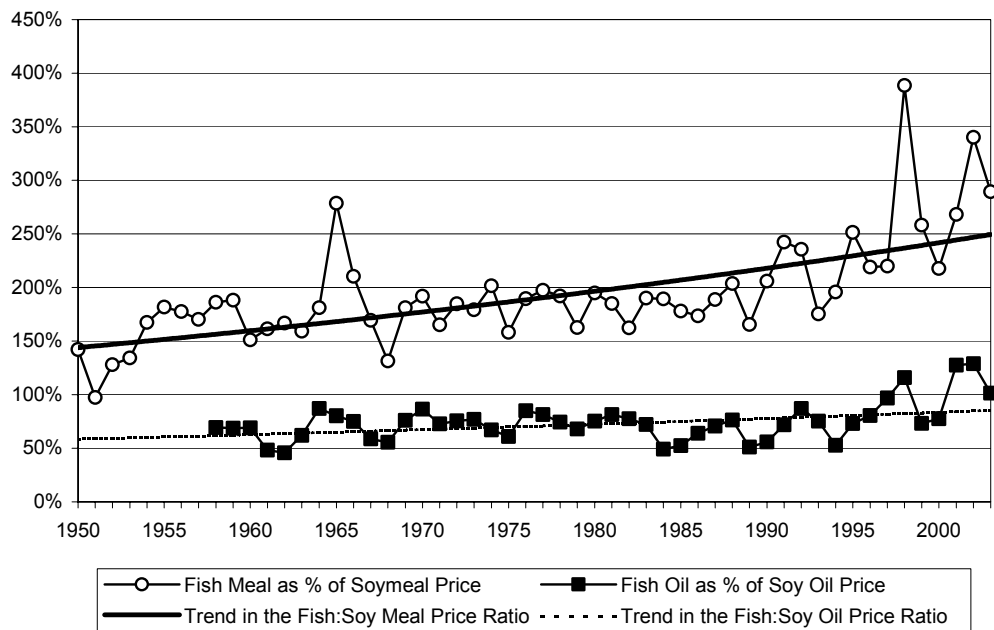
A detailed historical review of the global supply and demand situation of fishmeal and fish oil, together with projections to 2005, 2010 and 2015, is presented, along with comparisons of their output and price to those of their vegetable oilseed counterparts, shown in Diagrams 4 and 5.

This chapter describes the influence that the major producing countries (especially Peru) and consuming countries exert on prices and potential availability. It also details how the growing competition among aquaculture and other end-users serves as the market's means of rationing these increasingly scarce resources. Price-sensitive end-users of both fishmeal and fish oil are giving way to aquaculture, for which both these products are difficult to replace in many feed formulations.

**Diagram 4: Fishmeal and Fish Oil Output as % of Vegetable Oilseed Output**



**Diagram 5: Fishmeal and Oil Price Ratios to Soybean Products**



## **CHAPTER 6: THE OUTLOOK FOR THE SUPPLY OF NOVEL NUTRITIONAL PRODUCTS**

Chapter 6 focuses on those feed components that offer the greatest opportunity for the substitution by vegetable meals and oils for fishmeal and fish oil in the diets of intensively farmed fish. It also examines the opportunities for a number of feed additives that are essential for aquafeeds. A detailed list of these novel feed ingredients is provided in Table 2.

Furthermore, the chapter describes trends in the aquaculture feed industry and their potential influence on the adoption of fishmeal and fish oil substitutes, and provides details of feed demand on a species level and on a regional basis. Current fishmeal and fish oil demand are also disaggregated on a species level, along with forecasts to 2005, 2010 and 2015.

The analysis points to the urgency in identifying vegetable meal and oil substitutes, since the majority of both fishmeal and fish oil will be required by aquaculture by 2015. Diagram 6 reveals the particularly critical position of fish oil, for which 80% of the global supply will be required in aquaculture feed by 2015. There is currently no cost effective alternative source of  $\Omega$ -3 fatty acids, putting the growth in output of the carnivorous fish species and crustaceans at some risk without rapid adoption of new technology for production of these  $\Omega$ -3 fatty acids.

The requirements for fishmeal, together with opportunities for its substitution by 17 vegetable protein concentrates and meals, are discussed in depth and demand for fishmeal substitutes is forecast to 2005, 2010 and 2015. The analysis takes into account their individual suitability for carnivore, omnivore and crustacean diets vis-à-vis their amino acid profile, price, availability and absence of anti-nutritional factors.

The advances in technology that are needed for improving the quality of vegetable meals and for reducing the price of vegetable protein concentrates are discussed in detail. A number of opportunities exist for supplementing these vegetable proteins with novel feed additives to enhance their feed performance; among these products are amino acids, enzymes and feed attractants.

The scope for substitution by ten vegetable oils and animal fats is also quantified for each species and species group, highlighting those species in which substitutions are possible, as well as those for which fish oil is still an absolutely essential ingredient, such as crustaceans. The most appropriate lipid substitutes are identified and ranked in terms of their suitability according to fatty acid profile and price, and their demand is projected to 2005, 2010 and 2015. As with fishmeal, certain additives are or may be required when vegetable oil substitutions are made, including choline, cholesterol and lecithin.

Other feed additives that are required, whether or not fishmeal and fish oil are substituted, include vitamins, colourants, animal health products such as immune stimulants, antioxidants and binders. These products are discussed in detail for each species group, together with the scope for their expansion in the aquafeed uses.

For each of these novel feed additives, the current market value and volume are calculated, together with forecasts of their market volumes to 2005, 2010 and 2015. Opportunities for value-added products in each of these feed ingredient areas are explored in detail, in the light of the formulation challenges that the aqueous environment presents for many of these products.

**Table 2: Novel Aquaculture Feed Ingredients Included in This Study**

**Amino Acids**

Aspartic Acid  
 Betaine  
 Carnitine  
 Glutamic Acid  
 Glycine  
 Lysine  
 Methionine  
 Threonine  
 Tryptophan  
 Other (Alanine, Arginine, Taurine, Valine, etc)

**Enzymes**

Phytase  
 Non-Starch Polysaccharide Hydrolysing Enzymes

**Lipids Derivatives**

Cholesterol  
 Choline  
 Lecithin

**Antioxidants**

BHA  
 BHT  
 Ethoxyquin  
 Other (Vitamin E, Vitamin C, Citric Acid, Lecithin)

**Immune Stimulants**

Beta-glucans  
 Mannan-oligosaccharides  
 Nucleotides  
 Probiotics

**Vitamins**

Astaxanthin  
 Canthaxanthin  
 Vitamin A  
 Vitamin B family:  
     Biotin  
     Cyanocobalamin (B12)  
     Folic Acid  
     Inositol  
     Niacin (B3)  
     Pantothenic Acid  
     Pyridoxine (B6)  
     Riboflavin (B2)  
     Thiamine (B1)  
 Vitamin C  
 Vitamin D  
 Vitamin E

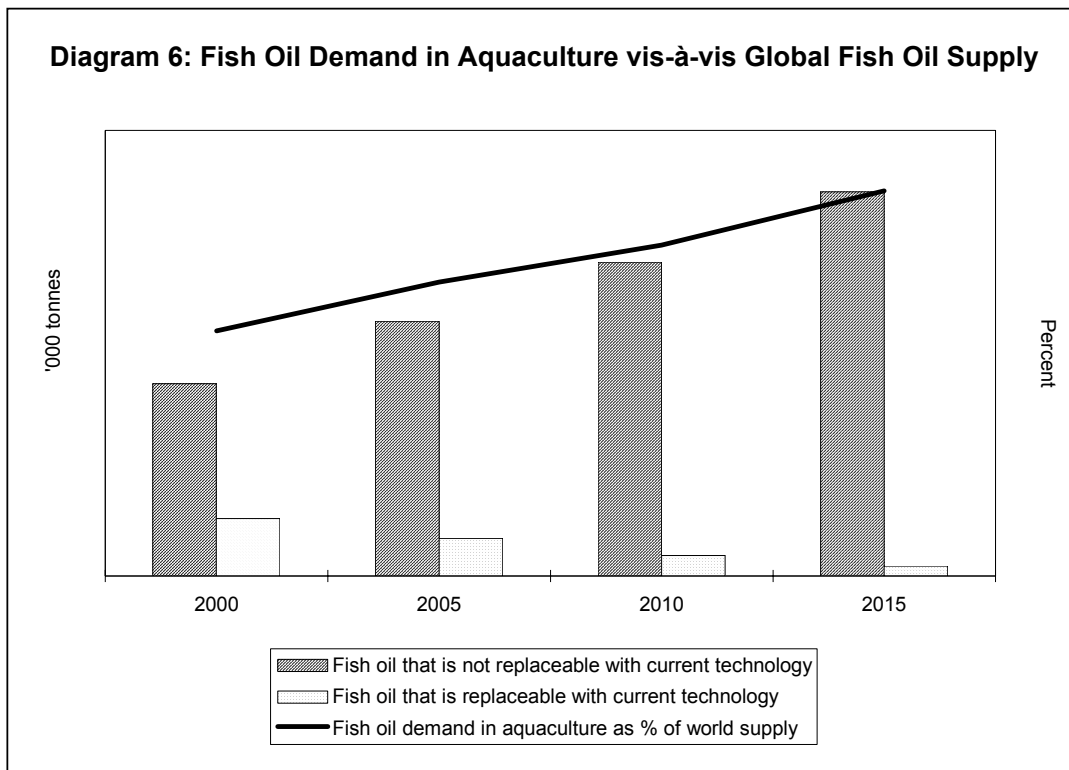
**Binders** (Protein, Hydrocolloid, Cellulose, Lecithin, Synthetic)

**Organic Acids** (Propionic, Formic, Lactic, Citric, etc)

**CHAPTER 7: STRATEGIC CONCLUSIONS**

This final chapter draws conclusions from the foregoing analyses to provide a comprehensive view of the future for the aquaculture sector. Traditionally, aquaculture has been segmented by species. LMC’s expectation is that, with aquaculture coming of age, the meaningful distinction now will be based on differences in approach to culture, with increasing commonality between sectors that were formerly regarded as disparate, e.g., salmonids, shrimp, tilapia and catfish. As a result, the industry will mature into a large, integrated, global high-value agribusiness (incorporating a number of major “agribusinesses” during the coming decade), and will increasingly become both the supplier of choice to wealthy high-end seafood markets and a major contributor to bulk whitefish supplies.

The more exciting and challenging areas of investment in aquaculture, and indeed the most critical for its future growth, are in the application of present technology and the development of new technology to solve the impending oil and protein shortfall. This is particularly critical for fish oil, and only slightly less so for fishmeal. This study addresses future opportunities in both of these important areas.



The final chapter examines other strategic conclusions that are essential for industry participants in both the aquaculture industry and in those sectors that supply its feed requirements. The critical questions to which it provides answers include:

- What is the outlook for each of the intensively produced species; which will be the winners and which ones will fall behind?
- How will the evolving two-tier structure of the prime seafood and the bulk whitefish markets influence the supply and demand, as well as prices, for fish and crustaceans within each of these categories?
- How will changes in output of fish and crustacean groups influence the demand for fishmeal and fish oil, and what impact will that have on demand for novel feed ingredients?
- Which vegetable meals and concentrates have the greatest opportunities to substitute for fishmeal, and what technology advances will be required to improve their quality and lower their cost?
- Which vegetable oils and animal fats will offer the most cost-effective service as substitutes for fish oil?
- What are the opportunities for novel feed ingredients that specifically compensate for deficiencies in the vegetable protein and vegetable oil substitutes used in aquafeeds?
- What are the most lucrative opportunities within the novel feed additives, in terms of present demand as well as in terms of adding value to existing products?

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Aspartic Acid  
Betaine  
Carnitine  
Glutamic Acid  
Glycine  
Lysine  
Methionine  
Threonine  
Tryptophan  
Other (Alanine, Arginine, Taurine, Valine, etc)

*Antioxidants*

BHA  
BHT  
Ethoxyquin  
Other (Citric Acid, Lecithin, Vitamin C, Vitamin E)

*Binders* (Cellulose, Hydrocolloid, Lecithin, Protein, Synthetic)

*Enzymes*

Phytase  
Non-Starch Polysaccharide Hydrolysing Enzymes

*Immune Stimulants*

Beta 1-3, 1-6 Glucans  
Mannan-oligosaccharides  
Nucleotides  
Probiotics

*Lipids Derivatives*

Cholesterol  
Choline  
Phospholipids and Lecithin  
*Organic Acids* (Citric, Formic, Lactic, Propionic, etc)

*Vitamins*

Astaxanthin  
Canthaxanthin  
Vitamin A  
Vitamin B family:  
Biotin  
Cyanocobalamin (B12)  
Folic Acid  
Inositol  
Niacin (B3)  
Pantothenic Acid  
Pyridoxine (B6)  
Riboflavin (B2)  
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  - Silver Bream
  - Channel Catfish
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  - African (Clarias) Catfish
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  - Astaxanthin
  - Canthaxanthin
  - Amino Acids as Protein Supplements
  - Amino Acids as Feed Attractants & Growth Promoters
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  - Amino Acids as Protein Supplements
  - Amino Acids as Feed Attractants & Growth Promoters
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## **Availability, Fee and Deliverables**

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### **AVAILABILITY**

The study, *Feeding the Growth in Aquaculture to 2015: The Scope for Novel Nutritional Products*, is available immediately.

### **FEE**

The fee for the study is €22,500.<sup>1</sup>

### **DELIVERABLES**

Subscribers to the study will receive:

- Two copies of the study;
- Four copies of the study's Executive Summary; and
- A CD-ROM providing an electronic copy of the study

During the six months after receipt of the study, subscribers will also be entitled to:

- Up to one full day of consulting by senior LMC staff to assist clients in the interpretation of the study's findings and to discuss other matters concerning the study. If these meetings are held elsewhere than at LMC's Oxford office, LMC will expect to be reimbursed for travel and subsistence costs.
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Subscribers will also be entitled to commission special additional research, built on the analysis in the study, tailored to their specific commercial needs and undertaken by LMC on a strictly confidential basis. LMC has extensive experience in undertaking such consulting assignments and will be pleased to prepare a proposal and fee quote for work commissioned to meet a subscriber's requirements.

### **CONFIDENTIALITY**

The study and any additional services are offered by LMC for subscription on the strict understanding that the subscriber agrees to the following conditions: that the content of the study and related materials provided shall remain confidential within the subscribing organisation, and shall not be disclosed in whole or in part, in any manner, to any third party without the prior written consent of LMC International Ltd.

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<sup>1</sup> Please note: Subscriptions from clients in New York State are subject to sales tax, which is not included in these fees.

## **The Project Team's Capabilities and Experience**

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### **THE PROJECT TEAM**

To carry out the proposed study, LMC International joined forces with aquaculture expert Mr Nigel Peacock, of the Napfisheries consultancy, to form a project team with unique breadth and depth of experience, as outlined below.

#### **NIGEL PEACOCK, NAPFISHERIES**

Nigel Peacock is a leading expert on aquaculture, with some 25 years of experience of the global industry. He has advised clients in the private and public sector on end-markets and their prospects, on marketing, on competitive conditions, on investment and on development strategies.

He has managed specific studies on salmonids, shrimp, seabass and seabream, tilapia, carp, shellfish and novel species. Devising models to analyse costs and to underpin forecasts of growth has been one of his particular strengths. He also has extensive practical and market experience in the sector, having developed and supervised aquaculture projects, as well as undertaking numerous surveys of the seafood market.

Nigel Peacock's knowledge of the sector comes from a career that began with work overseas implementing fisheries and aquaculture projects. He subsequently joined the UK consultancy LML to develop a fisheries and aquaculture capacity, and the firm went on to become a leading practitioner in this field. This involved managing and conducting over 40 aquatic resource studies, with the fast expanding aquaculture sector a key focus. Alongside this, he directed major fisheries and aquaculture development projects worldwide – working in Africa, Latin America, South East Asia, South Asia, the Middle East, the Former Soviet Union and the Pacific, as well as most OECD countries involved in aquaculture.

Working independently as Napfisheries for the last three years, he continues to direct aquatic development projects, in Southern Africa and Ukraine, but has focussed specifically on strategic and technical aquatic resource studies, including:

- Nigeria: shrimp farming strategy study
- Global: overview of the international market for canned fish
- EU: study of the socio-economics of fisheries
- South Africa: study for a post-apartheid fisheries company
- Iran: shrimp farming feasibility study

#### **LMC INTERNATIONAL**

LMC is an independent economic and business consultancy serving a range of industries related to agricultural commodities, foods, raw materials and their end-markets. Founded in 1980, it provides economic, marketing and planning services for industry participants around the world. Its headquarters are in Oxford, England, while its office in New York serves the USA, Canada and Mexico.

LMC has teams of economists that focus on particular industry sectors, helping participants in the sectors to operate with improved market knowledge, efficiency and competitiveness. With this focus and almost 25 years of experience throughout the world, LMC combines unrivalled understanding of each industry – its markets,

technology, participants and challenges – with analysis and advice of the highest standard.

Its expertise and experience make LMC exceptionally well qualified to assist industry participants to respond to the threats and opportunities facing them. The company serves all segments of each industry, including growers, traders, processors and manufacturers, end-users, financial institutions, trade associations, governments and international organisations. A representative list of the company's clients is presented at the end of this document.

## **Capabilities**

LMC's particular capabilities include:

- Market Research, Analysis and Forecasting
- Analysis of Cost Competitiveness, Technical Performance and Profitability
- Pricing and Marketing Studies
- Advice on Product and Production Strategies
- Feasibility and Investment Studies
- Analysis and Advice on International Trade Issues and National Policy

## **Services**

The company's services, described in the following pages, include:

- Single client studies – consultancy for individual clients
- Multi-client studies – on key market issues
- Regular service – monthly

## **LMC SINGLE CLIENT STUDIES**

LMC undertakes consultancy assignments tailored to the specific needs of individual clients. The scope of such work is diverse, and projects carried out have covered a very wide range of production, marketing, purchasing, planning and policy issues. Titles of a few such studies are presented below.

### **Market Research, Analysis and Forecasting**

- The World Market for Fishmeal
- Changes in European Oilseeds Proteins and Cereal Markets
- Markets for Soy Isoflavones
- The Oilseeds, Oils and Meal Proteins Economy

### **Analysis of Cost Competitiveness, Technical Performance and Profitability**

- The Competitiveness of Soybean Meal and Soybean Oil
- Oilseeds, Pulses and Cereals — Costs of Production in Selected EU Countries
- The Competitiveness of the North and South American Oilseed Industries

### **Pricing and Marketing Studies**

- The Pricing of Oilseeds and Oilseed Products
- Edible Oils: How Will Consumer Concerns About Diet Affect Demand?
- Development of a Marketing Strategy for a Novel Food Ingredient
- The Promotion of Soymeal Exports

### **Advice on Product and Production Strategies**

- Long Term Planting Strategies in Indonesia
- Analysis of Strategic Options for a Food Ingredients Company
- Prospects for Palm Oil in Indonesia

### **Feasibility and Investment Studies**

- Feasibility Study for an Oilseed Processing Complex
- Opportunities for an Investment in a Soybean Crushing Plant in Brazil

### **Analysis and Advice on International Trade Issues and National Policy**

- The Impact of EU Oilseeds Policy on the Spanish Crushing Industry
- The Impact of Mercosur on the Pricing of Sugar and Maize in Argentina

### **LMC MULTI-CLIENT STUDIES**

The multi-client approach enables clients to obtain the results of ambitious research projects at a fraction of the overall costs of undertaking such studies. On this basis, LMC has carried out unique and innovative research on a wide range of industry issues. LMC multi-client studies include:

***Oilseeds and Oilseed Products to 2015: A Strategic Assessment for Producers, Processors and Investors***

***The Outlook for Oleochemicals to 2015: The Scope for Adding Value to Vegetable Oil Production***

***The LMC Worldwide Survey of Oilseeds and Oils Production Costs***

***Genetically Modified Oilseeds: The Implications of Customised Oilseeds for Seed Companies, Oilseed Producers and Processors***

*Brochures describing these multi-client studies are available on request.*

### **LMC REGULAR SERVICE**

Drawing on its continuing research undertaken in the oilseeds, oils and meals sectors, LMC offers this monthly service, available in hard copy and online:

#### ***Oilseeds, Oils & Meals Analysis***

Each issue provides:

- An authoritative evaluation of the current state of the market, in a concise and easily understood format. Production, consumption, the world supply/demand balance, stocks, trade and prices are assessed for seeds, oils and meals.
- A major article analysing a key market topic in depth. Together, the articles provide a resource for market awareness and planning. Each article is of direct commercial relevance to industry participants and draws on the results of LMC's global research. Subjects covered have included, for example: the global market for oil meals (reviewed annually), the price drivers for vegetable oils and meals, recent trends in vegetable oil refining and fat modification, biodiesel and biosolvents, Indonesia's palm oil sector, soy protein, palm oil in Malaysia, technological change in the vegetable oils market, the Chinese oilseeds sector, and the impact of GMOs on the global oilseeds industry.

## LMC Client List

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LMC has an exceptionally wide range of clients, including private and public sector bodies throughout the world. Among those for whom LMC has undertaken research projects or who have subscribed to LMC's regular services are:

Aarhus Oliefabrik A/S .....	Denmark
African Products Pty Ltd .....	South Africa
Agriculture and Agri-Food Canada .....	Canada
Agriculture and Livestock Industries Corp .....	Japan
Ajinomoto Co, Inc.....	Japan
Ajicorp SAA .....	Chile
Almidones Mexicanos SA .....	Mexico
American Soybean Association .....	USA
Amylum Europe NV .....	Belgium
API Grain Processors .....	Canada
Archer Daniels Midland Co .....	USA
Asian Agri Group.....	Indonesia
Asian Development Bank .....	Philippines
Asiatic Development Bhd .....	Malaysia
Associação Brasileira das Indústrias de Oleos Vegetais .....	Brazil
Association des Amidonneries de Céréales de l'UE.....	Belgium
Avebe ba .....	Netherlands
Banco do Brasil .....	Brazil
BASF AG .....	Germany
Bolsa de Mercadorias e Futuros .....	Brazil
Bunge Ltd .....	USA
Canadian Oilseed Processors Association .....	Canada
Canola Council of Canada .....	Canada
Cargill, Inc.....	USA
Cereol SA .....	France
Chicago Board of Trade .....	USA
CJ Corp .....	South Korea
Common Fund for Commodities .....	Netherlands
ConAgra Foods, Inc.....	USA
Corn Products International, Inc. ....	USA
Cosun .....	Netherlands
Daesang Corp.....	South Korea
Degussa AG .....	Germany
Department for Environment, Food & Rural Affairs .....	UK
The Dow Chemical Co. ....	USA
DSM Nutritional Products .....	Switzerland
E I du Pont de Nemours & Co.....	USA
European Commission .....	Belgium
Ex-Seed Genetics, LLC.....	USA
Fedepalma .....	Colombia
Fediol .....	Belgium
Felda Marketing Services Sdn Bhd .....	Malaysia
FMC Corp.....	USA
Food and Agriculture Organization of the UN .....	Italy
Fuji Oil Co Ltd .....	Japan
Genencor International, Inc.....	USA
Godrej International Ltd .....	India
Golden Hope Plantations Bhd.....	Malaysia
Grain Pool of Western Australia.....	Australia
Hap Seng Consolidated Bhd.....	Malaysia
Healy Food Ingredients Ltd .....	UK
Home Grown Cereals Authority .....	UK
Institute of Agricultural and Food Economics.....	Poland
International Finance Corp.....	USA
Itochu Corp.....	Japan
Japan Corn Starch Co .....	Japan
Jungbunzlauer AG .....	Switzerland
Kamani Oil Industries.....	India

Karlshamns AB	Sweden
Kerry Foodstuffs Co Ltd	Hong Kong
Kumpulan Guthrie Sdn Bhd	Malaysia
Kuok Oils & Grains Pte Ltd	Singapore
Les Huileries de Meknès	Morocco
Lesaffre International R & D	France
Lesieur Cristal	Morocco
Lloreda Grasas SA	Colombia
Loders Croklaan BV	Netherlands
Louis Dreyfus Corp	USA
Malaysian Palm Oil Board	Malaysia
Manildra Milling Corp	USA
Marico Industries Ltd	India
Marubeni Corp	Japan
Meadow Lea Foods	Australia
Midwest Grain Products Inc.	USA
Mitsubishi Corp	Japan
Mitsui & Co Ltd	Japan
Molinos Río de la Plata SA	Argentina
Monsanto Co	USA
National Oilseed Processors Association	USA
National Starch & Chemical Co	USA
Nestlé	Switzerland
Novozymes AS	Denmark
NSW Grains Board	Australia
ONIDOL	France
Ontario Ministry of Agriculture, Food and Rural Affairs	Canada
Ontario Soybean Growers	Canada
Penford Corp	USA
Pioneer Hi-Bred International, Inc	USA
The Procter & Gamble Co	USA
Product Board for Margarine, Fats & Oils	Netherlands
Productos de Maiz SA	Argentina
PTPP London Sumatra Indonesia	Indonesia
Rabobank International	Netherlands
Raisio Group plc	Finland
Renessen LLC	USA
Research-Works Pte Ltd	China
Rhodia	France
Roquette Frères	France
S&S Industries & Enterprises Ltd	India
Samyang Corp	South Korea
The Savola Co	Saudi Arabia
Sensus	Netherlands
Sime Darby Bhd	Malaysia
Solae LLC	USA
Staley-Tate & Lyle	USA
Syral SA	France
Tomen Corp	Japan
UNIDO	Austria
Unilever NV	Netherlands
United Coconut Associations of the Philippines, Inc	Philippines
United Plantations Bhd	Malaysia
United Soybean Board	USA
Univanich Palm Oil Public Company Ltd	Thailand
US Department of Agriculture	USA
Vopak Terminal Vlaardingen BV	Netherlands
Walter Rau Neusser Öl und Fett AG	Germany
The World Bank	USA

*and many others...*

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