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Economic Analysis of Issues Concerning Organic Dairy Farming

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgriQuality NZ</td>
<td>Provides organic certification service to organic producers and processors</td>
</tr>
<tr>
<td>BIOGRO NZ</td>
<td>The trading name of the New Zealand Biological Producers &amp; Consumers Council Inc.</td>
</tr>
<tr>
<td>BIOGRO label</td>
<td>The organic label certified by BIOGRO NZ</td>
</tr>
<tr>
<td>CERTENZ</td>
<td>The organic label certified by AgriQuality</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
</tr>
<tr>
<td>EU</td>
<td>The European Union</td>
</tr>
<tr>
<td>IFOAM</td>
<td>International Federation of Organic Agricultural Movements</td>
</tr>
<tr>
<td>LOJ</td>
<td>The Danish Association of Organic Farmers (Økologisk Landsforening, ØL)</td>
</tr>
<tr>
<td>MAF</td>
<td>Ministry of Agriculture and Forestry, New Zealand</td>
</tr>
<tr>
<td>MfE</td>
<td>Ministry for the Environment</td>
</tr>
<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>NZDB</td>
<td>New Zealand Dairy Board</td>
</tr>
<tr>
<td>OPENZ</td>
<td>Organic Products Exporters of New Zealand</td>
</tr>
<tr>
<td>WFF</td>
<td>Wattie Frozen Foods Ltd. (now Heinz-Wattie NZ)</td>
</tr>
<tr>
<td>Ø-Label</td>
<td>Organic label. Danish state-controlled guarantee symbol</td>
</tr>
</tbody>
</table>
Preface

Denmark (DK) has led the world in the development of organic dairy production. Whilst this development has been due to a number of factors, some of which are unique to Denmark, it does provide insights into how an organic industry has grown for which information is hard to obtain.

New Zealand (NZ) has similarities to DK with both countries having a well-developed dairy sector, which rely upon exports. However, NZ has an undeveloped organic dairy sector of a few farms, which have generally supplied local consumers. There is interest in NZ to increase the output of organic dairy products.

To better inform NZ dairy producers and to assess the potential risks and benefits of organic dairy production, the Danish experience will be used in this report as an example to assess scenarios which the NZ industry may face. These scenarios include the growth in market for organic products both in NZ and overseas, as well as changes in production.

The report will be of particular interest for the NZ dairy sector, Fonterra, OPENZ (Organic Products Exporters of New Zealand) as well as the organic dairy sector in DK since NZ is a potential competitor.
Summary

This report reviews organic production and consumption with particular focus on organic dairy farming in Denmark (DK) and New Zealand (NZ).

A brief introduction describes the current worldwide status of organic production and consumption. This is followed by a literature review of the Danish and NZ market situations within organic – and in particular dairy - farming.

Organic dairy farming is very developed within DK, whereas it is only just beginning in NZ. The Danish experiences are used to define scenarios for future development within NZ. These scenarios are modelled in the Lincoln Trade and Environment Model (LTEM), resulting in estimates of NZ dairy producer returns derived from a shift towards organic production. Assumptions on development within NZ’s main trade partner countries – United States (US), European Union (EU) and Japan (JP) – are included in the modelling.

The LTEM modelling shows how the NZ dairy sector could benefit overall from some conversion to organics. Even very conservative estimates of organic consumption and consumers’ preference for organic dairy products result in increases in NZ organic and total producer returns. We argue, therefore, that it is important for the NZ dairy sector to commit itself towards organic production and signal this to the NZ dairy farmers.
Chapter 1
Introduction

1.1 Background and Objectives

The objective of this report is to determine potential costs and benefits to the New Zealand (NZ) dairy sector of increasing the level of production of organic products.

The report firstly presents a short introduction to organic production and consumption worldwide. A literature review on the Danish organic sector follows - with emphasis on dairy - along with an assessment of current development within the NZ organic (dairy) sector. The Danish experience is then used to define scenarios which the NZ industry may face.

The report then examines the impact on NZ dairy producers of converting to organic production methods. These impacts are estimated using the Lincoln Trade and Environment Model (LTEM). The factors included in the model are shifts in consumer preferences towards organic dairy produce, and shifts in supply curve incurred by increased production costs of organic production compared to conventional. Furthermore, the model includes different proportions of organic production and consumption share in NZ and its three most important trade partners: United States, European Union and Japan.
Chapter 2
Organic Production and Consumption Worldwide

2.1 Introduction

This chapter gives a brief introduction to the development and expectations for growth in the organic sector worldwide. This provides an overall context for which analysis of the dairy sector in NZ can be assessed. Most of the data presented are taken from Lohr, (2001).

Prior to a review of the organic sector it is important to define what an organically produced food is. Organic foods can be distinguished from non-organic foods by methods of production and processing. However, being credence goods, organic food items usually do not have any observable or testable characteristics. This makes a credible third party certification and labelling system - that consumers are familiar with and trust - crucial for organic suppliers.

There is currently no single international standard that defines organics, but generally accepted organic rules are (Lohr, 2001):

- No use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives.
- No use of genetically modified stock, no application of sludge to organic acreage and no food irradiation.

Attempts to harmonize definitions of what is organic are currently taking place among the major markets as the exchange of organic products internationally increases (Lohr, 2001).

2.2 Worldwide Organic Production and Trade

Organic food markets have experienced growth rates of between 15-30 per cent in Europe, the United States (US) and Japan over the period 1996-2001. In 2001 the value of the European market was estimated at US$5,255 billion and the Japanese market at US$3 billion (Table 1).

However, despite growth in the market, in the four countries in Europe that account for 63 per cent of total European organic retail value, organics still has a relatively small share of total sales: Germany (US$1.6 million in sales, 1.2 per cent retail market share); Italy (US$750 million, 0.5 per cent retail market share); France (US$508 million, 0.4 per cent retail market share); and United Kingdom (US$445 million, 0.4 per cent retail market share). The highest organic retail market shares within Europe are found in Denmark, Austria, Sweden and Switzerland (at between 1.8-2.5 per cent). Japan and the US, with organics accounting for one per cent of the retail market share, dominate markets in the Pacific and Northern America (Table 1).

In general, European countries are significant net importers of organic produce. China and Mexico are net exporters and the US is a net exporter of some organic commodities.

Taking organic retail market share, total population, import share and expected growth rate into consideration, Japan, the US, the United Kingdom and Germany appear as markets with potential for organic exports.
Table 1 shows the retail value and share for the main markets of organic products. The table also shows import share and growth.

<table>
<thead>
<tr>
<th>Market</th>
<th>Retail value (US$ million)</th>
<th>Retail share (% organic of total sales)</th>
<th>Import share (% of organic sales)</th>
<th>Annual market growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>225-270</td>
<td>2.0-2.5</td>
<td>30</td>
<td>10-15</td>
</tr>
<tr>
<td>Belgium</td>
<td>75-94</td>
<td>0.3-1.0</td>
<td>50</td>
<td>n.a.</td>
</tr>
<tr>
<td>Denmark</td>
<td>190-300</td>
<td>2.5-3.0</td>
<td>25</td>
<td>30-40</td>
</tr>
<tr>
<td>France</td>
<td>508-720</td>
<td>0.4-0.5</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Germany</td>
<td>1.6-1.8 (billion)</td>
<td>1.2-1.5</td>
<td>40</td>
<td>5-10</td>
</tr>
<tr>
<td>Italy</td>
<td>750-900</td>
<td>0.5-3.0</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Netherlands</td>
<td>230-350</td>
<td>1.0-1.5</td>
<td>60</td>
<td>10-15</td>
</tr>
<tr>
<td>Spain</td>
<td>32-35.5</td>
<td>1.0</td>
<td>50</td>
<td>n.a.</td>
</tr>
<tr>
<td>Sweden</td>
<td>110-200</td>
<td>0.6-3.0</td>
<td>30</td>
<td>30-40</td>
</tr>
<tr>
<td>Switzerland</td>
<td>350</td>
<td>2.0</td>
<td>n.a.</td>
<td>20-30</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>445-450</td>
<td>0.4-2.0</td>
<td>70</td>
<td>25-35</td>
</tr>
<tr>
<td>Japan</td>
<td>3 (billion)</td>
<td>1.0</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>China</td>
<td>6</td>
<td>n.a.</td>
<td>0</td>
<td>n.a.</td>
</tr>
<tr>
<td>Taiwan</td>
<td>9.7</td>
<td>n.a.</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Australia</td>
<td>123-130</td>
<td>0.2</td>
<td>1.0</td>
<td>400</td>
</tr>
<tr>
<td>United States</td>
<td>6.6 (billion)</td>
<td>1.0</td>
<td>n.a.</td>
<td>20</td>
</tr>
<tr>
<td>Canada</td>
<td>200-500</td>
<td>1.0</td>
<td>80</td>
<td>15</td>
</tr>
<tr>
<td>Mexico</td>
<td>12</td>
<td>n.a.</td>
<td>0</td>
<td>n.a.</td>
</tr>
</tbody>
</table>


Price premiums on organic products vary between different product categories but also between different countries. Table 2 shows price premiums for key markets. From this it is evident that organic products are priced between ten and 100 per cent above conventional products. However a price premium between ten and 30 per cent is the most common.

<table>
<thead>
<tr>
<th>Market</th>
<th>Price Premium (Per cent above conventional price)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>25-30</td>
</tr>
<tr>
<td>Denmark</td>
<td>20-30</td>
</tr>
<tr>
<td>France</td>
<td>25-35</td>
</tr>
<tr>
<td>Italy</td>
<td>35-100</td>
</tr>
<tr>
<td>Germany</td>
<td>20-50</td>
</tr>
<tr>
<td>Netherlands</td>
<td>15-20</td>
</tr>
<tr>
<td>Sweden</td>
<td>20-40</td>
</tr>
<tr>
<td>Switzerland</td>
<td>10-40</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>30-50</td>
</tr>
<tr>
<td>Japan</td>
<td>10-20</td>
</tr>
<tr>
<td>United States</td>
<td>10-30</td>
</tr>
</tbody>
</table>

Source: Lohr, 2001
Organic products are distributed through three main channels; supermarkets (retail-chain stores), specialty stores and/or producer direct sales. The structure of organic food retailing seems to go through three stages over time from niche market to maturing market with availability of organic products mainly sold in supermarkets (retail-chain stores) (Figure 1). Initially organic sectors are small with produce typically sold directly from producer to consumer. The market then develops, with an increase in amount sold through specialist stores. Final stages tend to have high processing and marketing costs. As the market goes through these three stages so does the growth in organic market share.

Figure 1
The Change in Market for Organic Products Over Time

Retail-chain distribution mainly occurs in the markets with the highest organic retail share. Due to a large customer base, supermarkets can generate turnover more quickly, thus reducing costs and maintaining product appearance and quality. Furthermore, supermarket availability makes organic produce more accessible for the consumers. Thus, a combination of supermarket distribution and organic market share is thought to reduce distribution costs (Lohr, 2001).

In Europe the majority of organic products is distributed through supermarkets (retail-chain stores), whereas speciality stores tend to be used for distribution in the US. Japanese organic produce is mainly distributed directly from the producer or through speciality stores (Lohr, 2001) (Table 3). Thus European markets seem to be more mature than the Pacific and North American markets due to high retail value and retail share in combination with large-scale distribution through supermarkets (retail-chain stores). Although this pattern, especially in Japan, may reflect cultural differences.
Table 3
Percentage Shares of Organic Retail Market by Distribution Channel

<table>
<thead>
<tr>
<th>Market</th>
<th>Supermarkets¹</th>
<th>Speciality stores²</th>
<th>Producer direct³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>77</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Denmark</td>
<td>70</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>France</td>
<td>45</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>Italy</td>
<td>25-33</td>
<td>33</td>
<td>33-42</td>
</tr>
<tr>
<td>Germany</td>
<td>25</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>Netherlands</td>
<td>20</td>
<td>75</td>
<td>5</td>
</tr>
<tr>
<td>Sweden</td>
<td>90</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Switzerland</td>
<td>60</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>65</td>
<td>17.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Japan⁴</td>
<td>High-end-stores</td>
<td>Widely available</td>
<td>Widely available</td>
</tr>
<tr>
<td>United States</td>
<td>31</td>
<td>62</td>
<td>7</td>
</tr>
</tbody>
</table>

¹Includes supermarkets and hypermarkets that offer conventionally grown foods
²Includes organic supermarkets, natural products and health food stores, cooperatives and other
³Includes on-farm sales, farmer markets, box schemes, CSAs, teikei and other
⁴Share data not available for Japan, but qualitative information suggests the relative availability of product in each country
Source: Lohr, 2001

Many European countries are experiencing a reduction in growth in organic markets compared to the high levels experienced over the last decade. However, European medium term growth is still expected to be significant, at between 10-20 per cent (depending on the country) (International Trade Centre, 2002). Projection for the US is a growth rate of 20 per cent and for Japan 15 per cent in the short term. Growth in the Australian and Canadian markets is expected to continue and to be supplied domestically as production capacity is realized. China and Mexico are projected to have relatively insignificant domestic organic demand and continue being net-exporters of organic produce (Lohr, 2001).

In summary, it is anticipated that Europe, Japan and US will remain the key import markets for at least the next five to ten years (Lohr, 2001).

Reasons for buying organics have shown to be similar across countries. Factors such as taste, freshness, quality and perception of organic food being healthier are all mentioned in consumer surveys. Furthermore food scares such as mad-cow disease, E. coli contaminations, pesticide poisonings and concerns over genetic engineering (GE) in foods have contributed to increased consumer interest for organic produce (Lohr, 2001).

There are several factors affecting the size of the organic market. The key issues are organic price premiums, price-quality trade offs and the country of product origin. According to Lohr (2001) the size of organic price premiums reflect availability, the frequency of purchase, products placement and branding. Consumer price premiums are lowest in countries with large organic market shares and a high percentage of distribution through supermarkets (retail-chain stores). Lohr (2001), shows how data suggest a slight positive correlation between percentage of consumers buying organic produce regularly and the amount of organics sold in retail market outlets.
2.3 Conclusion

Organic food markets have grown in recent years so that the 2001 value is estimated at US$5,2556 for Europe and US$36 for Japan. Organic products commonly receive a price premium of from ten to 30 per cent. Market stage and structure seem to be related, with highest market share of organics in markets which have high sales through supermarkets.
Chapter 3  
The Organic Sector in Denmark

3.1 Introduction

The purpose of this chapter is to give an introduction to the organic sector in Denmark (DK). In particular, this section concentrates on the dairy sector. The first section describes a few key points on the development of Danish organic farming. Then production, consumption, and trade of organic products are explained.

3.2 Development of Organics

Denmark has been a pioneering country in the development of the organic sector since the 1970s. Pollution issues, the environment, and organics became the keywords of this decade. A group of young idealists took over the Danish estate “Svanholm” and started running it according to organic principles. By doing this, they initiated a distinct alternative to established Danish agriculture. This initiative was characterised by niche production and producer direct sales, that is, the first market stage of development.

In 1981, The Danish Association of Organic Farming (LOJ) was founded. A number of specific rules and objectives for organic farming and organic production methods were formulated and LOJ set up its own inspectorate (Økologisk Landsforening, 2002; OrganicDenmark, 2002).

In 1982, retail chain stores launched the sale of organic carrots. Sales and consumer interest were not overwhelming, but during the 1980s, the range of organic products expanded in accordance to an up-scaling of production (Økologisk Landsforening, 2002). Through this upscaling, the organic sector moved to the second stage of market development. The first organic cheese was sold in the Danish retail stores in 1986 with organic liquid milk being introduced the following year (Arla Foods, 2002). The first Danish legislation on organic agricultural production was adopted in 1987 (further details in Whitby, 1996). Under this legislation, the Ministry of Food, Agriculture, and Fisheries took over the administration and inspection of organic production (both farming, processing, and trade), which had been managed by LOJ up until then. Thus, since 1987, organic foods could only be produced at accredited farms and work places (Økologisk Landsforening, 2002).

Agricultural extension services run by farmers’ organisations in Denmark started giving advice and information about organic farming indicating that from 1987 and onwards, farmers organisations acknowledged organic farming methods and their importance (Thrane et al., 1999). Therefore, organic farmers had similar access to advisors, knowledge networks and information as their conventional colleagues.

In 2001, organic farms accounted for 6.6 per cent of Danish farms, equivalent to 3,532 farms cultivating 171,467 hectares (total cultivated agricultural area in Denmark is 2,659,000 hectares), and nearly half of the organic farms were dairy farms (Landbrug, 2002a; Landbrug, 2002b).

**Organic Certification**

In 1989, the Ministry of Food, Agriculture, and Fisheries introduced the “Ø-label” which is a State-controlled guaranteed organic symbol for marketing of organic products. The “Ø-label”
on food (pictured in Figure 2) signifies that the Danish authorities have carried out a survey on the farms and work places that produce, process, package or label the organic goods in Denmark (Fodevareministeriet, 2002a).

Source: Landbrugsraadet, 2002a

Figure 2
The Organic “Ø-label”

In 1991 the EU introduced common legislation for organic products of vegetable origin. Organic products of animal origin have been included since 1999. The legislation defines “organic agriculture” and standards for organic production and processing. The regulations associated with the “Ø-label” were from then set according to the Common EU legislation - although Danish rules still apply in a few areas, since Common EU legislation does not cover all aspects of organic activities (Fodevareministeriet, 2002c).

An EU-based organic label was introduced in 2000 based on the legislation of 1991. This label can be used instead or together with national Member State organic labels such as the “Ø-label”. However, the EU organic label has never really been implemented in any Member States because is does not have the same credibility in the market with consumers, so countries prefer their own national labels (Landbrugsraadet, 2002b).

3.3 Organic Dairy Production in Denmark

The organic agricultural sector in Denmark has developed considerably within the past 10-15 years and dairy farming has been the dominant part of this sector. By 1992, 122 dairy farms were producing 33 mega tonne (m.t.) of organic milk (0.75 per cent of the total 1992 dairy production of 4.405 m.t. milk). Organic yoghurts were launched in the same year which meant the Danish consumer then had a whole range of organic dairy products: milk, butter, cheese and yoghurts (Danish Dairy Board, 2002a).

The retail-chain-store “FDB” and the largest Danish dairy - Arla Foods - decided to collaborate in 1993 on lowering the retail prices of organic milk by 15-20 per cent. This resulted in a huge shift in demand towards organic liquid milk from 10,500 tonne in 1992/93 to 20,100 tonne in 1993/94, causing a shortage in supply of organic milk (Arla Foods 2002a, Arla Foods, 2002b).

Consequently Arla Foods raised the premiums paid to dairy farms for organic milk. Until 1994 the producer premium for organic raw milk was 40 per cent. From 1994 an additional premium of 15 per cent was given in the conversion period to increase incentives for dairy farmers to convert (Arla Foods, 2002a). This resulted in a rapid growth in the number of organic dairy farms, rising from 132 in 1993 to 344 farms in 1996 (Danish Dairy Board, 2002a). However, because a minimum of two years is required to convert from conventional to organic dairy farming, the full effect of the increase in organic dairy suppliers from 1994
and onwards did not show in production until 1996-1998. The additional 15 per cent premium for producers was removed again at the end of 1995 and the producer premium lowered from 40 per cent to 30 per cent as well\textsuperscript{1} (Arla Foods, 2002a).

Since 1996 there has been an imbalance between supply and demand of organic milk. The effect of lowering retail prices and increasing producer premiums caused supply to increase. Consequently only about 30-40 per cent of the organic milk was sold as organic products in 2001. The rest was used in production of conventional milk products such as yoghurt and cheese (Danish Dairy Board, 2002d).

The imbalance between organic dairy supply and demand is likely to be an example of a dynamic market with lagged adjustment – also known as the cobweb theory. The consumers’ organic demand is a function of present price, $p_t$, whereas farmers supply is a function of price in period $t-x$ where they make decision on a production plan. So

\[ D_t = a p_t + b \]
\[ S_t = a p_{t-x} + B \]

Since it takes a minimum of two years to convert a conventional dairy farm the lag ($x$) is at least this long.

Thus the reduction in retail prices for organic milk in 1993 increased demand and caused a lack of supply. Farmers/processors realized the lack, and with the rise in producer premium the number of farms converting to organic dairying also rose. This process of conversion took at least two to three years and resulted in oversupply.

Another reason for the imbalance between supply and demand of organic dairy products is that the Danish domestic market seems to have matured within the past few years. The organic products are now established products on the Danish market and recent research indicates a slowing in the growth rates in sales of organic products. Section 3.3 discusses this further (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001).

From 1997 the producer premium was once again lowered from 30 per cent to 20 per cent. However at the same time a “co responsibility-supplement” was introduced. This means that the organic farmer receives supplementary payment per kilogram of raw milk when 50-90 per cent of the organic milk is sold as organic products.

### 3.3.1 Production Economics of Denmark Organic Dairy Production

In Denmark dairy farms are less of a problem to convert to organic production than other farm types since the general trend in Danish dairy farms is towards free stall barns, which are easy

\textsuperscript{1} Whether the organic dairy retail premium (of around 20%) has been adequate to pay retail-chain-outlets as well as the dairy when the producer premium has been ranging between 40% (+15%) and 20% is uncertain. It is not possible to obtain information from the dairies – e.g., Arla Foods – on the earnings from organic dairy products. Not even co-operative owners have access to the information. Accounts have not been separated into a conventional and an organic part. However the official policy within Arla Foods has been to set organic producer premiums equal to additional earnings (in comparison with conventional products’ earnings) from selling organic dairy products (Arla Foods, 2002c).
to adjust to the standards set for organic dairy farming. This reduces conversion costs – and thereby also risk. The additional costs of using organic dairy farming methods are around 15-20 per cent, occurring because of a ten per cent reduction in the milk yield, less yield from production of roughage, and increased barn- and labour costs (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001).

By producing organic raw milk the farmer gets a producer premium of 20 per cent (plus possibly the supplementary payment mentioned above 3.2) compared to conventional milk (Landbrugets Raadgivningscenter, 2002c). The total amount of EU-subsidies received on average on organic dairy farms is around the same as received on conventional dairy farms (section 3.2.2 explains EU subsidies) (Landbrugets Raadgivningscenter, 2002a).

Research indicates the overall effect of the factors discussed results in similar average producer returns for organic and conventional dairy farmers. However, the range of producer returns is larger for organic dairy farmers than for their conventional colleagues (Landbrugets Raadgivningscenter, 2002a).

3.3.2 EU Subsidies

In the EU (and thus DK) subsidies are given for organic farming. It takes two years to convert and in this period the farmer receives DKK 450 (approx NZ$125) per hectare in conversion subsidy. In addition an organic subsidy of DKK 600 (approx NZ$167) per hectare is given for a five-year commitment period. At the end of each period the farmer has to reapply for the organic subsidy and commit to organic production for another five years (Table 4).

In 1998/99 direct subsidies accounted for ten per cent of organic dairy gross returns. For conventional dairy farmers the figure was 8.6 per cent (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001). Thus, the support for organic production in Denmark is significantly above that for other producers.

Pig and crop farmers get paid supplementary conversion subsidies to increase incentives for organic pork and crop production (the latter is important since there is a lack of organic feed within the EU) (Table 4). Policy makers have increased incentives for low intensity/organic production through the Agri-Environment Schemes (further information on these schemes is available in Lampkin (1999) and Whitby (1996).

<table>
<thead>
<tr>
<th>Subsidy</th>
<th>1998 (and onwards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Converting (2 years)</td>
<td>450 (NZ$125)</td>
</tr>
<tr>
<td>Organic-subsidy (5 years)</td>
<td>600 (NZ$167)</td>
</tr>
<tr>
<td>Reduced fertilization</td>
<td></td>
</tr>
<tr>
<td><strong>Supplementary conversion subsidy</strong></td>
<td></td>
</tr>
<tr>
<td>Crops (first two years)</td>
<td>2.000 (NZ$557)</td>
</tr>
<tr>
<td>Crops (third year)</td>
<td>1.200 (NZ$334)</td>
</tr>
<tr>
<td>Crops (fourth and fifth year)</td>
<td>500 (NZ$139)</td>
</tr>
<tr>
<td>Pigs (five years)</td>
<td>2.000 (NZ$559)</td>
</tr>
</tbody>
</table>


DKK 1 = NZ$ 3.59 (currency conversion 2002, September 19th)

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2 This is because arable land gets hectare-subsidies and, on average, conventional farmers have more arable land than their organic counterparts.

3 DKK 1 = NZ$ 3.59 (currency conversion 2002, September 19th)
3.3.3 Denmark Development in the Number of Organic Dairy Farms

Figure 3 illustrates the development in the number of organic dairy farms and the total organic milk production from these farms. This shows a huge rise – especially from 1995 and onwards - in production and number of organic farms. Production is still rising although the number of farms fell slightly from 2000 to 2001.

In 2001 Danish production of organic milk had a relatively large share of the market at around ten per cent of total production. In Germany the same figure is about 1.2 per cent and in Sweden 3.5 per cent (Danish Dairy Board, 2002).

Organic dairy farming is however still considered a niche production sector within the dairy industry, despite the enormous growth in organic raw milk production from 24 m.t. in 1990 to 451 m.t. in 2000, as conventional dairy farming produced 4,418 m.t. of milk in 2000 (Danish Dairy Board, 2002c).

Organic milk production can increase either through the conversion of dairy farms or the expansion of output on existing organic farms. Figures 3 and 4 (showing average milk production per organic dairy farm) shows that (except from 1992, 1997 and 1998) the increase in milk production has been larger than the increase in number of organic dairy farms. Therefore, the level of production on each farm has increased. This is a common effect of structural development. Within the Danish dairy sector in general the total number of producers is decreasing ten per cent annually. This is now happening within the organic dairy sector as well, and one of the reasons why almost no new conversions from conventional production have taken place over the last two and half years.

The first organic dairy farmers (until the beginning of the nineties) were pioneers that had to develop suitable organic production methods. Furthermore processing and distribution in the organic food chain had to be developed. All of this began on an experimental small-scale basis. After production methods were developed and described, and processing and distribution units were set up, more farmers became interested in organic dairy farming. The dairy factories introduced an economic incentive to convert by raising the organic milk premium (as described in Section 3.2), and structural development began. This resulted in more and larger scale production sites, development of retail distribution channels and thus benefits from economics of scale. Along with this, EU policy incentive schemes (Agri Environmental Schemes) were introduced, increasing incentives towards extensive/organic farming.

The five-year commitment period for receiving EU-subsidies means that the farmers who converted to organic production in the mid-1990s now face a decision of committing to organic farming for another five-year period or returning to conventional production. The risk of taking on an additional five-year period without knowing how market prices and EU regulations (subsidies and policy incentive schemes) are going to develop has made some farmers cease organic production (Danish Dairy Board, 2002d).
3.4 Consumption of Organic Products by Type

Overall, Denmark has one of the highest consumption rates of organic products in the world (Statens Jordbrugs- og Fiskeriøkonomiske Institut, 2001). Dairy products are dominant in the Danish organic retail sector, accounting for 45 per cent of total organic sales, followed by meat (13 per cent), bread (12 per cent) and eggs (eight per cent) (see Figure 5).
The domestic market share for organic products is shown in Figure 6. This shows how a quarter of all liquid milk consumed in Denmark is organic, which is quite extraordinary. Furthermore, organic oats, eggs and carrots have relatively large market shares.

Source: Arla Foods, 2002

**Figure 5**

**Percentage Weight of Total Organic Dairy Product Retail Sales**

Source: OrganicDenmark, 2002

**Figure 6**

**Domestic Market Share for Organic Products in Denmark**
The market for organic liquid milk has grown rapidly from three per cent of consumption in 1993 to nearly 26 per cent in 2001. Markets for processed organic dairy products such as cheese and butter are also developing but at a slower pace (Figure 7).

![Figure 7](image)

**Figure 7**

**Danish Domestic Market Share of Organic Dairy Products**

The Danish retail price premium of organic liquid milk is between 18-20 per cent but even so a large share of Danish consumers still buy organic instead of conventional liquid milk. This shows that is possible to have both a considerable organic premium (18-20 per cent) and a large market share (above 25 per cent). There are several explanations for the occurrence of such a market situation. The difference in conventional and organic liquid milk price may be insignificant when considering the proportion of liquid milk in relation to the total household expenditure. Another reason may be that organic liquid milk is easily accessible in the retail-chain stores, making it convenient for the Danish consumers to buy organic liquid milk if they prefer so. In addition, Danish retail-chain stores and dairies have continuously run marketing campaigns to promote organic products in general, as well as organic dairy products specifically.

Altogether this has meant that the market has expanded rapidly, and the trend line in Figure 7 indicates a possible maturing trend of the market only very recently. However, the Danish market is still growing and if demand in other markets behaves similarly to the Danish market in the future there will be enormous potential within organic dairy sales, even if markets start maturing before reaching a 25 per cent market share.

For the broad total range of processed organic milk products (as shown in Figure 6) production increased in the 1990s in response to development in the domestic market and also, very importantly, in the export markets. In 1999 the total amount of processed dairy products was 131.716 m.t.. This increased to 155.620 m.t. in 2001 – an increase of slightly more than 18 per cent. (Danish Dairy Board, 2002c).

---

4 October 14, 2002 retail price for one litre conventional whole milk was DKK 7.20 (NZ$ 2.02) and for one litre organic whole milk DKK 8.60 (NZ$ 2.42) (using currency conversion: NZ$ 1=DKK 3.59).
3.5 Trade: Denmark Agricultural Exports

Only one third of the total Danish agricultural production is sold on the domestic market (Landbrugsraadet, 2001a). The remaining production is exported, mainly to Germany, Japan and UK (Table 5), illustrating that exports are an important part of the Danish agricultural sector.

Table 5 Danish Agricultural Exports

<table>
<thead>
<tr>
<th>Country</th>
<th>Agricultural Export, January 2002 (DKK 1,000)</th>
<th>Country</th>
<th>Agricultural Export, January 2002 (DKK 1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>807,077</td>
<td>Norway</td>
<td>82,503</td>
</tr>
<tr>
<td>Japan</td>
<td>725,187</td>
<td>Finland</td>
<td>70,922</td>
</tr>
<tr>
<td>UK</td>
<td>630,541</td>
<td>Greece</td>
<td>66,833</td>
</tr>
<tr>
<td>Italy</td>
<td>310,339</td>
<td>Saudi Arabia</td>
<td>65,750</td>
</tr>
<tr>
<td>Sweden</td>
<td>276,591</td>
<td>South Korea</td>
<td>55,628</td>
</tr>
<tr>
<td>France</td>
<td>172,736</td>
<td>Belgium</td>
<td>27,492</td>
</tr>
<tr>
<td>USA</td>
<td>165,889</td>
<td>Hong Kong</td>
<td>26,084</td>
</tr>
<tr>
<td>Russia</td>
<td>113,362</td>
<td>Portugal</td>
<td>22,722</td>
</tr>
<tr>
<td>Spain</td>
<td>102,789</td>
<td>Ireland</td>
<td>17,136</td>
</tr>
<tr>
<td>Holland</td>
<td>99,050</td>
<td>Ostrich</td>
<td>14,684</td>
</tr>
</tbody>
</table>

Source: Landbrugsraadet, 2001b

DKK 1 = NZ$ 3.59 (currency conversion 2002, September 19th)

Pork is the biggest export, accounting for 35 per cent of total agricultural exports in 2000 however cheese is also an important export commodity (Landbrugsraadet, 2001a). Figure 9
shows how meat exports have grown over the last decade mainly due to pork exports rising, while dairy exports have increased slightly, and grain and other vegetable products have shown a small decline.

![Graph showing Danish Food Exports by Type](image)

Source: Danish Dairy Board, 2002d

**Figure 9**

Danish Food Exports by Type

### 3.5.1 Denmark Organic Exports

Danish organic exports are mainly dairy (especially cheese) accounting for 55 per cent of the total organic exports. This is followed by organic meat products – mainly pork – with 21 per cent of exports. Figure 10 shows the Danish organic exports in 2001 by type.
Because of a maturing trend in the Danish domestic market for organic dairy products, and expansion of production, organic producers/processors have been forced to look into export markets. According to a report from “Økologisk Landscenters Eksportafdeling”, growth in organic exports in 2001 is estimated to be around 30-40 per cent (Alt-om-okologi, 2002). Demand in the main export markets such as Germany, Sweden, UK and USA is still rising and those markets are still developing. Close markets such as Germany, UK and Sweden are of particular interest for Danish organic exports.

3.5.2 Denmark Dairy Exports (Conventional and Organic)

Exports of dairy products have been reasonably stable from 1990 to 2000, as illustrated in Table 6. Organic dairy exports are still a niche market compared to conventional exports. Organic dairy exports accounted for DKK122m (NZ$ 34 m) out of the total of DKK11,193m (NZ$ 3,118 m.) dairy exports in 2000. However organic dairy exports rose rapidly by 51 per cent to DKK184 m (NZ$51 m) from 2000 to 2001 (Danish Dairy Board, 2002d).

<table>
<thead>
<tr>
<th>Million (m.) DKK</th>
<th>1990</th>
<th>1996</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td>5,746 (NZ$1,601 m.)</td>
<td>6,463 (NZ$1,800 m.)</td>
<td>7,230 (NZ$2,014 m.)</td>
</tr>
<tr>
<td>Butter</td>
<td>1,414 (NZ$394 m.)</td>
<td>1,402 (NZ$391 m.)</td>
<td>1,252 (NZ$349 m.)</td>
</tr>
<tr>
<td>Preserved milk products</td>
<td>2,599 (NZ$724 m.)</td>
<td>2,809 (NZ$782 m.)</td>
<td>2,711 (NZ$755 m.)</td>
</tr>
<tr>
<td>Total</td>
<td>9,759 (NZ$2,718 m.)</td>
<td>10,674 (NZ$2,973 m.)</td>
<td>11,193 (NZ$3,118 m.)</td>
</tr>
</tbody>
</table>

Source: Landbrugsraadet 2001a
DKK 1 = NZ$ 3.59 (currency conversion 2002, September 19th)

The quantities of the main products exported within conventional and organic dairy production are shown below in Figure 11. Cheese is the single major product exported and export quantity has been reasonably stable over the past ten years. Whole milk powder (“WHP”) has decreased to nearly half whereas “other products” have gained. This gain is mainly due to the higher quantity of infant formula. Export quantities of milk and liquid milk
products, butter and “SMP” (skim milk powder) have been fairly stable seen over the ten year horizon.

![Graph showing export quantity of conventional and organic dairy products](image)

Source: Danish Dairy Board, 2002c

*Other products includes infant formula

**Figure 11**

Export Quantity of Conventional and Organic Dairy Products

Of the total amount of exported dairy products, the estimated export quantities of organic products for 2000 were: Cheese 1,000 tonne, cultural milk products 500 tonne, liquid milk 20 million litres and butter/other products 1,500 tonne. Therefore organic exports amounts are small compared to the conventional dairy exports. However, it is worth noticing that organic butter accounted for four per cent of total exports (2000 figures) (Danish Dairy Board, 2002d).

### 3.5.3 Trade Barriers to Organic Exports

At present Danish dairy processors experience barriers in accessing other countries’ organic markets. The main barriers are different certification/labelling and control systems, lack of supply, inefficient distribution channels and thus surplus costs.
It is of great importance that the consumers are able to identify the product as being organic – otherwise they are not prepared to pay an organic price premium. This means a well functioning and trustworthy control - and labelling system is essential (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001).

Standards, regulation and legislation within organic production and processing have not yet been completely harmonized within the EU, despite common legislation (Member States use the legal right to incur transitional periods for implementing the Common legislation). This is used as a technical trade barrier. In the short term, the Danish authorities can help Danish organic export companies overcome this by setting up bilateral agreements on organic standards. However this is not a feasible long-term solution (Danish Dairy Board, 2002d).

Another barrier to organic exports is surplus processing and distribution costs. These costs are a result of overall inefficiency because of costly processing, labelling and transportation when organic products are sold in relatively small amounts. As markets mature and production increases, the processing, labelling, transportation, sales and marketing become more efficient because of economies of scale. Consequently surplus processing and distribution costs cease (see Section 2.1).

Furthermore, limited supply of organic products in the retail chain stores where the consumers buy most of their food is also a barrier to setting up large-scale organic exports. In some countries organic products are mainly distributed through special shops in which the majority of consumers do not buy their goods. So the organic products simply do not reach the consumer. However this is changing as organic markets develop eg., in Sweden and UK where the majority of organic products are sold through retail chain stores (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001).

Domestically, Denmark has overcome many of the limitations above by ensuring credible standards, development of markets through retail outlet sales and thus reduced surplus costs (as described in Section 3.2.3). Consequently, the Danish organic market has developed into the third stage explained in Section 2.1 and Figure 1. This is partly the explanation for the relatively large proportion of domestic organic consumption in Denmark compared to other European countries. Thus whilst interest in organic products seems to be high in most other European countries, this demand cannot be met until the factors discussed above have been overcome (Statens Jordbrugs- og Fiskeriokonomiske Institut, 2001).

3.6 Conclusion

Therefore the Danish organic dairy sector has experienced rapid change with period of growth. The size of organic liquid/milk market is significant at 26 per cent even with premium of close to 20 per cent.
Chapter 4
The Organic Sector in New Zealand

4.1 Introduction

This chapter describes the development of the New Zealand (NZ) organic sector with particular emphasis on dairy production.

4.2 Development of Organic Production in NZ

Organic farming in NZ started as an idealistic movement in 1950-60s, consisting of a loose coalition of people with many different interests. However, in 1983 the coalition institutionalised itself by setting up New Zealand Biological Producers Council (BIOGRO), which from then on administrated production standards under the BIOGRO certification system (Saunders et al. 1997a). Successful aggressive targeting of organic products to niche exports markets in the 1990s attracted attention to NZ organic food products. Processors needed continuity in supply and started recruiting conventional farmers. However growth in supply has not been able to keep up with demand and this is a problem the organic industry has had to face (Saunders et al. 1999).

Organic horticulture (vegetable and kiwifruit production) is relatively well established within NZ. In 2001 approximately five per cent of the NZ kiwifruit crop was organic with the figure expected to reach 10 per cent by 2005 (Zespri Ltd., 2002). Organic livestock and arable farms, however are a relatively low proportion of their sectors (Ministry of Agriculture and Forestry, 2002a).

4.3 Production of Organic Dairy Products in NZ

Organic raw milk production is insignificant compared to total NZ milk production of 1,047 million kgs (Fonterra, 2002). In NZ in 2002 there were around 4,500 cows on organic farms, each producing 6,000 litres of organic milk, that is 27 million litres in total (not all of this is sold as organic milk though) (Mason, 2002).

Organic milk is mainly processed by local co-operative factories and sold as liquid milk or processed into cream, yoghurts, cheese and milk powder. At the moment virtually none of the organic dairy products are exported. Domestically in NZ, organic products are mainly distributed through retail-chain supermarkets. A large-scale production and processing of organic dairy focusing on domestic sales is taking place under the name “Simply organics”.

The industry giant Fonterra (which accounts for more then 95 per cent of total milk solids processed in NZ) has announced a ten per cent producer premium for organic raw milk in July 2002 and intends to start organic dairy processing and marketing by September 2002. Fonterra wishes to concentrate solely on the exports market and has identified 48 farms with the ability to meet organic standards within the next two years (Manhire, 2002; Fonterra, 2002).

The retail price premium within NZ for organic dairy products is considerable – especially for organic liquid milk. Table 7 shows a mark-up in 2001 of 51 per cent on organic liquid milk in retail stores.
Table 7
Retail Premiums for Some NZ Organic Dairy Products (2001, NZ$)

<table>
<thead>
<tr>
<th>Product</th>
<th>Certification</th>
<th>Organic Retail Price</th>
<th>Conventional Retail price</th>
<th>% premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO Farm Organic Milk</td>
<td>BIOGRO</td>
<td>2.65</td>
<td>1.75</td>
<td>51</td>
</tr>
<tr>
<td>(1L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO Farm Natural Yoghurt</td>
<td>BIOGRO</td>
<td>3.91</td>
<td>3.16</td>
<td>23</td>
</tr>
<tr>
<td>(500 gm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclops Sour Cream</td>
<td>BIOGRO</td>
<td>2.18</td>
<td>1.76</td>
<td>23</td>
</tr>
<tr>
<td>(250 gm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BIOGRO, 2002b

4.3.1 Production Economics within NZ Organic Dairy Farming

On average, NZ organic producers seem to perform as well as conventional producers. However the range of returns tends to be greater for organic farmers, as experienced in other countries (Saunders et al. 1997a). However, as organic dairy farms are few in NZ, data is limited.

Conversion of a dairy operation to organics requires only relatively small changes compared to other farming systems and hence has a relatively small impact on production levels. This exposes dairy producers to relatively lower risk during both the conversion period and when fully certified. However critical factors to conversion are animal health (particularly mastitis control) and maintaining nutrient fertility. A MAF industry workshop identified a need for understanding more about mastitis control and how biological activity of the soil can be improved using organic production methods (Ministry of Agriculture and Forestry, 2002a).

The 2002 MAF study on costs and risks of conversion to organic production systems provides assumptions for conversion to organic production. It is based on an average property of 83 effective hectares, wintering 220 cows and producing 62.250 kg milk solids (MS) (Ministry of Agriculture and Forestry, 2002). Table 8 shows that for organic farms, MS production tends to be around seven per cent lower, farms gross farm revenue around five per cent smaller, but also cash farm expenditure nearly nine per cent lower.

Table 8
Cash Farm Expenditure, Milk Solids and Gross Farm Revenue for Conventional and Organic Farm Systems

<table>
<thead>
<tr>
<th></th>
<th>MAF (conventional) model</th>
<th>Organic model</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk solids (MS)</td>
<td>68500 kg (825 kg/ha)</td>
<td>63,200 kg (761 kg/ha)</td>
<td>-7</td>
</tr>
<tr>
<td>Cash farm expenditure</td>
<td>$193,815 ($2,335/ha)</td>
<td>$176,395 ($3,903/ha)</td>
<td>-9</td>
</tr>
<tr>
<td>Gross farm revenue</td>
<td>$341,380 ($4,113/ha)</td>
<td>$323,960 ($3,903/ha)</td>
<td>-5</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture and Forestry, 2002b

A Masters thesis study of returns for organic dairy farms shows slightly different figures (Table 9). Here MS production is ten per cent lower per hectare on organic farms, however gross margins tend to be higher due to lower production costs (fertilizer and animal health costs decrease on organically managed dairy farms) (Bauer-Eden, 1999).
Table 9
Range per Hectare of Milk Production and Gross Margin

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk production kg MS/ha</td>
<td>630-1,060</td>
<td>580-950</td>
</tr>
<tr>
<td>Milk and stock income $/ha</td>
<td>2,347-4,108</td>
<td>2,346-3,692</td>
</tr>
<tr>
<td>Variable costs $/ha</td>
<td>934-1,211</td>
<td>433-728</td>
</tr>
<tr>
<td>Gross margin/ha</td>
<td>1,414-2,954</td>
<td>1,913-2,964</td>
</tr>
</tbody>
</table>

Source: Bauer-Eden, 1999

However, the general consensus is MS yield only reduces by around five per cent when converting to organic dairy production (Manhire, 2002).

To summarize, the overall effect of converting from conventional to organic dairy production reduces milk yield by five-ten per cent, affecting costs per unit MS and revenue. This bundle of effects can be interpreted as an upward-shift in the supply curve for organic dairy production in relation to conventional production.

4.3.2 NZ Constraints for Conversion

There are several possible reasons why NZ dairy production is still in the first stage of development and has not experienced significant conversion towards organics. Constraints have been identified within several components of the food chain.

Organisational Constraints
An organisational constraint in the past has been the lack of knowledge about the organic dairy sector and potential for development of this sector. Furthermore, organic and agricultural processing, marketing and export organisations are very concentrated in NZ. Consequently, full support from these organisations is a necessity in order to expand organic (dairy) production. This support may not have been present so far (Appendix 1 explains the structure of NZ exports chain and Organic Products Exporters of NZ).

Industry Constraints
The lack of processing and marketing capability has been identified by producers, contractors, consultants and agribusiness researchers within NZ as the single biggest factor limiting the growth of the organic dairy sector (Ministry of Agriculture and Forestry, 2002a).

The conventional dairy industry has been able to successfully market and sell their products – both on the domestic and in particular exports markets – resulting in reasonable returns. This may have made it less compelling to diversify the industry by, for example, introducing an organic product range. Furthermore, dairy processing plants are set up on a large scale, which means incurrence of substantial surplus costs if a small amount of organic milk is to be processed in between large amounts of conventional milk. Shifting from processing of conventional to organic milk implies a stop in processing to clean the plant and thereby hindering efficient processing. This industry lack of organic processing capability in existing plants has meant some farmers have had to sell organic raw milk production as conventional, reducing incentives for others to convert (Manhire, 2002).

Large dairy plants and small amounts of organic milk is a main reason why Fonterra’s organic producer premium is not set higher than ten per cent. Some of the price-premiums from the processed organic milk are used to cover the surplus costs. However, the producer premium
for organic milk might actually increase as numbers and production scale of organic dairy farming increases (Manhire, 2002).

**Producer Constraints**

As an organic (dairy) producer, good management is important in order to achieve returns. It is crucial to be forward looking, a good planner and have other reaction patterns than conventional farmers. This is because one of the risks of organic production is that if unforeseen circumstances occur there are limited allowable responses if the organic status is to be maintained. However, within organic dairy farming there is a lack of advisors, knowledge networks and subsequently access to information at farmer level. Consequently organic (dairy) farmers do not have the same extent of knowledge and management infrastructure available as their conventional colleagues, and gaining knowledge on production methods etc. to minimize risk within the farm operation becomes more difficult, time consuming and expensive (Ministry of Agriculture and Forestry, 2002a).

Thus a better industry/organisational support and information is required if more dairy producers are to convert (Ministry of Agriculture and Forestry, 2002a).

Altogether organisational, industrial and producer constraints increase the uncertainty an organic dairy farmer has to face compared to a conventional colleague, reducing producer incentives to convert into organic dairy production Figure 12.

![Constraints Against Organic Dairy Conversion](image)

**Figure 12**

**Constraints Against Organic Dairy Conversion.**

**4.4 Trade: NZ Agricultural Exports**

Over 90 per cent of NZ agricultural products are exported but only a small proportion of these are organic as shown in Figure 13.
The dairy sector is currently the single largest export earner in NZ, with around 90-95 per cent of the total production of 1.5 million tonnes of dairy produce being exported. In the year ended June 2000, earnings from dairy exports were NZ$ 4.778 million – accounting for almost 30 per cent of NZ’s total non-tourism exports. NZ accounts for 31 per cent of dairy products traded on world markets (in comparison the EU accounts for 38 per cent and Australia for 12 per cent). Excluding intra-EU trade, NZ is the largest exporter of butter, and second largest exporter of skim-, whole milk powder and cheese (Ministry for the Environment, 2001).

The main product groups manufactured by NZ dairies are whole milk powder (contributing 32 per cent of total dairy export revenue in 1999), cheese (25 per cent), butter (25 per cent) and skimmilk (15 per cent). Development in export value of these product groups during the 1990s is shown in Figure 14.
The US, the UK (EU) and Japan are NZ’s predominant trade partners, with the UK (and the EU) being NZ’s most valuable market for butter. Primary markets for casein and cheese are the US, Japan and the EU. Milk powder is mainly exported to Central/South American and South East Asian markets. The major export markets for NZ dairy products are shown in Table 10.

**Figure 14**
NZ Dairy Exports by Value

**Table 10**
Major Export Markets for NZ Dairy Products for the Year Ended June 2002

<table>
<thead>
<tr>
<th>Market</th>
<th>% of total dairy products exported to market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>5</td>
</tr>
<tr>
<td>Korea</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>8</td>
</tr>
<tr>
<td>UK</td>
<td>6</td>
</tr>
<tr>
<td>US</td>
<td>15</td>
</tr>
<tr>
<td>Other Asia</td>
<td>31</td>
</tr>
<tr>
<td>Other Europe</td>
<td>9</td>
</tr>
<tr>
<td>Other Countries</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Ministry for the Environment, 2001

### 4.4.1 NZ Organic Exports

Organic exports have grown considerably from NZ$12m in 1997 to NZ$70m in 2001, but this is still insignificant compared to total NZ exports. In 2001, domestic sales are estimated to be between NZ$50-70m (Figure 15) (BIOGRO, 2002a). This implies that around half of the NZ organic production is sold on the domestic market. OPENZ predicts organic exports sales to rise to NZ$500m by 2005 (OPENZ, 2002c).
Fresh fruit (kiwifruit, apples etc.) account for 71 per cent of total NZ organic exports with processed food accounting for 14 per cent and meat/wool 7 per cent (Figure 16).

The main export markets for New Zealand organic products are Europe and Japan, with the US and Australian markets developing quickly (Figure 17). The main processors to export are Heinz-Wattie New Zealand (WFF) and Zespri International Ltd (NZKMB), covering markets of peas, potatoes, sweet corn, beans and carrots and kiwifruit.
Demand for organic products on the Japanese market increased at an annual rate of 20 per cent from the mid 1980s, and Japan is one of the important organic exports markets for NZ (Saunders et al. 1997). Domestic Japanese organic production is small, creating opportunities for New Zealand organic exporters. However, Japanese customers are very concerned with food safety and the origin of the products, making the establishment of the Japanese market a long-term process.

Europe is one of New Zealand’s traditional export markets for agricultural products in general, and has also become an important organic export market. However, development of organic farming in Europe is rapid and mainly driven by policy rather than market signals, making Europe one of NZ’s most dominant competitors within organic production.

The US has significant potential as an organic export market. The American consumers have increased their awareness of food safety and quality and thereby increased interest in organic products. Furthermore Australia is another potential export market and competitor. However Australian organic production is not very developed yet and export promotion has not been as aggressive as in New Zealand (Saunders et al. 1997; OPENZ, 2002b; OPENZ, 2002c).

4.4.2 NZ Organic Certification

NZ has three organic certifiers: BIOGRO, AgriQuality and Demeter (all members of OPENZ), in contrast to DK with only one national certification standard.

BIOGRO is one of 17 IFOAM accredited certifiers. It takes three years to convert under the BIOGRO system. The majority of NZ exporters (under OPENZ) have chosen to use BIOGRO standards for certification of their organic products (BIOGRO, 2002a). The number of BIOGRO licenses has increased from 89 in 1988 to 289 in 1997. About 25 of the certifications within BIOGRO were dairy producers in 2002 (Mason, 2002).

AgriQuality is a state-owned enterprise (formerly part of MAF Quality Management) that has been providing certification through its certification business CERTENZ since 2000.
CERTENZ is based on Codex Alinorm 99/22, EU Regulations and Australian National Standard. It has ISO 65 accreditation and is currently under approval for the IFOAM standards (AgriQuality, 2002a; Manhire, 2002). It takes two years to convert production systems the same time horizon as within the EU (Manhire, 2002).

CERTENZ and BIOGRO are competing certification systems. Both BIOGRO and CERTENZ were accepted for organic exports to the European Union (EU) and rewarded with a “third country listing” in 2002. This will simplify access for organic products exported to the EU and avoid the need for NZ exporters to obtain import licenses from individual states within the EU (OPENZ, 2002).

Demeter is a worldwide certification system, used to verify to the consumer that the product has been produced by biodynamic methods. The Bio Dynamic Association is the certifier in NZ. Biodynamics is a holistic approach to organic agriculture (OPENZ, 2002a).

Table 11 shows division between BIOGRO, CERTENZ and Demeter certified organic land in New Zealand.

<table>
<thead>
<tr>
<th></th>
<th>Hectares/Year</th>
<th>2001</th>
<th>1999 est.</th>
<th>1998</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOGRO</td>
<td>31,185</td>
<td>14,000</td>
<td>10,694</td>
<td>8,860</td>
<td></td>
</tr>
<tr>
<td>CERTENZ</td>
<td>13,184</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Demeter</td>
<td>2,155</td>
<td>2,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46,525</td>
<td>16,500</td>
<td>10,694</td>
<td>7,359</td>
<td></td>
</tr>
</tbody>
</table>

Source: AgriQuality, 2002a; Saunders et al. 1997a

4.5 NZ Public/Governmental Influence

Unlike within the EU, the New Zealand government does not have incentive policies to increase organic/low input production. Instead it aims to minimize institutional barriers in the market and promote open markets with clear market signals. To some extent research grants are awarded through the “Sustainable Farming Fund” and other sources to fund research within e.g. organic farming production and processing (Manhire, 2002).

4.6 Comparison of Organic Food Industries (NZ and Denmark)

Table 12 describes a brief overview of some key characteristics for country and farming in NZ and DK. NZ and DK both have a strong agricultural base. Population-wise, DK is slightly larger than NZ, however NZ land area is significantly greater than DK. DK’s GDP is significantly higher than NZ’s, but the GDP composition by sector is similar for NZ and DK.

DK, with emphasis on organic dairy production, has a larger organic land area than NZ, where the main organic sectors are kiwifruit and vegetables. DK’s organic production is mainly directed towards the domestic market, which is very developed. NZ organic production is mainly directed towards exports.

DK organics have been influenced by policies and have one main standard, whereas the NZ organic development is market driven with three competing standards.
Table 12
Comparison of Organic Food Industries in NZ and Denmark

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>New Zealand</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>3.8 million</td>
<td>5.3 million</td>
</tr>
<tr>
<td>Land area</td>
<td>268.670 sq km</td>
<td>42.394 sq km</td>
</tr>
<tr>
<td>GDP (2000)</td>
<td>$67.6 billion</td>
<td>$136.2 billion</td>
</tr>
<tr>
<td>GDP composition by sector</td>
<td>Farm (8%), industry (23%), services (69%) (1999)</td>
<td>Farm (3%), industry (25%), services (72%) (2000)</td>
</tr>
<tr>
<td>Arable land, permanent crop and pastures</td>
<td>64%</td>
<td>65%</td>
</tr>
<tr>
<td>Agricultural base</td>
<td>Strong</td>
<td>Strong</td>
</tr>
<tr>
<td>Organic support from government (stimulation)</td>
<td>No support (market driven)</td>
<td>Supported/subsidized (policy driven)</td>
</tr>
<tr>
<td>Total organic land area</td>
<td>46.525 ha (2001)</td>
<td>180.000 ha (2002)</td>
</tr>
<tr>
<td>Main organic sector</td>
<td>Kiwifruit and vegetables</td>
<td>Dairy</td>
</tr>
<tr>
<td>Organic export</td>
<td>Export dominated (estimate: 58% of total sales in 2001)</td>
<td>Limited exports (10% of total organic production in 2001)</td>
</tr>
<tr>
<td>Organic domestic consumption</td>
<td>Weak (1st stage of development)</td>
<td>Strong (3rd stage of development)</td>
</tr>
<tr>
<td>Organic dairy sector</td>
<td>Weak (1st stage of development)</td>
<td>Strong (10% of total production) (3rd stage of development)</td>
</tr>
<tr>
<td>Organic (dairy) farm advisors, knowledge networks and access to organic (dairy) research information</td>
<td>Limited</td>
<td>Well established through farms extension services</td>
</tr>
</tbody>
</table>

Source: AgriQuality, 2002a; Landbrug, 2002; Theodora, 2002

4.7 Conclusion

Therefore, NZ has also experienced growth in organic food sectors. However, this has been mainly export led and has not included the dairy sector.
Chapter 5
Analysis of the Impact on NZ of Various Scenarios Relating to Changes in the Organic Dairy Sector

5.1 Introduction
This section introduces the model used in this report to simulate impact on NZ of various scenarios relating to the development of the organic dairy sector.

5.2 LTEM Empirical Model

The empirical model, Lincoln Trade and Environment Model (LTEM), has a multi-country, multi-commodity setting, which focuses on the agricultural sector in a partial equilibrium framework. The framework is used to analyse the impact on price, demand, supply and net trade levels of various scenarios relating to organic and conventional production. These include introducing shifts in consumer preference for organic dairy products, and shifts in supply when converting to organic dairy production. Of particular interest is the impact on the development in NZ organic dairy producer returns from these scenarios.

LTEM is a price equilibrium, non-spatial model and the commodities in LTEM are considered to be homogeneous with respect to the country of origin and destination and to the physical characteristics of the product. Therefore commodities are perfect substitutes in consumption in international markets. The exception is the ability to separate out organic and conventional production. Importers and exporters are assumed to be indifferent about their trade partners. Based on this, the model is built as a non-spatial type which emphasizes the net trade of commodities in each region. However, the supply and demand shares of countries in trade can be traced.

LTEM is a dynamic framework since it provides the time paths of endogenous variables within a short to medium-term time horizon. LTEM allows the application of various domestic and border policies to be modelled explicitly, such as production quotas, set-aside policies, input and/or output related producer subsidies/taxes, consumer subsidies/taxes, minimum prices, import tariffs and quotas, export subsidies and taxes. Basically, the model works by simulating the commodity based world market clearing price on the domestic quantities and prices, which may or may not be under the effect of policy changes, in each country. Excess domestic supply or demand in each country spills over onto the world market to determine world prices. The world market-clearing price is determined at the level that equilibrates the total excess demand and supply of each commodity in the world market by using a non-linear optimisation algorithm. The general equation structure of each commodity at country level in LTEM is represented by eight behavioral equations and one economic identity as the in the equations 1 to 9.

\[
\begin{align*}
pt_{ij} &= f(WDpt_i, ex_j) \quad (1) \\
pp_{ij} &= g(pt_{ij}, Zsp_j) \quad (2) \\
p_{cij} &= h(pt_{ij}, Zdp_j) \quad (3) \\
qs_{ij} &= l(pp_{ij}, pp_{ijk}, pp_{ij}, org, ssft_{ij}, Zsq_j) \quad (4) \\
qd_{ij, fo} &= m(pc_{ij}, pc_{ijk}, pp_{ij}, org, dsft_{ij, fo}, pinc_j, pop_m) \quad (5) \\
qd_{ij, fe} &= m'(pc_{ij}, pc_{ijk}, pp_{ij}, org, pp_{dairy, j}, dsft_{ij, fe}) \quad (6) \\
qd_{ij, pr} &= m''(pc_{ij}, pc_{ijk}) \quad (7) \\
qst_{ij} &= n(qs_{ij}, pc_{ij}, ssft_{ij}) \quad (8) \\
qt_{ij} &= qs_{ij} - (qd_{ij, fo} + qd_{ij, fe} + qd_{ij, pr}) - \Delta qst_{ij} \quad (9)
\end{align*}
\]
The trade price ($pt$) of a commodity ($i$) in country ($j$) is determined as a function of world market price ($WDpt_i$) of that commodity and the exchange rate ($ex_j$). The total effect of the world market price on the trade price of the country is determined by the price transmission elasticity.

Domestic producer ($pp_{ij}$) and consumer ($pc_{ij}$) prices are defined as functions of commodity $i$’s trade price, the commodity specific production and consumption related domestic support/subsidy policies and tariffs ($Z_{spj}$ and $Z_{dpj}$).

The domestic supply and demand equations are specified as constant elasticity functions that incorporate both the own and cross-price effects.

Supply ($qs_{ij}$) is specified as a function of producer prices of the own ($pp_{ij}$), other substitute and complementary ($pp_{ijk}$) commodities and a supply shifter ($ssft_{ij}$), which represents economic factors that may cause shifts in supply. In addition, a policy variable ($Z_j$) reflects production related policies/tariffs and the supply equation is specified to include the cross-price ($pp_{ij, org}$) effect of conventional and organic products on each other.

The dairy sector is modelled as five commodities; raw milk is defined as the farm gate product and then allocated to the liquid milk, butter, cheese, whole- and skim milk powder markets depending upon their relative prices subject to physical constraints. The domestic supply of raw milk is specified as a function of producer price for raw milk, beef (as a gross substitute) and consumer prices of feed inputs such as grains, oilseeds and oil meals. Thus domestic supply of dairy products (liquid milk, butter, cheese, whole- and skim milk powder) is determined from the raw milk production, which reflects the physical constraint on processed dairy production and producer prices of various dairy products.

Total demand is separated into food ($qd_{ij, fo}$), feed ($qd_{ij, fe}$) and processing industry ($qd_{ij, pr}$) demand.

Food demand ($qd_{ij, fo}$) is specified as a function of consumer prices of own ($pc_{ij}$), other substitute and complementary ($pc_{ijk}$) commodities and a demand shifter ($dsft_{ij, fo}$), representing economic factors that may cause shifts. Furthermore a per capita real income ($pinc_j$) variable in the economy and growth in population ($pop_{m}$) are included. Feed demand ($qd_{ij, fe}$) is defined as a function of $pc_{ij}$ and $pc_{ijk}$, the extent of dairy production ($qp_{dairy, j}$) and a demand shifter ($dsft_{ij, fe}$). Processing industry demand ($qd_{ij, pr}$) is defined as a function of $pc_{ij}$ and $pc_{ijk}$. In addition, food and feed demand functions also incorporate cross-price effects of conventional and organic products on each other.

Concerning the dairy sector, raw milk is consumed and exhausted in various forms of dairy products, and consequently the domestic demand for raw milk is not modelled in LTEM, instead the demand for dairy products are modelled endogenously at country level. The domestic demand for liquid milk is defined as a function of consumer prices of the own, substitute and complementary commodities, per capita income and population growth rate. The stocks ($qst_{ij}$) are determined as a function of quantity supplied ($qs_{ij}$), consumer price ($pc_{ij}$) and a stock shifter ($stsft_{ij}$). There is no stock demand for raw and liquid milk. It is assumed that raw milk is stocked in the form of butter, cheese and/or milk powder.

Finally net trade ($qt_{ij}$) of the country ($j$) in commodity ($i$) is determined as the difference between (domestic) supply and sum of (domestic) demand components and stock changes in the related year. Since it is assumed that all produced raw milk is utilized in the form of processed products, raw milk is not traded in LTEM.
LTEM is a synthetic model since the parameters are adopted from studies in the literature. The model works by simulating the commodity based world market clearing price on domestic quantities and prices in each country. The world market-clearing price is determined at the level which equilibrates the total demand and supply of each commodity in the world market. LTEM can capture the disequilibrium situations in the economy that may result from temporary shortages or excess supply situations by allowing the determination of stock levels endogenously. The interdependencies between primary and processed products and/or between substitutes are reflected by cross-price elasticities. The model is used to quantify the price, supply, demand and net trade effects of various policy changes. From this producer returns can be calculated.

The regional coverage of the LTEM is specified as seven countries plus the European Union (as a single “country”) and one additional region (rest of the world). Fourteen products are included but these are differentiated into conventional and organic components and each is dealt with as a different product, effectively meaning twenty-eight different products are modelled (see Appendix 3 for a complete list of products and countries). The model is calibrated to year 1997 and short- to medium-run simulations are carried out up to 2010.

LTEM works by simulating the commodity based world market clearing price on the domestic quantities and prices, which may or may not be under the effect of policy changes, in each country. Excess domestic supply or demand in each country spills over onto the world market to determine world prices. The world market-clearing price is determined at the level that equilibrates the total excess demand and supply of each commodity in the world market by using a non-linear optimization algorithm.

5.3 Empirical Analysis

LTEM shows the impact on trade, prices, output and thus producer returns for certain key agricultural commodities from running various scenarios in the model associated with conventional and organic products. The scenarios estimate the impact on NZ dairy producer returns given different assumptions relating to market developments for conventional and organic commodities. These include:

- Shifts in consumer preferences towards organic dairy produce revealed by consumer willingness to pay a premium for organic dairy produce. The shifts in preferences are incorporated through the use of exogenous shifts in intermediate and final demand.
- Shifts in supply curve incurred by increase in production costs as a consequence of reduction in the quantity of raw milk produced when increasing the share of organic dairy production.

This is tested against assumptions relating to the proportions of organic consumption and production share in New Zealand (NZ) and its three most important trade partners within organics; United States (US), European Union (EU) and Japan (JP). No changes in other countries in the LTEM-model were simulated.

The scenarios were developed to reflect expectations for developments in organic dairy production on the basis of the Danish experience and development within organics worldwide (as reviewed in the previous sections).

The results from the scenarios are intended to assess factors that may affect NZ farmers and so estimate the potential risks and benefits for NZ farmers converting to organic dairy production. These scenarios reflect both the most likely outcomes of given market development, but also some extremes to determine high risk and benefit possibilities.
The scenarios are based upon varying four factors relating to the organic market as follows:

a) **Shift in consumer preference towards organic dairy produce.**

   Increased consumer preference towards organic food produce implies willingness to pay an organic food premium. As described in section 2.1, price premiums on organic products in general vary a lot but a majority of the premiums are within a 10-30 per cent “boundary”. Furthermore, Fonterra has announced a 10 per cent producer premium for organic raw milk (section 4.1).

   Thus four levels of price premiums were used in the model:
   - 0 per cent to reflect a situation where organic milk does not attract a premium
   - 10 per cent to reflect the Fonterra premium to producers
   - 20 per cent to reflect the premium in the Danish market
   - 30 per cent to reflect the higher premium, which is closer to the current NZ market premium

b) **Shifts in supply curve due to increase in production costs with organic milk production.**

   In general, converting from conventional to organic dairy production results in a decrease in production which is equivalent to a shift in the supply curve. The impact on NZ dairy production of converting to organics is discussed in section 4.1.1, and section 3.2.1 describes the reduction in output within the Danish organic dairy sector. Danish dairy farming is comparable with other European countries, US and JP because of the type of production methods used and intensity of production; whereas NZ dairy production is more extensive.

   Thus the most realistic scenario is:
   - A 5 per cent increase in production costs in NZ production and 10 per cent increase in EU, US and JP.

   In addition, to assess the range of risks to NZ producers relative to those in other countries, 3 further scenarios were assumed:
   - A zero change in producer costs in NZ, EU, US and JP
   - 30 per cent increase in NZ production costs relative to 10 per cent increase in EU, US and JP.
   - An extreme scenario of 30 per cent increases in production costs in NZ, EU, US and JP.

c) **Organic market share in New Zealand, United States, EU and Japan**

   Table 1 in section 2.1 describes percentage organic retail shares and shows that European markets such as UK, Germany and Italy have organic retail shares between 0.3 per cent and 1.2 per cent (with higher shares in Austria, Sweden and Denmark). It also shows US and JP have a share of 1 per cent. However this data is for the period 1997-99 and since then organic markets have experienced rapid annual growth, implying higher organic consumption shares than stated above. The extent of organic consumption also varies significantly between different categories of organic produce. Figure 7 (section 3.3) illustrates that the market share for organic liquid milk in DK was 25.9 per cent in 2001 with the market share for cultural milk products being 7 per cent and 4.5 per cent for cheese/butter.

   As indicated in chapter 4, the NZ market for organic produce is not as developed as the US, EU and JP markets. No exact empirical data exists for the percentage of organic
Thus organic consumption rate was modelled at two levels;  
- 1 per cent in NZ and 2 per cent in US, EU and JP for the period 1997-2010  
- 2 per cent in NZ and 5 per cent in US, EU and JP for the period 1997-2010.

Taking the Danish experience within organic consumption into account, these levels are very low and set conservatively, implying that future development in organic consumption rate is most likely to increase above the levels modelled. Hence results of the modelling can be interpreted as a minimum achievable producer return for NZ organic dairy sector.

d) Organic dairy production level in New Zealand, United States, EU and Japan

According to “Stiftung Okologie & Landbau, 2002” 2 per cent of the total agricultural production in Europe is organic. Section 3.2.3 describes how the share of organic dairy production out of total production accounts for 12 per cent in Austria, 10 per cent in Denmark, 3.5 per cent in Sweden and 1.2 per cent in Germany. In modelling organic dairy production of total dairy production, it was conservatively assumed to be 2 per cent for the EU.

“Stiftung Okologie & Landbau, 2002” also states US organic production to be above 1 per cent of total production and experiencing rapid growth. Subsequently percentage organic dairy production of total dairy production was set at 2 per cent for the US.

“Asian Institute of Technology, 2002” states that alternative agriculture in Japan accounts for 1 per cent of total production. This includes different kinds of alternative agricultural production – not only “mainstream” organic production. JP organic dairy production was set at 1 per cent.

NZ organic dairy production is not significant. However, provided the current constraints to conversion discussed in section 4.12 are removed by e.g. organisational- and industry commitment (as seen from Fonterra recently, see section 4.1), it is expected that NZ organic dairy production can reach a level of 2 per cent of total production relatively easily. However, learning from the Danish experience within organic dairy production (described in section 3), it is likely NZ organic dairy production will expand beyond that.

Thus four percentage levels of NZ organic dairy production out of total NZ dairy production were used:
- 0.05 per cent NZ organic dairy production
- 2 per cent NZ organic dairy production
- 6 per cent NZ organic dairy production
- 10 per cent NZ organic dairy production

These levels of NZ organic dairy production are set conservatively, given the fact that DK is already producing 10 per cent organic milk level and Austria 12 per cent. Thus results on NZ organic dairy producer returns presented below are seen as conservative estimates of possible future development.

Thus in total 32 different scenarios were run.

---

5 In the modelling organic dairy feed production (such as grain and oilseed meals) was assumed to be produced at the same percentage share as organic dairy production in order to ensure sufficient organic feed supplies.
The scenarios were modelled with the base year 1997, up till 2010. This report presents the 2010 model results by showing the overall effect on organic producer returns in NZ (unless otherwise stated). The first section defines a “benchmark scenario”. The next section looks at the relative impact on the NZ organic dairy sector from shifts in supply (compared with conventional production), along with different levels of consumer preferences for organic dairy produce (i.e. premiums). This is followed by the relative impact on the NZ organic dairy sector from different levels of NZ organic dairy production, and finally the impact from different levels of preferences for organic dairy produce. Data for the figures is listed in appendix 5.

On the basis of the empirical data presented in the chapters 2, 3 and 4, and according to the paragraphs above, a “benchmark scenario” was defined. The “benchmark scenario” is used as a comparison to other scenarios and seen as a realistic definition of the organic dairy sector with regards to a shift in supply curve and extent of organic dairy production within the next couple of years, provided NZ gets production started. However, extremely conservative levels for organic consumer premium and market share are applied in the benchmark scenario. This means that this scenario indicates an absolute minimum for expected future organic producer returns in NZ.

In the “benchmark scenario”:
1. 10 per cent shift in consumer preference towards buying organic dairy produce in NZ, US, EU and JP i.e. 10 per cent premium.
2. 5 per cent shift in supply curve for organic dairy production in 5 per cent for NZ. 10 per cent shift for US, EU and JP.
3. Organic market share is 1 per cent for NZ and 2 per cent for US, EU and JP
4. Organic dairy – and dairy feed – production accounts for 2 per cent of total dairy production in NZ, US and EU and for 1 per cent in JP

This benchmark scenario results in NZ producer returns from organic dairy production of US$ 95.756 in 2010.

Figure 18 illustrates NZ organic dairy producer returns of different supply shifts alongside different levels of consumer premiums for organic dairy produce. Assumptions behind the figure are organic dairy/dairy feed production of 2 per cent in NZ, US, EU and 1 per cent in JP along with organic consumption of 1 per cent in NZ and 2 per cent in US, EU and JP.

Figure 18 shows whatever price premiums result in the highest returns for NZ occur where it is assumed NZ, US, EU and JP have a 30 per cent shift in supply. However, a realistic 5 per cent shift for NZ along with a 10 per cent shift for US, EU and JP results in only slightly lower organic producer returns. Assuming, albeit unrealistically, that NZ has a 30 per cent shift in supply and US, EU and JP a 10 per cent shift, results in significantly lower NZ producer returns, as expected.
Comparing a zero per cent shift in supply to a 5 per cent shift for NZ with a 10 per cent shift in US, EU and JP, creates NZ producer return increases of between 6.26 per cent and 6.36 per cent depending on the consumer premium.

An assumed 30 per cent shift in supply for NZ, US, EU and JP results in a small increase in NZ producer returns. NZ dairy production is less intensive than the US, EU and JP, making a 30 per cent shift in supply less significant to NZ than to US, EU and JP.

The effect on producer returns of shifts in supply may also reflect an inelastic demand for organic dairy products. Shifts in the supply curve from increasing cost (i.e. reduction in milk yield) still result in larger producer returns (see figure 19). This is concluded since producer returns develop in the same way for all countries in LTEM when shifting the supply curve.
Naturally, the level of organic dairy production has a very significant effect on producer returns, as shown in figure 20. The figure shows that no matter what the level of consumer preference for organic dairy produce is, there is a consistent increase in producer returns as the extent of organic dairy production increases. Assuming conservative organic consumption rates of 2 per cent in US, EU and JP and 1 per cent for NZ, sufficient demand for a NZ organic dairy production of up to 10 per cent of total production, appears to be created – and possibly even more than this.

Rising NZ organic dairy production from 0.05 per cent to 2 per cent results in a significant increase in NZ organic producer returns of 317-399 per cent (depending on the level of producer premium). Rising NZ production from 2 per cent to 6 per cent results in an increase in NZ organic producer returns of 172-178 per cent. Rising NZ production from 6 per cent to 10 per cent results in a slightly less but still significant increase of between 61-65 per cent.

![Figure 20](image_url)

**Figure 20**
**Level of NZ Organic Dairy Production**

However in this connection it is very relevant to look at the development of total producer returns. This is shown in table 13. An increase in the percentage of organic dairy production results in an increase of total producer returns at all levels of consumer premium. The percentage increase in total producer returns varies from 0.03 per cent (at zero premium level rising organic dairy production from 2 per cent to 6 per cent) to 0.78 per cent (at 30 per cent premium level rising organic dairy production from 0.05 per cent to 2 per cent of total production). This means that the dairy sector seen as a whole may actually benefit from conversion into organic farming, regardless of the consumer premium.
Table 13
NZ Organic Dairy Production Level’s Influence on NZ Total Dairy Producer Returns

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total Producer Returns (PR)</th>
<th>0.05% org.prod./0% premium</th>
<th>0.05% org.prod./10% premium</th>
<th>0.05% org.prod./20% premium</th>
<th>0.05% org.prod./30% premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PR</td>
<td>Not modelled</td>
<td>3,850,088</td>
<td>3,855,074</td>
<td>3,856,918</td>
<td></td>
</tr>
<tr>
<td>Total PR</td>
<td>2% org.prod./0% premium</td>
<td>2% org.prod./10% premium</td>
<td>2% org.prod./20% premium</td>
<td>2% org.prod./30% premium</td>
<td></td>
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<tr>
<td>Total PR</td>
<td>3,868,219</td>
<td>3,874,384*</td>
<td>3,880,702</td>
<td>3,887,165</td>
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<tr>
<td>Total PR</td>
<td>6% org.prod./0% premium</td>
<td>6% org.prod./10% premium</td>
<td>6% org.prod./20% premium</td>
<td>6% org.prod./30% premium</td>
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</tr>
<tr>
<td>Total PR</td>
<td>3,869,516</td>
<td>3,884,729</td>
<td>3,900,185</td>
<td>3,915,876</td>
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<tr>
<td>Total PR</td>
<td>10% org.prod./0% premium</td>
<td>10% org.prod./10% premium</td>
<td>10% org.prod./20% premium</td>
<td>10% org.prod./30% premium</td>
<td></td>
</tr>
<tr>
<td>Total PR</td>
<td>3,879,500</td>
<td>3,901,041</td>
<td>3,922,857</td>
<td>3,944,945</td>
<td></td>
</tr>
</tbody>
</table>

*Benchmark scenario

Figure 21 graphs the effect on NZ organic dairy producer returns of different consumer preferences for organic dairy produce (i.e. extent of willingness to pay an organic premium). The figure shows that the level of preference has an increasing effect on producer returns. This indicates that premiums for organic production would be good incentive stimulation tools from the industry to the dairy farmers in order to increase conversion towards organics.

In the modelling it was assumed that the producer premium is paid by the consumers, then allocated back through the food chain to the organic dairy farmer. However a 10 per cent rise in producer premium does not convert into 10 per cent increase in producer returns as well. For every 10 per cent increase in premium, NZ producer returns increase by 6.88 per cent, 6.60 per cent and 6.33 per cent respectively (see appendix 4 for data tables). This decreasing effect of rising producer premiums on NZ producer returns emerges clearly from figure 21, indicating that as premiums increase so do producer returns, but not by the same value, which is consistent with findings in chapter 4.1.2.
The level of organic consumption has a strong impact on NZ organic producer returns. As shown in figure 23, even a small increase in the level of organic consumption from 1 per cent to 2 per cent in NZ and from 2 per cent to 5 per cent for US, EU and JP has a significant effect on the level of producer returns. The increase in consumption creates a rise in organic producer returns of between 360 per cent (at 0 per cent consumer premium) and 340 per cent (at 30 per cent consumer premium). This indicates the importance to the dairy industry of paying attention to consumer behaviour and trying to increase organic consumption, as this will increase earnings considerably. The Danish organic industry has - on its own and in cooperation with retail chain stores - carried out several marketing campaigns, especially on the domestic market in order to increase organic consumption share (see e.g. OrganicDenmark, 2002b for more information).
Figure 22
Level of Organic Consumption’s Effect on NZ Organic Dairy Producer Returns
Chapter 6
Conclusion

The organic industry is currently expanding worldwide and there is increasing attention on the farmer, industry and research level. The focus of this report is organic dairy production.

Within organics there appears to be three stages in the market development:

1\textsuperscript{st} stage: Niche production distributed via producer direct sales  
2\textsuperscript{nd} stage: Upscale production sold in specialty stores  
3\textsuperscript{rd} stage: Mainstream production distributed via retail-chain-stores

Organic dairy production in Denmark is a good example of the third stage in the market development. In the Danish domestic market more than 70 per cent of the organic produce is distributed via retail-chain stores. The domestic market share of organic liquid milk is a significant 25.9 per cent, and 10 per cent of total dairy production is organic.

Danish organic production developed through pioneering farmers with support from institutional organisations (such as farm extension services and dairies). The institutional organisations have committed to organic dairy production by providing information and premium incentives to dairy farmers. This has reduced farmers’ uncertainty and risk in converting to organic dairy production. Furthermore, the presence of national and EU policy incentive schemes has also to some extent contributed to the development of a significant Danish organic dairy sector.

NZ organic production – especially within dairy – is still at first stage of market development. However the dairy industry and New Zealand Dairy Board (NZDB) have indicated a wish to develop NZ organic dairy production into a larger scale.

In NZ there are currently several constraints to conversion. An industry commitment - as recently stated by Fonterra – to create capacity, which may encourage conversion and development of industry to second or third market stage. The commitment may reduce farmers’ uncertainty and thereby reduce one of the current constraints for conversion. Furthermore, a producer premium could be introduced as part of an incentive scheme, reducing the financial risk when converting to organic production.

The main finding of the literature review on the Danish and NZ development within organic – and in particular dairy – production is that a supporting institutional structure is important for developing an organic sector. Furthermore, the quantity produced influences the costs. Processing small amounts of organic raw milk incurs substantial surplus costs that will be reflected in the consumer price. However, these surplus costs will vanish once production quantity increases. Larger amounts of processed organic milk also make a large-scale distribution possible. So economics of scale within organic dairy production is an important factor.

The Danish organic dairy experiences were used to suggest scenarios for development of the NZ dairy industry. These scenarios were simulated using the Lincoln Trade and Environment Model (LTEM). Consequently various levels of NZ organic dairy production and organic consumption within NZ and its main trade partners (United States, EU and Japan) were modelled. In addition, different assumptions concerning shifts in supply as a consequence of
change in production costs when increasing NZ rate of organic dairy production, and shifts in consumer preferences towards organic food produce were included.

The conclusion of the literature review and LTEM analysis taken together is if NZ farmers are to convert, it is crucial that the dairy industry makes a credible commitment towards entering organic dairy production. The Danish organic dairy sector developed because of the organisational/industrial commitment by providing information and premium incentives to dairy farmers.

An important conclusion of the LTEM analysis is that the NZ dairy sector may benefit overall by some extent of conversion into organic production. So industry investments and incentive schemes would be worthwhile.

The LTEM analysis shows good opportunities of selling NZ organic dairy products on the world market. Since NZ has a comparative advantage from being an experienced agricultural exporting country especially within the dairy sector excess supply problems – as seen in Denmark – does not seem to be likely to occur.

However, aggressive exports marketing campaigns to increase awareness of organic products and thereby organic consumption will be an important factor as well. The LTEM analysis shows large potential gains from increase in organic consumption in the main export markets of NZ.
References


Appendix 1
NZ Exports Chain & OPENZ

NZ Exports Chain

Statutory producer marketing boards as well as private companies control almost 80 per cent of NZ’s export marketing and promotion within agriculture. The marketing and promotion boards include ENZA (formerly Apple and Pear Marketing Board), the New Zealand Dairy Board (NZDB), Zespri (formerly Kiwifruit Board), Wools of New Zealand (formerly the Wool Board) and Meat Producers’ Board.

With more than a 90 per cent share of the 1.5 million tonnes yearly, NZDB is NZ’s largest single exporter and the world’s largest dairy export marketing organisation. Total annual sales are around NZ$7.7 billion.

The individual NZ dairy companies are responsible for domestic marketing of dairy products, whilst NZDB organises marketing in overseas markets. The Board works with the dairy companies to ensure manufacturing programmes meet standards of international markets. Furthermore it integrates the industry’s shipping, packaging, transport, storage, market promotion and quality control needs as well as providing support services such as financial facilities, data processing, livestock improvement and administration.

Marketing within NZDB is separated into two divisions; New Zealand Milk (deals with marketing of consumer dairy products) and NZMP (deals with ingredients for the processing industry) (Ministry for the Environment, 2001).

The figure below shows the production, processing, marketing and distribution process of NZ dairy exports, from farmer (conventional or organic) through to a dairy company, NZDB and on to exports markets and consumption, interacting with researching and NZDB overseas officers.
Organic Products Exporters of New Zealand (OPENZ)

The Organic Products Exporters of New Zealand (OPENZ) is a network of businesses, research, institutions, consultancies and certifying agencies that was formed in 1995 with support from the New Zealand Trade Development Board. Members range from NZ’s largest food companies to small family businesses. OPENZ’ focus is to help members sell their...
products – and thereby internationally market organic products within horticulture and agriculture. OPENZ helps to develop experience and infrastructure within the industry to ensure sustainable export growth. This is done by providing members state-of-the-art information on organic topics and helping the organic community to network better, providing market researches, organizing trade fairs and missions, facilitating access to markets and lobbying for increased public- and private funding directed towards research into organic production methods.

To guarantee the integrity of NZ’s organic exports, OPNEZ requires members to certify according to internationally recognized organic standards. OPENZ has three certifying agencies associated as detailed below (Ministry for the Environment, 2001).
# Appendix 2
## Data Tables for Chapter 2 & 3

### Denmark/Year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of organic dairy farms</td>
<td>81</td>
<td>122</td>
<td>132</td>
<td>146</td>
<td>147</td>
<td>344</td>
<td>430</td>
<td>672</td>
<td>751</td>
<td>827</td>
<td>749</td>
<td>695</td>
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<td>Milk production (m.t)</td>
<td>24</td>
<td>33</td>
<td>39</td>
<td>47</td>
<td>50</td>
<td>129</td>
<td>137</td>
<td>175</td>
<td>294</td>
<td>415</td>
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</table>

Source: Danish Dairy Board, 2002c

### Danish Organic dairy production m.t./Year

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
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<tbody>
<tr>
<td>Wholemilk</td>
<td>22,828</td>
<td>20,788</td>
<td>18,356</td>
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<tr>
<td>Semi-skimmed milk</td>
<td>51,588</td>
<td>52,084</td>
<td>40,492</td>
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<tr>
<td>Skimmilk</td>
<td>37,240</td>
<td>42,374</td>
<td>77,771</td>
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<tr>
<td>Buttermilk</td>
<td>5,341</td>
<td>5,215</td>
<td>5,319</td>
</tr>
<tr>
<td>Cream</td>
<td>1,781</td>
<td>1,732</td>
<td>1,403</td>
</tr>
<tr>
<td>Cultural cream</td>
<td>313</td>
<td>368</td>
<td>323</td>
</tr>
<tr>
<td>Cultural milk products</td>
<td>5,886</td>
<td>5,508</td>
<td>5,482</td>
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<tr>
<td>Chocolate milk</td>
<td>714</td>
<td>566</td>
<td>431</td>
</tr>
<tr>
<td>Other milk products</td>
<td>1,866</td>
<td>1,344</td>
<td>1,366</td>
</tr>
<tr>
<td>Butter</td>
<td>1,365</td>
<td>1,275</td>
<td>1,358</td>
</tr>
<tr>
<td>Cheese</td>
<td>2,793</td>
<td>3,269</td>
<td>3,318</td>
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</tbody>
</table>

Source: Danish Dairy Board, 2002c

### Danish Domestic organic market share (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>1993</th>
<th>1995</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
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<tbody>
<tr>
<td>Liquid milk</td>
<td>3</td>
<td>7.5</td>
<td>14.5</td>
<td>20</td>
<td>22.5</td>
<td>24.5</td>
<td>26</td>
</tr>
<tr>
<td>Cultural milk products</td>
<td>0.5</td>
<td>1.5</td>
<td>1.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>Cheese/butter</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>7.5</td>
<td>8</td>
<td>7</td>
<td>7</td>
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</tbody>
</table>

Source: Danish Dairy Board, 2002d

### Danish Exports (organic and conventional) m.t./Year

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<th></th>
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<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td>244.2</td>
<td>226.3</td>
<td>258.3</td>
<td>236.3</td>
<td>255</td>
<td>263.3</td>
<td>247.1</td>
<td>249.4</td>
<td>235.5</td>
<td>242.8</td>
<td>253.2</td>
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<tr>
<td>WHP</td>
<td>88.7</td>
<td>99.5</td>
<td>94.8</td>
<td>103.6</td>
<td>92.8</td>
<td>89.3</td>
<td>91.7</td>
<td>92.3</td>
<td>83.7</td>
<td>78.6</td>
<td>63.5</td>
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<td>Butter</td>
<td>47.8</td>
<td>46.1</td>
<td>44.5</td>
<td>47.3</td>
<td>48.7</td>
<td>54.2</td>
<td>48.2</td>
<td>42.9</td>
<td>39.5</td>
<td>39.7</td>
<td>40.7</td>
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<tr>
<td>Milk and liquid milk products</td>
<td>44.5</td>
<td>43.7</td>
<td>44.4</td>
<td>44.1</td>
<td>40.1</td>
<td>39.3</td>
<td>39.3</td>
<td>41.9</td>
<td>43.1</td>
<td>50.4</td>
<td>52.9</td>
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<tr>
<td>SMP</td>
<td>11.8</td>
<td>7</td>
<td>19.1</td>
<td>18.6</td>
<td>19.7</td>
<td>25.2</td>
<td>16.6</td>
<td>12.2</td>
<td>22.5</td>
<td>14.6</td>
<td>10.1</td>
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<tr>
<td>Other products</td>
<td>44</td>
<td>34.7</td>
<td>40.8</td>
<td>36.2</td>
<td>39.2</td>
<td>41.9</td>
<td>43.1</td>
<td>50.4</td>
<td>52.9</td>
<td>52.9</td>
<td>60.3</td>
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</table>

Source: Danish Dairy Board, 2002c

### New Zealand's dairy exports by value

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Butter</td>
<td>796.51</td>
<td>834.04</td>
<td>725.94</td>
<td>860.38</td>
<td>917.51</td>
<td>1028.82</td>
<td>990.01</td>
<td>1003.72</td>
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<tr>
<td>Cheese</td>
<td>497.94</td>
<td>527.97</td>
<td>604.51</td>
<td>617.4</td>
<td>838.44</td>
<td>897.74</td>
<td>983.29</td>
<td>987.3</td>
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<tr>
<td>Wholemilk powder</td>
<td>930.26</td>
<td>971.01</td>
<td>905.12</td>
<td>942.46</td>
<td>1049.98</td>
<td>1123.75</td>
<td>1199.77</td>
<td>1269.55</td>
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<tr>
<td>Skimmilk powder</td>
<td>393.17</td>
<td>439.47</td>
<td>459.14</td>
<td>491.59</td>
<td>623.17</td>
<td>571.79</td>
<td>569.07</td>
<td>590.76</td>
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<tr>
<td>Other</td>
<td>38.83</td>
<td>47.68</td>
<td>52.79</td>
<td>70.26</td>
<td>86.29</td>
<td>100.87</td>
<td>119.26</td>
<td>122.16</td>
</tr>
<tr>
<td>Caseins/caseinates</td>
<td>522.88</td>
<td>558.89</td>
<td>509.11</td>
<td>557.15</td>
<td>569.36</td>
<td>651.66</td>
<td>762.89</td>
<td>800.63</td>
</tr>
</tbody>
</table>

## Appendix 3

### LTEM

#### Table 14

**LTEM Country and Commodity Coverage**  
(each commodity is included as a conventional and organic component)

<table>
<thead>
<tr>
<th>Countries:</th>
<th>Commodities:</th>
</tr>
</thead>
</table>
| AR-Argentina | Coarse grains  
| AU-Australia | Maize  
| CN-Canada | Oilseeds  
| EU-European Union (15) | Oilseeds meals  
| JP-Japan | Oils  
| MX-Mexico | Apples  
| NZ-New Zealand | Kiwifruit  
| US-United States |  
| RW-Rest of World |  
|  | Raw milk  
|  | Milk (liquid, other products)  
|  | Butter  
|  | Cheese  
|  | Whole milk powder  
|  | Skim milk powder  

Appendix 4  
Data Tables for LTEM Analysis

All producer returns presented are in US$ 2010-value.

Data in figure 18  
NZ Organic Dairy Producer Returns with Different Levels of Reduction in Milk Yield

<table>
<thead>
<tr>
<th>Premium</th>
<th>0% red.milkyield NZ/US/EU/JP</th>
<th>5% red. milkyield NZ.10% red.milkyield US/EU/JP.</th>
<th>30% red. milkyield NZ.10% red.milkyield US/EU/JP.</th>
<th>30% red.milkyield NZ/US/EU/JP</th>
<th>Benchmark scenario</th>
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</thead>
<tbody>
<tr>
<td>0%</td>
<td>84,313</td>
<td>89,591</td>
<td>67,140</td>
<td>90,206</td>
<td>95,756</td>
</tr>
<tr>
<td>10%</td>
<td>90,084</td>
<td>95,756</td>
<td>71,699</td>
<td>96,526</td>
<td></td>
</tr>
<tr>
<td>20%</td>
<td>95,998</td>
<td>102,074</td>
<td>78,688</td>
<td>103,003</td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td>102,050</td>
<td>108,538</td>
<td>82,946</td>
<td>109,629</td>
<td></td>
</tr>
</tbody>
</table>

Data in figure 20  
NZ Organic Dairy Production Level’s Influence on NZ Organic Dairy Producer Returns

<table>
<thead>
<tr>
<th>Premium</th>
<th>Benchmark scenario</th>
<th>Org. prod.: NZ 0.05%, US/EU 2%, JP 1%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Org.cons.: NZ 1%, US/EU/JP 2%</td>
</tr>
<tr>
<td>0%</td>
<td>N/A</td>
<td>89,591</td>
</tr>
<tr>
<td>10%</td>
<td>95,756</td>
<td>19,176</td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td>24,163</td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td>26,007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Premium</th>
<th>Benchmark scenario</th>
<th>Org. prod.: NZ 6%, US/EU2%, JP1%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Org.cons.: NZ1%, US/EU/JP2%</td>
</tr>
<tr>
<td>0%</td>
<td>N/A</td>
<td>249,522</td>
</tr>
<tr>
<td>10%</td>
<td>95,756</td>
<td>19,176</td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td>24,163</td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td>26,007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Premium</th>
<th>Benchmark scenario</th>
<th>Org. prod.: NZ10%, US/EU2%, JP1%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Org.cons.: NZ1%, US/EU/JP2%</td>
</tr>
<tr>
<td>0%</td>
<td>N/A</td>
<td>412,969</td>
</tr>
<tr>
<td>10%</td>
<td>95,756</td>
<td>19,176</td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td>24,163</td>
</tr>
<tr>
<td>30%</td>
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<td>26,007</td>
</tr>
</tbody>
</table>
### NZ Organic Dairy Production Level’s Influence on Total NZ Dairy Producer Returns

#### Table 13

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2% org.prod./0% premium</th>
<th>2% org.prod./10% premium</th>
<th>2% org.prod./20% premium</th>
<th>2% org.prod./30% premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR (conventional)</td>
<td>3,778,628</td>
<td>3,778,628</td>
<td>3,778,628</td>
<td>3,778,628</td>
</tr>
<tr>
<td>PR (organic)</td>
<td>89,591</td>
<td>95,756</td>
<td>102,074</td>
<td>108,538</td>
</tr>
<tr>
<td>Total PR</td>
<td>3,868,219</td>
<td>3,874,384</td>
<td>3,880,702</td>
<td>3,887,165</td>
</tr>
</tbody>
</table>

#### Table 21

<table>
<thead>
<tr>
<th>Scenario</th>
<th>6% org.prod./0% premium</th>
<th>6% org.prod./10% premium</th>
<th>6% org.prod./20% premium</th>
<th>6% org.prod./30% premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR (conventional)</td>
<td>3,619,993</td>
<td>3,619,993</td>
<td>3,619,993</td>
<td>3,619,993</td>
</tr>
<tr>
<td>PR (organic)</td>
<td>249,522</td>
<td>264,736</td>
<td>280,192</td>
<td>295,883</td>
</tr>
<tr>
<td>Total PR</td>
<td>3,869,516</td>
<td>3,884,729</td>
<td>3,900,185</td>
<td>3,915,876</td>
</tr>
</tbody>
</table>

#### Table 22

<table>
<thead>
<tr>
<th>Scenario</th>
<th>10% org.prod./0% premium</th>
<th>10% org.prod./10% premium</th>
<th>10% org.prod./20% premium</th>
<th>10% org.prod./30% premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR (conventional)</td>
<td>3,466,531</td>
<td>3,466,531</td>
<td>3,466,531</td>
<td>3,466,531</td>
</tr>
<tr>
<td>PR (organic)</td>
<td>412,969</td>
<td>434,510</td>
<td>456,326</td>
<td>478,414</td>
</tr>
<tr>
<td>Total PR</td>
<td>3,879,500</td>
<td>3,901,041</td>
<td>3,922,857</td>
<td>3,944,945</td>
</tr>
</tbody>
</table>

---

Data in figure 21

**Effect of Producer Premium on NZ Organic Dairy Producer Returns**

<table>
<thead>
<tr>
<th>Producer Premium (Benchmark scenario)</th>
<th>Producer Returns (95.756)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>89.591</td>
</tr>
<tr>
<td>10%</td>
<td>95.756 (+6.88%)</td>
</tr>
<tr>
<td>20%</td>
<td>102.074 (+6.60%)</td>
</tr>
<tr>
<td>30%</td>
<td>108.538 (+6.33%)</td>
</tr>
</tbody>
</table>

---

Organic dairy production: 2% NZ/US/EU, 1% JP. Organic consumption: 1% NZ, 2% US/EU/JP

Reduction in milk yield: -5% NZ, -10% US/EU/JP
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242 Instruments for Internalising the Environmental Externalities in Commercial Fisheries.
Hughey, K. F. D., Cullen, R., Kerr, G. N. and Memon P. A. 2000

243 New Zealand Farmer and Grower Intentions to Use Genetic Engineering Technology and Organic Production Methods.
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245 Smallholders in Canterbury: Characteristics, Motivations, Land Use and Intentions to Move.
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246 A Comparison of the Employment Generated by Forestry and Agriculture in New Zealand.
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247 Forestry and Agriculture on the New Zealand East Coast: Socio-economic Characteristics Associated with Land Use Change.
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Swaffield, Simon R. and Fairweather, John R. 2000

249 Gisborne/East Coast Field Research on Attitudes to Land Use Change: An Analysis of Impediments to Forest Sector Development.

250 Criteria to Evaluate the Application of Policy Instruments Designed to Internalise Externalities from Commercial Fisheries.

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142 Papers Presented at the 2nd Annual Conference of the NZ Agricultural Economics Society. Blenheim 1995

143 The Implications of Government Reform in New Zealand for the Canadian Agri-Food Sector.
Storey, Gary G 1996

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147 Papers Presented at the 6th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2000

148 Papers Presented at the 7th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2001

149 Papers Presented at the 8th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2002