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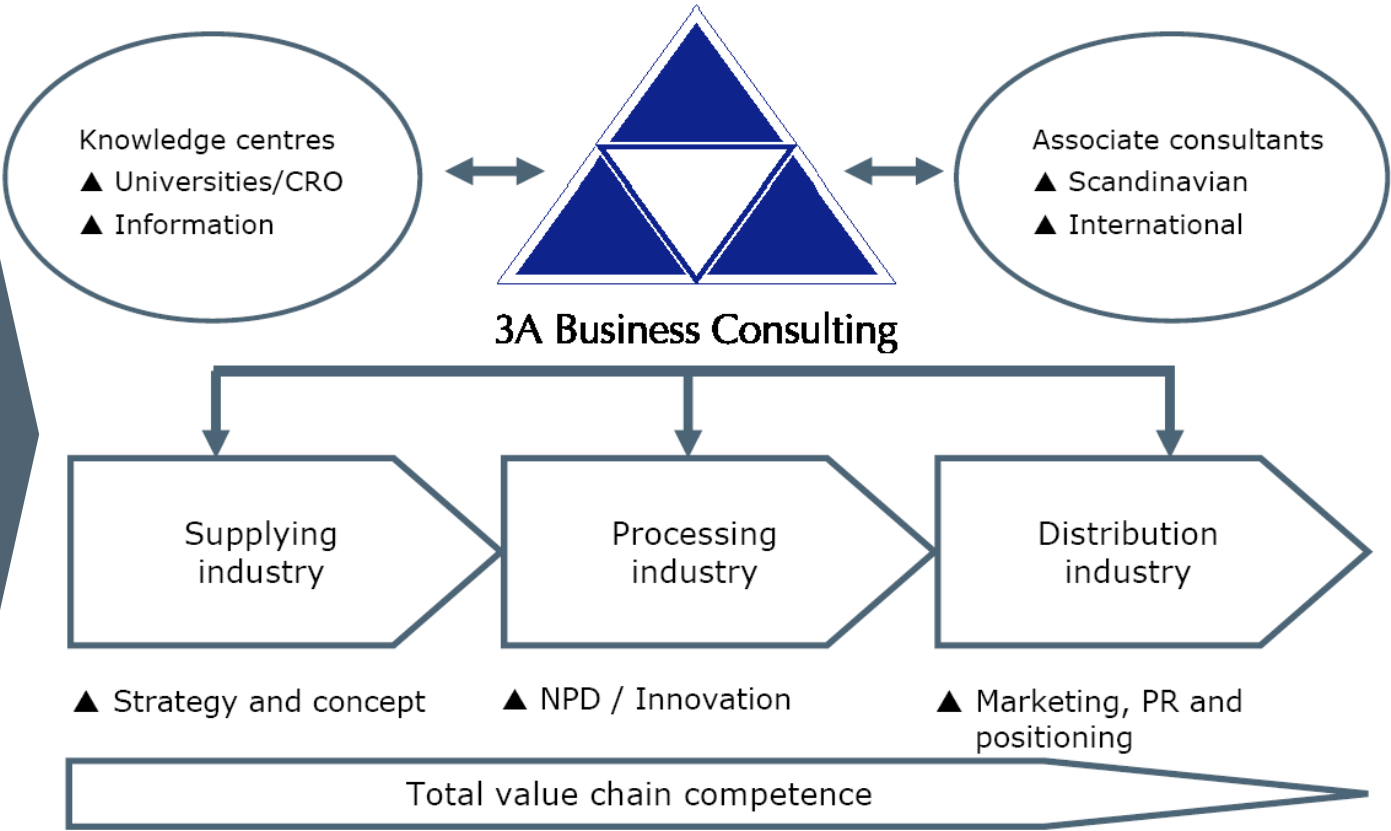
# Market developments and industry challenges for lactose and lactose derivatives



May 15, 2007

# 3A Business model

- Strategy and business development for all elements of the food value chain
- Key competences within functional foods, health & wellness and ingredients
- Core structure - global network



# 3A multi-client reports

February 2006

**China – dairy opportunities unlimited**  
- dairy production, consumption & trade, trends, players and outlook 2008

3A Business Consulting

SHAIN WRIGHT  
CONSULTING

**Dairy Ingredients in Nutritional Sectors Supply/Demand/Forecasts 2005-2010**

USA, EUROPE

Date

**GIRACT**  
**3A BUSINESS CONSULTING**

Website: [www.giract.com](http://www.giract.com)  
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Email: [mail@3abc.dk](mailto:mail@3abc.dk)

November 2005

**Global Market Analysis of Whey and Lactose Products 2004-2009**  
- From commodities to value added whey protein fractions and lactose derivatives

3A Business Consulting

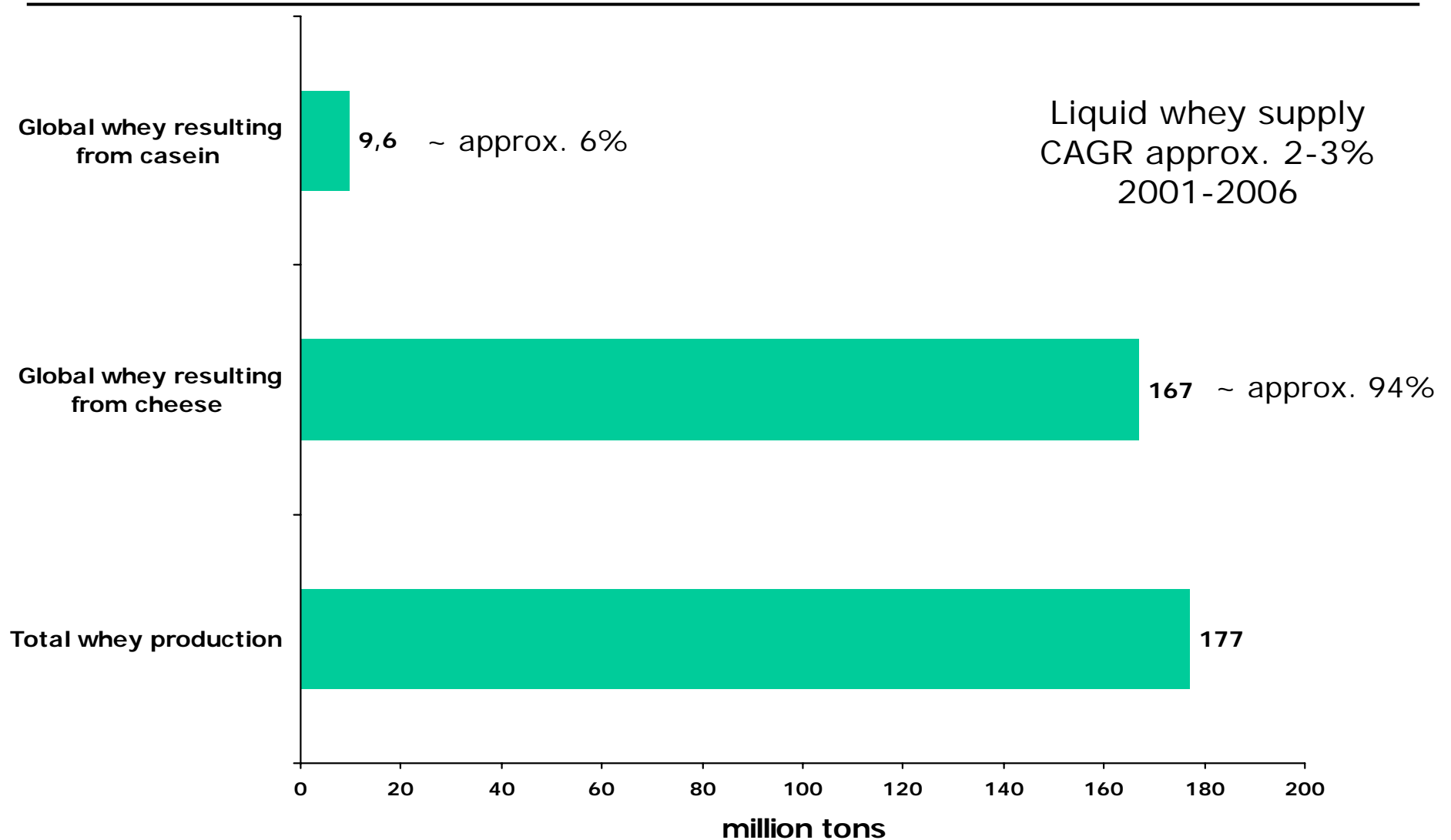
Update version available from August 2007

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## Market developments and industry challenges for lactose and lactose derivatives

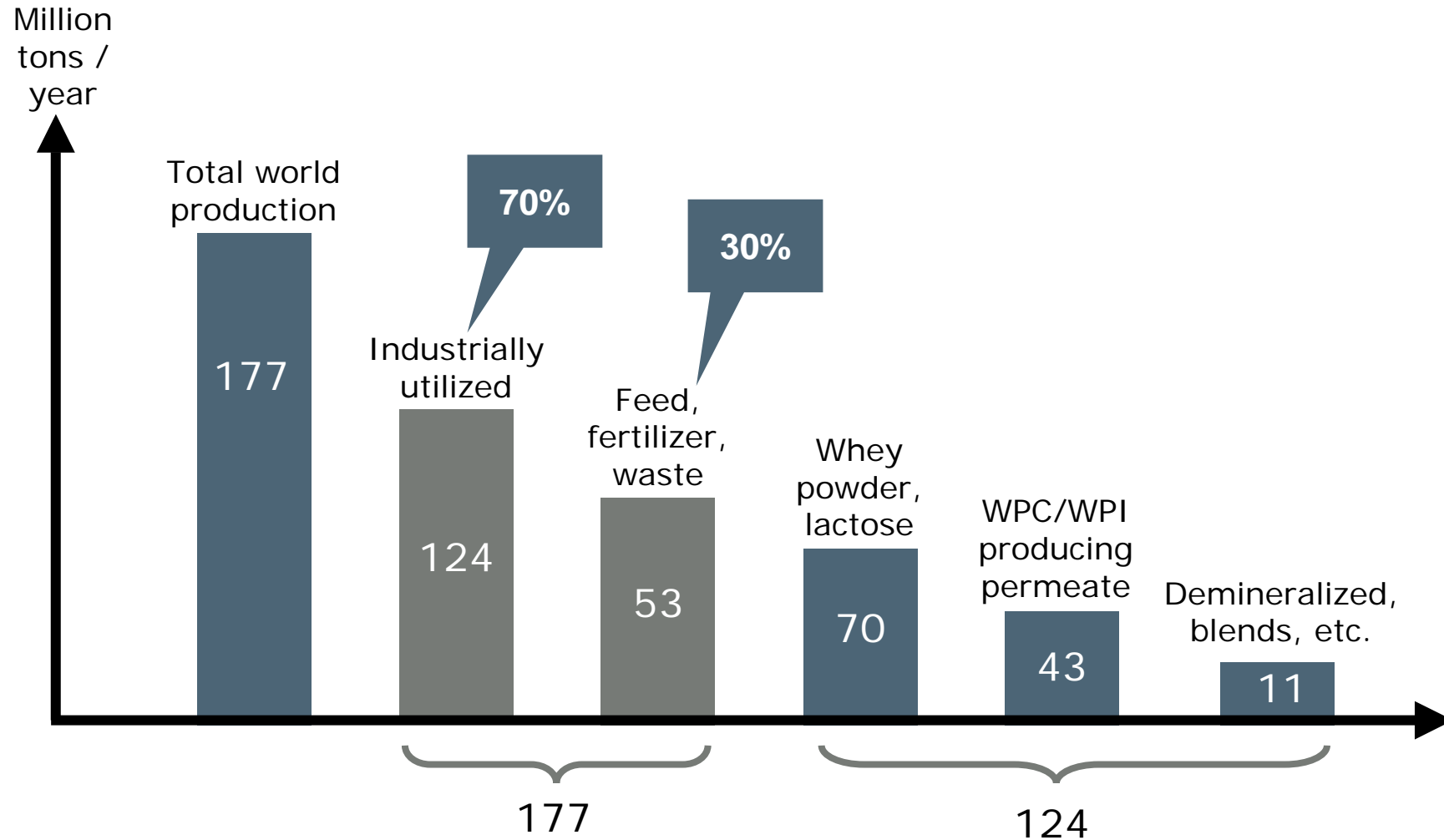


# Global whey production figures - 2006



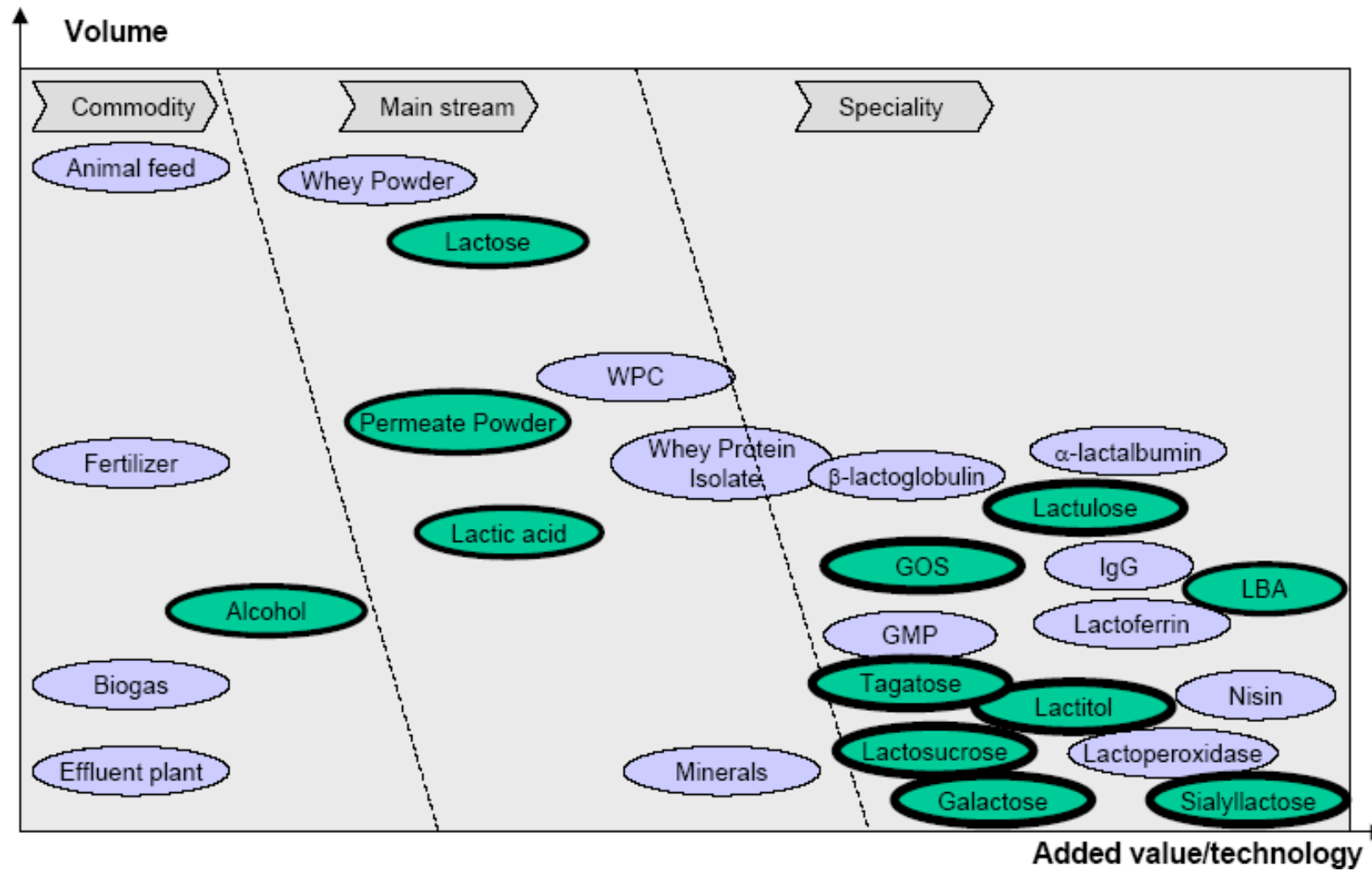
Source: 3A Business Consulting

# World whey utilization - 2006



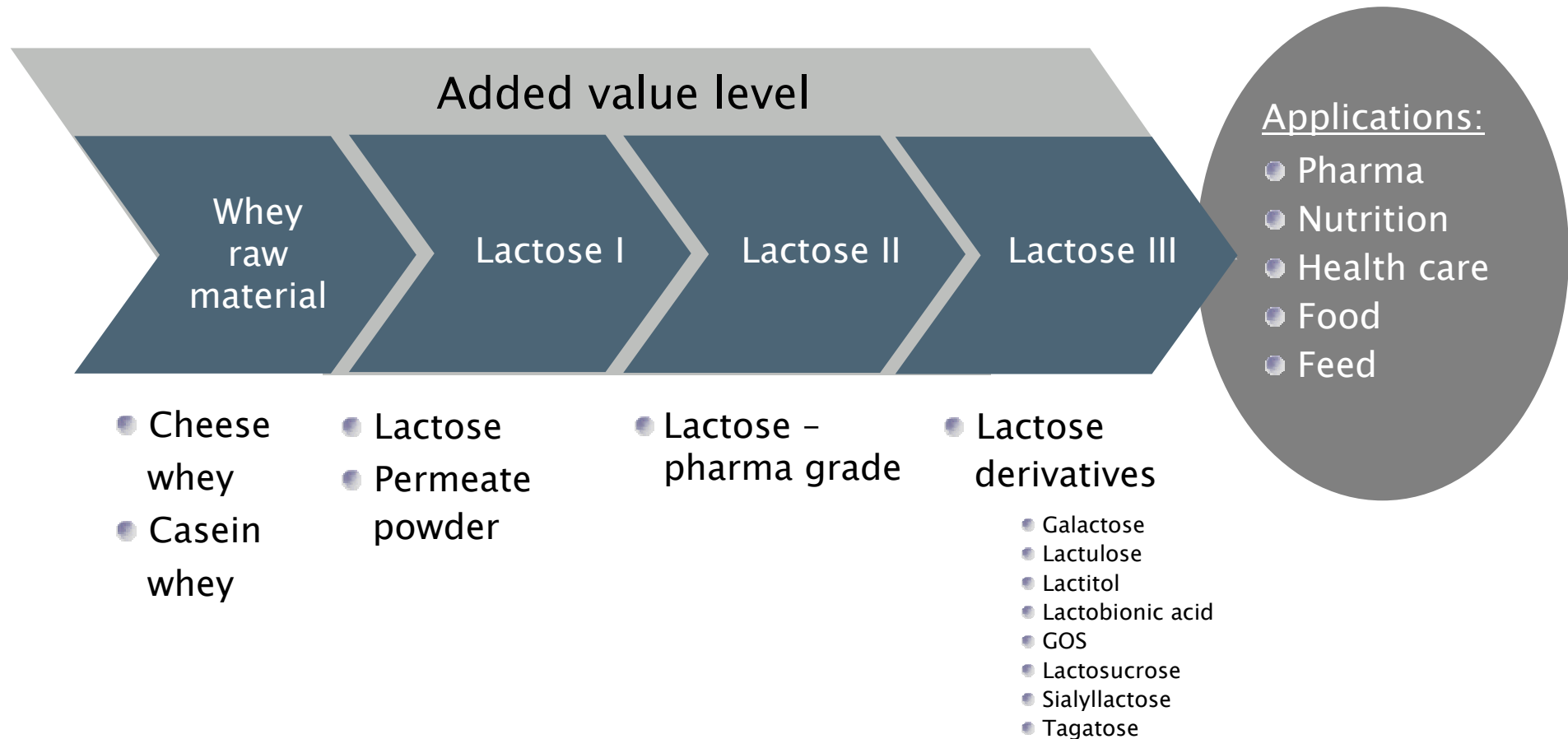
Source: 3A Business Consulting

# Whey and lactose product universe



Source: 3A Business Consulting

# Lactose products universe

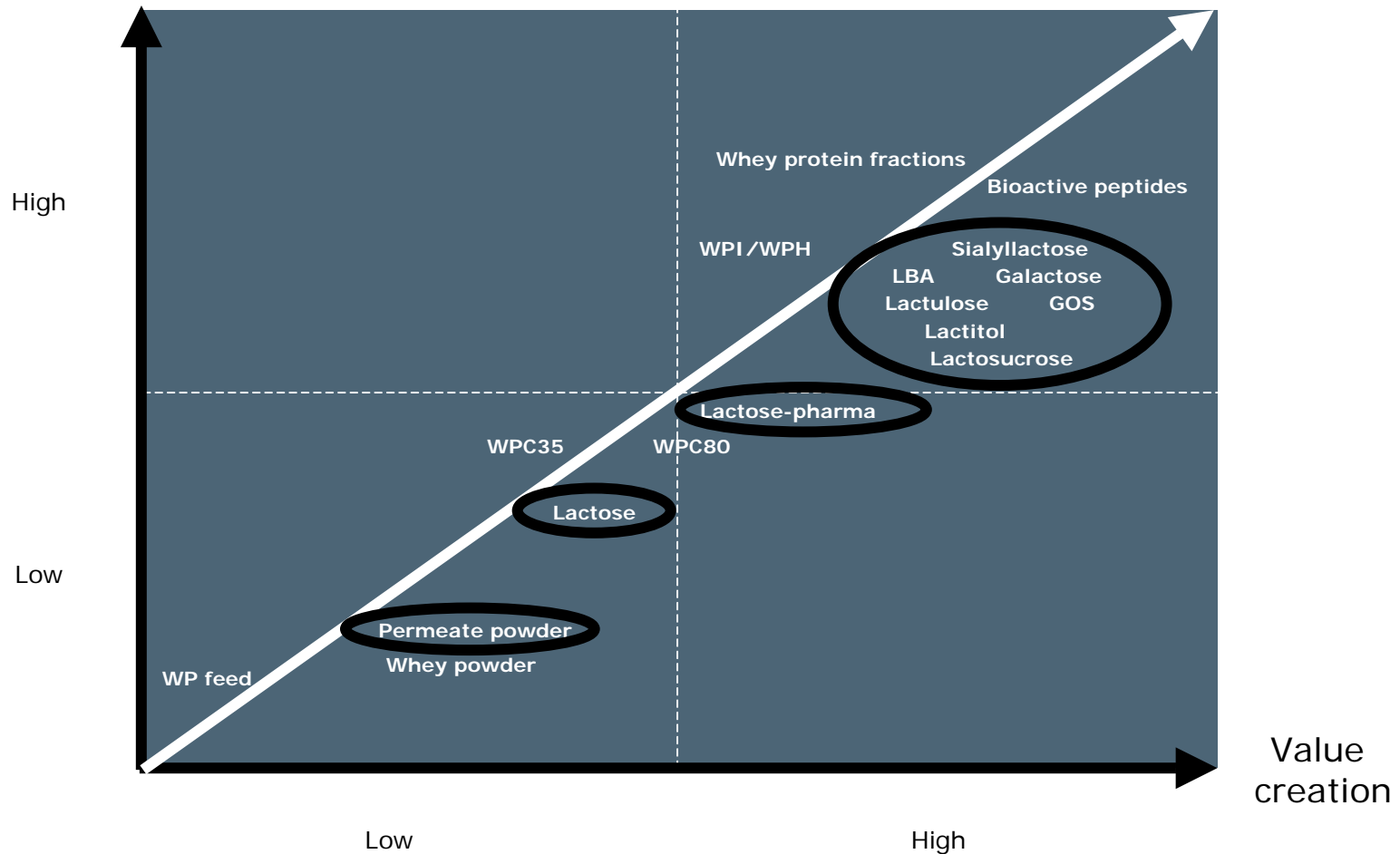


Source: 3A Business Consulting



# Value-adding in whey processing (illustration)

Technology requirements



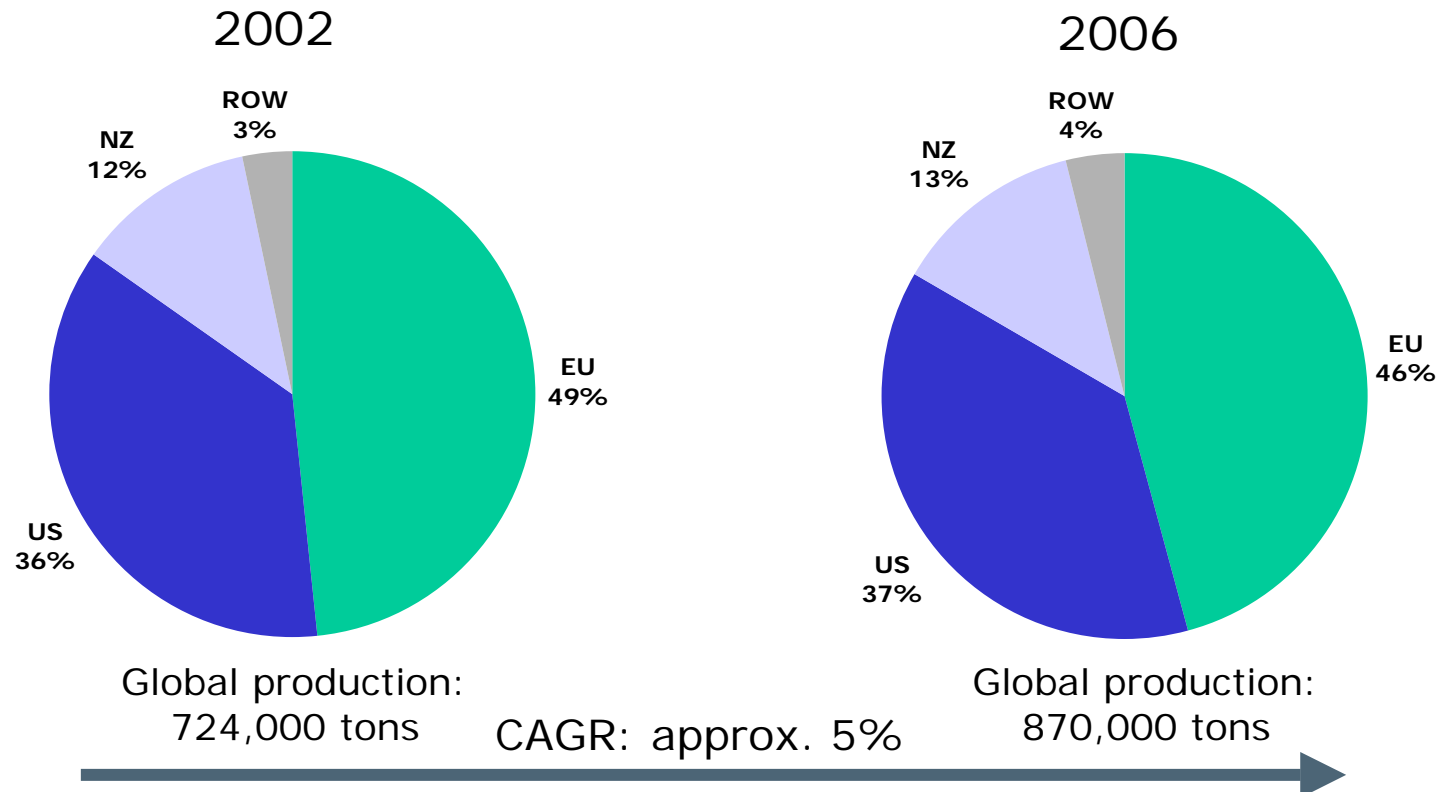
Source: 3A Business Consulting

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## Market developments and industry challenges for lactose and lactose derivatives



# Overview of global lactose production 2002-2006



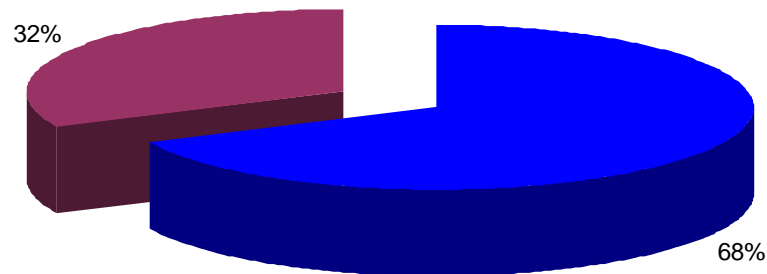
- The EU and the US are the major producing countries representing more than 83% of the global production (down from 85% in 2002)
- New Zealand is the only other major producing country with 13% of the global production corresponding to 110,000 tons (up marginally from 12% in 2002)

Source: USDEC, University of Wisconsin, 3A Business Consulting

# Commodities still make up the most significant part of the lactose business

2004

High value-added lactose ingredients  
(lactose derivatives)  
US\$ 217 million

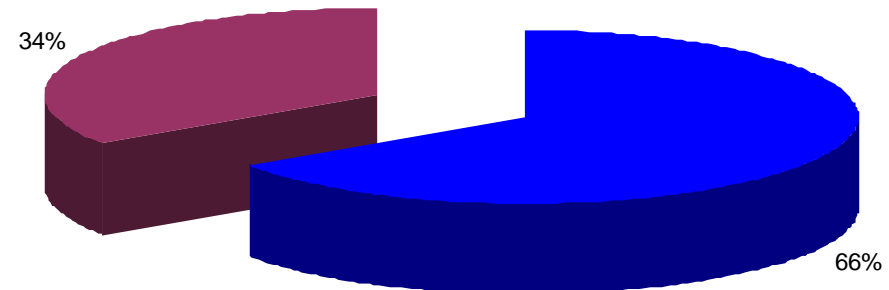


Commodities  
(lactose, permeate powder)  
US\$ 460 million

US\$ 677 million

2006

High value-added lactose ingredients  
(lactose derivatives)  
US\$ 665 million



Commodities  
(lactose, permeate powder)  
US\$ 1265 million

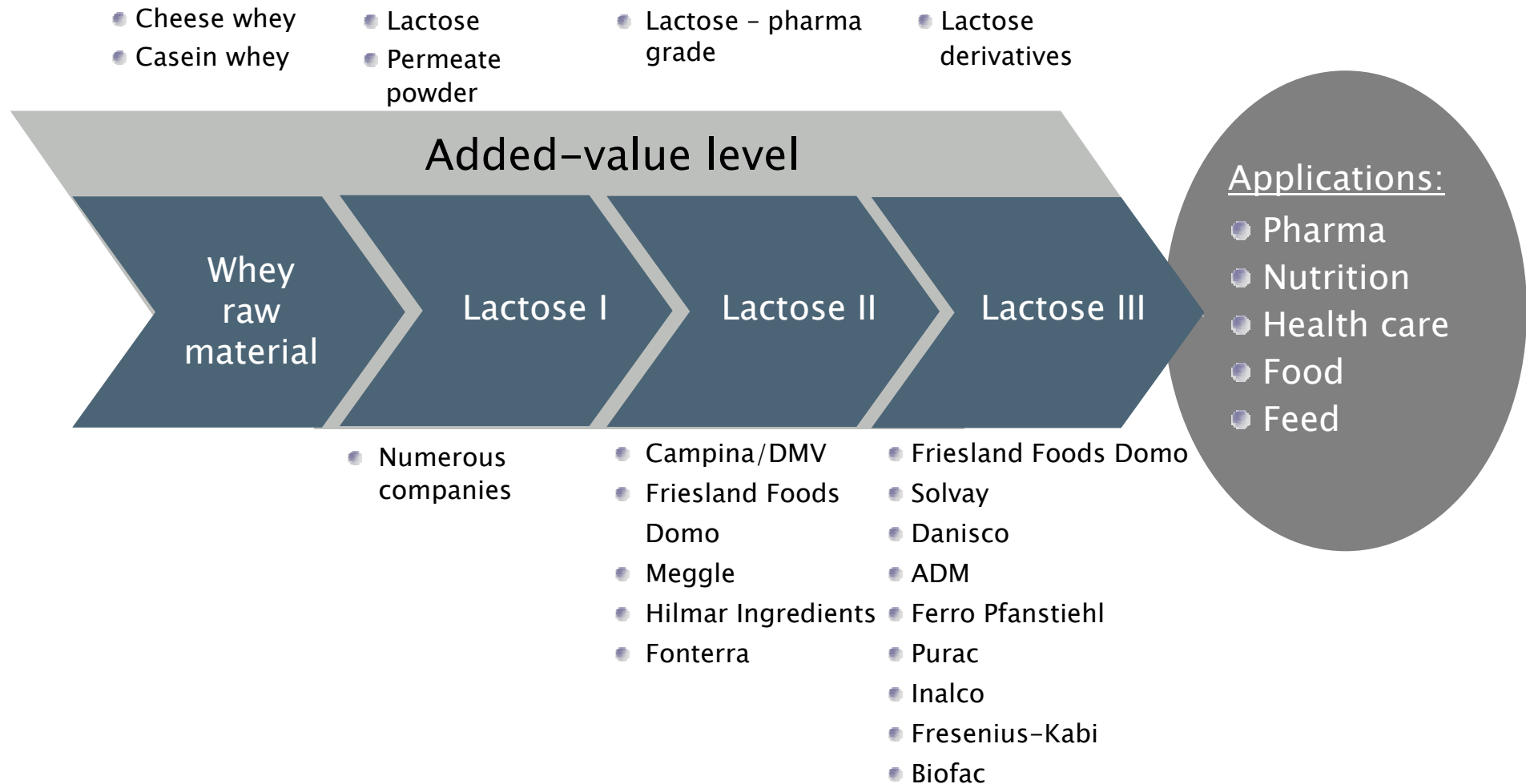
US\$ 1,930 million

Market value growth 185%



Source: 3A Business Consulting

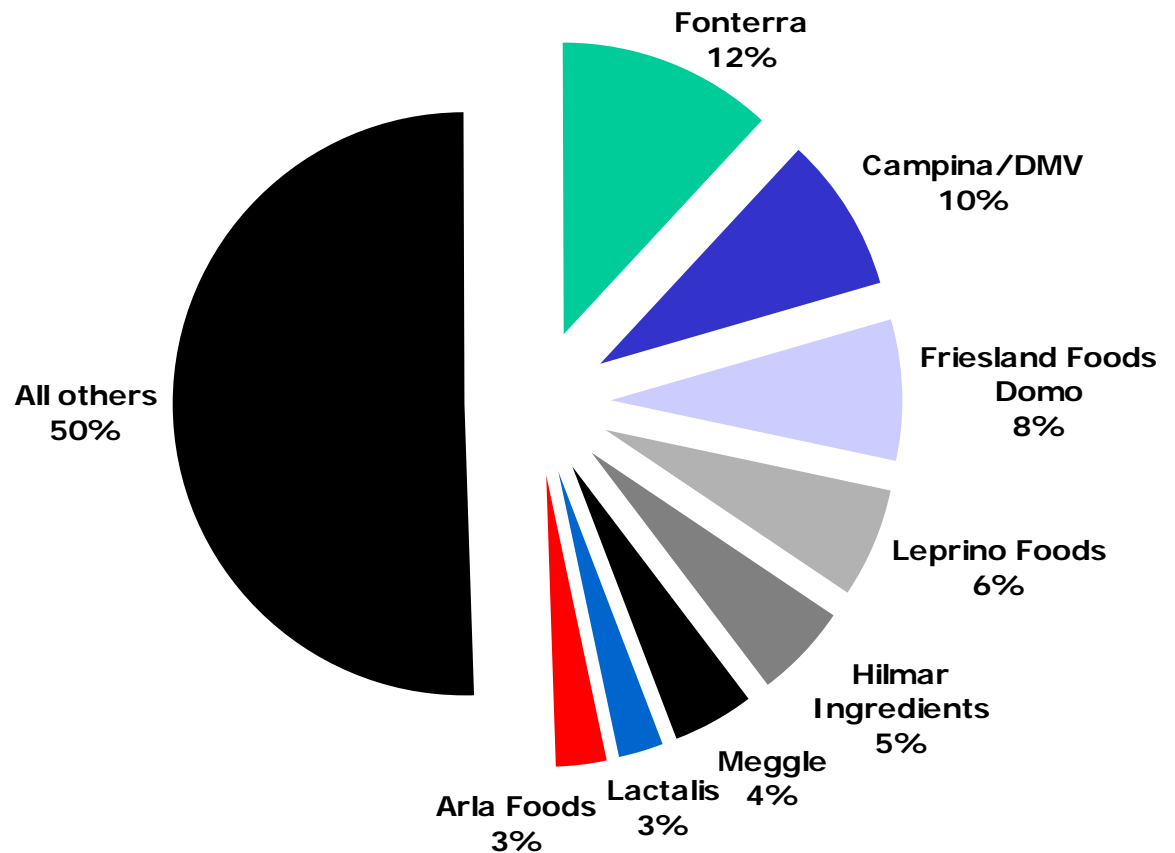
# Illustration of lactose ingredient producers



Source: 3A Business Consulting

# World's leading lactose producers

- In 2006, 7 out of the 8 biggest lactose producers in the world are found in the EU and the US
- Fonterra has achieved the position as the world's biggest lactose producer with 12% market share



## Lactose/permeate derivatives and producers

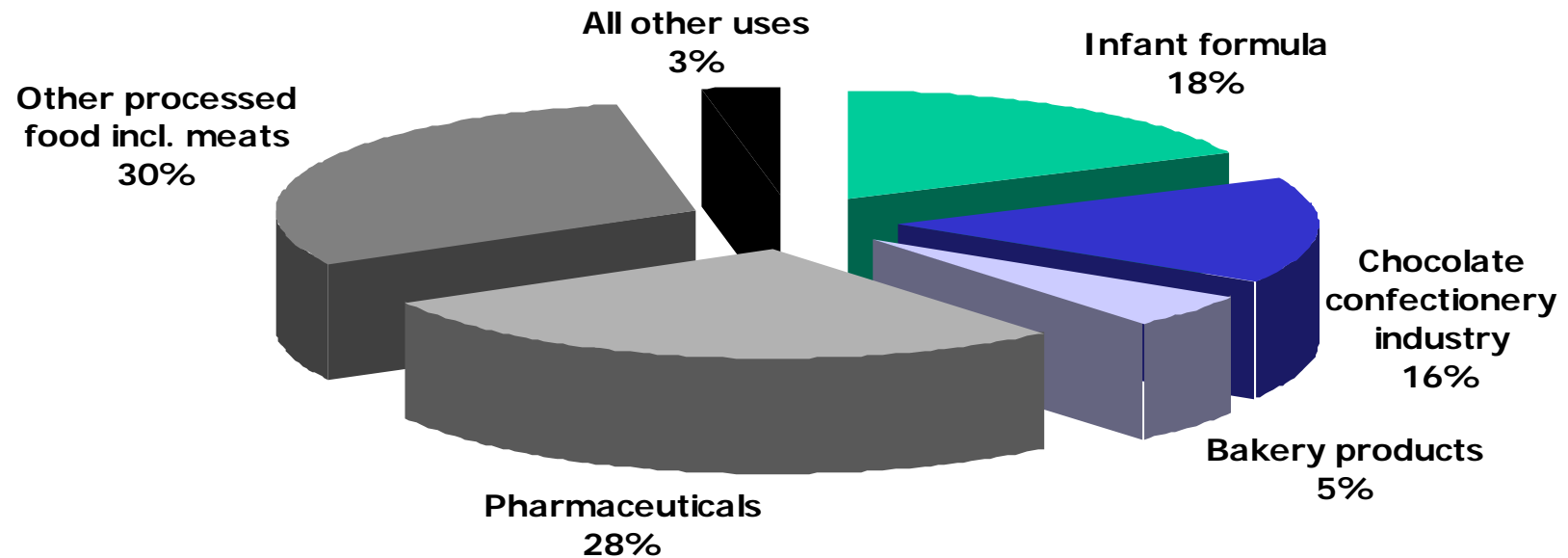
Products	Producers
Lactulose	Morinaga, Milei, Solvay, Inalco, Fresenius-Kabi, Relax, Biofac
Lactitol	Danisco, Purac, Towa, Nikken
Lactobionic acid	Solvay, Sandoz, US Dairy Ingredient Company
GOS	Friesland Foods Domo, Morinaga, Snow Brand, Yakult, Nissin
Alcohol	Carbery, Anchor Alcohol
Lactic acid	Purac, Cargill, Hendan Jindan, ADM, Galactic
Lactosucrose	Hayashibara, Ensuiko

Note: In 2006 Arla Foods Ingredients stopped their production of tagatose due to economics

# Lactose segment break down – 2005

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## EU production distribution/applications



EU consumption approx. 325,000 MT; not same distribution/applications

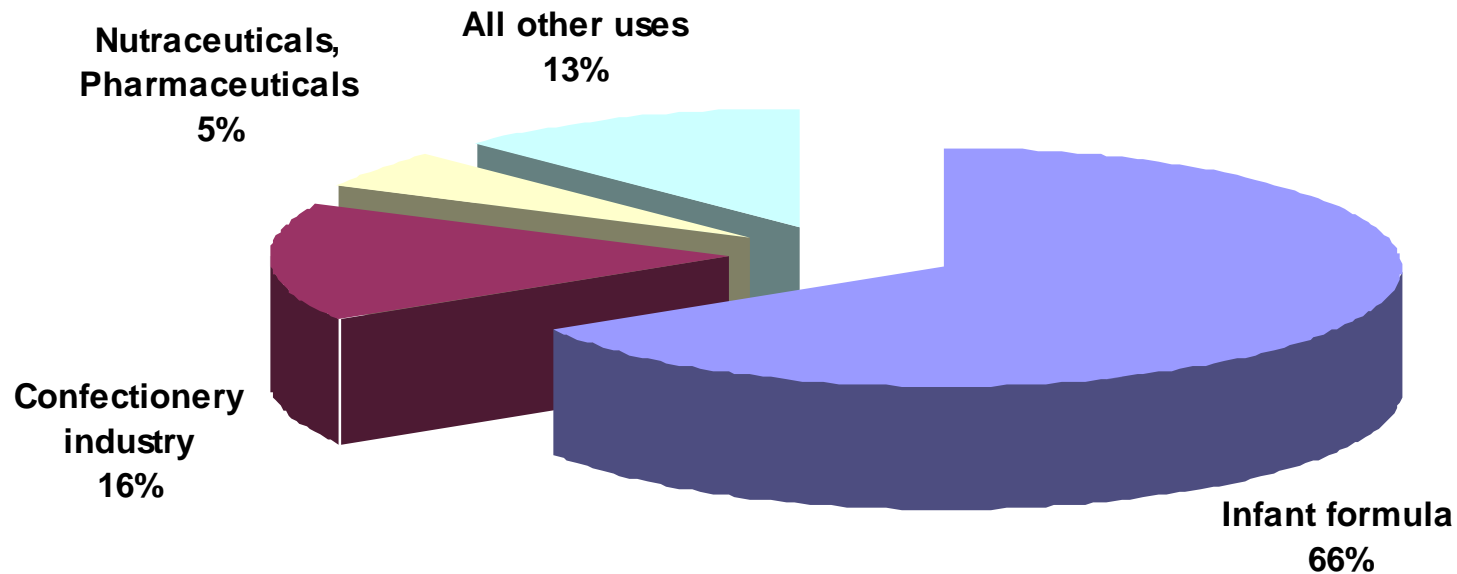
Source: 3A Business Consulting/EWPA/ZMP



# Lactose segment break down – US market applications 2005

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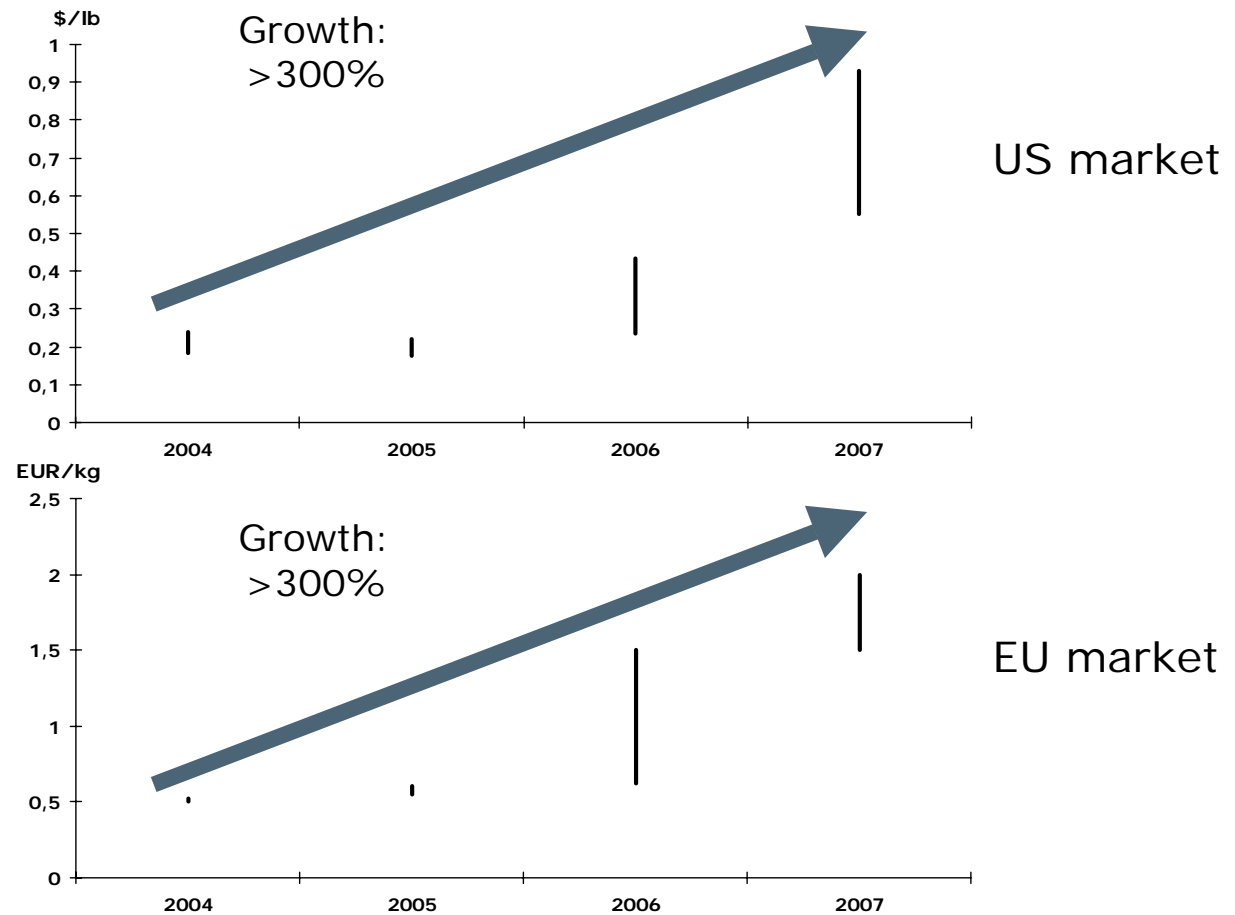
Total US consumption approx.  
130,000 MT



Source: 3A Business Consulting/ADPI

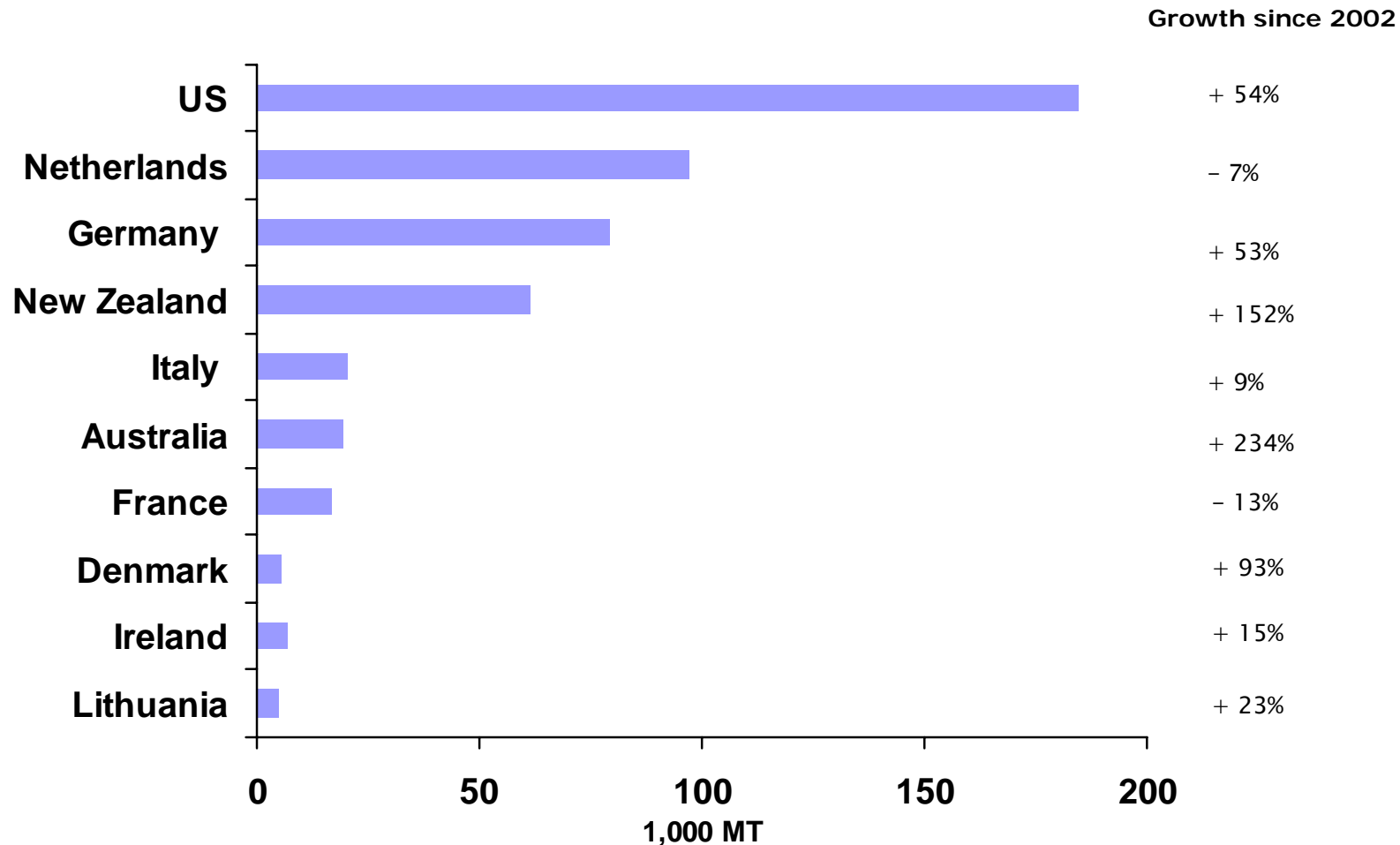
# Lactose price development from 2004 to date

Lactose prices



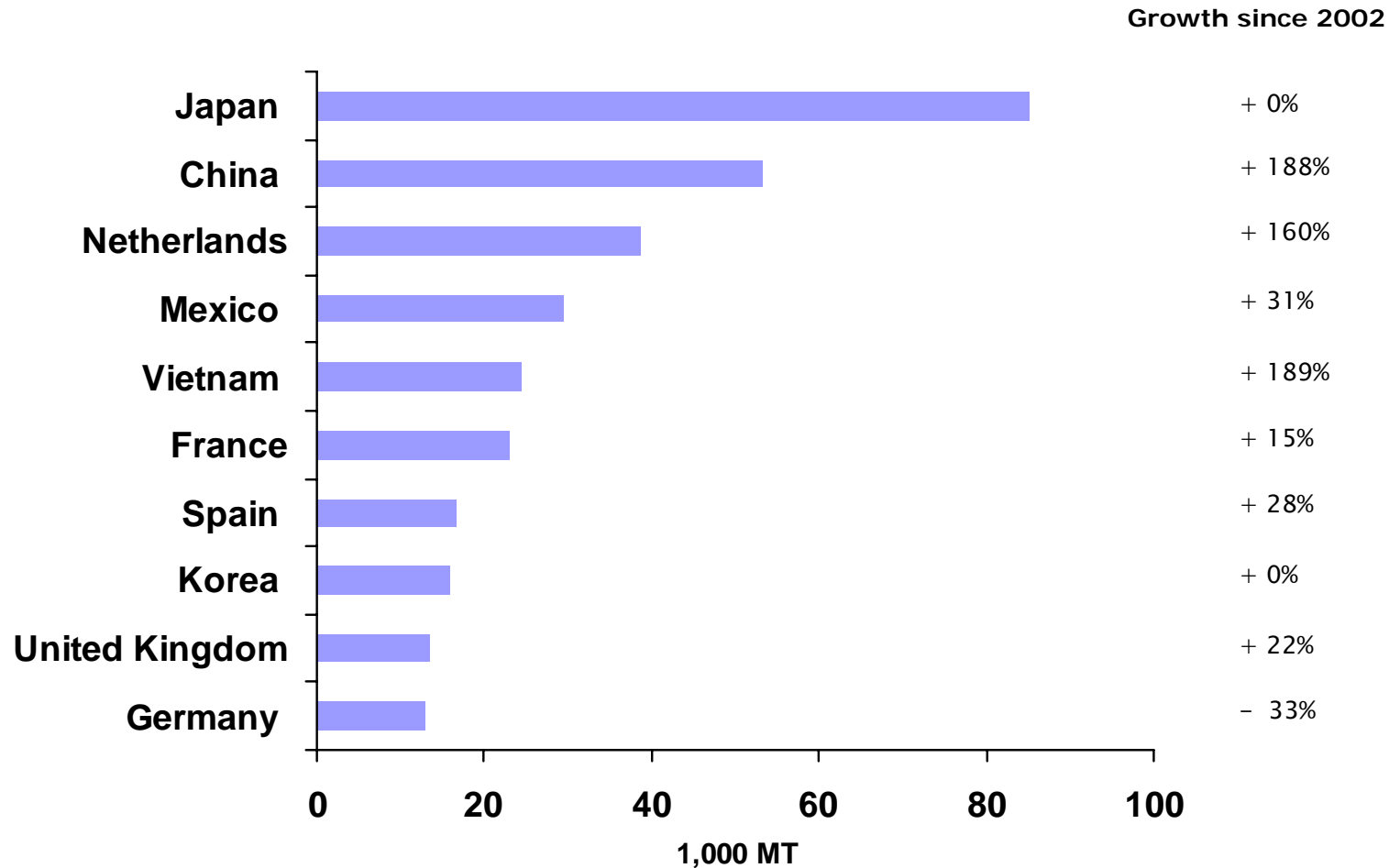
Source: University of Wisconsin, EWPA, Trade interviews

# Top 10 lactose exporting countries 2005



Source: FAOSTATS & 3A Business Consulting

# Top 10 lactose importing countries 2005



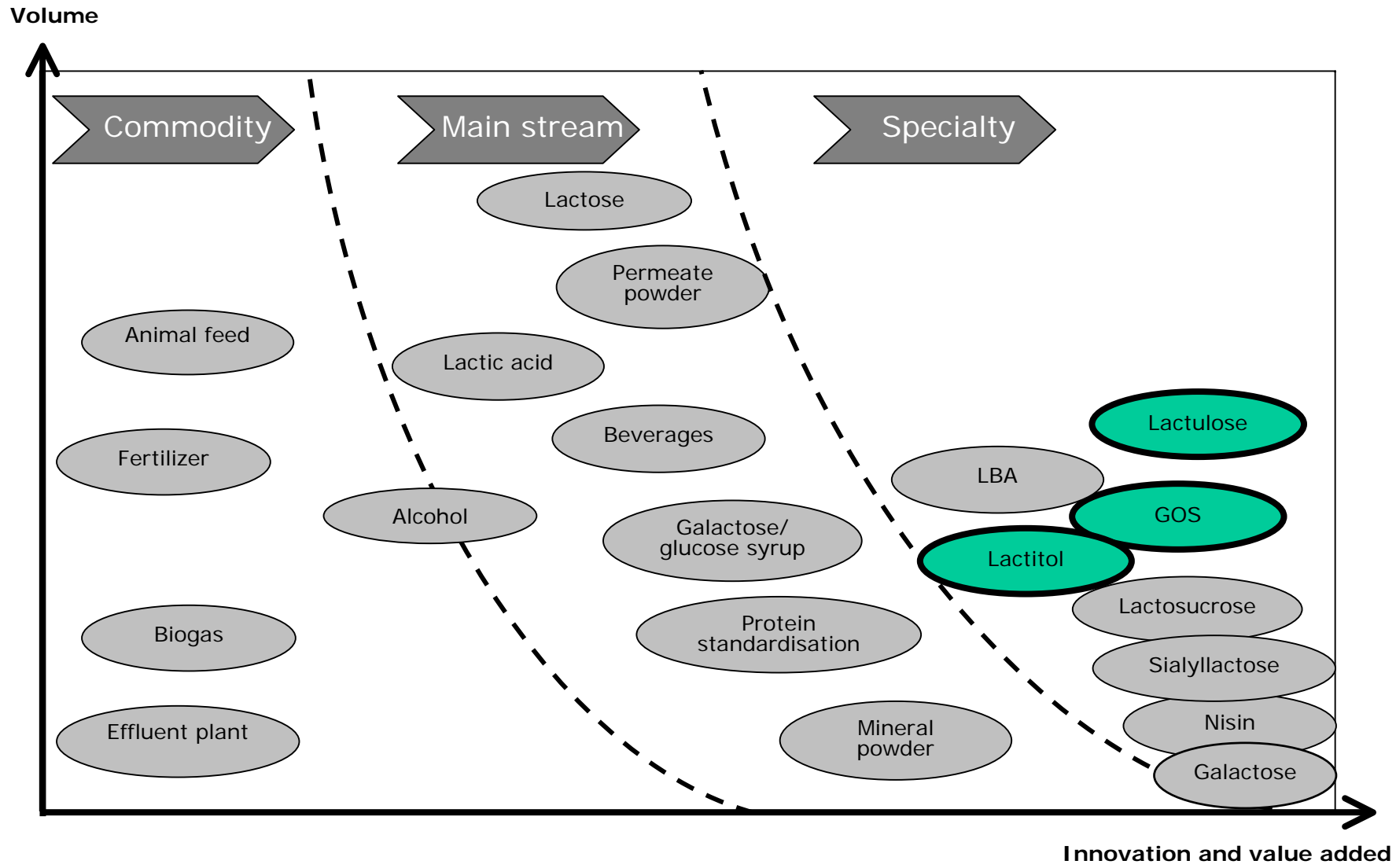
Source: FAOSTATS & 3A Business Consulting

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## Market developments and industry challenges for lactose and lactose derivatives



# Lactose derivatives – strategic mapping

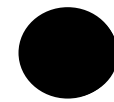
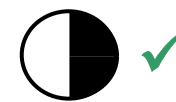
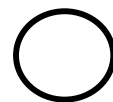


## Market data - Lactitol

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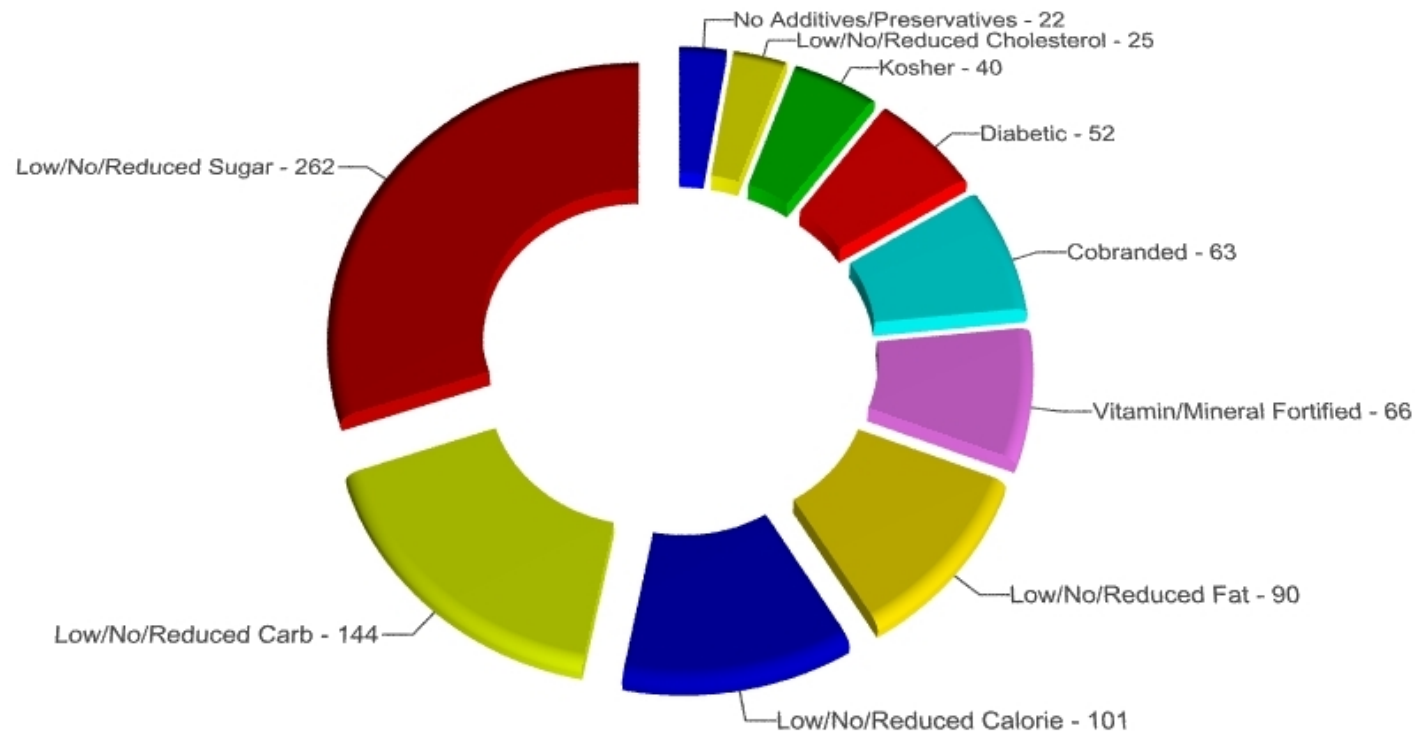
- **Market positioning/segments:** Bulking agent for sugar free products, low sweetness, high viscosity and low hygroscopicity properties, non-cariogenic, reduced calorie-effect. Also some pharma use
- **Competing products:** Food: maltitol, isomalt and erythritol. Possibly isomaltulose, trehalose and tagatose. Pharma: lactulose
- **Competition:** Danisco (DK), Purac (NL), Towa (J), Nikken (J)
- **Market size:** Approx. 10,000 MT and US\$ 50 million  
CAGR: 2-4%

Overall evaluation/market potential/future prospects



# New products with Lactitol

Number of New Products by Positioning Claims



Total number of new products: 865

Source: Mintel, 2001-2007



# Product examples with Lactitol

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## Alimentos NutraBien – Nutrabien Chocolate Chip Cookie



Nutrabien Chocolate Chip Cookie is sugar-free, low in sodium and high in fiber. The product is free from colorants and preservatives. Also available is an Oats variant.

## Yakult – Yakult Bifiene Fermented Drink



Yakult Bifiene is a milk-based fermented drink that contains bifidobacterium breve Yakult, which is said to help promote good intestinal function.

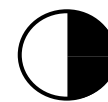
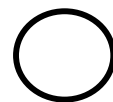
Source: Mintel

## Market data - Galactooligosaccharides

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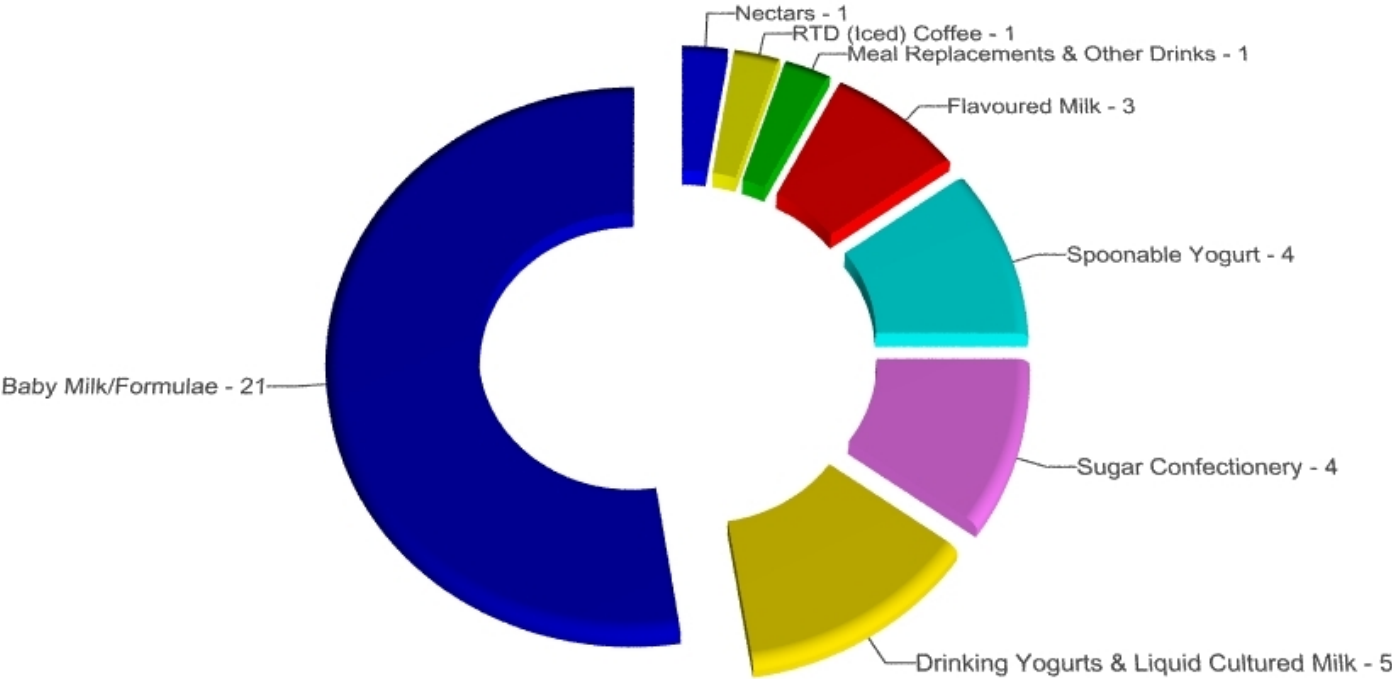
- **Market positioning/segments:** Prebiotic, non-cariogenic, positive effect on constipation. Main potential segments include beverages, dairy products, infant formula
- **Competing products:** Other prebiotics/oligosaccharides
- **Competition:** Friesland Foods Domo (NL), Morinaga (J), Snow Brand (J), Yakult (J), Nissin (J); possibly new players
- **Market size:** Approx. 20,000 MT and US\$ 120 million  
CAGR: 10-20%

Overall evaluation/market potential/future prospects



# New products with galactooligosaccharides

Number of New Products by Sub-Category



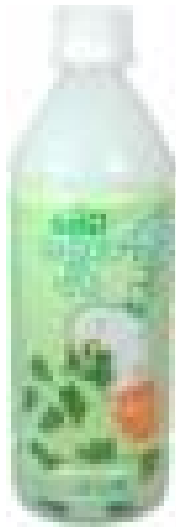
Total number of new products: 40

Source: Mintel, 2001-2007

# Product examples with galactooligosaccharides

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## Coca-Cola – Ooo – Muscat Au Lait



A milky drink with 1% muscat grape juice and oligosaccharide.

## Kasdorf – Nutricia Bagó Nutrilon Premium – Infant Milk powder



Nutricia Bagó Nutrilon Premium Después de la Primera Infancia Infant Milk Powder is a modified milk powder, with prebiotics, made from partially skimmed milk, maltodextrin, vegetable oil, vitamins and minerals. It is said to help reinforce the immune system of infants.

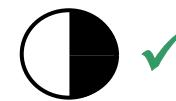
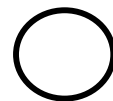
Source: Mintel

## Market data - Lactulose

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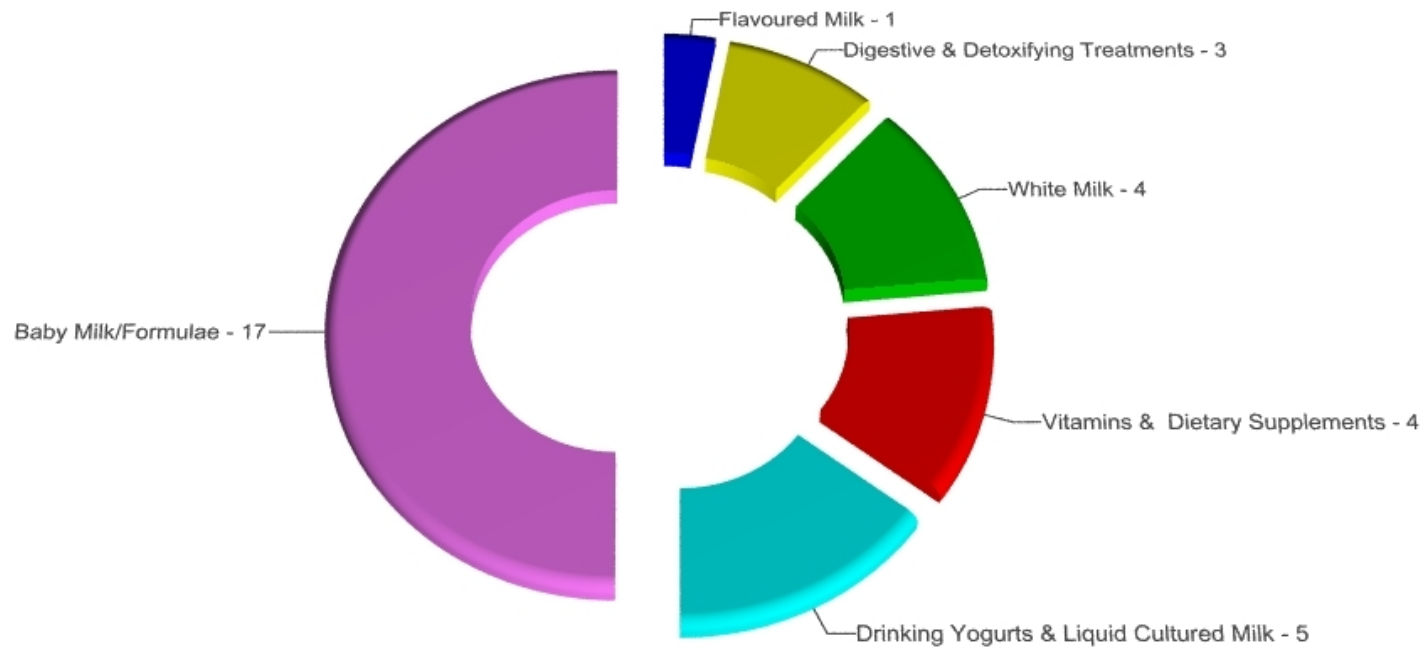
- **Market positioning/segments:** Pharma: mainly treatment of constipation, Food: as a nutraceutical ingredient in infant formula, diabetic foods, soft drinks etc.
- **Competing products:** Other oligosaccharides in food, lactitol in pharma
- **Competition:** Morinaga (J), Solvay (B), Inalco (I), Fresenius-Kabi (AT), Relax (SA), Biofac (DK)
- **Market size:** Approx. 25,000 MT and US\$ 300 million  
CAGR: 2-4%

Overall evaluation/market potential/future prospects



# New products with Lactulose

Number of New Products by Sub-Category



Total number of new products: 34

Source: Mintel, 2001-2007

# Product examples with Lactulose

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## Merck Génériques – Merck Génériques Lactulose – Prune Flavoured Laxatives



Lactulose are prune flavoured laxatives which are said to relieve constipation. It is suitable for adults and children aged seven years and older.

## Pasteur – Pasteur – Regular Motions Yoghurt Drink

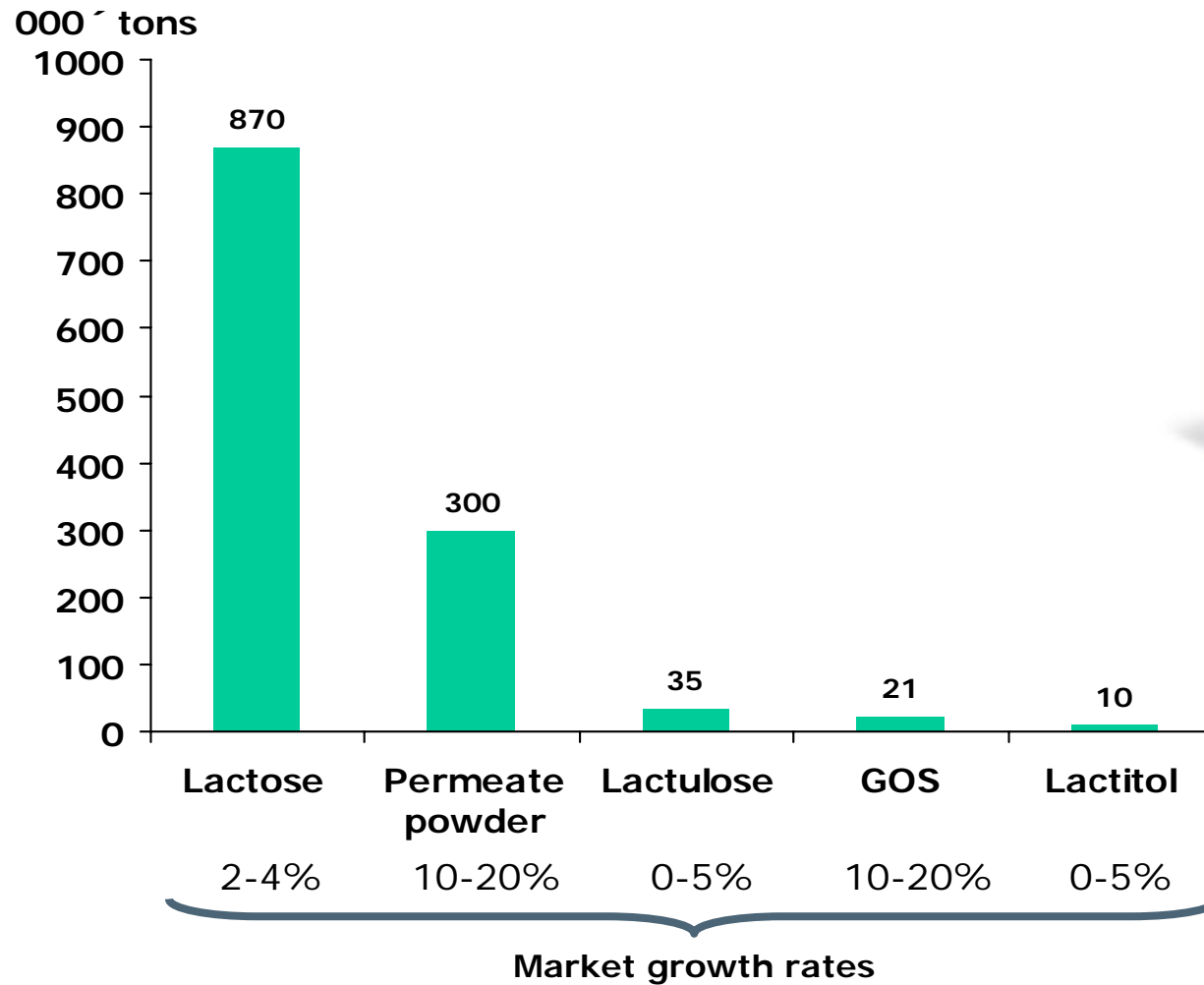


Pasteur has launched Regular Motions Yogurt Drink, which contains synbiotics for regular motions, complex dietary fibre, complex oligosaccharides and prune juice.

Source: Mintel

# Lactose/permeate derivatives overview 2006

Market overview



Source: 3A Business Consulting



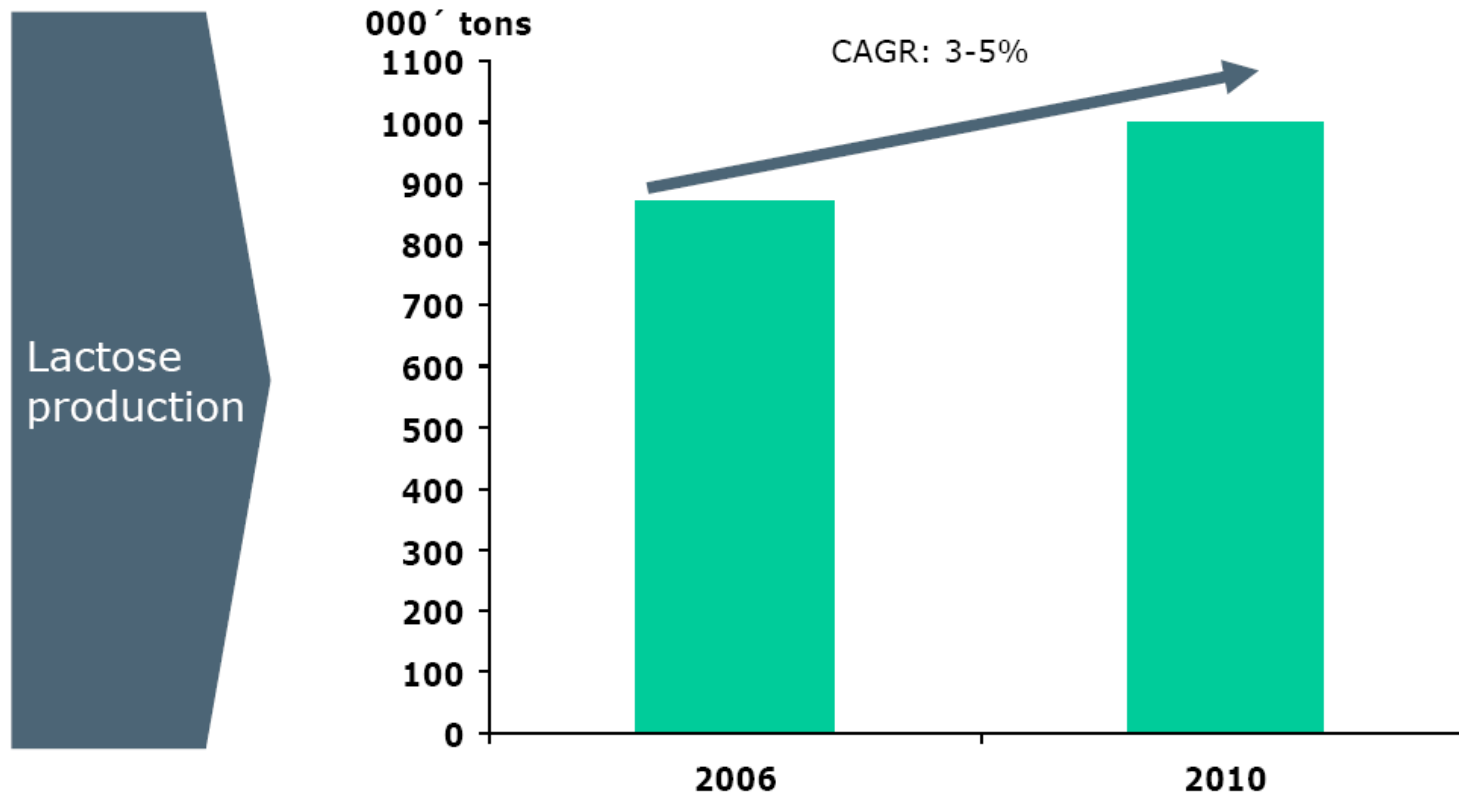
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## Market developments and industry challenges for lactose and lactose derivatives



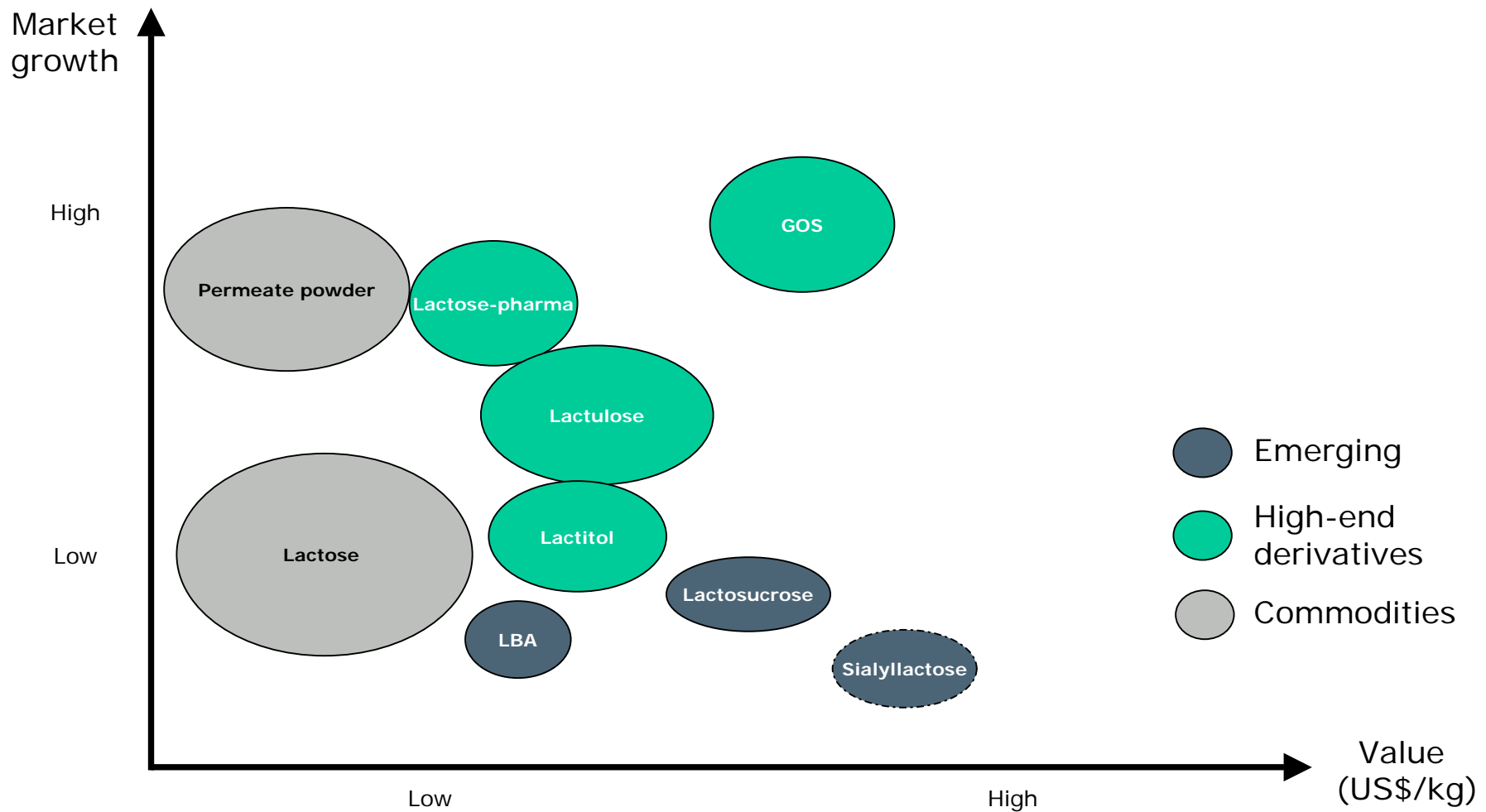
# Expected market development for lactose

Lactose production 2010: 979 – 1.060,000 tons



Source: 3A Business Consulting

# Growth opportunities ahead for lactose and derivatives for the industry 2006-2010

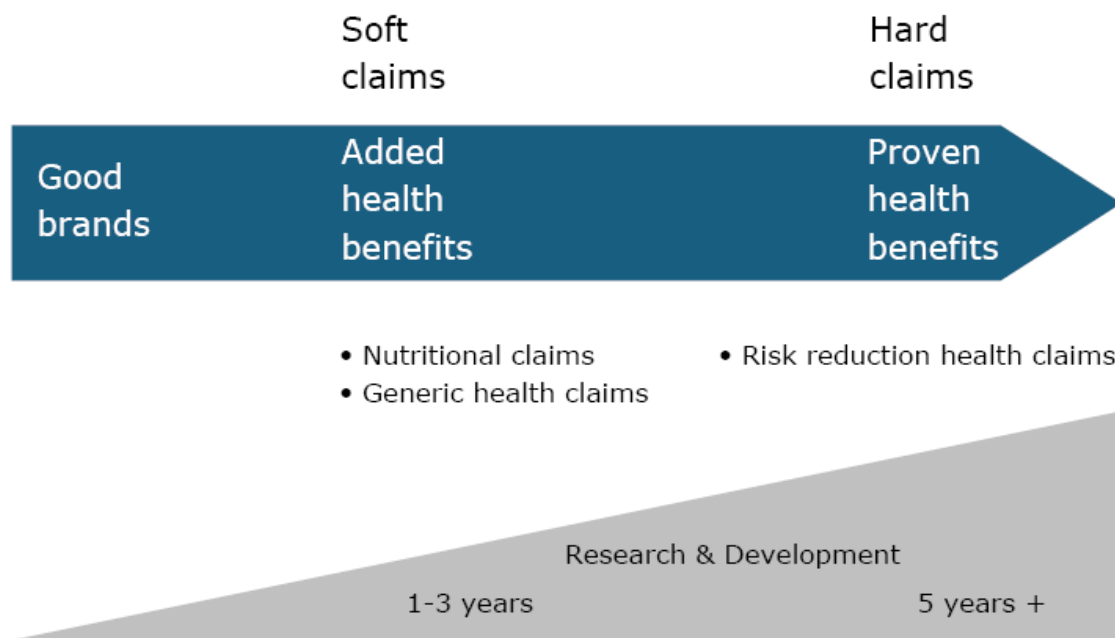


Source: 3A Business Consulting

# Regulatory challenges for new dairy ingredients/lactose derivatives

- Ingredient approval EU – Novel Foods regulation and the US – FDA Food additive petition/GRAS approval
- Documentation of health benefits

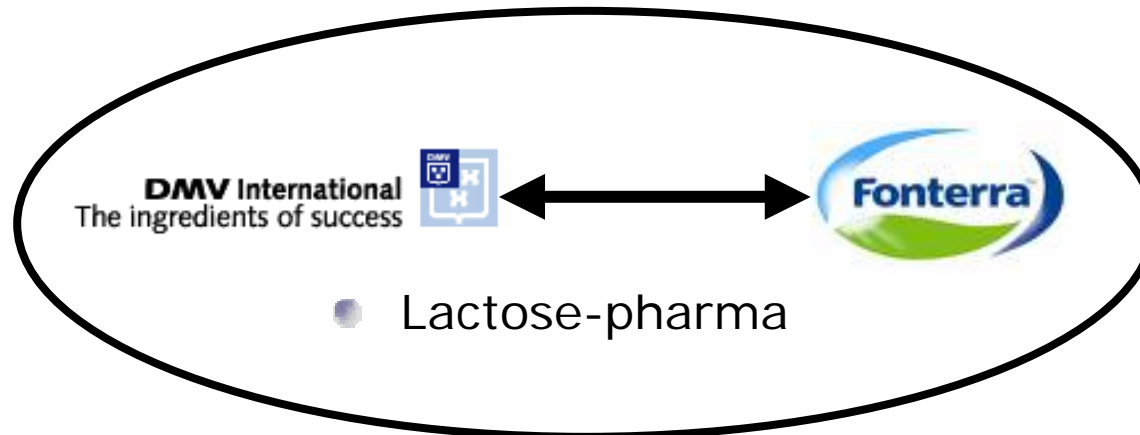
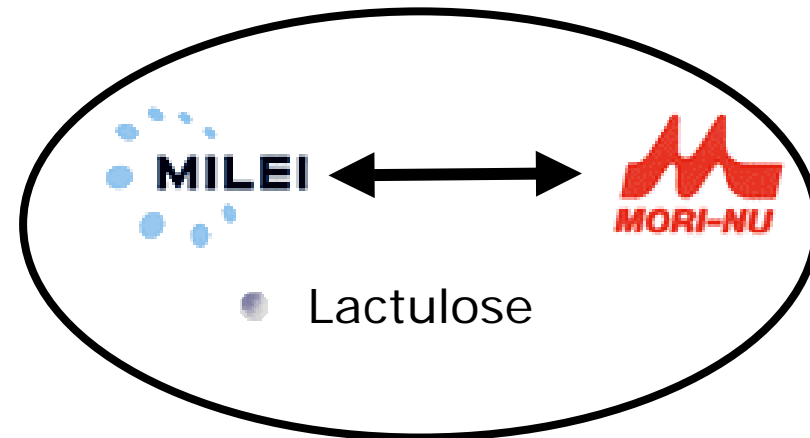
## Aligning science and consumer benefits



# A number of strategic alliances exist within dairy ingredient processing



# Examples of strategic alliances within lactose processing



# Whey ingredients set for growth

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- The market for industrially utilised whey ingredients will continue to grow particularly in food and nutrition applications
- High-value added lactose ingredients will also see moderate growth rates due to increasing demand from the nutritional and pharmaceutical segments, however the pharma market face competition from other excipients e.g. MCC and starch
- Lactose derivatives such as lactulose, lactitol alongside galactooligosaccharides are showing interesting new application opportunities and significant annual growth rates
- New lactose derivatives such as LBA and sialyllactose are emerging and will develop into commercial products

# Market dynamics for lactose

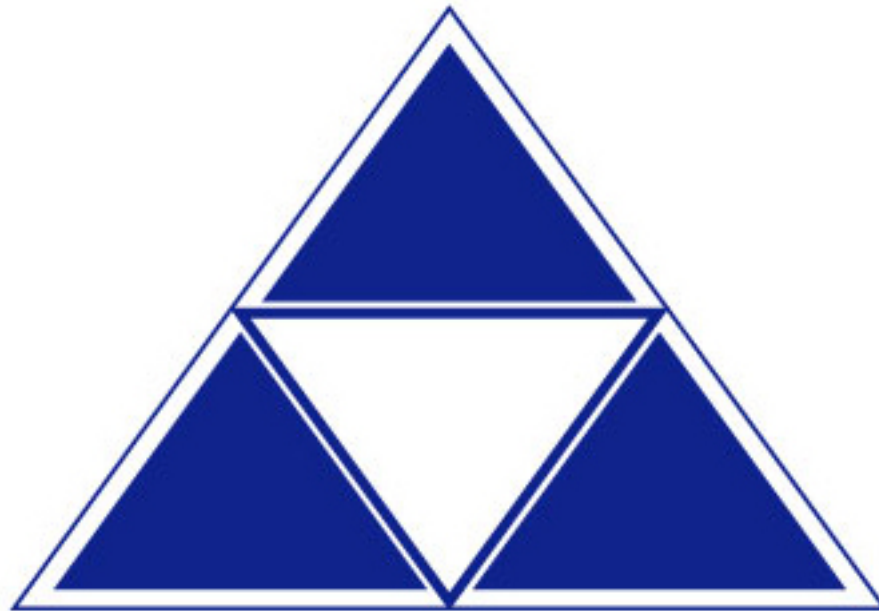
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- Global market demand for dairy products and dairy ingredients approx. 2.8% CAGR exceeds current global milk supply growth of less than 1%
- The dramatic increase in the price of SMP due to lower production and elimination of EU and US stocks have had a knock-on effect on the price of WP and lactose
- A growing demand for lactose for pharma and nutrition usage as well as for lactose derivatives and protein standardization of SMP has further pushed up lactose prices
- High end applications for lactose will continue to be locked into lactose, whereas low end applications will try to reformulate product compositions
- Increase in lactose supply will not likely keep up with demand



Dairy commodities/ingredients including lactose will remain high priced well into 2008 and the foreseeable future





Thank you for your attention  
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