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A STUDY OF THE DAIRY INDUSTRY IN CHINA AND AUSTRALIA'S EXPORT POTENTIAL

A Thesis
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by

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STATEMENT OF AUTHORSHIP

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis presented by me for another degree or diploma.

No other person's work has been used without due acknowledgment in the main text of the thesis.

This thesis has not been submitted for the award of any other degree or diploma in any other tertiary institution.

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ABBREVIATIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABC	Agricultural Bank of China
ADC	Australian Dairy Corporation
AFS	Australian Friesian-Sahiwal
AHB	Animal Husbandry Bureau
AI	Artificial Insemination
AMF	Anhydrous Milkfat
ATM	Agricultural Trade Market
BMP	Buttermilk Powder
BRW	Business Review Weekly
BSF	Bureau of State Farms
CAHIT	(Provincial) Corporation for Animal Husbandry, Industry and Trade
CBE	Commercial Butter Equivalent. Unit of Conversion of AMF to butter (1 kg butter = 0.805 kg AMF)
CDDSSG	China Dairy Development Strategy Study Group
CIS	Commonwealth of Independent States
CMT	California Mastitis Test
CNSB	China National Statistics Bureau
CSICSC	China Statistical Information and Consultancy Service Centre
DFAT	Department of Foreign Affairs and Trade
DPIE	Department of Primary Industry and Energy
EC	European Community
GATT	General Agreement on Tariffs and Trade
GCAHIT	General Corporation for Animal Husbandry, Industry and Trade (Beijing)
GB	Grain Bureau
MAA	Market Administration Agency
MOA	Ministry of Agriculture
MOFERT	Ministry of Foreign Economic Relations and Trade
NCE	Natural Cheddar Equivalent. Unit of conversion of processed Cheddar, pastes and spreads to natural Cheddar (1 kg processed product weight = 0.806 kg natural Cheddar)
NFIO	National Feed Industry Office
RCC	Rural Credit Cooperatives
SEC	State Economic Commission
SH	Specialised Household
SMP	Skim Milk Powder
S&MC	Supply and Marketing Cooperatives
SNF	Solids Non Fat
SPC	State Planning Commission
SSB	State Statistical Bureau (P.R. China)
UHT Milk	Milk subject to Ultra Heat Treatment
UN	United Nations
US	United States
VT	Veterinary Technician
WMP	Wholemilk Powder
WPC	Whey Protein Concentrate

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GENERAL INTRODUCTION

"There is no finer investment for any community than putting milk into babies."

Winston Churchill 1874-1965
Radio Broadcast 21 March 1943

1.1 Rationale

In the last eight years, there has occurred an unprecedented increase in international trade. However, today, there is a global climate of uncertainty consequent upon revolutionary changes in Russia and Eastern Europe and heightened by the stalled Uruguay round of GATT talks, the economic recession of the western world, and the crippling debt of Third World countries.

The situation in Australia reflects both recession and the debt. However, geographically Australia lies on the doorstep of the one bright light in an otherwise gloomy international scenario, the East and South-East Asian region, where in the last decade, seven countries (Malaysia, Thailand, South Korea, Taiwan, Singapore, Indonesia and Hong Kong) have leapt from Third to Second World economic status. Current annual growth rates range from 5.4% in Hong Kong to 8.6% in Thailand (Taber, 1992, p. 29).

As Mr. Taber described in Time magazine, this is the most rapid spurt of economic growth ever recorded in history and is likely to continue. Millions of East Asian consumers are enjoying the new found affluence they have produced and are creating a renewed boom. Some 70% of the population of the so-called "Seven Little Dragons" is under 30 and they are voracious consumers of everything from the latest electronic wizardry to cars (Taber, 1992, p. 32). The secret of

economic success in Asia is an increase in intra-regional trade driven by industrial specialisation and investment, especially by Japan and Taiwan, and flexible policy responses to external events. In 1991, intra-regional exports among East Asian countries expanded 10% from the previous year (Taber, 1992, p. 31).

Total trade of the Seven was $784 billion in 1992. Their biggest partner by far was Japan to whom they exported $27.3 billion and from whom they imported nearly USD 68 billion. Overseas Chinese industries, especially from Hong Kong, have also contributed to the success of the Seven and one-third of the foreign investment in Malaysia, Thailand and Indonesia comes from the original four "Dragons": Taiwan, South Korea, Singapore and Hong Kong. The economic experiments of the Seven have spilled over into Vietnam and southern China which are adopting many aspects of their economic development programs. Growth rates of these two countries now exceed those of the Dragons, although they are starting from lower levels (Taber, 1992, p. 30).

In Australia, the dynamism so obvious in east Asia is lacking. For example, in the second quarter of 1992, GDP in Australia grew only 0.6% on an annualised basis which was down from 1.6% in 1991 (Deans, 1992, p. 96). Australia's largest export earner, coal, has played a major role in the development of South East Asia and Australia possesses the primary products and agricultural and engineering technology that Asia needs.

The stage is set for Australia to enter this extraordinarily dynamic arena in which agriculture should play an important part.

It is estimated that over the next decade, the food industry in Japan and East and South Asia will grow by US$100 billion (A$138.9 billion) compared with US$6 billion (A$8.3) in Australia and New Zealand. Food imports in South Korea swelled 18% over the three years ending 1990, in Japan by almost 14% and in Hong Kong by 12%. The percentage of processed food, a by-product of affluence, is rapidly rising. The New Zealand Dairy Board has acted quickly and already captured a third of Japan's imported cheese market (Stretton, 1992, p. 82-83).

The very high penetration of television in Asian households ranging from 99% of South Korea and Japan to 40% in the backblocks of the Philippines is broadening the East's exposure to Western-style food. Meanwhile tariffs on food imports are being lowered in many countries. This should provide unprecedented market entry opportunities for Australian food marketers. If they can establish preferred supplier status with expanding convenience store and supermarket companies such as 7-Eleven, Makro and Wellcome, they can "ride" on these retailers' growth. Another strategy could be to consider off-shore operations to capture lower production costs, create insider status and gain greater market access.

Like almost every other industry in Australia today, the dairy industry is currently experiencing a revolutionary awakening. Major changes in policy in Canberra towards zero tariff levels and the possibility of deregulation pose considerable challenges.

It is said that in the future "China will not only be the growth engine for Asia, but for the world" (Rennie, 1992, p. 95). In 1991 her exports grew by 15.8% to US$71.91 billion (CMN, 1992, p. 17). China now accounts for 2% of world trade making it the world's 13th largest trader (Australia is the 22nd). In January 1991, China stopped issuing subsidies to foreign trade corporations and this did not affect its exports adversely. The foreign trade system has now liberalised with three sets of import tariff reductions affecting 43 types of import commodities. The reductions in January and June of 1991 applied mostly to industrial and agricultural chemicals, the one in 1992 affected 225 types of goods including food stuffs, raw materials, and medical instruments (CMN, 1992, p. 18).

China's economic performance in the fourteen years since the policies of Mr Deng Xiao-ping were adopted in 1978 has brought about one of the biggest improvements in human welfare anywhere at any time. Real GNP has grown by an average of almost 9 per cent a year (Rohwer, The Titan Stirs. 1992, p.3). The success of Mr Deng's policies and the enormous desire of the Chinese population to modernise provides a potential market for every imaginable technology and product.

Professor Ross Garnaut reported in 1989 that: "Demand for agricultural produce - not only grain and fibre, but also sugar, fats and oils and a range of other products - has been growing more rapidly in China than in any other economy over the past decade (Garnaut, 1989, p. 196). In a more recent publication with Mr. Ma Gou-nan, he stated that China's reported GDP would need to be raised by a factor of three to maintain its food consumption patterns which do not conform to the group of poorest 25 world economies often characterised by famines and financial bankruptcy. Overall consumption of high-value foods enjoyed by an average Chinese consumer in the late 1980s had already reached Taiwan's level in the mid-1960s (Ma and Garnaut, 1992, p. 3).

The performance of agriculture in China since 1978 as measured by growth of production across a broad front has been remarkable. Tyres and Anderson (1992, p.277) remark that the striking feature of the 1980s was the initial rise in agriculture's share of net material product from 33% in 1978 to 40% in 1984 before it fell back to 34% in 1987. This reflects the fact that China's reforms were implemented to a much greater degree in rural than in urban areas. In particular farm product prices rose much more substantially than the general level of producer prices during that decade. Agricultural output by 1988 was 83% above the 1978 level leading to a reversal of the long-run decline in agriculture's share of national product in the early 1980s.

The important question facing China and other food exporting countries is to what extent is China's food and feed production growth likely to diverge from consumption growth in the 1990s and what will be the consequences for world food markets. Optimists like Garnaut believe a repeated doubling of incomes in China would be possible in the 1990s if economic reform continues (Tyres and Anderson, 1992, p.281) What is unknown is how agriculture's share of the Chinese economy may change by the year 2000.

The Chinese, and Han people in particular, are not traditional consumers of milk products. In fact as recently as 1950, the vast majority of Chinese had never tasted milk. However, by 1979 per capita consumption of milk from cattle had increased to 1.1kg and from then to 1985 it more than doubled to 2.4kg (Simpson, 1988, p.25)

There is a widespread misconception in the West that all Asians are lactose intolerant. In fact this problem affects only about 40 per cent of any population.

Although China increased production of milk from 6.4 million pounds to 9.3 million pounds between 1986 and 1990 and the number of dairy cows increased from 1.85 million head in 1986 to 2.53 million in 1989 (Carlson, 1991), average milk consumption is still very low by European standards. Availability averages about 2 litres of milk per head per year compared with 300 litres in northern Europe (Commodities and Agriculture: China's dairy shake-up has a long way to go,

Financial Times, 1992, p. 4). However, demand for dairy products in China is growing. Ice-cream which originated in China in 1000 BC, is becoming popular and profitable as is yoghurt and yoghurt drinks. On the other hand, the Chinese dairy industry is unlikely to be able to meet consumer needs in the near future and the system will take quite a few years to change.

Australia is strongly advocating and promoting the concept of co-production with China which would involve upgrading work on traded products carried out at both the export and import ends. This is the latest attempt by Australian authorities to achieve greater Australian input in commodity based exports to Asia. According to Mr. Alan Reid, Australia's Trade Commissioner in Beijing:

> "The Australia-China economic connection has turned hot, together with the pace of Chinese economic activity. The "big-sleeper" is food processing, with a number of major deals under negotiation at the moment. There is a constant stream of Chinese delegations going to Australia. I'm working 14 to 15 hours a day. It's quite extraordinary" (Byrnes, 1992, p. 7).

Given the above, this research focuses on the potential demand for dairy products in China and Australia's ability to meet this demand for the benefit of both countries.

1.2 Aims

The aim of the study is to develop an understanding of production and demand of dairy related products in China with a view to providing a basis to determine the export potential of dairy products from Australia. In order to achieve this aim, the following specific objectives were addressed.

- To provide an outline of the Chinese dairy industry including favourable developmental factors and developmental constraints.
- Taking into account the influence of history, culture and dietary preference on production and consumption, to examine how current demand for dairy products in China has been met through local production and or imports.
- To develop an understanding of the Australian dairy industry and its capacity to satisfy any existing shortfall in supply or contribute to any future growth in demand for dairy products which is unlikely to be met through China's domestic dairy industry.

1.3 Delimitations and Definitions

Dairy Products:

For the purpose of this study, the term dairy products refers only to milk and milk products obtained from cattle. Such products include pasteurised ready drinking milk, butter, milk powder, yoghurt, ice cream, cheese and whey powder.

Milk/Product Conversions

The milk product yield conversion standards are those formulated by the Australian Dairy Corporation. Details of these are contained in Appendix 1.

China:

The research was restricted primarily to the People's Republic of China with emphasis on Han residential areas.

Australian Dairy Industry:

The characteristics of the Australian dairy industry which influence international marketing strategies related to exportable dairy products have been included.

Statistical Data:

With the exception of Tables 4-1-1, 4-1-9, 4-1-10, 4-2-3, 4-2-4, 4-2-6, 4-2-7 and 6-1-1 which include official projected data, in this study all data prior to 1991 are official figures. Figures for 1991 and 1992 are estimates and for 1993-2000 are projections which have been made using fundamental and technical analyses and relying heavily on field research and the opinions of experts. Please note there are doubts about the validity of some of the Chinese figures.

Cultural Differences:

A knowledge of the culture of a country including business etiquette is of utmost importance in establishing international trading relationships. This topic is not covered in great detail in this thesis.

1.4 Methodology

Contrary to the predictions of Malthus and Ricardo, population pressure in the world to this point in time has not lead to rising prices for agricultural products (Tisdell, 1974, p.63). This has been due largely to technological progress which has enabled the output from the available land to be vastly expanded. However, the developing economies of the countries of Asia with their large populations may see the "Malthus-Ricardo" trend yet asserting itself.

There are many ways of analysing data: demand schedules, supply schedules, market demand schedules, indifference curves, the Cobweb Model (involving lagged reactions and thus with particular application to agricultural markets but possibly unrealistic due to simplicity), consumer's equilibrium, income consumption curves, Engle Curves which show that the proportion of personal expenditure devoted to necessities decreases as income rises and is relevant to food products. This income elasticity of demand, however, depends on whether the product is deemed superior or inferior.

The Hicksian approach to determining the demand for a product estimates market demand curves on the basis of empirically obtained preference relationships for each consumer in the market. It adds together the demand curves which individual consumers have for a product. However, it is impractical as it does not take into account social factors such as bandwagon

and snob effects which influence the market demand curve (Tisdell, 1974, p.95).

The econometric approach relies on the assumption that market equilibrium is achieved (or virtually achieved) in each observation period. When this is not so, for example because Cobweb relationships are important, the method is inadequate. Traditional demand theory ignores group and social influences. Traditional economic theory assumes that consumers are well informed and rational, at least on the whole. It is evident that some consumers are in fact poorly informed and that the majority of consumers are comparatively ignorant about the properties of many new and complex products (Tisdell, 1974, p.99).

The situation with a product such as milk is further complicated by the fact that the demand for milk for liquid consumption is relatively insensitive to price giving it a steep demand curve, whereas the demand for milk for manufacture is much more price sensitive (Hill, 1990, p.103).

In the 1980s many different models for farm economies were developed. The most recent ones try to incorporate all factors in the system and are extremely complex. They have been reviewed by Tyres and Anderson (1992, p.157) and are outlined in the discussion of this work.

Any attempt to analyse and forecast aspects of China's food

market in the present period of enormous change in the country's economic system is a considerable challenge. This is particularly so when the foremost authors on the subject have stated that "official figures for China make no real sense and that China's GNP is underestimated by a factor of three" (Ma and Garnaut, How Rich is China, 1992, p.3) and "How production and consumption will respond as the Chinese economy reforms is very difficult to predict..." (Tyers and Anderson, "Disarray in World Food Markets" 1992, p.295).

There were several alternative ways to approach this study of China's dairy market and Australia's ability to supply, among them the established agricultural model employed by the F.A.O. based on incomes, income elasticities, population, etc. or an opportunity analysis or a survey of new business development. Given that much of the data are difficult to evaluate, income elasticities are irrelevant in situations where demand for product outstrips supply, opportunity costs are not relevant in countries which desire to maintain self-sufficiency in food production, and new business development is under the auspices of central planning, a simpler model (Figure 1-4-1 pers. comm. Dr W. Schroder, Syme Business School, Melbourne) is employed. Put simply, consumption less local supply equals import demand. The various factors involved are considered. Mention is made both to opportunity analysis with relation to trade liberalisation in world food markets in the discussion (section 7.2) and new business development is mentioned with regard to milk processing facilities (section 3.1).

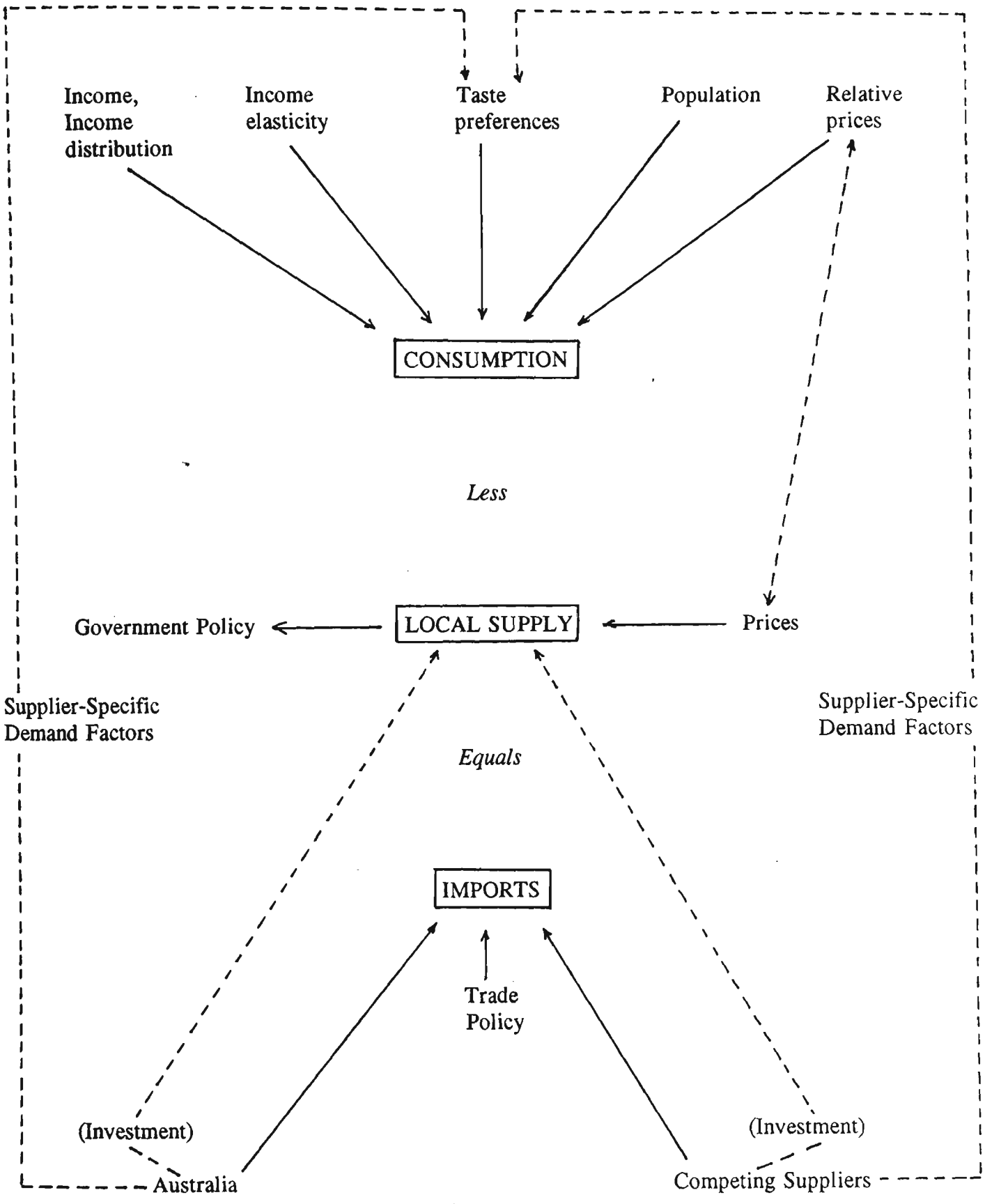


Figure 1-4-1 **Factors Influencing Consumption and Import Demand**
Source: Dr W.R. Schroder, Syme Business School, Melbourne.(pers. comm.)

In this study, data has been collated and forecasts extrapolated from recent historical trends. This was considered to be the most suitable approach given for example that figures for per capita income, a benchmark macro-economic variable in estimating trends in economic change, in China do not reflect reality as it exists today.

Seventy five selected Chinese dairy industry experts were contacted in person and interviewed. Similar interviews were held with 20 authorities in the Australian dairy industry. The author was given particular assistance in this area of the study by Murray Goulburn Co-operative Limited and the Department of Primary Industry and Energy in Australia.

Dairy farms both in Australia and China were visited to obtain a clear picture of the industry. Visits were also made to dairy processing factories to gain a better understanding of processing technology both in Australia and China and to enable appropriate comparisons to be made.

In addition, several visits were made to the Melbourne Royal Agricultural and Industrial Exhibition and Brisbane Agricultural Exhibition to establish contacts with producers.

Desk research carried out in China included analysis of published resources, published surveys, market research projects, experiments and case studies. Access was also provided to formal unpublished reports provided by officials

associated with the Chinese dairy industry. This was conducted in conjunction with some sampling (7 cities in China and 5 cities in Australia), interviewing and consulting (about 100 Chinese dairy industry authorities and experts, see Appendix 2), statistical measures (with China's Ministry of Agriculture), and systematic data collection (yearbooks, CD-ROMs and relevant literature) both in Australia and China. The review of literature for the purpose of gaining an insight into the Australian dairy industry included secondary sources from Victorian based libraries and official reports.

Dairy Industry Visit to China

In view of the author's prior knowledge and experiences in China's agricultural industry, in November, 1992, the author was invited to join an Australian Dairy Industry Trade Mission to the People's Republic of China. The purpose of this Mission was to obtain first hand experience of the market structure and access primary source data concerning the current status of the dairy industry. The author was one of the four members responsible for preparing the mission report - "China's Dairy Industry" which was submitted to the Department of Primary Industry and Energy on 15th December, 1992.

1.5 Organisational Structure

A brief review of the literature is given in Chapter 2. Four seminal texts are considered in detail in the Discussion.

In Chapter 3, the emphasis of the research is on dairy production in China, the cost of which is fundamental to the economics of the dairy industry.

Chapter 4 details the production and consumption patterns in different areas of China and at different income levels. It includes a description of the distribution system and substantial data analysis of relevant aspects of China's dairy industry.

A brief introduction to the Australian dairy industry is presented in Chapter 5 and comparisons are made with the international industry.

Chapter 6 gives a detailed analysis of China's dairy consumption by product: liquid milk, butter, cheese, whey powder, milk powder, yoghurt and ice cream. Australia's potential to supply various segments of the Chinese dairy market is also included.

Finally, Chapter 7 includes a discussion of factors influencing consumption and import demand in China; factors influencing Australia's ability to supply the Chinese market; forecasts for the dairy industry (Australian and international); a summary of the findings of this study and how Australia might best formulate a strategy to participate in the Chinese market.

This research offers a substantial analysis of the dairy industry in China, which is still little known internationally. It also provides a good starting point for future research of the Chinese dairy industry.

2

LITERATURE REVIEW

Excerpt from Marco Polo's "Description of the World"

"You must know that, when a traveller leaves Yang-chau (Yang Zhou) and continues south-eastwards for fifteen miles, he reaches a city called Sinju (I-ching), which is of no great size but is a busy resort of ships and merchandise. The people are idolaters and subject to the Great Khan. Their money is of paper. This city stands on the biggest river in the world, which is called Kiang (Yang Zi Jiang = Chang Jiang). In some places it is ten miles wide, in some eight, in others six, and in length it extends to 100 days' journey. Thanks to this river it is a city of innumerable ships, carrying quantities of goods and merchandise, and consequently a great source of revenue to the Great Khan.

I assure you that this river runs for such a distance and through so many regions and there are so many cities on its banks that truth to tell, in the amount of shipping it carries and the total volume and value of its traffic, it exceeds all the rivers of the Christians put together and their seas into the bargain. I give you my word that I have seen in this city fully 5,000 ships at once, all afloat on this river. Then you may reflect, since this city, which is not very big, has so many ships, how many there must be in the others. For I assure you that the river flows through more than sixteen provinces, and there are on its banks more than 200 cities, all having more ships on than this. This excludes the cities and territories situated on rivers flowing into the main stream, which also carry much shipping. And all these ships carry goods to this city of Sinju (I-ching) and back again. The chief article of commerce on the river is salt, which traders load at this city and carry throughout all the regions on the river and also up-country away from the main stream along the tributaries, supplying all the regions through which they flow. For this reason salt is brought from a log stretch of the sea-coast into Sinju and there it is put on board ship and transported into all these regions. The same ships also carry iron. On the return journey downstream they bring into this city wood, charcoal, hemp, and many other articles on which the coastal regions are dependent. Even so, the shipping does not suffice to carry everything; a great many wares are transported on rafts. Hence this port or city provides the Great Khan with a substantial income."

R. Latham, "The Travels of Marco Polo",
Harmondsworth, 1958, p. 175.

China is part of the dynamic growth area of North-East Asia, a region described as "by far the most important food market for Australia ... in the next several decades" (Garnaut, R. "Australia and the North-East Asian Ascendancy", 1989, p.193). In fact, primary products comprised 65 per cent of Australia's exports to North-East Asia in 1990 (DFAT East Asia Analytical Unit, "Australia and North-East Asia in the 1990s. Accelerating Change", 1992, p.4). More specifically China has been projected "to remain dependent on imports of wheat, coarse grain, dairy products and sugar and to become a net importer of rice" in the future (Anderson, K. and Tyers, R. "Economic Growth and Market Liberalisation in China: Implications for Agricultural Trade", 1987, p.140).

Despite the fact that, of the rural industries in Australia, dairying ranks fourth, after wheat, wool and beef, in terms of value of production and employs a considerable number of people in related down-stream manufacturing and processing establishments, a search of the literature reveals that very little work has been published specifically analysing the prospects of the Australian dairy industry in the Chinese market. This situation is possibly due to the reputed "milk-intolerance" of Asians, the fact that dairy products are not a traditional part of the Asian diet, the complexity of the Chinese market and lack of accurate statistics on agriculture (remarked upon by Barker, R. and Sinha, R. in "The Chinese Agricultural Economy", 1982, p. 1), and an underestimation of the development of diet diversity which accompanies a rising standard of living.

2.1 World Food Markets:

The seminal agricultural economics text on world food markets is D.G. Johnson's "World Agriculture in Disarray" published in 1973 when the world was experiencing a "food crisis". A second edition was printed in 1991. Other texts on the subject which include the dairy industry (except Wen, S.) are:

- Anderson, K. and Tyers, R. (1987) "Economic Growth and Market Liberalisation in China. Implications for Agricultural Trade." The Developing Economies 25, (2) June, pp. 124-151;
- Roningen, V.O., Dixit, P.M. and Seeley, R. (1989) "Agricultural Outlook for the year 2000: some alternatives." in Maunder, A. and Valdes, A. (Editors) "Agriculture and Governments in an Interdependent World";
- Wen, S. (1990) "Government Policies and Food Sector Performance: The Chinese Experience" in Tyagi, D.S. and Vyas, V.S. (Editors) "Increasing Access to Food. The Asian Experience";
- Tyers, R. and Anderson, K. (1992) "Disarray in World Food Markets. A quantitative assessment";
- Carr, E. (1992) " A Survey of Agriculture - Grotesque." The Economist, Dec. 12, pp. 1-18.

Recognised as the most comprehensive and detailed text to date, Tyers and Anderson's 1992 work introduces a behavioural model of world food markets which formalises the relationships between structural changes and food policies on the one hand and their production, consumption, price, trade and welfare consequences on the other. It examines seven food groups

including dairy products in a special partial equilibrium model and also considers China. These authors state that "the important question now facing the food exporting countries - not to mention China itself - is: to what extent is China's food and feed production growth likely to diverge from consumption growth in the 1990s, and what will be the consequences for world food markets?" (p. 279).

The afore-mentioned texts are especially pertinent to this thesis and the findings of several of them are summarised and related to this work in the discussion (Chapter 7).

2.2 World Trade and the GATT:

The future of world trade today revolves around the outcome of the Uruguay Round of GATT negotiations which is focused on banking, investment, intellectual properties and telecommunications but also includes textiles and agriculture. The talks were suspended in December 1990 over the issue of European government subsidies for agricultural products. Talks have resumed but are at present still unresolved. When this Round of negotiations began in September 1986, the levels of protection for agricultural products were greater than when the first of the three Rounds, the Dillon Round negotiations, started (D.G. Johnson, 1991, pp. 308-309).

A number of texts discuss the details and implications for Australia and China of agricultural trade reform by the GATT notably :

. Horridge, M., Pearce, D. and Walker, A. (1990) "World Agricultural Trade Reform: Implications for

Australia", The Economic Record 66, pp. 235-248;

- Goldin, I. and Knudsen, O. (Editors) (1990) "Agricultural Trade Liberalisation. Implications for developing countries" OECD, Paris;
- Tyers, R. and Anderson, K. (1992) already cited;
- Drysdale, P. and Elek, A. (1992) "China and the International Trading System." Pacific Economic Papers No. 214, Dec. 1992. Australia-Japan Research Centre.

It is generally agreed that Australia's rural industries will benefit in the medium and long term from a successful GATT outcome (ABARE, Australian Resources Quarterly (ARQ) (1992) p. 50).

Factors relating to China's membership of the GATT and future possible outcomes however are extremely complex and multifaceted. China is a very large country but still a relatively small trader (Drysdale and Elek (1992) p. 9) As mentioned, the effect of China's expected future trade expansion is causing concern to all exporting countries but it is likely that there would also be positive effects on exports to the Chinese market and consumers in world markets. China's penetration of world markets and the consequent need for adjustment by others will be concentrated in the sectors where its comparative advantage lies. It will be economically efficient for China to import an increasing share of land-intensive products such as grain for human and animal consumption as well as an increasing range of meat products (Drysdale and Elek, 1992, p. 13).

The uncertainties caused by China's non-participation in the GATT are perhaps most vividly illustrated by the annual tensions surrounding the renewal of China's "most favoured nation" (MFN) status by the US. China's resumption of participation in the GATT would be very helpful in reducing such uncertainties - full participation would ensure, for example, that China could receive automatic MFN treatment from all other contracting parties to the GATT. China would also have the right to appeal against any arbitrary actions such as unjustified anti-dumping measures, and selective import safeguards, which might be taken in response to increased exports by China (Drysdale and Elek, 1992, p. 15).

2.3 Economies of the Asia-Pacific Region:

There is a considerable amount of literature on the analysis of the economies of the Asia-Pacific region since its major importance to the world economy became evident. These studies include distinguishing the policies which have contributed to the rapid growth of the successful economies in East Asia. Most notable is the World Bank's study entitled "The East Asian Miracle" (1993) which concluded that success was due to superior accumulation of physical and human capital and the ability to allocate physical and human resources to highly productive investments and to acquire and master technology. It concludes that there is no single "East Asian Model". The eight high-performing Asian economies (HPAEs) (Hong Kong, Singapore, Indonesia, Japan, Korea, Malaysia, Thailand and Taiwan) studied used different and changing sets of policies to achieve rapid growth with equity (p. 347).

Some key aspects of these market-friendly policies which have played a crucial role in the rapid growth of the HPAEs are:

. Ensuring low inflation and competitive exchange rates;
. Building human capital;
. Creating effective and secure financial systems;
. Limiting price distortions;
. Absorbing foreign technology; and
. Limiting the bias against agriculture (World Bank, 1993, pp. 347-352)

The authors stress however the importance of good macroeconomic management and broadly based educational systems (p. vi). China, as a latecomer, has the benefit of seeing the outcomes of the HPAEs choices and can profit from their experience in her own future policy decisions.

2.4 Comparative Studies of China's Reforms:

A number of texts deal with a comparative study of China's reforms and the role of government and trade liberalisation in the different countries of the Asian region, notably:

. Garnaut, R. and Liu, G-G. (Editors) (1992) "Economic Reform and Internationalisation: China and the Pacific Region";
. Sicular,T (Editor) (1989) "Food Price Policy in Asia. A comparative study";
. Garnaut, R. (1989) "Australia and the North-East Asian Ascendancy".

Garnaut and Liu's book details the ways in which China is similar to and different from various economies with which it is commonly compared - especially in the Pacific and Eastern

Europe and focuses on the important question at the centre of China's reforms - the respective roles of the market and the state in sustained economic growth - drawing experience in East Asia and the once-communist countries (p. 8). These concerns are beyond the scope of this thesis.

2.5 Australia's Position in the North-East Asian Area:

Australia's position in the North-East Asian area is considered by:

- Garnaut, R. (1989) already cited, and
- The Department of Foreign Affairs and Trade (Australia) DFAT East Asia Analytical Unit (1992) "Accelerating Change".

DFAT's East Asia Analytical Unit stresses the fact that "North-East Asia is so dynamic that continual assessments of economic trends are necessary and that Australia needs to be alert and responsive to the big changes occurring there" (p. 10).

The majority of texts dealing with the food industry are general and those which are specific to the dairy industry are indeed few in number. The main issues in the Chinese dairy industry today are: how to increase the local production of milk powder and how to improve the quality of its dairy products. A major issue for the Australian dairy industry is how to provide a reliable supply to export market demand.

There is no detailed study of Australia's potential to supply the dairy market in the P.R. China. In undertaking this study

detailed basic information of both the Australian and Chinese dairy industries are brought together. The work fills a void in the literature, and aims to provide mutual understanding of the two industries.

2.6 Statistical Data:

Statistical data relating to the Chinese dairy industry is available in various publications of the China Ministry of Agriculture, Beijing, and especially of the China Dairy Development Strategy Study Group.

Statistical data on the Australian Dairy industry and figures on international trade are published in ABARE's Agricultural Resources Quarterly, (1992) and Commodity Statistical Bulletin (1992); also in the Australian Dairy Corporation's Dairy Compendium (1991).

In addition to published data, this study emphasises field work and has placed importance on discussions with people at diverse levels of the dairy industry for their views on the industry's future. It includes opinions that are not in centrally formulated statistics and attempts to bring these together with data banks.

This thesis provides a starting point for further research into the potential for specific products of the Australian dairy industry e.g. SMP, whey powder, cheese and ice-cream pre-mix, in the Chinese market. Its aim is to make a contribution to Australia's knowledge of the market potential for dairy products which will assist Australian companies in

decision-making and thus successfully compete in the extraordinary dynamic market opportunity which exists in China today.

3

THE CHINESE DAIRY INDUSTRY - A BRIEF INTRODUCTION

"When the sun stood at midday, the Divine Husbandman held a market. He caused the people of the world to come together and assembled the riches of all under Heaven. There they exchanged with one another and then returned home, each thing having found its appropriate place."

I-ching (Book of Changes)

3.1 General Background

Introduction

China's landmass encompasses a climate of great diversity ranging from sub-arctic to tropical. Formidable physical barriers have isolated China from easy contact with other major cultures and these barriers also resulted in the border regions of China being inhabited by unassimilated non-Han populations.

China's dairy industry has a long history. About five thousand years ago, minority nationalities in Northern and Western China already had the custom of milking cows and yaks. Dairy products formed an important part of the diet. Historic records contain many passages describing the drinking of fresh milk and the eating of cheese which was regarded as a nutritious delicacy. Marco Polo, the famous Italian traveller, wrote in his travel journal that the Mongol cavalry used milk powder as rations. Over the last century or so, with the introduction of Friesian, Simmental, Swiss Brown, British Shorthorn and other premier breeds of dairy cattle and milking goats, dairy farms and small scale processing factories were established in and around the coastal cities to supply fresh milk to foreign residents, needy babies, the ill, and wealthy Chinese. After 1949, the people's living standard rose, and, as part of the development of the food industry, the dairy sector gradually extended geographically (China's Dairy Development Strategy Study Group, 1988, pp. 35-40).

However premature collectivisation of agriculture in the late 1950s, the policies adopted in 1958 which were followed by three years of famine and then the regrettable consequences of the Cultural Revolution of 1966-76 badly disrupted China's economic progress. After 1976 Mr Deng's first reforms concentrated on creating a market economy in food, initially by freeing prices for most food except grain (and milk) and eventually by abolishing the agricultural communes as the unit of production and replacing them with what were basically family farms (Rohwer, The Titan Stirs, 1992, p.6).

These two moves brought about an enormous increase in farm production, resulting in a surplus of rural savings necessary to finance the industrialisation of China. The political genius of the reforms was that they captured this surplus not by milking the countryside as Stalin did in the USSR, but by making farmers richer. Mr Deng's second element of early reform was the "open-door policy". This eliminated the central government's monopoly over foreign trade by establishing special economic zones. These drew in foreign capital, companies and expertise mainly from the ethnic Chinese businessmen of Hong Kong and Taiwan (Rohwer, The Titan Stirs, 1992, p.7). These policies resulted in a change from a situation where per capita consumption of food fluctuated around a stagnant general tendency (1952-1978) to an acceleration of per capita outcome and income growth which has fluctuated around a strong upward trend ever since (Ma and Garnaut, 1992 p.7).

Production Statistics

According to various issues of China's Yearbook published by the Chinese Bureau of Statistics, the total production of cattle and goat milk has increased 18 fold in the 39 years since the founding of new China. During these 39 years, from 1949 to 1988, the total dairy cattle population, including premier breed cows and approved crossbred animals, increased from 120,000 to 2.22 million head. Milk goats increased from 170,000 to 3.22 million head, representing an average annual growth rate of 7.8%. During the same period, the total production of cow and goat milk increased from 217,000 tons to 4.189 million tons, an average annual growth rate of 7.9%. From 1949 to 1987, dairy cattle numbers increased at an average annual rate of 4.9%. During the most rapid development period from 1979 to 1985, the average annual growth rate for dairy cattle was 19.1%, while that of milking goats was only 6.5%. The total milk production during the period increased at an annual rate of 16.9%.

From 1986-1988, the annual growth rate of dairy cattle numbers was 9.7% while that of milk goats was 17.5%. The total milk output for this period increased by an average annual rate of 12.2%. This indicates a significant increase in the milk production per cow during these three years. Since 1988, the number of cows and cow milk production have shown a tendency to stagnate and decline (China's Dairy Development Strategy Study Group, 1988, pp. 35-40).

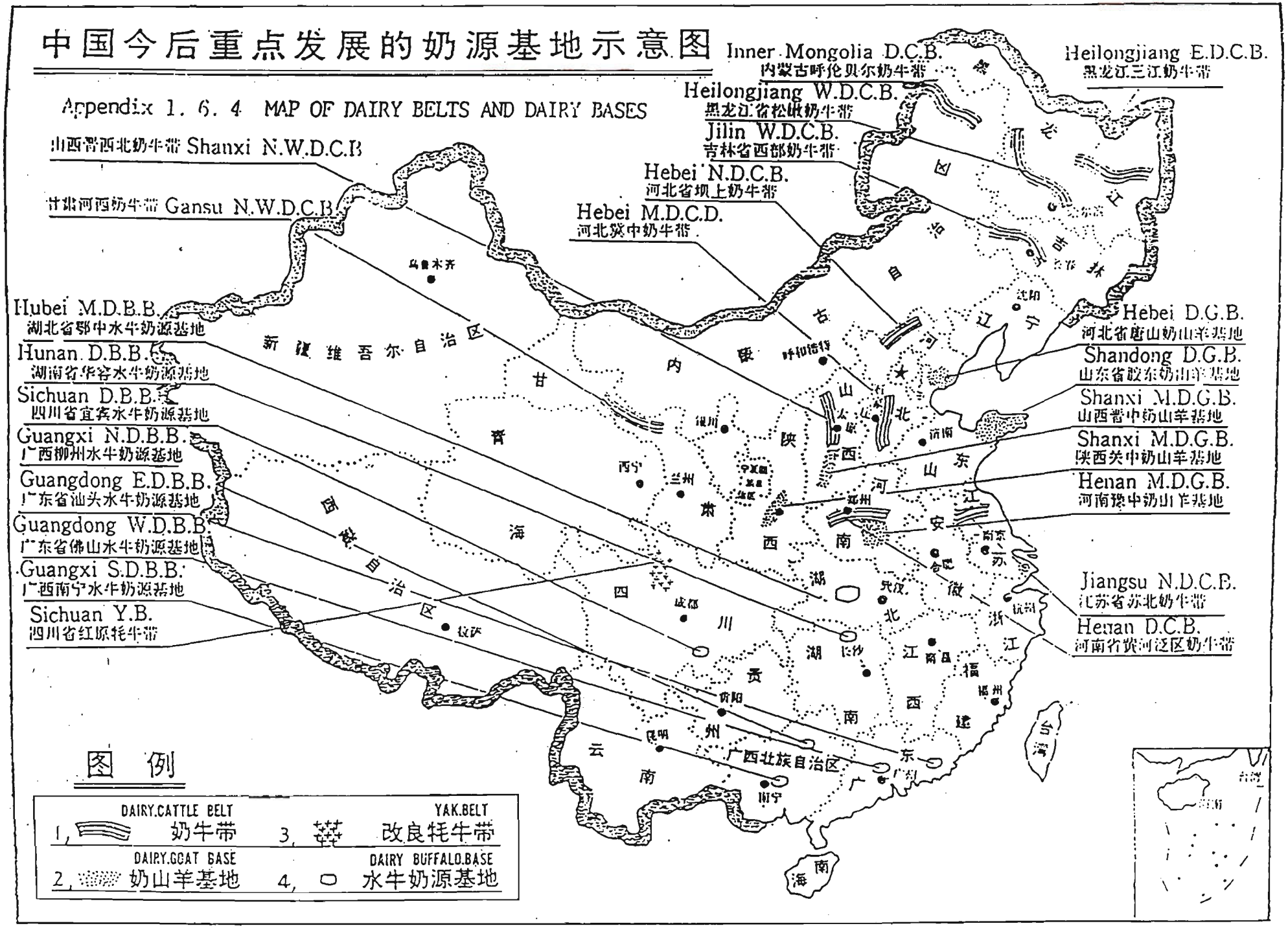


Figure 3-1-1 Map of China Showing Dairy Belts and Dairy Bases, 1988.
Source: China's Dairy Development Strategy Group (1988) Development Strategy for China's Dairy Industry, Beijing, p. 42.

Dairy Animal Resources and their Distribution

In China, the published statistics categorise milk as cattle milk and goat milk. The 1988 China Statistical Yearbook shows cattle milk comprising 87.4% of the total, with the remaining 12.6% coming from goats. The category "cattle milk" includes that from registered dairy cows, from Yellow cattle (a Chinese breed), yaks and water-buffaloes.

Among the 2.222 million head of dairy cattle in China, there are 1.36 million Chinese black-and-white, 110,000 Sanhe cattle, and 140,000 head of pure bred and crossbred Simmental. Chinese cows originated by breeding local yellow cows with exotic Holstein-Friesian bulls from a number of countries and the breed has been developed through a process of upgrading. These cattle are spread all over China, with the main concentrations in the suburbs of large and medium-sized cities as well as in industrial and mining areas.

In 1987, average annual output of milk cows in lactation was 1,556 Kg. per head. However, among the registered cow herds nation-wide, there were 598 herds which had an average annual production per cow of over 5000 kg. The total adult cow population of these herds was 100,633 of which, 10,682 cows achieved an average milk production over 7000 kg and 39334 achieved over 6000 kg.

Sanhe cows, Xinjiang Brown cows and Pastoral Red cows are all raised for both milk and beef. They are mainly distributed in

the rural and pastoral regions in Mongolia, Xinjiang, Jilin, Heilongjiang and Hebei provinces and in some other areas. Given favourable conditions, the lactation yield of these types of cow is generally between 1500-3500 kg.

The ownership of registered dairy cattle is divided as follows: one third is owned by the State and two thirds by collective farms or individuals. Overall, some 50% of the dairy cattle are owned by individuals but this percentage varies greatly from city to city. For example, the percentage of private ownership is as high as 92% in the city of Fuzhou in 1987.

There are 60.659 million head of Yellow cattle in China, among which 24.793 million are production cows. There are over ten different varieties including Qinghua cattle, Nanyang cattle, Luxi cattle and Yanbian cattle. These are mainly distributed in rural and pastoral regions. The areas with a stock of over one million head of production cows are the Autonomous Regions of Guangxi, Inner Mongolia and Xinjiang. The Mongolian cattle are seasonal producers of milk with an annual production of around 500 kg.

The country has 14 million yaks, 4.62 million of which are production animals. After a resource survey, 10 high quality breeds were identified and selected: Maiwa Yak in Yinchuan, Tianzhu White Yak in Gansu, Huanhu Yak in Qinghai, Jiali Yak in Tibet, Bazhou Yak in Sichuan, Qinghai plateau Yak, Yadong

Yak in Tibet, Sibu Yak in Qinghai and Tibet, and Zhongdian Yak in Yunnan. These are mainly distributed in the south-west and north-west plateau pastures of the Provinces of Gansu, Qinghai, Sichuan, Yunnan and the Autonomous Regions of Tibet and Xinjiang. Of the total, 92.2% are concentrated in Qinghai, Tibet and Sichuan.

Production yaks have a unit milk production of 250 Kg annually, with a fat content of 6.5-7.5% and a dry matter content of 17.3-18.4%. Yak milk provides 90% of the milk products in Tibet, 80% in Qinghai and over 70% in Sichuan.

There are 21.067 million water buffaloes in China, among which 8.042 million are production buffaloes. Water buffaloes in China are the marshland type, and have traditionally been used as draft animals. They are mostly found in the central-south and south-west regions, where 84% of the country's total stock is concentrated. The better known breeds are the Haizi water buffalo in Jiangsu, Dehong water buffalo in Yunnan, Dechang water buffalo in Sichuan, Binhu water buffalo in Hubei and Hunan, and Xinglong buffalo in Guangdong. A production buffalo cow produces, during one lactation, 500-1000 Kg of milk, with a fat content of 7-11% and a dry matter content of 17-21%.

In the 1950s, the Mora buffalo was introduced from India, and later the Neri-Rafi buffalo was also introduced from Pakistan. They were used for crossbreeding with Chinese water buffaloes. At present, there are 150,000 hybrid water buffaloes in

various parts of China, with each mature buffalo cow capable of producing 1500-2000 Kg of milk during one lactation. According to preliminary statistics, there are about 4,000 water buffaloes at present which are actually being milked.

There are 3.22 million milk goats in China, with 2.252 million head of production Nanny goats. They consist mainly of hybrids from crosses between Saanen goats and various local breeds, resulting in Xinong Saanen goats, Laoshan mountain milk goats, Hongdong milk goats and Guanzhong milk goats. Between 60-70% of the country's total goat stock are descended from the Xinong Saanen goat.

A production Nanny goat of this type produces 235-600 Kg. of milk annually. Their main distribution areas are the provinces of Shanxi with 828,000 head, Shandong with 801,000 head, Henan with 410,000 head and Hebei with 328,000 head, making up a total of 2.367 million head, the equivalent of 73.6% of the total stock in the country. They have a combined milk production of 402,000 tons which represents 75.8% of the national goat milk production.

Appendix 3, Appendix 4 and Appendix 5 show cattle, goat and sheep distribution and milk production composition in different provinces in 1991.

Favourable Development Factors

Existing Specialised Dairy Herd and Extension Services

According to China's Dairy Industry Report compiled by the Ministry of Agriculture (China), in 1988, there were 1.21 million adult dairy cows and 1.02 million heifers giving a total herd of 2.22 million dairy cattle. More than half of the cattle are China Black and White (CBW) derived from Holstein/Friesians and there are significant numbers of high yielding cattle of other exotic breeds such as the Simmental. Because of the size of the herd and its potential for natural increase, the expansion in dairy cattle numbers can now be achieved from domestic sources.

Artificial Insemination (AI) is widely accepted and practised on farms in China. There are many high quality imported bulls and the local semen supply is supplemented by imported frozen semen. This is being used both to upgrade the potential of the existing CBW herd and in a program of crossbreeding with the local Yellow cattle. Crossbreeding involves some three million cows per year - two thirds to enhance dairy production and one third for beef production.

Third generation dairy crossbreds with a production of more than 3,000 litres of milk per lactation can he classified as CBW cattle and the crossbreeding program has permitted a faster rate of growth of the dairy herd than would have been possible from the natural increase in the established CBW herd. Between 80,000 and 100,000 crossbreed animals are

introduced to the dairy herd each year.

In the southern provinces there are 8.04 million buffalo cows. A breeding program has commenced with some 4,000 milk buffaloes which should provide a basis for a significant expansion of buffalo milk production in the longer term.

In certain areas, Saanen goats and their crossbreeds are the dominant source of milk. Within China 64 base counties have been designated as centres of dairy goat production and these are supported by research centres and breeding farms. Goats have the advantages of needing a lower percentage of concentrates in their diet, strong disease resistance and rapid reproduction rates. With a low initial capital investment they are particularly suitable for milk production on small farms in rural areas.

Feed and Fodder Availability

The technique of silage making to provide winter feed is widely practised and there is an experimental program on the ammonisation of straw to improve the feed value of some of the crop residues and to provide a cheaper alternative to some of the poorer quality hays used on urban dairy farms. The total quantity of straw ammoniated and otherwise chemically treated in 1988 was 1.5 million tons and there are plans to establish pilot ammonisation stations in Hebei, Henan and the Xinjiang Uygur Autonomous Region.

Only 30% of the estimated annual availability of 500 million tons of straw and stalks is used for livestock feed. Annual stover production is some 30 million tons and most of the intensive dairy farms are now reported to prepare 3 to 5 tons of silage per cow per year to be used as an important element of the basic ration. The Authorities are attaching great importance to techniques for raising the nutritional value of the roughage in order to minimise the concentrate requirements.

In the pastoral areas there is a continuing program of reseeding. As an illustration of the work which has been undertaken, the area of improved and artificial pasture in the main grazing lands reached 5.14 million ha. in 1987. The corresponding figure for the hilly areas near the agricultural land was 4.52 million ha.. There is also a program of aerial sowing of grass seed which has been applied to 0.98 million hectares. By the year 2000, the total area of improved pasture is planned to be 20 million hectares (Walker, K.R. & Kueh Y.Y., 1988).

Industrial and crop by-products are important elements of livestock feed and over 70 million tons are produced each year, including 12 million tons of oil seed cakes. In some areas around 50% of the cotton seed and rape seed cakes, which have limited use in pig and poultry production, is still used as fertiliser. After detoxification, much of this could be used more efficiently as a cattle feed which would increase manure production.

Dairy cattle in 1988 consumed an estimated 700,000 tons of grain which represents less than 10% of the total of 99.4 million tons used as livestock feed. In some regions where the length of the growing season does not permit the production of maize grain as a second or third crop it may be possible to raise the production of the agricultural land by introducing a crop of fodder maize.

For compound feed, there are factories which manufacture pre-mixes, supplements and concentrates. The feed milling industry, which is mainly concerned with the production of pig and poultry feed does have excess capacity in many areas which could be used to improve the availability of compound feed.

Milk Processing Facilities

During the field trip to China in late 1992, Mr. Greame Wren (technical expert, Murray Goulburn Ltd.) gave the following accurate description of the present situation:

"In many areas there is a substantial under-utilisation of dairy processing capacity. Some apparent excess capacity is necessary to cope with seasonal variations in milk supply and to allow for growth in milk production. Additional milk supply could be processed with only minimal additional capital investment and an improvement in the overall plant utilisation would improve the profitability."

The local dairy machinery industry has invested in the capacity to produce a wide range of dairy equipment. This

local manufacture will reduce the need for foreign exchange payments for the establishment of new processing works.

Many of the more progressive processing organisations have product development teams to introduce new product specifically for the Chinese market. These will help to expand the total market for dairy products and should improve the overall profitability of milk processing. Special training centres have been established, sometimes with the support of other countries including Denmark, Finland and Sweden. This investment can help ensure a supply of trained personnel for existing and new dairy enterprises.

Government Support

Various measures have been introduced by the Authorities to make it easier for farms to start dairy enterprises and to improve the financial returns from milk production. These measures include the provision of long-term loans at low interest rates and the making available of supplies of compound feed and concentrates at State listed prices. Incomplete statistics show that in the last ten years the agricultural banks have provided some 300 million Yuan of loans in the dairy sector of which 130 million Yuan were provided in Heilongjiang. In a few areas, land for fodder production is also allocated to farmers starting dairy production. Various subsidies are also made available to the processing enterprises, including the remission or reduction of taxes.

Dairy development was included in the 1988 "Vegetable Basket Project" and has been given a high priority in the planning of the development of supplies of meat, vegetables and other non-staple foodstuffs.

Development Constraints

Shortage of Concentrates and High Quality Fodder

On a per capita basis the land area in China suitable for intensive agricultural production is very limited and for the past five years the national grain production has fluctuated around 400 million tons. After meeting the direct human consumption requirements only around 20% of the cereal production is available for livestock feed. The demand for pig and poultry meat has been rising rapidly and the consumption trend is towards leaner meat. Pig and poultry farmers are seeking increasing quantities of grain and other concentrates which has caused a rapid increase in "negotiated" prices. This is causing some farmers to reduce cattle feeding and results in lower milk yields. Unless policies can be introduced to increase the quantity of concentrates used by the dairy industry, the industry will stagnate and the national feed grain to animal protein conversion rate will decrease.
Arrangements of the provision of compound feed are inadequate in many areas.

Deficiencies in Extension Services

Although there is a good network of veterinary centres, dairy cattle represent such a small percentage of the livestock population that the experience of the technical personnel in many areas is limited. Farmers in areas with a low

concentration of dairy cattle may have to travel considerable distances to obtain specialist assistance for both AI and veterinary services. Minor diseases, particularly mastitis and hoof and limb diseases are widespread in many cities and will require corrective measures.

In many areas there is no adequate cattle insurance system. This exposes dairy farmers, particularly individual owners, to high financial risks.

Milk is a highly perishable product. In many areas the network of collection centres is inadequate and farmers may have to travel considerable distances to deliver their milk. Particularly in hot weather, delays in getting the milk to a refrigerated centre have an adverse effect on the quality of the milk and, in extreme cases, may cause it to go bad.

Problems of Management and Training

Although the past few years have shown considerable improvements in the skills of farm and processing works management there is still a great variation in levels of skills. Training at all levels from advanced management techniques to the basic practice of cow feeding and milking are important for future development. For maximum efficiency the management must be able to respond quickly to changed circumstances and the effectiveness is reduced if the decision making process is too long.

Outdated Processing Equipment

There is no unified policy making body to guide management of the industry. As a result there has been inefficiency in investment, particularly in the processing sector where there has been a significant duplication and an irrational location of new plants and collection centres.

Many of the older milk plants are unable to meet the strict standards necessary for the production of high quality products. In addition, the dairy machinery industry is currently unable to supply the numbers and types of test equipment necessary for a national milk quality improvement program.

The over capacity of processing equipment means that the total energy consumption is higher than necessary and the cash generation is generally inadequate to provide for replacement of equipment at the end of its useful life or to undertake necessary maintenance. The small size of many of the older plants makes it impossible for them to devote adequate resources to the introduction of new products for their local markets.

Insufficient Quality Control

The aforementioned problems have had an adverse effect on the quality of milk and dairy products. In many areas the quality control on these products is inadequate or ineffective. This has permitted widespread adulteration of milk and contamination with penicillin which makes much of the milk

unsuitable for the production of yoghurt. Improved quality would require adequate training and supervision of all involved, from milking, through collection and processing to distribution and selling. Investment is also required in test equipment and refrigeration.

Inexperience in Marketing and Selling

Although the nutritional value of milk has been well recognised by the Chinese people, the sales, particularly of pasteurised milk, are restricted by the inconvenience to the consumer of selling arrangements. When sales were severely limited by low production, priority was rightly given to the simplest and cheapest distribution and selling methods. As the milk supply improves more emphasis must be placed on consumer convenience, including improved packaging, if the full market potential is to be achieved.

Shortage of Investment Funds

Compared with most other farming activities, the dairy industry is capital intensive. In order to help control inflation the Authorities have restricted the supply of credit. It is now more difficult to obtain loans and interest subsidies which play an important part in enabling farmers to start or expand dairy production. Financial limits are also restricting the amount municipalities are able to invest in state dairy farms. Particularly in dairy developing areas, such farms may play an important role in acting as nucleus farms and in providing support services for local individual farmers.

Milk Prices

The farmgate price for raw milk has not kept pace with the prices of other livestock products or with that of concentrated feed at "negotiated" (free market) purchases. In the period 1984-1988, the farmgate price of raw milk lagged by approximately 12% behind increases in meat, eggs, poultry and grain prices (CDDSSG 1988). This reduced the profitability of dairy production and in some areas, some of the State farms, even with substantial feed and other subsidies, are at present making losses. When there are changes in production costs, official milk price adjustment decisions must be made very quickly because small farmers, in particular, lose confidence very fast and recent history shows that they start selling and sometimes slaughtering their cows at short notice.

In 1988, the milk price was increased by 1.78%, but this did not compensate for production cost increases and a serious decline in viability took place in the first half of 1989. Particularly in the private sector, many farmers responded to the decline in profitability by reducing their herds or even quitting dairy operations altogether.

The price for the consumer, since milk is regarded as a health commodity, has always been strictly controlled and fixed at a permanently low level. In 1992, a general trend to abolish price fixing occurred since with fixed prices, it is extremely difficult to react adequately to changes in production costs have taken place during the last few years.

To maintain standards for the urban consumers, milk should be treated in plants which require relatively high volumes for efficient operation. In the past, this inhibited the development of a free market and made the dairy industry more reliant than other livestock industries on the level of prices set by the authorities. The processing profit margins were restricted to the point where pasteurised milk often provided little profit or even, in some cases, made losses. This inhibited sales development.

In several cities the equivalent price of milk powder was higher than that of liquid pasteurised milk, which stimulated milk powder production rather than the processing of liquid milk.

Conclusion

A foundation has already been laid for extension and production support services. There are over two hundred agricultural universities and colleges such as Beijing Agricultural University in the country, most of which have departments of animal husbandry and veterinary science. Some have special courses on dairy cattle and milking goats and are equipped with research facilities for these subjects. Some offer special courses in dairy processing. Among the secondary level agricultural schools, 40 have departments of animal husbandry. There are ten dairy cattle research centres nation-wide, and five dairy industry training centres and new product development centres that are open to students from all over the country. There are six organisations with the

responsibility for technical co-ordination and breeding including: the Dairy Association of China; Commissions on breeding each of the following: Sanhe cattle, Xinjiang Brown cattle, Pasture Red cattle, Simmental cattle, Yellow cattle, water buffaloes and yaks; and the National Scientific and Technical Coordination Group on Milk Goats and Goat Milk Processing. Sixty nine cattle breeding stations have been established as well as 251 Black-and-White dairy breeding farms and eight Saanen goat farms. These are generally relatively large farms producing high quality animals.

A four-level, i.e. provincial, county, township and village, network for livestock health care has now been established although the coverage is still being improved. There are 3200 county level veterinary stations with a total staff numbering over 100,000 people. There are also 59,600 township level Veterinary Stations staffed by 310,000 people. Some of these stations have developed into multi-purpose service centres for livestock procurement, disease prevention and treatment and for the collection of milk and the distribution of feed. These organisations are working actively in the vast rural and pastoral regions to provide multi-stage services for the development of the dairy industry.

At present, artificial insemination is widely used throughout the public sector farm system in the country. In counties which have been chosen as Yellow cattle improvement bases, artificial insemination is now used in over forty per cent of cases. Embryo transplant research and experimental programs

have been undertaken in a number of centres. Consideration is now being given to the practical application of this technique.

The two major diseases of dairy cattle, tuberculosis and brucellosis, have been effectively controlled and all the cattle on the farms in Beijing, Shanghai, Tianjin, Shenyang, Harbin and other cities are free of major diseases.

In the past few years, dairy cattle feeding practices have improved considerably and the use of silage as become widespread. Research has been undertaken into the ammonisation of straw to improve the feeding quality of some of the roughage and to provide an alternative to some of the poorer quality hay in the diet.

Calf feeding practices have also been improved significantly and the quantity of milk fed per calf has approximately been halved on the better farms. The authorities have estimated that when this technique is applied throughout the industry the saving, which can be sold as commercial milk, will be approximately 30,000 tons.

The vigorous development in livestock raising, dairy processing and dairy machinery manufacturing industries as well as the extension of various appropriate technologies, since the founding of new China, has provided a good base for the further development of China's dairy industry. However, many weak points still exist. Only by recognising them and

taking appropriate corrective action can a continuous, steady and coordinated development for China's dairy industry be achieved (China's Dairy Development Strategy Study Group, 1988, pp. 90-97).

3.2 Development of the Dairy Processing Industry

Introduction

The dairy processing industry has undergone a comparatively rapid development in China. There are 760 dairy processing factories, 3% of which have daily capacities of over 100 tons of fresh milk. Another 40% of the factories each has a capacity of processing around 50 tons of fresh milk per day. The remaining 57% have daily capacities of less than twenty tons. The province with the largest processing capacity is Heilongjiang, which also has the largest production of milk. It has 143 processing factories, with a combined capacity of 3700 tons of fresh milk a day. Over half of the country's total milk collection is sold as pasteurised milk; the balance undergoes further processing (CDDSSG 1988).

According to the China National Statistics Bureau (C.N.S.B.), China's Yearbook (1990), the total production of dried dairy products was 294,000 tons in 1988. Over 70% was in the form of milk powder and the balance comprised relatively small quantities of cream, cheese, casein and lactose. This production represented an increase 5.4 times (540%) over the 1978 figure of 46,000 tons (China's Yearbook (1990) p.256).

The provinces, autonomous regions and cities that produce over 10,000 tons of dairy products annually include Heilongjiang, Zhejiang, Inner Mongolia, Guangdong, Shaanxi, Shanxi and Shanghai. In order to satisfy the consumer demand and the needs of the food processing industry, a considerable amount of dairy products is imported from abroad every year. Published statistics show that 390,000 tons of milk powder and 10,600 tons of condensed milk were imported during the period 1979-1986.

In 1988 the situation in China showed that of raw milk produced, cow's milk comprises 4,157,000 tons, and goat's milk 606,000 tons, totalling 4,763,000 tons, of which 60% is pasteurised for drinking and 40% is for further processing to milk powder or condensed milk. The total number of personnel is 100,000 staff, 3.5% of which are technical people.

Every province in China has at least one processing factory and Heilongjiang and Shaanxi have the highest number of these. Production of dairy products (pasteurised milk, yoghurt, milk drinks, ice cream) in 1949 was more than 600 tons and had increased in 1987 to 272,000 tons.

In the early 1950's, there were only 8 different kinds of products, today, there are 30 kinds. Milk powder, used for infants, old people and pregnant women, comprises 70% of all dried milk products.

China has three dairy training centres: Beijing, Harbin and Shanghai. In addition, most of the light industry colleges have dairy science courses, as do most of the agricultural universities and schools. In 1986, China introduced a national standard for dairy products and set up a national dairy quality control centre. China has a huge population but a comparatively tiny dairy production, thus has been a dairy importer for a long time.

Improvement in China's dairy technology has occurred over the last decades. The improvement of equipment and new technology applications is dated as follows: in 1950s, evaporation by pan type drying was widely applied; in 1960s, spray drying became popular; in 1970s, spray drying was widely used; and in 1990s, China can design 50-100 ton milk powder plants by itself, including evaporators, homogenisers, milk tanks and cleaning systems. The sequence of product development is as follows: in the 1950s, whole milk powder reached families; in the 1970s, formula products became popular; in the 1980s, infant formulae and soya bean products predominate the market.

Today the dairy service systems in China include: dairy training schools; the Dairy Industry and Academic Association; the tertiary dairy education system; the Dairy Industry Design Institute; dairy technology development centres; dairy technology and information exchange agents; the Dairy Enzyme Supply Centre; dairy industry machinery factories; dairy instrument factories; dairy industry journals; and the national dairy supply network.

Current problems of the dairy industry include the following:

- a scarcity of dairy resources causing demand to outstrip supply. Many factories operate at only 1/3 of their capacity;
- a scarcity of technical personnel in that only 3.5% of the Chinese dairy staff are technically qualified;
- out of date equipment which is not fully automatic is common and productivity reaches only 6 tons of dairy products per dairy worker per annum;
- an almost total ignorance of diversification of products with customers having little choice;
- insufficient quality control; and
- poor management of dairy factories because they can be under a wide variety of departments e.g. local government, light industry, agriculture, commerce and trade.

Ownership

The ownership of milk processing factories in China is shown in a generalised form in Figure 3-2-1.

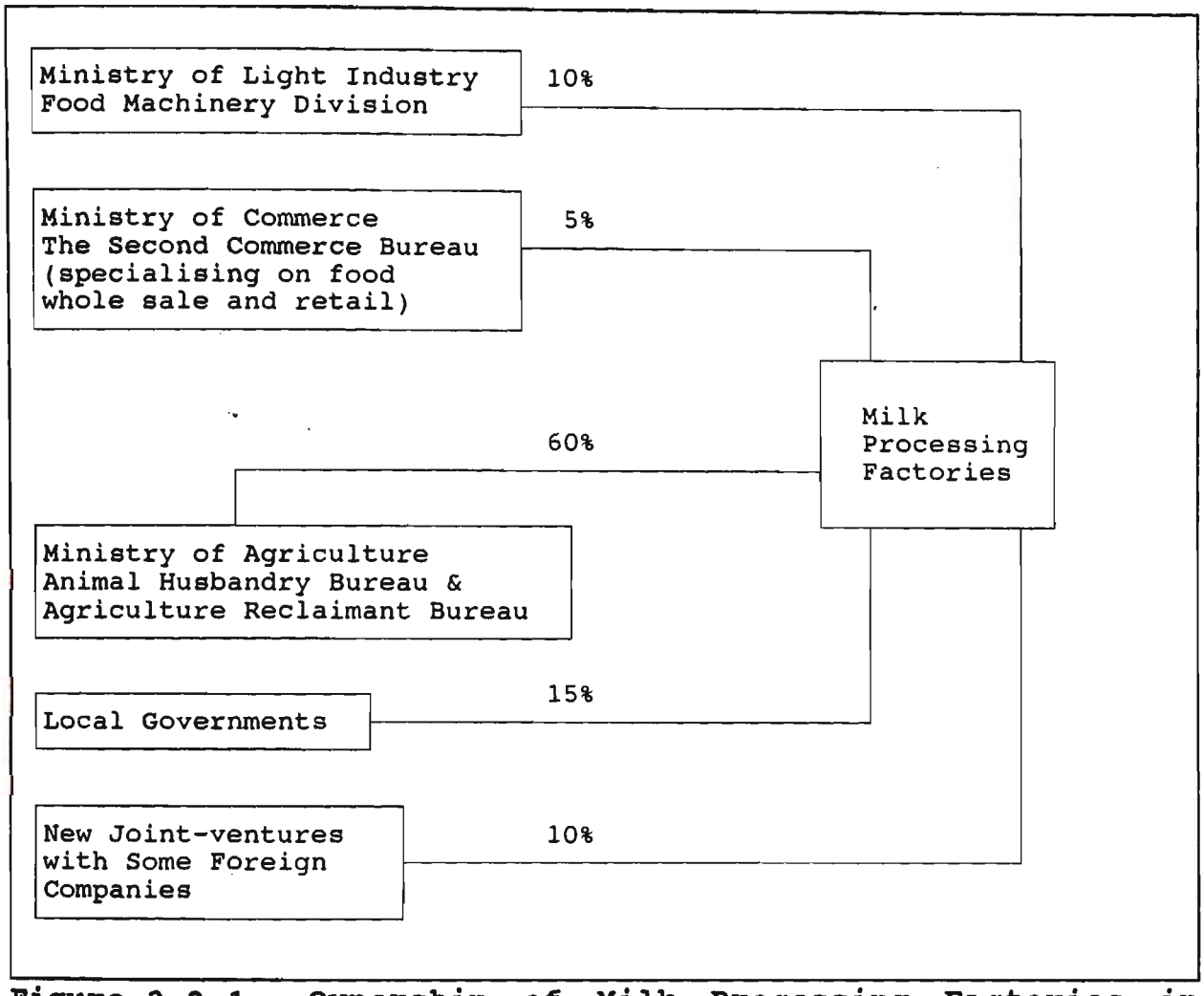


Figure 3-2-1 Ownership of Milk Processing Factories in China

Note:

- At present there are no privately owned milk processing factories but as China increases its open policy this situation may change.
- It is the opinion of many people in the industry that privately owned factories will eventually comprise at least 50% of the total.
- Joint-ventures will undoubtedly play a major role in these changes.

Infrastructure

Milk Collection and Product Delivery System

Most of the dairy farms in China have no freezing equipment available for cooling the milk or what they have is insufficient. The alternative solution is to either transport the milk somewhere to be processed or consume or process locally. In the remote areas, dairy farmers have to dry the milk locally and then transport the powder out of the area. In the areas where a transportation service is available, the milk tankers come to the collecting spots village by village regularly. All the work including evaluating the quality of milk, weighing the volume and paying for the milk has to be done on the spot. In the suburbs of big cities, fresh milk is transported mainly by tankers from specialised State and Collective farms to city milk plants. Some seven per cent of the total comes from private farms.

The collected milk has to be grossly filtered and then mixed with some re-constituted milk before the combined product is pumped into the processing line for pasteurising, packing and delivery. Pasteurising is mainly done by normal heat treatment but some factories do have UHT pasteurisation facilities. Fresh milk is available in towns in remote areas thanks to milk powder from grazing areas and international imports.

Pasteurised, plastic bagged, or bottled milk is distributed in Beijing, Shanghai, and other large cities. Supplies are limited to children under three years, sick or elderly people and foreigners. In Shanghai, milk is supplied to 460,000

families of the total 7,220,000 population. Distribution is in 0.25 kg bottles or plastic bags through 120 centres and 700 distribution points. At present, marketing remains very largely on this special commodity basis.

City Milk Plants

These plants were built mainly to supply fresh milk to city residents. Most are located in the suburbs or even in the centre of the cities themselves.

There are two methods available for the production of liquid milk in the plants. The first is to use fresh milk transported mainly by tankers from specialised State and Collective farms. This milk is subjected to routine testing and pasteurisation. The second method is to use skimmed milk powder and butter or butteroil. The normal re-combining procedure is that firstly the milk powder and butter are diluted with water and blended by mixers. The blended mix is then pumped to the liquid milk tanks for further blending with some fresh milk. The blended milk also has to be pasteurised before being packaged in plastic bags or glass bottles.

Since China has a milk voucher system in the main big cities (standing voucher orders are purchased by individual citizens, such voucher guarantees at least one month's liquid milk supply in advance), the demand volume of milk in each city is quite stable. The plants just have to know the amount of daily milk collected from the farms (this figure fluctuates seasonally), then the volume of milk powder and butter can

easily be calculated from the difference between the collected amount and the required voucher volume. The fresh milk is normally collected by the plants in the morning and the packed liquid milk is available in the late afternoon. The milk is standardised at a fat level of 3%.

City milk plants all belong to the Agriculture and Reclamation Bureau, of the Ministry of Agriculture. According to the planned economy in China, the Agricultural Bureau takes the major responsibility for liquid milk transactions in China.

Milk Powder Factories

Because of transportation problems and the scarcity of freezing facilities, 40% of total milk production is converted into milk powder. There are no geographical barriers for milk powder factories so long as fresh milk is available. They can be located in the remote regions or the suburbs of cities.

The technology in these milk powder factories is not very advanced because of long time neglect in the food industry, especially dairying. The city plants are comparatively better equipped and possess a higher capacity than those in the remote areas. Their equipment includes driers (mostly spray driers), pasteurising equipment and packing tools. Almost all of the milk powder produced in this way is packed in plastic bags to minimise costs.

The main product of the remote milk powder factories is full cream milk powder as there is no market for butter since the Chinese use vegetable oil for cooking.

Yoghurt and Ice-Cream Factories

China has produced yoghurt and ice cream for many years. The popularity of these two products has boomed in the last decade in many of the large and medium sized cities.

Because of the difficulty of transportation and the local milk subsidy policy, there are very few inter-city transactions. Most of the factories in a city belong to the local government and the aim of the investment by local government is mainly to raise the standard of living of local people.

Yoghurt and ice-cream factories are all located in the cities. The facilities of the factories include freezing and fermenting equipment. Except in the big cities such as Beijing, Shanghai and Tianjin, the varieties of yoghurt and ice-cream are limited.

Consumers can purchase yoghurt or ice-cream at any time in normal shopping hours as shops possess some freezing facilities. Small private retailers go to the factories in the early morning to buy their products which are then available on the streets by mid morning.

In the 1980s, the Chinese government imported sophisticated dairy processing equipment aiming to promote the availability

of dairy products. More than ten joint venture milk processing factories were established. These factories offer an increase in varieties of milk products. Since all these factories are concentrated in the large cities and their number is small, it will be some years before the majority of the Chinese will be able to taste these products.

Cheese Factories

There are very few cheese factories in China because cheese is not a traditional Chinese food. Most locally produced cheese is only for catering purposes and is made at certain large factories. Recently, China has begun to produce Cheddar cheese to supply the fast food industry, e.g. Pizza Hut and Macdonald's.

Technology

Production

The majority of dairy processing factory buildings and equipment are old but functional. A great deal of equipment (pasteurisers, evaporators, driers are locally designed and fabricated).

Where equipment replacement is being considered, it appears to be along much the same design as existing equipment. In fact, greater use should be made of international dairy supply firms to gain up-to-date information on the latest technological developments in terms of production efficiencies, process automation, energy savings and special design features. For example, where spray driers producing whole and infant milk

powders are being replaced, consideration should be given to equipment that is capable of producing a true instantised powder providing a marketing edge in what is a very competitive product, this is more or less restricted by the availability of foreign currency and the skills which local workers can obtain.

Packaging and Handling

In China consumer packaging and handling is now well advanced regarding design and materials for both liquid and dried milk products.

However, there is always cause for concern when pasteurised liquid milk products are stored under less than ideal conditions at milk vendor outlets and markets. The dangers of rapid deterioration of such products when exposed to light and temperature need to be well understood.

An opportunity exists at all powder factories to achieve more efficient outputs of consumer packs by installing simple automatic filling machines to replace the labour intensive manual system. If this were done, the risk of product contamination due to excessive handling would be reduced.

Environmental Issues

Environmental contamination in China will no doubt become an issue in the future.

Close monitoring and identification of product losses from both liquid and dry processes will be necessary. This will result in greater financial returns and reduce the risk of contaminating the environment.

In some factories, over-exposed production areas are subject to pathogen contamination of the final product. Tighter environmental controls and regular maintenance of buildings, floors and drains would reduce this risk. In addition to this, a tighter process control and final product testing and clearance program would assist in improved management.

3.3 Development of the Dairy Manufacturing Industry

Introduction

Before 1949, the dairy machinery manufacturing industry was virtually non-existent in China. A few dairy factories in coastal cities introduced some more advanced machinery and equipment on a piecemeal basis but other dairy factories generally used simple indigenous equipment. After the founding of new China, especially since 1979, along with the rapid development in cow and goat milk production and the growth in market demand for dairy products, there has been a large increase in the demand for dairy machinery. A manufacturing industry has emerged to meet this requirement.

The early factories included the Shanghai Beverage Machinery Factory which produced separators and the Shanghai Tobacco Machinery Factory for high pressure pumps. Specialised factories included the Shanghai Dairy Machinery Factory and the An Da Machinery Factory in Heilongjiang.

More recently, the technology in these factories has been updated and they now offer their Chinese compatriots turn-key processing factories with a capacity ranging from 10 tons to 50 tons per shift.

New factories include: Ning Bo Food Equipment Factory (Zhejiang Province) which can provide UHT machines; Da Cheng Dairy Processing Equipment Factory (Shaanxi Province); and Tianjin Aero Electrical Component Factory which offers soft packaging machinery.

Thus, the manufacturing plants have progressed from producing single machines to producing complete sets of equipment and are now able to meet many of the requirements of the dairy processing industry.

Current Situation

At the moment, there are over 700 milk processing factories in China with a total capacity in 1989 estimated at 287,000 tons (dry product). In 1985 alone, 56 new projects were set up.

Almost all these factories use equipment made in the 30 or so dairy machinery equipment factories in China.

Dairy Machinery and Equipment Plants

Most of these factories belong to the Department of Light Industry, Machinery and Agriculture, while a few come under the Departments of Aviation and Aerospace Industries, Shipping and Armaments Industries, and Commercial or Medical departments.

Overall they have about 30 years experience in this field. The huge increase in milk processing plants over the last decade has provided a wealth of expertise and today they are highly specialised and highly efficient.

Technical Level of Equipment

Most of the machinery produced in the plants has a small capacity. They are of practical design but are not precision made. Stainless steel is the most widely used material and overall the machines cost as little as one fifth of those purchased from overseas.

Different machines provide capacities of 5 tons, 10 tons, 20 tons and 50 tons. Some larger ones (100 tons per eight hours), are also available. In all, the equipment can produce products which may be grouped in 18 categories (e.g. full cream milk powder, yoghurt, butter, cheese, etc.) with 63 varieties (e.g. flavoured milk, agitated yoghurt, etc.) and 264 specific formulae (e.g. strawberry milk, banana yoghurt, etc.).

The machines include equipment for milking and transport, for the storage of milk and for milk collection; equipment for

high-pressure homogenisation, heat exchangers, evaporators and driers, equipment for producing condensed milk, cream, ice-cream and malt and milk extracts, as well as packaging equipment. Some of the products, including series plate heat exchangers, a double effect evaporator and an ultra high temperature steriliser, have won the State's gold medal for quality, and the medal for outstanding new products.

Problems of Dairy Manufacturing Plants

Because of the situation that the plants are administered by at least five different departments, a uniform policy is very difficult to put in place. In addition, as mentioned, most of the factories are small and incapable of renewing machinery and implementing new technology, so the demand for innovative machines is low.

The weakest point has been the inability of the factories to provide a quality testing device to processing plants. In addition most of the processing equipment has a high energy consumption rate.

Finally, the fact that 90% of all milking in China is carried out by the traditional hand method poses a major restriction on the purchase of milking machines.

Regional Distribution

Appendix 6 and Appendix 7 show the regional distribution of dairy equipment plants in 1988.

In fact, Shanghai and Heilongjiang dominate the southern and northern Chinese markets respectively whereas Beijing, Liaoning, Shaanxi, Jiangsu, Guangdong and Zhejiang have strong and promising industry capability for the future.

4

THE CHINESE DAIRY INDUSTRY - DEMAND FOR AND SUPPLY OF PRODUCTS

"When the sun stood at midday, the Divine Husbandman held a market. He caused the people of the world to come together and assembled the riches of all under Heaven. There they exchanged with one another and then returned home, each thing having found its appropriate place."

I-ching (Book of Changes)

4.1 Farms

Introduction

Population distribution and the cultural diversity of China's minority groups originally determined the extent and location of dairy production. China's population is 1.143 billion (1990), the world's largest, and population density is 118 persons per square kilometre. Eighty per cent of the population is classified as rural. The bulk of the population resides on the alluvial and coastal plains (10% of China's land surface).

The general distribution of population is illustrated in Table 4-1-0 below:

Table 4-1-0 The Population of China's Provinces and Other Administrative Areas (1990 year end)
Source: China Brief (1991) Canberra

	(million)		(million)
Anhui	56.8	Jilin	24.8
Beijing	10.9	Liaoning	39.7
Fujian	30.4	Ningxia	4.7
Gansu	22.6	Qinghai	4.5
Guangdong	63.5	Shaanxi	33.2
Guangxi	32.7	Shandong	84.9
Guizhou	32.7	Shanghai	13.4
Hebei	61.6	Shanxi	28.0
Heilongjiang	35.4	Sichuan	108.0
Henan	86.5	Tianjin	8.8
Hubei	54.5	Tibet	2.2
Hunan	61.3	Xinjiang	15.3
Inner Mongolia	21.6	Yunnan	37.3
Jiangsu	67.7	Zhejiang	41.7
Jiangxi	38.1	Armed Forces	3.2
	Total	1.143 billion	

Approximately six per cent of the population is comprised of non-Han minorities, the largest of which are as follows (Department of Foreign Affairs and Trade, China Brief, 1991, p.7):

Zhuang	(Guangxi Autonomous Region)
Mongol	(Inner Mongolia and Xinjiang Autonomous Region)
Hui	(Guizhou)
Miao	(Guizhou)
Manchu	(Manchurian Region)
Bu Yi	(Guizhou)
Korean	(Manchurian Region)

Because of cultural diversities and the relative numerical insignificance of these groups in China's overall economic development, they have been excluded from detailed discussion in this study.

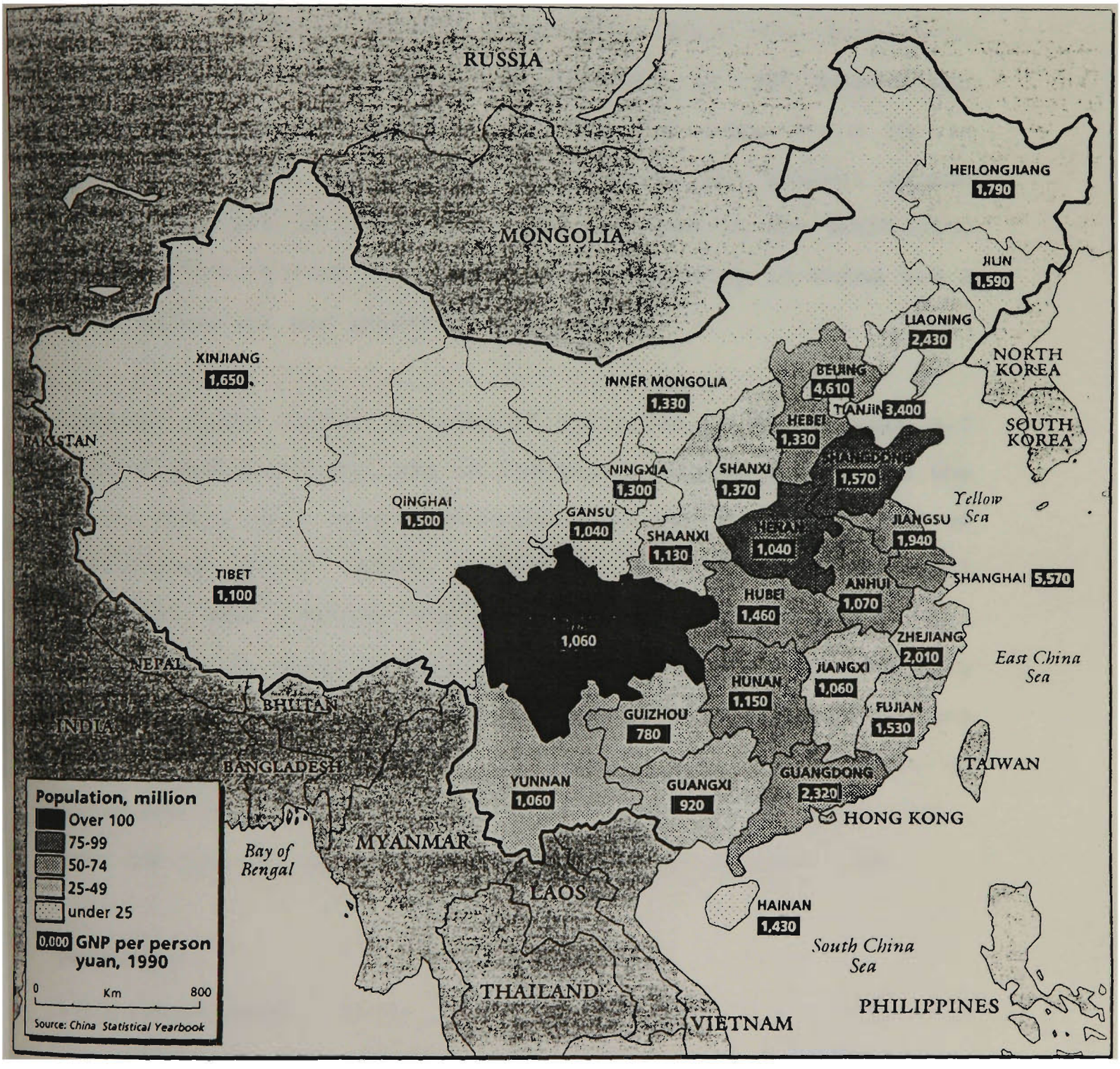


Figure 4-1-1 Map of China showing Population Density, 1992
Source: Rohwer, J. (1992) "The Titan Stirs", The Economist, 28 Nov., p. 3.

As mentioned, the Chinese, and Han people in particular, are not traditional consumers of milk products, however from 1979 to 1985 consumption of milk from cattle more than doubled to 2.4 kg per capita per annum. By contrast, in 1985 Japan's per capita consumption was 60.8 kg compared with 104.0 Kg in Australia. This would indicate that with the general growth and development in the economy and increase in the purchasing power of the Chinese people, the dairy industry in China has a great potential for growth in the future.

Although China covers an area of 9,571,300 sq.Km. (almost 3.7 million square miles), and is the third largest country in the world, there were only approximately 20,000 to 30,000 head of specialised dairy cattle in 1950. By 1981, the national inventory had reached 700,000 head with an output of 1.1 million metric tons of milk per annum. By 1987, the inventory stood at 2.1 million head whilst output was 3.2 million tons per annum. Average annual output per head of milk cows in lactation was about 1,570 Kg in 1981 and 1,556 Kg in 1987. This decline was due to rapid growth in dual purpose cows.

Ownership

Administratively, China is divided into 24 provinces (including Taiwan); 5 autonomous regions (A.R.) and three municipalities, all of which are directly under the Central Government (= State). There are over 2,000 counties and cities, which are subdivided into 74,000 people's communes. Other organisational structures such as macro-economic and

military regions may embrace several provinces, while urban street organisations complete the administrative framework.

Almost all the state owned dairy farms and their relevant distribution systems belong to China's Ministry of Agriculture. Among these, 80% belong to China National Agriculture, Industry and Commerce Corporation (Agriculture Reclaimant Division of Ministry of Agriculture), the remainder belong to China's National Animal Husbandry, Industry and Commerce Corporation (Animal Husbandry Division of Ministry of Agriculture). Most of the State owned dairy farms and their relevant distribution systems are controlled by the provincial Agriculture, Industry & Commerce Bureau or the provincial Animal Husbandry, Industry & Commerce Bureau. Each of these organisations have their own county level equivalent which actually operates the farms. In fact, the Agriculture, Industry & Commerce Bureau monopolises the dairy producing industry and most of the fresh milk distribution systems in China. The majority of collective farms belong to the county level local governments. These are usually very small. Private dairy farms are owned by individual farmers, each farm having 5 to 25 dairy cows. These probably represent the future of China's dairy industry.

China is changing towards a market economy. From official forecasts made by Ministry of Agriculture, the ownership structure of dairy farms is predicted to undergo changes in the period 1988-2000 as shown in Table 4-1-1.

Table 4-1-1 Proportionate Ownership of Dairy Cattle in China

Source: Development Strategy for China's Dairy Industry (1989) Hubei, China

YEAR 1988				
ITEMS	NO. OF DAIRY COWS	PROPORTION OF THE TOTAL NATION (%)	NO. OF PRODUCTION COWS	PROPORTION OF THE TOTAL NATION (%)
State Owned Dairy Farms	710000	32.90	390000	31.97
Collective Dairy Farms	330000	15.29	180000	14.75
Private Dairy Farms	1118000	51.81	650000	53.28
Total	2158000	100.00	1220000	100.00
YEAR 2000				
ITEMS	NO. OF DAIRY COWS	PROPORTION OF THE TOTAL NATION (%)	NO. OF PRODUCTION COWS	PROPORTION OF THE TOTAL NATION (%)
State Owned Dairy Farms	1100000	20.00	610000	20.13
Collective Dairy Farms	660000	12.00	360000	11.88
Private Dairy Farms	3740000	68.00	2060000	67.99
Total	5500000	100.00	3030000	100.00

Table 4-1-1 indicates that the Government intends the size and the number of private dairy farms to increase markedly in the coming years.

Production Systems

There are four major milk production systems in China, one of which is pastoral based and provides milk for family use. This is a subsistence level type operation. The second type, which is also a subsistence type, involves very small private producers, usually with 1-4 cows in lactation. In this agricultural area based system, producers frequently herd their animals alongside roads or in communal grazing areas when forage is available. These producers also cut and carry forage and, during winter, feed stored forage. A third, emerging type of production system consists of small private

producers with 5 to 25 cows in which the animals are maintained almost exclusively in barns and exercise yards. This semi-intensive type of enterprise is usually part of an agricultural operation where the producer grows his or her own feedstuffs (Simpson, 1988, pp. 25-32).

The last system, which is likely to become most important in the future, includes the State farms and, to a lesser extent, the collective (communal) farms. These intensive type production units are rather homogeneous in most of China and centre around substantial brick buildings with large upright silos. The barn usually has a central walkway with cows tied on a gently sloping pad on each side.

The basic roughage in most areas is maize silage, but a wide variety of seasonal feedstuffs, such as surplus vegetables, sweet potato vines, fresh forage and hay along with crop residues like maize stover and rice bran, cottonseed meal, soybean meal and spent brewers grains are also commonly fed.

State and Collective farms produce the bulk of their own feeds such as green chopped rye, barley and maize, and to a lesser extent alfalfa and clover. They also contract with surrounding villages or private producers primarily for root crops, surplus vegetables, sweet potato vines and fresh grass. Hay is a basic feedstuff for dairy cattle around the world, especially in colder areas, but it is in short supply in China's major specialised dairy cattle areas due to land

constraints. Some attempt is made to bring hay from pastoral areas, but high transportation costs limit this activity.

A serious problem is the widespread practice of simply feeding what is available without consideration of nutritive values or compatibility with other feedstuffs. In addition, forages found in communal areas or alongside roads are low quality and inferior to improved grass and legume varieties now readily available internationally. Variable feed quality also affects animal health.

Medium and large dairy producers usually mill their own maize, and just add a pre-mix or other ingredients to make a compound feed. Sometimes these producers will purchase maize to mix with compound feed. Small producers will buy either a complete mix or a simple mixed feed from one of the State owned feed mills. In both cases, a production subsidy is often provided by permitting them to buy maize at the State controlled price in proportion to the amount of milk delivered to milk processing plants. In addition, some provinces, such as Shanghai, have, on occasion, even provided some feedstuffs free of charge on a proportion basis. Previously, a typical subsidy of this type was 1 Kg of crop by-product for each 2.5 Kg of milk supplied. The amount for grain was 1 Kg of grain for 4 Kg of milk delivered. In practice, State farms had first access to available subsidised feed supplies. Collectives and small producers sometimes had to buy on the free market, which had considerable impact on their profits.

Specialised (very small) dairy producers often milk their cows four times per day or at least three times. Collective and State farms almost always milk three times a day. Virtually no one milks twice daily. In addition, there is little use of milking machines except in very large operations. The reason for frequent milking, and by hand, is abundance of very cheap labor. In addition, milking machines are best justified when a completely modern milking parlour is introduced. It should be noted that the incidence of mastitis is increased when milking machines are used. Finally, although introduction of such machines may be economically beneficial in some completely new operations, it would seem that a real push for their installation will only come when emphasis is placed on improving sanitary standards. At present, somatic cell counts are seldom made in milk plants. (The aforementioned comments were made to the author during his research trip in China.)

Animal Health

According to the FAO's Animal Health Yearbook, 1985, China has one of the world's lowest incidences of animal disease. The only dairy cattle related disease reported is contagious bovine pleuropneumonia. However, personal interviews conducted during visits throughout China indicate that bovine tuberculosis and Johne's disease are found among dairy cattle. There are no reports of brucellosis. Some foot and leg problems characteristic of cattle maintained for long periods on concrete and in muddy exercise yards do occur (FAO, 1985, pp. 154-145).

Mastitis is not considered a problem, mainly because of hand milking. Most farms experience disease incidence of 5% or less, but there are reports of 20% clinical mastitis on some large farms which would be normal in high yielding herds milked by machine. Improved udder washing with salt water has reduced the problem in small herds. Most large farms use drugs more specific to this end.

Calf mortality is very low on most farms, usually about 3-5%. One main reason seems to be the introduction of the responsibility system in which one labourer is assigned to half a dozen or more calves and a bonus or deduction given based on death loss. This system is widely used in China. Another reason is that newborn calves are usually held individually in very clean small pens for up to a week during which time they are fed colostrum milk.

Despite the generally low level of disease, reproductive disorders are common. For example, there is a high incidence of retained placenta (up to 20% of calving on some farms) and conception rates to first insemination are as low as 30-35% (FAO, Animal Health Yearbook, 1983, pp. 247-289).

Internal parasites are not a problem and cattle are not drenched because they are maintained in barns. External parasites are not treated for in the north, but some fly control along with parasite treatment is practiced in the south.

Milk Handling Technology

Almost all milk which is sold is required to be marketed through the State. Exceptions are the Communes and Collective farms which may sell to members when output and distance to market are prohibitive and thus do not warrant transportation to processing plants. Municipal governments usually collect, process and distribute milk. Provincial governments set prices.

Milk is picked up directly from larger farms and via collection station from small farmers. Raw milk, mainly transported in cans, is often picked up three times daily in summer and twice a day in winter as there are virtually no cooling systems either on farms or at collection points. Despite this, severe losses of raw milk have been recorded, especially in the summer (Gartner & Krostitz, 1984, 35-43). There are no can washers in most milk plants and washing is usually done on farms by hand in cold or lukewarm water, thus adding to sanitation problems.

As of 1984, there were a total of about 400 milk processing factories in China. Most were small, with production capacities of less than 10 tons per day. By 1988 about 30-40 new plants with a daily capacity of 500-1,000 tons had been inaugurated. The larger ones not only process milk for liquid consumption, but also manufacture milk powder, condensed milk, malted milk powder and some butter. Legal standards for pasteurised milk are a minimum of 3% fat and 11.2% total milk

solids. A number of medium to large processing plants have been built in the past few years.

Economic Analysis

Introduction

For a long period the Chinese Government did very little to develop the dairy industry. The reasons being the self-supply system in the pastoral areas and the fact that dairy products are a very small proportion of traditional Chinese cuisine. However, because the Chinese regard milk as a healthy (curing) food, the government gave comparatively large subsidies and fixed the price of milk for almost 30 years (1950-1980). For the benefits of children, the government even decreased the milk price several times during this period.

After 1980, China introduced an open market economy and the price of milk began to reflect demand and supply.

Cost Structure

Appendix 8, Appendix 9 and Appendix 10 show the different costs experienced by the three different production systems which respectively are (1) urban dairy farms (2) dairy farms in pastoral areas (3) dairy farms in agricultural areas. Among these three, dairy farms in pastoral areas bear losses because they are far from the market in the urban areas.

Costs Differentials between Production Systems in 1988 are shown in Table 4-1-2.

Table 4-1-2 Costs Differentials between Production Systems in 1988

Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

	TOTAL COSTS PER COW (YUAN)	MILK PRODUCTION PER COW (KG)	FEED EXPENSES	SALARIES (YUAN)	OTHER COSTS (YUAN)	MILK COSTS (YUAN/KG)
State Owned Dairy Farms	4386.92	6631.01	2544.42	386.05	1456.45	0.6616
%	100.00		58.00	8.80	33.20	
Collective Dairy Farms	3487.14	5063.03	1952.80	484.71	1049.63	0.6887
%	100.00		56.00	13.90	30.10	
Private Dairy Farms	2938.61	4838.02	1866.02	493.69	578.90	0.6074
%	100.00		63.50	16.80	19.70	
Weighted Mean	3401.28	5309.79	2043.77	444.14	913.36	0.6406
%	100.00		60.09	13.06	26.85	

From the table, it can be seen that the cost of milk production in China is greatly affected by the price of animal feedstuffs to the extent of up to 60% (cf. approximately 40% in Europe). Furthermore, the private dairy farms were the most efficient producers in China.

Cost of Milk

The cost of milk production is related to two major factors:

. Ownership: The cost of milk production on private dairy farms is the lowest with the cost of feed representing 63.5% of the total. This is typical in China because of the huge cheap labour force.

. Cost of Feed and Management: This cost has been increasing since 1988 when China withdraw most of the subsidies on feed to dairy farmers, leading to a sharp increase in the stock feed prices as the following table shows.

Table 4-1-3 **Stockfeed Price Comparison 1987-1988**
Source: Ministry of Agriculture (1988) The Report of Dairy Projects in the Cities in China, Beijing, China.

YEAR	1987	1988	PRICE INCREASE (%)
Bean Cake	0.320	0.740	131.250
Maize	0.343	0.600	74.927
Rice	0.410	0.560	36.585
Wheat	0.420	0.580	38.095
Rye	0.060	0.090	50.000
Carrot	0.112	0.180	60.714
Silage	0.070	0.200	185.714
Maize Straw	0.014	0.064	357.143
Grass	0.014	0.018	30.000
Bean Residue	0.050	0.080	60.000
Rice Straw	0.044	0.082	86.364

Table 4-1-4 **Farm Management Cost Comparison between 1987 and 1988**

Source: Ministry of Agriculture (1988) The Report of Dairy Projects in the Cities in China, Beijing, China.

ITEM	COAL	ELECTRICITY	PETROL	MEDICINES	SALARIES	OTHERS
Price Increase	40-80	28-40	40	35	20	50

It extremely difficult to calculate accurately the rate of increase in the production cost of milk, because China is currently developing very rapidly and concomitantly converting to a market economy. The virtual complete deregulation of the industry makes it almost impossible to predict the rate of price increase. For the year 1988, the MOA figures for price increases for some farm input costs are shown in Table 4-1-4. A weighted mean of these cost increases gives an estimate of the annual increase in milk production costs of 12%. This estimate was substantiated as reasonable by a number of experts in the field in China. When applied to the 1988 figures it allows projection forward of milk production costs to 1993 (Table 4-1-5).

Table 4-1-5 **Milk Costs in China 1988-1990**

YEAR	STATE FARM MILK COSTS (YUAN)	COLLECTIVE FARM MILK COSTS (YUAN)	PRIVATE FARM MILK COSTS (YUAN)	WEIGHTED MEAN OF MILK COST (YUAN)
1988	0.6616	0.6887	0.6074	0.6377
1989	0.7410	0.7713	0.6803	0.7132
1990	0.8299	0.8639	0.7619	0.7978
1991	0.9295	0.9676	0.8534	0.8923
1992	1.0410	1.0837	0.9558	0.9981
1993	1.1660	1.2137	1.0704	1.1164

Farmgate Price

To the producers, the farmgate price should be sufficiently high to provide incentive to continue in the industry.

In 1988, the Ministry of Agriculture (MOA) did a survey of the ratio between the cost of milk, and the farmgate price in 8 cities. This is shown in Table 4-1-6.

Table 4-1-6 Comparison between Cost of Milk and Farmgate Price in 1988

Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

CITY	WEIGHTED MILK COSTS	WEIGHTED FARMGATE PRICE	RATIO BETWEEN FARMGATE PRICE AND MILK COST
Beijing	0.567	0.660	1.1640
Shanghai	0.663	0.692	1.0437
Tianjin	0.498	0.640	1.2851
Nanjing	0.672	0.735	1.0938
Xian	0.518	0.580	1.1197
Guangzhou	0.891	1.050	1.1785
Hangzhou	0.637	0.713	1.1193
Changsha	0.677	0.800	1.1817
Average	0.640	0.734	1.1469
Weighted Mean	0.611		

If farmer's profit is taken as the excess of farmgate price over the cost then the above table calculates the average profit for farmers for the regions covered in the survey as 15%.

Comparison of Farmgate Price in Australia and China

As shown in Appendix 11, in the official foreign exchange swap market in China at the end of 1992, the exchange rate Yuan/USD reached 7.2962. Many economic analysts believe that the rate of devaluation of the Chinese Yuan is 10% per annum. Using these figures to convert the respective farmgate prices to USD, it is possible to compare the farmgate prices both in China and Australia. It would seem that the farmgate manufactured milk price per litre in Australia will remain comparatively stable, and in fact is very similar to the Chinese farmgate price which will be slightly higher, but the difference will be minimal as shown in Table 4-1-7.

Table 4-1-7 Farmgate Price Comparison between Australia and China 1988-1992

Source: C.N.S.B. China's Yearbooks, 1985-1990, Beijing

YEAR	FARMGATE PRICES IN CHINA (YUAN/KG)	EXCHANGE RATE (USD/YUAN)	FARMGATE PRICES IN AUSTRALIA (AUD/KG)	EXCHANGE RATE (USD/AUD)	FARMGATE PRICE IN CHINA (USD/KG)	FARMGATE PRICE IN AUSTRALIA (USD/KG)
1988	0.7314	3.7220	0.1830	1.1689	0.1965	0.1566
1989	0.8180	4.7220	0.2230	1.2651	0.1732	0.1763
1990	0.9150	5.2220	0.2420	1.2932	0.1752	0.1871
1991	1.0234	5.3560	0.2140	1.2900	0.1911	0.1659
1992	1.1447	5.7662	0.2274	1.4500	0.1985	0.1568

Projected Milk Production

The population of dairy livestock in China is shown in Table 4-1-8.

Table 4-1-8 **Cattle Distribution in China**
Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

CATEGORY	TOTAL POPULATION ('000 HEAD)	PRODUCTION LIVESTOCK ('000 HEAD)
Total Large Ruminants	97950	30000
Other Cattle	58437	24793
Dairy Cattle	2222	1220
Water Buffalo	21067	8040
Yak	14000	4620
Milk Goats	3218	2252

Although the main increase in milk production will come from specialised dairy cattle herds, the other milking animals are likely to play an important role, particularly in limited areas to which they are well adapted.

Based upon reviews which have been undertaken of the potential for production in particular areas, a number of specialised papers have been published such as UN's Livestock Yearbook of China. The conclusions of these papers indicate possible growth projections for the different species. These are summarised in Table 4-1-9.

Table 4-1-9 Projected Numbers of Dairy Animals in China to the year 2000

Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

YEAR	REGISTERED DAIRY CATTLE ('000 HEAD)	ANNUAL MILK YIELD (KG)	MILK BUFFALOES ('000 HEAD)	ANNUAL MILK YIELD (KG)	MILK YAKS ('000 HEAD)	ANNUAL MILK YIELD (KG)	MILK GOATS ('000 HEAD)	ANNUAL MILK YIELD (KG.)
1988	1220	2664	4	800	2050	200	2252	235
1989	1257	2689	6	816	2070	200	2288	239
1990	1295	2714	8	832	2090	200	2325	242
1991	1334	2739	11	849	2110	200	2362	246
1992	1375	2764	15	866	2130	200	2400	250
1993	1510	2769	21	877	2153	200	2465	254
1994	1658	2775	29	889	2176	200	2532	258
1995	1820	2780	40	900	2200	200	2600	262
1996	2015	2785	52	900	2220	200	2670	278
1997	2232	2791	68	900	2239	200	2742	294
1998	2471	2796	88	900	2259	200	2816	312
1999	2736	2802	115	900	2280	200	2892	330
2000	3030	2807	150	900	2300	200	2970	350

These livestock population projections have been used to estimate future milk production and the results are summarised in Table 4-1-10.

Table 4-1-10 **Projected Dairy Production by Different Animal Resources in China to the year 2000**

Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

YEAR	REGISTERED DAIRY MILK PROD. ('000 TON)	PERCENT OF TOTAL MILK PROD. (%)	MILK PROD. OF BUFFALOES ('000 TON)	PERCENT OF TOTAL MILK PROD. (%)	MILK PROD. OF YAK ('000 TON)	PERCENT OF TOTAL MILK PROD. (%)	MILK PROD. OF GOATS ('000 TONS)	PERCENT OF TOTAL MILK PROD. (%)
1988	3250.08	77.52	3.20	0.08	410.00	9.78	529.22	12.62
1989	3379.72	77.80	4.54	0.10	413.94	9.53	546.09	12.57
1990	3514.53	78.06	6.45	0.14	417.92	9.28	563.50	12.52
1991	3654.72	78.31	9.15	0.20	421.94	9.04	581.46	12.46
1992	3800.50	78.53	12.99	0.27	426.00	8.80	600.00	12.40
1993	4180.86	79.55	18.25	0.35	430.62	8.19	625.93	11.91
1994	4599.29	80.50	25.63	0.45	435.28	7.62	652.98	11.43
1995	5059.60	81.39	36.00	0.58	440.00	7.08	681.20	10.96
1996	5613.45	82.00	46.89	0.69	443.93	6.48	741.28	10.83
1997	6227.93	82.56	61.08	0.81	447.89	5.94	806.67	10.69
1998	6909.67	83.06	79.56	0.96	451.89	5.43	877.82	10.55
1999	7666.04	83.50	103.64	1.13	455.93	4.97	955.24	10.40
2000	8505.21	83.88	135.00	1.33	460.00	4.54	1039.50	10.25

In these projections, milk production will continue to be dominated by classified dairy cows and the percentage of milk from this source is expected to rise from 78% in 1988 to 83% in the year 2000.

With efficient farm management, the natural increase in the number of classified dairy cattle could be sustained at a rate as high as 12% per annum. The national milk production targets could therefore be reached with a lower rate of growth of the other animals and a higher rate for the classified dairy cows. There is, therefore, little doubt that the overall target production levels are physically feasible.

With regard to goat milk projections, it has been assumed that there will be a relatively low rate of growth, similar to that achieved during the past few years. This is partially because goat milk is currently perceived by many consumers to be of a lower quality than cow's milk. However, in some countries, such as the United Kingdom, a premium image for goat milk has been successfully promoted. Another reason for the historically low rate of increase in goat milk production has been that in the rural areas, which contain most of the dairy goat production, fewer official incentives have been applied for goat milk than for cow's milk. If, as recommended in this strategy, the same incentives are applied to all types of dairy animals, goat milk production is likely to expand more rapidly than assumed in the previous tables.

In the pastoral areas away from the towns and cities, most of the milk is being produced by cows which are not classified as dairy animals. The potential for expanding the milk production in these areas e.g. Inner Mongolia is probably substantially greater than is shown in the statistics.

As a result of a crossbreeding program in agricultural areas and in pastoral and agricultural areas near the cities, a significant quantity of milk is being produced from F1 and F2 crosses which are not classified as dairy animals. If this breeding program is continued, it is likely that the quantity of milk from this source will increase. There are no national statistics on the total quantity of milk produced from such animals, but in some agricultural areas the percentage of the commercial milk from such animals could approach 25%. However, the national figure is likely to be no higher that 10%.

The buffalo milk projections are based on a dramatic rate of growth. This is partially because of the very small number of buffaloes which are currently milked. The experience of one village has shown that a local demand for buffalo milk at very high prices can be developed. If this proves to be more than an isolated instance, farmers would be expected to respond very rapidly to this high profit potential.

Another reason for encouraging buffalo milk production is to counter the sharp fall in buffalo numbers in certain areas. The Chinese traditionally use their buffalo only as a draught

animal. Today they are being displaced by increasing mechanisation (China's Dairy Development Strategy Study Group, 1988, pp. 105-109). The current plan of the Ministry of Agriculture is for farmers to convert their female draught animals into a dairy source. The intention is to use high milk yield AI semen to produce a hybrid dairy animal. If this plan is successful buffalo milk could contribute a high proportion of total national milk production.

4.2 Products

Introduction

China is a multicultural nation and there is a wide variety of traditions and hence traditional foods.

In the north-west and northern pastoral areas, dairy products have always been an important part of the herdsman's diet.

In the large urban areas dairy products are now no longer regarded as merely health foods but are becoming part of the general diet.

However, in agricultural areas, which account for 80% of the total population of China (S.S.B., China Statistical Yearbook, 1991); the diet remains traditional; that is to say, very little milk is consumed and protein is sourced from meat,

poultry, eggs, fish and shell-fish. In these areas, formula milk is the extent of people's knowledge of dairy products.

In the 1980s with increased income resulting from an expanding economy, the demand for dairy products showed a marked increase. This also occasioned a 53% annual increase in imported dairy goods.

Since then, the original healthy concept of dairy foods has been developed further so that milk is now regarded as a daily necessity.

The annual per capita consumption of liquid milk in China has increased over the past decade (Ministry of Agriculture, Dairy Projects Report, 1989):

1970	1978	1980	1985	1986	1987	1988
0.9 Kg	1.0 Kg	1.4 Kg	2.7 Kg	3.2 Kg	3.5 Kg	3.9 Kg

This reveals a 280% increase over the decade 1978-88. Even so, this consumption rate is very low compared with an average per capita dairy consumption in the other developing countries over the same period of 36.6 Kg. and the average consumption in the developed countries of 103 Kg. (Australia's consumption was 101.7 Kg. in 1988)

Table 4-2-1 **Dairy Product Consumption in China (1978-1992)**
Source: Statistical Yearbook of Asia and the Pacific (1990) United Nations

YEAR	TOTAL MILK CONSUMP. ('000 TON)	POPULATION (MILLION)	TOTAL DAIRY PRODUCT CONSUMP. (KG/CAPITA)	PER CAPITA DAIRY PRODUCT CONSUMP. INCREASE (%)
1978	997	958.10	1.04	
1979	1190	969.01	1.23	18.01
1980	1380	981.24	1.41	14.52
1981	1561	1006.91	1.55	10.23
1982	2465	1020.18	2.42	55.86
1983	2588	1029.85	2.51	4.00
1984	3100	1040.04	2.98	18.61
1985	3501	1051.27	3.33	11.73
1986	4000	1067.93	3.75	12.47
1987	4137	1079.47	3.83	2.32
1988	4274	1100.86	3.88	1.30
1989	4471	1130.00	3.96	1.91
1990	4875	1143.61	4.26	7.74
1991	4914	1156.57	4.25	-0.33
1992	5332	1169.67	4.56	7.29

Dairy Product Consumption by Region

In China there are three distinct geographical market segments:

- urban,
- rural pastoral, and
- rural agricultural.

The urban segment includes 67 cities; the rural pastoral segment includes: Xinjiang, Inner Mongolia, Qinghai and Tibet together totalling 20% of the rural population; and the remainder which comprises the rural agricultural segment supporting 80% of the rural population.

Table 4-2-2 Dairy Product Consumption by Region in China in 1986

Sources: Statistical Yearbook of China (1987)

CONSUMPT. TOTAL BY REGION	POPULATION TOTAL (MILLION)	MILK CONSUMP. TOTAL ('000 TONS)	DAIRY CONSUMP. PER CAPITA (KG/HEAD)	CONSUMP. PROPORTION OF THE TOTAL (%)
National	1000.394	3329	3.33	100.00
67 Cities	97.800	1386	14.17	41.63
Pastoral Regions	31.970	766	23.96	23.01
Agri. Region	702.300	1177	1.68	35.36

From Table 4-2-2, it can be seen that dairy consumption per capita in the cities and pastoral regions is much higher than in the rural agricultural areas.

According to the survey sponsored by the Ministry of Agriculture (China), the consumption ratio between the rural agricultural areas and the urban areas is:

MEAT	POULTRY	EGGS	DAIRY PRODUCTS
1:1.8-2.0	1:2.7-3.5	1:2.0-3.0	1:4.0-5.0

Urban Areas

The market for dairy products in China is mainly concentrated in the cities where the income level is highest. In most cities demand outstrips supply. Much of this supply comes from the European Community (EC) which gives milk aid to 20 cities and the Untied Nation's World Food Planning Committee (WFPC) which donates milk to six cities.

WFPC and EC milk recipient cities are:

- Beijing
- Shanghai
- Tainjin
- Wuhan
- Nanjing
- Xian

A further fourteen cities receive free milk from the EC:

- Guangzhou
- Shenyang
- Chengdu
- Chongqing
- Qingdao
- Fuzhou
- Hangzhou
- Hefei
- Changsha
- Nanchang
- Dalian
- Guilin
- Suzhou
- Wuxi

These cities represent the capital cities of most of China's thirty one provinces.

In 1986, Milk consumption was:

Beijing	Shanghai	Tianjin	Nanjing	Xian	Wuhan
31.1 Kg/head	22.5 Kg/head	15.8 Kg/head	11.1 Kg/head	22.8 Kg/head	13.9 Kg/head

In the cities dairy products have become regarded as daily essential items. Of the consumption in Beijing in 1986, the following data was recorded for different age groups:

YEARS	0-3	4-18	19-60	>60
(%)	19%	20%	33%	28%

Milk consumption in Beijing in 1985 was mainly by foreign residents and tourists and some high ranking Chinese intellectuals. By 1987, this situation had changed and milk products reached a much greater range of the population:

SEGMENT	INTELLECTUALS	WORKERS	CARDERS	STUDENTS	INFANTS	RETIRED PEOPLE
(%)	8%	14%	9%	14%	31%	24%

Concomitant with this increased consumption has been a change in attitude in that previously some people only consumed milk

either when they were ill or during the winter months. In 1987, 86% of families purchased milk throughout the twelve months of the years.

Also, in the urban areas a marked increase in variety of dairy products has become available e.g. flavoured yoghurt and ice-creams which were unheard of previously.

Rural Pastoral Areas

This classification includes Xinjiang, Inner Mongolia, Qinghai, Tibet and parts of Gansu, Ningxia, Heilongjiang, Sichuan and Hebei provinces. It encompasses a total of 119 counties and a population of 10,927,000.

In these regions milk is an important traditional food. For example, in Tibet province in 1987, milk production totalled 185,000 tons and average per capita consumption was 95 Kg. In Qinghai province, the consumption in the same year was only 45 Kg, explained by the province's mixed population of Tibetans and Han Chinese, in that the former are traditional milk drinkers and the latter are not.

In Inner Mongolia average milk consumption was the highest of all provinces at 179.41 Kg accounting for 16.7% of total expenditure on food.

In these pastoral areas, milk is self-supplied due to the vast distances and difficulties in transportation and

communication. However the people are accustomed to home-made cheese, butter and even a milk brewed wine, in their diets.

Their supply is individually regulated by milking from their animals only that which is required daily.

Rural Agricultural Areas

Because milk is not a traditional Han or Manchu Chinese food, its consumption is minimal in these areas.

The farmers are not accustomed to lactose in their diet and most prefer products derived from home-grown beans. Their limited income has long restricted their purchasing power.

Table 4-2-3 Projected Consumption Pattern of Various Food Items in China 1986 and Projections to the year 2000

Sources:
- C.N.S.B. Urban Statistics Yearbook (1987) China, and
- M.O.A. "Vegetable Basket Project Report" (1988) Beijing, China

ITEM	TOTAL ANIMAL FOOD	DAIRY PRODUCTS	MEAT PRODUCTS	EGG PRODUCTS	AQUATIC PRODUCTS
City Province 1986 (%)	100	25	27	25	23
Pastoral Cities 1986 (%)	100	54	30	13	3
Southwest Cities 1986 (%)	100	7	78	9	6
Coastal Cities 1986 (%)	100	4	28	9	59
Quantity Nationwide 1988 (Kg/head)	42.6	42.6	3.81	22.8	6.4
Food Proportion Nationwide 1988 (%)	100	8.9	53.5	15	22.5
Estimated Quantity Nationwide 2000 (Kg/head)	63	8	28	12	15
Estimated Proportion of Dairy/Total Animal products Nationwide 2000 (%)	100.	12.7	44.4	27.9	23.8

The national figures shown in Table 4-2-3 are averages and do not give a clear picture of the consumption in different regions or an indication of the marked differences between urban and rural consumption. A particular feature of milk consumption is that, apart from the minority populations in pastoral areas, milk only plays a significant part in the diet of urban residents. The China National Statistics Bureau, Urban Statistics Yearbook for 1987 shows that the per capita availability of milk ranged from 1.7 Kg in the rural areas, through 14.2 Kg in 67 large and medium sized cities to 23.3 Kg in the pastoral areas. Since the herdsmen in the pastoral areas represent less than 20% of the total population of those areas, the actual consumption by the herdsmen is considerably higher than the reported average.

In the calculation of the projected consumption patterns in Table 4-2-3, the Ministry of Agriculture has used figures from current plans and projections for the various livestock products. The figures for dairy products were based on a per capita milk production of approximately 8 Kg.

In absolute terms, over the period 1988 to the year 2000, total per capita consumption of milk is expected to increase by approximately 50% while that of dairy products should more than double.

Although in absolute terms milk will remain a relatively minor part of the diet, the relationship of milk and meat is

expected to improve substantially from less than 17% to more than 29% of the total diet.

Dairy Product Proportion of Diet

The Chinese traditionally eat cereals as staple food, animal products only representing accompaniments. Among the latter, pork is the most commonly used followed by beef, mutton, poultry products and aquatic products. During the last 10 years, the proportion of dairy products in the diet has been increasing as shown in Table.

Table 4-2-4 Average Dietary Intake of various Food Items in China 1978-1988

Source:
- China Statistical Yearbook (1988) and Back Issues
- M.O.A. "Vegetable Basket Project Report" (1988) Beijing, China

YEAR	TOTAL ANIMAL FOOD (KG)	DAIRY (KG)	MEAT (KG)	EGG (KG)	AQUATIC (KG)	ANNUAL CEREAL (KG)	ANNUAL VEGE. OIL (KG)
1978	15.37	1.00	8.90	12.80	3.50	195.46	1.60
1978	100.00	6.50	58.00	1.94	22.70		
1985	30.10	3.30	16.90	5.00	4.90	254.35	5.13
1985	100.00	11.00	56.10	16.60	16.30		
1986	32.00	3.80	17.50	5.30	5.40	256.00	5.24
1986	100.00	12.10	54.60	16.50	16.80		
1987	33.00	4.10	17.69	17.00	5.54	251.44	5.66
1987	100.00	12.80	54.00	5.60	16.20		
1988	33.89	4	18.25	5.81	5.73		
1988	100	12.1	53.9	17.1	16.8		
Annual increase (%)		0.56	-0.41	1.52	-0.59		
2000 (projected Kg.)	63	8	28	12	15		
2000 (projected %)	100	12.9	44.4	19	23.8		
Annual Increase (projected %)		0.0667	-0.7917	0.1583	0.5833		

Dairy Consumption and Income Level

Table 4-2-5 Proportion of Annual Income Spent on Dairy Products in China 1978-1992

Source: S.S.B., China Statistical Yearbook (1988)

YEAR	GDP PER CAPITA (IN 1987 USD)	FOOD GRAIN (KG)	ADJUSTED FOOD GRAIN (KG)	DAIRY CONSUMPTION OF AVERAGE INCOME (%)	DAIRY CONSUMPTION OF AVERAGE TOTAL EXPENDITURE (%)
1978	315.00	167.30	0.56	0.18	0.33
1979	346.00	191.00	0.69	0.20	0.36
1980	376.00	222.30	0.84	0.22	0.38
1981	397.00	247.30	1.03	0.26	0.41
1982	422.00	268.80	1.25	0.30	0.47
1983	463.00	295.70	1.54	0.33	0.52
1984	545.00	339.50	1.88	0.34	0.55
1985	668.00	626.00	3.03	0.45	0.48
1986	737.00	477.30	3.61	0.49	0.76
1987	859.00	550.20	4.21	0.49	0.77
1988	1066.00	699.50	5.15	0.48	0.74
1989	1178.00	773.00	6.30	0.54	0.82
1990	1271.00	810.00	7.71	0.61	0.95
1991	1414.97	914.48	9.43	0.67	1.03
1992	1575.26	1032.45	11.54	0.73	1.12

The average expenditure figure is obtained from the following equation based on the 1988 price of milk expressed in constant money terms: Average expenditure = (Liquid milk consumption x Average liquid milk retail price) + (average manufactured dairy product consumption x average price of milk powder)

As can be seen from Table 4-2-5, the expenditure on dairy products represents an extremely small proportion of total expenditure.

With the developing economy in China, the per capita income, based on a constant 1988 US dollar rate is expected to rise to USD 800 by the year 2000. These figures indicate a possible fall in the percentage of expenditure on dairy products. However, experience has shown that the 1988 price levels were too low to sustain an expansion of the dairy industry. In addition, the widening of the range of dairy products available to the Chinese people is changing the pattern of consumption towards higher value-added products such as yoghurt. Detailed calculations on the possible market for diversified products are unavailable but it is probable that an 8 Kg per capita consumption will include an increase over the 1988 figure for the percentage spent on dairy consumption.

In the calculations in Table 4-2-5, it is assumed that the average household expenditure will continue to represent 66% of per capita income. The official estimates (MOA) yield an expected per capita expenditure of 1,964 Yuan in the year 2000. Thus at current real prices the average expenditure on dairy products would represent only 0.65% of total expenditure.

Because of this low statistical weighting in the price index statistics, changes in milk prices would have a negligible effect on overall price indices and the reported rate of inflation.

Future trends in Dairy Consumption

In general, it is predicted that as China's economy develops further the gap between demand and supply of dairy products will increase.

The first priority of the dairy industry is thus to provide sufficient liquid milk to the cities. As the supply increases the industry needs to emphasise liquid milk's importance in the general diet and convince the population that it is a daily requirement. This is especially important in rural agricultural areas because 80% of the Chinese population resides there, and thus that is where the dairy industry's future market lies.

In the self-supplied pastoral areas, marketing concepts can be introduced to encourage herdsmen to process their surplus milk. Once the dairy industry has established its market share, it should diversify the products to meet different demands from different groups: fruit flavoured yoghurt, flavoured ice-creams, calcium enriched milk and Cheddar cheese.

Once the consumer demand reaches a certain level, the dairy industry can start to provide industrial dairy products, e.g. for the confectionery and bakery industries. These will eventually comprise about one third of all dairy production.

There is a current trend in those cities which already have a significant per capita milk supply for a greater percentage of incremental supplies to be used in this way.

The 1988 statistics for 20 cities showed that 17.5% of the milk was used for milk powder production and 15% for the production of yoghurt, condensed milk, cream, soft drinks with milk, crystallised malted milk and cheese. The production of yoghurt also increased rapidly and reached 407,000 tons, accounting of 4.76% of the total milk production.

Taking account of these trends, an estimation of the likely structure of the dairy product market in the year 2000 has been made. It is shown in Table 4-2-6 with an indication of the likely division of the production quantities between the industries in the suburban, agricultural and pastoral areas. Note that the condensed milk market is confined largely to the southern coastal provinces where it is often used in place of milk powder due to climatic conditions.

Table 4-2-6 Projected Percentage of Dairy Product Consumption in China to the Year 2000

Source: China's Dairy Development Strategy Study Group (1988) Development Strategy for China's Dairy Industry, Hubei, China

	TOTAL VOLUME ('000 TON)	PERCENT OF TOTAL (%)	CONSUMP. IN URBAN REGIONS ('000 TON)	PERCENT OF TOTAL (%)	CONSUMP. IN PASTORAL REGIONS ('000 TON)	PERCENT OF TOTAL (%)	CONSUMP. IN AGRI. REGIONS ('000 TON)	PERCENT OF TOTAL (%)
National Total	10240	100.00	3040	100.00	1480	100.00	5720	100.00
Drinking Milk	4185	40.87	1885	62.01	870	58.78	1430	25.00
Yoghurt	865	8.45	365	12.01	220	14.86	280	4.90
Milk Powder	331	3.23	304	10.00	148	10.00	2860	50.00
Condensed Milk	300	2.93	50	1.64		0.00	250	4.37
Ice-cream	290	2.83	70	2.30	100	6.76	120	2.10
Cheese	316	3.09	76	2.50	100	6.76	140	2.45
Soft Drinks with Milk	730	7.13	260	8.55		0.00	470	8.22
Other	244	2.38	30	0.99	42	2.84	17	0.30

The major growth is expected to be in yoghurt and other fermented products, causing the percentage of milk supply to almost double, and in the production of soft drinks with milk. The sales of soya milk mixed with 10% cows milk showed a dramatic growth in Guangzhou in 1986 and Beijing launched a new range of milk soft drinks in 1988.

Dairy Product Supply Analysis

It is a major objective of the dairy industry in China that the production basis in and around the cities supply liquid milk while the essential milk powder is produced mainly in the agricultural and pastoral areas for export to other provinces, particularly those in southern China.

This would represent a reinforcement of the existing pattern whereby pasteurised milk represents a major component of the processing works' production in the urban areas but a much smaller component in the major milk exporting provinces such as Heilongjiang and Inner Mongolia. The 1986 national statistics reported that 65.1% of the total milk supply was consumed as raw liquid milk whereas an analysis of the data from 20 large cities in 1988 showed that 67.5% of the production was sold as pasteurised milk.

The major differences in the per capita consumption of dairy products by urban dwellers, the rural population and the herdsmen in pastoral areas is based on historical differences resulting largely from the supply limitations in the various regions. However, even after catering for taste preference, change tends to be a relatively slow process. Because the availability of fresh milk has been more limited geographically than that of most other products there may be more significant differences between the actual consumption pattern and the demand. It is also difficult to gain a true picture of regional dairy product consumption because reliable statistics are not available on the consumption of milk powder and condensed milk, for which there is a substantial inter-regional trade.

Based on the difference in demand in the three area classifications, a summary of the likely production requirements is shown in Table 4-2-7.

Table 4-2-7 Expected Production Targets of Three different Market Segments in the year 2000
Source: China Statistical Yearbook (1990) Beijing, China

REGION	POPULATION (MILLION)	MILK PRODUCTION ('000 TON)	MILK PRODUCTION QUANTITY PER CAPITA (KG)	POPULATION GROWTH RATE (%)
100 Major Cities	152.0	3040	20.0	
Pastoral Regions	42.2	1477	35.0	2.0
Agricultural Regions	1085.8	5720	5.2	1.4

Price Considerations

All price statistics show that since 1980 the price of milk relative to those of other livestock products, and particularly to grain and feedstuff prices, has been declining. For some years this effect was largely compensated by improvements in the technical efficiency of dairy cattle management and feeding so that it was possible for the farms to maintain good or adequate profitability. Some of the dairy farms have now achieved high technical standards and good yields even by the standard of countries with highly developed dairy industries. Especially for the farms that have already reached a high level production, the possibilities for further improvement and technical progress in the short term are limited.

The main problem recognised by the dairy farmers is the rapid increase in negotiated feed prices and fodder prices, particularly those for concentrates. The figures in Table 4-2-8 show that since 1950 grain prices have increased by a factor of seven whereas the average milk price has increased by only 47%.

Table 4-2-8 Agricultural Product Price Indices (Yuan) 1952-1988 (1950=100)

Source: China's Statistical Yearbook (1990) Beijing, China

YEAR	AGRICULTURAL PRODUCTS	CEREALS	MEAT	EGGS	RAW MILK
1952	121.6	121.4	102.7	104.7	100
1978	217.4	258.9	200.2	217.4	79
1980	284.4	364.6	257.5	264.6	94
1985	382.9	522.2	328.1	368.3	106
1987	432.4	619.8	408.1	510.8	134
1988	551.9	710.3	608.5	606.3	147

It is estimated that to return to the pre-1987 position when the farmers had great enthusiasm for expanding dairy production, a price increase of 15% or more would be required. From the analysis of some monthly accounts of a small number of State farms in 1989, an increase of around 15-20% would in fact be required to provide a reasonable return on the capital invested. Since there are substantial differences in price levels in different areas this is only a general indication which should be reviewed on a case by case basis.

During the field research in China, discussions with consumers and dairy corporation personnel in a number of cities indicate that milk is regarded as a relatively cheap, healthy food and that a retail price increase of 10-15% would have a negligible effect on sales.

The equivalent price of milk powder is generally higher than that of liquid milk. This encourages the demand for liquid milk in the cities, where the higher nutritional value of pasteurised milk is already recognised, and discourages consumption of milk powder. For the rural people, the relatively high prices for milk powder may reduce the demand for dairy products. While this price relationship, continues, urban dairy factory management will have an incentive to maximise the production of powder at the expense of pasteurised milk.

International Trade and Financial Assistance

Dairy Products

China has been a net importer of dairy products for several years. Recent official trade statistics are not available but it is estimated that between 1979 and 1986, China imported a total of 390,000 tons of milk powder and 10,600 tons of condensed milk. Annual figures for this period, although incomplete, indicate that major imports started in 1982 and have since represented up to 20% of the total national milk supply. A significant percentage of dairy product imports have been associated with the WFP and the EC support programs but

the major part has been commercial imports both for retail sale and for manufacturing (C.D.D.S.S.G., Development Strategy Study of China's Dairy Industry, 1988).

Despite the sharp increases in the world market prices for dairy products and China's tighter foreign exchange policy, substantial quantities of imported powders are still available in the shops. Particularly in the southern coastal cities consumers are still prepared to pay a substantial premium for high quality imported products.

Between 1979 and 1986, 51,760 tons of fresh milk were exported to Hong Kong and Macao from China. The volume of this trade is tending to increase as the demand for milk in those areas develops. As part of compensation trade arrangements China also exported small quantities of milk powder to Romania and Japan.

In the foreseeable future, the policy will be to maximise the percentage of the milk which is produced within the country. It is likely that imports of high quality products will continue to be necessary to meet special consumer needs such as those of the developing tourist industry. However, there must be some controls to ensure that any future reduction in world market prices does not lead to a flood of imports which could damage the market for the local industry.

Through the year 2000, China is expected to remain a net importer of dairy products. However, there is the possibility of generating some foreign exchange by small export values of high priced, traditional speciality products which include milk in the formulation. An example is the "imperial milk cakes" recently exported to Japan.

The policy to maximise the percentage of domestic milk production will continue whilst China debates to what extent to be self-sufficient in agriculture. Whilst China still feels vulnerable to political pressure from outside the self-sufficiency argument will apply (Tyers and Anderson, 1992, p. 294) as it has done for 50 years in the EC. Later the opportunity cost of being able to feed a population approaching 1.2 billion may well change this policy and provide opportunities for Australia.

Livestock and Equipment

During the 1980s a total of 10,808 head of dairy cattle and 430 milk goats were introduced into the country. These included both grants from overseas countries and commercial imports. These imports played an important role in helping develop the dairy industry through an improvement in quality and quantity.

In the future, the import of live animals is only anticipated in exceptional circumstances. The existing stock of dairy cows is sufficient to support the proposed development program and

the main emphasis will be on selection within the herd. Imported frozen semen, and possibly embryos, will be used to introduce new blood lines as a relatively small supplement to the production from the existing network of bull stations.

Although the industry has made great progress, foreign technical assistance and equipment such as is being provided by the EC and other donors still has a major role to play in the expansion of the industry and the introduction of new techniques to improve quality and technical efficiency.

4.3 Merchandising

In parallel with the marked increase in milk production, especially through the development of collective and private rearing of cattle, a multi-channel management of sales and purchasing of dairy products is being developed in China.

Domestic Transactions

Organisation

The major relevant organisations involved in domestic dairy product transactions in each city are as follows:

- Sugar & Wine Company (SWC)
- Non-staple Food Company (NSF)
- Animal Husbandry, Industry & Commerce Corporation (AHICC)
- Agricultural, Industry & Commerce Corporation (AICC)
- China Food Industry Supply and Marketing Company (CFISMC)

AHICC and AICC are owned by the Ministry of Agriculture (MOA). They control the local dairy plants whose production is 45-50% liquid milk and 45-50% manufactured dairy products.

These local dairy plants furnish all liquid milk on the market and 90% of all manufactured dairy products. The MOA owns the entire distribution network for liquid milk. The corporations (AHICC & AICC) deal in not only local dairy products but also the products from outside the area and sometimes deal in imported products.

The entire production of CFISMC which is owned by the Ministry of Light Industry, supplies 10% of manufactured dairy products.

The SWC and NSF are owned by the Ministry of Commerce and they own all local shops (State). They distribute 90% of all manufactured dairy products sourced from the dairy plants via their local shops.

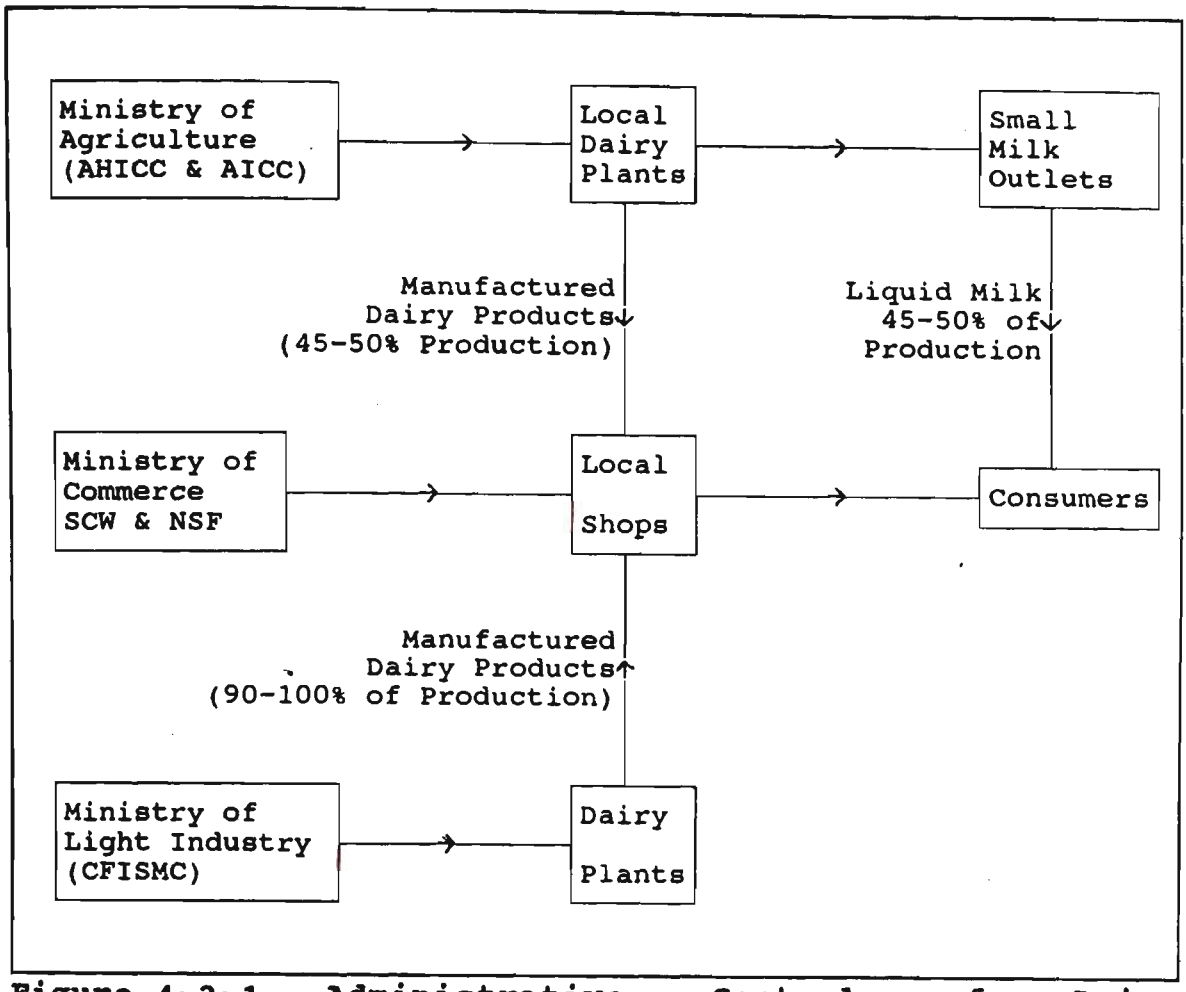


Figure 4-3-1 Administrative Control of Dairy Factories in China 1992

Figure 4-3-1 shows the inter-relationship of the organisations concerned with dairy product transactions.

Distribution Network for Liquid Milk

Fresh milk is delivered to dairy plants where it is pasteurised, blended with no more than 50% of re-combined milk and packaged in bottles or plastic sachets. The milk is then delivered to milk delivery centres.

Milk distribution centres act as wholesalers. They distribute liquid milk to retail shops, selling stalls and milk delivery outlets. As seen in Figure 4-3-2, milk delivery outlets serve

the consumers who have standing voucher orders for pasteurised milk, while retail shops and selling stalls sell certain amounts of pasteurised milk and yoghurt to the consumers who have no standing voucher orders.

Note: Standing voucher orders are purchased by individual citizens. Such voucher guarantees at least one month's liquid milk supply in advance.

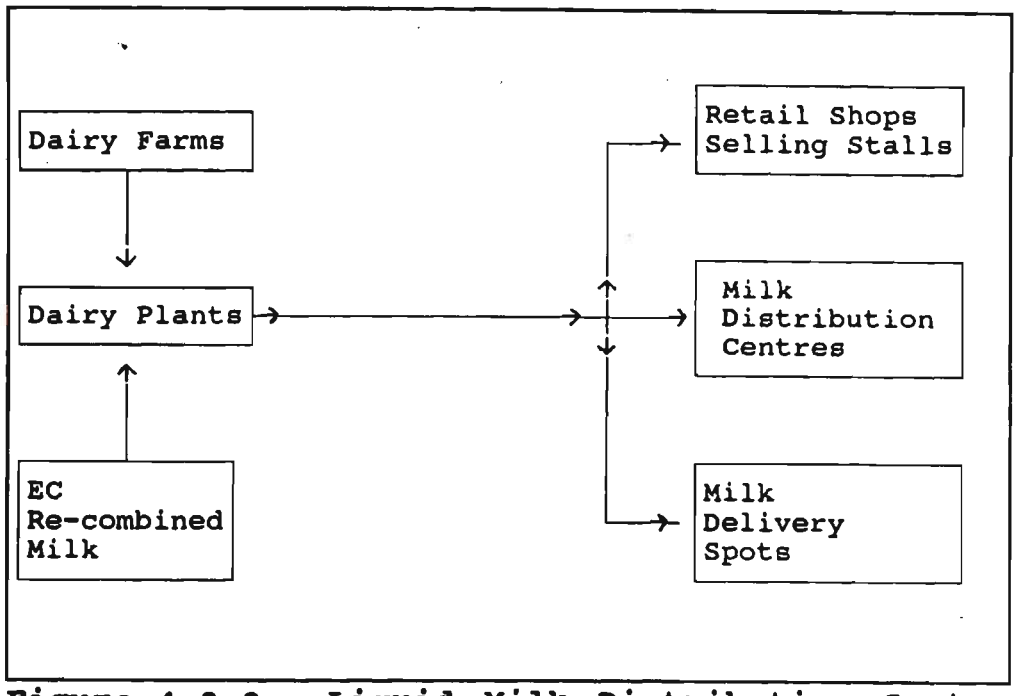


Figure 4-3-2 Liquid Milk Distribution System in China 1992

International Transactions

Currently, China is an importer of dairy products and the volume imported is likely to increase in the future.

Organisation

Major Importers of Dairy Products

- China Oil Foodstuff Import & Export Corporation (COFCO) is an important importer of dairy products. Their division, China Foodstuff and Beverage Import & Export Company, specialises in dairy product trading, especially in whey powder. Most of the time, COFCO has adequate foreign currency and good commercial skills.
- Provincial Foodstuff Import & Export Companies are the major local importers of dairy products. They formerly belonged to COFCO, but are now completely independent in international transactions of dairy products.
- The Ministry of Light Industry owns 10% of advanced dairy factories nation-wide and takes most of the responsibilities for dairy equipment, manufacturing and dairy product quality control. In order to maintain and develop baby foods, such as infant formula milk powder, the central government allocates a certain amount of foreign exchange quota to the Ministry of Light Industry.
- The Ministry of Commerce controls most of the retailing and wholesale organisations for manufactured dairy products. They are also involved in importing manufactured dairy products.

- The Ministry of Agriculture has some companies which can make deals on the import and export of foreign dairy products.
- Most joint venture enterprises also have their own import and export rights on the relevant products they are producing. Joint-venture enterprises also enjoy some favourable tariff reductions.
- Some additional import & export companies have been organised by each city or region. These companies can also import and export dairy products but they are not very skilful at this.
- Trading companies in special economic zones (SEZs) such as Guangzhou, Shenzhen, Xiamen make full use of favourable government economic policies and usually pay lower customs duty and taxes and sell the imported dairy products nationally. They usually make little profit in this business transaction.

Import Application Procedure

Import application procedure as exemplified by a Shanghai dairy processing plant is shown in Figure 4-3-3.

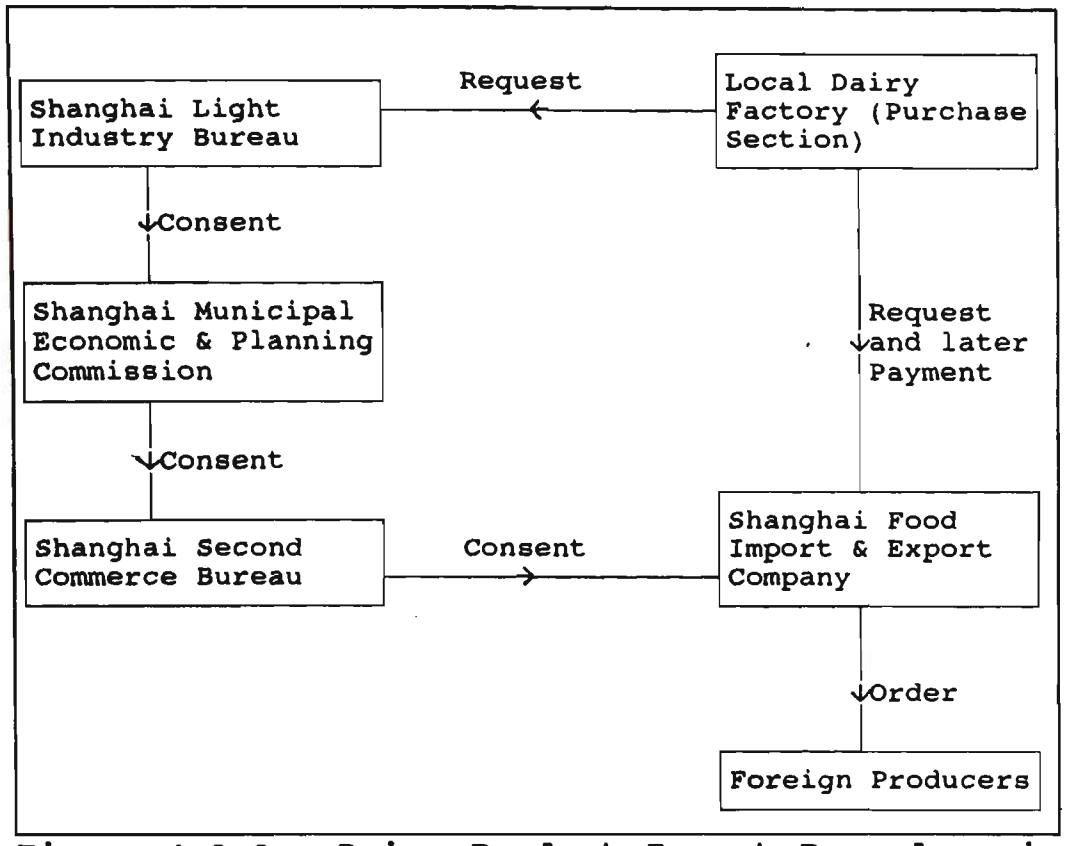


Figure 4-3-3 Dairy Product Import Procedure in Shanghai 1992

At the preliminary stage, the purchasing section of a local dairy factory, e.g. of the Sugar & Dairy Products of Shanghai SWC Corp., drafts a report to apply for importing a milk product usually in powder form. The report has to be approved by each level of the administrative hierarchy and finally by the Municipal Economic & Planning Commission. They then give consent to the Commerce Bureau. Meanwhile the Local Dairy has requested an Import/Export Company to import a product for them. The Second Commerce Bureau gives consent to the Import/Export Company and the Local Dairy pays the Import/Export Company.

Customs Duty on Dairy Products

Table 4-3-1 Customs Duties on Dairy Products in China in 1992

Source: The Import Duty Handbook of People's Republic of China, 1989, Beijing, pp. 35-78.

ITEMS	MILK POWDER (%)	BUTTER (%)	WHEY POWDER (%)
Lowest Tariff	30	70	20
Common Tariff	40	90	30
Tax of Industry, Commerce & Administration	10	5	5

Note:

- Some taxes may be deducted for special industries, such as the baby food industry.
- China is applying to join GATT and it is possible that most tariffs will be discontinued in 1993.

Industrial Dairy Products

Milk Powder

Large industrial users have direct access to the supply of industrial raw materials. However, they have to obtain their sugar supply from the Industrial Raw Material Section of the national SWC Corp. Some large users have no storage facilities for keeping the milk powder fresh, therefore, they have to leave a part of their order at SWC's warehouse even though the price is little bit higher.

Small and medium industrial users usually have direct business connections with local dairy factories. When there is a shortage in production of local milk powder, the users

increase their orders of milk powder from SWC Corp. and the local Foodstuffs Industry Corp.

Whey powder

At present, the only users of whey powder are the dairy factories. Either the dairy factories which produce infant formula milk powder, or local dairy corporations have direct business connections with the importers. Until now, all whey powder consumed in China was imported. Apart from central government imports, local foreign import and export companies also trade in whey powder such as Jilin Import & Export Company.

Butter

Large users can buy directly from suppliers, or from the SWC Corp. Small and medium sized factories buy from local manufactures or from distributors such as SWC Corp. and other trading companies. A relatively small quantity of butter both foreign aided and imported is shipped to China annually. Note that there is no foreign made margarine on the Chinese Market.

Skim milk powder (SMP) is imported by central government dairy factories and both local and foreign trading companies.

Retail Dairy Products

The sale of imported dairy products in China requires a persistent marketing program. Most of this activity is concentrated in southern China where the economy is very

volatile. The importers have to lobby the department stores and big hotels to persuade their customers to buy. At the moment, there are a lot of imported dairy products on the shelves especially in southern China.

Future Trends

Skimmed milk powder (SMP) would have a huge potential market in China if the EC milk aid program was terminated. The present trend of exporting bakery and confectionary products will cause an increasing demand for industrial dairy products.

Imported retail dairy goods are still beyond the reach of ordinary Chinese because of their high price. This situation will remain for a long time or until the income level of the Chinese reaches a threshold level (e.g. USD 1,000 per capita per annum) or import duties are decreased which seems unlikely in the foreseeable future.

There are relatively large quantities of infant formula milk powder and cheese imported. This situation will persist for several years and then it is probable that most of these products will be replaced by joint-venture production or local production in northern China.

Distribution System for Imported Dairy Products

At the moment, China allows a whole range of dairy products to be imported including UHT milk. The import channels are as shown in Figure 4-3-4.

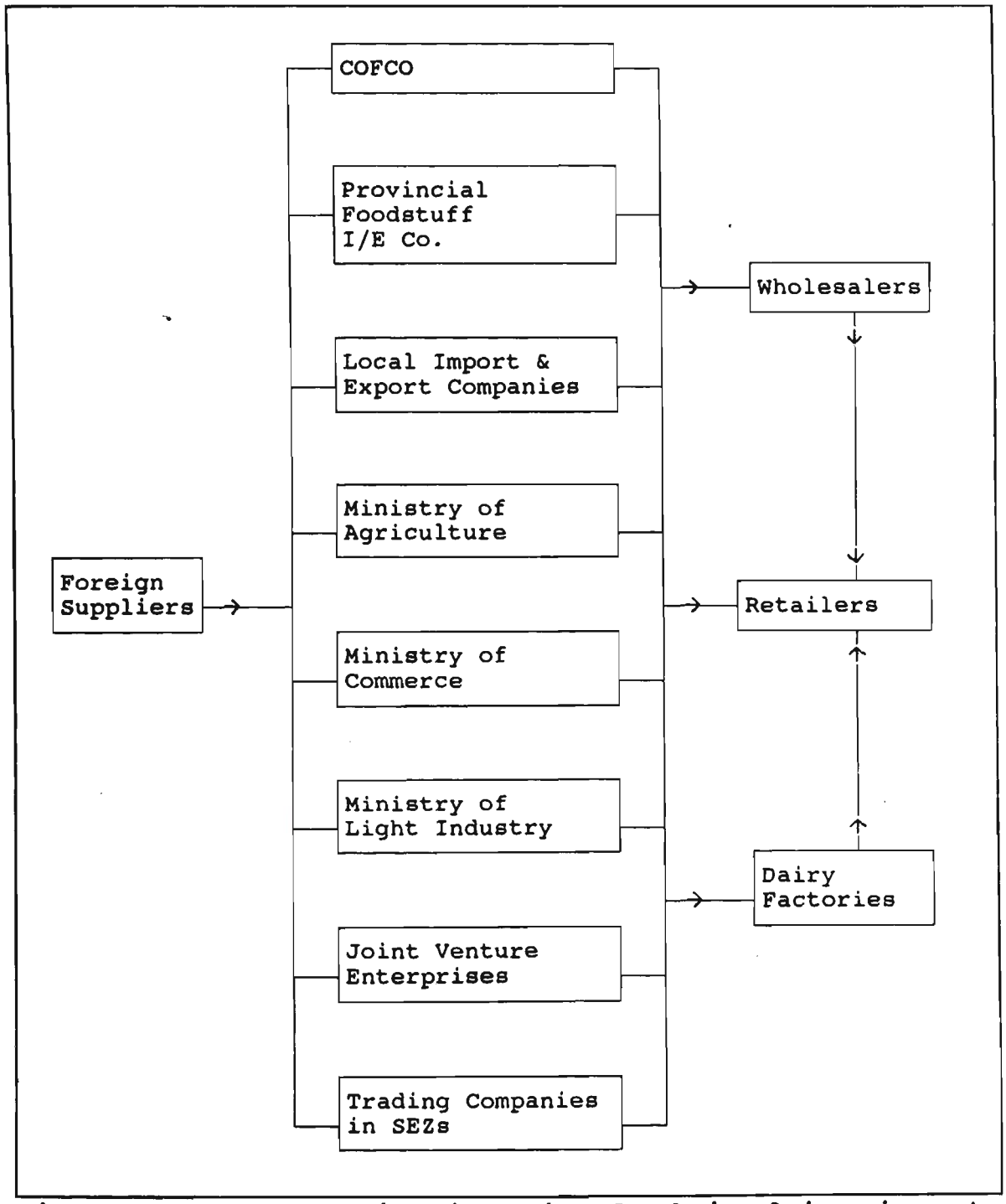


Figure 4-3-4 Organisations involved in dairy imports to China 1992

Throughout China's history communications have been a great problem. Today, with China's rapidly expanding economy enormous strains have been placed on its transport infrastructure. This strain is evident in port congestion, inadequacies in the rail and road systems, constraints on the movement of coal, and logistical problems in moving and expanding agricultural production to markets. In 1987 it was estimated that China's transport system will have to carry 45% more freight by 1990 and so the development of transport capacity was a key priority of China's Five-Year Plan for the period 1986-90. (Tyrchniewicz et al. 1987, p.264)

The current transport situation in China not only affects the development of China's agricultural sector but also affects the distribution of imported agricultural commodities.

Figures based on government agencies' grain transports in China showed that 85% of transport was intraprovincial and 15% interprovincial (Tyrchniewicz et al. 1987 p. 266). Road accounted for 62% of long distance movements and virtually all of it was intraprovincial. Rail accounted for 25% and inland waterways in South China for 13%. Congestion on the north-south railway lines indicated that greater use should be made of coastal shipping.

A further major constraint is the availability of transfer and storage facilities. Increasing imports of grain into China place an even greater strain on port storage facilities;

demurrage charges for foodstuffs were estimated at almost USD 200 million in 1982. (Tyrchniewicz et al. 1987 p.267).

Infrastructure requirements are two-fold: improvements and strengthening of major intercity highways and bridges, and the development and expansion of rural road networks. In 1987 the pace of new road construction declined with cost being the main reason. The World Bank has estimated that the cost of upgrading existing infrastructure in China (apart from the construction of new roads) would be approximately USD 10-15 billion (Tyrchniewicz et al. 1987, p. 267). These figures give an indication of the size of the infrastructure problem facing China which exporters also face in trading with China.

5

THE AUSTRALIAN DAIRY INDUSTRY IN THE INTERNATIONAL ARENA

"What would this island be without foreign trade, but a place of confinement to the inhabitants, who (without it) could be but a kind of hermites, as being separated from the rest of the world; it is foreign trade that renders us rich, honourable and great, that gives us a name and esteem in the world."

Charles Molloy
De Jure Maritimo et Navale, 1676

It is important to review the Australian dairy industry and its role in the international market in order to elucidate any similarities and differences in the dairy industries of the two nations under consideration.

5.1 International Dairy Trade

According to the various issues of the World Trade Statistical Yearbook published by the United Nations, only a small proportion of world milk production is traded in international markets each year. The major dairy trade items are bulk butter, cheese, milk powder and condensed milk. Annual trade in these products (excluding intra-EC trade) is approximately 25-30 million tonnes on a milk equivalent basis, or about 6% of total world milk output.

This trade scene reflects the fact that in most countries dairy production is geared to the promotion of domestic self-sufficiency and this has supported artificially high domestic prices paid to farmers. This has lead over the past 20 years to increasing restrictions on access to international markets.

A significant proportion of current trade is transacted under direct bilateral quota arrangements or other quantitative import controls. Much of the trade in cheese is subject to such agreements. Currently Australia has bilateral quota access to the EC for 3,000 tonnes of Cheddar cheese and to the

USA for 4,000 tonnes of cheese, 600 tonnes of SMP and small volumes of other minor dairy products. These arrangements cover around 10% of Australian traditional export volumes of cheese but less than 1% of exports of the other products mentioned (ADC, Dairy Compendium, 1991, p. 53).

In addition, although many countries operate under protective arrangements which boost domestic supply, only a few are significant exporters.

The EC is the major exporter of dairy products accounting for slightly over half of all export sales. The world's largest producer, the Commonwealth Independent States (CIS), has remained a net importer of dairy products to date. Its import purchases have helped balance world supply and demand in recent years, particularly in the case of butter. The other major producer, the USA, has been more concerned to restrict import access to its domestic market. However, the USA has regularly disposed of its government stocks of skim milk powder (SMP) and butter in international dairy markets through subsidised sales and food aid programs (ADC, Dairy Compendium, 1991, p. 54).

Figure 5-1-1 Australian Dairy Areas showing Percentages of National Production, 6,401 million litres in 1990-91.

Source: Australian Dairy Corporation (1991) "Dairy Compendium", p.6.

5.2 Australia's Dairy Industry in the World Context

As mentioned, the EC countries supply over 50% of dairy products on the international market. Although it accounts for only 2% of world milk output, New Zealand is the second largest supplier of manufactured products to the world market. It accounts for about 20% of total sales on a milk equivalent basis. The large majority (over 80%) of New Zealand production is dedicated to export sales. Australia, which accounts for just over 1% of world milk output, accounts for between 6% and 7% of export sales (ADC, Dairy Compendium, 1991, p. 54).

The remainder of the international market has traditionally been supplied by subsidised exports from developed economies such as Canada and the non-EC countries of Western Europe with some milk powders supplied by Eastern European countries such as Poland and Czechoslovakia. In 1989 and 1990, export surpluses from Eastern Europe rose sharply after they removed long-standing consumer subsidies on dairy products. This greatly disrupted traditional trade flows. Cuts in domestic production, particularly in Poland, in the past year have reduced the size of these surpluses. However, both Poland and Czechoslovakia should remain active in world markets.

Australia currently exports around 30% of its annual milk production (over 40% of its output of manufactured products). Its principal export products in both value and volume are SMP and cheese, with butter and wholemilk powder also being major contributors to export sales. Over the past three years SMP

has increased significantly in exported volume. In recent years long-life milk has also been exported in increasing volumes to the growing retail markets of Asia (ADC, Dairy Compendium, 1991, p. 53). The value of Australian dairy exports in 1989-90 was approximately AUD 700 million, an increase of 8% on the previous year (Office of Trade and Investment, Victorian State Government, Milk Production - Australian Context, 1992, p.255).

The direction of Australian export sales differs from the general pattern of international trade flows. Australian exports are concentrated in South-East Asia, Japan, Taiwan and the Middle East with only limited industry involvement in the North African and American markets. It is also influenced by the extent to which Australia is excluded from other major markets by direct restrictions (as in the case of the EC and the USA) or by the impacts of the export subsidy programs of major competitors (Australian Dairy Corporation, 1991, p. 56).

Japan remains the largest single market for exports followed by ASEAN nations such as the Philippines, Singapore, Thailand and Malaysia. Saudi Arabia remains the largest single market in the Middle East. Taiwan and North Asia remain the principal destinations for export sales of wholemilk powder.

The pattern of product sales also varies between regions. Japan remains the major market for Australian cheese. Traditionally this trade was dominated by sales of Cheddar for processing but in recent years there has been strong growth in

the sales of natural cheeses for direct consumption such as cream cheeses, Mozzarella and shredding type cheeses. Japan is also a significant purchaser of SMP and specialty powder formulations for use in industrial food processing.

The Middle East has traditionally been a strong market for consumer packs of processed varieties of Cheddar cheese and butter/butteroil. The nations of South-East Asia predominantly purchase SMP and butteroil with much of this product being recombined to produce fluid milk for resale in local markets (Australian Dairy Corporation, 1991, p. 56).

Whereas Australian dairy products are effectively locked out of, or subject to tight restrictions in, major markets including the EC and North America, Australia allows relatively free access to imported dairy products. Australian dairy product imports are small and comprise mainly cheese from New Zealand and, to a lesser extent, from Europe (Office of Trade and Investment, Victorian State Government, 1992).

Table 5-2-1 Australian Dairy Product Exports by Weight (Tonnes) 1986-1991

Source: Dairy Compendium (1991) Australian Dairy Corporation, Melbourne

YEAR	CHEESE	BUTTER	AFM & GHEE	SMP, BMP & SMP/BMP MIX	CASEIN	WMP
1986	68441	26953	22720	100039	7130	40804
1987	62560	10151	20155	90750	8275	51518
1988	77342	27323	20353	80281	8343	49573
1989	62720	23907	23091	73941	6115	48388
1990	52375	28747	17640	97088	4257	42681
1991	62672	29488	21131	125690	3190	44606

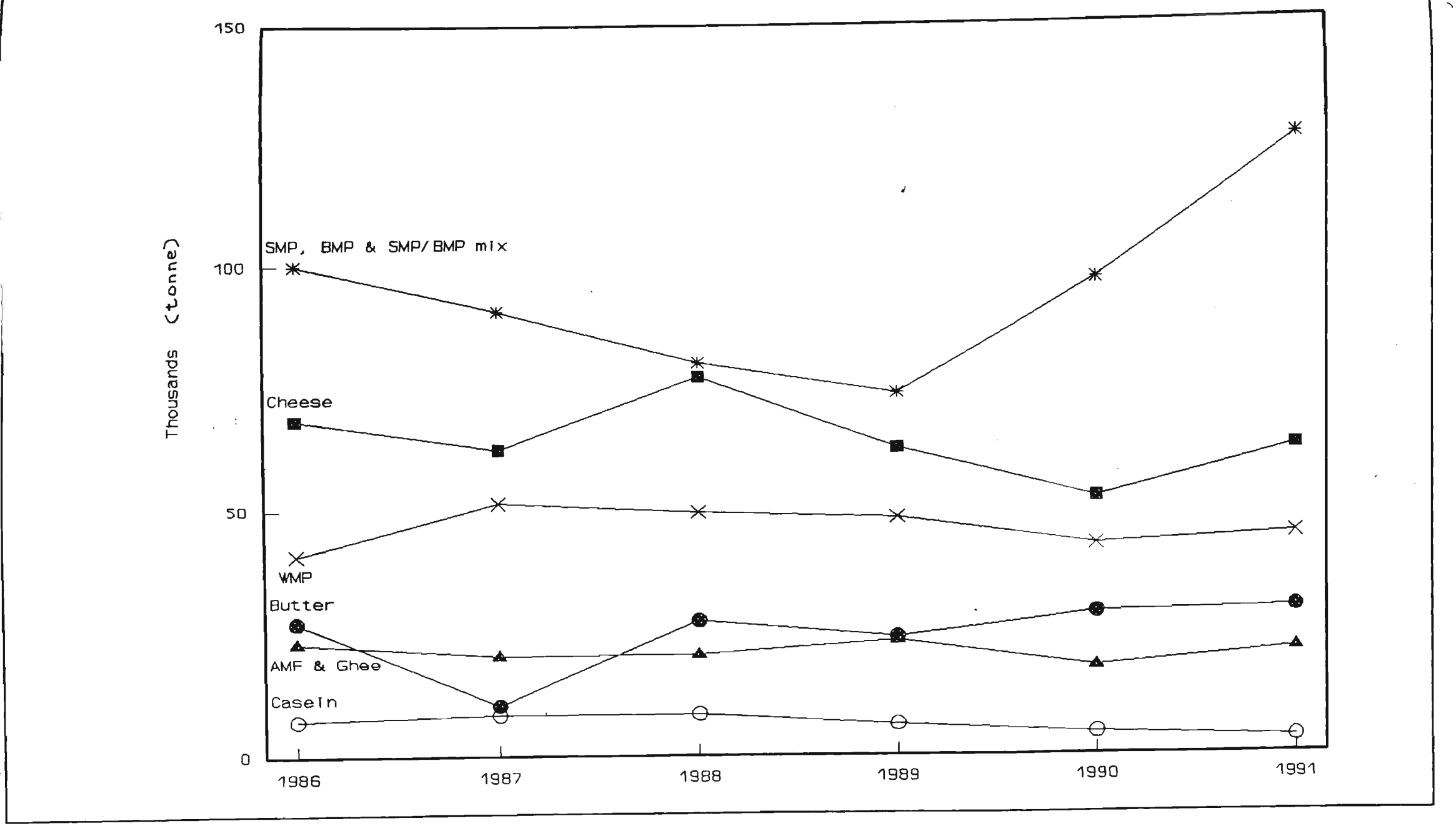


Figure 5-1-2 **Australian Dairy Exports 1986-1991**
Source: ADC Dairy Compedium (1991)

There are significant differences in average milk yields and production costs between countries. Efficient producers such as New Zealand, Australia and Argentina largely rely on low cost, seasonally-based pasture feeding techniques (ADC, Dairy Compendium, 1991, p. 31).

As an efficient producer of dairy products the Australian industry stands to gain significantly from any initiative towards competitive disciplines and a successful conclusion to the Uruguay round of GATT talks. Although a medium-sized dairy produce trader, Australia is a price-taker on world markets.

5.3 Trade Flows of Major Products

Outside bilateral trade arrangements between Western economies, the major end user markets for diary products are the Middle East, Central and South America, North Africa and South-East Asia (ADC, Dairy Compendium, 1991, p. 55).

The major exporters of butter are the EC and New Zealand. The EC is itself a major destination for New Zealand exports under a bilateral quota arrangement between New Zealand and the UK. In recent years the CIS has been the major purchaser of butter, accounting for around 35% to 45% of traded volumes. North African countries such as Algeria and Morocco, and the Gulf states of the Middle East, are more traditional end users of butter/butteroil.

The EC, New Zealand and Australia are major exporters of cheese. The USA is a major market taking up to 111,000 tonnes annually under bilateral quota arrangements. A significant proportion of this access is restricted to subsidised exports from the EC (48,000 tonnes) and other Western European countries (25,000 tonnes). Other key export markets included Japan, the Middle East and North Africa.

The EC is a major supplier of SMP to world markets followed by New Zealand and Australia. Recently, Eastern European suppliers have also traded significant volumes. The USA traditionally supplies significant quantities of SMP to Central and South America under food aid programs. A considerable proportion of internationally traded SMP is sold as stock feed to countries such as Japan. The EC and Eastern Europe are major suppliers to this market segment. The traditionally important end user markets of SMP for human consumption are in Central and South America and North Africa.

Wholemilk powder is used in a wide variety of end user markets but is often sold in instantised forms in consumer packs for retail sale in countries which lack widespread refrigeration. The Middle East, Africa, Central and South America are the major markets for this product in world terms while the EC and New Zealand are the major suppliers.

Casein exports are dominated by New Zealand and the EC, with Ireland being the major supplier within the EC. Japan and the

United States remain key end user markets for this product.

5.4 International Prices for Dairy Products

Domestic prices for milk and dairy products vary markedly between countries in line with differences in the costs associated with production and domestic price support arrangements (ADC, Dairy Compendium, 1991, pp. 71-72).

In the same way, returns from export sales can vary considerably between markets, depending upon whether market access is arranged through bilateral quotas or is subject to global competition. Returns from sales to quota markets are generally influenced by the domestic price structure in the importing country and tend to be well above the prevailing international price.

International prices in non-quota markets are more uniform and are largely determined by the policy initiatives of major Western producers. Owing to its dominant position in terms of supply volumes for most major products, the EC tends to set traded prices in those international markets which are not subject to quota restrictions. Typically, export prices in non-quota markets tend to equate to the internal supported price for products in the EC less the available EC export refund.

Other factors which can influence international market price movements include:

- the level of government held stockpiles of surplus product in the USA and EC;
- changes in regulations relating to internal disposals of surplus product in these countries; and
- the seasonality of product availability from Southern Hemisphere producers.

The periodic disposal of US product surpluses in world markets (either as food aid or through subsidised commercial sales) also has a destabilising influence on trade and prices. To a large extent, however, US support arrangements have acted more to limit the extent of increases in international prices for products such as SMP than affect day to day market pricing.

While New Zealand supplies a significant share of world exports, it is dependent on export markets for a large proportion of its sales because of the absence of a significant domestic market. Consequently, it tends to be a price-taker in world markets for dairy products.

International budgetary pressures within the EC led to a reduction in export subsidies in 1988 and 1989. These cuts, in conjunction with the decline in international stocks of butter and SMP during these years, allowed world dairy prices to rise substantially. However, this trend was reversed in 1990, when a combination of increased production and static consumption in the EC gave rise to a renewed emphasis on export sales.

EC export refunds for all major products other than cheese were increased by around USD 300 per tonne in 1990 and international prices fell accordingly. Exchange rate movements in early 1991 forced the EC to cut refund rates for butter, butteroil and wholemilk powder to ensure that its export offer prices did not fall below the minimum export price established under the GATT International Dairy Arrangement. However, refunds for butter and butteroil were increased in September 1991 following a realignment in exchange rates. EC export refunds in September 1991 were equal to 70% of the international traded price for SMP and 170% of the traded price for butter.

The US also expanded the range of dairy products able to be exported at subsidised prices under its Dairy Export Incentive Program in 1991 to include Cheddar cheese. Previously, this scheme had covered the subsidised sales of butter, butteroil and SMP.

Despite the higher export subsidises, international prices for most major dairy products, and particularly milk powders, increased in the second half of 1991. This mainly reflects a short-term improvement in the supply and demand balance for these products in countries such as the EC and Japan, which has pushed up internal wholesale prices. However, producer returns for exports remain below those prevailing in the early 1980s in both nominal and real terms (see Appendix 12).

It is of interest to compare farmgate milk prices both within

Australia and internationally. In Australia in 1991, Queensland farmers received the highest price for market milk at 47.4 cents per litre with prices decreasing to 38.4 cents/litre in Victoria, the lowest.

For manufacturing milk, Queensland received the second lowest price at 20.9 cents/litre only 0.5 cents up on the Tasmanian price. In NSW, farmers received 24.3 cents/litre and Victorian farmers, 21.1 cents/litre.

In 1990, Switzerland's farmers received the highest price of all for milk at AUD 92.45 per kilogram, thereafter followed Finland with AUD 82.70, Japan with AUD 73.32 and Sweden with AUD 61.58. Danish farmers were paid AUD 53.38, Canadian AUD 51.49, French AUD 40.24; the USA price was AUD 38.36 and in the UK AUD 37.92. Australia's average price was AUD 26.20 per kg. twice that paid in New Zealand at AUD 13.90 (ADC, Dairy Compendium, 1991, pp. 17 and 42) (see also Appendix 13 and Appendix 14).

5.5 Trends in the Dairy Industry

There has been a shift away from wholemilk toward low fat milk which, with the introduction of ultra-filtration, has greatly improved in taste in most of the Western nations.

To the health conscious consumers of today, the ideal food has little or no fat or salt and is high in fibre. Milk contains

up to 4% saturated animal fat and cholesterol which has been one of the dairy industry's greatest problems.

There are three kinds of fat:

. saturated	as in animal fat and chocolate;
. polyunsaturated	as in vegetable oils; and
. mono-unsaturated	as in olives, almonds, macadamia nuts, rape-seed oil.

Australian Co-operative Foods (ACF) is a NSW company which supplies 60% of the requirements (fresh milk) of the city of Sydney. Previously they had produced four kinds of milk in response to the rising demand for a low fat product. They contained 3.8%, 1.4%, 0.15% and 0.01% fat, the last being skim milk. The problem with skim milk is that it has practically no taste.

Recently, ACF has made a breakthrough with its new product "Farmer's Best" which contains 1.35% mono-unsaturated fat and only 0.1% saturated fat. The process, which has been patented, involves the removal of the natural fat from milk and its replacement by 1.35% fat obtained from rape-seed (canola) which is said to have a beneficial effect on the body (ABC Television, "Landline" 12.00am, 27th Sept. 1992).

ACF sees a bright future both on the domestic front where consumers are quite willing to pay an increased price for this ideal product, no fat but taste, and on the foreign market where it intends to license the technology. They intend to target the markets in Asia, North America and Europe and

estimate returns of the order of AUD 80 million.

Demand has also increased for fat protein-modified yoghurt in Australia (Office of Trade and Investment, Victorian State Government, 1992). Total yoghurt sales are around 60,000 tonnes per annum with low fat products representing 46% of sales.

Australian butter consumption has declined steadily over the years. Total domestic consumption has not kept pace with population growth reflecting not only health concerns but also the relatively high price of butter compared with its main substitute, margarine.

Butter is a key ingredient in ice-creams, confectionery and bakery lines, and significant growth in sales of there items has occurred in the non-retail sector.

Australian per capita consumption of ice-cream and frozen confections grew strongly during the 1960s and early 1970s but declined during the 1980s. In volume terms, 1988-89 ice-cream and frozen confection production was estimated at over 270 million litres and per capita ice-cream consumption approximately 18 litres. This is the third highest in the world, exceeded only by the USA (22.5 litres) and New Zealand (19 litres) (ADC, Ice-cream Leaflet, 1989).

The Australian ice-cream and frozen confection industry produces principally for the local market with only a very small amount of ice-cream mix being exported. Imports are similarly small. However, the Japanese ice-cream market, which is no longer restricted by import quotas should offer Australian producers new opportunities.

Apart from fresh milk, cheese is the major dairy product sold in Australia. Growth in speciality and low/reduced fat cheese sales has been dramatic. The proportion of milk production used to produce cheese has increased from approximately 14% in the early 1970s to over 30% by 1988-89.

In 1989-90, the total domestic cheese market was 151,747 tonnes. Cheddar type cheese now represents 58% of total sales, down from 72% in 1980. Australian cheese has approximately 86% of the domestic market, with other main suppliers being New Zealand and the EC.

The retail sector accounts for around 92,000 tonnes, with the balance of cheese being used in food service and food ingredient applications. Increasingly popular fast food outlets represent an important market.

Milk is being incorporated into more and more food products. Already these include: milk based baby foods, canned cream, milk-based health, infants and invalids beverages, liquid or dried ice-cream mix, lactose, malted milk powder, milk and

coffee mixtures, thick shake milk-based mixes, canned liquid milk, condensed or concentrated milk, evaporated milk, canned liquid milk and cream, full cream milk powder, and sugar of milk.

There is, in fact, a secular decline in the real price of food which reveals ever-rising farm productivity due to better machinery, management, fertilisers and crops.

For example three decades ago in the US, 20 million cows produced 125 billion pounds (57 million tonnes) of milk a year; today 10 million cows produce 150 billion pounds. Milk yields are climbing by 2.5% a year (America's Farm Subsidies. The trough., The Economist, June 27, 1992, p. 21).

The market in food is dynamic constantly reflecting new trends, fashions and propaganda. Today consumers demand fresh nourishing convenient foods.

A new category of health oriented products termed "functional foods" (Shoebridge, BRW, Aug. 7, 1992, p.85) is currently in vogue. These foods perform a specific health function and act in some way to promote health. They are different from food ingredients that have therapeutic applications such as vitamins, minerals and anti-oxidants. They are big news in Japan where the category has grown from zero in 1987 to projected sales of AUD 3 billion in 1992 and are tipped soon to account for 5% of the total Japanese food market.

Examples of functional foods include those that enhance the body's immune system, prevent or control disease, aid recovery from disease, regulate body rhythms and suppress ageing, e.g.

- oat-bran which has cholesterol-lowering benefits;
- baked beans and wheat-bran which reduce the risk of bowel cancer; and
- EAC Plumrose's Yoplus yoghurt which contains acidophilus and bifidus, two live bacterial cultures that aid digestion.

A new set of rules is being devised for functional and medical foods which will dramatically change the food marketing industry.

Supercritical extraction, a process which is able to remove cholesterol from milk fat, offers the possibility of improving butter's competitive position relative to margarine (Office of Trade and Investment, Victorian State Government, 1992).

Consumers, also, have been responsive to marketing focusing on milk and milk products as a way of overcoming calcium deficiency and osteoporosis.

Finally, we are entering an era of genetically engineered foods, dubbed "Franked foods" by some scientists such a Professor Rong Yi, which doubtless will provide adventurous products appropriate to the 21st century (Guilliatt, BRW, 1992, p. 60).

6

AN ANALYSIS OF CHINA'S DAIRY CONSUMPTION AND AUSTRALIA'S EXPORT POTENTIAL

Trace Science then, with Modesty thy guide;
First strip off all her equipage of Pride,
Deduct what is but Vanity, or Dress,
Or Learning's Luxury, or Idleness;
Or tricks to shew the stretch of human brain.
Mere curious pleasure, or ingenious pain:
Expunge the whole, or lop th'excrescent parts,
Of all, our Vices have created Arts:
Then see how little the remaining sum,
Which serv'd the past, and must the times to come!

Alexander Pope 1733

6.1 Liquid Milk

Milk provides a wide variety of nutrients essential to the human diet. It is outstanding for its supply of protein, calcium, vitamin A, riboflavin, thiamine and niacin.

For preservation, milk is usually heat treated. This may be done in two ways:

- Pasteurisation - All milk sold in Australia is pasteurised which prevents the growth of bacteria and ensures its safety for human consumption. It is heated rapidly to 72^{0}C (162^{0}F) for at least 15 seconds and then cooled rapidly; flavour and food value are unaffected.
- UHT (Ultra Heat Treatment) - Sometimes called "long-life" milk, UHT milk has been sterilised by heat. It is packed under sterile conditions, usually in laminated cardboard cartons, and may be stored without refrigeration for 2 to 3 months, or longer. (Under extreme heat, refrigeration will extend its life.) (ADC, Dairy Compendium, 1989)

In fact, the demand for milk shows great elasticity, especially in the cities. If average income increases, as it has recently, most people will want to consume milk.

In 1987, the Ministry of Agriculture (MOA) calculated the income elasticity of food in China in major cities. They found

that income level had a direct effect on dairy product demand as follows:

Food	Milk	Cereal	Pork	Beef & Mutton	Poultry	Eggs	Aquatic Products
0.69	1.62	-0.005	0.9	0.47	1.63	1.14	1.32

Soya bean milk has been used by many people in China for many years instead of dairy milk. It has a particular odour which many people dislike and also provides different nutritional elements, e.g. it contains less calcium.

Products on the Chinese Market

Local

Products and retail prices in 1992 were:

- pasteurised milk in glass bottles: Yuan 1.56/Kg
- pasteurised milk in sachets: Yuan 1.68/Kg
- pasteurised milk in cartons: Yuan 1.58/Kg

Imported

Products and retail price in 1992 were:

- UHT (Australia) in Tetrapak cartons Yuan 8.50/Kg
- UHT (Holland) in Tetrapak cartons Yuan 8.30/Kg
- UHT (Singapore) In Tetrapak cartons Yuan 8.80/Kg

Industrial

These products are sold wholesale:

If there is a surplus in the local liquid milk supply it is directly delivered to the ice-cream and yoghurt factories for further processing at the same farmgate price as paid for pasteurised milk.

Product Quality

Most of the dairy farms and dairy factories in China are not as clean as those in Western countries. There are two main reasons for this. First, the dairy industry is not a traditional industry in China and has been ignored for a long time. Secondly, the Chinese always boil milk prior to drinking. It is almost impossible to find a Chinese who drinks "fresh" milk.

The quality of milk in China is not standardised because most dairy factories lack testing facilities. In addition, sometimes the fresh milk is diluted with water by the dairy farmers to increase their production volume. Some retail liquid milk contains less than 1% fat.

As mentioned previously, the demand for milk is much higher than supply so there is no need for the dairy factories to promote any brand name or image. Furthermore, limited transportation facilities restrict any long distance fresh milk delivery with the cheapest package protection and, in any case, packaging and packing are minimal.

Consumer Profile

Introduction

Under the regulations of some cities, only children under a certain age and old people above a certain age qualify to obtain milk quota which is subsidised by the government. Everyone else, who wants to drink milk has to either buy at

high prices or use milk powder which is not subsidised as highly as fresh milk.

Method of Use

The Chinese believe that all milk should be boiled before it is consumed so very few people drink raw milk.

Consumer Knowledge of Product

The Chinese desire to drink milk is related mostly to its reputation as a food of high nutritional value.

Product Preference

The Chinese think the milk is good if a thin layer of fat forms on the top when it is boiled. This means that there is a high milk fat content and the nutritional value is high. If this is not the case they complain about the quality of the product.

Under Chinese dairy quality regulations, buyers can demand a replacement of equal volume, free of charge if they find any residues in the milk or if it is contaminated.

Seasonality and Climate

Since there is a high percentage of recombined milk in the liquid milk market under normal circumstances, when the fresh milk supply drops seasonally, the amount of milk powder used in recombination is increased.

China is a very large country and has many different climates. However, the peak milk periods differ between the north and the south thus reducing the effects of seasonality.

In fact, consumers actually prefer to buy milk powder, which they regard clean and easy to transport, and recombine it at home. However, this is a more costly method than purchasing liquid milk.

In hot weather, the Chinese drink less milk than in cold weather, because of their custom of boiling. In addition it is thought that milk increases body heat so it is avoided in the summer months.

Packaging

Most liquid milk is packaged in 0.25 Kg units. There are four types of packaging of local milk:

- plastic sachets,
- glass bottles,
- plastic bottles, and
- cartons.

These different packs are available only in the cities. In the rural agricultural areas, the people use milk powder. Plastic sachets are the most common packaging form because of their low cost. They, like glass and plastic bottles, show no product description, merely the production date.

Cartons possess a certain design indicating product name, producers's name, trade mark, a brief description of the product, contents, instructions, date of production and shelf-life.

Market Analysis

Total Raw Milk Production

The average increase in raw milk production over the decade 1978-88 in China was 16.3% per annum. In recent years, the real GDP growth rate has been 10% per annum. It is generally accepted that the increase in total raw milk production will be approximately 10% over the next decade.

Total Dairy Consumption

The average increase in total dairy consumption from 1978-88 was 18.9% per annum, 2.6% higher than that of raw milk production. This 2.6% difference was serviced by imports.

The average annual increase in net imports of dairy products was 53% in the same period, revealing previous trade isolation and a very low starting figure.

It has been estimated that the rate of increase in total national dairy consumption will approximate 10% per annum for the next decade.

Total Liquid Milk Consumption

This figure is directly related to population and per capita consumption. The Ministry of Agriculture (MOA) has estimated that China's population in the year 2000 will be 1.28 billion and per capita consumption 4 Kg per annum.

Liquid Milk Market Segment

This figure concerns total dairy consumption and liquid milk consumption. It is estimated that the demand for a variety of dairy products will increase faster than the demand for liquid milk. According to the data and projection done by Ministry of Agriculture (MOA), in 1992, the market segment for liquid milk was 53%; it is predicted that this will decrease to about 40% in the year 2000.

In 1989, Ministry of Agriculture made a survey on the liquid milk consumption in six cities in China from 1982 to 1989, the result shows that, on average, liquid milk consumption is increasing at 16.2% per annum (see Appendix 15). This may be regarded as a reasonably accurate reflection of increased liquid milk consumption by the entire population.

Table 6-1-1 Liquid Milk Consumption in China 1978-92
Source: S.S.B., China Statistical Yearbook various Issues

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	LIQUID MILK CONSUMP. ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		686		68.83
1979	1190	19.36	779	13.52	65.46
1980	1380	15.97	857	10.00	62.10
1981	1561	13.12	917	6.99	58.73
1982	2465	57.91	1365	48.86	55.37
1983	2588	4.99	1346	-1.39	52.00
1984	3100	19.78	1643	22.09	53.00
1985	3501	12.94	1996	21.46	57.00
1986	4000	14.25	2604	30.49	65.10
1987	4137	3.43	2605	0.05	62.97
1988	4274	3.31	2604	-0.06	60.92
1989	4471	4.61	2635	1.19	58.93
1990	4875	9.04	2779	5.48	57.00
1991	4914	0.80	2710	-2.49	55.14
1992	5332	8.50	2844	4.96	53.34

Table 6-1-1 indicates a reduction of the market segment held by liquid milk from 68.83% in 1978 to 53.34% in 1992.

Table 6-1-2 Liquid Milk Consumption per Capita in China 1978-1992

Source: S.S.B., China Statistical Yearbook various issues

YEAR	LIQUID MILK CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	LIQUID MILK CONSUMP. PER CAPITA (KG)	GROWTH RATE (%)
1978	686		958.10	0.72	
1979	779	13.52	969.01	0.80	12.24
1980	857	10.00	981.24	0.87	8.63
1981	917	6.99	1006.91	0.91	4.26
1982	1365	48.86	1020.18	1.34	46.93
1983	1346	-1.39	1029.85	1.31	-2.32
1984	1643	22.09	1040.04	1.58	20.89
1985	1996	21.46	1051.27	1.90	20.16
1986	2604	30.49	1067.93	2.44	28.45
1987	2605	0.05	1079.47	2.41	-1.02
1988	2604	-0.06	1100.86	2.37	-2.00
1989	2635	1.19	1130.00	2.33	-1.42
1990	2779	5.48	1143.61	2.43	4.22
1991	2710	-2.49	1156.57	2.34	-3.58
1992	2844	4.96	1169.67	2.43	3.78

Table 6-1-2 suggests that the per capita consumption of liquid milk will only increase to 2.43 Kg per annum in 1992. This represents a growth rate of 3.8%. This consumption volume is extremely low when compared with that of western countries. It is very interesting to see the annual growth rate was "very" high during 1978-1986, and then the annual growth rate suddenly dropped dramatically during 1987-1992. There are plenty of reasons to explain these changes, such as changes in the Chinese government's rural policy, food price fluctuations and consumer reactions to dairy products. In the view of the author, variations in dairy production figures reflect alternative methods applied to statistical data by the Chinese

government. However, the fact remains that there is more milk available on the market for the ordinary Chinese to consume in 1993 than there has been in previous years. Please note that a detailed study of discrepancies in these figures is not covered in this research.

Price Analysis

Table 6-1-3 Analysis of Retail Liquid Milk Prices in China 1988-1992

Source: Field Research and Personal Communications (see Appendix 2, Ref. No. 1, 3, 4, 8, 32 and 38)

YEAR	FARMGATE PRICE IN CHINA (YUAN/KG)	LIQUID MILK RETAIL PRICE IN CHINA (YUAN/KG)	LIQUID MILK RETAIL PRICE IN AUSTRALIA (AUD/KG)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	LIQUID MILK RETAIL PRICE IN CHINA (USD/KG)	LIQUID MILK RETAIL PRICE IN AUSTRALIA (USD/KG)
1988	0.7314	1.0473	0.8375	3.7220	1.1689	0.2814	0.7165
1989	0.8180	1.1713	0.8513	4.7220	1.2651	0.2481	0.6729
1990	0.9150	1.3102	0.8650	5.2220	1.2932	0.2509	0.6689
1991	1.0234	1.4654	0.9263	5.3560	1.2900	0.2736	0.7180
1992	1.1447	1.6391	0.9700	5.7662	1.4500	0.2843	0.6690

In 1988, MOA (Ministry of Agriculture) made a survey on the milk prices in eight cities (Beijing, Shanghai, Tianjin, Nanjing, Xian, Guangzhou, Hangzhou and Changsha) in China (see Appendix 16). It can be seen that the difference i.e. factory profit, between farmgate price and retail liquid milk price is 43% which is approximately half the corresponding Australian figure.

Volume and Value of Australian Exports to China

Table 6-1-4 Volume and Value of Australian Liquid Milk Exports to China 1987-1992

Source: . Export Division, ADC (1993) Melbourne,
. ABARE's Commodity Statistical Bulletin (1992) Canberra.

Note: Figures in 1988, 1989 and 1990 are estimates by the author

YEAR	AUSTRALIAN UHT MILK VOLUME EXPORTED TO CHINA (TONNE)	LIQUID MILK RETAIL PRICE IN AUSTRALIA (AUD/TONNE)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	VALUE OF EXPORTED MILK (AUD '000)	VALUE OF EXPORTED MILK (USD '000)
1987	0.2640				
1988	0.6115	838	1.1689	512	438
1989	1.4163	851	1.2651	1206	953
1990	3.2805	865	1.2932	2838	2194
1991	7.5983	926	1.2900	7038	5456
1992	40.7640	970	1.4500	39541	27270

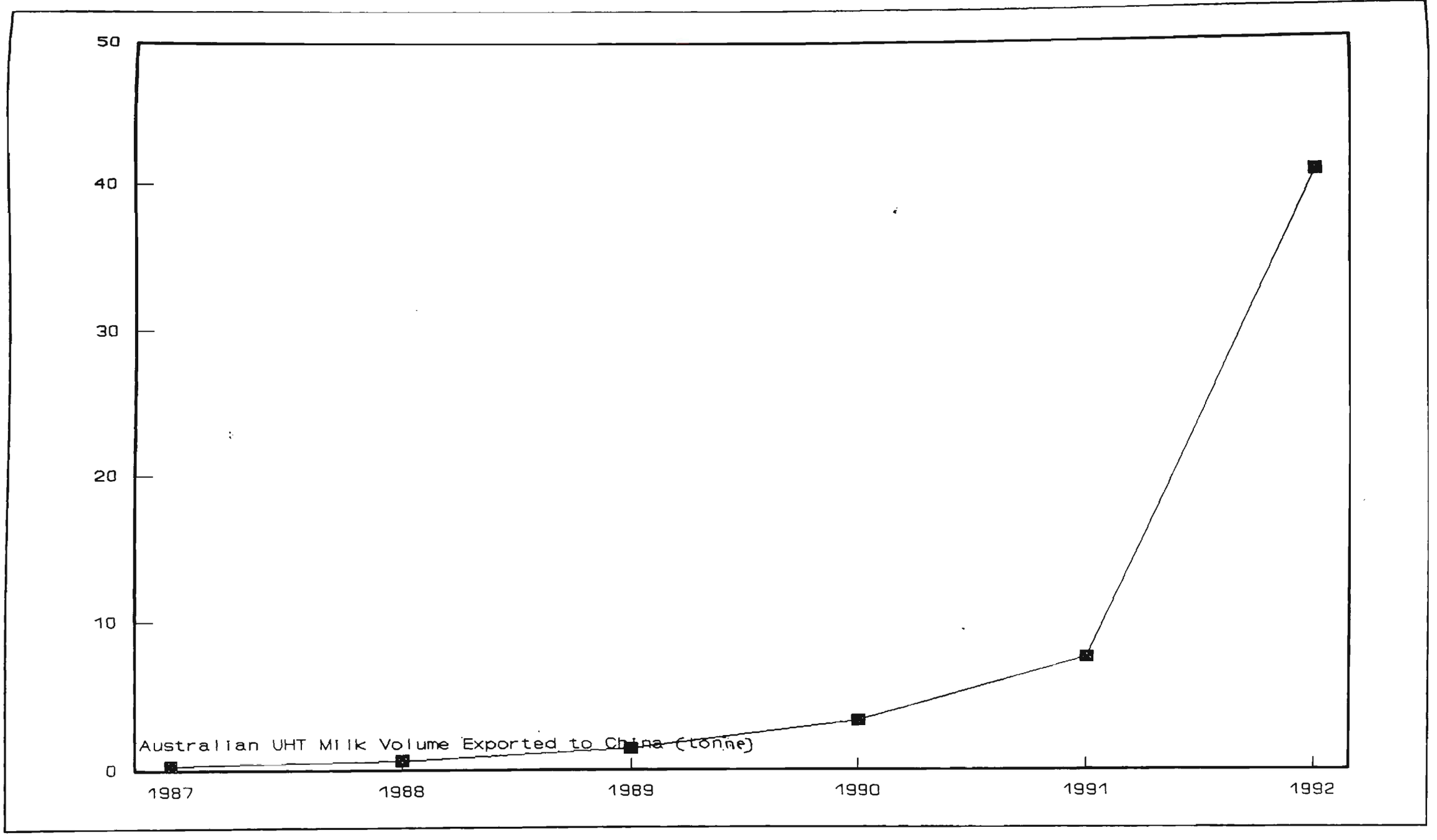


Figure 6-1-1 Australian Liquid Milk Exports to China 1988-1992
Source: Export Division, ADC, 1993, Melbourne

As can be seen from Table 6-1-4 and Figure 6-1-1, Australia's exports of UHT milk to China demonstrated a dramatic increase in 1992. This represents a major effort to obtain market share for Australia in an enormous potential market. However, the profit margin on the exercise is suspect under present conditions which must take into consideration transport costs, import duty, storage costs and the financial capability of the Chinese consumers.

Opportunities for Export of Australian Products

From the previous analysis it has been shown that opportunities for exports of liquid milk to China are doubtful due to price factors.

In recent years, some Australian UHT milk has been exported but this would seem also to be not a viable proposition for the future because of the costs required for effective marketing.

Already in Hong Kong and Macao, many people are buying Chinese liquid milk, because of its low price. It would appear that the only perceived future for Australia is to export UHT technology for which it is well placed. Another possible avenue would be to export milk supplements such as milk calcium and lactose enzymes. Finally there is a very small niche market for UHT milk for foreign residents in China and international hotels.

6.2 Milk Powder

There are two types of milk powder:

- Full cream milk powder which is whole milk with the water completely removed by spray drying and which retains its original food value when mixed with water in the proportion directed; and
- Non-fat skim milk powder in which the cream layer of the milk is removed by a mechanical separator. The milk is then spray dried to produce a powder. Some skim milk products are treated to make them readily soluble in cold water. The food value of non-fat milk is equal to whole milk, apart from cream and the soluble vitamins A and D. This makes it lower in calorie content (ADC, Dairy Compendium, 1989).

Milk powder is a very popular product in China because of its healthy image and ease of transportation. Most of the milk powder is for recombination into liquid milk for drinking. Soya bean powder is a relatively new product in China. However, since early times soya beans have been ground by family groups to produce a meal paste. This was then boiled with water for at least 10 minutes to produce a drink. Soya bean powder is a possible strong competitor for dairy milk powder in the future.

Products on the Market

Local:

- sweetened full cream milk powder;
- unsweetened full cream milk powder;
- skim milk powder;
- fortified milk powder;
- milk formula for infants;
- longevity milk powder for the elderly; and
- milk powder with special flavours.

Imported:

. Nespray	Switzerland
. Anchor	New Zealand
. Dutch Lady	Holland
. Xinmeili	Taiwan
. Power	Taiwan

Table 6-2-1 shows the prices of various milk powder products in five different regions of China.

Table 6-2-1 **Prices of different Milk Powders in Five Regions of China in 1989**

Source: Field Research and Personal Communications (see Appendix 2, Ref. No. 2, 10, 11, 17, 33, 34 and 38)

MILK POWDER BRAND	GEOGRAPHIC SEGMENT	PRODUCTION PLANT SITE	WHOLESALE PRICE (YUAN)	RETAIL PRICE (YUAN)
Haihe	Tianjin	Tianjin	3.50/lb	3.93/lb
Songhua Lake	Tianjin	Heilongjiang	4.00/lb	4.80/lb
Bright	Wuhan	Wuhan	2.30/lb	2.50/lb
Yangzijiang	Wuhan	Wuhan	2.30/250g	2.50/250g
Nespray	Beijing	Switzerland	13.39/500g	15.00/500g
Nespray	Tianjin	Switzerland	14.00/450g	15.41/450g
Lactogen	Shanghai	Holland	43.20/Kg	48.00/Kg

Industrial:

Industrial milk powder is mostly imported and is chiefly used to make recombined liquid milk. Donations from the EC aid program supplies 20 cities in China with skim milk powder and butter for recombination to form liquid milk.

Locally produced Chinese milk powder is marketed under more than a hundred different brand names. Of these the most popular are Haihe, Songhuahu, Bright and Yangzijiang.

Product Quality

Local

- Most local milk powders can not be dissolved in water easily. In addition, local milk powders are very sweet because manufacturers add a lot of sugar as a preservative. Some people would prefer that this did not occur because they want milk powder not what they regard to be sugar milk powder.
- There is a high degree of foreign matter in some of the milk powders, e.g. grit and plastic threads which leads to a slight cloudiness.
- Of the local producing joint venture plants Nestle milk powder is regarded as the best by the Chinese public.

Imported:

These products are at present superior to the local ones because of:

- . better dissolution index;
- . consistent quality; and
- . product diversity.

Field research and market investigation shows that Nestle virtually dominates the milk powder import market in China. It is estimated that it accounts for 70-80% of the total retail market.

Consumer Profile

Introduction

Market research shows that the majority of consumers of local milk powder are young women with young children and middle aged people. Imported milk powder is mainly bought by young couples. These include single child families, high income families and the intelligentsia. Intellectuals, especially those who are single and on a higher income are mainly concerned with the quality and taste of the product. Compared with other consumer groups the life style of these people is more westernised. They believe the quality and taste of foreign milk powder is superior to that of domestic products.

Method of Use

Milk powder is recombined with boiled water to give liquid milk.

Consumer Knowledge of Product

A survey was carried out by the Ministry of Agriculture (MOA) in six cities giving the following criteria on which to judge products:

- price;
- brand name;
- packaging;
- prize winning record;
- recommendation by friends, and
- desire to sample a new product.

The most important criteria were: brand name and prize winning record. Almost all customers had a limited knowledge of the product they wanted to buy. Most could not differentiate between whole milk products and skim milk products and at the point of purchase were more concerned with the date of production and the condition of the packaging.

Product Preference

Consumers prefer powders with a strong milk taste and a high dissolution index. They also prefer simple packs because otherwise they think they are being charged extra for special packaging.

Seasonality and Climate

The consumption of dairy products in China shows unclear seasonal fluctuations. People consume slightly more dairy products during the cold season and less in the summer months.

According to traditional Chinese medical science, dairy products may induce excessive internal heat. However babies are born in all seasons in China so the consumption of milk powder as well as of liquid milk also occurs between June and September.

Fashions also affect product sales. For example, in 1982-84, malted milk was very popular. This triggered a higher demand for milk powder especially in the city of Wuhan in Hubei province where the maximum output of malted milk powder reached 20,000 mt. in 1984. Since then the market has changed and experienced a dramatic decrease of 50-80%.

Packaging

There are three kinds of packaging for consumer milk powder on the market:

- polyethylene bags: 250g, 454g or 500g;
- multi-layer compound bags: 250g, 454g or 500g; and
- metal tins 454g, 900g or 1000g.

The domestic product is mostly packed in bags, either polyethylene or compound. The most popular brands of milk powder are packed in polyethylene bags. Imported milk powders are packed in compound bags or tins.

Market Analysis

In 1989, the Ministry of Agriculture made a survey of milk powder consumption in six cities of China (Beijing, Shanghai, Tianjin, Wuhan, Nanjing and Xian) for the period from 1982 to

1989. The result shows the annual increase in sales of milk powder in six Chinese cities over the period 1982-1989. The average growth rate was 10.74 but reached 55% in Beijing and 22% in Nanjing (see Appendix 17).

Table 6-2-2 Milk Powder Market Analysis 1978-1992
Source: S.S.B., China Statistical Yearbook various issues.

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	MILK POWDER CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		43	411		41.24
1979	1190	19.36	48	456	10.85	38.30
1980	1380	15.97	51	491	7.70	35.56
1981	1561	13.12	54	516	5.05	33.03
1982	2465	57.91	79	756	46.65	30.67
1983	2588	4.99	77	737	-2.50	28.49
1984	3100	19.78	86	820	11.24	26.45
1985	3501	12.94	90	860	4.88	24.57
1986	4000	14.25	95	913	6.10	22.81
1987	4137	3.43	92	877	-3.95	21.19
1988	4274	3.31	88	841	-4.06	19.68
1989	4471	4.61	92	879	4.55	19.66
1990	4875	9.04	105	1003	14.07	20.57
1991	4914	0.80	111	1058	5.45	21.52
1992	5332	8.50	126	1200	13.51	22.51

Table 6-2-2 shows that, on average, milk powder consumption is increasing at 13.5% per annum, more or less reflecting the increased rate of consumption of milk powder by the population. It is predicted by the Chinese dairy experts from the Ministry of Agriculture interviewed in Beijing such as Mr. Yin Cheng Wen through their surveys that milk powder sales will enjoy a high growth rate in the coming years as income

level increases in the country areas and cold store facilities are still inadequate.

Table 6-2-3 Milk Powder Consumption per Capita in China 1978-1992

Source: S.S.B., China Statistical Yearbook various issues

YEAR	TOTAL MILK POWDER CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	MILK POWDER CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	43.02		958.10	44.90	
1979	47.69	10.85	969.01	49.21	9.60
1980	51.36	7.70	981.24	52.34	6.35
1981	53.95	5.05	1006.91	53.58	2.37
1982	79.12	46.65	1020.18	77.55	44.74
1983	77.14	-2.50	1029.85	74.90	-3.41
1984	85.81	11.24	1040.04	82.51	10.15
1985	90.00	4.88	1051.27	85.61	3.76
1986	95.49	6.10	1067.93	89.42	4.45
1987	91.72	-3.95	1079.47	84.97	-4.98
1988	88.00	-4.06	1100.86	79.94	-5.92
1989	92.00	4.55	1130.00	81.42	1.85
1990	104.94	14.07	1143.61	91.76	12.71
1991	110.66	5.45	1156.57	95.68	4.27
1992	125.61	13.51	1169.67	107.39	12.24

Table 6-2-3 anticipates that, if per capita consumption level reaches 270g per annum, each individual will consume an extra 2.5 litres of recombined milk annually.

Price Analysis

Table 6-2-4 Price Analysis of Milk Powder in China 1988-1992

Source: Field Research and Personal Communications (see Appendix 2, Ref. No. 18)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON)	MILK POWDER WHOLESALE PRICE IN CHINA (YUAN/TON)	AUSTRALIAN MILK POWDER PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	MILK POWDER WHOLESALE PRICE IN CHINA (USD/TON)	AUSTRALIAN MILK POWDER EXPORT PRICE (USD/TON)
1988	731	7996	1399	3.7220	1.1689	2148	1197
1989	818	8943	2245	4.7220	1.2651	1894	1775
1990	915	10003	2341	5.2220	1.2932	1916	1810
1991	1023	11188	1784	5.3560	1.2900	2089	1383
1992	1145	12514	1953	5.7662	1.4500	2170	1347

Table 6-2-4 shows the different prices for milk powder in China and Australia. Australian milk powder is around 50% cheaper than the Chinese milk powder. It also indicates that the Chinese are used to consuming re-combined milk; it is obvious that milk powder has been the dominant imported dairy product in China. This market has been monopolised by the EC's free aid milk powder (around 200 million US dollars a year) for five years which makes it impossible for Australian dairy exporters to enter this market.

Volume and Value of Australian Exports to China

Table 6-2-5 Volume and Value of Australian Milk Powder Exports to China 1987-1992

Source: . Export Division, ADC, 1993, Melbourne
. ABARE's Commodity Statistical Bulletin (1992) Canberra.

Note: Figures for 1988 to 1990 and 1992 are estimates by the author

YEAR	AUSTRALIAN MILK POWDER VOLUME EXPORTED TO CHINA (TONNE)	AUSTRALIAN MILK POWDER EXPORT PRICE (AUD/TONNE)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	VALUE OF MILK POWDER EXPORT (AUD '000)	VALUE OF MILK POWDER EXPORT (USD '000)
1987	1526.00	1133			
1988	1005.99	1399	1.1689	1407	1204
1989	663.18	2245	1.2651	1489	1177
1990	437.19	2341	1.2932	1023	791
1991	190.00	1784	1.2900	339	263
1992	125.25	1954	1.4500	245	169

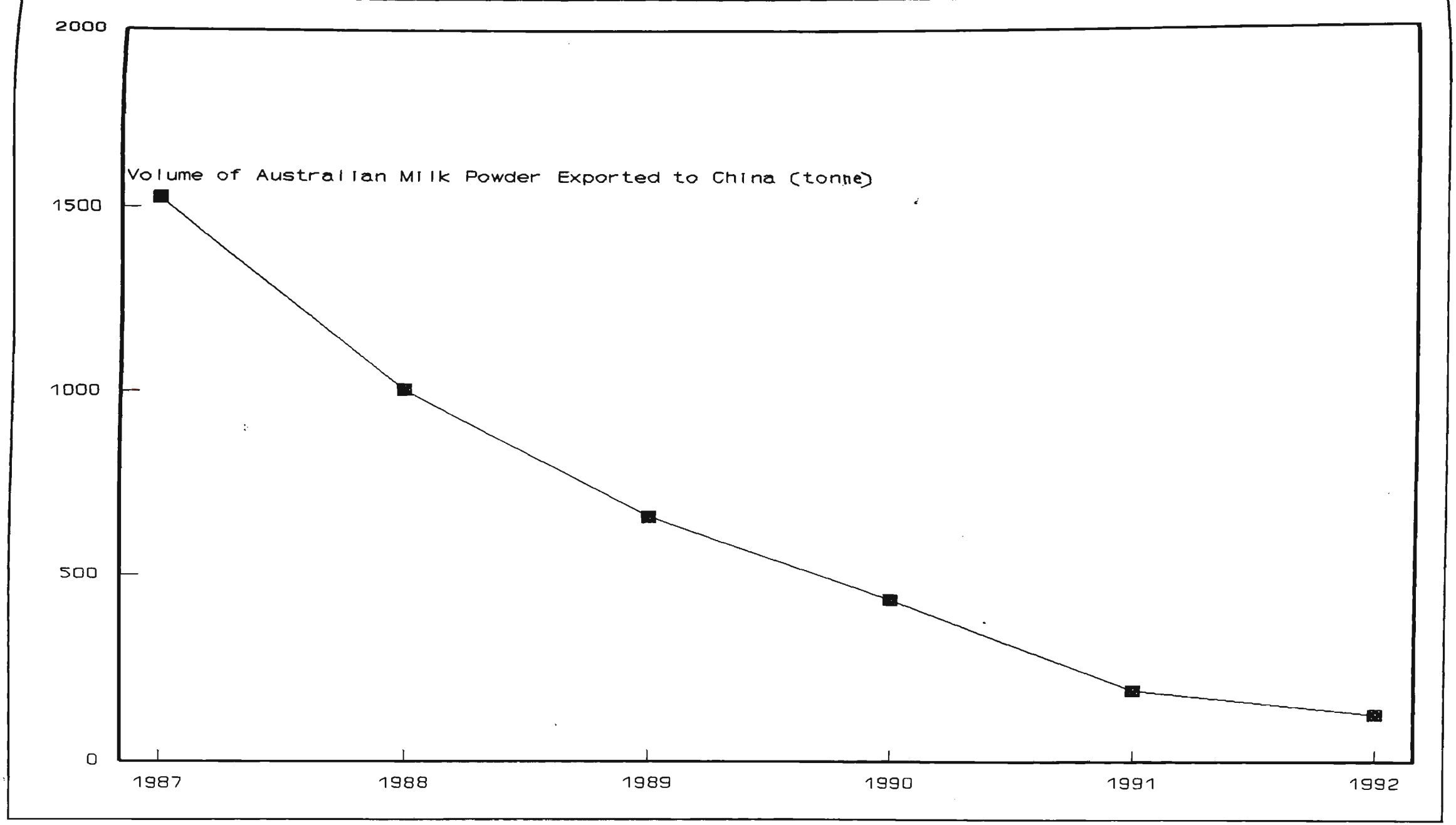


Figure 6-2-1 Australian Milk Powder Exports to China
Source: Export Division, ADC, 1993, Melbourne

Table 6-2-5 and Figure 6-2-1 reveal a declining trend in Australia's exports of milk powder to China in reverse to market demand.

Opportunities for Export of Australian Products

Australia has a great potential opportunity to export milk powder to China. However, if international subsidies prevail and Australia is forced to sell at present prices which are below production costs, there is a problem.

Australia can export SMP and butter for the recombined liquid milk market in most large Chinese cities. This is possible because once landed transportation is cheap and inaccessible markets can be reached from county processing plants.

6.3 Butter

Butter is a natural product, churned from cream, and is one of the most highly concentrated of all dairy foods. It has a minimum of 80% butterfat and not more than 16% water and 2% of other milk solids.

Butter contains energy giving butterfat and fat soluble vitamins of which vitamin A is the most important.

There are a several types of butter:

- Creamy butter:
  - Salted: the salting of butter dates back to the time when salt was used as a natural preservative. (Australians have developed a natural preference for salted butter made from sweet fresh cream.)
  - Unsalted: this is butter made from fresh cream without the addition of salt.
- Cultured butter: this butter has a cultured flavour. A selected bacterial culture is added to the cream to give a milk acidity and enhance the butter flavour. (This type is increasing in popularity in Australia due to the influence of European migrants.)
  - Salted: the salt level is usually less than that of normal butter.
  - Unsalted: most cultured butter is unsalted. It is often referred to as Danish type.
- Soft butter: there are several ways of improving the spreadability of butter. One is the Modified Alnarp Treatment which heats then cools the cream under controlled conditions before churning. Re-working butter before packing may also be used to obtain this consistency.
- Clarified butter: this is also known as butteroil or ghee and is traditionally used for cooking in India. Its use is now increasing because is contains no salt or moisture and does not spatter or foam when melted. Water and non-fat solids are removed by centrifuging and the

fat is cooled slowly. It will keep without refrigeration.

. Butter concentrate: it is composed of non-fat milk solids. It is used mainly in tropical climates (Butter Leaflet, Australian Dairy Corporation, 1989).

There are some other butter related dairy products on the market e.g. a mixture of butter and margarine, however, the demand for these products is low.

Dairy products in China have always been and still remain scarce. Traditional Chinese cooking is based on vegetable oils (peanut, sunflower, rape seed, sesame, soya bean and maize) and they provide an age old substitute for butter. The Chinese consume on average 5.66 Kg of vegetable oil per capita per annum.

The likelihood of changing this tradition seems extremely remote, since not only does oil not require refrigeration but also is a much cheaper product.
(Note: coffee whitener is produced from vegetable oils)

Products on the Market

Local

In China the consumption of butter and cream is a foreign habit. There is only one local butter in the market place. It is an unsalted type manufactured in Inner Mongolia and sells for 30 Yuan/Kg. There is equally only one type of cream. It is manufactured in Shanghai and retails at 20 Yuan/Kg.

Imported

There are many imported brands of butter available to foreigners in China. These products service the diplomatic and foreign business communities and foreign hotels. Anchor is the most successful brand. Most butters retail at about 60 Yuan/Kg. There are also several brands of margarine available to the same market segment. The Chinese population do not buy either of these products.

Industrial

Industrial butter is mainly imported from the US, New Zealand, Holland and Australia. It is used in bakeries and confectionary products. Industrial butter is also used in recombination with skim milk powder to boost the liquid milk volume when required, as previously mentioned (section 6.2 on milk powder).

Product Quality

Local

Most Chinese do not eat butter so are quite unable to judge its quality. In fact, the local product which is unsalted is quite unsophisticated as might be expected.

Most dairy factories do not have separator facilities which precludes the production of cream and hence butter. The main reasons for this is the priority given by the central government for the production of pasteurised liquid milk and the fact that there is no local market for the product.

Imported

All imported butter is tested by the National Quality Control Bureau to prevent adulterated products entering the market.

Consumer Profile

Introduction

Imported butter and margarine are purchased by urban Chinese who return home after long periods posted abroad.

Method of Use

- Coffee whitener (non dairy) is popular amongst the Chinese who drink coffee confirming their preference for dried products.
- Butter and other foreign products have also now assumed a prestige level amongst Chinese consumers.

Consumer Knowledge of Product

The majority of Chinese have no knowledge of butter and would be unable to distinguish it from margarine.

Industrial butter is purchased by large Chinese bakeries and by import/export companies both of whom have a reasonable knowledge of the product.

Packaging

Local butter is packaged in 50g lots in foil. Local cream is packed in 50g plastic containers. Coffee whitener (non dairy) is marketed in glass bottles.

Table 6-3-1 Butter Consumption in China 1978-1992
Source: . S.S.B., China Statistical Yearbook various issues
. Statistical Yearbook for Asia and the Pacific (1990) United Nations

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH (%)	BUTTER CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH (%)	MARKET SEGMENT (%)
1978	997		10.52	63		3.91
1979	1190	19.36	15.82	94	50.39	4.05
1980	1380	15.97	18.68	111	18.06	4.20
1981	1561	13.12	26.68	159	42.81	4.35
1982	2465	57.91	31.42	187	17.78	4.50
1983	2588	4.99	33.44	199	6.41	4.66
1984	3100	19.78	33.57	200	0.41	4.83
1985	3501	12.94	29.42	175	-12.36	5.00
1986	4000	14.25	33.31	198	13.21	5.18
1987	4137	3.43	34.33	204	3.07	5.37
1988	4274	3.31	39.90	238	16.23	5.56
1989	4471	4.61	42.74	254	7.10	5.69
1990	4875	9.04	43.69	260	2.23	5.34
1991	4914	0.80	41.29	246	-5.50	5.00
1992	5332	8.50	42.00	250	1.72	4.69

Butter consumption in China is directly linked to liquid milk consumption as butter is a prime constituent of recombined whole milk. Thus, as milk becomes a more acceptable dietary item, butter consumption will increase. It is thought that table spreads will have little potential but butter consumption will also increase in relation to both the confectionary and fast food industries.

Table 6-3-2 Butter Consumption per Capita in China 1978-1992

Source: S.S.B., China Statistical Yearbook various issues

YEAR	BUTTER CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	BUTTER CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	10.52		958.10	10.98	
1979	15.82	50.39	969.01	16.33	48.70
1980	18.68	18.06	981.24	19.04	16.59
1981	26.68	42.81	1006.91	26.49	39.17
1982	31.42	17.78	1020.18	30.80	16.25
1983	33.44	6.41	1029.85	32.47	5.41
1984	33.57	0.41	1040.04	32.28	-0.58
1985	29.42	-12.36	1051.27	27.99	-13.30
1986	33.31	13.21	1067.93	31.19	11.45
1987	34.33	3.07	1079.47	31.80	1.96
1988	39.90	16.23	1100.86	36.25	13.97
1989	42.74	7.10	1130.00	37.82	4.34
1990	43.69	2.23	1143.61	38.20	1.01
1991	41.29	-5.50	1156.57	35.70	-6.55
1992	42.00	1.72	1169.67	35.91	0.58

Figures shown in Table 6-3-2 indicate that per capita consumption of butter in China increased only at a very low rate per annum over the past decade.

Price Analysis

Table 6-3-3 Butter Prices in Australia and China 1988-1992 (Exchange rates 1988-1992 are real values)

Source: Field Research and Personal Communications (see Appendix 2, Ref. No. 1, 2, 7, 10, 15, 25, and 34)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON)	BUTTER WHOLESALE PRICES IN CHINA (YUAN/TON)	EXPORT BUTTER PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE BUTTER PRICE IN CHINA (USD/TON)	AUSTRALIAN BUTTER EXPORT PRICE (USD/TON)
1988	731	4982	1399	3.7220	1.1689	1338	1197
1989	818	5572	2245	4.7220	1.2651	1180	1775
1990	915	6232	2341	5.2220	1.2932	1193	1810
1991	1023	6971	1784	5.3560	1.2900	1301	1383
1992	1145	7797	1953	5.7662	1.4500	1352	1347

Table 8-3-3 shows that the prices of Australian export butter and the local Chinese product were approximately equal in 1992. In fact, the Chinese price does not reflect market forces because the amount consumed is negligible.

Volume and Value of Australian Exports to China

Table 6-3-4 Volume and Value of Australian Butter Exports to China 1987-1992

Source:
- Export Division, ADC, 1993, Melbourne
- ABARE's Commodity Statistical Bulletin

Note: All data from 1989 to 1990 are estimates by the author

YEAR	AUSTRALIAN BUTTER VOLUME EXPORTED TO CHINA (TONNE)	BUTTER EXPORT PRICE FROM AUSTRALIA (AUD/TONNE)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	VALUE OF EXPORTED BUTTER (AUD '000)	VALUE OF EXPORTED BUTTER (USD '000)
1987	948.55				
1988	404.30	1638	1.1689	662	567
1989	322.51	1765	1.2651	569	450
1990	257.27	2259	1.2932	581	449
1991	105.76	1811	1.2900	192	148
1992	244.42	1921	1.4500	470	324

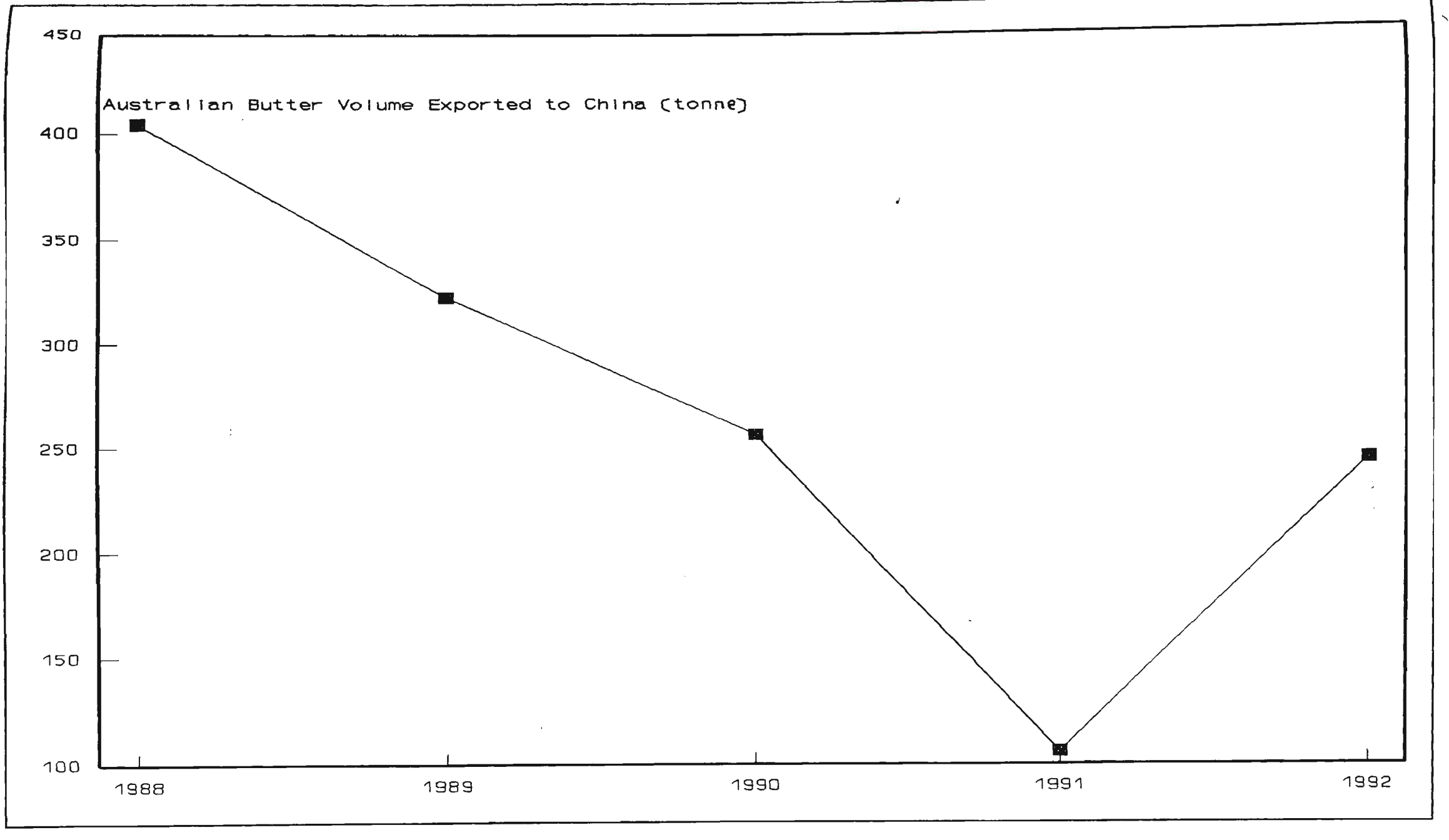


Figure 6-3-1 Australian Butter Exports to China 1988-1992
Source: . ABARE's Commodity Statistical Bulletin

As Table 6-3-4 shows Australian butter exports to China in 1992 totalled 244.42 tons, an increase of 100% on the previous year. This was due to the combination of two factors: a decrease in export market demand and historical events at that time.

Opportunities for Export of Australian Products

It will be difficult for Australia to sell butter in China for the recombined milk market because this is related to supplies of SMP and the market is dominated by subsidised EC products.

With regard to exports for the burgeoning confectionary trade, Australia could aim for a market share. Two facts should, however, be kept in mind:

- butter does not feature in traditional Chinese cuisine, and
- China could easily produce butter cheaply with the introduction of simple technology.

6.4 Yoghurt

Yoghurt is a natural cultured milk product made with special strains of acid-producing bacteria to give it a mildly acid flavour.

There are several types of yoghurt:

- Set yoghurt: The culture is added to the milk in the container in which it will be sold. The texture resembles that of junket.
- Stirred yoghurt: This is made before packaging. The junket-like curd is stirred to give a soft custard consistency.
- Flavoured yoghurt: This has flavouring and sugar added prior to the addition of the culture, and then is set or stirred.
- Fruited yoghurt: This is usually a stirred type with fresh fruit pieces and sugar added.

Since extra milk solids are added, yoghurt is more concentrated than milk and has 25% more food value than whole milk (ADC, Dairy Compendium, 1989).

In the last few years, there has been a strong demand for yoghurt and supply has not been able to meet this in China. This has led to inelasticity of demand. There are no substitutes for yoghurt and no cream cheese, or "fromage frais" desserts on the market.

Products on the Market

Local

There are three types of yoghurt available in China: set, stirred and fruited. The average price is about 4 Yuan/Kg. Note that there is also an enzyme milk beverage (yoghurt drink) locally produced for the Chinese market which is based on a European formula.

Imported

There are no imported yoghurts in China, however several European and American dairy companies have set up joint venture production plants e.g. Nestle in Sichuan. These products sell for around 6 Yuan/Kg.

Product Quality

The Chinese have never traditionally produced yoghurt. Its advent came with the Europeans and has only been produced in its modern form locally for about 30 years. However the quality of the local products is very good.

Consumer Profile

Introduction

The consumers are mostly urban young people and children in the major cities, and large towns. Yoghurt is inexpensive and thus accessible to the general populace.

Method of Use

Yoghurt is consumed mostly as a refreshing social drink in the summer months in the North and all year round in the South.

Consumer Knowledge of Product

The Chinese are well aware of the quality of set yoghurt, however stirred varieties are a more recent addition on the market and consumers have very little knowledge in them.

Product Preference

Market surveys have shown a preference for strong vanilla-flavoured rich smooth soft yoghurt. Joint venture products are also preferred because of the reputation of the foreign companies involved.

Seasonality and Climate

In summer there is an increase in yoghurt consumption because it is regarded as a refreshing social drink. In Southern China there is a considerably higher consumption rate than in the North due to climatic differences.

Packaging

The overwhelming majority of Chinese people prefer simple packaging. Yoghurt is packaged in several ways: plastic bottles, glass bottles and earthenware pots, all of which are acceptable.

Table 6-4-1 Estimated Yoghurt Consumption in China 1978-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 2, 15, 26 and 40)

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	YOGHURT CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		15.77	15.77		1.58
1979	1190	19.36	18.92	18.92	20.00	1.59
1980	1380	15.97	22.70	22.70	20.00	1.65
1981	1561	13.12	27.24	27.24	20.00	1.75
1982	2465	57.91	32.69	32.69	20.00	1.33
1983	2588	4.99	39.23	39.23	20.00	1.52
1984	3100	19.78	47.08	47.08	20.00	1.52
1985	3501	12.94	56.49	56.49	20.00	1.61
1986	4000	14.25	67.79	67.79	20.00	1.69
1987	4137	3.43	81.35	81.35	20.00	1.97
1988	4274	3.31	97.62	97.62	20.00	2.28
1989	4471	4.61	117.15	117.15	20.00	2.62
1990	4875	9.04	140.57	140.57	20.00	2.88
1991	4914	0.80	168.69	168.69	20.00	3.43
1992	5332	8.50	202.43	202.43	20.00	3.80

Because the dairy industry is so small and the yoghurt consumption is too tiny to be recorded, there are no official data available at the moment on yoghurt consumption in China. The author visited nearly one hundred Chinese dairy experts (see Appendix 2) and the general opinion was of an estimated growth rate of 20% per annum. This is believed to be the most realistic estimate obtainable at present.

Table 6-4-2 **Estimated Yoghurt Consumption per Capita in China 1978-1992**

Source: Field Research and personal communications (see Appendix 2 Ref. No. 2, 15, 26 and 40)

YEAR	YOGHURT CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	YOGHURT CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	15.77		958.10	16.46	
1979	18.92	20.00	969.01	19.52	18.65
1980	22.70	20.00	981.24	23.14	18.50
1981	27.24	20.00	1006.91	27.06	16.94
1982	32.69	20.00	1020.18	32.05	18.44
1983	39.23	20.00	1029.85	38.09	18.87
1984	47.08	20.00	1040.04	45.27	18.82
1985	56.49	20.00	1051.27	53.74	18.72
1986	67.79	20.00	1067.93	63.48	18.13
1987	81.35	20.00	1079.47	75.36	18.72
1988	97.62	20.00	1100.86	88.68	17.67
1989	117.15	20.00	1130.00	103.67	16.91
1990	140.57	20.00	1143.61	122.92	18.57
1991	168.69	20.00	1156.57	145.85	18.66
1992	202.43	20.00	1169.67	173.06	18.66

Tables 6-4-1 and 6-4-2 show an average yoghurt consumption growth rate of 20% and per capita consumption increase of 18%, the difference being explained by population growth. In fact, today, yoghurt is the most popular dairy product amongst the younger population in the cities.

Price Analysis

Table 6-4-3 Estimated Yoghurt Price in Australia and China 1988-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. Ref. No. 2, 15, 26 and 40)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON)	YOGHURT WHOLESALE PRICE IN CHINA (YUAN/TON)	AUSTRALIAN EXPORT YOGHURT PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE YOGHURT PRICE IN CHINA (USD/TON)	AUSTRALIAN YOGHURT EXPORT PRICES (USD/TON)
1988	731	3450	1987	3.7220	1.1689	927	1700
1989	818	3859	2158	4.7220	1.2651	817	1706
1990	915	4316	2214	5.2220	1.2932	827	1712
1991	1023	4828	2216	5.3560	1.2900	901	1718
1992	1145	5400	2500	5.7662	1.4500	936	1724

Table 6-4-3 shows that the significant difference in price between the Australian exported product and locally made Chinese one will remain more or less constant.

Opportunities for Export of Australian Products

The export of yoghurt to China would seem not to be a feasible proposition due to transport costs and the time involved. However, the newly developed extended life yoghurt with a shelf life of 10 weeks is a possible export product.

In fact, joint ventures using Australian technology, formulae and various additives, would be the most effective route to penetrate the Chinese market.

6.5 Ice-cream

The Australian Dairy Corporation describes ice-cream as a food and hence its production is closely regulated by law. It must meet exacting standards for texture, body, colour, flavour and taste.

According to these laws, the basis of ice cream must be dairy products (whole milk, cream, skim milk, milk fat) and it must contain at least 10% milk fat. It may contain other wholesome foods such as sugar or glucose. It may also contain permitted stabilisers, colourings and flavourings. However, under Australian law, these additives are very closely policed - only those on the Government's permitted list can be used, all others are automatically banned.

As well as ensuring not less than 10% milk fat, the rules also require ice cream to contain at least 168 grams of food solids per litre (Ice-cream Leaflet, Australian Dairy Corporation, 1989).

Currently the demand for ice-cream is growing dramatically showing a 50% increase in sales annually in China. This additional consumption is most evident in Southern China. There are some water-ice products with various fruit flavours but these occupy only 10% of the market. They sell for 1 Yuan/Kg.

Products on the Market

Local

There are many kinds of local ice-cream products including flavoured (chocolate, vanilla and fruit) in China. Several of the larger local ice-cream producers add Swedish ice-cream pre-mix to their product. The average cost of ice-cream is 3 Yuan/Kg.

Imported

There are no imported brands in the local market place, however, some imported ice-cream is available in the international hotels. Some joint venture plants have been set in Southern China e.g. with American and Swedish companies. Their products retail at around 6 Yuan/Kg.

In addition, ice-blocks containing a small amount of milk are widely available to the general populace. They cost less than 1.5 Yuan/Kg and occupy 80% of street sales.

Product Quality

China has a long history of ice-cream consumption compared with other dairy products. The quality of local ice-cream is reasonably good.

Consumer Profile

Introduction

Buyers are mostly teenagers, at present income levels, ice-cream is available to everyone, at least in the major cities

and medium sized towns. Home ice-cream consumption is limited to those in the population who own refrigerators.

Method of Use

Ice-cream is enjoyed in the hot summer months, especially by people in the streets and parks in their leisure hours. It is reported that ice-cream sales are higher in winter because the climate facilitates street sales.

Home consumption is usually from 1 Kg plastic bags. These are purchased from confectionary stores where the product is kept at $-18^{0}C$ enabling it to be taken home by bicycle, a relatively slow mode of transportation.

Consumer Knowledge of Product

Most of the Chinese have a limited knowledge of ice-cream, because for many years the few products available have remained virtually unchanged.

Product Preference

Taste preference is for rich, smooth and soft ice-cream flavoured with either vanilla or chocolate. Note that green tea ice-cream is currently being marketed in Japan, and it is assumed that it would be most acceptable also in China (Rees, 1992, pp. 79-80).

Seasonality and Climate

As previously mentioned, there is some contention between whether ice-cream sales increase in winter or summer. In general, the Chinese believe ice-cream is advantageous to their health in summer for its cooling properties. However, climate facilitates sales in the winter months.

Packaging

There are two kinds of packaging of domestic ice-cream in China: 1 Kg plastic bags and 1 Kg plastic buckets. Consumers prefer the plastic bag packs because they are cheaper. Joint venture ice-cream products are only packed in 500g plastic buckets. Street sales are based on corn cones.

A estimate of the price of ice-cream in China in 1992 is shown in Table 6-5-3. Please note that these figures are only estimates based on field research.

Table 6-5-1 Estimated total volume of Ice-cream Consumption in China 1978-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 2, 3, 14, 17, 25 and 37)

YEAR	TOTAL DAIRY CONSUMPTION ('000 TON)	GROWTH RATE (%)	ICE-CREAM CONSUMPTION ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		2.78	2.78		0.28
1979	1190	19.36	3.34	3.34	20.00	0.28
1980	1380	15.97	4.01	4.01	20.00	0.29
1981	1561	13.12	4.81	4.81	20.00	0.31
1982	2465	57.91	5.77	5.77	20.00	0.23
1983	2588	4.99	6.92	6.92	20.00	0.27
1984	3100	19.78	8.31	8.31	20.00	0.27
1985	3501	12.94	9.97	9.97	20.00	0.28
1986	4000	14.25	11.96	11.96	20.00	0.30
1987	4137	3.43	14.36	14.36	20.00	0.35
1988	4274	3.31	17.23	17.23	20.00	0.40
1989	4471	4.61	20.67	20.67	20.00	0.46
1990	4875	9.04	24.81	24.81	20.00	0.51
1991	4914	0.80	29.77	29.77	20.00	0.61
1992	5332	8.50	35.72	35.72	20.00	0.67

Tables 6-5-1 and 6-5-2 show ice-cream consumption in China will increase by 20% annually reflected in an 18% increase in per capita consumption. This is similar to the estimated growth rate in sales of yoghurt by the Chinese dairy authority experts such as Mr. Zhou Ding Nian (ex-director of China's National Dairy Association) in Beijing (see Appendix 2) since there are no official data available at the moment.

Table 6-5-2 Estimated Ice-cream Consumption per Capita in China 1978-1992

Source: Field Research and personal communications (see Appendix 2 Ref. No. 2, 3, 14, 17, 25 and 37)

YEAR	ICE-CREAM CONSUMPTION ('000 TON)	GROWTH RATE (%) *	POPULATION (MILLION)	ICE-CREAM CONSUMPTION PER CAPITA (G)	GROWTH RATE (%)
1978	2.78		958.10	2.90	
1979	3.34	20.00	969.01	3.45	18.65
1980	4.01	20.00	981.24	4.08	18.50
1981	4.81	20.00	1006.91	4.77	16.94
1982	5.77	20.00	1020.18	5.66	18.44
1983	6.92	20.00	1029.85	6.72	18.87
1984	8.31	20.00	1040.04	7.99	18.82
1985	9.97	20.00	1051.27	9.48	18.72
1986	11.96	20.00	1067.93	11.20	18.13
1987	14.36	20.00	1079.47	13.30	18.72
1988	17.23	20.00	1100.86	15.65	17.67
1989	20.67	20.00	1130.00	18.29	16.91
1990	24.81	20.00	1143.61	21.69	18.57
1991	29.77	20.00	1156.57	25.74	18.66
1992	35.72	20.00	1169.67	30.54	18.66

* Estimated figure by the Chinese dairy expert - Mr. Zhou Ding Nian (see Appendix 2, Ref. No. 4)

Price Analysis

Table 6-5-3 Comparison of Estimated Ice-cream Prices (USD) in Australia and China 1988-1992

Sources: Field research and personal communications (see Appendix 2 Ref. No. 2, 3, 14, 17, 25 and 37)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON) *	ICE-CREAM WHOLESALE PRICES IN CHINA (YUAN/TON)	AUSTRALIAN ICE-CREAM WHOLESALE PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE ICE-CREAM PRICE IN CHINA (USD/TON)	AUSTRALIAN WHOLESALE ICE-CREAM PRICE (USD/TON)
1988	731	1342	351	3.7220	1.1689	361	300
1989	818	1501	383	4.7220	1.2651	318	303
1990	915	1679	395	5.2220	1.2932	321	305
1991	1023	1877	397	5.3560	1.2900	351	308
1992	1145	2100	450	5.7662	1.4500	364	310

* Table 6-1-3, p. 152.

Prices shown in Table 6-5-3 predict an increased trend in cost in China, while the Australian cost, which is lower, will remain relatively stable.

Opportunities for Export of Australian Products

It would not be feasible to export Australian manufactured ice-cream to China under present or projected economic scenarios. Ice-cream pre-mix, however, has an excellent potential in the Chinese market. It has every advantage: excellent quality, ease of transport, minimal storage requirement and elementary production technique.

Flavours may be added to suit local tastes and quality can be varied depending on milk/water additions to suit consumer income.

Already, joint venture projects are also very successful. They are today, as mentioned, the easiest method of accessing the Chinese market.

UHT soft serve and UHT yoghurt soft serve are also potential export earners for Australia.

6.6 Cheese

Cheese is milk in concentrated form. It takes about 10 litres of milk to make 1 kg of cheese. A large percentage of milk is moisture and this must be removed before cheese is made from the remaining solids. Although each variety of cheese is made in a special way, there are basic steps common to all cheese making. The milk is pasteurised, warmed and a starter culture

added to turn lactose into lactic acid. Rennet is added to set the milk into a curd, which is then cut into small blocks to release the whey. The curd is manipulated to develop the characteristics of a chosen variety, shaped, pressed and left to mature.

Cheese provides a large number of daily nutrient needs in some countries. It provides more protein than the same weight of meat, fish or eggs. It is highly digestible and contains one third water, one third protein and one third fat plus minerals and vitamins (ADC, Dairy Compendium, 1989).

Currently, there is no real demand for cheese so the majority of people are unaware of price changes. Demand centres on the fast food industry and is increasing, but so is consumer awareness and a preference for fast foods. So the demand is quite elastic.

Products on the Market

Local

The only locally produced cheese type on the Chinese market is Cheddar. This is available only in the major cities and then only in a few stores. There is very little information available about cheese in China. Two major centres are the Shanghai Dairy Research and Training Centre and the Huaguan Dairy Factory in Beijing. The latter is the largest and the major supplier for the Pizza Hut and Macdonalds chains.

Different varieties of European cheeses are being produced in some dairy research institutes in China but are not yet on the market.

Imported

Almost all internationally known cheeses are available in certain stores for Europeans in the large capital cities.

Industrial

All industrial Cheddar cheese is locally produced. This is used in the rapidly expanding fast food industry (Macdonalds, Pizza Hut).

Product Quality

The locally produced Cheddar cheese lacks subtlety, but is reasonably good in both taste and texture.

Consumer Profile

Introduction

In China, very few people eat cheese. Only those returning from overseas postings have acquired this habit.

Method of Use

Cheese is used almost exclusively in the fast food industry.

Consumer Knowledge of Product

Most Chinese people have very limited ideas if any about cheese.

Product Preference

In the future, if cheese becomes more widely acceptable by the Chinese, they would probably prefer an unsalted variety with high moisture content.

Seasonality and Climate

These factors do not affect the fast food industry.

Packaging

Industrial cheese, prior to packaging, is sliced or shredded, then delivered in bulk to the fast food outlets.

Market Analysis

Table 6-6-1 Cheese Consumption in China 1978-1992
Source: . Statistical Yearbook for Asia and the Pacific (1990) United Nations and Various Issues
. Field Research and personal communications (see Appendix 2. Ref. No. 2, 3 and 7)

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	CHEESE CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997					73.65
1979	1190	19.36	26.70	159		61.82
1980	1380	15.97	31.33	187	17.33	51.88
1981	1561	13.12	47.31	282	51.01	43.55
1982	2465	57.91	58.25	347	23.12	36.55
1983	2588	4.99	63.44	378	8.92	30.68
1984	3100	19.78	144.94	863	128.47	25.75
1985	3501	12.94	127.07	757	-12.33	21.61
1986	4000	14.25	134.99	804	6.23	18.14
1987	4137	3.43	80.38	479	-40.45	15.22
1988	4274	3.31	91.72	546	14.11	12.78
1989	4471	4.61	95.73	570	4.38	12.75
1990	4875	9.04	89.16	547	-4.12	11.21
1991	4914	0.80	79.03	484	-11.36	9.86
1992	5332	8.50	75.41	462	-4.59	8.67

Table 6-6-2 **Cheese Consumption per Capita in China 1978-92**
Source: Statistical Yearbook for Asia and the Pacific (1990) United Nations various issues
Field Research and Personal Communication (see Appendix 2. Ref. No. 2, 3 and 7)

YEAR	CHEESE CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	CHEESE CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	10.52		958.10	10.98	
1979	26.70	153.79	969.01	27.55	150.93
1980	31.33	17.33	981.24	31.93	15.87
1981	47.31	51.01	1006.91	46.99	47.16
1982	58.25	23.12	1020.18	57.10	21.52
1983	63.44	8.92	1029.85	61.60	7.89
1984	144.94	128.47	1040.04	139.36	126.23
1985	127.07	-12.33	1051.27	120.87	-13.27
1986	134.99	6.23	1067.93	126.41	4.58
1987	80.38	-40.45	1079.47	74.46	-41.09
1988	91.72	14.11	1100.86	83.32	11.89
1989	95.73	4.38	1130.00	84.72	1.68
1990	89.16	-6.87	1143.61	77.96	-7.97
1991	79.03	-11.36	1156.57	68.33	-12.35
1992	75.41	-4.59	1169.67	64.47	-5.66

Note: The figures in Table 6-6-2 significantly veer up and down. The author believes that there must have been some calculation errors from the UN data. Alternatively, different methods have been used by different people to calculate statistics. (Please see p. 151).

Price Analysis

Table 6-6-3 **Comparison of Estimated Cheese Prices (USD) in Australia and China 1988-1992**

Source: Statistical Yearbook for Asia and the Pacific United Nations various issues
Field Research and personal communications (see Appendix 2. Ref. No. 2, 3 and 7)

YEAR	FARMGATE PRICES IN CHINA (YUAN/TON)	CHEESE WHOLESALE PRICES IN CHINA (YUAN/TON)	AUSTRALIAN CHEESE EXPORT PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE CHEESE PRICES IN CHINA (USD/TON)	AUSTRALIAN CHEESE EXPORT PRICE (USD/TON)
1988	731	6697	2732	3.7220	1.1689	1799	2337
1989	818	7489	2999	4.7220	1.2651	1586	2371
1990	915	8378	3461	5.2220	1.2932	1604	2676
1991	1023	9370	3203	5.3560	1.2900	1749	2483
1992	1145	10481	3317	5.7662	1.4500	1818	2288

Table 6-6-3 would indicate that locally produced Chinese Cheddar is cheaper than imported cheese at present. It must be noted that most of the Chinese population tried cheese for the first time only when the Western fast food industry entered the Chinese market five years ago. Also that the above figures are unreliable and cannot show the real price of industrial cheese production.

Volume and Value of Australian Exports to China

Table 6-6-4 **Volume and Value of Australian Cheese Exports to China 1988-1992**

Source: Field Research and personal communications (see Appendix 2. Ref. No. 2, 3 and 7)

YEAR	AUSTRALIAN CHEESE VOLUME EXPORTED TO CHINA (TONNE)	CHEESE EXPORT PRICE FROM AUSTRALIA (AUD/TONNE)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	VALUE OF EXPORTED BUTTER (AUD '000)	VALUE OF EXPORTED CHEESE (USD '000)
1988	5.657	2732.00	1.1689	15	13
1989	2.025	2999.00	1.2651	6	5
1990	17.07	3461.00	1.2932	59	46
1991	0.909	3203.00	1.2900	3	2
1992	17.543	3317.00	1.4500	58	40

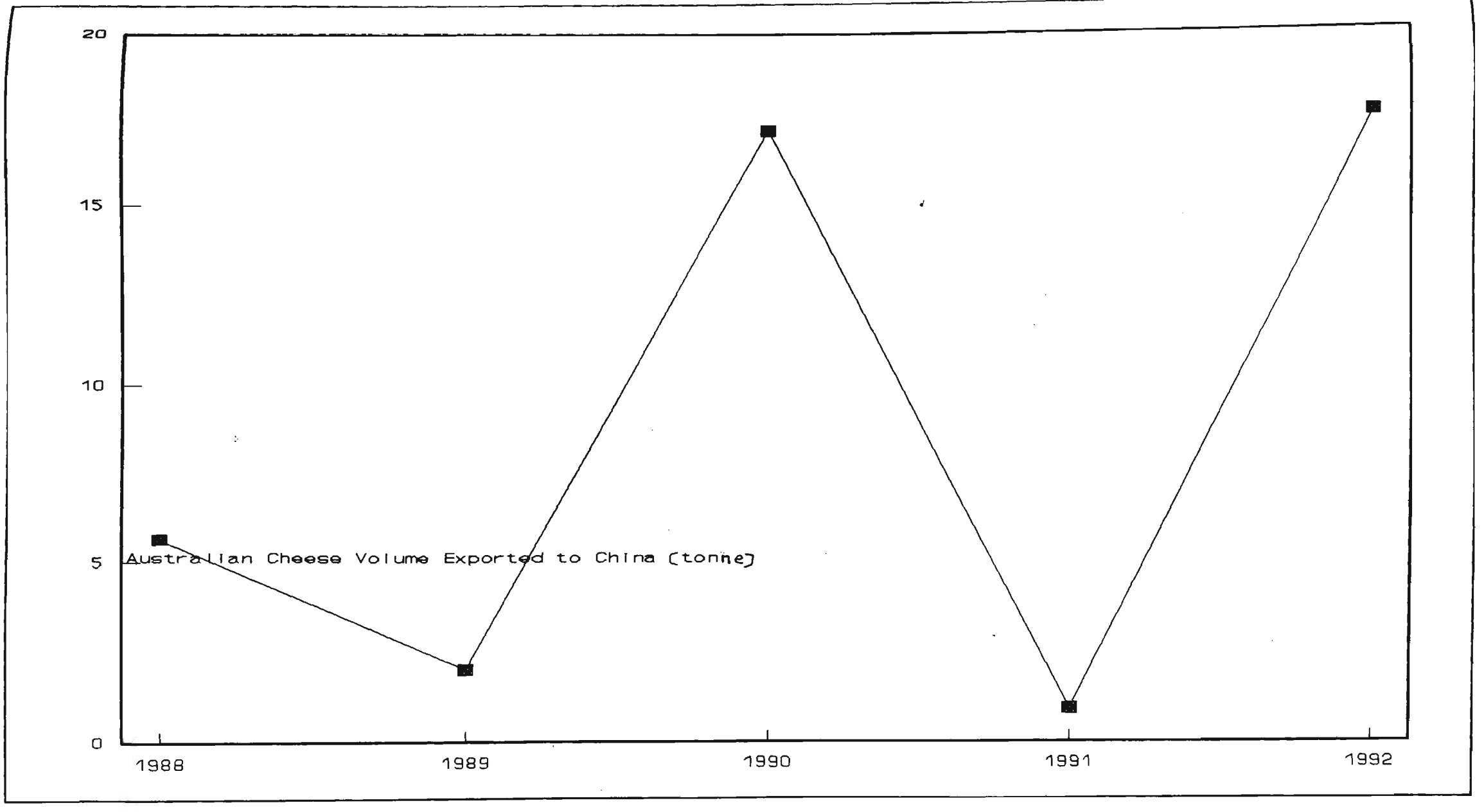


Figure 6-6-1 Australian Cheese Exports to China 1988-1992
Source: . Export Division, ADC, 1993, Melbourne

Opportunities for Export of Australia Products

There is a market for both sliced and shredded Cheddar cheese in China, for the fast food industry. It is quite possible also that sliced Cheddar cheese could be introduced to the domestic market for use in sandwiches if bread is accepted as a daily food item. This would depend on a considerable westernisation of Chinese eating habits and a successful marketing program. Soft cheese could also become acceptable for desserts e.g. cheesecake and "fromage frais". Price would be a major factor in the success of this (ADC, Dairy Compendium, 1989).

6.7 Whey Powder

Whey is the serum or watery part of milk that separates from the curds in the process of making cheese. It is the largest by-product of the Australian dairy industry, and used to be one of the most troublesome by-products produced by any industry. It is now having considerable impact and value as a food ingredient.

There are two kinds of whey:

- sweet, the effluent from whole milk used to make natural or processed cheeses such as Cheddar; and
- acid, the effluent from skim milk which is used to make cottage cheese.

Sweet whey has a pH of 5 to 7 and is relatively easy to spray

dry. Acid whey has a pH between 4 and 5, possesses a pungent smell, and is more difficult to dry. There is little difference between the dried whey powders produced from sweet and acid whey (ADC, Dairy Compendium, 1989).

These is no appropriate substitute for whey powder at the moment. No other product approaches the high calorific level of lactose contained in whey. For this reason it is used in infant formulae and because of the single child policy in China parents are willing to pay almost anything to provide their child with the best of everything. This results in strict inelasticity.

Products on the Market

Local

China produces 150,000 tons of cheese and theoretically should obtain roughly 80,000 tons of whey powder. However, because this cheese is mainly produced in the pastoral regions, and the technological and transportation infrastructure is totally inadequate, there is no way that whey powder can be available for processing into other products on the domestic market.

Industrial

There are three kinds of whey powder on the market and all are used industrially. They are as follows:

- non-hygroscopic whey powder (ash content < 8.5%). This is used as a milk replacer for piglets. China produces over 300 million pigs annually and they require approximately

200,000 tons of this powder. If the powder is available at an acceptable price on the international market, suckling of piglets is interrupted after a week or ten days and the milk replacer used. By this method, the breeding program can be accelerated.

- 40% de-mineralised whey powder (ash content < 5.5%). This is a food additive used in the bakery, confectionary and sweets industries. All of these industries are currently undergoing rapid expansion in China and hence the market for D-40 whey powder is very strong. The Chinese have readily accepted the use of this powder in these products which include chocolate and ice-cream.
- 70% de-mineralised whey powder (ash content < 3%). This is an ingredient of infant formula. All factories producing this formula use imported whey powder due to the scarcity of the domestic product. It retails at about 30 Yuan/Kg. China's population growth rate is now 2-3% annually which means at least 20 million new babies every year. Current market demand for D-70 whey powder solely for infant formula stands at 20,000 tons annually.

Sources of imported whey powder include: the US, Australia, Finland, Holland, Denmark, New Zealand, the CIS and Poland.

Besides the aforementioned, there are some fully imported infant formula mixes on the market. These retail at about 45 Yuan/Kg and brands include: Lactogen, Neslac, SMA and Prodislac.

Product Quality

Imported industrial whey powders exhibit different qualities. Some of them are very white in colour and some are cream which is preferred by the Chinese. Some of the powders are very fine, some more coarse; of these the latter is better because it is has been subjected to a superior method of drying.

The powders also exhibit differences in solubility, the more easily dissolved ones being preferred. Ash content also varies from 2-9% and the lower the ash content, the higher the grade of powder. The various infant formulae show the same variations as mentioned above, except that ash content must be less than 3%.

Consumer Profile

Introduction

The major consumers of whey powder are local Chinese factories and joint venture plants. Although the majority of the factories are equipped with testing facilities, all imports must be sampled by China's Commodity Inspection Bureau on arrival in the country.

Method of Use

Whey powder is used as a component of:

- stockfeed for piglets;
- bread, confectionary, sweets and ice-cream to provide a milky taste; and
- infant formulae

Consumer Knowledge of Product

The technical staff of the local factories and joint venture plants are well-versed in the requirements for whey powder despite the brief period (5-10 years) of this product's exposure on the market. Many young couples purchase infant formula for their children believing it to be health promoting.

Product Preference

The Chinese prefer whey powder imported from Australia, New Zealand, Holland, the USA and Canada to that of Poland and the CIS because the product quality is uniform and the powder easy to use.

Reiterating the preferences already mentioned, they are: cream colour, coarse form and good solubility. With regard to infant formulae as with many countries, there are conflicting factors influencing choice of purchase e.g. some mothers will choose the most expensive product, believing it to be the best, others, on a lower income will choose the cheapest.

Seasonality and Climatic

Whey powder is used as a food ingredient in a broad spectrum of products. The demand is constant and has been increasing steadily over the past five years and shows no significant influence by either seasons or climate.

Packaging

Most whey powders are sold in bulk and thus not packaged. They are packed for transport in 25 Kg polyethylene-lined multi-wall pinch bottom bags.

Market Analysis

Table 6-7-1 Estimated Whey Powder Consumption in China 1978-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 14,. 20 and 30)

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	WHEY POWDER CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		2.85	13		1.30
1979	1190	19.36	3.44	16	20.67	1.31
1980	1380	15.97	4.04	18	17.24	1.33
1981	1561	13.12	4.62	21	14.36	1.34
1982	2465	57.91	7.37	33	59.65	1.36
1983	2588	4.99	7.82	36	6.15	1.37
1984	3100	19.78	9.47	43	21.10	1.39
1985	3501	12.94	10.82	49	14.18	1.40
1986	4000	14.25	12.50	57	15.51	1.42
1987	4137	3.43	13.07	59	4.56	1.43
1988	4274	3.31	13.65	62	4.45	1.45
1989	4471	4.61	16.24	74	19.00	1.65
1990	4875	9.04	17.90	81	10.24	1.67
1991	4914	0.80	18.25	83	1.91	1.69
1992	5332	8.50	20.01	91	9.69	1.71

Tables 6-7-1 and 6-7-2 show a 9% increase in consumption of whey powder in China over the past years. These growth rates in sales of whey powder were estimated by the Chinese food authority expert Mrs Mu Jing Ju (Chief director of China Food Industry Supply and Marketing Co.) in Beijing (see Appendix 2) since there are no official data available at the moment.

Table 6-7-2 **Estimated Whey Powder Consumption per Capita in China 1978-1992**

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 14, 20 and 30)

YEAR	WHEY POWDER CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	WHEY POWDER CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	2.85		958.10	2.98	
1979	3.44	20.67	969.01	3.55	19.31
1980	4.04	17.24	981.24	4.11	15.78
1981	4.62	14.36	1006.91	4.59	11.45
1982	7.37	59.65	1020.18	7.23	57.57
1983	7.82	6.15	1029.85	7.60	5.15
1984	9.47	21.10	1040.04	9.11	19.92
1985	10.82	14.18	1051.27	10.29	12.96
1986	12.50	15.51	1067.93	11.70	13.71
1987	13.07	4.56	1079.47	12.10	3.45
1988	13.65	4.45	1100.86	12.40	2.42
1989	16.24	19.00	1130.00	14.37	15.93
1990	17.90	10.24	1143.61	15.66	8.92
1991	18.25	1.91	1156.57	15.78	0.77
1992	20.01	9.69	1169.67	17.11	8.47

Price Analysis

Table 6-7-3 **Comparison of Estimated Whey Powder Prices (USD) in Australia and China 1988-1992**

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 14, 20 and 30)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON)	WHEY POWDER WHOLESALE PRICE IN CHINA (YUAN/TON)	AUSTRALIAN WHEY POWDER EXPORT PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE WHEY POWDER PRICE IN CHINA (USD/TON)	AUSTRALIAN WHEY POWDER EXPORT PRICE (USD/TON)
1988	731	1917	490	3.7220	1.1689	515	490
1989	818	2144	500	4.7220	1.2651	454	495
1990	915	2398	510	5.2220	1.2932	459	500
1991	1023	2682	520	5.3560	1.2900	501	510
1992	1145	3000	530	5.7662	1.4500	520	515

Table 6-7-3 and Figure 6-7-1 anticipate that there will be an opportunity for Australia to export whey powder to China because of the widening price differential of the product in the two countries.

Volume and Value of Australian Exports to China

Table 6-7-4 Volume and Value of Australian Whey Powder Exports to China 1988-1992

Source:
- Export Division, ADC, 1993, Melbourne,
- Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 14, 20 and 30)

YEAR	VOLUME OF AUSTRALIAN WHEY POWDER EXPORTED TO CHINA (TONNE)	AUSTRALIAN WHEY POWDER EXPORT PRICE (AUD/TONNE)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	VALUE OF WHEY POWDER EXPORTS (AUD '000)	VALUE OF WHEY POWDER EXPORTS (USD '000)
1988			1.1689	0	0
1989			1.2651	0	0
1990	528.5	510.00	1.2932	270	208
1991	912	520.00	1.2900	474	368
1992	462.604	530.00	1.4500	245	169

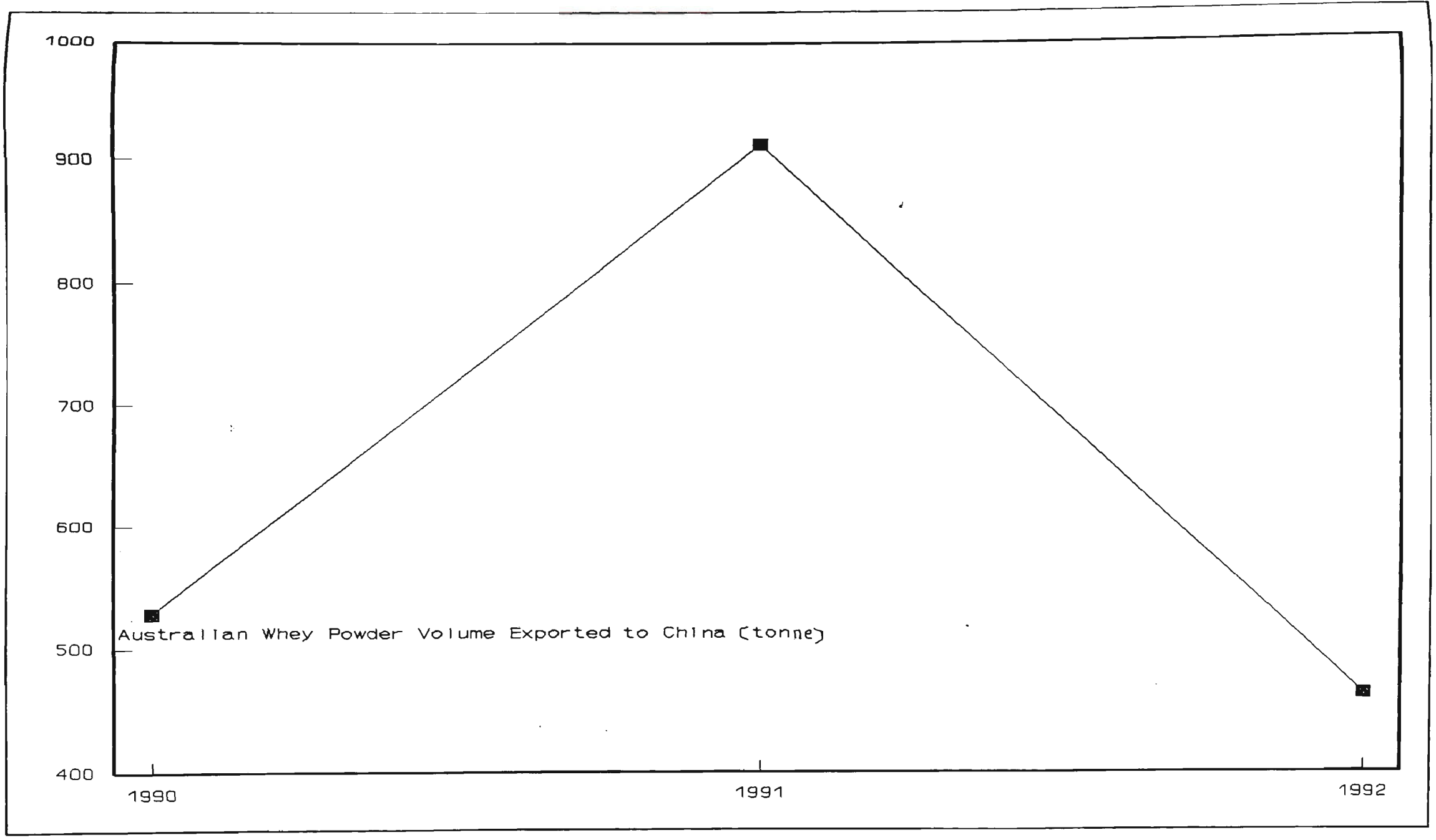


Figure 6-7-1 **Australian Whey Powder Exports to China 1990-92**
Source: Export Division, ADC, 1993, Melbourne

Opportunities for export of Australian Products

In the long term, China will continue to import whey powder because of its very small national cheese production. Major opportunities thus exist and many Australian dairy companies have successfully entered the market over the last 6-7 years. The market for infant formula is likewise very promising and there is currently some room for new suppliers.

6.8 Sweetened Condensed Milk

Sweetened condensed milk is milk with part of the water removed and sugar added, to act as a preservative and offset the need for sterilisation. It will keep indefinitely without refrigeration in a sealed can. Sweetened condensed milk contains all the food value of whole milk in a more concentrated form plus added sugar (ADC, Dairy Compendium, 1989). The demand for the product is decreasing and it is thought will eventually be completely replaced by milk powder.

Products on the Market

Local

There are a number of small factories producing sweetened condensed milk in China. It is a product which has gone out of fashion, but one which is simple to make and has an excellent storage life. Today not many Chinese in urban areas consume this product.

Imported

No data was available on sweetened condensed milk imports although some sources estimate the volume imported in 1986 to have been 11,800 tons (Rees, 1992, pp. 79-80).

Product Quality

The quality of the local sweetened condensed milk is good and has been being produced for several decades.

Consumer Profile

Introduction

Most consumers are in village areas as the product is out of fashion in the cities. People from Southern China consume more condensed milk than those from the North.

Method of Use

Condensed milk serves the same purpose as milk powder, being recombined for use as liquid milk for drinking.

Product Preference

The product is very sweet and non palatable to many Chinese. However, those who do enjoy it prefer the very sweet and very viscous types.

Seasonality and Climate

Previously, sweetened condensed milk served to eliminate seasonal production variations. Surplus milk in high

production time was converted into condensed form and used to boost low production periods.

Packaging

The product is packaged in 100-400g glass bottles with screw tops.

Market Analysis

Table 6-8-1 Estimated Condensed Milk Consumption in China 1978-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 33 and 36)

YEAR	TOTAL DAIRY CONSUMP. ('000 TON)	GROWTH RATE (%)	CONDENSED MILK CONSUMP. ('000 TON)	MILK EQUIVALENT ('000 TON)	GROWTH RATE (%)	MARKET SEGMENT (%)
1978	997		125.30	125.30		12.57
1979	1190	19.36	130.32	130.32	4.01	10.95
1980	1380	15.97	135.53	135.53	4.00	9.82
1981	1561	13.12	140.95	140.95	4.00	9.03
1982	2465	57.91	146.59	146.59	4.00	5.95
1983	2588	4.99	152.45	152.45	4.00	5.89
1984	3100	19.78	158.55	158.55	4.00	5.11
1985	3501	12.94	164.89	164.89	4.00	4.71
1986	4000	14.25	171.49	171.49	4.00	4.29
1987	4137	3.43	178.35	178.35	4.00	4.31
1988	4274	3.31	185.48	185.48	4.00	4.34
1989	4471	4.61	192.90	192.90	4.00	4.31
1990	4875	9.04	200.62	200.62	4.00	4.12
1991	4914	0.80	208.64	208.64	4.00	4.25
1992	5332	8.51	216.99	216.99	4.00	4.07

Table 6-8-2 Estimated Condensed Milk Consumption per Capita in China 1978-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 33 and 36)

YEAR	CONDENSED MILK CONSUMP. ('000 TON)	GROWTH RATE (%)	POPULATION (MILLION)	CONDENSED MILK CONSUMP. PER CAPITA (G)	GROWTH RATE (%)
1978	125.30		958.10	130.78	
1979	130.32	4.01	969.01	134.49	2.84
1980	135.53	4.00	981.24	138.12	2.70
1981	140.95	4.00	1006.91	139.98	1.35
1982	146.59	4.00	1020.18	143.69	2.65
1983	152.45	4.00	1029.85	148.03	3.02
1984	158.55	4.00	1040.04	152.45	2.98
1985	164.89	4.00	1051.27	156.85	2.89
1986	171.49	4.00	1067.93	160.58	2.38
1987	178.35	4.00	1079.47	165.22	2.89
1988	185.48	4.00	1100.86	168.49	1.98
1989	192.90	4.00	1130.00	170.71	1.32
1990	200.62	4.00	1143.61	175.43	2.76
1991	208.64	4.00	1156.57	180.40	2.83
1992	216.99	4.00	1169.67	185.51	2.84

Tables 6-8-1 and 6-8-2 indicate a possible market segment for condensed milk of 2.84% in the year 2000. The growth rate is predicted to reach 4% annually (China Ministry of Agriculture (MOA), 1988, Beijing). The growth rate was also estimated in sales of condensed milk by the Chinese specialised dairy trading experts such as Mrs. Li Zhi Ru and Mr. Zhu Pin Xian (executive directors of Cenoway Ltd. Co.) in Beijing (see Appendix 2. Ref. No. 2) since there are no official data available at the moment.

Price Analysis

Table 6-8-3 Comparison of Estimated Condensed Milk Prices (USD) Australia and China 1988-1992

Source: Field Research and personal communications (see Appendix 2. Ref. No. 1, 2, 33 and 36)

YEAR	FARMGATE PRICE IN CHINA (YUAN/TON)	CONDENSED MILK WHOLESALE PRICE IN CHINA (YUAN/TON)	AUSTRALIAN CONDENSED MILK WHOLESALE PRICE (AUD/TON)	AVE. ANNUAL EXCHANGE RATE (YUAN/USD)	AVE. ANNUAL EXCHANGE RATE (AUD/USD)	WHOLESALE CONDENSED MILK PRICE IN CHINA (USD/TON)	AUSTRALIAN WHOLESALE CONDENSED MILK PRICE (USD/TON)
1988	731	6262	2688	3.7220	1.1689	1682	2300
1989	818	7003	2968	4.7220	1.2651	1483	2346
1990	915	7833	3093	5.2220	1.2932	1500	2391
1991	1023	8762	3144	5.3560	1.2900	1636	2437
1992	1145	9800	3600	5.7662	1.4500	1700	2483

As can be seen in Table 6-8-3, the Australian Export price is likely to remain higher than the local Chinese product in the foreseeable future.

Opportunities for Export of Australian Products

The market for sweetened condensed milk is shrinking and its future is not encouraging with a view to exporting.

6.9 Summary

From the above analysis of dairy products, it can be noted that there exists a wide variety of consumption patterns and export potential for Australian products such as milk powder, whey powder, specialised powder products and even cheese and butter. UHT milk has very little potential in the future.

7

DISCUSSION

"The public buys its options as it buys its meat, or takes in its milk, on the principle that it is cheaper to do this than to keep a cow. So it is, but the milk is more likely to be watered."

Samuel Butler (1835-1902)
"Life and Love"

7.1 China's Dairy Industry - Factors Influencing Consumption and Import Demand

The origin of the foreign trade of China is shrouded in the mists of remotest antiquity. As early as the beginning of the classical Zhou Dynasty (B.C. 1122-249) there were eight neighbouring foreign nations whose merchants came to Canton (Guang Zhou) bringing their goods to exchange for products of the Celestial Empire (See, 1970, p. 15).

From the works of Pliny and Ptolemy we know of active commercial intercourse between Alexandria and the Far East for several hundred years before Christ, and Chinese silks reached the Roman Empire by way of the Central Asian caravan routes which were later followed by the Polo brothers and their nephew, Marco (Morse, 1966, p. 270).

Originally the Chinese were not exclusive but on the contrary assumed a liberal attitude toward foreign trade. They welcomed embassies from neighbouring countries and dispatched missions abroad to foster trade and other relations (Morse, 1966, p. 270). The portals were thrown wide open. Foreigners were admitted everywhere and even high official positions were available to strangers from afar; witness Marco Polo who is said to have been the Governor General of Yang Zhou.

The whole policy was one of "open door" in the truest sense of the term. However, the situation was entirely transformed at

the beginning of the sixteenth century with the arrival of the Europeans. Events compelled China to abandon her original attitude and replace it by a rigid policy of surveillance and exclusion (Morse, 1966, p. 270). In recent times, after 40 years of relative isolation from the rest of the world, China once again has an open door policy. This comes at a time when a new imperialism of political control through economic power is occurring. A tide of private-enterprise ideology swept the world in the 1980s, from the shores of Margaret Thatcher's Britain and Ronald Reagan's US to Mikhail Gorbachov's Soviet Union and on into Asia (Rowley, 1992, p. 66).

China too was affected and current elder statesman Mr. Deng Xiao-ping's plans include:

- the creation of several "Hong Kongs" along China's coast;
- a cut of one-third in the 3 million strong armed forces;
- controls being lifted on most agricultural commodities, including staple foodstuffs such as grain and oil; and
- management and other reforms being introduced to force loss-making enterprises to be responsible for their bottom-line performance (Rowley, 1992, p. 66).

He warns recalcitrant conservatives that "whoever does not reform will have to leave the stage". Deng Xiao-ping aims to make China rich. With GNP growth climbing towards double digits, healthy foreign exchange reserves and an RMB 1 trillion (USD 180 billion) cushion of bank deposits, some say the only thing keeping China's economic policy makers awake at

night is the spectre of inflation which could undermine rising living standards (Kaye, 1992, p. 66).

Inflation must indeed by one of the major factors influencing Chinese government policy, which Cyril Lin, an Oxford economist, terms "open-ended reform". The driving force in this "method" of experiment, diversity and decentralisation has been competition: between regions, firms, foreign investors and styles of industrial organisation (Rohwer, The Titan Stirs, 1992, p.18).

The fact that what is occurring in China today has never taken place before, namely the rapid transition from a centrally planned economy to a free market one in a vast country with until recently a traditional culture of Confucianism, would indicate that application of the traditional Western parameters to assess consumption and import demand for products - let alone dairy products which do not form part of traditional Han Chinese diets - is fraught with difficulties.

A significant problem in any attempt at analysis is the unreliability of some of the statistical data for China, another is the enormous size of the country and its population such that most analysts focus on only one province in any attempt to carry out a market feasibility study.

It must also be borne in mind that separating out demand for individual dairy products is complicated by the fact that milk powder and butter in China are used for the liquid recombination milk sector. The amount used in this fashion is seasonally affected and involves EC subsidies to the extent of a virtual monopoly. Product demand is also influenced in China at the present stage by the development of new Western industries such as the fast food industry. Butter and cheese consumption for example have increased in relation to this development.

Using the previously mentioned model (Figure 1-4-1) each of the factors is considered. Firstly factors influencing consumption. These include trends in per capita income, income distribution, income elasticity of demand, taste preferences, population and relative prices to consumers.

Trends in per capita income: There is a very strong link between national income and consumer demand. The World Bank's published GDP per capita for China in 1990 was USD 370. This figure has been disputed and, for example, Ma and Garnaut (1992, pp. 3-7) argue that the figure should be increased by a factor of three (e.g. to USD 1110). Another unconfirmed estimate calculated on the basis of PPP (purchasing power parity) puts China's 1990 GDP per capita at USD 1950. These figures differ enormously but whichever ones are taken into account the trend in per capita income is upwards which impacts in a positive way on consumption.

To obtain accurate figures for *income distribution* in China in the current transitional phase is almost impossible. It is known that the distribution of income and wealth in an economy affects the overall demand for goods and services. It has been suggested that an increase in the proportion of national income going to people on lower incomes will increase national demand by a greater amount than if it went to those on higher incomes (Bennett 1992, p.240). In China, many factors are involved which affect people's income e.g. the different opportunities in urban and rural areas and the different productivity of different provinces. For example China's richest province, Jiangsu, has a total productivity 67 times greater than the poorest, Tibet (Sivin et a. 1988, p.108). Within rural households, the proportion of middle income (200 to 500 RMB p.a.) almost doubled between 1980 to 1986. In 1987 wages were apportioned as follows:

- Agricultural workers 98.08 yuan p.a.
- Manufacturing industry workers 118.08 yuan p.a.
- Construction workers 136.08 yuan p.a.
- Transport and communication workers 133.67 yuan p.a.

(UN Statistical Yearbook for Asia and the Pacific 1990 p.87)

More recently the population drift from rural to urban areas, the establishment of more Special Economic Zones, and the relative freeing up of the economy including the farming sector are but a few of the factors which would make more recent figures difficult to obtain.

Studies carried out on *income elasticities of demand* with regard to milk indicate that this is very high (1.62) especially in the cities (CNSB, Urban Statistics Yearbook, 1987). This would be anticipated as income elasticity of demand varies with income level which is increasing. In China today as the people's income increases, they want to consume milk and already demand is much higher than supply. Likewise for cheese, due to the development of the fast food industry demand is quite elastic.

It is a well established fact that food items enjoy some increased demand when the economy grows but proportionately not as much as the growth of average incomes (Bannock et al. 1987, p.196). This does not apply to China at present because demand for milk outstrips supply.

In the dairy industry there are significant changes in *taste preference* which occur over time and which reduce consumption of some products and increase production of others. If there were adequate milk supply at affordable prices the Chinese would currently show a preference for milk with a high fat content.

With regard to *product preference*, the widening range of dairy products is changing the pattern of milk consumption towards higher value-added products such as yoghurt. However, detailed calculations on the possible market for diversified

product are unavailable at this point in time. In general, milk powder is preferred to liquid milk. This is, however, not a preference in the usual Western sense but one based on the fact that milk powder has a healthy image and transportation is easier.

There is a preference for foreign yoghurt because of the reputation of foreign companies. This reflects product novelty and possibly snob factor as Chinese stirred yoghurt is an excellent product, a fact frequently remarked upon by foreigners.

There are also *geographical and climatic effects* on consumption. Dairy consumption per capita varies in the three regions already described (urban, rural pastoral and rural agricultural) being much higher by a factor of three in the cities and rural pastoral regions than in the rural agricultural areas. The market for dairy products is chiefly concentrated in the cities where the income level is highest. Consumption in the rural pastoral regions is by minority populations which are self-sufficient.

The total dairy product consumption in 1987 was on average 3.83 Kg per capita. Regional variation included 179.41 Kg in Inner Mongolia, 95 Kg in Tibet and 45 Kg in Qinghai, all with considerable minority populations. The provincial capitals of these provinces (Hohhot, Lhasa and Xining) are for this reason not recipients of the free EC or UN milk programs.

Climatic conditions are also pertinent to consumption, e.g. temperature leads to a higher consumption of yoghurt and ice cream in southern China whereas the increased consumption of sweetened condensed milk in the same reagion is due to high humidity and ease of product storage.

Population growth is an important factor influencing economic growth. It has two effects - it provides labour and human talent thus adding to GNP, but it is also the main charge on GNP. As mentioned, the population of China is the largest in the world at 1.143 billion in 1990. Six municipalities and provinces (including Beijing) have a population density exceeding 500 persons per square kilometre (DFAT, China Brief 1991, p.7). Even excluding the 80 per cent of China's population which is classed as rural the market potential opportunities are enormous. However, to many, population growth is a spectre because when population increases faster than GNP, real income per head falls. Population also contributes to pollution, congestion and exploitation of non-renewable resources.

Since 1984 China has had an official "one-child policy" which should result in a slow decline in growth rate. However *annual growth rate* of the population in 1989 was 2%, markedly higher than the 1.1% for the previous year (UN Statistical Yearbook for Asia and the Pacific 1990, p.78). One estimate for average rate of increase over the period 1990-1995 is 1.43% (UN Population Fund, 1992). Life expectancy is 69 years and

taking into account all these figures there will be another 180 million people added to the labour force between now and 2000 (Rohwer, The Titan Stirs, 1992, p.28). This coupled with the negative environmental issues poses major problems for the Chinese government and will impact on allocation of land for agriculture and capacity to feed the population.

Projected population figures from 1980 to the year 2000 indicate not only a growth in numbers but a marked change in *age distribution*. In 1980 the percentage of under 15 year-olds was 35.7% and for over 65 year-olds was 4.6%. These percentages are predicted to change to 21% of under 15 year-olds and 7.9% of over 65 year-olds by the year 2000 i.e. the younger generation will reduce by approximately one third and the elderly will increase by about two thirds.

Normally, a population with a decreasing proportion of young people will have a decreased demand for consumer goods. In China at present two factors would initially mask this effect with regard to milk demand: the lack of adequate supply and the subsidised allocation of milk to both the young and the aged group which latter will have increased to a greater extent and so offset the fall in the younger group.

With regard to *age preference*, consumption of milk by parents with young children and the elderly is not a preference but a situation which is encouraged by the government as a health measure. Yoghurt is most popular with young people in the

cities and likewise ice-cream. However, ice-cream is only available in the major cities and towns so this statement is not a general one. As young adults receive sufficient disposable income for the first time they will be able to impulse buy e.g. ice-cream; when they marry and have a child they will increase the infant formula market for example.

Given the aforementioned subsidies for women with young children, the *sex ratio* of the population is a factor at present as to who has better access to milk supplies and thus milk consumption. This is however an artificial situation. According to the UN Statistical Yearbook of Asia and the Pacific 1990 (page 78) the masculinity ratio of the total population in China in 1987 was 1 : 0.963; in urban regions it was 1 : 0.960 and in rural regions it was 1 : 0.959. However, there is generally thought to be a higher masculinity ratio in the countryside than in the cities contrary to the above figures.

In China, the provincial governments set the price for milk to the consumer at a strictly controlled fixed low level. *Relative pricing* does not affect milk *consumption* firstly because at present demand is greater than supply and secondly because there is no real substitute for milk once it is accepted into one's diet. (Soya milk provides different nutritional elements and has an unpleasant odour to some consumers.)

In China, however, prices may be compared for the local product, the product of Joint-Venture (J-V) projects and the imported product. All of these products supply individual niche markets. Figures used are taken from this text and are only approximations:

- Milk: The local product sells at 1.60 yuan/Kg, imported milk at about 8.53 yuan/Kg;
- Milk powder: Local product sells at 10 yuan/Kg, imported product at about 39 yuan/Kg;
- Butter: Only local production in Inner Mongolia priced at 30 yuan/Kg;
- Cream: Only one producer in Shanghai priced at 20 yuan/Kg;
- Yoghurt: Local product sells for 4 yuan/Kg, none imported, J-V product sells at 6 yuan/Kg;
- Ice-cream: Local product priced at 3 yuan/Kg, J-V products retail at about 6 yuan/Kg
- Cheese: Local Cheddar supplies fast food chains, imported products only for European hotels;
- Whey powder: (Used in industry) Local product not processed into infant formula, imported ones are and retail at about 30 yuan/Kg
- Sweetened condensed milk: Local product produced in a small number of factories, no data on imported products.

As can be seen at present, milk consumption (demand) cannot really be linked to demand factors and the price of milk is not determined in accordance with traditional economic theory i.e. that the price of a commodity is determined by the interaction of supply and demand and that changes in supply and demand conditions will be resolved through price change and thus price accounts for everything.

The price of milk in China does not reflect the distillation of cumulative buying and selling forces in the market at any one moment, it is distorted by government price fixing, various national subsidies to farmers and manufacturers, the EC free milk aid program to 20 cities and the UN's WFPC donations to 6 cities, a virtual monopoly of the milk powder sector for recombined milk and infant formula production, and product scarcity necessitating liquid milk quotas. The availability of milk per capita in China ranges from 1.7 Kg in rural agricultural areas through 14.2 Kg in large and medium sized cities to 23.3 Kg in pastoral areas (the latter having large minority populations).

Relative prices also play an important role in *production* (supply) as they can give or take away incentive to local producers. In recent years in China, farmgate prices have not kept pace with the prices of other livestock products or with that of concentrated feed on the "free market". From 1984 to 1988 the farmgate price lagged behind that of other products by an estimated 12%. In 1988 price levels were too low to

sustain an expansion in the dairy industry and cow milk production has tended to stagnate and decline ever since (China Dairy Development Strategy Study Group, 1988 pp. 35-50).

Cost structure varies with the three different production systems (urban, rural pastoral and rural agricultural). Putting aside the rural pastoral areas, the cost of milk is greatly affected by the price of animal feedstuffs to the extent of 60% compared with about 40% in Europe. A major problem Chinese farmers face is the rapid increase in negotiated feed and fodder prices especially those for concentrates. An example of the effect of relative prices was demonstrated when in several cities the equivalent price of milk powder was higher than that of liquid pasteurised milk and this stimulated the production of milk powder.

Factors influencing local product supply include: price to producers, subsidies, investment by competing foreign suppliers, geographic and climatic issues and natural resources.

There are substantial regional differences in *prices paid to producers* and as aforementioned the farmgate prices have not kept pace with prices of other livestock products. Production costs have changed markedly over the last few years and there have been changes in distribution systems and rural institutions (Ma and Garnaut 1992, p. 8). In 1992, there was

a general trend to abolish price fixing for milk because of the difficulty in reacting adequately to these changes.

For any given level of production there is a close inter-relationship between *government economic policy* and prices required by farmers to produce that output. In China today, milk is perceived as a product of importance to health but as it has not been a traditional part of the Han Chinese diet there is a shortage of supply. Per capita income in China is also low and these facts have resulted in government subsidies being given to local producers and manufacturers. These subsidies take various forms e.g. :

- Dairy producers (large, medium or small) may receive a production subsidy based on the amount of milk delivered to milk processing plants permitting them to buy maize from state controlled feed mills.
- In some provinces e.g. Shanghai, some feedstuffs are provided free of charge on a proportional basis. State farms have first access to these subsidised supplies;
- Various subsidies including remission or reduction of taxes and land allocation are available to Chinese processing factories.

In 1988 the Chinese government began to withdraw subsidies on feed to dairy farmers.

Government policy for dairy factories is complex because management of the factories may be under a wide range of departments e.g. local government departments, or the

Departments of Light Industry, Agriculture or Commerce and Trade. In addition the Ministry of Agriculture owns the entire distribution for liquid milk. The Ministry of Commerce and Trade owns all local State shops and distributes all manufactured dairy products from dairy plants through their local shops.

A further issue is that governments often perceive the existence of domestic food processing industries as necessary for food security reasons. Current government policy uses tax incentives to encourage foreign companies to set up joint venture projects. The policy regarding infant formula milk powder and cheese is for import replacement by further joint venture projects.

Making agriculture the foundation of the economy is a key element to basic national policy. The plan of the Central Committee is for agriculture to achieve two major transitions by 2000: the transition from a self-sufficient or semi-self sufficient economy to a commodity economy, and the transition from traditional agriculture to modern agriculture.

In accord with government policy *investment by foreign companies* takes the form of joint ventures. These projects influence the volume of local supply of the product and often the products profit from the reputation of having a higher quality than the local ones and supply the upper end of the market. To date several European companies have set up joint

venture factories in China notably Nestle, Kraft, Danone and Wei Quan.

China's *geography* with its seven different *climatic zones and natural resources* is enormously varied as might be expected. However only 11% of land is capable of being cultivated so China is extremely poorly endowed with agricultural land per capita. Yet this 11% which comprises some 7% of the world's cultivated land supports more than 20% of the world's human population in almost all its needs for food and clothing (Sivin, 1988, p. 154). Two key factors make this achievement possible the availability of a huge labour force and the high quality of much of the cultivable land. About 50% of the agricultural land in China, mainly in the subtropical south, is of excellent quality. Much of the rest is fertile lowland which can produce good crops provided it is not affected by drought or flood. For example the loess plateau in the eastern steppe zone (Mongolia and Shanxi) needs little or no fertiliser and very little tillage, the only limiting factor is annual rainfall.

However, with the continuing increase in population and urbanisation, valuable land formerly used for agriculture is being diverted to housing. This can be countered with increases in production efficiency but not indefinitely and environmental issues are already posing major problems for China. Soil erosion due to destruction of original vegetation affects an area of 1.5 million square kilometres (He, 1991,

p.29). It has been estimated that since 1985 over 4.1 million acres of arable land have been lost every year. Industrial construction alone has claimed 1.5 million acres yearly while residential construction in the countryside took another 82,500 acres (He, 1991, pp.32-33).

The usual equation that consumption less local supply equals import demand does not easily fit with the present situation in China where *trade policy* is a major factor. In China, however, there is now a clear trend towards balanced trade with the trade surplus contracting from USD 3.81 billion in the last quarter of 1990 and USD 2.25 billion in the first quarter of 1991 to USD 1.42 billion in the second quarter of 1991. Import restrictions imposed in 1989 were relaxed in 1991 due to increasing pressure from countries such as the US and Japan both of which have huge deficits in their trade with China (DFAT, China Brief Dec. 1991 p. 34).

China's policy in general is one of import replacement and thus a preference for joint venture projects over foreign imports. However, imported dairy goods do reach China. They are still beyond the reach of the ordinary people because of their high price. Some think that this situation will remain for a long time or until the income of the Chinese reaches a threshold level (e.g. USD 1,000 per capita) or there is a reduction in import duties. Ma and Garnaut (1992 p.2) consider that the published World Bank estimates of the Chinese national GDP for 1990 at USD 370 should be adjusted

upwards by a factor of three. This would arrive at a GDP of USD 1110 possibly not too far off the required threshold level. If China is to gain membership of GATT, more liberalisation of trade is required which will reduce the price of imported goods.

In the market for dairy goods in China, Australia's competitors are the UK, the EC (Switzerland, Denmark, France, Holland, Germany,) and New Zealand. The author's personal experience with the activities of these countries is as follows:

- UK and New Zealand — very strong and forceful marketers of all dairy goods;
- Denmark and Holland — very strong in all types of cheese;
- Germany, Switzerland — very strong in yoghurts;
- France — strong both in cheese and yoghurts.

"It is evident that the determination of consumer demand is fairly complex and still not fully understood." (Bennett, 1992, p.242). This remark was made about market economies. The situation is even more complex with regard to China. However, it would seem that even with the predicted 12% increase in cow numbers the gap between the demand for dairy products and supply will increase as the economy develops. The decade to 1988 saw dairy consumption in China increase by 280% and occasioned a 53% annual increase in imported dairy foods. This situation will possibly continue to the year 2000.

7.2 Australia's Dairy Industry - Factors Influencing Ability to Supply the Chinese Market

Australia is classed as a mixed economy based on the free market system. However it has to contend with large companies which dominate many markets, strong trade unions and professional associations; and widespread government intervention in business. There is extensive government involvement in production (approximately 23% of the total), in redistribution of income, in regulation of activity in the private sector, in assistance and protection of many sections of the economy, and, by reason of its efforts to manage the level of production, in employment and pricing (Bennett. 1992, p. 27).

Australians have had very good luck with resources and a high standard of living. Now they have to find the means to sustain this. The only way is to globalize, to become much more market-oriented and to start offering professional services because they are very high value added (Bennett, 1992, p. 27).

Both major Australian political parties share the common aim of making Australia an open, competitive economy that can prosper as Asia's "odd man in" (The Economist, p. 7).

In line with its policy to make Australia "an outward-looking community, enmeshed with the dynamism of the Asia Pacific

Region", the current Labour government is committed to cutting the average tariff for most of its imports to 5% by 2000, compared with 20% when Labour won power in 1983 (The exceptions being cars, textiles, clothing and footwear.) (Rohwer, Odd man In, 1992, p. 9). Under these conditions, for Australian industries to remain viable it is essential that they become internationally competitive. The ability of Australia's dairy industry to supply the Chinese market depends greatly on this but also upon China's trade barriers to processed agricultural products (ABARE ARQ 1992, p. 570).

Factors which influence this ability to supply include: international trade policy and more precisely the outcome of the GATT talks, China's trade barriers, international trade blocs, the behaviour of Australia's competitors, likely changes in product and process technologies, likely trends in transport, physical and economic limitations to expansion of the Australian industry, and deregulation in the industry itself.

Perhaps the most vital factor for Australia is the successful outcome of the Uruguay Round of multilateral trade negotiations under the General Agreement on Tariffs and Trade (*GATT*) due to be concluded over the next few months.

In December 1991, Arthur Dunkel (Director General of GATT) in response to the continued failure of the negotiations, put forward a package of reform proposals which if implemented

would see a useful rise over the medium term in the prices of grain and other agricultural products of importance to Australia (ABARE, ARQ, 1992, p. 50).

The Dunkel package contains commitments for reductions in support to be implemented over six years from 1993 to 1999 in three areas:

- market access: Non-tariff barriers e.g. quotas to be converted to tariff equivalents and these tariffs to be reduced from the base level of 1986-88 by an average of 35% (minimum for each tariff line of 15%);
- domestic support: Total value of domestic support by trade distorting measures to be reduced by 20% from base level of 1986-88;
- export subsidies: Budget outlays on export subsidies would be reduced by 36% and volumes of subsidised exports by 24% from their 1986-90 averages.

(ABARE, ARQ, 1992, pp.197-199)

In January 1992, participating countries agreed that the Dunkel package provided a basis for completing the GATT negotiations. In May 1992 the EC announced a reform package for agriculture and the US has foreshadowed measures to move into effect in the first half of 1993. A recent study of the

benefits of a half-successful Round concluded that America would gain an annual USD 35 billion, Japan and Europe nearly USD 30 billion a piece and the rest of the world about USD 25 billion; a global gain of roughly USD 120 billion a year and these estimates are regarded as conservative (Freer Trade with Luck, The Economist, 1992, p.12).

Using the SWOPSIM world agricultural trade model recent estimates of the effects of liberalising trade in accordance with the Dunkel package, taking into account some of the limits that individual countries would like to see, include increases in the price of butter by 19%, of cheese by 29% and of milk powders by 24% (ABARE,ARQ, 1992, p.202).

The increase in the world butter price is caused by reduced exports from the US (about 45%) Australia (24%) and the EC (4%) (ABARE, ARQ, 1992, p.203). The reduction in US exports results from the required 20% reduction in internal support. This leads to a reduction in the internal US price and to a decline in domestic production and an increase in consumption. As a result, US butter exports decline by more than the 24% required under the export subsidy component of the Dunkel package.

Similarly the reduction in EC butter exports results from the reduction in internal prices which flows from the reduction in EC tariff equivalents. The reduction in domestic prices leads to a small increase in consumption and a reduction in exports.

This is despite the fact that the EC butter exports are already more than 24% below the average level for the 1986-90 base period.

For cheese, the increase in world prices results from a 24% reduction in exports from both the EC and Australia, combined with a 15% increase in US imports. The reduced exports from the EC and Australia result from implementation of the export subsidy commitments under the Dunkel package, while the increase in US imports arises from the required 20% reduction in domestic support (ABARE, ARQ, 1992, p.203).

A number of points must be taken into consideration when interpreting the results of this study:

- The analysis employed a static partial equilibrium modelling framework confined to the agricultural sector. Thus it needs to be kept in mind that:
  - No time path for agricultural commodity prices during the phase-in period (1993-99) could be estimated;
  - No account was taken of the impacts on production and consumption of changes in productivity and tastes over time; and
  - Developments in other sectors of the economy were not taken into account.

  The Uruguay Round reforms encompass resources, services and manufacturing and, if implemented, changes in these sectors would have an impact on

variables such as the overall rate of income growth, the exchange rate, the price level and the level of utilisation of various resources in countries which are participating in the Round. These changes would in turn impact on the agricultural sector of these countries. Conversely, changes in the structure of farm production and in producer incomes resulting from agricultural policy changes would also be likely to affect other sectors of the economy.

- No account is taken of the widespread changes occurring in Eastern Europe and the CIS which may result in prices, production, consumption and trade in these countries that are significantly different from those used in the study.
- Commodities in the model are assumed to be homogenous which might not be an accurate representation.

Agreement on the Dunkel package is far from the complete trade liberalisation that Australia has been striving to achieve but it is a move in the right direction. It would place binding constraints on the extent to which countries, particularly the EC, could protect their agricultural sectors and subsidise the disposal of surpluses on world agricultural markets. The potential increases in world market prices for agricultural products would be significant (ABARE, ARQ, 1992 p. 196). In fact, the largest increases in world prices are estimated to be for dairy products (over 20%) and grains (about 10%) with smaller increase for livestock products and other crops (ABARE, ARQ, 1992 p.196). The extent of these increases for

dairy products reflects the small size of world trade relative to production and consumption in major countries. Small policy induced changes in both production and consumption can markedly affect world import supplies and demand, thereby greatly affecting world prices. (ABARE, ARQ, 1992 p. 204). It is unlikely, however, that the Dunkel package will result in any immediate boost in rural prices but if agreement is reached to significantly reduce barriers to world agricultural trade there will be benefits for Australian agriculture over the medium to longer term.

China's trade barriers between the domestic economy and international markets were, to a large extent, set up by other nations. Prior to the early 1970s when the US and China began to normalise their diplomatic relations, the US has led many other Western nations in a general embargo on trade with China (Sicular, 1989, p.283). Today China's barriers include both tariffs and non-tariffs. Tariff levels are a major problem for countries seeking GATT entry but for China non-tariff barriers are an even greater problem. China applied to join the GATT in 1986 and hopes to be accepted by early 1993 but many think this is impossible (Goldstein & Baum, 1992, p.57).

In 1990, China had average ad valorem nominal tariffs on lightly processed dairy products of 52%, and on highly processed dairy products an average of 65%. In addition there is a wide range of non-tariff barriers which affect trade in agricultural commodities. Both types of processed foods are

affected by the fact that dairy products are controlled by the State Trading Monopoly. The Chinese government can influence production and imports through its procurement and pricing policies. The government controls producer prices through its own purchasing policies and it controls consumer prices through a rationing system. In some cases the government has subsidised consumers by selling domestically produced agricultural products to urban consumers at below world market prices (ABARE, ARQ, 1992, p. 581)

As already mentioned, procurement policies can be in the form of contract procurement under which farmers are requested to sell a certain portion of their output to the state at contract prices determined before planting or through negotiated procurement under which commodities are purchased from farmers at prices negotiated after harvest.

Imports to China can also be constrained by foreign exchange limitations.

Government pricing policies for agricultural inputs have both positive and negative effects on agricultural products in China. For example, credit is provided in some instances at concessional rates for infrastructure developments affecting agricultural industries, particularly for projects in poorer regions. This would have the effect of increasing production and reducing import requirements. On the other hand, state determined prices for chemical fertilisers and fuel generally

exceed world prices so have the effect of reducing production.

The conditions laid down for China's entry into GATT include a liberalisation of trade (which would speed up internal reforms) an end to copyright infringement and a freer system in general. China in its present transitional state to a market economy has requested extra protection from imports for its industries and plenty of time to tighten its slack system of intellectual property protection. It has allowed some liberalisation of foreign exchange controls and of foreign investment but still has a way to go.

In fact the benefits to China in joining GATT would be mainly political. It would represent an affirmation by the international community of China's reform process. On the economic side there are few benefits given that China's exports already enjoy most favoured nation (MFN) tariff status in all of its major markets (Goldstein and Baum, "Outside GATT's door, 1992, pp. 57-58). China has, in the view of the US, "a capitalist export regime and a socialist import regime". To allow China into GATT without regard to the principles of open trade would send false signals to other applicants such as the CIS and the Ukraine.

Trade groupings (blocs) are formed to facilitate freer trade between member nations. The two most common are free trade associations e.g. EFTA formed in 1959, ASEAN (1967) and LAIA (1980) and common markets e.g. the EEC (1957), ANCOM (1961)

and the Arab Common Market (1964). Recent alliances include ANZCERTA (1983) involving Australia and New Zealand and replacing NZAFTA (1965), MERCOSUR (1991) and the Free Trade Agreement of Central America (1992) (Cooke, 1991, pp.4-5). There are many bilateral agreements as well. This economic regionalism has only been possible because GATT in 1957, in contravention of its charter of laissez-faire economics, permitted the formation of the EEC which in 1993 will join EFTA to form the EU a grouping of 19 nations.

On January 1st. 1993 the ASEAN nations commenced a scheme of tariff cuts to continue for 15 years with a view to setting up the Asian Free Trade Area (AFTA). The key ingredient is to introduce a Common Effective Preferential Tariff of 5% for processed agricultural and manufactured goods made and traded within the grouping (Tigliao, 1992, p.50).

The recently formed NAFTA (1992) currently awaiting ratification before the US senate was a reaction to the action of the EC traders. NAFTA is a natural association of neighbours and is an enormous market stretching from Alaska to the Yucatan peninsula. Barriers to trade between the US, Canada and Mexico will be phased out over a period of 15 years (Awanohara et al., 1992, p. 50).

NAFTA is of paramount interest to all nations outside the NAFTA and EC blocs and it is hoped that the regional arrangement will lead to a global free trade one. EFTA and

ANZCERTA in fact have shown that regional groupings do stimulate trade and create pressures for further trade liberalisation (Hooper, BRW, 1992, p. 32).

In 1990, the Malaysian Prime Minister proposed a plan for an East Asian Economic Caucus (EAEC) which includes Japan and Korea but excludes Australia i.e. an exclusively Asian trade club (Arbouw, ABM, 1992, p. 125). Japan's response to EAEC was to say that it is not easy in a region as diverse as East Asia and that threats of trade blocs in other regions of the world made it imperative for East Asian co-operation to remain characterised by "diversity and openness" (Vatikiotis, 1993, p.11).

On the other hand, a regional free trade grouping based on the Asia Pacific Economic Co-operation Process (APEC) (1990) would have many advantages for Australia as nearly 70% of Australia's exports are absorbed by the APEC membership (Gill, Financial Review, 1992, p. 3). Australia has placed great emphasis on APEC which includes, in addition to the EAEC members, Australia and the US. APEC's focus is on :

- customs reforms,
- lowering administrative barriers to market access,
- developing data-bases on tariffs,
- pilot projects on electronic data interchange (EDI) and
- a guide to the investment regulatory procedures of member countries.

(Hooper, 1992, p.32)

Australian businessmen fear that trade blocs will divert commerce and investment away from the West Pacific and are especially concerned about the local content rules of NAFTA (62.5% of value of product must be local content for duty free access) (Awanohara, 1992, p. 73). Many feel that Fortress Europe and Fortress New World will leave Asia Pacific countries little choice but to band together in a defensive action and that it is essential for Australia's voice to be heard in APEC and her influence towards a free trading world continue to be heard. If this does not occur there is little future for her dairy producers in the long term.

The *behaviour of Australia's competitors* is also very important with regard to Australia's ability to compete internationally. The two major players in international agricultural trade are the EC and the US which practise, in the views of some people, "a lethal combination of protectionism at home and predatory pricing abroad". As Australia is now part of the global economy the actions of both these trading groups is of great importance.

With regard to the EC, after Britain joined in 1973, the high internal support prices and import barriers of the EC's Common Agriculture Policy (CAP) first squeezed Australia's food products out of a British market it had supplied for over a century and then started squeezing them out of third markets as well. Today, in an attempt to reduce their agricultural stockpiles, the EC dumps them on world markets at prices

subsidised to an extent which eliminates their unsubsidised competitors. This policy takes the form of the free milk program extended to China monopolising the milk powder market.

If the Dunkel package succeeds, there will still be considerable hurdles to overcome with regard to the EC. For example the EC does not define the tariff equivalent of its non-tariff barriers as the difference between its internal prices and world prices but adds a loading of 10% ("community preference") on top of its international prices in determining its base period tariff equivalents. This could result in a response to add "fat" into their own tariff equivalents by other countries.

At present the CAP is under pressure from two sides: the farm lobby will not allow the EC to lower guaranteed prices but equally budgetary pressures mean it can no longer afford unlimited spending (Carr, 1992, p. 17). The compromise is to maintain prices but to restrict volume of production on which those prices are paid. Quotas for milk (and sugar) already exist. This legislation, however, does not destroy the capacity to produce and as productivity improves the original dilemma returns and the government must either tighten the constraint more or reduce the price. The EC also has to contend with the emergence of Eastern Europe and the desire of many of the recently independent members to join the EC.

When the Eastern block countries became independent and

abandoned collectives some concessions were extended to them from the EC. However, many people fear that the EC will dump products in Eastern Europe hindering the recovery of their agricultural industries. They also believe that Europe's recent CAP reform is almost unworkable in the extra supervision of farmers that it demands (Carr, 1992, p. 13). Prior to World War II, the Ukraine was Europe's granary. Its soil and the density of its population today put it on a level with the North American prairies. Because farming is usually one of the first industries to return to health after economic collapse, the rest of Eastern Europe may also be hoping to export farm produce (Carr, 1992, p. 17).

With regard to the developing countries, the effect of trade liberalisation by the EC may be summarised as follows: in terms of equivalent income, consumption and number of people hungry, they lose whereas the developed countries gain (Goldin and Knudsen, 1990, p.233)

In Russia about one-third of farm output goes to waste because distribution is inefficient (Carr, 1992, p. 17). Instead of posing a threat as a competitor, at present there is a continued deterioration of the CIS economies. The former USSR traditionally accounted for about 50% of the world's trade in butter. The financial crisis which has enveloped the region has reduced CIS purchases and imports have only occurred in the form of aid. In the long term, with reform and released from EC dumping the CIS should become not only self-sufficient

in food but has the potential to be able to export.

With regard to the US, it has an Export Enhancement Program (EEP) under which it can "out-subsidise the EC on grains"! It has also shown itself to be determined to stave off the threat of open markets for its internationally uncompetitive farmers which include dairy farmers (Odd Man In, The Economist, 1992, p. 14)

Australian exports of dairy products to the US are limited by quotas and Australia exports very little dairy products to either the US or Mexico. Australia does not compete with the US in the Mexican market for farm products to any significant extent (although it does supply beef and sugar to the US market as does Mexico but the quantity of exports from Mexico is relatively small). Mexico is a net importer of dairy products (principally butter and cheese) (ABARE, ARQ, 1992, p. 362). The effect of NAFTA will be that whereas trade in agricultural products between the US and Mexico is likely to increase significantly it is likely to have only a small effect on world agricultural prices and trade.

A unilateral trade liberalisation by the US would result in a substantial change in the trade pattern of dairy products. The US becomes an importer and the export share of the US is largely gained by the EC and by New Zealand the latter exporting an additional 1.3 million tonnes of dairy products (Goldin and Knudsen, 1990, p.235).

There are also other participants in global agricultural trade which will be affected by a successful outcome to the GATT, e.g. Argentina, which should also be taken into account.

Farm protection which exists in both rich and poor countries, is so intricate and pervasive that it is not easy to work out who pays how much to whom (Carr, 1992, p.5). Since the 1980s, modelling of farm economies using computers has been most valuable in transforming the debate about subsidies. The studies differ but all agree that the cost of protection is high and getting higher (Carr, 1992, p.7).

In their study of opportunity costs, Anderson and Tyres found in Australia, for example, that for every dollar reaching producers 37 cents are wasted. This, when extrapolated world-wide, amounts to $60 billion of waste for developed countries. This waste occurs because food is being grown in the wrong place, with a needlessly expensive mix of land, labour and agri-chemicals (Carr, p.7). If poor farmers are the real target for subsidies, the waste is even greater. The poorest third of farmers produce only a tenth of the output, so most of the money that reaches farmers falls wide of the mark. Less than $1 in $10 reaches needy farmers. Because payment is linked to production, the rich collect enormous sums from the state.

Studies by the Centre for International Economics in Canberra tried to look at the effects of farm policies on employment

and wages in the rest of the economy e.g. if money spent on farm policies were injected into the most profitable part of the economy or if money was taken from inefficient industries and given to efficient farmers. They estimated that if the CAP policies of the EC were abolished, 2 million more jobs would be created (Carr, p.8). Not everyone agrees with the figures but in the view of Carr, "their message is indisputable: farm policies have effects that are large enough for consumers, companies and the unemployed to care".

Future trends in product and process technologies will also influence Australia's ability to compete internationally. Australia's traditional emphasis on agricultural research has been and will continue to be of great value to its farmers.

Traditional dairy product lines (milk, butter and cheese) are readily recognisable by consumers. However with process technologies increasing, dairy products are used in numerous industrial products which include for example:

- detergents and cosmetics (whey protein concentrates),
- fertilisers, fermentation of alcohol (liquid whey),
- plastics (buttons), stabiliser for rubber tyres (casein/caseinates),
- mirror silvering, toothpaste (lactose),
- pharmaceutics (peptides and lacto-ferins), and
- food preservation (lactoperoxidase and lacto-ferin).

The future direction for value-adding to milk and milk products lies in its fractionation which yields a range of products with high value in specialised markets (Dionysius, 1991, pp. 88-89). In addition, dairy cows are seen as an ideal animal for use as recipients (transgenics) for genetic engineering purposes. In this case the cows produce proteins which can be purified from the milk.

Future trends in transport and infrastructure capacity are important to servicing a market. In Australia a decline in infrastructure has become a big obstacle to the country's drive to become internationally competitive and create an export oriented economy (Stevens, 1992, p. 80). Since 1985 the freight moved around Australia by sea has declined from a high of 32 million tonnes to 28 million tonnes. Freight moved by rail has grown steadily from 7 million tonnes to 11 million tonnes whereas the trucking industry carried an estimated 15 million tonnes in 1991.

Of the three modes of transport, sea and rail are limited by restrictive union practices especially on the waterfront and by lack of investment in infrastructure particularly in rail. The trucking industry alone has been flexible with the introduction of new technology, the employment of logistics consultants and the installation of computerised warehousing systems (Stevens, 1992, p. 83). Recently the federal

government allocated AUD 600 million for rehabilitation of the national road system over the next two years.

As already mentioned, in China at present, the transport infrastructure is under enormous strain and despite government action this situation is likely to remain for some time to come. A major constraint is the availability of transfer and storage facilities and logistical problems in moving agricultural products to markets. (Tyrchniewicz et al., 1987, p. 267).

China's present infrastructure projects include:

- a new airport at Shen Zhen (30 km north of Hong Kong) (Westlake, 1992, p. 58);
- a doubling of handling capacity to 1.25 billion tonnes at sea ports by 2000;
- building an extra 9,000 km of inland shipping channels (Yu, 1992, China Economic News 34, p. 3);
- a quadrupling of the road mileage by the year 2000 (Yu, 1992 (34), p. 3);
- Hutchison Whampoa has recently acquired 50% share of Shanghai's container terminals and plans to build new ones needed to keep up with expanding foreign trade (USD 1.1 billion over 8 years) (Goldstein, 1992, p. 60);
- Guang Zhou recently has a new bonded area, six more are to be built in China (Li, 1992, China Economic News 29. p. 2)

In addition two Beijing backed corporations (CNAC and CTS) will acquire a 10% stake in Hong Kong's Cathay Pacific in which China's CITIC already holds 12.5% (Kaye, 1992, p. 49).

Ocean shipping is said to be on the verge of a new era of innovative technology with the development of the "Yamato 1" or "Rocketing Whale" the world's first ship powered by super-conducting magnets a concept as revolutionary as the invention of the first steamship. For example it is predicted that this will cut the Tokyo-Los Angeles crossing to 42 hours (Revolution on the High Seas, Asia Inc, 1992, Sept, p. 10)

Another future entrant on the scene is the Russian boat-plane, originally designed for military purposes, it is an enormous aircraft which cruises at very low altitudes just above sea-level. It has extensive capacity and the potential to make a major contribution to freight services.

However, with regard to air freight, airport hubs in the Asia Pacific region are already under enormous pressure. IATA thinks that only two (Singapore and Taipei) of the seven major airport hubs will be able to cope with future expansion and the rest will suffer from growing log-jams of passengers and planes (Westlake, 1992, Sept. 24, p. 86)

Doug Shears of ICM Australia and a member of the Agri-Food Council, a body set up by the federal government in July 1992 to boost the export skills of Australian food makers and

promote the marketing of Australia in Asia, says "If Australian food manufacturers are serious about going offshore they must develop an infrastructure overseas in terms of distribution, packaging and marketing, etc." (Shoebridge, BRW, 1992, Oct.23, p. 28). In short, China's infrastructure is a major hurdle for product distribution.

Physical limitations to Australia's ability to supply export markets should also be taken into consideration. In 1836, Charles Darwin wrote of Australia's fragile agricultural soils and predicted that: "Agriculture, on account of the droughts, can never succeed on an extended scale: therefore so far as I can see, Australia must ultimately depend upon being the centre of commerce for the southern hemisphere, and perhaps on her future manufactories." Andrew Campbell (1991, pp. 1-2) stresses that "The inherent productivity of much of our farmland is very low." However Australia enjoyed enormous prosperity from her agriculture in the 1950s and 1960s. Only now in the 1990s the extent of the impact of inappropriate European systems and the long-term cost have been made aware to policy and decision makers in Australia and sustainable development is now a catchphrase. Even so the pressure of intensive practices in agriculture must always be kept in mind when future projections of ability to supply markets are made.

The Australian farming community is well-educated and has been exposed to real market forces for a considerable period of time. The acceptance of sustainable treatment of the land is

being now imposed upon them and there has been and will continue to be rationalisation in the industry. One of Australia's marketing strategies is to stress its green image. This is most justifiable and appropriate as there is now environmental awareness amongst consumers and heightened concern about food safety (Tyers and Anderson, 1992, p. 315). On the other hand, in other parts of the world, there is every sign in the opinion of some that environmentalism will become the next pretext for protecting farmers. It will keep trade barriers standing and it will make a mockery of economics by subsidising farmers not only for environmental services that would exist in an unsubsidised world, but also for polluting less (Carr, 1992, p. 18). Thus the environment may be a double edged sword.

In the long term, the prime *economic limitation* to the ability of Australia's farmers to supply markets is the level of farm income. At the moment the macroeconomic indicators of 1990-91 and 1991-92 are encouraging. They show a major reduction in inflation (from 5.3% to 1.9%) and short and long term interest rates (12.2% and 12.1% respectively down to 8.1% and 9.9%) and a turn around in the growth of real GDP (-0.5% to 0.2%). This was against a background of almost identical trade weighted indices (58.9 and 58.2). The effective exchange rate was 86.6 in 1990-91 and 83.5 in 1991-92 and the domestic price index 149.1 in 1990 and 154.5 in 1991-92 (ABARE, CSB, p. 11).

In the period 1990-91 to 1991-92, the Australian trade balance

on goods and services increased for imports from AUD 65,522 million to 67,395 million and for exports from 65,379 million to 69,034 million. The current account balance decreased from AUD -15,629 million to -11,861 million. The terms of trade decreased from 101.5 to 99.4 (ABARE, CSB, p.15). However, for a population of 17.2 million, foreign debt climbed from AUD 137,210 million in 1990-91 or 36.3% of GDP to AUD 150,050 million in 1991-92 or 39.0% of GDP (ABARE, CSB, p.15).

The Australian economy is predicted to strengthen during 1992-93 with inflation remaining low because of the presence of excess capacity. The AUD and prime interest rates are presumed to remain around current levels for the period 1992-93. The overall economy is assumed to grow by 0.7% in 1991-92 and 4.8% in 1992-93, a remarkable turn around. The short term outlook for the world economy is very uncertain with the major economies being at critical turning points. However, the world economy is assumed to recover slightly in 1992 buoyed by continual strong growth (around 7%) in 1992-93 in South-East Asia. (ABARE, CSB, p.12)

In Australia, the value of rural exports is forecast to rise further by 5% to AUD 15.5 billion nearly AUD 680 million more than in 1991-92.

Over the period 1990-91 to 1991-92 farm costs in Australia fell from AUD 20,111 million to AUD 18,994 million (preliminary figure) and the net value of farm production

increased from AUD 1,023 million to AUD 1,473 million. The price index received by farmers for market milk increased from 114 to 120 and for manufacturing milk from 111 to 116. The total number of dairy cattle decreased from 2.43 million to 2.41 million (preliminary figure) and for dairy cows specifically from 1.637 million to 1.629 million. Australian statistics are also not easy to interpret at times as e.g. the manner of calculating the figures in these two financial years differs (ABARE, CSB, pp.23 and 79). Production of whole milk increased from 6,403 ML to 6,732 ML and manufactured dairy products, except for reduced milk, all exhibited an increase in production (ABARE, CSB, p.82). Consumption in Australia showed a notable increase for WMP (from 12.4 kt to 16.0 kt) and SMP (from 37.7 kt to 40.7 kt). Export prices FOB for the same period for butter rose from AUD 1811/tonne to 1921/tonne and for cheese from AUD 3203/tonne to 3317/tonne (1991-92 figures are preliminary) (ABARE, CSB, p.79).

In Australia, total farm costs are forecast to increase by about 3% to AUD 19.6 billion in 1992-93 with new investment in plant and structures expected to be 10% higher than in 1991-92 (ABARE, ARQ, p.167) In contrast, farm income is forecast to rise by only 2%. Farmers' terms of trade in 1992-93 are expected to be little different from their relatively low 1990-91 and 1991-92 levels. (ABARE, ARQ, p.5). Nevertheless, because of a forecast rise in volume of rural production in 1992-93, especially in the Queensland and northern NSW grain belt, aggregate net farm cash income in 1992-93 is forecast to

rise by 27% to AUD 4.45 billion. Taking into account depreciation of farm capital equipment, the net value of farm production, of which dairy products represent about 6.5%, in 1992-93 is forecast to rise by nearly AUD 1 billion to AUD 1.7 billion (ABARE, ARQ, p.9).

In the late 1980s, there were significant moves towards *deregulation of Australia's dairy industry* though even in 1991 there were still important quota and price support schemes in the various states. These changes, centred on supply restrictions, kept up the price of milk (by a decreased amount) but not the price of dairy produce such as cheese. (Bennett, 1992, p.366) All states have limited milk support schemes and the export prices for dairy products are also underwritten by the Commonwealth government. In effect, milk prices underwrite the returns for cheese and other dairy products on both the domestic and international markets. Due to falling farm incomes in 1990-91 the federal budget allocated AUD 146 million to subsidise the dairy industry. In 1991-92, despite the prolonged drought, the government proposed to reduce the AUD 2.4 billion assistance to Australian agriculture and pastoral industries to AUD 1.9 billion. These funds were spent on general measures such as water development, land development, produce inspection services and a variety of other specific measures.

In the opinion of Mr Ian Langdon, chairman of the Australian Co-operative Foods, "one of the greatest hurdles which has to

be overcome is the cocooning of our agricultural sector in co-operatives". (Goodward, 1992, p.9). According to Mr Raymond Bennett (1992, p.370) if Australia is to cope with the world economic conditions, reform changes should include the following:

- Artificial schemes that support the dairy producers should be reformed and completely abolished;
- Government subsidies need either to be phased out or at least made more public and have a sunset clause in them;
- The transport, handling and distribution system for farm produce needs to be dramatically overhauled and made more efficient;
- Much more effort needs to go into developing new products and markets, in particular very high quality cheese, etc.;
- The most important problems facing agriculture - soil erosion and water supply misuse - need to be urgently addressed since other crises about markets and costs become irrelevant if the means of production are lost;
- The efforts by the government in recent years to lower tariff levels have gone part - but only part - of the way to reducing the cost-price squeezes faced by Australian farmers. More needs to be done; and
- Australia's farmers need special loans and financial assistance if they are to adjust to the new conditions.

In the long term, support schemes largely based on supply quotas will soon almost completely be eliminated and even

import restrictions totally lifted. This could mean that within a few years most of Australia's milk will come from New Zealand (Bennett, 1992, p.366).

Taking all these factors into account, it is difficult to forecast more than in the short term the prospects of the Australian dairy industry. In summary, the successful outcome of the Dunkel package for the GATT talks is vital for a less costly international food economy. China's agricultural land area is finite and her trade barriers will not be able to be maintained once she has achieved GATT membership. However, Australia's agricultural land is fragile and much less able to support increased production demands than that of most of her competitors. The various geographical trade groupings will hopefully first promote freer exchange between members and eventually lead to the adoption of an international free trade market in food products. This cannot be achieved in the short term, even for NAFTA with just three member countries the time scale is 15 years. Australia's proximity to East Asia is an advantage and her membership of APEC and new trends in transport will assist in access to Asia however the trans-Siberian rail line is an equal facility for the Europeans. Australia's ongoing reforms within the dairy industry and microeconomic reform (labour market, transport sector, electricity generation, etc.) will be important in enhancing the competitiveness of the food industry. New products and product technologies are well within Australia's capabilities and with her newfound awareness of the complexities of the

international scene, the value of sustainable agriculture and the necessity for adaptability, the Australian dairy industry will, the author believes, be capable of meeting the exigencies of the world market in the future.

7.3 Forecasts for the Dairy Industry - Australian and International

Although China has a continuous history of more than 5000 years and a vast population of 1,200 million people, the Chinese dairy industry is still in its infancy. In 1990, milk production in China totalled 4,300,000 tons being an average milk production per capita of a mere 3.5 kilograms per year (China's Yearbook, China's National Statistic Bureau, 1990, pp. 65 & 87).

In contrast Australia, to which cattle were only introduced 200 years ago and with a population of only 17 million, possesses a well-developed dairy industry. In 1990, milk production in Australia totalled 6,413,000 tons and average milk production per capita was 377.2 kilograms, more than 100 times as much as Chinese consumption per capita. The dairy industry is Australia's third largest agricultural industry in terms of wholesale value with a total revenue of over AUD 4,000 million, some two and a half times its farmgate value. This illustrates the dairy industry's pre-eminent position as a value-adding rural industry in Australia.

These figures indicate that China is, and will continue to be, a major potential market for Australian dairy produce, and taking into consideration factors already discussed, that demand should escalate over a protracted period.

Forecasting market trends is both an art and a science. Formal methods of forecasting include fundamental analysis which relies on analysis of a country's economic fundamentals and technical analysis which is based on the historical trading action of a market itself (Brown et al., 1989).

There are four valuable publications regarding forecasts for the dairy industry which include Australia and the international scene. They are:

- ABARE's Agricultural and Resources Quarterly, 1992;
- Ma and Garnaut, How Rich is China: Evidence from the Food Economy, 1992;
- Tyers and Anderson, Disarray in World Food Markets, 1992; and
- Roningen et al., Agricultrural Outlook for the year 2000: some alternatives, 1989.

ABARE uses the general EMABA (Elasticity Modelling Australian Broadacre Agriculture) Model which incorporates Australian macroeconomic indicators (population, exchange rates, etc.) and livestock numbers, crop prices, current production levels etc.. In addition to current figures, historical data and trends, other factors e.g. existing weather conditions, are

entered into a spreadsheet. Information of the international scene is taken from historical data in publications such as Agri-Europe, OECD statistics and IDA (International Dairy Association). Finally individual analysts use their own judgement to reach the final forecasts. Short term forecasts for the dairy industry by ABARE, ARQ, are as follows:

The international scene: Good seasonal conditions in most dairy regions are likely to result in a rise in domestic production in 1991-1992. The improvement in world dairy product prices seen so far in 1991-92 is expected to be maintained in 1992-93. The SMP and WMP prices are forecast to average USD 1535/t and USD 1530/t respectively in 1992-93 representing increases of just over 10% for both products from 1990-91 prices. WMP and SMP consumption have risen as a result of aid packages and increased use of SMP as calf feed. In addition to renewed strong demand, declining production in the EC and Eastern Europe has meant that world prices have strengthened. Further declines in milk production are forecast for these regions in 1992-93 (p.20).

For the Australian domestic scene: Market milk prices are forecast to rise in 1992-93 by 2% to 44.3c/L. Depending on how they are calculated, manufacturing milk prices are forecast to rise slightly to 22.6c/L (p. 158) or by a significantly higher 6% to 25c/L (p. 319) in 1992-93 after rising by almost 5% in 1991-92. The increase in manufacturing milk prices in 1991-92 was a direct result of price

improvements on world markets due largely to the decline in EC production, and a firmer domestic and export demand for most products, and in particular milk powders. However, world stocks of butter remain high enough to dampen price rises (p. 158).

Australian milk production is estimated to have reached 6,600 ML in 1991-92 a rise of just over 3% from 1990-91. This is the highest level of national production since 1973-74. Most of the increased production was channelled into the export market which boosted export earning in 1991-92. Unless the exceptionally favourable seasonal conditions experienced since November 1991 are maintained, domestic milk production is forecast to fall in 1992-93 and value of dairy exports to decline by 5% to AUD 779 million (p.158)

The availability of manufacturing milk is expected to fall by about 4%. Domestic demand for manufactured products is likely to remain steady in 1992-93. Butter sales are likely to decline because of the continuing trend towards lower fat products but cheese sales are expected to improve slightly despite strong import competition especially from New Zealand. Liquid milk sales are forecast to rise by around 1% to 1785 ML in 1992-93 (p.319).

Australia's export prospects: Prospects for most exported dairy products are favourable especially for milk powders. Reduced availability of product for export from drought

affected northern hemisphere producers (Germany, UK and Denmark) coupled with the seasonal supplies from Australasia are expected to lead to improved milk powder prices in 1992-93. Prices for SMP are forecast to average USD 1780/t in 1992-93, 16% up from the average in 1991-92. The concurrence of stronger world prices and a lower value of the AUD is likely to more than offset the expected decline in exports resulting from lower milk production in 1992-93. Hence the value of the Australian dairy exports is forecast to rise by 13% to AUD 902 million in 1992-93 (p.319).

With regard to the Chinese economy, *Ma and Garnaut* (1992) in their attempt to rationalise conflicting data, focus on China's per capita income, one of the most basic economic indicators. They take into consideration other key economic and social variables such as demography, trade and consumer durables, and point out that China's subsidised health care and public housing further complicate income measures of GNP, as do self-constructed housing in rural areas.

Ma and Garnaut (pp.3-7) emphasise convincingly that China's GDP per capita figures need revision upwards by a factor of approximately three. They base their approach on the following points:

- mismatch between income levels and life expectancy,
- high export share of GDP, and
- ratio of real purchasing power to GDP.

They raise doubts about the whole statistical basis of the understanding of China's growth performance in the era of reform asking : "Have the economists of the IMF, the World Bank and the world's main centres of scholarship been duped...?" Ma and Garnaut (p.7) state that consumption quantities of food are a more reliable measure of the standard of living than GDP especially in developing countries. In China, growth rates in consumption of many food products do not accord with published growth rates of incomes. Ma and Garnaut (pp.9-10) base their analysis of per capita food consumption on a comparison with Taiwan in the 1960s revealing that China's late 1980s figures relate to Taiwan's level of the mid-1960s. This upward adjustment of China's GDP would make it the world's fourth largest economy a touch behind Germany with a foreign trade ratio about two thirds that of the US with both output and foreign trade ratio rising rapidly (p.13).

In their 1987 publication (p.197), *Anderson and Tyres* made a considerable contribution to the rationalisation of Chinese data and forecasts for future agricultural trade. They used a simulation model of the international agricultural economy to project the impact of economic growth in China on world markets.

Assuming an annual population growth of 1.2%, real national income growth of 6.3% annually and real domestic prices at the levels of the early 1980s, the model projects among other

things that dairy imports will rise from negligible levels to almost 8 million tonnes a year. Assuming no impact on world prices, these combined agricultural imports would require 4% of the Chinese GDP by 1995 compared with 2% of the GDP in the early 1980s. Such a large increase in import demand would raise world prices unless there were compensating changes elsewhere in the international agricultural economy e.g. in the US and successful reform in the USSR.

In their most recent publication (1992), the authors underline the distortions in world food market figures and stress the short-comings of multi-commodity models employed to capture the interaction in production and consumption between the traded food staples under consideration (p.156).

Tyers and Anderson review agricultural models to date as follows (1992, p.157): "Usually the general equilibrium (GE) model of the world economy, the type used by Whalley (1984) is typically short on commodity detail and hence represents only crudely the commodity interactions within sectors such as agriculture. In the model used by Loo and Tower (1989) for example agriculture is one undifferentiated sector. Burniaux et al. (1988) devised a model with two sub-sectors for agriculture plus three processed food sectors within manufacturing. This economy-wide model was adopted by the OECD. Another earlier GE model with two farm sectors each producing multiple products (Burniaux and Waelbroeck, 1985) had each of the divisions within these two sectors based on

the assumption that elasticities of transformation are constant across all pairs of products (pp. 156-157).

"In addition to the GE models, there are several partial equilibrium models of world food markets which incorporate considerable commodity detail. These include Zietz and Valdes (1985) from the International Food Policy Research Institute, Ronningen (1986) from the US Department of Agriculture, Parikh (1988) from the International Institute for Applied Systems Analysis and the OECD model (1987) from the Agricultural Directorate of the OECD Secretariat" (p.157).

While Tyers and Anderson draw on modelling results to provide an indication of the possible price and quantity effects that China's growth (among others) may have in the 1990s, they have sought to improve the previous models by incorporating production uncertainty characteristic of agricultural markets, risk-spreading agents such as stockholders and a differentiation between short-run and long-run responsiveness of agents e.g. farmers. A welfare analysis is also included in the model.

The model is restricted to major traded food staples (wheat, coarse grain, rice, meat of ruminants (cattle and sheep), meat of non-ruminants (pigs and poultry), dairy products and sugar). These seven commodity groups account for about half of world food trade and one tenth of global trade in all commodities. The model is a partial equilibrium one but its

special features include notably:

- global coverage (30 countries);
- incorporation of cross-effects in both production and consumption between interdependent markets;
- two models, a dynamic mode and a static equilibrium mode;
- stochasticity (randomness) in that production uncertainty is included via probability distributions associated with each commodity's production levels;
- stockholders' behaviour (empirical analysis of public and private stock level responses to prices and quality changes);
- policy e.g. price transmission equations are used to incorporate the two key features of each country's food price policies (protection and insulating components) (p.158).

Their chapter on "Economic Reform in the Centrally Planned Economies" is qualified as "The Great Enigma". These countries (which include P.R. China) in the mid-1980s accounted for more than one-third of world food production and consumption and one quarter of world food imports. They thus play an important role in the world food economy and changes in their policies can impact significantly on world markets for farm products. These economies have traditionally discriminated heavily against their agricultural sectors, particularly by setting producer and consumer prices of food relative to industrial products well below international levels (measured at shadow exchange rates) (p.274). These two

authors (1992, pp.274-276) state that: "Unfortunately, it is not possible to estimate even roughly the effects of the policy distortions in the CPEs for several reasons:

- Numerous prices often operate simultaneously with restriction on inter-regional trade enabling prices to differ also across regions within a country;
- Quantitative restrictions affect producer and consumer activities much more in these than in other economies e.g. food queues at food shops are a clear manifestation of rationing on the consumer side;
- The currencies of these countries are typically not convertible and the official prices for foreign exchange are usually grossly overvalued;
- Gross distortions to prices and qualities in markets for non-food products to the extent to which agriculture is discriminated against (or favoured) is even more difficult to ascertain than in developing countries.

"Thus to say the very least, modelling the response of agents to price or policy changes in these countries is somewhat problematic."

Despite this, Tyres and Anderson (1992, pp.282-288) apply their world food model to China under various assumptions and two different growth scenarios. Their conclusions are as follows:

If real incomes per capita grow at the conservative rate of

4.3% per year between 1986 and the end of the century the regression equations project agriculture's shares of employment and GDP to fall to 50% and 25% respectively. However, if a growth rate of per capita incomes of 7.7% is maintained agriculture's shares would be as low as 43% of employment and 20% of GDP. This implies that real agricultural GDP would grow at 2.8% (conservative scenario) or 4.4% (optimistic scenario).

The four specific assumptions for the optimistic scenario as compared with the conservative one for the 1990s are:

- national output and hence income to grow 50% faster;
- food productivity growth to be 50% faster (except for rice);
- population to grow at a slower (1.3% p.a.) rate than 1.7% p.a.;
- the proportion of livestock grainfed to be somewhat higher.

In both scenarios real domestic food prices in the 1990s are presumed to remain unchanged from their 1990 level. The impact made by faster growth on China's food economy would be considerable. Overall self-sufficiency in the seven food groups is projected to continue its decline of the 1970s and 1980s to 90% by the year 2000 in both scenarios. The projected effects of faster economic growth in China on international food prices would be higher (by 3%) in the optimistic scenario.

"In conclusion, the development of the Chinese economy is almost certain to lead to an increasing demand for food (and especially feed) imports, during the next decade and beyond. These demands will become even more pressing as industrialisation proceeds rapidly and the government lags behind in allowing domestic food prices to rise towards international levels." (p. 294)

It seems likely that agriculture will become a relatively much smaller part of a growing Chinese economy contributing by 1995 perhaps only three-fifths of employment, one quarter of GDP and one-sixth of exports (excluding some "processed agricultural exports"); and that China's importance in world agricultural exports will grow little in aggregate, while its importance in agricultural imports will more than double during the 1980s (1987, p.130).

With regard to policy implications for industrial countries like Australia, liberalising their agricultural policies as is the policy of the GATT Uruguay meeting will not only reduce the enormous cost of present protectionist policies but also encourage developing and centrally planned economies to reform their policies (1992, p.308).

In the view of these two authors, formerly centrally planned economies have much to gain from opening up and relying more on markets than planning. Even if they were to become large importers of food as a result, as would be the case in the

optimistic scenario for China, the impact on international food prices and hence on per unit price of their imports need not be very large due to the flexibility of the world food market even in the presence of current insulation policies. For this to happen, however, two sets of assurances might be sought by such countries as they embark on their economic reforms: one is that food exporting countries agree not to use food export embargoes as a political or economic weapon and the other is that industrial countries' markets be open to the exports of these reforming economies; without the latter, they would not have the hard currency to purchase imports from the West (p.310). In other words, the best of all possible worlds.

Further comments on the outlook for agriculture in the year 2000 are furnished by *Roningen et al.* (1989 pp.615-626) whose conclusions are as follows:

The secular decline in real agricultural prices that we have observed over the last few decades will continue to the end of the century the exceptions being that of ruminant meat and dairy products whose prices will rise slightly. (This will be due to the high income elasticity of demand for animal products and the rapid population and income growth in most developing countries (p.619)). This trend, however, could be reversed under two conditions: a breakthrough in GATT negotiations that could lead to substantial policy reforms in developed countries or accelerated economic growth as occurred

in the early 1970s.

The picture for the developing countries over the next decade is problematic. Rapid increases in population are likely to create expansions in demand that would outpace growth in supply, increasing developing countries' food import costs. Small changes in population are not likely to change the outlook substantially. Self-sufficiency in agricultural products for developing countries would be lower in the year 2000 (p.620). Their projected growth in supply would be unable to keep up with their expansion in demand.

These countries, however, would be better off if developed countries liberalised their agricultural policies. If developed countries multilaterally eliminated all assistance to agriculture and liberalised their agricultural markets by the year 2000, they would gain nearly USD 27 billion annually (pp.620-622). Their farmers would suffer real income losses because increases in prices would not be sufficient to compensate for the loss of government assistance. However, developing countries would be more self-sufficient in agricultural products and would improve their agricultural balance of trade substantially (p.623).

They note that trade liberalisation and changes in economic growth influence world agriculture much more than slight changes in the assumed rate of population growth (p. 625).

7.4 Summary of Findings of this Study

In this study data prior to 1990 are official figures as are some projections. For others fundamental analysis and technical analysis of both price change and volume of transactions using historical trading, trends and weighted averages were used. In addition, due to the complexity of the topic and the uncertainties of virtually every factor examined, the author has included experience gained from field research, personal communications with leading figures in the industry, and first-hand knowledge of the market's practical reality.

In 1992 China was Australia's second largest food export destination.

By the year 2000, it is estimated by the MOA that:

- China will have increased her dairy herd to 5,500,000;
- The number of privately owned dairy farms will have increased by approximately 8%;

Basing projections on various ratios of farmgate to retail price, the following proportions of the dairy market segment in the year 2000 were obtained:

· liquid milk	40.00%
· milk powder	32.00%
· butter	0.58%
· yoghurt	8.50%
· ice-cream	1.50%
· whey powder	1.86%
· cheese	3.10%
· condensed milk	2.90%
· dairy food ingredients	9.56%

In a similar manner, per capita consumption estimates were as follows:

. liquid milk	2835.07g p.a.
. milk powder	2268.06g p.a.
. butter	41.11g p.a.
. yoghurt	602.45g p.a.
. ice-cream	106.32g p.a.
. whey powder	131.83g p.a.
. cheese	219.72g p.a.
. condensed milk	205.54g p.a.
. dairy food ingredients	677.58g p.a.

These per capita estimates total 7,087.68g per annum. Based on present conditions and assuming a static population of 1.2 billion this figure gives a total domestic consumption of 8,505.216 g per annum in agreement with the milk production estimate of 8,505,210 tons (Table 4-1-10). However the estimates are based on the same data and do not take into consideration the fact that there is currently a scarcity of liquid milk in China, that GDP per capita is rising, that the Western food fashion is becoming more and more popular and that the population is not static but increasing, and so there will be, as now, a shortfall in product available which will be met by imports.

In the opinion of all the people interviewed in the course of this research, China will continue to invest in her present system of intensive dairy farming. This will involve cattle breeding programs with careful genetic selection and artificial insemination techniques. This program will include not only semen straw imports but also live cattle including dairy cows and Australian Friesian Sahiwal (AFS) breed stock.

Intensive dairy management relies on vast quantities of grain and fodder crops in which Australia can act as a prime supplier. Feed

additives will become increasingly important as management becomes more aware of their potential. Australia is also eminently able to provide these.

There will be a strong market for milk handling equipment, such as milking machines, refrigerated milk vats, pumps and milk tankers which Australia is well placed to supply in this expanding market.

Increased dairy consumption will also require the establishment of an increased number of small processing factories. This will give rise to a strong market for milk processing machinery. Much of this market will be able to be provided by Chinese local light industrial plants or joint venture plants. However Australia could participate, even now, and achieve a market share.

As management increases in expertise, quality controls will assume a more important role. Laboratory equipment and facilities will be required and there will be a big demand for milk analysis, antibiotic detectors and pollution indicators.

With regard to final products, Australia already exports UHT milk, milk powder, whey powder, butter and cheese to China.

As mentioned, there are no major opportunities in the future for Australia to export UHT milk to China. The international hotel milk market is very small and the trend is very much in favour of joint ventures. However, there will be a strong market for milk supplements (calcium and lactose).

Much of China's population are accustomed to using milk powder (WMP or SMP) in their homes to provide liquid milk for drinking. Processing factories also use SMP and butter in re-combined liquid milk to supplement low production in the off-season. This product is mixed with fresh milk before retailing. It has been estimated that there will be a 2% annual increase in imports of SMP in the coming years.

It is also possible that China will reduce her import tariff on SMP which will enhance the opportunities for Australian producers.

As discussed, at present the EC milk aid program virtually dominates the Chinese large city markets. If this program ceases there will be a vacuum for competitive products like those of Australia.

Australian expertise in formula diversification would be another avenue for export. Creation of products which suit the Asian palate e.g. fruit and coconut flavourings have great promise for the future. This should be done in joint venture projects.

The butter exports to China are for the production of recombined liquid milk, confectionary and the international hotel trade. The former presents a considerable market volume but purchases are dependent upon sales of SMP in conjunction with the butter.

Australia is currently exporting extended life yoghurt which has a shelf life of 10 weeks. It would be possible to penetrate the

Chinese market (international hotels and supermarkets in Southern China) with this product.

There is a large market for yoghurt cultures and flavourings. Australia, in contrast to New Zealand, has a wide variety of flavourings which could be promoted whilst others could be developed specifically for Chinese taste preferences.

Ice-cream pre-mix is currently being exported to Hong Kong. There would be an enormous market for this product in China. This also applies to UHT soft serve and UHT yoghurt soft serve which are newcomers to the market.

The fast food industry is rapidly developing in China at the moment. These outlets require a high volume of shredded Cheddar cheese. Australian cheese is extremely competitively priced and there is no doubt of the success of this export to China in the 1990s.

China already imports an enormous quantity of whey powder for use in feed ingredients and infant formulae. It is estimated that demand for whey powder will increase at a rate of 20% annually over the next decade.

Overall the market for sweetened condensed milk is in decline, however there is still a market for flavoured sweet condensed varieties in small towns.

In summary, as the level of technology improves and the resulting product sophistication is accepted by the populace the demand for dairy products like milk powder, yoghurt, ice-cream and cheese will soar. This will shift the import volume of dairy products to China to a much higher level.

In addition to the sale of pure dairy products, whey powder, butter and milk powder will all feature strongly as good ingredients for bakery and confectionary lines and in the stockfeed industry.

The total consumption of dairy products in China is forecast to continue to increase at the rate of 8% annually. Local milk production is increasing at only 5.5% leading to a 2.5% gap which currently can only be filled by imported products.

The import market value for dairy goods has been estimated at USD 100 million per annum indicating a bright future for the industry.

7.5 Conclusion

In 1993 the European Community (EC) and European Free Trade Area (EFTA) will join to form European Union (EU), a group of 19 nations and 380 million people, said to be the world's largest single market... but is it?

To date China, now regarded as the "Japan of the 1950s', remains a bloc of more than 1 billion people offering extraordinary

opportunities for skilful marketing strategies.

In almost every economic publication perused today one reads of China as being:

- "the fastest growing economy on earth" (Worthy, 1992, p. 18) (Shepherd, 1992, p. 64);
- "the greatest investment story in the world right now" (Friedland, 1992, p. 47);
- "the single big Asian market that we should all put our effort into" (Gilchrist, 1992, p. 53);

and so on.

Likewise reminders of what Australia's role should or could be in the area of trade with the booming Asian economies abounds:

- "Australia's main task over this decade is to fit into Asia" ("Odd Man In", The Economist, 1992, p. 3);
- "Australia has the chance to be the lucky country all over again" (Austrade's Export Report, in BRW, 1992, p. 65);
- "by 1994 about 75% of Australia's overall increase in export growth will be in the North and South-East Asia (Tucker, The Voice of Business, 1992, p. 12).

Trade between Australia and China has grown significantly over the last decade. This trade was inevitable for each country possesses what the other lacks, namely a highly developed agricultural and mining sector in Australia and a huge low-cost labour force in China. In addition, at present Australia has a comparative advantage in minerals, energy and agriculture and China has a

comparative advantage in manufacturing (textiles, clothing and footwear).

A country's comparative advantage in agriculture is usually measured by agriculture's share of exports from the country concerned relative to the share of agriculture in world exports. According to Anderson and Tyres (1987, p.128) the so-called index of "revealed" comparative advantage for China fell in the period 1970-1980. Its "revealed" comparative disadvantage is projected to rise. In addition, trade theory suggests that the lower a country's land/labour ratio the weaker is likely to be its agricultural comparative advantage to that of other countries with similar capital/labour ratios. If the strategy of exploiting comparative advantage was applied throughout the economy, the manufacturing sector would expand its exports of labour-intensive products which would provide the foreign exchange to purchase food and feed imports (Anderson and Tyres, 1987, p.145).

The same authors (1992) predict that Chinese agricultural imports will more than double in the 1980s and there will be an increase in Chinese dairy imports of 8 million tonnes p.a. which will cause an increase in world prices if the USSR has still not undergone agricultural reform. Roningen et al. (1989) while predicting a secular decline in real agricultural prices excludes dairy products "whose prices will rise slightly". ABARE predicts a rise in both international production and international demand; further that Australian domestic production will fall but the value of Australian dairy exports will rise by 13% in 1993-94.

It appears that there is a general consensus that in developing countries self-sufficiency in agricultural products will decline and that demand for dairy products will increase to the year 2000 and this in particular in China. The key to success for Australia in penetrating this market lies, apart from successful deregulation of its own industry, in understanding the Chinese market and in adopting a long-term strategy. The importance of a successful outcome to the GATT talks on which the actions of the EC and US depend is vital to Australia's future. In addition, it is imperative to be flexible for the time scales for many of the factors discussed are unknown e.g. for China's decision on whether to remain self-sufficient in agriculture, for a change in government policy concerning trade restrictions (acceptance as a member of GATT) and domestic pricing, for GDP per capita to reach a certain threshold; for recovery in Eastern Europe and the CIS; for infrastructure improvements in China, for reduced land availability and environmental effects to make a serious impact, for increasing population to impact on policy, and for foreign investment in joint ventures to impact more fully on the Chinese market.

In the point of view of this study, the most successful strategy would be to export a number of value-added products emphasising Australia's healthy and clean environment to test the market and gain product brand recognition. Long-term benefits will only eventuate if Australia then sets up joint-venture projects in China or enters into co-production agreements since this is stated Chinese foreign policy.

The products which have greatest chance of success include whey powder, Cheddar cheese and skim milk powder.

Direct trade can also succeed with value-added products like ice-cream pre-mix, UHT soft serve and "fromage frais", which also eventually could enter into joint-venture projects. The recent success of dairy desserts like: Fruche and Pietit Miam in Australia which latter increased sales from AUD 10 million in 1989 to AUD 80 million in 1992 (Shoebridge, 1993, p.59) could also be achieved in China.

Australia has well-known inventive skills which could be tapped in the development of new products to maintain direct trade.

Australian technology and expertise can also be exported to China. At the moment, this is extremely expensive for China's budget but this cost could be greatly reduced by entering into barter arrangements. In the long term it is believed that income from Australian dairy technology will outstrip that for her dairy products.

In conclusion, taking into consideration all of the factors examined and mindful of the forecasts of the experts, China will continue to be a huge potential market for the Australian dairy industry in manufactured goods and joint ventures in the short term and technology in the longer term. However, it is crucial that exporters and planners keep in mind what will happen when China, one fifth of mankind and already the biggest producer of

large numbers of industrial and food products, really starts industrialising and exporting (Rohwer, 1992 "The Titan Stirs", p. 18); keep in mind also Napoleon's prediction that "When China wakes it will shake the world".

8

ADDENDUM

The World Bank thinks that by 2000 fully half of the growth of the world economy will come from East Asia. If the past decade's ferocious pace keeps up, this could soon be the world's richest region, prompting proud talk of a "Pacific Century".

"East Asia's wobbles."
The Economist Jan. 5, 1996 p.27

DEVELOPMENTS IN THE FIELD SINCE THE ORIGINAL SUBMISSION OF THIS THESIS (1st September 1993):

8.1 The Chinese Dairy Industry:

Dairy Production in China:

- China's dairy industry increased its production capacity to 4,500,000 tons in 1994 worth 5.23 billion yuan.
- In 1994, China had 500 dairy enterprises including 150 comparatively large scale ones.
- China has invested in making dairy machines and has 60 such enterprises able to manufacture 102 types of equipment ranging from milking machines, evaporators and ice-cream machines to packaging machinery.
  (Xinhua News Agency, Beijing, 6 July, 1995)

Consumer Product Preference:

- High calcium, non-fat milk powders are popular with health-conscious Chinese because they help reduce osteoporosis.
  (National Business Review, 25, Aug. 1995)

One Regional Dairy Corporation Forecast:

- The Shanghai Dairy Corporation intends to establish ten dairies each with between 400 to 500 cows each year over the next three years to meet local demand for fresh milk and dairy products.
- The programme seeks to create a mass supply of milk and dairy products for city-wide distribution by 1998.
  (P. Chen, Shanghai Star, 8, Sept. 1995)
- By the year 2000, the Shanghai Dairy Corporation expects to be the largest dairy producer in the country.
  (Shanghai Star, 2, Feb. 1996)

8.2 The Australian Dairy Industry:

Dairy Production in Australia:

- In Australia domestic milk production in 1992-93 was 7,327 million litres an increase of 8.9% compared with 1991-92; Average production per dairy cow was 4,318 litres in 1992-93.
  (ABS, Year Book Australia 1995, 77, p. 491)

Butter Exports to China:

- Australia exported 44 tonnes of butter to China in 1993 and the provisional figure for 1994 is 100 tonnes.
  (ADC, Dairy Compendium, 1994 p.60)

Dairy Production Forecasts for Australia:

- In 1995-96, Australian milk production is forecast to rise by 5% to 8,600 million litres.
- The average Australian manufacturing milk price is forecast to increase by 16% in 1995-96.
- The value of Australian product exports is forecast to rise by 39% to AUD 1,925 million in 1995-96. ("ABARE Economics, Australian Commodities 2 (4) Dec 1995 p. 446)

Australian Joint-Ventures in China:
To date there are five companies/associations in Australia involved/interested in joint ventures in China.

- QUF Industries, a Queensland company, took over Associated Dairies of Victoria who had started negotiations for a joint-venture with the Shanghai Yong An Dairy Company. The joint-venture was established in 1993-94. The processing factory uses local milk to produce liquid milk, UHT milk and yoghurt.
- Victorian Dairy Industry Authority is associated with the Tianjin State Farm Bureau. They process local milk in small UHT 250 ml tetrapaks with flavourings (chocolate and strawberry) imported from Australia. The object is to establish the flavoured milk brand name "Big M". Sales cover the Tianjin, Beijing and Dalian region.
- Murray-Goulburn Co-operative has a joint venture with the Tianjin Dairy Corporation, registration certificate dated May 1995. The factory, now called "Tianjin Murray-Goulburn Dairy Company", produces series whey powder and formulated WMP by dry-blending 100% imported Murray-Goulburn milk powder.
- Ausdairy, a subsidiary of the Australian Dairy Corporation, has a memorandum of understanding (1995) with the Hangzhou Food Factory in Zhejiang province to set up a multi-disciplinary factory producing milk powder, ice cream, UHT milk and yoghurt. Their aim is to establish Australia as a preferred supplier of dairy raw materials for repacking in China with value added dairy products.
- Since 1994, Bonlac Foods has been interested in setting up a joint venture in Tianjin or Guangzhou. They are currently exporting branded product to China.

8.3 World Trade Regulation, Regionalism and Alliances:

GATT and the World Trade Organisation (WTO):

- 15th December 1993, after seven years of negotiations, the Uruguay Round of GATT ended successfully bringing agriculture under its ambit. (The Economist, Dec. 18, 1993 pp. 9-10)
- The outcome is a complex set of new undertakings and agreements which will govern global trade in the future. The GATT aims to provide a collective protection for all countries, and in particular small and medium-sized countries.
- 1st. January 1995 the WTO took over from GATT. It provides a dispute settlement process and ensures that these countries are sufficiently protected against unilateral action by the major economic powers. It is the first time that agriculture and textiles are to be fully integrated under GATT. The treaty is scheduled to come into effect during 1995 with many of its key provisions to be phased in over six years. (ABS, Yearbook Australia 1995, 77, p. 465)
- More than two dozen countries, from China to Vanuatu, are in the queue to join the WTO. Most face a long wait. ("World Trade. Knock, knock" The Economist, Jan. 13, 1996 pp. 80-81)

GATT's Impact on Agriculture:

- The OECD estimates that the outcome on agricultural and industrial products alone will provide a boost to the global economy of AUD 418 billion by the year 2002.
- The Australian Industry Commission, has estimated that the long-term effects of the Round will eventually be an annual increase in Australia's exports of over AUD 5 billion and an increase in Australia's GDP of around AUD 3.7 billion per year. All sectors of the Australian economy stand to benefit, especially agriculture. (ABS, Yearbook Australia 1995, 77, p. 465)
- The key result for the dairy sector will be a reduction in export subsidies. Both the US and the EU will be cutting sales of subsidised SMP while the EU will also cut subsidised cheese.
- There will be access into the US, EU and Asian markets with quotas being increased and tariffs being reduced. This will allow a more predictable environment for Australia to trade in.
- However, there needs to be restructuring of the Australian industry's market support system. Under present arrangements, Australian exports are classified as subsidies under the terms of the agreement and the volume of subsidised exports will have to be reduced for Australia to comply with the limits on volumes of subsidised exports. (ABS, Yearbook Australia 1995, 77, p. 467)
- China will be one of the world's biggest gainers from the Uruguay Round, if it gets in. That is because its export growth has centred on manufacturing, and textiles in particular. The Uruguay round liberalised trade in manufacturing more sweepingly than trade in the primary products that make up a larger share of other poor countries exports. The World Bank estimates that China's exports to America, the EU and Japan would increase by 40% under a post-Uruguay GATT. The average poor country would enjoy only a 15% rise. (China wants to join the club." The Economist, May, 14, 1994, p.29)

Trade Regionalism:

There is a big trend in the world economy towards "regionalism" and the reassertion of economic geography. More than half of Asian countries' trade is now with other Asian countries, catching up with the 60% of the EU's trade that is internal.

China's rapid strides towards a market economy are transforming it from Asia's outsider to its core: at almost USD 200 billion a year in exports and imports, China is gaining fast on the world's top ten traders. ("The trade winds shift." The Economist, Nov. 20, 1993, pp. 13-14)

Trade Alliances:

- 1st January 1993 the EC officially became a "single market" granting capital, goods, services and people free movement within its borders and heralding the birth of the European Union (EU) on 1st November 1993. (Not the union they meant" The Economist, Nov. 6, 1993, pp. 56-57)

- 1st January 1995 the EU admitted Austria, Finland, Sweden and Norway, increasing its membership from 12 to 16. ("The door opens." The Economist, May, 7, 1994, pp. 84-85)
- 17th November 1993 the US House of Representatives approved the North American Free Trade Agreement (NAFTA). ("The trade winds shift" The Economist, Nov. 20, pp. 13-14).
- 1st January 1994 NAFTA came into being.
- 18-20th November 1993 the Asia Pacific Economic Co-operation forum (APEC) (comprising 18 countries) met in Seattle, USA. Agreement to create a "community of Asia Pacific Economies" ("The trade winds shift" The Economist, Nov. 20, 1993, pp. 13-14)
- November 1994 APEC meeting in Jakarta, Indonesia. "Commitment to free and open trade and investment" in the region by 2010 for the industrial nations that make up 85% of regional trade and 2020 for the rest.
- November 1995 APEC meeting in Osaka, Japan. "Action agenda" to begin implementation of their commitment on 1st January 1997. ("The case for APEC. An Asian push for world-wide free trade." The Economist Jan. 6, 1996, pp. 76-77)

To date APEC has worked surprisingly well. There is virtually no secretariat and the Brussels bureaucracy is viewed as a nightmare to be avoided at all costs.

The history of other successful regional organisations, and the dynamics of the region's private sector suggest that APEC may achieve its goals well before the agreed dates of 2010 and 2020. There is good reason to believe that it will represent the first big international institutional success of the post-cold-war era. ("A case for APEC", The Economist, Jan. 6, 1996, pp. 76-77)

8.4 Outlook for World Dairy Markets:

The short-term outlook is for a continuing firm product demand, tight supply and as a consequence a marked increase in world prices. Average world prices for 1995-96 are forecast to increase: 36% for butter, 18% for cheese and 13% for Skim Milk Powder. (ABARE Economics, Australian Commodities 2 (4) Dec. 1995 p. 446)

Milk Sales in Asia:

- Over the period 1986-1992, the amount of milk sold in Thailand has trebled reaching a value of USD 610 million in 1992. The Thai's natural aversion to dairy products is being overcome by a combination of a government health campaign, the increasingly cosmopolitan tastes of the Thai middle-class and manufacturers' experiments with coloured and sweetened milk. ("Pastures new." The Economist, Oct. 9, 1993 p. 73)

European Union:
In 1995, farm incomes in the EU rose by an estimated 2.6% in real terms, to a 20-year high. World markets helped with

prices of cereals and dairy products rising but the real reason was the EU's attempt to reform farm subsidies. Brussels compensated farmers with direct payments set too high for a drop in income that never eventuated. ("Milking it." The Economist, Jan. 20, p.74)

USA:

- In 1995, Mead Johnson of the USA opened a USD 30 million joint venture in Guangdong with the Light Industry Bureau of Guangzhou and the Guangzhou Economic and Technological Development Zone to manufacture milk products for the domestic market.
- Plant capacity will be up to 15,000 tonnes of milk products a year. Ingredients will be imported from New Zealand and processed by equipment from the USA, Spain and Germany.
  (Economist Intelligence Unit, Business China, 4, Oct. 1995)

Russia:

- 27th October 1993 Russian decree allowing agricultural land to be bought and sold freely in Russia for the first time since 1917. The result could change Russia but it may take some time before a quarter of the butter consumed in Britain comes from Siberia, as it did before Russia's 1917 revolution. The rebirth of Russia as a food exporter no longer seems a distant dream. ("Europe's once and future granary" The Economist, Oct, 30, 1993 pp. 58-59).
- 28th February 1996 Russia admitted to the Council of Europe.

8.5 Some Recent Publications:

"A billion consumers." (A survey of Asia) The Economist, (1993) Oct. 30, p.60 (1-24)

ABARE Economics (1995) Australian Commodities Forecasts and Issues. Commonwealth of Australia, 2 (4) Dec. 1995.

Australian Bureau of Statistics (1996) 1995 Year Book Australia" ABS, 77.

Australian Dairy Corporation (1994) Dairy Compendium. Australian Dairy Corporation.

"Europe's once and future granary." The Economist (1993) Oct. 30, pp. 58-59.

Garnaut, R. (1994) Asian Market Economics. Challenges of a Changing International Environment. Institute of South-east Asian Studies, Singapore.

Garnaut, R. and Drysdale, P. (1994) Asian Pacific Regionalism. Readings in International Economic Relations. Harper Educational Publications, Pymble, NSW.

Hughes, H. (1995) "Why have East Asian Countries led economic development?" The Economic Record, 71, March pp.88-104.

"Milking it." (1996) The Economist, Jan. 20, p.74.

"Not the union they meant." (1993) The Economist, Nov. 6, pp. 56 and 59.

"Pastures new." The Economist, (1993) Oct. 9, p. 73.

"The case for APEC. An Asian push for world-wide free trade." (1996) The Economist, Jan. 6, pp. 76-77.

"The trade winds shift." (1993) The Economist, Nov. 20, pp. 13-14.
"World Trade. Knock, knock." (1996) The Economist, Jan., 13, p. 80.
"World trade ordeal." (1995) The Economist, Nov. 4, p.30.

9

APPENDIXES

"Tse Kung asked, saying, "Is there one word which may serve as a rule of practice for all one's life?"

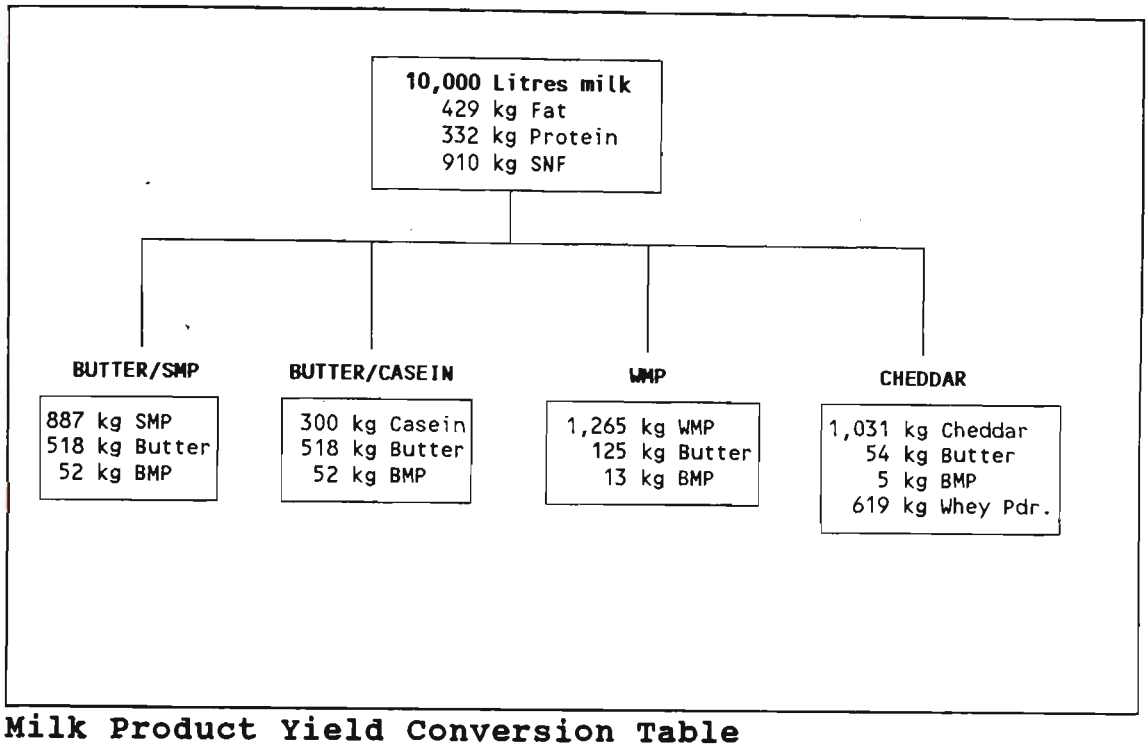
The Master said, "Is not Reciprocity such a word? What you do not want done to yourself, do not do to others."

Confucian Analects

APPENDIX 1 **MILK PRODUCTS YIELD CONVERSION**
Source: Dairy Compendium (1991) Australian Dairy Corporation, Melbourne. p. 78.

All data in the research are based on the following conversions:

Milk Product Yield Conversion Table



Milk Product Yield Conversion Table
Source: Dairy Compendium (1991) Australian Dairy Corporation, p. 76.

Milk Input Conversion Table

The following table shows the amount of milk needed to produce a given amount of each dairy product. Note that because of the joint nature of butter/SMP and butter/casein lines, these products are derived from the same milk input.

Milk Input Conversion Table

1,000 TONNES PRODUCT	ML MILK	'000 TONNES MILK
BUTTER	19.31	19.88
SKIM MILK POWDER	11.27	11.61
BUTTERMILK POWDER	193.05	19.88
CASEIN	33.33	34.33
CHEDDAR CHEESE	9.70	9.99
WHOLEMILK POWDER	7.91	8.14

APPENDIX 2 DAIRY EXPERTS INTERVIEWED IN CHINA

1. China's Ministry of Agriculture

1.1 Mr. Zhang Zhen Guo
Department of International Cooperation, China's Ministry of Agriculture
Officer

1.2 Mr. Xu Ji
Department of International Cooperation, China's Ministry of Agriculture
Deputy Director

1.3 Mr. Wang Jian
Department of International Cooperation, China's Ministry of Agriculture
Deputy Director

1.4 Mr. Sun Sheng Zhi
Department of International Cooperation, China's Ministry of Agriculture
Officer

1.5 Mr. Zhang Jian Qu
Department of International Cooperation, China's Ministry of Agriculture
Officer

1.6 Mr. Yin Cheng Wen
Deputy Director of Dairy Project Office, China's Ministry of Agriculture
Deputy Director

1.7 Mr. Zhang Chuan Yi
Deputy Director of Dairy Project Office, China's Ministry of Agriculture
Deputy Director

1.8 Mr. Zhao Shu Bo
Division Chief of Import Office, China's Ministry of Agriculture
Director

2 Cenoway Ltd. Co.

2.1 Mrs. Li Zhi Ru
Managing Director

2.2 Mr. Zhu Pin Xian
Executive Director

3 Beijing Agricultural University

3.1 Professor Rong Yi
Professor of Beijing Agriculture University
Honorary Researcher, Chinese Academy of Agricultural Science
Vice-President, Chinese Feed Industry Association

4 China Agricultural Academic Science Institute

4.1 Professor Liu Zhao
Beijing Zhong Gu New Biotechnology Development Corporation

4.2 Professor Zhou Ding Nian
Feed Research Institute, China's Academy of Agricultural Sciences
General Secretory of China Dairy Association

5 Beijing Municipal Dairy Corporation

5.1 Mr. Xiao Chun Yuan
General Manger

5.2 Mr. Wang Zhu Qing
Vice General Manager

6 Beijing State Farm Administration Bureau

6.1 Mr. Zhao Dong Sheng
Deputy Director

7 Beijing Hua Guang Dairy Corporation

7.1 Mr. Song Feng Zao
Director

8 Beijing Bei Jiao State Farm

8.1 Ms. Liu Bao Zhen
Party Branch Secretary

8.2 Mr. Dong Meng Lin
Deputy Director

9 Beijing Xi Jiao Dairy Factory

9.1 Mr. Jia Lian Dong
Deputy Director

10 China's Ministry of Commerce
China Sugar & Wine Company

10.1 Mr. Hu Wen Ming
Director

10.2 Ms. Liu Fang
Officer

11 China's National Cereal & Oil Import & Export Corporation
China beverage & Foodstuffs Import & Export Corporation

11.1 Mr. Han Xiang Qing
Deputy Chief Director

11.2 Ms. Yan Min
Manager

11.3 Ms. Huang Jin
Manager

12 China General Corporation of Animal Husbandry, Industry & Commerce

12.1 Mr. Yang Xin Rui
Deputy Chief Director

12.2 Mr. Luo Zhi Gang
Manager of Dairy Division

13 China's National Commodity Inspectation Bureau

13.1 Mr. Shi Shu Sheng
Director of Inspection Control Division

13.2 Mr. Bao Jun Kai
Veterinarian

13.3 Mr. Yuan Ke Wen
Deputy Director

14 Ministry of Light Industry
China Food Industry Supply and Marketing Company

14.1 Ms. Mu Jing Jun
Chief Director

14.2 Mr. Cai Jian
Division Director

14.3 Mr. Jia Yu Xin
Officer

14.4 Mr. Ping Guang Yuan
Officer

15 Hebei Provincial Animal Husbandry & Fishery Bureau

15.1 Mr. Guo Tai
Chief Director

15.2 Mr. Fan Jian Wu
Director of the Foreign Trade Office

15.3 Mr. Gu Chuan Yue
Director Assistant

16 Shi Jia Zhuang Municipal Dairy Corporation

16.1 Mr. Wang Yu Liang
Technology Manager

16.2 Mr. Cai Shu Wei
Merchandise Manager

16.3 Mr. Li Bao Ying
Financial Manager

17 Hebei Provincial Cereal & Oil Import & Export Corporation

17.1 Ms. Zhang Huan Xin
Manager

17.2 Mr. Xia Jun Tao
Officer

18 Qing Dao Municipal Dairy Project Office

18.1 Mr. Yang Yong Dong
Vice Manager

18.2 Mr. Tang Xiao Dong
Deputy Director

19 Qingdao Municipal Commission of Foreign Economic Relations & Trade

19.1 Mr. Chu Cheng Dong
Officer

19.2 Mr. Cong Yan
Director

20 Qing Dao Foreign Trade & Development Corporation

20.1 Mr. Luan Ying Xian
General Manager

21 Qing Dao Municipal Agricultural Committee

21.1 Mr. Zhu He Ting
Deputy Director

22 Qing Dao Cereals, Oil & Foodstuffs Import & Export Corporation

22.1 Mr. Zheng Fang Si
Deputy Chief Director

23 Qing Dao No. 1 Dairy Farm

23.1 Mr. Zong Zhu Giu
Director

24 Shanghai Municipal Agricultural Committee

24.1 Mr. Yuan Yi Xing
General Secretary

24.2 Ms. Ang Jin Lian
Deputy Director of Foreign Affair

24.3 Mr. Jiang Shan Chang
Investigator of Planning Division

24.4 Mr. Gu Yi Ping
Official

25 Shanghai Food Import & Export Corporation

25.1 Mr. Wu Shun Bao
General Manager

25.2 Ms. Cai Xiu Lian
Vice Manager

25.3 Mr. Wu Rong Hua
Officer

26 Shanghai Shen Feng Foods Company Limited

26.1 Ms. Ding Yi Fang
General Manager

26.2 Mr. Ren Rong Biao
Deputy Manager

27 Shanghai Dairy Machinery Factory

27.1 Mr. Xin Cheng Hui
Deputy Director

28 Shanghai No. 7 Dairy Farm

28.1 Mr. Yang Wei Rong
Deputy Director

29 Shanghai No. 3 Dairy Factory

29.1 Mr. Cao Hui Xing
Director

30 Shanghai No. 8 Dairy Factory

30.1 Mr. Hu Ren Yu
Director

31 Shanghai Dairy Training and Research Centre

31.1 Mr. Qian Wei
Deputy Director

32 Institute of Animal & Veterinary Sciences
Shanghai Academy of Agricultural Science

32.1 Mr. Zhao Fang Gen
Senior Animal Husbandry Specialist

33 Shanghai Dairy Corporation

33.1 Mr. Liu Gong Liang
Deputy Chief Director

33.2 Ms. Xie He Fang
Development Manager

33.3 Mr. Sha Zhen Xia
Vice Manager of Development Division

33.4 Mr. Wang Guang Wen
Animal Husbandry Specialist

33.5 Mr. Wang Hong Zhang
General Adviser of Shanghai Dairy Corporation

34 Guang Zhou Foodstuffs Import & Export Corporation

34.1 Mr. Lag Fu Biao
Deputy Manager

34.2 Ms. Yang Hong
Officer

34.3 Ms. Liu Hui Zhu
Officer

35 China's International Exchange of Agriculture Association

35.1 Mr. Xie Rong Sen
Director

36 Agriculture Department of Guangdong Province

36.1 Mr. Han Hong Guang
Deputy Director

37 Guang Zhou Dairy Factory

37.1 Mr. Li Wen Yu
Deputy Director

38 Guanzhou Municipal Light Industry Bureau

38.1 Ms. Gong Hai Rong
Officer

39 Guang Zhou Fenghuang Integrated Farm

39.1 Mr. Jiang Yao Quan
Director

40 Hang Zhou Food Factory

40.1 Mr. Zou Xi Jia
Director

APPENDIX 3 **CATTLE DISTRIBUTION IN CHINA**

Source: CSICSC* (1991) China Statistical Yearbook, Beijing

PLACE NO.	PROVINCE	CATTLE AND BUFFALOES ('000 HEAD)			PROPORTION OF REGISTERED DAIRY COWS
		Total	Cows	Other Cattle	(%)
0	National Total	102884	2691	100193	2.62
1	Sichuan	10080	45	10035	0.45
2	Henan	8925	29	8896	0.32
3	Yunnan	7675	54	7621	0.70
4	Guangxi	7039	5	7034	0.07
5	Guizhou	5901	17	5884	0.29
6	Shandong	5518	29	5489	0.53
7	Qinghai	5386	65	5321	1.21
8	Tibet	5056	233	4823	4.61
9	Anhui	5012	14	4998	0.28
10	Guangdong	4765	29	4736	0.61
11	Hunan	3992	7	3985	0.18
12	Inner Mongolia	3853	394	3459	10.23
13	Hubei	3515	25	3490	0.71
14	Xinjiang	3382	476	2906	14.07
15	Gansu	3379	112	3267	3.31
16	Jiangxi	3237	13	3224	0.40
17	Shaanxi	2416	42	2374	1.74
18	Heilongjiang	2368	540	1828	22.80
19	Hebei	2079	95	1984	4.57
20	Jilin	1883	50	1833	2.66
21	Shanxi	1793	82	1711	4.57
22	Liaoning	1509	60	1449	3.98
23	Fujian	1295	21	1274	1.62
24	Hainan	1223	1	1222	0.08
25	Jiangsu	715	35	680	4.90
26	Zhejiang	680	40	640	5.88
27	Ningxia	279	19	260	6.81
28	Beijing	145	65	80	44.83
29	Tianjin	103	23	80	22.33
30	Shanghai	81	71	10	87.65

*CSICSC: China Statistical Information and Consultancy Service Centre

APPENDIX 4 **GOAT AND SHEEP DISTRIBUTION IN CHINA**
Source: CSICSC (1991) China Statistical Yearbook, Beijing

PLACE NO.	REGION NAMES	SHEEP AND GOATS ('000 HEAD)			PROPORTION OF GOATS IN EACH PROVINCE
		Total	Goats	Sheep	(%)
0	National Total	210021	112816	97205	53.72
1	Inner Mongolia	30239	9490	20749	31.38
2	Xinjiang	28308	4494	23814	15.88
3	Shandong	20764	15527	5237	74.78
4	Tibet	16769	5662	11107	33.76
5	Qinghai	16083	2036	14047	12.66
6	Henan	12795	11295	1500	88.28
7	Gansu	11098	2309	8789	20.81
8	Hebei	10745	5626	5119	52.36
9	Sichuan	9459	5986	3473	63.28
10	Jiangsu	8508	7974	534	93.72
11	Yunnan	7224	5686	1538	78.71
12	Shanxi	7096	3039	4057	42.83
13	Shaanxi	6126	4482	1644	73.16
14	Anhui	3980	3823	157	96.06
15	Ningxia	3176	903	2273	28.43
16	Heilongjiang	2833	342	2491	12.07
17	Liaoning	2672	734	1938	27.47
18	Jilin	2336	150	2186	6.42
19	Zhejiang	1851	774	1077	41.82
20	Guizhou	1777	1373	404	77.27
21	Hubei	1631	1607	24	98.53
22	Guangxi	806	806		100.00
23	Beijing	784	521	263	66.45
24	Tianjin	670	364	306	54.33
25	Hunan	665	660	5	99.25
26	Fujian	600	600		100.00
27	Shanghai	372	289	83	77.69
28	Hainan	371	371		100.00
29	Guangdong	142	142		100.00
30	Jiangxi	141	140	1	99.29

APPENDIX 5 MILK PRODUCTION COMPOSITION IN DIFFERENT PROVINCES

Source: CSICSC (1991) China Statistical Yearbook, Beijing

PLACE NO.	REGION NAMES	TOTAL MILK PRODUCTION (TMP) ('000 TON)	COW'S MILK PRODUCTION (CMP) ('000 TON)	COW'S MILK PROPORTION IN THE REGION (%)	REGIONAL WEIGHT OF THE TOTAL NATIONAL PRODUCTION (%)
0	National Total	4751	4157	87.50	100.00
1	Heilongjiang	1027	1017	99.03	21.62
2	Inner Mongolia	396	370	93.43	8.34
3	Xinjiang	356	308	86.52	7.49
4	Shandong	296	70	23.65	6.23
5	Sichuan	268	264	98.51	5.64
6	Shanghai	227	227	100.00	4.78
7	Beijing	218	217	99.54	4.59
8	Shaanxi	212	95	44.81	4.46
9	Qinghai	210	201	95.71	4.42
10	Shanxi	179	160	89.39	3.77
11	Tibet	158	126	79.75	3.33
12	Liaoning	153	144	94.12	3.22
13	Hebei	143	112	78.32	3.01
14	Jilin	121	117	96.69	2.55
15	Zhejiang	113	113	100.00	2.38
16	Jiangsu	89	87	97.75	1.87
17	Gansu	81	79	97.53	1.70
18	Tianjin	77	76	98.70	1.62
19	Yunnan	76	73	96.05	1.60
20	Henan	74	27	36.49	1.56
21	Guangdong	56	55	98.21	1.18
22	Hubei	52	52	100.00	1.09
23	Fujian	49	48	97.96	1.03
24	Ningxia	41	41	100.00	0.86
25	Anhui	26	25	96.15	0.55
26	Jiangxi	22	22	100.00	0.46
27	Hunan	11	11	100.00	0.23
28	Guizhou	10	10	100.00	0.21
29	Guangxi	9	9	100.00	0.19
30	Hainan	1	1	100.00	0.02

APPENDIX 6 **REGIONAL DISTRIBUTION OF DAIRY EQUIPMENT FACTORIES IN CHINA IN 1988**

Source: China's Dairy Development Strategy Study Group (1988) China Development Strategy for China's Dairy Industry, Hubei, China

PROVINCE	NUMBER OF FACTORIES	PROVINCE	NUMBER OF FACTORIES
Shanghai	10	Sichuan	1
Heilongjiang	4	Tianjin	1
Beijing	3	Qinghai	1
Shaanxi	3	Henan	1
Guangdong	2	Hebei	1
Zhejiang	2	Liaoning	1
Jiangsu	2	Hubei	1

APPENDIX 7 **DAIRY EQUIPMENT FACTORY LOCATIONS IN CHINA IN 1988**

Source: China Dairy Development Strategy Study Group (1989) Development Strategy for China's Dairy Industry, Hubei, China

Product Catalogue	Product Name	No. of Product Types	Location
Milk & Milk Delivery Equipment	Milking Equipment	4	Shanghai
	Milking Trolley	1	Shanghai
	Milk Receptacle	1	Shanghai
	Milk Bucket	4	Shanghai & Zhejiang
	Milk Tank Trolley	1	Shanghai
	Milk Tank Truck	8	Shanghai
	Milk Tank	1	Shanghai
Milk Storage	Vertical Vat	12	Shanghai, Zhejiang, Heilongjiang & Shaanxi
	Horizontal Vat	6	Shanghai
	Vertical Vat with Refrigerator	1	Shanghai
	Horizontal Vessel with Refrigerator	4	Shaanxi, Shanxi & Zhejiang
Pump	Centrifugal Pump	16	Shanghai
	Positive Displacement Pump	9	Shanghai, Zhejiang & Jiangsu
High Pressure Homogeniser	High Pressure Pump	17	Shanghai
	Vertical Homogeniser	2	Zhejiang
	Horizontal Homogeniser	5	Liaoning, Tianjin
Milk reception Equipment	Milk Tank	4	Heilongjiang, Shanghai, Zhejiang, Shaanxi
	Milk Receiver	8	Heilongjiang, Shanghai, Zhejiang, Shaanxi
	Vacuum Milk Tank	3	Beijing, Shaanxi & Shanghai
Centrifugal Separator	Separator	11	Shaanxi, Qinghai & Jiangsu
	Butter Fat Indicator	3	Shanghai, Qinghai
Evaporator	Mono-Stage Type	5	Shanghai
	External Evaporation Radiator Type	2	Shanghai
	Dual-Stage Type	3	Heilongjiang
	Trio-Stage Type	3	Shanghai
	Centrifugal Type	1	Fujian
Drying System	Centrifuge	5	Shanghai
	Spray (Horizontal)	3	Heilongjiang
	Spray (Vertical)	13	Shanghai
	Two Stage Drying	3	Zhejiang
Condensed Milk Machine	Crystallisation Vat	1	Shanghai
	Vacuum Crystallisation Vat	2	Heilongjiang
	Crystal Agitator	1	Shanghai
Butter Churn	Agitator	2	Shanghai
Ice-cream Machine	Refrigerator	7	Shanghai
	Filling Machine	4	Beijing
Malt Processing Machine	Agitator (Mixer, Doser)	1	Shanghai
	Vacuum Equipment	1	Shanghai
	Oven	1	Shanghai
	Pelleting	1	Shanghai
Filling & Packing Machines	Bottle Cap Sealing Machine	2	Shanghai
	Bottle Sealing Machine	2	Shanghai
	Condensed Milk Filling Machine	1	Shanghai
	Can Sealing Machine	2	Guangdong
	Soft Packing Machine	3	Tianjin
	Pasteurised Milk Filling Machine	3	Beijing
Washing Equipment	Bucket Washing Machine	3	Shanghai
	Tube (Duct) Washing Unit	2	Shaanxi
	Bottle Washing Unit	2	Jiangsu
	CIP (Cleaning in Place) Unit	2	Zhejiang
Others	Vibrator	2	Heilongjiang
	Sieve	2	Zhejiang
	Filter	5	Shaanxi
	Double Layered Container	5	Shaanxi
	De-odour Device	1	Shanghai
Whole Set of Equipment	Milk Powder	7	Shanghai
	Yoghurt	1	Zhejiang
Analysis Equipment	Butter Fat Indicator	4	Guangdong

APPENDIX 8 **COST STRUCTURE OF URBAN DAIRY FARMS IN 1988**

Source: China's Dairy Development Strategy Study Group (1988), "Development Strategy for China's Dairy Industry", Wuhan, Hubei, China.

URBAN AREAS			
Item	Total Costs per Annum (Yuan)	Costs per cow (Yuan)	Proportion of the Total Costs (Yuan)
FIXED COSTS			
Depreciation	385672	964	22.45
VARIABLE COSTS			
Feeding Costs	1025701	2564	59.71
Personnel	144000	360	8.38
Maintenance	28405	71	1.65
Management, Admin. etc.	134000	335	7.80
Sub-total	1332106	3330	77.55
TOTAL COSTS	1717778	4294	100.00
RETURNS			
Raw Milk	1579930	3950	88.39
Sales of Animals	207550	519	11.61
TOTAL RETURNS	1787480	4469	100.00
PROFIT/LOSS	69702	175	
Return on "written down" capital (%)	4.06		

The fixed and variable costs are based on figures for:

Depreciation of fixed costs including:
- buildings and yards (Yuan/cow)
- equipment (Yuan/cow)
- animals (Yuan/cow); and

Variable costs include:
- Production costs (feeding costs)
  - feed concentrates (Kg/cow)
  - feed additives (Yuan/cow)
  - forage (Yuan/cow)
  - medicines (Yuan/cow)
- Personnel
  - wages and salaries (Yuan/year/person)
  - bonus (Yuan/year/person)
  - medical insurance (Yuan/year/person)
  - pensions (superannuation) (Yuan/year/person)
- Maintenance
  - buildings and yards (Yuan/cow)
  - equipment (Yuan/cow)
- Other costs
  - management and administration (Yuan/cow)
  - power, water, etc. (Yuan/cow)
  - interest from working capital (Yuan/cow)
  - general (Yuan/cow)
- Sales of animals
  - cows for slaughter (Yuan/head)
  - cows for re-stocking (Yuan/head)
  - male calves (Yuan/head)

APPENDIX 9 COST STRUCTURE OF DAIRY FARMS IN PASTORAL AREAS IN 1988

Source: China's Dairy Development Strategy Study Group (1988), "Development Strategy for China's Dairy Industry", Wuhan, Hubei, China.

PASTORAL AREAS			
Item	Total Costs per Annum (Yuan)	Costs per cow (Yuan)	Proportion of the Total Costs (Yuan)
FIXED COSTS			
Depreciation	33463	669	20.15
VARIABLE COSTS			
Feeding Costs	72919	1458	43.91
Personnel	21000	420	12.65
Maintenance	1425	29	0.86
Management, Admin. etc.	37253	745	22.43
Sub-total	132597	2652	79.85
TOTAL COSTS	166060	3321	100.00
RETURNS			
Raw Milk	103492	2070	86.03
Sales of Animals	16800	336	13.97
TOTAL RETURNS	120292	2406	100.00
PROFIT/LOSS	-45768	-915	
Return on "written down" capital (%)	-27.56		

The fixed and variable costs are based on figures for:

Depreciation of fixed costs including:
- buildings and yards (Yuan/cow)
- equipment (Yuan/cow)
- animals (Yuan/cow); and

Variable costs include:
- Production costs (feeding costs)
  - feed concentrates (Kg/cow)
  - feed additives (Yuan/cow)
  - forage (Yuan/cow)
  - medicines (Yuan/cow)
- Personnel
  - wages and salaries (Yuan/year/person)
  - bonus (Yuan/year/person)
  - medical insurance (Yuan/year/person)
  - pensions (superannuation) (Yuan/year/person)
- Maintenance
  - buildings and yards (Yuan/cow)
  - equipment (Yuan/cow)
- Other costs
  - management and administration (Yuan/cow)
  - power, water, etc. (Yuan/cow)
  - interest from working capital (Yuan/cow)
  - general (Yuan/cow)
- Sales of animals
  - cows for slaughter (Yuan/head)
  - cows for re-stocking (Yuan/head)
  - male calves (Yuan/head)

APPENDIX 10 COST STRUCTURE OF DAIRY FARMS IN AGRICULTURAL AREAS IN 1988

Source: China's Dairy Development Strategy Study Group (1988), "Development Strategy for China's Dairy Industry", Wuhan, Hubei, China.

AGRICULTURAL AREAS			
Item	**Total Costs per Annum (Yuan)**	**Costs per cow (Yuan)**	**Proportion of the Total Costs (Yuan)**
FIXED COSTS			
Depreciation	3754	751	25.20
VARIABLE COSTS			
Feeding Costs	8548	1710	57.38
Personnel	1225	245	8.22
Maintenance	70	14	0.47
Management, Admin. etc.	1300	260	8.73
Sub-total	11143	2229	74.80
TOTAL COSTS	14897	2980	100.00
RETURNS			
Raw Milk	13312	2662	85.62
Sales of Animals	2235	447	14.38
TOTAL RETURNS	15547	3109	100.00
PROFIT/LOSS	650	129	
Return on "written down" capital (%)	4.36		

The fixed and variable costs are based on figures for:

Depreciation of fixed costs including:
- buildings and yards (Yuan/cow)
- equipment (Yuan/cow)
- animals (Yuan/cow); and

Variable costs include:
- Production costs (feeding costs)
  - feed concentrates (Kg/cow)
  - feed additives (Yuan/cow)
  - forage (Yuan/cow)
  - medicines (Yuan/cow)
- Personnel
  - wages and salaries (Yuan/year/person)
  - bonus (Yuan/year/person)
  - medical insurance (Yuan/year/person)
  - pensions (superannuation) (Yuan/year/person)
- Maintenance
  - buildings and yards (Yuan/cow)
  - equipment (Yuan/cow)
- Other costs
  - management and administration (Yuan/cow)
  - power, water, etc. (Yuan/cow)
  - interest from working capital (Yuan/cow)
  - general (Yuan/cow)
- Sales of animals
  - cows for slaughter (Yuan/head)
  - cows for re-stocking (Yuan/head)
  - male calves (Yuan/head)

APPENDIX 11 **YUAN AND AUD EXCHANGE RATES AGAINST USD 1978-1992**

Source: United Nations, Statistical Yearbook for Asia and the Pacific (1990).

YEAR	EXCHANGE RATE (YUAN/USD)	ANNUAL INCREASE (%)	EXCHANGE RATE (AUD/USD)	ANNUAL INCREASE (%)
1978	1.6500			
1979	1.5100	-8.4848	0.9046	
1980	1.5300	1.3245	0.8469	-6.3785
1981	1.7460	14.1176	0.8866	4.6877
1982	1.9230	10.1375	1.0198	15.0237
1983	1.9810	3.0161	1.1204	9.8647
1984	2.7960	41.1408	1.2080	7.8186
1985	3.2020	14.5207	1.4686	21.5728
1986	3.7220	16.2399	1.5053	2.4990
1987	3.7220	0.0000	1.3840	-8.0582
1988	3.7220	0.0000	1.1689	-15.5419
1989	4.7220	26.8673	1.2651	8.2300
1990	5.2220	10.5887	1.2932	2.2212
1991	5.3560	2.5661	1.2900	-0.2474
1992	5.7662	7.6587	1.4500	12.4031

APPENDIX 12 WORLD EXPORTS OF DAIRY PRODUCTS (LEADING COUNTRIES, PROVISIONAL DATA) '000 TONNES, 1990

Source: Australian Dairy Corporation, Glen Iris, Statistics (pers. comm.).

COUNTRY	BUTTER/AMF	CONDENSED/ EVAPORATED MILK	CHEESE	CASEIN	SMP	WMP
EC	195.6	336.0	431.6	59.1	327.2	493.7
Netherlands	187.8	348.9	437.0	10.0	156.3	236.5
France	94.5	39.4	341.4	30.8	139.1	180.9
West Germany	75.6	197.6	317.9	25.1	291.1	59.1
New Zealand	202.7	0.6	95.8	63.3	149.6	190.8
Denmark	50.9	0.3	235.0	14.0	33.5	74.8
Belgium	108.0	32.4	70.9	0.0	63.4	35.6
Ireland	80.0		69.8	26.6	87.8	27.6
U.K.	34.4	49.3	40.4	0.0	103.7	54.7
Australia	44.1	1.8	51.1	3.8	94.9	41.7
Poland	24.0			20.0	71.3	
Sweden	31.9		4.0		30.5	
East Germany	60.0					
Finland	35.9					23.1
Italy	13.0	na	77.2	0.0		
Switzerland			61.5			
Canada	4.1	3.8	12.0		42.5	
Argentina	7.4		22.5		27.3	

APPENDIX 13 TYPICAL FARMGATE MILK PRICES IN AUSTRALIA 1987-1991

Source: "Dairy Compendium" (1991) Australian Dairy Corporation, p. 17.

YEAR ENDED 30 JUNE	NSW	VIC	QLD	SA	WA	TAS	AUST.
MANUFACTURING MILK							
1987	17.1	17.4	14.1	16.3	12.3	16.1	16.9
1988	18.6	18.9	15.4	17.8	13.5	17.4	18.3
1989	19.4	23.2	18.9	20.2	15.9	21.6	22.3
1990	21.2	25.1	20.1	23.5	20.4	22.8	24.2
1991	24.3	21.1	20.9	24.0	23.8	20.4	21.4
MARKET MILK							
1987	33.4	32.7	39.9	30.6	29.4	34.5	33.8
1988	35.8	35.1	41.7	33.2	30.9	35.4	36.0
1989	39.0	36.3	43.6	35.5	32.3	37.3	38.2
1990	39.7	37.6	44.9	38.3	36.0	39.8	39.7
1991	41.2	38.4	47.4	42.7	42.8	40.7	41.9

APPENDIX 14 **Farmgate Milk Prices in 1990 - Selected Countries**

Source: "Dairy Compendium" (1991) Australian Dairy Corporation, p. 42.

COUNTRY	NATIONAL CURRENCY/100 KG OF MILK				AUD/100 KG OF MILK
Year	1987	1988	1989	1990	1990
Belgium	1061.00	1149.00	1239.00	1100.00	40.60
Denmark	225.00	249.00	263.00	268.00	53.38
West Germany	59.54	63.41	68.00	61.28	46.39
Spain	3425.00	3709.00	4478.00	3850.00	46.22
France	172.71	177.04	186.86	178.50	40.24
Ireland	17.55	19.54	22.18	19.00	38.68
Italy	52010.00	53228.00	58119.00	58600.00	60.50
Netherlands	66.38	72.14	73.04	65.40	43.98
U.K.	15.20	16.32	17.33	17.20	37.92
ECONOMIC COMMUNITY AVERAGE					45.32
Sweden	291.50	307.80	319.80	298.10	61.58
Finland	231.20	234.45	258.71	258.60	82.70
Switzerland	92.25	100.10	100.30	103.30	92.45
Austria	442.00	487.90	521.16	545.00	58.63
U.S.A.	27.65	27.05	29.90	30.25	38.36
Canada	42.79	46.77	47.06	47.45	51.49
Japan	8970.00	9000.00	9050.00	8940.00	73.32
New Zealand	18.76	26.32	29.72	17.69	13.90
Australia	23.50	26.04	27.77	26.20	26.20
Manufacturing Milk	19.13	22.04	23.73	20.81	20.81
Market Milk	35.05	37.04	38.69	40.70	40.70

APPENDIX 15 LIQUID MILK CONSUMPTION IN SIX CITIES IN CHINA FROM 1982-89

Source: Ministry of Agriculture (1989), "The Dairy Projects Report in Six Cities of China", Ministry of Agriculture, Beijing.

CITY	TOTAL ('000 TON)	BEIJING ('000 TON)	SHANGHAI ('000 TON)	TIANJIN ('000 TON)	WUHAN ('000 TON)	NANJING ('000 TON)	XIAN ('000 TON)
1982	145.77	68.70	40.47	13.96	6.76	7.21	86.77
1983	167.08	71.92	46.29	16.96	11.04	9.17	11.70
1984	239.16	92.94	67.77	29.91	17.70	14.40	16.44
1985	311.25	112.16	89.65	41.07	25.95	20.15	22.27
1986	357.86	123.35	106.06	46.74	32.00	22.56	27.16
1987	366.98	125.70	114.38	47.72	28.58	23.96	26.64
1988	396.95	133.54	136.62	48.23	31.07	20.83	26.66
1989	417.30	142.57	149.33	56.41	25.30	20.23	28.45
Annual Increase (%)	17.0	11.4	21.1	24.2	24.7	18.1	2.3

APPENDIX 16 COMPARISON OF MILK PRICES IN EIGHT CITIES IN CHINA IN 1988

Source: China's Dairy Development Strategy Study Group (1988), "Development Strategy for China's Dairy Industry", Wuhan, Hubei, China, p. 236.

CITY NAME	WEIGHTED FARMGATE PRICES (YUAN/KG)	WEIGHTED LIQUID MILK RETAIL PRICE (YUAN/KG)	RATIO BETWEEN WEIGHTED PRICES(LIQUID MILK/FARMGATE)
Beijing	0.660	0.840	1.2727
Shanghai	0.692	1.235	1.7847
Tianjin	0.640	0.600	0.9375
Nanjing	0.735	1.000	1.3605
Xian	0.580	0.860	1.4828
Guangzhou	1.050	1.550	1.4762
Hangzhou	0.713	1.045	1.4656
Changsha	0.800	1.280	1.6000
Average	0.734	1.051	1.4319

APPENDIX 17 **MILK POWDER CONSUMPTION IN SIX CITIES OF CHINA 1982-89 (TONS)**

Source: The Dairy Projects Report in Six Cities of China (1989), Ministry of Agriculture, Beijing.

CITY	TOTAL ('000 TON)	BEIJING ('000 TON)	SHANGHAI ('000 TON)	TIANJIN ('000 TON)	WUHAN ('000 TON)	NANJING ('000 TON)	XIAN ('000 TON)
1982	5.54	0.33	2.74	1.33	0.79	0.15	0.20
1983	7.35	1.33	3.24	1.59	0.87	0.12	0.21
1984	8.47	1.71	3.73	1.70	0.95	0.15	0.22
1985	9.96	2.21	4.09	2.07	1.13	0.22	0.25
1986	9.95	2.20	3.88	2.11	1.00	0.28	0.38
1987	10.61	2.49	3.88	2.18	1.22	0.43	0.33
1988	10.82	2.93	3.52	2.41	1.30	0.33	0.33
1989	10.95	2.84	3.54	2.21	1.46	0.47	0.42
Annual Growth Rate (%)	10.74	55.46	2.94	6.79	9.60	22.04	12.79

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BIBLIOGRAPHY

A Night-Mooring at Ezhou

The clouds dispersed and Hanyang appeared far away.
The voyage of our lone sail would take one more day.
The merchants dozed till dusk as the waves did subside.
And boatmen talked at night, I felt the pull of tide.
As streams were cold with frost, my hair was hoar with care.
Under the moon I would in thought homeward repair.
Ruined by war was I, both estate and career.
What pangs I felt when distant war-drums I did hear!

Lu Lun

Akiner, S., Allen, B.J., Baral, J.R. et al. (Editors) (1991) The Far East and Australasia 1991, Europa Publications Ltd., England.

Alfa Laval (1985) Dairy Handbook, Alfa Laval Food Engineering A.B., Lund, Sweden.

"America's builds a trade block" (1992) The Economist, Aug. 15, pp. 55-56.

"America's farm subsidies. The trough." (1992) The Economist, June 27, pp. 21-22 and 24.

Anderson, K. and Tyres, R. (1987) Economic Growth and Market Liberalisation in China: Implications for Agricultural Trade. The Developing Economies, 25 (2) June, pp.124-51.

Andrews, N.P., Roberts, I.M. and Love, G.C. (1992) Recent developments in the Uruguay Round for Agriculture. ABARE, Agricultural and Resources Quarterly 4 (2) June.

Arbouw, J. (1992) "Will Asia form the third bloc?", Australian Business Monthly, July, pp. 125-126.

Austrade (1989) Austrade's Business Guide to (the) People's Republic of China. Australian Trade Commission, Canberra.

Austrade's Export Report (1992) Business Review Weekly, Mar. 13, p. 65.

Australia-China Trade (1984) Report from the Senate Standing Committee on Industry and Trade.

Australian Bureau of Agricultural and Resource Economics (ABARE) (1992) Agricultural and Resources Quarterly (ARQ).

Australian Bureau of Agricultural and Resource Economics (ABARE) (1992) Commodity Statistical Bulletin (CSB).

Australian Bureau of Statistics (1989) Catalogue No. 1102.0, Publications issued in December 1989.

Australian Bureau of Statistics (1991) Foreign Trade Australia, 1989-1990, Cat. No. 5410.0.

The Australian Commerce and Industry Office (1988) Long-term Projections Dairy Product Consumption and Dairy Industry Development in Taiwan, Taipei.

Australian Dairy Corporation (1989) Butter Leaflet, Australian Dairy Corporation, Victoria.

Australian Dairy Corporation (1989) Dairy Compendium, Australian Dairy Corporation, Victoria.

Australian Dairy Corporation (1991) Dairy Compendium, Australian Dairy Corporation, Victoria.

Australian Dairy Corporation (1993) Export Division (pers. comm.)

Australian Dairy Corporation (1989) Ice-cream Leaflet, Australian Dairy Corporation, Victoria.

Awanohara, S. (1992) "Liberal infection, Asia concerned by the pacts in the Americas", Far Eastern Economic Review, Sept. 10, pp. 73-74.

Awanohara, S., Rowley, A. and Paisley, E. (1992) "New kid on the bloc", Far Eastern Economic Review, Aug. 27, pp. 50-51.

Bannock,G., Baxter, R.E. and Davis, E. (1987) Dictionary of Economics. Penguin Books Australia, Ringwood, Victoria.

Barker, R., Sinha, R. and Rose, B. (Editors) (1982) The Chinese Agricultural Economy. Westview Press, Boulder, Colorado.

Bennett, R. (1992) Applied Economics and Australian Business, M.M. & B. Book Co. Pty. Ltd., Sydney.

Brown, A.J.F., Bell, D.M.H., Murphy, K.R., Pearson, A.G., Slaviero, M.E., Sullivan, M.S. and Van Helten, J.J. (1989) International Banking and Finance, Serindip Publications, Wamberal, N.S.W..

Buchanan, S. (1992) 1992 CRB Commodity Yearbook, Commodity Research Bureau, New York.

Burniaux, J.M., Delorme, F., Lienert, I., Martin, J.P. and Hoeller, P. (1988) Quantifying the economy-wide effects of agricultural policies: a general equilibrium approach. Working Paper No.55, Department of Economics and Statistics, O.E.C.D., July 1988, Paris.

Burniaux, J.M. and Waelbroeck, J. (1985) The impact of the CAP on developing countries: a general equilibrium analysis. In C. Stevens and J. Verloren van Themaat (Eds.) Pressure Groups, Policies and Development. Hodder and Stoughton, London.

Byrnes, M. (1992) Co-production with China is Australia's next big chance, Financial Review, Sept. 7, p. 7.

Campbell, A. (1991) Planning for Sustainable Farming. Lotham Books, Port Melbourne.

Carlson, G. (1991) China's milk production up 45% in last five years, Cheese Market News, II (29) Sept. 6.

Carr, E. (1992) A Survey of Agriculture. "Grotesque". The Economist, Dec.12, pp.1-18

"CER's mutual trade benefits" (1992) The Economist, May 16, p. 15.

Chan, W.K.K. (1977) Merchants, mandarins, and modern enterprise in late Ch'ing China, East Asian Research Centre, Harvard University Press, Cambridge, Massachusetts.

Chen, X.L. and Liu, L. (1991) "The Effects and problems of Government Price Policies on Agricultural Products after 1987", Chinese Economic Reforms, Vol. 24, pp. 35-51.

Chen, H.Y. (1989) "An Innovative Approach to Agricultural Marketing", Industry of Free China, June, pp. 13-23.

Cherry-Burrell Corporation (1986) "A joint-venture company in China", Dairy Industries International, December, pp. 14-15.

Cheung, T.M. (1992) "Pushing the pendulum. Deng leads China's economic reformers against party diehards", Far Eastern Economic Review, Apr. 9, pp. 46-47.

China Media Development Inc., Xinhua News Agency, P.R. China (Editors and Translators) (1989) The China Directory of Industry and Commerce, 3rd. Ed., Volumes I-III. N.C.N. Limited, Hong Kong and Jardine Printing, Hong Kong.

China Ministry of Agriculture (MOA) (1988) China Dairy Industry Report. Beijing.

China Ministry of Agriculture (MOA) (1988) The Report of Dairy Projects in the cities of China. Beijing.

China Ministry of Agriculture (MOA) (1988) Vegetable Basket Project Report 1988.

China Ministry of Agriculture (MOA) (1989) The Dairy Projects Report in Six cities of China. Beijing.

China National Statistic Bureau (CNSB) (1987) Urban Statistics Yearbook of China, China National Statistic Bureau, Beijing.

China National Statistic Bureau (CNSB) (1990) China's Yearbook, China National Statistic Bureau, Beijing.

China National Statistic Bureau (CNSB) (1992) Statistical Communique of the State Statistical Bureau of the P.R. China on 11 National Economic and Social Development, Beijing Review, 12, May 23-29, pp. 36-43.

China's Dairy Development Strategy Study Group (CDDSSG) (1988) The Development Strategy Study of China's Dairy Industry, Hubei Science and Technology Press, Wuhan, China.

"China's first modernised dairy starts up" (1991) Dairy Industries International, Oct., p. 6.

"China swings back to reform" (1992) The Economist, Feb. 1, pp. 23-24.

"Chinese dairy industry in period of expansion" (1988) Cheese Market News, II, p. 1.

CMN. (1991) "China's milk production up 45% in last five years", Cheese Market News, Sept. 6, p. 1.

CMN. (1992) "Price reform, The Progressive Way", Beijing Review, 12, May 4-10, pp. 14-18.

"Commodities and Agriculture: China's dairy shake-up has a long way to go" (1992) Financial Times, London, July 25, p. 4.

"Comprehensive Program" (1990) European Dairy Magazine, part 2, pp. 44-49.

Cooke, I.M. (1991) Overseas Marketing from Australia, Australian Institute of Export, Brisbane.

Croll, E. (1983) The Family Rice Bowl. Food and the Domestic Economy in China. UN Research Institute for Social Development. ZED Press, London.

CSIRO (1991) Whey - too valuable to dump!, CSIRO Dairy Research Laboratory, Melbourne.

Dairy Cabinet Development Department, Australian Dairy Corporation (1989) How to Increase Profits with Dairy Foods, A.D.C., Melbourne.

Dairy Research and Development Corporation (1991) Five Year Research and Development Plan (1991-1995).

Deans, A. (1992) Hard going, Far Eastern Economic Review, 155 (38), Sept. 24, p. 96.

DBIRD, (1992) QINDIS Database. Exporters of Dairy Products - Location Report.

Department of Foreign Affairs and Trade, China Section (1988) China Brief, January.

Department of Foreign Affairs and Trade, China Section (1991) China Brief, December.

Dionysius, D. (1991) Milk - A Source of Pharmaceuticals. Fresh Directions '91, p.88.

Drysdale, P. and Elek, A. (1992) China and the International Trading System. Pacific Economic Papers No. 214 Dec. 1992. Australia-Japan Research Centre.

East Asia Analytical Unit, DFAT (1992) Australia and North-East Asia in the 1990s. Accelerating Change. Australian Government Publishing Service, Canberra.

Epson J. (1986) "China plans for the future", Dairy Industries International, October, pp.34-37.

External Services Division of Economic Daily and EAI Information & Agency (1992) China Economic News, Economic Daily, Beijing.

Food and Agriculture Organisation (FAO) (1983) Animal Health Yearbook.

Food and Agriculture Organisation (FAO) (1985) Animal Health Yearbook.

Freeberne, M. (1992) The Far East and Australia - 1992, Europa Publication Ltd., England.

"Freer Trade with Luck" (1992) The Economist, Oct. 17, p.12.

Fresh Directions '91. (1991) Dairy Convention '91 - Towards 2000. Proceedings International Dairy Convention, Surfers' Paradise, 9-12 July.

Friedland, J. (1992) Bulls in a China shop. Fund managers cash in on market opening, Far Eastern Economic Review, Apr. 9, pp. 47-48.

Garnaut, R. (1989) Australia and the Northeast Asian Ascendancy, Australian Government Publishing Service, Canberra.

Garnaut, R. (1990) Australia's Response to Northeast Asian Ascendancy. Australian International Business Centre, University of Queensland, St. Lucia.

Garnaut, R. and Liu, G-G. (Editors) (1992) Economic Reform and Internationalisation: China and the Pacific Region. Allen and Unwin, St. Leonards, NSW.

Gartner, J.A. and Krostitz W. (1984) "Milk for the main cities of China", World Animal Review, July-September, pp.35-43.

"GATT will build the world" (1992) The Economist, June 27, pp. 11-12.

General Administration of Customs, China, Order 29 (1992) Procedures of the Customs of the People's Republic of China for the Supervision of, and the Imposition of or Exemption from Tax on, Imports and Exports by Overseas Investment Businesses, China Economic News, 9, Supplement 9, pp. 1-7.

Gilchrist, M. (1992) Plugging in to China's market, Business Review Weekly, Apr. 10, p. 53.

Gill, P. (1992) "Australia as trade orphan", Financial Review 3, July 22, p. 3.

Goldin, I. and Knudsen, O. (Eds.) (1990) Agricultural Trade Liberalisation. Implications for Developing Countries. O.E.C.D., Paris.

Goldstein, C. (1992) Stranglehold loosens. Hong Kong's Li Ka-Shing boosts Shanghai port. Far Eastern Economic Review, Oct. 15, p.60.

Goldstein, C. and Baum, J. (1992) "Outside GATT's door". Far Eastern Economic Review, Oct 22, pp.57-58.

Goodward, F. (1992) "Getting more business into farming." Business Queensland, Aug. 3, p. 9.

Gruen, F. H. et al. Long Term Projections of Agricultural Supply and Demand: Australia 1965-1980. US Department of Agriculture, Economic Research Service, Washington, DC 1967. (Cited by Tisdell, C.A. p.31)

Grummitt, K. (1986) China Economic Handbook, Euromonitor Publications Ltd., London.

Guilliatt, R. (1992) "To war, with a clever tomato", Business Review Weekly, Sept. 18, pp. 60 and 63.

Gunasekera, H.D.B.H., Andrews, N.P., Haszler, H C., Chapman, J.N., Tian W.M. and Zhao Z. (1991) Agricultural Policy Reform in China, Australian Bureau of Agricultural and Resource Economics, Canberra.

Hardaker, J.B.,Lewis, J.N. and McFarlane, G.C. (1970) Farm Management and Agricultural Economics. Angus & Robertson, Sydney.

Harding, B. (Editor) CSIRO Business (1992) "Food-processing Research offers a big boost in export earnings", Business Review Weekly 14 (16) May 1, pp. 90-92.

He, B.C. (1988) China on the Edge. The crisis of ecology and development, China Books and Periodicals, San Francisco.

Hill, B. (1990) An Introduction to Economics for Students of Agriculture. (2nd Ed.) Pergamon Press, Sydney.

Hiraiwa, K. (1992) "Foreign Investment in the P.R. China, 1990-91", China Newsletter, January-February, pp. 11-14.

Hook, B. (1982) The Cambridge Encyclopedia of China, Syndicated Press of the University of Cambridge, London.

Hooper, N. (1992) "Which way should Australia jump?", Business Review Weekly, Sept. 18, pp. 30 and 32.

Hornby, A.S. (1988) Oxford Advanced Learner's Dictionary of Current English with Chinese Translation, Oxford University Press, London.

Horridge, M., Pearce, D. and Walker, A. (1990) World Agricultural Trade Reform: Implications for Australia. The Economic Record, 66, pp. 235-248.

The Import Duty Handbook of the People's Republic of China. (1989) Beijing.

James, R.S. (1988) "China's Dairy Industry: Economic Analysis and Implications" Feedstuffs, 188, Oct. 3, p. 25.

Jiang, Y. (1986) "China, Some Goat Breeds", World Animal Review, April-June, pp. 31-41.

Johnson, D.G. (1991) World Agriculture in Disarray. 2nd. Edition. St. Martin's Press, New York.

Kaye, L. (1992) "Debt without Tears", Far Eastern Economic Review, Apr. 16, p. 66.

Kaye, L. (1993) "Formation Flying", Far Eastern Economic Review, July 23, p.49.

Klein, L.R. (1960) An Introduction to Econometrics. Prentice-Hall Inc., Englewood Cliffs, N.J.

Krostitz, W. (1990) International Dairy Federation/FAO Consultation on World Dairy Situation, June, Rome.

Krostitz, W. (1990) Medium Term outlook for Dairying in the Developing Countries, International Dairy Federation/FAO Consultation on World Dairy Situation, Rome, June 7-8, pp. 1-7.

Kung, J.K. (1992) "Food and Agriculture in Post-Reform China", Modern China, April, pp. 138-170.

Larsen, N. (1984) "China - on her way!", Danish Dairy Industry - worldwide, no. 4, pp. 47-48.

Latham, R. (1958) The Travels of Marco Polo, Penguin Books Ltd., Harmondsworth, England.

Li, Mao-Ming (1992) China to have 8 more bonded areas. China Economic News 29, Aug. 3, p.2.

Longworth, J.W., (1987) China's Rural Development Miracle, University of Queensland Press, Queensland.

Loo, T. and Tower, E. (1989) Agricultural Protection and the less developed countries: the relationship between agricultural price, debt servicing and the need for development aid. In A. Stoeckel (Ed.) "Macroeconomic consequences of Farm-Support Policies" Duke Uni. Press, Durham.

Ma, G. N. and Garnaut, R. (1992) How rich is China: Evidence from the food economy, Department of Economics and National Research School of Pacific Studies, Australian National University, Canberra.

Mansfield, E. (1980) Statistics for Business and Economics, W.W.Norton & Company, Pennsylvania, U.S.A.

Mann, E.J. (1988) "New Product", Dairy Industries International, 53 (12), pp.10-11.

Miller, R.J. and Shade, E.D. (1991) Foundations of Economics. Longman Cheshire, Melbourne.

Morse, H.B. (1966) The Trade and Administration of the Chinese Empire, Ch'eng-wen Publishing Company, Taipei.

"Odd man In" A Survey of Australia. (1992) The Economist, Apr. 4, pp.1-18.

O.E.C.D. (1987) "National Policies and Agricultural Trade. Agricultural Directorate of the O.E.C.D. Secretariat, May, Paris.

Office of Trade and Investment, Department of Manufacturing and Industry, Victorian State Government, Melbourne (1992) Milk Production - Australian Context.

Office of Trade and Investment Department of Manufacturing and Industry, Victorian State Government, Melbourne (1992) Milk Production - Overseas Context.

Olscheske, J.H. (1990) 1990 Asian Cheese Market research, Wisconsin Department of Agriculture, U.S.A..

Onyeneho, S.N., Partridge, J.A., Brunner, J.R. and Guan J. (1987) "Manufacture and Characterisation of Gua-Nai: A New Dairy Food Produced with an Oriental Type Culture", Dairy Science, 70 (12), pp. 2499-2503.

Parikh, K.S., Fischer, G., Frohberg, K. and Gulbrandsen, O. (1988) Towards Free Trade in Agriculture. Mortimers Nijhoff for IIASA, Amsterdam.

PJB. (1992) "Outlook for the world livestock situation in 1992", Animal Pharmaceutical, January 24, pp. 10-15.

Pratley, J.E. (1991) Trees - The essential farm ingredient. Riverina Outlook Conference 1991 held at Charles Sturt University, Riverina.

Rees, J. (1992) "Taste of Australia. Are Food Multinationals Seeking an Export Base?", Far Eastern Economic Review, Oct. 29, pp. 79-80.

Remer, C.F. (1972) The Foreign Trace of China, Ch'eng-wen Publishing Company, Taipei.

Rennie, P. (1992) "Getting a piece of the China boom", Business Review Weekly, 14 (31), Aug. 14, p. 95.

"Revolution on the High Seas" (1992) Asia Inc. September, p.10.

Ritson, C. (1977) Agricultural Economics. Principles and Policy. Cosby Lockwood Staples, London.

Rohwer, J. (1992) "The Titan Stirs", The Economist, Nov. 28, pp. 3-6.

Roningen, V.O. (1986) A Static World Policy Simulation (SWOPSIM) Modelling Framework. US Department of Agriculture, ERS Staff Report No. AGES 860625, July, Washington DC.

Roningen, V.O., Dixit, P.M. and Seeley, R. (1989) Agricultural Outlook for the year 2000: some alternatives. In A.Maunder and A. Valdes (Ed.) "Agriculture and Governments in an Interdependent World. Proceedings, Twentieth International Conference on Agricultural Economics, pp.615-626. Dartmouth for the IAAE, London

Rowley, A. (1992) "Governing markets", Far Eastern Economic Review, Apr. 30, p. 66.

Rowley, A. (1992) "High marks for Asia. World Bank presents its annual report card", Far Eastern Economic Review, Sept. 24, pp. 89-90.

Sanderson, F.H. (1988) "The Agro-Food Filiere: A Macroeconomic Study on the Evolution of the Demand Structure and Induced Changes in the Destination of Agricultural Outputs", The Agro-Technological System Towards 2000, pp. 185-208.

See, C.S. (1970) The Foreign Trade of China, AMS Press, New York.

Schauble, J. (Ed) (1993) The SBS World Guide. The Text Publishing Co., Melbourne.

Shepherd, G. (1992) China's southern comfort, Australian Business Monthly, May, p. 64.

Shoebridge, N. (1992) "Dairy marketers reap the benefits of a new image", Business Review Weekly, July 24, pp. 82-84 and 87.

Shoebridge, N. (1992) "Food for Asia: A market on the boil", Business Review Weekly, Oct. 23, pp. 22-28.

Shoebridge, N. (1992) "The new flavour of food marketing", Business Review Weekly, Aug. 7, pp. 85 and 87.

Shoebridge, N. (1993) "Petit Miam, A rare copycat success", Business Review Weekly, Feb. 5, pp. 59-60.

Sicular, T. (1989) Food Price Policy in Asia. A Comparative Study. Cornell Uni. Press, Ithaca.

Simpson, J.R. (1988) "China's Dairy Industry: Economic Analysis and Implications", Feedstuffs, Oct. 3, pp. 25-32.

Sivin, N., Wood, F., Brooke. P. and Ronan, C. (1989) The Contemporary Atlas of China. Collins Publishers Aust., Sydney.

State Statistical Bureau of the P.R. China (SSB) (1989) China Trade and Price Statistics 1989, The China Series, Praeger, New York.

State Statistical Bureau of the P.R. China (SSB) China Statistical Yearbook, (Issues 1988-1991) China Statistical Information and Consultancy Service Centre for the Advancement of Science and Technology Ltd., Beijing.

Stevens, M. (1992) Infrastructure the top priority. Business Review Weekly, July 17, p.80.

Stork, (1990) "Comprehensive Program", European Dairy Magazine, part 2, pp. 44-49.

Strachan, S.F. (1992) Dairy Products. Recent Developments in GATT. Agriculture Resources Quarterly 4 (1) March.

Stretton, R. (1992) A feast of opportunities, Bulletin 114, Sept. 15, pp. 82-83.

Taber, G.M. (1992) Growing, growing... Time 7 (37) Sept. 14, pp. 28-32.

Tigliao, R. (1992) On the launch pad. Far Eastern Economic Review, Nov. 5, p. 50.

Tisdell, C.A. (1974) Economics of Markets. An Introduction to Economic Analysis. John Wiley & Sons Australasia Pty. Ltd.

Tucker, K. (1992) "Going global: Lessons from our top players", The Voice of Business 158 Dec.91/Jan.92, p.12.

Tyers, R. and Anderson, K. (1992) Disarray in World Food Markets. A quantitative assessment. Cambridge University Press.

Tyrchniewicz, E.W., Honeyman, D.D. and Zhong, F-N. (1987) Developing transport and infrastructure facilities for China's agriculture. In Longworth, J.W. (Editor) China's Rural Development Miracle with International Comparisons. Papers presented at an International Symposium held at Beijing, China, 25-29 October, 1987.

United Nations (1991) Livestock Yearbook of China.

United Nations (1992) Population Fund Projections. (in SBS World Guide p.110)

United Nations (1990) Statistical Yearbook for Asia and the Pacific, (Annuaire Statistique pour l'Asie et le Pacifique) 1990.

United Nations (1991) Statistical Yearbook of World Trade.

Vatikiotis, M. (1992) EAEC fails to Appeal. Far Eastern Economic Review, Jan 29, p.11.

Victorian State Government, Melbourne, Office of Trade and Investment (1991) Milk Production - Australian Context and World Context.

Walker, K.R. and Kueh Y.Y. (1988) "Food and Agriculture in China during the Post-Mao Era", China Statistics Monthly, December, pp. 5-20.

Ward, G.M., Oltjen R., Temple R. and Gates D.H. (1986) "New technologies needed to improve animal production in China", Feedstuffs, January 6, pp. 22-31.

Watson, A. (1988) "The Reform of Agricultural Marketing in China Since 1978", The China Quarterly, March, pp. 1-27.

Wen, S. (1990) Government Policies and Food Sector Performance: The Chinese Experience. In Tyagi, D.S. and Vyas, V.S. (Editors) "Increasing Access to Food" (pp. 145-240) Sage Publications, New Delhi.

Westlake, M. (1992) Flying Start. Far Eastern Economic Review, Aug. 6.

Westlake, M. (1992) Hubs under pressure. Far Eastern Economic Review, Sept.24, p.86.

Whalley, J. (1984) Trade Liberalisation Among Major World Trading Areas. Cambridge MIT Press.

Williams, R. (Ed) (1991) Growback '91. Growback Publications, University of Melbourne, Victoria.

The World Bank (1991) China - The Livestock Sector, The World Bank, Washington, D.C., U.S.A..

The World Bank (1993) The East Asian Miracle. Economic Growth and Public Policy. Oxford University Press.

Worthy, F.S. (1992) Where capitalism thrives in China, Fortune International, 125, 5, pp. 18-25.

Xiao, Y.Z. (1988) "Buffaloes as dairy animal in China", Asian Livestock, March, pp. 25-27, and 34.

Xue, M.Q. (Editor-in-Chief) (1986) Almanac of China's Economy TM 1985/1986, Modern Cultural Company Ltd., Tai Dao Publishing Ltd., Hong Kong.

Yu, J.D. (1992) "China sets Targets for Transportation", China Economic News, 34 (13), p. 3.

Yu, J.D. (1992) "Transport: Inroads to Make Investment", China Economic News, 35, p. 6-7.

Zhang, P.J. and Huenemann, R. (1987) China's Foreign Trade, Oolichan Books and the Institute for Research on Public Policy: L'Institute de Recherches Politiques, Canada.

Zietz, J. and Valdes, A. (1985) The costs of Protectionism to less-developed countries: an analysis for selected agricultural products. World Bank and the International Food Policy Research Institute, January (Mimeo) Washington, DC.