

Policies and technical factors affecting the evolution and efficiency of the Australian dairy supply chain

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Introduction

In some respects the factors affecting efficiency of the dairy supply chain in many Asian dairy industries has some parallels with early supply chain developments in Australia's dairy industry. In Australia the catalyst for higher returns and industry growth was the transition from localised farm based sales of milk products to a factory based system. It coincided with a gradual shift from small scale mixed farmers to specialist dairy farmers.

The evolution of the Australian dairy industry supply chain has been shaped by a variety of factors. The two key factors were the adoption of new technology and government policy measures. The aim of this note is to give a brief overview of some key events that contributed to Australia's supply chain development. It may provide some insights for policy development in improving chain efficiency the Asian dairy sector.

Technical factors affecting the evolution of the supply chain

In Australia the transition to a commercially focused dairy industry began in the late 19th century. The industry was composed of small scale dairy herds on mixed output farms. Some milk was retained for home use. The residual milk was sold to local villages as fresh milk or as butter and cheese made on farm. Transport constraints, variations in farm hygiene conditions and the absence of cold storage facilities restricted the opportunities for sales in the major population centres.

Butter and cheese was made by traditional hand-made production techniques. Product quality was highly variable. Food safety contamination risks were high especially for butter as the production process was to allow the milk to 'stand' until the cream rose to the top. The cream would often become contaminated by dust and insects. Salt was added to reduce the food safety risks and boric acid was used as a preservative.

The development of a factory based production system was rudimentary at first. It simply involved a central collection point for milk that would be used to produce cheese and butter. This centralised processing was successfully used for cheese production but it was less successful for butter production because of the approach used to extract cream.

Farmers were paid for the milk delivered to these 'factories' and the products were sold locally. Fresh milk was not part of this initial effort to centralised processing of dairy products. Milk collectors visited farms and collected milk for distributing to households and retail outlets. The milk was transferred by hand from milk cans to a bucket (milk pail) at each house. There was no refrigerated transport and the milk was consumed within a short period of time because of a lack of cold storage.

The transition to factory based dairy production was accelerated by the invention and rapid adoption of the separator. In conjunction with equipment that mechanised the churning process and a test for butterfat content the separator created opportunities for wider commercial sales of butter.

The separator eliminated the most of the contamination issues associated with the hand-made production system. Milk from surrounding farms could be combined to produce uniform, higher quality butter. Butter factories were rapidly established in all the major dairying regions. Farmer cooperatives were formed to finance the development of butter and cheese factories.

The separator was the catalyst for an industry expansion driven by growth in milk sales for manufacturing purposes. On-farm milk separation allowed cream to be sold to butter factories with the skim milk was retained for livestock feed. Some cheese factories were converted to creameries producing butter because of growth in consumer demand. Most factories had no refrigeration and relied on cellars for product storage.

Another important development was the introduction of milk fat testing. Farmers were paid according to the fat content of their milk instead of milk volume. This move was resisted at first but eventually became a commonly accepted practise. It had two major advantages in terms of industry development:

- it eliminated watering of milk; and
- it encouraged improvements in stock selection.

Fresh milk sales were handicapped by the lack of an effective refrigerated supply chain from on-farm cold storage through to home storage. This problem was overcome when milk distributors established a cold chain distribution system. The process involved an immediate cooling of farm milk purchases with transport to major population centres in ice cooled rail wagons or trucks.

These distributors were the early forms of milk processing companies. The milk was transported in milk cans filled to the top to minimising milk churning during the trip. In conjunction with testing for milk fat this approach significantly improved the quality of the fresh milk. It also reduced the food safety and spoilage risks.

The fresh milk sold under these distribution conditions reportedly earned a higher price. This created an incentive for farmers supplying milk to these distributors to take more care with handling their milk. In time herd testing and regular microbiological testing of milk was introduced. But hygienic milking conditions and on-farm storage did not become a common feature of Australian dairy farms for some time.

Another major technological factor that shaped industry development was pasteurisation. It took some time for widespread commercial adoption of this process. In the early 1900s very few cheese and butter factories had pasteurisers. Milk distributors did not pasteurise their fresh milk sales.

The introduction of bottled fresh milk encouraged the transition of milk distributors into milk processors. Previously milk distributors had a depot for receiving and distributing milk. With bottled milk sales a more substantive factory operation was required.

It took some time for bottled milk to be used for home deliveries. Loose milk was still hand delivered until well after the Second World War. Bottling reduced contamination risks during delivery but there was no regulation requiring milk to be pasteurised the milk. Eventually pasteurisers and refrigeration became a standard feature of milk processing due to demands by the armed services for milk with a longer shelf life.

Improvements in on-farm milk handling were another factor in industry development. Convincing farmers of the need for cleanliness and hygiene in their milking parlours was a slow process. The importance of sterilising equipment used in the dairies was not well understood. There were widespread concerns about un-hygienic storage conditions for milk before it was transported to butter factories or distributed to households.

Milking machines were not widely adopted until after the Second World War. A lack of electricity on dairy farms, the small scale of mixed farm dairy enterprises and limited access to loans due to the depression constrained the introduction milking machines and on-farm chillers for freshly harvested milk. There were no regulations requiring the use of on-farm chillers and milk quality was highly variable.

Improved on-farm milk handling practises were encouraged through government funded extension services. But it was food safety regulations that brought about the required change in attitudes and investment in farm plant and equipment. This was a key step in the transition to a more specialised dairy industry. Farmers had to choose between a small scale mixed farm approach and a larger scale specialised dairy farm.

Refrigerated farm holding tanks began to be introduced from the late 1950s. Bulk milk collections by refrigerated road tankers followed soon after. This was the catalyst for a rationalisation in the number of dairy factories – there was no need for a factory in every village based region. It subsequently triggered widespread mergers of village based dairy cooperatives into larger regional based operations.

Policy measures affecting the evolution of the supply chain

Commercialisation of the industry was driven by the adoption of new technology, the emergence of locally based farmer cooperatives, enforcement of food safety regulations and infrastructure improvements. Policy measures were largely confined to government funded extension activities. The aim was to encourage the adoption of new technology and to teach farmers about the need to improve milk handling practises:

- travelling demonstration dairies were used to explain the benefits of using the new separator technology and improved milk handling practises;
- demonstration farms were used to educate farmers on livestock handling practises.

There were some attempts to regulate prices in the early 1900s because of concerns about fluctuations in returns and farm incomes. In general it appears these concerns were linked to the strong competition among fresh milk vendors in the major population centres.

The drinking milk sector was only nominally regulated by State Governments in the early 1900s. The regulations were essentially a requirement for milk vendors to register with a local authority. There were no market entry restrictions for milk vendors and many delivery routes were serviced by several vendors.

Consumers also complained about price fluctuations. State Governments had legislative powers to regulate the fluid milk market and in the early 1930s decisions were made to regulate drinking milk supplies in order to stabilise prices. This involved establishing regional agencies to control the production and distribution of milk. States were broken up into discrete zones and the following arrangements applied:

- the number of producers and vendors were fixed – new entrants were only allowed if supplies were considered to be inadequate;
- prices were regulated by the relevant local authority;
- milk production was restricted by quotas; and
- minimum milk quality standards were established and there were regulations on the methods of milk production, processing and transport.

Price regulations initially involved the setting of a maximum price. After the Second World War the arrangements were altered to allow State Authorities to fix the wholesale price of milk sold to the distributing vendors. This incorporated fixed prices for producers, vendors and retailers. Decisions on adjusting the fixed prices were based on assessments of the cost of production for each component of the marketing chain.

Individual State Governments also became involved in regulating the markets for butter and cheese. In the early 1900s fluctuating farm returns and unstable consumer prices led to calls for government intervention. But early attempts to regulate cheese and butter marketing failed.

The first attempt at regulating the marketing of dairy products was a voluntary industry arrangement known as the Paterson Plan – it was not backed by government legislation. The scheme was based on the concept of price equalisation. It involved imposing a levy on all butter production. The levy revenue was used to pay a bounty (subsidy) to dairy manufacturers on all butter exports:

- the net effect of the arrangements was to raise the price of butter on the domestic market – it was known as a home price support scheme;
- per unit returns on all butter production were 'equalised' as producers of butter exports received a subsidy to compensate for the lower export returns.

There were problems with the scheme as it was not supported by all butter manufacturers. There were also complications caused by different prices charged for butter in different States and the volume of exports was expanding. There were calls for Federal legislation to control the movement of product between the States. The Government did not agree to these proposals so a voluntary equalisation arrangement was established instead.

A company was established to negotiate agreements with each manufacturer for the equalisation of returns. Total returns received by all manufacturers from all markets – domestic and export – were pooled and divided by the total quantity sold to yield an average price for each manufacturer. These industry based equalisation arrangements operated for both for butter and cheese.

These arrangements removed the incentive for individual companies to increase sales on the higher priced domestic market. State Governments established quotas for production sold in each state and the surplus product was exported. This allowed the domestic price to be maintained at higher levels than the export price. The scheme required effective import controls to prevent the higher domestic price being undermined by imports.

This voluntary system of price equalisation lasted for some time. But there were times when arrangements were threatened by market developments. When export prices were weak the high priced domestic market was attractive to cheese and butter producers. Companies that had focused on domestic sales had to make bigger payments to the pool of returns – this was a source of friction that threatened to disrupt the system.

Eventually the arrangements were backed by Federal Government legislation to control the domestic price of butter and cheese. The company that had administered the voluntary scheme was relieved of this responsibility. This was done to get some balance between the interests of manufacturers and domestic consumers. Changes in the ex-factory domestic price were based on estimates of changes in the cost of production.

The effect of these arrangements was to increase producer returns and farm incomes. But it also stimulated higher production most of which had to be sold on lower priced export markets. Expanding export sales diluted the value of the support arrangements. This created political pressures to raise the fixed ex-factory price.

In the late 1940s there was a further change when the Federal Government announced it would guarantee farmer returns. This meant the size of the subsidy to butter and cheese producers was determined by market conditions and the level of guaranteed returns. The guaranteed return was based on estimates of the cost of production.

Initially the guaranteed returns applied to all output but it was subsequently adjusted to focus on domestic sales. The Federal Government eventually gained control of the price fixing powers of the State Governments. This allowed greater control of the size of the subsidy required by the guaranteed returns.

Concluding comments

The early evolution of the Australian dairy supply chain was shaped by a number of technical and policy factors. The technical factors involved the introduction of new technology at the farm level in milk handling and the separation of milk components. Over time the shift to a factory based system of milk handling saw the transfer of these technologies from on-farm adaption to milk collection centres.

There were substantial improvements in on-farm milk handling practises that reduced losses from spoilage and contamination. The introduction of on-farm cooling tanks, milk testing for contaminants and milk fat, larger scale milk pick-up services and a cold chain milk pick-up and transport system were key factors in this evolution. The efficiency gains in handling milk from farm gate to processing plants were complimented by gains in milk quality that reduced losses and improved the productivity of processing dairy products.

The policy factors that shaped the evolution of the supply chain involved a mix of measures. From an efficiency perspective some policy related factors enhanced outcomes and others had a detrimental effect. There were gains achieved through then introduction of food safety regulations that encouraged the adoption of new technologies and improved milk handling practises. Industry efficiency gains were also obtained from government funded extension efforts that focused on post milk harvesting:

- farmer education programs on milk handling practises and demonstration dairies to encourage the adoption of new technologies were important policy related developments in the evolution of a more efficient supply chain;
- these measures complimented the extension efforts to improve farm production efficiency – a balanced approach in the use of farm extension assistance was a key factor in improving supply chain efficiency.

However, there were other policy factors that were less advantageous from an efficiency perspective. The establishment of price support policies required the introduction of regulations that restricted the opportunities for farm output growth for the fluid milk market. For manufactured dairy products, price equalisation and price pooling policies created a complex set of marketing arrangements that reduced the incentive for:

- market growth and development;
- new product development;
- increased consumption of dairy products; and
- the adoption of new milk processing technologies.

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