CANTERBURY DAIRYING - A STUDY IN LAND USE CHANGE AND INCREASING PRODUCTION

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Abstract

The purpose of this research was to quantify the extent of the increase in dairy farming in Canterbury, New Zealand, and to examine factors that have led to the changes in land use and production. In this paper we present data on land use change, production and productivity, together with product price data for the alternative activities.

Data were obtained from a variety of printed sources and personal communications. Between 1980 and 2009 the land used for dairying in Canterbury increased from about 20,000 ha to nearly 190,000 ha. Per cow and per hectare production also increased both in absolute terms and also relative to elsewhere in New Zealand. Total production increased about fifteen fold during this period. On a national basis Canterbury produced 15% of New Zealand's milk in 2008-09 compared to 2% in 1982-83. Drivers of this land use change were the development of irrigation, lower land prices relative to elsewhere in New Zealand, the adoption of new technologies and reduced profitability of some aspects of traditional farming systems. It is suggested that, given the current price relativities and some further irrigation development, the Canterbury land area involved in dairy farming could double in the next 20 years.

Keywords: land use change, dairy productivity, irrigation

Introduction

In the 1960s and 1970s, dairying in Canterbury was a minor industry. There was a town supply industry (fluid milk), plus some small butter and cheese factories that coalesced around the Tai Tapu Butter Factory and the Temuka Cheese Factory. Dairy cows were farmed predominantly on heavy soils such as clay and silt loams, where the main soil-related challenge was drainage. Conventional wisdom said that drainage investment returned 20% on capital. Having done this, but only then, it was possible to obtain a 10% return on capital through irrigation. In those days, most of the light lands of the Canterbury Plains were used for sheep production, based on what were then called 'fat lambs' plus wool. On the medium soils, the predominant land-use was a mix of sheep, wheat, barley, white clover seed and grass seed. In this paper we present data on land use change, production and productivity, together with product price data for the alternative activities. We offer some explanations which are being further investigated with on-going studies.

Methods

Dairy industry data were sourced from the New Zealand Dairy Board (1970-1985) and the LIC (1985-86 to 2008-09). Lamb, beef and wool data was obtained from the New Zealand Meat Board (1980-2000) and from 2001 to the present, the same information was available from Meat and Wool New Zealand (2001-2009). Additional meat and wool information was obtained through personal communication with E. Gonzalez-Macuer of Beef + Lamb NZ (2010). Historical levels of inflation were available on the Reserve Bank of New Zealand website. Information on wheat prices were obtained from the National Bank (personal communication, K. Wilson) and NZX AgriFax. The authors have also drawn on their own experiences and observations, both as academic observers, and in the case of the first author, direct experience over more than 20 years as a practicing Canterbury dairy farmer.

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Results

Irrigation Development

Substantial irrigation first came to Canterbury through the Rangitata Diversion Race (RDR) scheme which became operational in 1944 (Rangitata Diversion Race Management Ltd. 2008). It draws water from the Rangitata River and provides about 64,000 ha with water between the Rangitata and Rakaia Rivers. In early years the water was applied almost solely using border-dyke irrigation and much of the irrigation is still of this form. Farmers initially tended to use this water as drought insurance for their mixed sheep and crop farming systems. Investigations during the 1960s, led by Lincoln University Farm Management staff (Stewart 1963, Stewart and Haslam 1964), showed that many farmers, using the cheap water within traditional systems, were not achieving an overall increase in profitability. More recent community schemes included the Amuri (first water supplied in 1980, with considerable government subsidies) and the Opuha Dam in South Canterbury (commissioned in 1998, with major funding from farmers). Extensive development of underground water sources commenced in the 1990s as a consequence of submersible pump technology. A recent estimate (Bright 2006) is that about 400,000 ha of Canterbury land is irrigated, with a little over half coming from community-based schemes using river water, and the remainder coming from underground sources (both shallow and deep wells).

Irrigation as an Enabler

Apart from limited areas of heavy soils and other small areas in rain shadows close to the foothills, and excluding the special but limited historical case of town supply dairying operations, dairying without irrigation has never been economically feasible under Canterbury conditions. However, with irrigation, dairying has always provided a gross income several times that of traditional uses, except possibly intensive horticulture. Nevertheless, during the 1970s and 1980s, the prevailing culture was that Canterbury was for sheep and cropping. Also, there was limited rural finance apart from the Government-owned Rural Bank. Accordingly, although irrigation was a necessary enabler, it was not a sufficient condition. Some entrepreneurs tested the principles of dairying under border-dyke systems and Canterbury winters, but most farmers just watched while remaining with their more traditional farming systems.

Dairying Takes Off

Early attempts to milk cows on irrigated light lands began in the late 1970s and early 1980s. There were a number of early entrepreneurs, but the one who received the most publicity through the 'Dairy Exporter' (Gilbert 1978) was Don McDonald, who came to Canterbury from South Auckland. Others soon followed. However, in terms of substantial land change, it was not until about 1992 that 'take-off' occurred (Figure 1). Prior to that, the statistics indicate that the development of new dairy farms on the light land was approximately counterbalanced by farmers moving away from dairying on the heavy soils. Since that time, the land use conversion has fluctuated around a trend of about 10,000 ha per annum, reaching 188,235 ha in 2008/09; the latest year for which data is available.

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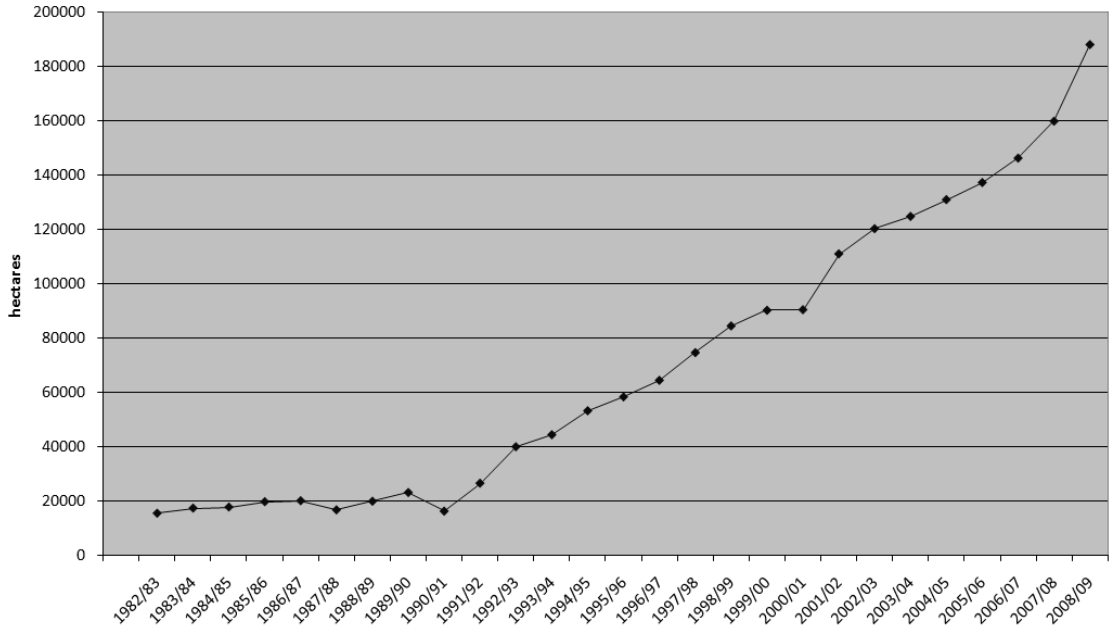

Figure 1. Canterbury dairy farming area (ha) 1982-83 to 2008-09

The Push and Pull of Prices

Most of the new dairying entrepreneurs of the late 1980s and throughout the 1990s came from outside of Canterbury. Many came from the North Island, but many came from overseas, from Holland in particular, but also from the United Kingdom. Farming syndicates and equity partnerships became increasingly popular in the late 1990s. Corporates, such as Tasman Agriculture and, more recently, Dairy Holdings and Synlait, have also played a major role.

In all cases, these new entrants were attracted by the economics of dairying, based in particular on lower land prices and a larger scale of operation than in the North Island. However, none of this would have been possible if it were not for a steady stream of land coming onto the market from farmers who were exiting from sheep and cropping. In addition, a smaller number of sheep farmers themselves made the move to dairying, often linked to employment of a sharemilker or involvement with an equity partner.

Although it is widely assumed that returns from dairying have increasingly outstripped returns from lamb, the data does not support this notion (Figure 2). Between 1980 and 1990 all product prices declined markedly in inflation-adjusted terms. Since then, both milksolids[2] and lamb have more than kept pace with inflation, and apart from the dairy boom year of 2007/08, both the short term price fluctuations and the overall price trend of each have followed a similar pattern. The real problem has been the loss of income from wool, which has made sheep farming non competitive. The ongoing relative decline in crop prices has also been important.

[2] The term 'milksolids' is defined in New Zealand to include protein plus fat but does not include other solids components such as lactose and minerals

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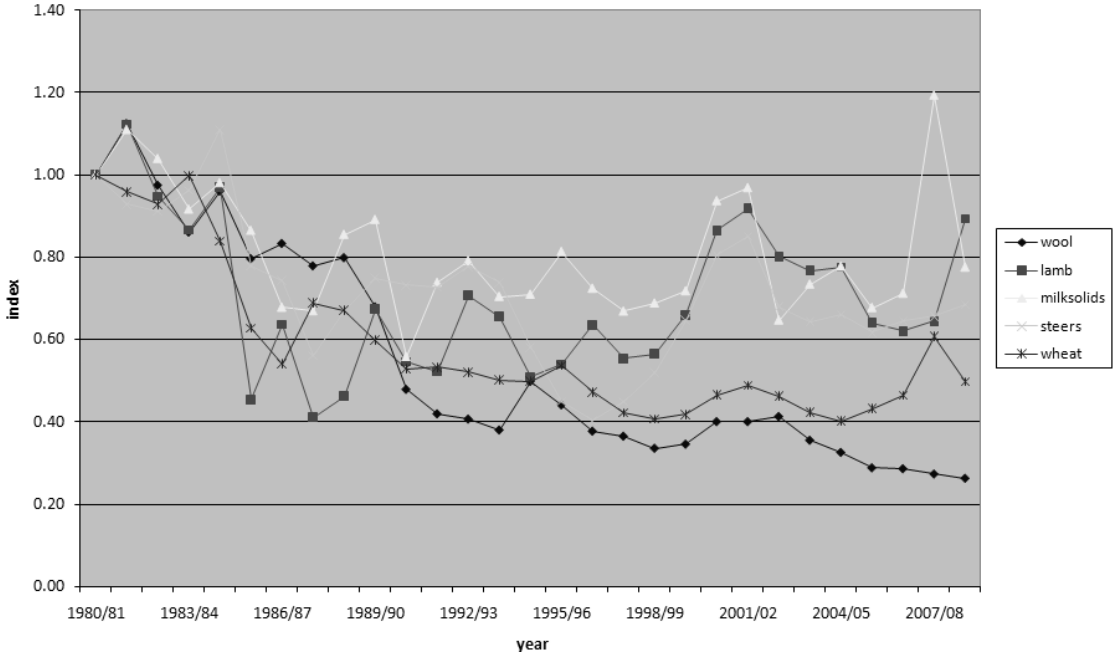

Figure 2. Inflation-adjusted indices of agricultural commodity prices (1980-81 to 2007-08)

Encircled by Pivots

The technology of pivot irrigation has been known for many years but arguably it was slow to come to Canterbury dairying. It would seem that some Canterbury consultants and farmers, towards the end of the 1990s, saw the systems working in Tasmania, and recognised the applicability of the same technology. Prior to that, the challenge of irrigating the corners, which is now possible through either pivot extenders or alternative spray systems, was seen as a constraint. Also, for river irrigators there had been little economic incentive to change from using established low cost flood systems. The availability of water being restricted to rostered days was another constraint for spray systems. This started to change about 2000, first on farms using underground water due to increased power costs. However, in 2010, even in the Amuri where river water is used, approximately half the farms have pivots due to a need for watering efficiency. There are also increasing numbers in the RDR scheme, often in association with small on-farm storage dams.

For the early movers, it came as a pleasant surprise to find that not only were the pivots more water-efficient, they also led to increased production. Some of this production increase is due to less water stress on the plant, and some is due to increased irrigable area once borders and head races are removed. Many farms have been able to increase production by 15-20% as a result of the shift.

The Importance of Technology Packages

Since 1985, dairy production per hectare has increased faster in Canterbury than elsewhere in New Zealand (Figure 3). Part of this is undoubtedly due to irrigation technology. First it was improved border strip irrigation systems, including laser levelling. More recently it has been influenced by pivots as already described. Other factors have been improved pasture management systems, improved methods for making and transporting silage, and the increased use of nitrogen. Teasing out the importance of further factors, such as the impact of the Lincoln University Dairy Demonstration Farm, is more complex.

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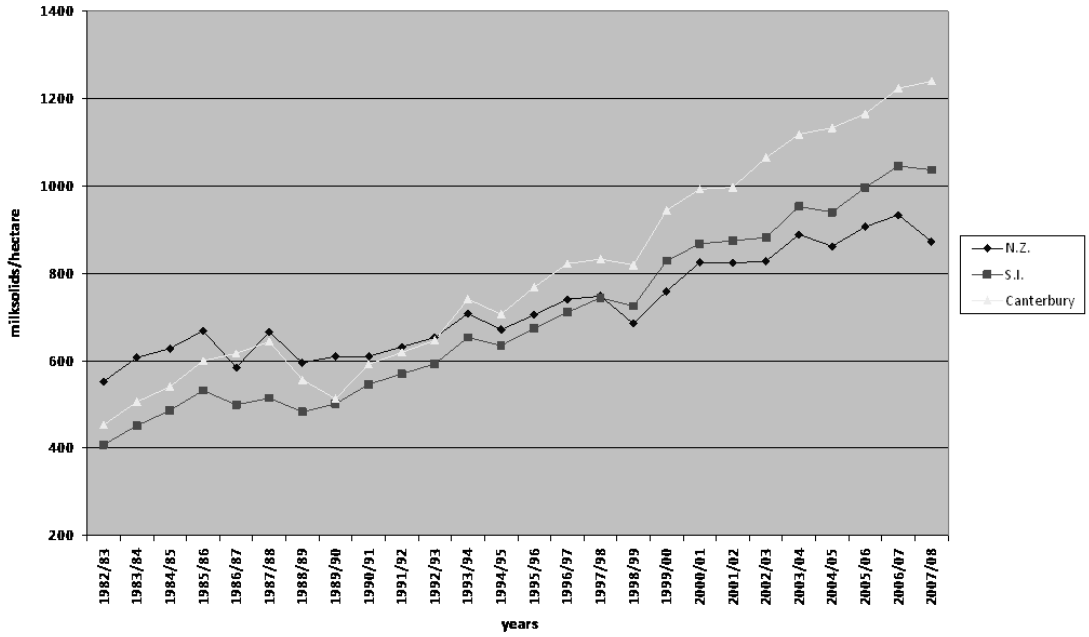

Figure 3. Milksolids production per hectare for New Zealand, the South Island and Canterbury (1982-83 to 2007-08).

Although some new technologies have led to stocking rates that have increased faster than elsewhere in New Zealand (Figure 4), there have also been substantial improvements in per cow production relative to New Zealand overall (Figure 5). This can be postulated as being mainly due to improvements in metabolisable energy, linked to grazing management and improved silage quality. Irrigation and the increased use of supplementary feed have also increased production through allowing more days in milk.

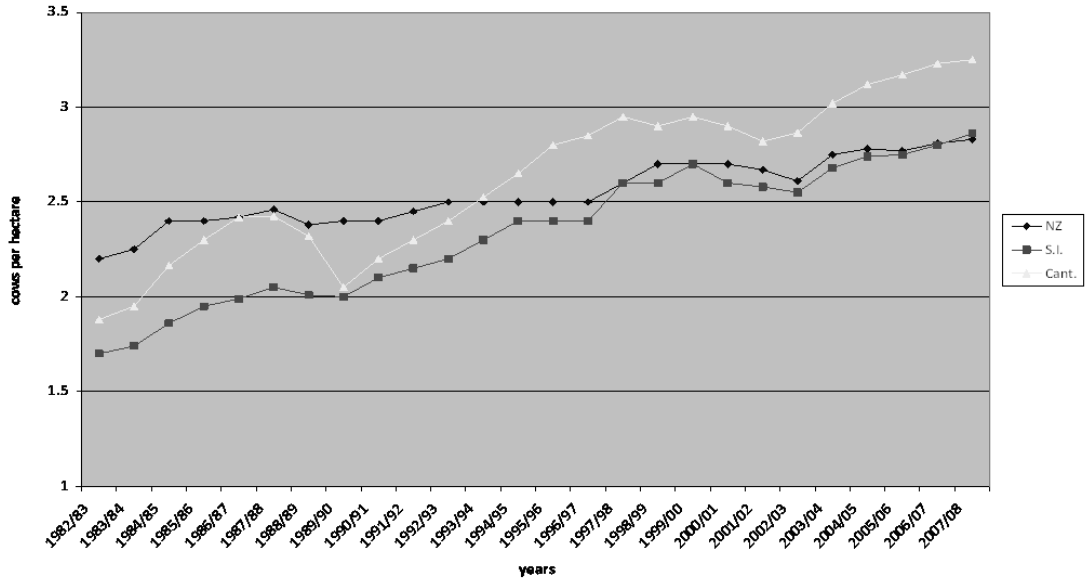

Figure 4. Stocking rates (cows/ha) for New Zealand, the South Island, and Canterbury (1982-83 to 2007-08).

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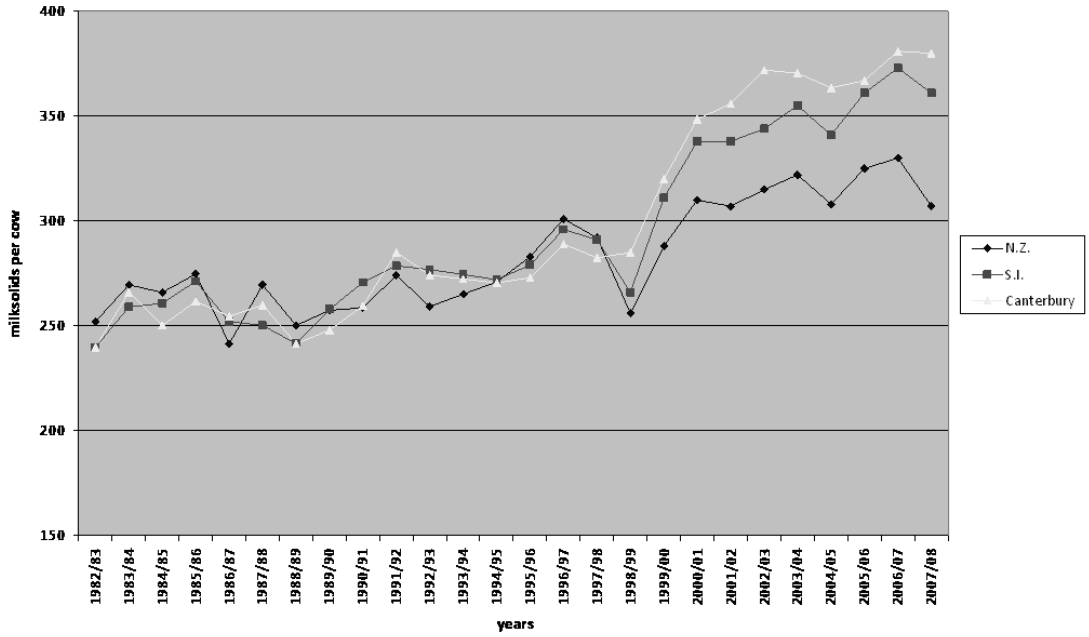

Figure 5. Milksolids production per cow (kg) for New Zealand, the South Island and Canterbury (1982-83 to 2007-08).

Discussion and Conclusions

Dairy farming has become a major agricultural industry in Canterbury. With the development of irrigation and the adoption of new technologies, Canterbury farms carry larger numbers of cows per hectare and produce more milk per cow than elsewhere in New Zealand. This leads to the province having the highest levels of milksolids production per hectare in NZ. As the technologies were developed that allowed the industry to establish, entrepreneurial farmers took advantage of lower land prices to rapidly expand their businesses. This coincided with reduced income levels for wool and crops, although lamb prices have maintained some relativity to dairy prices.

We consider it likely but cannot prove that the overall technological improvements in Canterbury dairying have been greater than for the competing sheep and cropping industries. We contend that in the competing industries there has been no technology package that matches the dairy package of nitrogen technology, ryegrass endophyte technology, new grass species, management of pasture residuals, and labour saving in the milking shed. Although ewe productivity has increased in sheep farming (Davison and Gonzalez-Macuer 2009), and grain yields have increased significantly in cropping (MAF 2002), these have been insufficient to maintain relativity to the dairy industry.

The future of dairying in Canterbury is controversial. There are concerns about its impact on water quality, and there remains a fundamental belief in parts of the urban community that there is something fundamentally wrong with dairying. However, there are known technologies (Moir, Cameron, Di 2007) to ensure that dairying has no more impact on water quality, and in many cases less impact than do other farming types. Also, economic issues are likely to lead to ongoing changes away from sheep and mixed sheep plus crop. We foresee closer integration between crop farming and dairying, with the increased use of annual crops for feed, particularly by cropping farmers who convert part of their farm to dairying. We note that the area of Canterbury suitable for irrigation has been estimated at about 1.2 million ha, of which about 650,000 ha are currently consented for irrigation, and perhaps a little over 400,000 ha is currently under irrigation (Bright 2006). We note that the current area in dairying is only in the order of 200,000 ha. Accordingly, we can see a scenario that Canterbury dairy production could easily double in the next 20 years.

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