Rae, Allan; Nixon, Chris; Lattimore, Ralph

Working Paper

Adjustment to agricultural policy reform: Issues and lessons from the New Zealand experience

NZ Trade Consortium Working Paper, No. 35

Provided in Cooperation with:
New Zealand Institute of Economic Research (NZIER), Wellington

Suggested Citation: Rae, Allan; Nixon, Chris; Lattimore, Ralph (2004) : Adjustment to agricultural policy reform: Issues and lessons from the New Zealand experience, NZ Trade Consortium Working Paper, No. 35, New Zealand Institute of Economic Research (NZIER), Wellington

This Version is available at:
https://hdl.handle.net/10419/66075

nzier
authoritative analysis

Adjustment to agricultural policy reform – issues and lessons from the New Zealand experience

NZ Trade Consortium working paper no 35

February 2004

The New Zealand Trade Consortium

in association with the

New Zealand Institute of Economic Research (Inc)

Preface

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established *Quarterly Survey of Business Opinion* and *Quarterly Predictions*.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

NZIER was established in 1958.

Authorship

This report has been prepared at NZIER and Massey University (CAPS) by Allan Rae, Chris Nixon and Ralph Lattimore

8 Halswell St, Thorndon

P O Box 3479, Wellington

Tel: +64 4 472 1880

Fax: +64 4 472 1211

econ@nzier.org.nz

www.nzier.org.nz

Summary

Pressures for the reform of agricultural policies in wealthy countries will increase. Current policies are expensive and inefficient and impose substantial costs on countries that cannot afford to subsidize their agricultural sectors. A major political impediment to policy reform is the real or assumed costs of adjustment that would be imposed on farmers. In this paper, we illustrate some of the key issues by reference to the New Zealand experience. Issues covered include adjustments in output and input markets, productivity and innovation. Adjustments by farmers and others, along with reforms outside of agriculture, ensured that farm incomes and the agricultural sector recovered from the initial shock of deregulation.

Contents

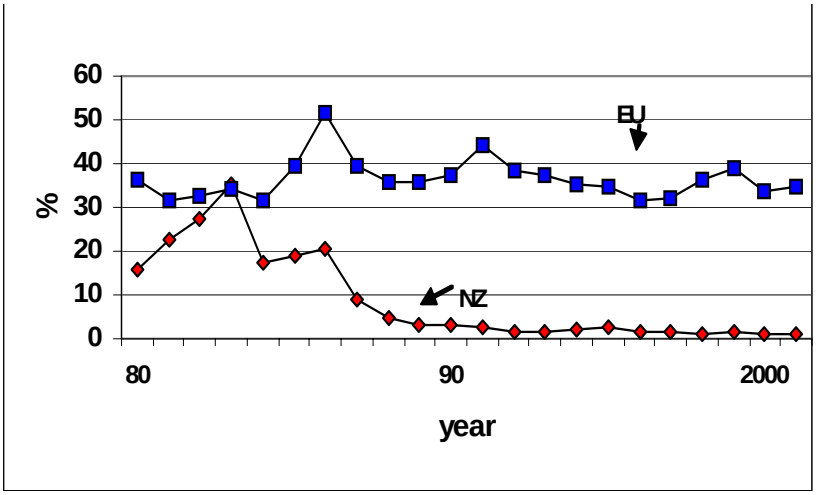
Figures

Tables

1. Introduction

Relatively little government assistance had been provided agriculture in New Zealand up until the mid-1960s. Then, following a number of balance of payments crises, government began the introduction of a range of assistance programmes aimed to increase production and therefore, given the export-orientation of New Zealand agriculture, foreign exchange earnings. These included subsidised inputs such as fertiliser and credit, taxation concessions, export incentive schemes, stabilised and supported prices, and grants for land development and the stocking of that land. The producer support estimate (PSE)[1] measure for New Zealand agriculture peaked at 35% in 1983 (OECD), and was almost identical to that of the EU (Figure 1).

Figure 1 Producer support estimates



Source: OECD

By 1984 a number of economic problems had become acute: the fiscal deficit had reached 9% of GDP, servicing the public debt accounted for 15% of public expenditure, a current external deficit problem persisted, the exchange rate was over-valued, and loose monetary policy and excessive monetary growth. Heavy selling of the New Zealand dollar, which threatened to exhaust the country's foreign reserves, culminated in a snap election in June 1984 and a change of government. The new administration then set about a reform programme unlike any developed country had attempted. Agricultural support was an obvious target given its transparency, the seriousness of the fiscal deficit, the size of the agricultural sector relative to the rest of the economy and its export orientation, and the fact that the reforms were being implemented by a Labour government (not strongly supported by farmers). Such assistance was rapidly withdrawn. Farmers had benefited most noticeably from the supplementary minimum prices

[1] The PSE measures the percentage of the value of (assisted) output that is provided by the various government agricultural assistance programmes.

(SMP) scheme, which operated in a way similar to deficiency payments or export subsidies, depending on the commodity. This support was totally removed over two years. Most other assistance programmes were phased out by the early 1990s, by which time the PSE had fallen below 3%.

But the reform programme was not restricted to agriculture. Among the early actions of the new government in 1984 were a 20% devaluation of the New Zealand dollar, removal of financial and exchange market controls, and the floating of the dollar. Export assistance was removed, tariffs were progressively lowered and import controls were dismantled, all with the objective of promoting international competitiveness. Later, the central bank was given increased autonomy in its pursuit of price stability and a 0-2% inflation target (1989), and the labour market was deregulated (1991). The public sector was downsized, and commercial activities of government were corporatised or privatised (including agricultural extension).[2]

Politicians and farm leaders sometimes behave as if the removal of subsidies will inevitably lead to the decline and fall of farming. This would seem to ignore the point that agricultural markets adjust to changes in supply and demand as predicted by economic theory. A major thesis of this paper is an obvious one - that agricultural agents, be they farmers, processors or marketers, do in fact change direction in the face of new economic and policy environments. The result is that the decline of agriculture is not as severe as is often feared because adjustment costs are shared between market participants. Short-term declines might even be turned around after a period.

How did the New Zealand agricultural sector manage to survive such an abrupt withdrawal of assistance? Just how savage the deregulation was is apparent from falls in the New Zealand PSE - from its peak of 35% in 1983, the PSE had fallen to 9% four years later and by 1994 was only 2%. Therefore the removal of assistance payments equivalent to 35% of output value might be expected to have an equivalent impact on farm profitability. However in New Zealand, this has not been the case. Such an interpretation of the PSE assumes other things do not change - as will be explained, farmers and others in the food system reacted rationally to the withdrawal of subsidies, and reforms elsewhere in the economy also had a positive effect on farm and sector profitability. The failure to recognise the latter effects encourages an overly pessimistic view of the consequences of agricultural reforms. Thus the New Zealand experience has been that removal of farm support did not lead to permanently lower farm incomes. So what happened to allow farming to remain viable? What are some of the lessons to other countries with high levels of farm assistance, which might harbour fears that removal of subsidies will devastate farm profitability? The remainder of the paper addresses these issues.

[2] Fuller accounts of the deregulation are given in Johnson et al. (1989), Johnson (1991), Johnson (1993), Sandrey and Reynolds (1990), Valdes (1994), Sandrey and Scobie (1994), Johnston and Frengley (1994) and Johnson (2000).

2. Product Market Adjustments

Sheep and beef farms are a major component of New Zealand's farm sector, whose outputs comprised 44% of the value of total agricultural output in 1984. They were also the most heavily assisted farm type, with total assistance that amounted to over 38% of the value of farm output in 1983[3] . For much of this section, therefore, attention is focussed on this component of the agricultural sector, and the period up to 1990, as they bore the brunt of the adjustment process.

2.1 Changes in output prices

While the removal of assistance had a significant impact on farm prices, especially for the more-heavily supported sheepmeat and wool prices, other factors also played a role. These included foreign exchange rates and domestic price stability, which were also influenced by macro aspects of the reforms. Domestic inflation, which had exceeded 20% during the 1970s, was not substantially reduced until after the passing of the Reserve Bank of New Zealand Act (1989) which gave the central bank increased autonomy in its pursuit of price stability and mandated a 0-2% inflation target. Hence the margin between fob export prices and farmgate returns tended to increase for much of the adjustment period, exacerbating the negative impacts on farm prices of the withdrawal of assistance. On the positive side, world commodity prices (in foreign currency) increased during the first year of the adjustment period (1984 to 1985) for wool, sheepmeat, beef and dairy, and at other times during the adjustment period as well. Whether these foreign price movements translated into higher fob export returns was influenced by exchange rate policy. A 20% devaluation of the New Zealand dollar took place immediately after the 1984 election, which amplified the impact of higher world prices on farmgate returns for all pastoral commodities in 1985. However removal of the earlier interest rate freeze and a tighter monetary policy attracted foreign capital to New Zealand due to the increasing interest rates, and the NZ dollar appreciated during 1986 and 1988. In some cases this counteracted increases in world prices, and in others augmented the impact of lowered world prices on farmgate returns.

These effects are summarized in Table 1, where year-on-year changes in assistance are compared with corresponding changes in farmgate prices. Assistance payments to lamb, for example, peaked in 1984 at 67% of the farmgate price. This assistance was almost completely removed over the following three years, yet the farmgate return increased in two of those years. In spite of increased domestic margins, higher world prices and a depreciating currency contributed to this outcome. For mutton, assistance was withdrawn over 1986 and 1987, after peaking at 87% of the farmgate price in 1985. In total over 1986 and 1987, assistance fell by 78c/kg, while the farm price was reduced by the smaller amount of 34c/kg, due to the mitigating effects of other factors discussed above.

[3] Total assistance given to sheepmeat, wool and beef, as a percentage of the value of output of these products (Sandrey and Reynolds, 1990, Table 4.2)

Assistance payments to wool did not comprise such high proportions of the farmgate price as was the case for sheepmeat. Nevertheless, assistance comprised 18% of the wool farmgate price in 1983 and this support was eliminated over the following three years. During 1985 the farm price for wool actually rose due to world price and exchange rate effects, and in the previous year the farm price fell only marginally as world prices had increased that year.

Table 1: Annual changes in assistance payments and prices

Nominal c/kg change from previous year

June years	Wool	Lamb	Mutton	Beef	Milkfat
		Assistance and Farmgate price change ()			
1983	12 (0)	61 (4)	7 (11)	-3 (14)	9 (60)
1984	-30 (-2)	24 (8)	-7 (10)	-10 (7)	-23 (-10)
1985	-19 (47)	-35 (15)	70 (16)	-2 (67)	1 (46)
1986	-4 (-25)	-27 (-83)	-51 (-70)	3 (-71)	0 (4)
1987	0 (57)	-49 (57)	-27 (36)	-1 (-1)	2 (-45)
1988	0 (34)	-6 (-41)	-1 (-2)	-1 (8)	-4 (52)
1989	0 (54)	0 (22)	0 (-2)	0 (50)	-1 (163)
Av.1985-89	-4.6 (33.4)	-23.4 (-6)	-23.4 (-6)	-0.2 (10.6)	-0.4 (44)

Source: Sandrey & Reynolds (1990) Ch 8

2.2 Changes in farm output

Prior to 1984 price signals to farmers had been disguised, especially by the administered price schemes for sheepmeat and wool. The impact of deregulation on the product mix on sheep and beef farms was rapid - the number of sheep declined from 70.3 million in 1983 to 60.5 million six years later with consequent reductions in sheepmeat and wool production. To some extent the reduction in sheep stock numbers was replaced by beef cattle and the newly-establishing farmed-deer and goat enterprises - between 1983 and 1989, the number of beef cattle rose from 4.5 million to 4.9 million by 1988, but fell back to 4.5 million the following year. Over the same period the number of farmed deer rose from 0.2 million to 0.8 million and farmed goat numbers rose from 0.15 million to 1.2 million. Since then, the goat industry has all but disappeared, but the deer industry has continued to develop (see Section 5). Using three-year averages based on 1984 and 1990, the volumes of sheepmeat produced fell 19% over this period, that of wool fell by 14%, while beef and veal production increased by 10%.

Dairy returns were affected relatively less by the removal of farm subsidies (Table 1). While dairy cattle numbers have increased steadily since the early 1990s, in

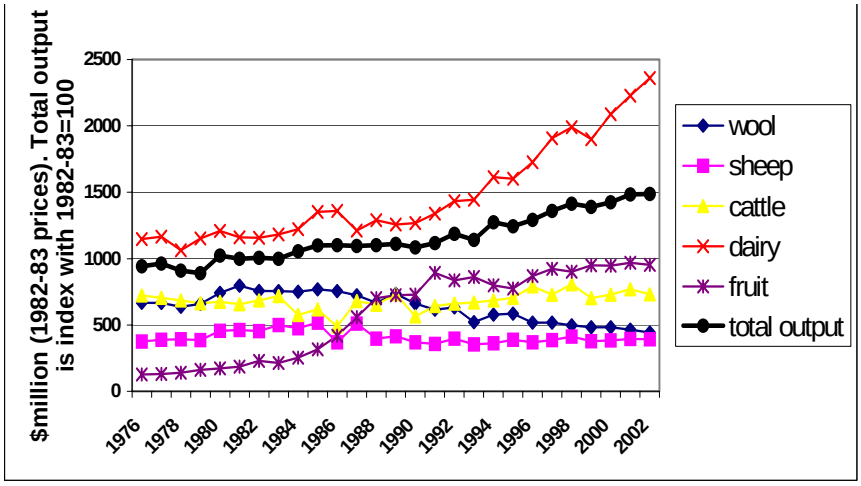
part due to the conversion of sheep and beef farms, the number of dairy cattle and volume of milk production showed little change during the late-1980s adjustment period.

Fruit production almost doubled between 1984 and 1990. Because of the time lags in perennial cropping, however, this growth likely reflected earlier investment decisions rather than resource re-allocations due the deregulation. In fact, this growth would have been partly encouraged by the export incentive scheme that existed for non-traditional farm products and which was phased out over the 1985-90 period.

At the aggregate level real agricultural output, which had increased during the early 1980s, did not decline over the remainder of that decade when farming was undergoing adjustment to the deregulation. In fact, real output remained largely static from 1985 until 1990. Thus it was the agricultural sector's output mix that changed during this period, rather than total sector output (Figure 2).

Figure 2 Changes in NZ Agricultural Output

Selected commodities and total output index



Source: Johnson and Forbes (2000), updated by Forbes (personal communication).

2.3 Actions taken by marketing channel participants

An important objective of the deregulatory reforms was to increase competition in the domestic economy, along with international competitiveness. As regards agriculture, various domestic marketing boards were soon disbanded, including those responsible for fluid milk, wheat, eggs and citrus, and the domestic marketing of apples. This cleared the way for the entry of private sector participants in the marketing of such products.

Labour market and waterfront reforms also had significant impacts on marketing efficiency and productivity. New legislation in 1989 abolished the organisation that operated a national pool of labour for the waterfront (a high proportion of

New Zealand's agricultural output is exported), and gave employers the responsibility for negotiating pay and conditions. Comparing 1989 with 1986, the number of waterside workers had fallen by 34% and payout per worker had increased by 45%. Productivity gains are indicated by a 53% increase in tonnage handled per worker (Pomeroy, 1990). In 1989-90 conventional stevedoring costs fell by 30% for dairy product loading and by 50% for some horticultural products (Johnson, 1991).

The labour market reforms of 1987-1991 have also had profound impacts on the marketing channel, and processing costs and performance in particular. Compulsory union membership was abolished, and greater flexibility was introduced into labour relations by providing employers and employees with more freedom of choice in negotiating terms of employment. In the meat processing sector, agreements with the two major unions were replaced by company or plant-specific agreements, union membership had dropped by a third by 1993, and industrial stoppages dropped markedly (Ellis, 1993).

3. Non-Factor Markets

3.1 Input prices

Assistance to farmers included subsidization of input prices, especially of fertilizer. In 1984, total subsidy expenditures on purchased inputs amounted to 7% of total assistance to pastoral agriculture. But in addition to the phasing-out of these subsidies, another factor associated with the reforms that impacted on input prices was the significant reduction in inflation achieved towards the end of the 1980s due to the tightening of monetary policy. This impacted on the prices of non-tradable inputs to farming, which group accounted for about 65% of farm inputs at that time. Tariff reductions and the ending of import licensing, along with exchange rate changes, also combined to influence the prices of tradable farm inputs. In some instances, such events offset to some extent the impacts of the removal of input subsidies. Tradable inputs showed the more rapid drop in the rate of price increase, from an annual rate of 19% in 1985 to just 1% in 1989. In contrast, the rate of price increase for non-tradable inputs remained between 5% and 10% between 1985 and 1988, but decreased in 1989 as domestic inflation came under control. (Sandrey and Reynolds, Ch. 8). Thus pastoral farmers, who had seen their index of input prices increasing by over 20% per year during the late-1970s, experienced lower farm input price inflation of 10% per year between 1984-1987, and 3% over the 1987-1990 period. The farm input price index actually fell during 1992-94, and costs have inflated by about 1.5% per year since then.

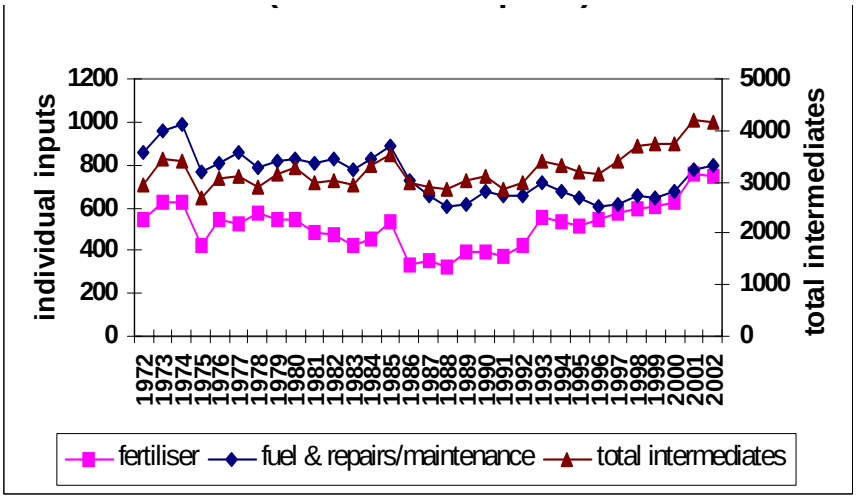
3.2 Changes in intermediate input use on farms

Fertiliser and repairs and maintenance are the major variable inputs on typical sheep and beef farms in New Zealand (both accounted for 11% of total expenses

for the average sheep and beef farm in 1985). Expenditure on fertilizer subsidies to pastoral agriculture amounted to $62 million in 1980, but had reduced to $6 million by 1987 and zero thereafter. When output assistance and fertiliser subsidies were removed, and as farmers' debt repayments escalated due to increases in interest rates and the phasing out of concessional interest loans, fertiliser expenditure was one of the few areas in which farmers could attempt to reduce cash outlays. Over the period 1980-84, sheep and beef farmers applied on average around 15.5 kg of fertiliser per stock unit - fertiliser application was more than halved from the 1985 to the 1986 season, and remained around 6-7 kg for the next couple of years. Total sales of fertiliser in 1988 were 45% lower than the volume of sales in 1985. Spending on repairs and maintenance was also sharply reduced, and in physical terms decreased by about half between 1985 and 1989. In the aggregate, intermediate inputs to the agricultural sector fell by 8% over the1984-1990 period (Figure 3).

Figure 3 Intermediate Inputs to Agriculture

$ million 1982-83 prices



Source: Johnson and Forbes (2000), updated by Forbes (personal communication).

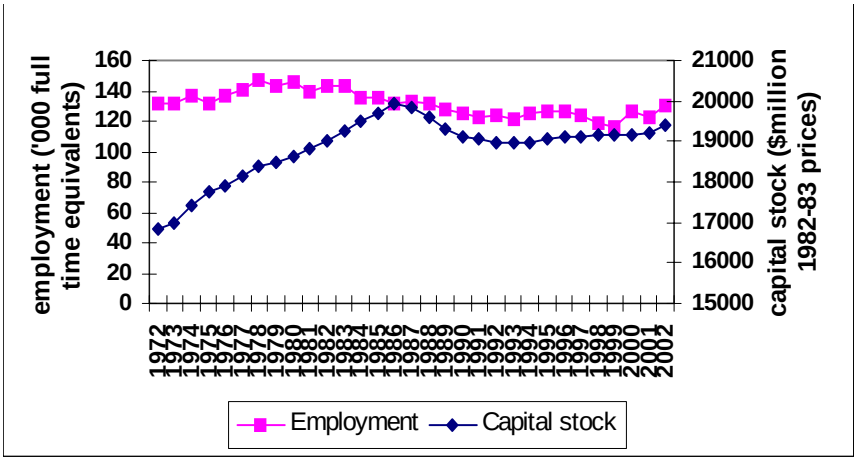
4. Factor markets

4.1 Agricultural credit

Farmers also responded to the deregulation through reductions in capital investment in farming. Capital expenditure had shown strong growth during the 1970s and early 1980s, partly in response to policies on price support and incentives for development including subsidized credit. Interest rates (which had been frozen under the previous government's price freeze) increased sharply with the removal of price controls in 1984 and for many farmers, debt servicing became their major item of expenditure and new investment suffered. The removal of such assistance since 1984, along with higher interest rates, saw capital expenditure reduced to very low levels. Real investment on farms during

1988 was only 30% of 1984 levels (Sandrey and Reynolds, Ch. 9). Further, the level of new investment was insufficient to offset depreciation, so the total agricultural capital stock also declined (Figure 4).

Figure 4 Employment and Capital Stock in NZ Agriculture



Source: Johnson and Forbes (2000), updated by Forbes (personal communication).

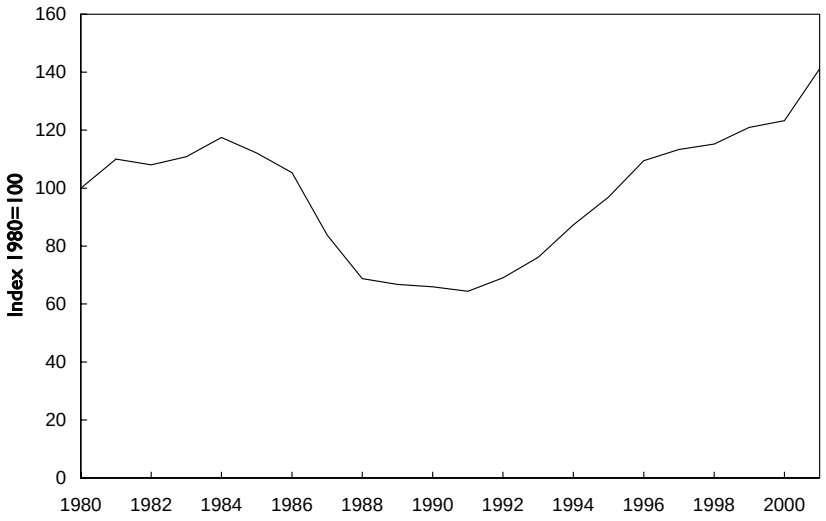
The demand and supply of credit finance mirrored the reduction in investment just referred to. This is illustrated in Figure 5. Agricultural credit fell nearly fifty percent in nominal terms from its 1984 peak but somewhat less in real terms given the high rate of inflation during the late 1980's. A significant amount of debt was written off by private lenders (often families) but the major debt write-offs were orchestrated by the state-owned Rural Bank (see Section 6). The private sector debt write-offs are illustrative of the market adjustments that occur in sharing the burden of adjustment. This burden sharing was reflected in the fact that farm bankruptcies were much lower than had been expected – even by the reforming government itself.

Figure 5 also shows that the nominal value of agricultural credit did not recover its 1984 level for over 10 years. In large part this is due to the persistent reductions in farm land values that occurred after 1984, discussed below.

4.2 Farm land

The fall in the profitability of sheep enterprises relative to other types of farming led to major changes in land use patterns. Davison (1996b) estimated that over the decade between 1984 and 1994, the area of grassland under sheep and beef cattle farming declined by 1.93 million ha, or by -16%. Of this, 1.08 million ha (56%) were changed to other grassland uses such as dairy farming and diverse uses that included farmed grassland associated with vineyards, other horticulture, and semi-urban 'lifestyle' blocks. The remaining 850,000 ha of diverted land has been changed to forestry or involved retirement of marginal lands.

Figure 5 Agricultural Credit



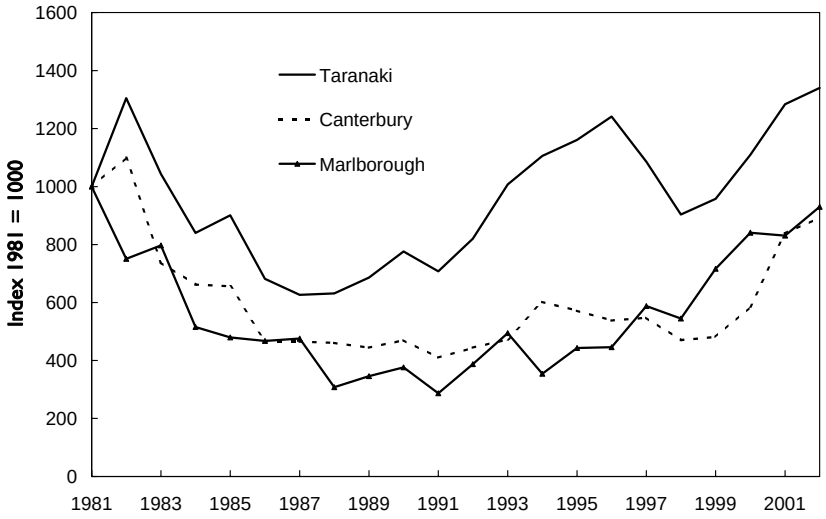
Source: NZIER and Thorpe (2003)

Farm land prices had fallen somewhat, before the reductions in product prices associated with the reforms. This is shown in Figure 6. This Figure shows the prices of farm land in three agricultural regions of the country from 1981, relative to urban residential property prices in those regions. Farm land prices fell after 1981 in a number of countries around the world in what may have been a generalized global response to increasing real interest rates following the advent of monetarist reforms from the late 1970s (first in Britain in 1979 and followed by the US). There may have been other factors involved prior to the New Zealand reforms as discussed by Alston and Johnson (1988).

From an index number of 1000, farm land prices were around 80 percent of their 1981 level at the onset of the reforms in 1984 (800). During the reform adjustment period, farm land prices fell around 20 percent in the predominantly dairying region of Taranaki, where agricultural subsidies had been relatively light. In regions where sheep production was more important, like Canterbury and Marlborough, land prices fell more – by around 50 percent.

Land price falls in the dairying region bottomed out in 3 years but the turn-round in the other two regions did not occur for seven years. Farm land prices then recovered strongly relative to urban residential prices during the 1990's and are currently back to their 1981 relatives, or ahead of urban land prices.

Figure 6 Real Farmland Prices
Deflated by urban residential property prices



Source: NZIER

4.3 Agricultural labour

Labour is a major input to New Zealand agriculture, but it has been of declining importance as a result of long term capital-labour substitution. Table 2 gives a breakdown of labour employment in primary agriculture from 1986 broken into two periods. The period 1986-91 may be taken to be the adjustment phase to the subsidy removal and the latter period, 1991-2001, as business-as-usual in the de-subsidised environment. Over the latter period, the total full time equivalent (FTE) workers on farms (made up of nearly 50 percent working owners) fell from 117,000 to 115,000. If we take that as the normal decline due to biased technical change then the reforms resulted in an 11 percent drop in farm labour employed – from 133,000 to 117,000.

The farm workforce (FTEs) in 1986 was made up of 53 percent working owners (71,000 farmers), 40 percent paid employees (53,000 FTEs) and the remainder (8,000 FTEs), unpaid family labour. The reforms resulted in an almost equal fall in the number of farmers and paid employees but proportionately, employees fared the worst. In 1991, farmers comprised 55 percent of the workforce and paid employees 38 percent. In short, there was a tendency for farm employee numbers per farm to fall with a higher proportion of the work being carried out by the working owner(s). This was a short term measure however. Over the period from 1991, farmer numbers continued to fall while employee numbers rose significantly.

The changing composition of the farm workforce was also being influenced by the changing product mix. The land size distribution of farms was becoming increasingly bimodal as extensive (sheep and beef) farms became larger but smaller in number, and smaller farms devoted to horticulture, deer and other

outputs increased in number but on smaller sized units. (There was also a large increase in the number of farms split up into small acreage 'lifestyle' blocks that became important in sectors like beef production – it is estimated that around 25 percent of beef breeding cows are now run on 'lifestyle' blocks in New Zealand.)

Table 2: Agricultural labour

Category	Units	1986	1991	2001
Farm workers	No. 000's	144	128	129
	FTEs 000's	133	117	115
Women	% of farm workers	29	30	33
Farmers	FTE 000's	71	64	52
Women	% of farmers	23	25	29
Employees	FTE 000's	53	45	50
Women	% of employees	31	30	31
Unpaid family	FTEs 000's	8	7	12
Women	Unpaid %	72	63	55
Part-time employees	%	20	21	23
Av. age farmers	Years	43	45	49
Av. Age Workers	Years	39	41	44

Notes: (1) Workers refers to all employers and employees, paid and unpaid. (2) Farmers refers to self employed and employers (mainly working owners) (3) Part-time employees (paid) as % paid employees.

Source: NZIER, derived from population census

The increasing number of smaller, but intensively farmed, horticultural and grape units also had an impact on the employment of part-time labour. So too did changes in the size of dairy farms employing part-time milkers. Part-time employees rose from 20 percent of total paid employees in 1986 to 23 percent in 2001.

Women's role as farmers increased steadily throughout the period, growing from 23 percent in 1986 to 29 percent in 2001. Women's role as paid employees remained around 30 percent throughout but was reduced in the category of unpaid family labour.

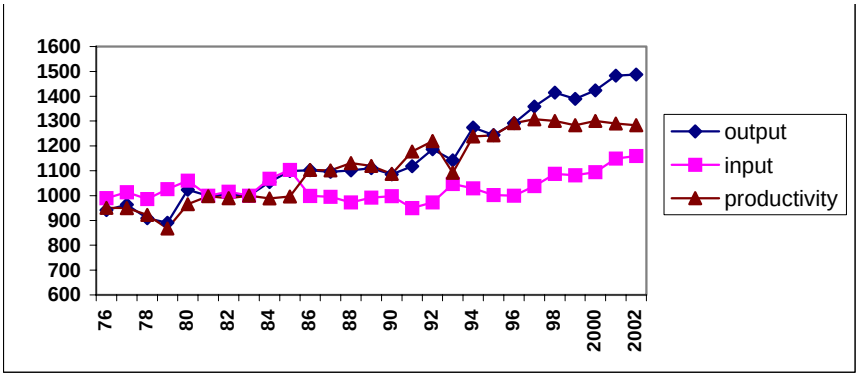
The reforms were hardest felt by younger farmers because they tend to have lower equities. In many districts, the number of farmers under 30 years of age fell by 50 percent from 1986 to 1991. The average age of farmers accordingly rose from 43 to 45 years (Table 2). This trend has continued since 1991 so that the average age is now around 49 years of age. Since 1991, farming has continued to be more capital intensive both on large farms (sheep, beef and dairy) and smaller farms (grapes, horticulture and specialized livestock). Land prices have risen again since 1991 so farms have become more finance intensive favouring owners with greater access to finance markets (older farmers).

It is interesting too that farm workers, as a whole, are getting older and that has been a steady trend since 1986. In part, this is probably due to the rapid increase in school leavers going on to tertiary education since 1986 driven by relative wage rates.

5. Innovation

It is clear from the above discussion that in the years immediately following deregulation, the level of input use on New Zealand farms declined but the volume of aggregate production did not. Forbes and Johnson (2001) and Johnson (2002) measured agricultural productivity trends up to the year 2002, and their data are summarized in Figure 7. For the agricultural sector as a whole, total input productivity grew at the annual rate of 1.0% over the 1976-84 period, when assistance to farming reached its peak. During the 1984-1990 period of adjustment to the withdrawal of such assistance, however, input productivity grew at the faster rate of 2% per year. The rate of productivity growth accelerated further during 1990-97, to average 2.3% per year.

Figure 7 Productivity Trends in NZ Agriculture



Source: Johnson (2002)

Such enhanced productivity performance, while it refers to agriculture in the aggregate, was likely instrumental in helping the sheep and beef sector in particular to weather the financial stresses of the deregulation adjustment period.

The removal of farm subsidies encouraged the expansion of previously unsubsidized outputs and stimulated innovation. One example of this expansion was the domesticated deer industry.

5.1 Case study – deer

The roots of the domesticated deer industry were in animals released in New Zealand to be hunted for sport which then became a pest marked for eradication. This developed into domesticated deer farming. The fuller story of this growth is in Nixon (2003). The temperate climate of New Zealand proved to be an ideal breeding ground. By the 1920s the deer population explosion began to have an impact on the environment. In some places wild deer were displacing domestic stock causing damage to crops, pine plantations, and pastures. The first attempts to control deer were in 1908 (Johns & MacGibbon, 1986). While different approaches were tried, it was not until the 1950s when deer culling started to impact on the wild population. The government, through the Deer Industry Association, developed a market in 1931 as an outlet for skins taken in culling operations and this was the focus of commercial operations up until the early 1960s.

5.2 Supply

The supply of deer can described in two distinct phases. Firstly, the hunting phase and secondly, the farming stage. In the early 1960s the venison supplied to the export market came from wild deer shot by hunters. By 1965, it became economic to use helicopters to shoot deer and the number helicopters used increased dramatically.

The switch between the hunting phase and the farming phase occurred in the early 1970s. By that time the culling of wild deer became unsustainable. As an alternative, farming was the only way to sustain and grow the deer population. At the same time research programmes were initiated to understand the best way to handle deer in a farming situation. From a slow start in the 1970s deer numbers have reached 1.6 million head in 2002. Most deer farms are now in the South Island since high country farms are most suited to deer farming. At first, farmers selected red deer because they were the most numerous. Now they are also seen as well adapted to the New Zealand environment and are more manageable than other breeds of deer.

Velvet and venison are by far the most important products, although other by-products are also profitable. While venison drove the development of farming deer, velvet production began in earnest with deer farming. To get the highest quality product velvet must be harvested at the right time, and it was only by luck that good quality antlers were acquired through hunting the animals. Harvesting velvet involves tranquillising the stag and removing the antlers. Care needs to be taken to remove the antlers at the correct time because the difference in quality can have a large impact on profitability.

5.3 Demand

The development of an export market for velvet and venison is a relatively recent phenomenon, with little trade until the mid-late 1960s. The demand is essentially an export demand with most product being exported to Germany (venison) and the Republic of Korea (velvet). The first shipment of venison was shipped to the United States in 1953, Anderson (1978). However, it was from Germany (then West Germany) that the main demand for venison has come. The German market still dominates the venison trade and in 2003 provided approximately 50% of the market for New Zealand venison.

Venison has followed the classic production-push pattern. Undifferentiated bulk commodity product was shipped into the market that was prepared to pay the highest price. As demand increased and prices improved in the German market the supply response fuelled the growth in deer numbers. Prices remained relatively firm until the Chernobyl incident in 1986. Since New Zealand venison was undifferentiated from Eastern Europe game meat which was tainted by high levels of caesium from Chernobyl, it met with considerable consumer resistance.

To differentiate its product the New Zealand industry launched venison as a branded product and this strategy continued with the New Zealand Cervena brand distinguishing New Zealand venison in the market. However, most of the New Zealand venison has been taken up by the wholesale market which ends up in the restaurant and catering outlets. Therefore, the ability to lift prices above the commodity prices level was limited. It has been only relatively recently that New Zealand branded venison has entered the German retail trade.

Initially, New Zealand producers presumed that the demand for velvet came from Hong Kong. It was discovered by accident that the drying of velvet was done in Hong Kong, but the product was then on-shipped to the Republic of Korea. It was only when New Zealand producers approached Korean importers that the latter also realised that New Zealand was the source of supply. To cut out the Hong Kong processor the Koreans began to set up drying operations in New Zealand.

5.4 The main innovations

Apart from some Scottish research, there was very little understanding of how to go about turning deer into a farm animal. Most of the research had to start from scratch using captured wild deer. Despite this, New Zealand researchers had a number of advantages in their quest to domesticate deer. Of particular importance was the ability to apply the knowledge and skills already learnt from the management of sheep and dairy. Techniques from sheep farming such as mating management, weaning, and grazing control were adopted readily in deer farming. Agriculture research stations also had the infrastructure and skills to develop world's best practice. This meant that the capacity was in place to deal with deer farming problems as they arose.

The main innovations were:

- Use of helicopters for retrieval. The use of helicopters improved the ability of hunters to recover deer.
- Deer handling. Deer are nervous, flighty, easily scared, given to panic, and can easily injure or kill themselves. Through research is was discovered that deer required time to adjust to new surroundings. Once the animals became familiar with their surroundings, coupled with the skill of those working with the animals the deer became more amenable to management.
- Reproduction. Successful reproduction requires: deciding what characteristics are required, measuring and record the relevant information that is important in selecting the type of animals required, identifying and selecting the type of animals required (use of ear tags for hinds and fawns) and breeding from superior animals.
- Yard plans. Deer behaviour has a big impact on yard design. Good design requires covering the facility to provide a dark interior, a round or octagonal drafting yard, at least one or two smaller pens to hold each mob drafted off, and an adjustable loading race for transporting animals.
- Good deer farm design includes: a central farm race enabling deer to be moved from yard to paddock easily, and any angles in the race should be screened with trees or a sight board, boundary fences should be at least 2 metres high, and ideally paddocks should be square with fresh water in each paddock.
- Feed requirements in intensive agriculture. Understanding the relationship between nutrition, liveweight, age, and performance are of crucial importance in managing an efficient deer farm.

Such innovation in the deer industry can be roughly divided into on- and off-farm developments. Most of the major breakthroughs in on-farm innovation occurred in the 1970s and early 1980s. These included the special facilities required for deer farming (fencing, farm layout, and yard design), requirements for growth and nutrition, reproduction, understanding animal behaviour, use of helicopters in deer recovery, and feed requirements for intensive agriculture. The off-farm innovations have occurred mainly in the post-1984 period. The use of brands (e.g. Cervena), the increase in marketing scale (as meat companies have entered the industry), and the development of the retail trade in Germany have all been significant marketing innovations. The off-farm innovations have benefited from stable and consistent government policies both in New Zealand and in importing countries, including low trade barriers. The challenge for the deer industry is overcome the tendency to rely on commodity marketing and build closer links with the retail sectors for both venison and velvet. Key to achieving this goal is the development of scale in processing and marketing to control supply and guarantee year round supply to retailers.

6. Government Facilitation of the Farm Adjustment Process

As agricultural assistance was withdrawn following 1984, it became apparent that marginal and non-viable farm families were not protected by the government's existing social welfare provisions. Therefore specific schemes were devised, including a Special Assistance to Farming programme which was in operation between 1986 and 1989. Provided certain criteria were met, grants were made to farmers who were in a critical financial position to provide for day-to-day living expenses. In this way, farmers and their families could receive a welfare benefit equivalent to the unemployment rate (Chadee and Johnson, 1994). An Exit Grant scheme was introduced in 1988, to provide assistance to non-viable farmers to encourage them to leave farming.

As discussed above, the increase in assistance to the farm sector in the years up to 1984 impacted on land prices. The deregulation of 1984 lead rapidly to falling land prices, rising interest rates and an increase in farm indebtedness. By 1987, 23% of sheep and beef farms had less than 50% equity compared with 6% of such farms in 1984. Farm lending, at that time, was dominated by the government-owned Rural Bank, and in 1986 this bank introduced a loan discounting scheme. Johnson (1989) reported that by 1988 approved applications involved average discounting of 33% of the original debt to the Rural Bank. Walker and Bell (1994) note that for most, debt restructuring and debt write-off followed, although for some selling was the only option - about 20% of the total debt owed by the farm sector was written-off, and about 5% of farms were sold.

Government also facilitated the adjustment process in other ways (Walker and Bell, 1994). A Rural Coordinator service was partially funded by government, which worked with local support groups, helped in financial counselling and helped initiate the development of non-farm activities in rural areas. The Ministry of Agriculture established a Rural Affairs Unit to monitor impacts on rural communities, appointed staff to coordinate strategic planning within the sector, funded a Rural Help Directory to advise of locally available sources of help, and funded a series of risk management seminars for farmers.

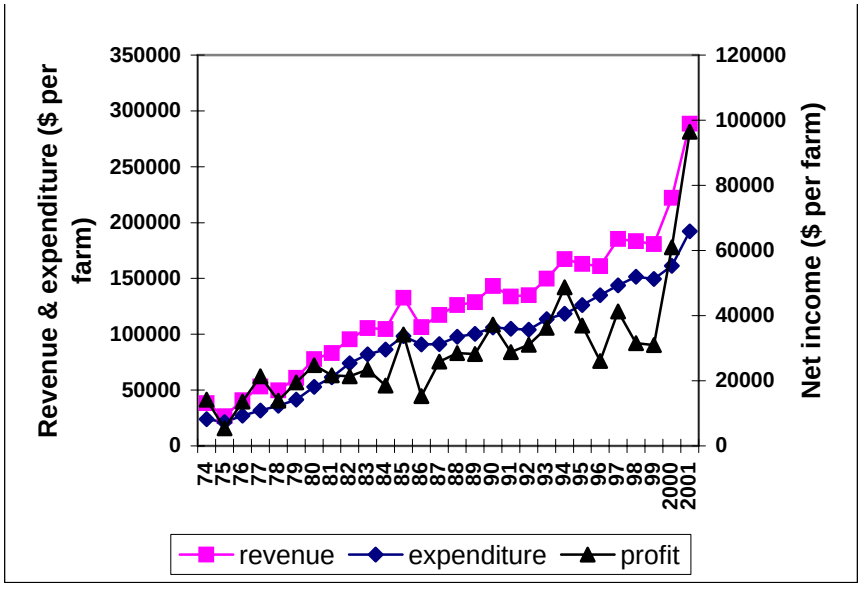
7. Impacts on Farm Incomes and Sectoral Value-Added

How did the removal of farm assistance in NZ combine with other factors discussed above to influence farm incomes and sectoral performance? Because of its dominance in NZ agriculture and its relatively high level of assistance, we will

first focus on sheep and beef farm incomes which are surveyed annually (NZMWBESb)[4] .

In the year ended 1985, during which the new government's deregulation began, average sheep and beef farm nominal incomes almost doubled from the previous year, and gross revenue increased by 25% despite the decline in assistance payments to wool and lamb output (Figure 8). On the revenue side, this was due to higher world prices for meat and wool, a depreciating NZ dollar, and increased meat and wool production. Increased lamb and sheep slaughter rates over the previous year contributed to the rise in meat production, as farmers began reducing sheep numbers in response to changing relative prices. Farm net incomes plummeted by 55% between 1985 and 1986, however, as the further reduction in assistance to sheepmeat output was now augmented by weaker world lamb and beef prices and an appreciating currency. Farmers responded by cutting nominal expenditure by 8% from the previous year, and halved their application of fertilizer. Much of the remaining assistance was removed in 1987, during which time world prices recovered, the NZ dollar depreciated and farm net incomes rose 67% over the previous year. Nominal net incomes then remained relatively stable over the remainder of the 1980s adjustment period. It was not until the early 1990s that fertilizer use increased on these farms, and more substantive productivity gains were achieved, for example with higher lambing percentages and lamb and beef slaughter weights.

Figure 8 Sheep and Beef Farm Incomes

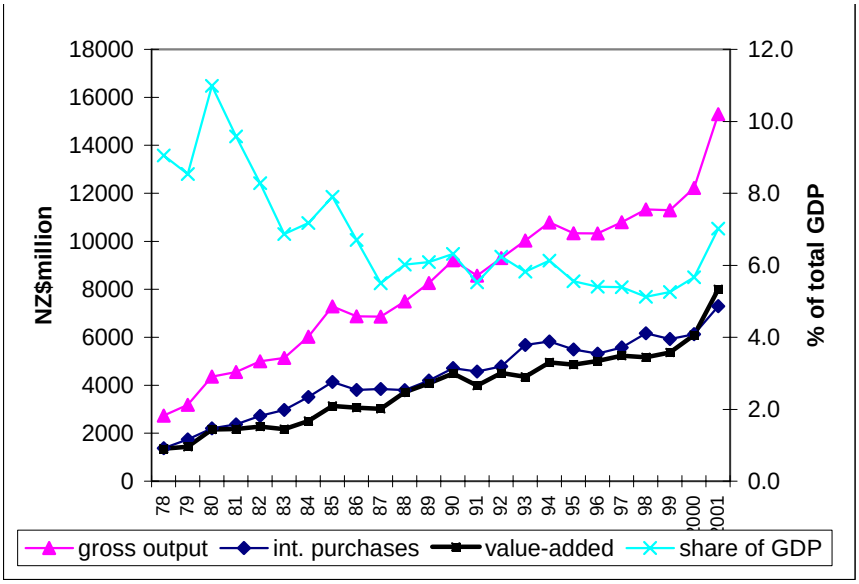


Source: MZBES (b)

[4] This is based on a random sample of farms, with at least 80% of revenue derived from sheep and beef cattle. Data presented here are weighted averages over all surveyed farm types and regions. Note that during the 1984-90 period, the average farm size varied between 487 ha and 502 ha.

Somewhat similar trends are observed at the aggregate sector level (Figure 9), which is not surprising given the relatively high share of sheep and beef farming in gross sectoral output during the mid-1980s. The nominal value of gross output increased by 20% during the first year of deregulation (1985) for reasons including those explained above along with an increased farmgate price for milk, but declined the following year. Gross output value then steadily increased until the mid-1990s. Gross expenditure on intermediate inputs also fell from 1985 to 1986, and remained at that level for a further two years, reflecting lower spending on inputs such as fertilizer and maintenance. Value-added in NZ agriculture was $3.14 billion in 1985, but declined over the next two years to $3 billion in 1987. From then to the mid-1990s, agriculture's contribution to GDP grew at about the same rate as the economy as a whole, so maintaining around a 6% share of total GDP.

Figure 9 Agricultural Sector GDP



Source: Statistics NZ (PCINFOS)

8. Lessons and Conclusions

A number of lessons can be concluded from the New Zealand experience, that may be of value to other countries wishing to improve levels of economic performance in agriculture.

Farmers and others have the scope and ability to make changes in reaction to the reduction in assistance, therefore raising business profitability above what it would have been had such a reaction not occurred. This may not occur however until farmers and others realise that government is unlikely to introduce policy U-turns.

Farmers do not bear all the adjustment costs required. Farmers do not face perfectly inelastic supply or demand curves. As a result the burden of adjustment is shared across the markets farmers participate in.

Macroeconomic stability plays an important role in re-establishing agricultural profitability, but adaption and innovation in the sector are by far the most important factors in re-invigorating the sector post-reform.

Agricultural deregulation becomes more feasible from a political point of view if other sectors of the economy are reformed at the same time - farmers may not be seen as the only contributing group, and will receive gains from the more general deregulation.

While agricultural deregulation was far from painless, negative impacts on farm profitability will be short-term and transitional in nature. Given time, profits recover from the initial shock as asset prices adjust to lower product prices, outputs change and demand grows.

Efficiency of resource use throughout the tradables sector of the economy will have benefited from the reforms as producers, be they manufacturers, farmers or others, now formulate decisions in the face of international price developments and market conditions. Resources will have been redirected towards those products with comparative advantage.

The adjustments are not instantaneous. Although New Zealand farmers did move quickly in terms of rescuing the profitability of their farms, it took considerably longer for economic growth to return and general unemployment to begin to subside.

During the adjustment period, there is a role for government assistance measures, decoupled from production decisions, to support household family consumption.

Finally, the reforms in agriculture have had positive environmental impacts. Prior to 1984, subsidies encouraged marginal land to be developed, encouraged higher stocking rates and encouraged the overuse of fertilisers. Since the removal of assistance, chemical usage has declined, and marginal and easily erodable land has been taken out of farm production.

9. References

Alston, Julian and Paul Johnson, 1988. Factor Price Equalisation among International Farmland Markets. Australian Journal of Agricultural and Resource Economics 32(2&3): 142-152.

Chadee, D., Johnson,R.W.M., 1994. The Uruguay Round: Final Agreements and Directions: Domestic Support. Review of Marketing and Agricultural Economics 62(2): 201-214.

Davison, R.M., 1995. A Decade of Change and Development. New Zealand Meat and Wool Boards' Economic Service, paper no. G2089, September.

Davison, R.M., 1996a. Economic Position of the Meat and Wool Industries. New Zealand Meat and Wool Boards' Economic Service, paper no. G2097, February.

Davison, R.M., 1996b. Agricultural Land Use Change With Reference to Sheep and Beef Farm Land: Salient Points. New Zealand Meat and Wool Boards' Economic Service, paper no. G2107, July.

Ellis, J., 1993. The Impact of Recent Labour Reforms on Agriculture. In: Situation and Outlook for New Zealand Agriculture, pp. 102-107.

Forbes, R., Johnson, R.W.M., 2001. Recent Trends in New Zealand Agricultural Productivity. Australian Agribusiness Review 9.

Griffiths, Gary and W.B. Moore, 1991. Livestock Production Policies and Meat Processing Margins: The Case of New Zealand, 1967-1988. Australian Journal of Agricultural and Resource Economics 35(1): 21-48.

Johnson, R.W.M., Schroder, W.R., Taylor, N.W., 1989 Deregulation and the New Zealand Agricultural Sector: A Review. Review of Marketing and Agricultural Economics 57: 47-71.

Johnson, R.W.M., 1991. Current Changes in New Zealand Agriculture: A Review. Review of Marketing and Agricultural Economics 59(2): 130-148.

Johnson, R.W.M., 1993. New Zealand Agricultural Policy Review: 1991-93. Review of Marketing and Agricultural Economics 61(3): 375-400.

Johnston, W.E., Frengley, G.A.G., 1994. Economic Adjustments and Changes in Financial Viability of the Farming Sector: The New Zealand Experience. American Journal of Agricultural Economics 76(5): 1034-1040.

Johnson, R.W.M., Forbes, R.N., 2000. Recent Productivity Trends in New Zealand Primary Sectors. MAF Technical Paper No. 2000/20, Wellington.

Johnson, R.W.M., 2002. Productivity Trends in the Agricultural and Forestry Sectors 1972-2002. Unpublished mimeo.

Kalaitzandonakes, N.G., Spinelli.F.J, Bredahl,M., 1993. Market Liberalisation and Productivity Growth: Lessons from the Deregulation of New Zealand Agriculture. Asia and Pacific Rim RS-93-6, Economic Research Service, USDA, September, pp. 77-82.

Ministry of Agriculture, Situation and Outlook for New Zealand Agriculture, various issues, Wellington.

Nixon, Chris, 2003. Innovation and Trade Liberalisation: A case study of the New Zealand deer industry. NZTC working paper no. 31, New Zealand Institute of Economic Research, Wellington.

NZMWBES (a), Annual Review of the Sheep and Beef Industry, NZ Meat and Wool Boards' Economic Service, Wellington, (various issues).

NZMWBES (b), The New Zealand Sheep and Beef Farm Survey, NZ Meat and Wool Boards' Economic Service, Wellington, (various issues).

OECD, Agricultural Policies, Markets and Trade, various issues, Paris.

Philpott, Bryan, 1994. Productivity Growth by Type of Farming, RPEP Paper 259, Victoria University, Wellington, March.

Philpott, B., 1995. New Zealand's Aggregate and Sectoral Productivity Growth 1960-95. RPEP Paper 274, Victoria University, Wellington, October.

Pomeroy, A.1990. Effect on Agriculture of Waterfront Restructuring and Need for Shipping Reform. Discussion paper no. 1/90, Ministry of Agriculture, Wellington.

Sandrey, R., Reynolds, R. (eds), 1990. Farming Without Subsidies: New Zealand's Recent Experience, Ministry of Agriculture and Fisheries, Wellington.

Sandrey, R.A., Scobie, G.M., 1994. Changing International Competitiveness and Trade: Recent Experience in New Zealand Agriculture. American Journal of Agricultural Economics 76(5): 1041-1046.

Scrimgeour, F.G., Pasour,E.C. Jr., 1996. A Public Choice Perspective on Agricultural Policy Reform: Implications of the New Zealand Experience. American Journal of Agricultural Economics 78(2):257-267.

Thorp, Clive, 2002. Developments in credit markets over two decades. Reserve Bank of New Zealand Bulletin 65(2): 38-50.

Thorp, Clive, 2003. Personal communication. Reserve Bank of New Zealand.

Valdes, A., 1994. Agricultural Reforms in Chile and New Zealand: A Review. Journal of Agricultural Economics 45:189-210.

Walker, A. and Bell,B., 1994. Aspects of New Zealand's Experience in Agricultural Reform Since 1984. MAF Policy Technical Paper 94/5, Ministry of Agriculture, Wellington, April.