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Notes
(a)   No papers were produced for the invited addresses by
      John Pryde in Theme One and Chris Day in Theme Four.

(b)   The invited address by Ron Sandrey in Theme Three is
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TRADE POLICY AND THE GATT NEGOTIATIONS

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Department of Trade and Industry

Agricultural economists will be well versed in the problems which
the current round of Multilateral Trade Negotiations is aiming to
overcome. Protection for domestic producers, subsidisation of
agricultural production and export subsidies are issues which New
Zealand has been confronting domestically and internationally for
many years. Measures like these taken by Governments on the
domestic front to support their agricultural sectors almost
invariably impact on international trade. The domestic problems
are thus exported to the rest of the world and are left to trade
negotiators to try and resolve.

Occasions such as this provide a valuable opportunity for an
exchange of ideas between trade negotiators and economists. We
depend very heavily on your analysis of the problems and on the
figures you produce to show how serious they are: my intention
today is to provide some insight for you into the negotiating
process in the GATT - which must often appear to be a very arcane
world. In particular I would like to give you some idea of the
dynamics of the current negotiations.

First however, I should sketch the background to the agricultural
negotiations in the Uruguay Round, and bring you up to date on
what has occurred so far.

You will have heard many times the claim that this is the first
time agriculture has been included in a GATT Round of Multilateral
Trade Negotiations. While this is not strictly correct - a
negotiating group on commodities was formed in the last round, and
agricultural products have been subject to tariff reductions in
previous rounds - it is certainly true that this is the first time
that GATT member countries have grasped the nettle of
comprehensive liberalisation of agricultural trade.

Until now agriculture has been shielded from proper scrutiny and
the rigours of GATT rules on subsidies and access by virtue of its
so called "special characteristics". This was largely due to the
emotional hangover of wartime food shortages and other disasters.
It is not only generals who have a weakness for always fighting
the last war. Thus, while trade in goods has shown a healthy
trend towards lower tariffs and fewer access barriers, trade in
agricultural products has become more and more distorted by
measures designed to protect food security and agricultural
producers in general.

However, thanks to a convergence of interests in the period leading up to the launch of the Uruguay Round, a new dynamic emerged in favour of agricultural trade reform. Politicians were shaken by the paradox of enormous food surpluses piling up in the developed countries while millions in the Third World were starving. At the same time the tremendous burden of propping up uneconomic production was beginning to place intolerable strain on EC and US budgets.

A strong mandate on agriculture was therefore given by Ministers of GATT member countries when they met to launch the round at Punta del Este, Uruguay, in September 1986. They identified an urgent need to bring more discipline and predictability to world agricultural trade by correcting and preventing restrictions and distortions. The aim of the negotiations was to achieve greater liberalisation of trade in agriculture and to bring all measures affecting import access and export competition under strengthened GATT rules.

In concrete terms, this comes down to ultimately creating a climate in which the EC, US and Japan will not be able to maintain restrictions on our dairy exports, in which Thailand will be able to export rice freely to the US, and in which the US will not cut Australia out of its traditional grain export markets by competing with subsidised exports.

However, the task of negotiators in the GATT is to devise a framework of principles and rules which can be applied on a global basis to meet these ends. We can all take satisfaction from bilateral deals such as the recent agreement on beef imports between Japan and the US (and Australia). The importance of the multilateral negotiations in the GATT is that all member countries' policies will be covered by the resulting agreements.

Since the round was launched, all the major parties in the agriculture negotiations have submitted proposals advocating methods for achieving agricultural trade reform. The US has targeted the elimination of all trade distorting subsidies and protectionist measures by the year 2000 - the "zero option". At the other end of the spectrum, the EC's proposal is for short term emergency measures to be taken on "problem" commodities (cereals, sugar, dairy and meat) and for a multilateral agreement on future supply and price management. The Japanese proposal shows little movement on access barriers and subsidies, and amounts to a prescription for continued control/management of world agricultural trade.

Between these widely divergent approaches sits the Cairns Group of Free Traders in Agriculture. Our proposal envisages three phases:

- for the long term, the development of a framework of rules and disciplines to govern international trade in agriculture;
- in the medium term, commitment by all countries to the progressive elimination of trade distorting domestic agricultural policies and trade practices;

- in the next two years a programme of early relief measures, including reductions in support for agriculture, access improvements, and agreement on the management of surpluses.

The details of this proposal still remain to be agreed on by Cairns Group members. The next step is to put our elaborated proposal back into the ring and attempt to engage the US and the EC in constructive negotiation - an objective which is made more difficult by the political tension and numerous trade disputes between the two.

Having given you an idea of the framework within which we are negotiating I would like to turn to the dynamics of the negotiating process.

As you will have gathered from the different approaches in the US and EC proposals, a choice exists between grasping short term measurable gains and aiming for longer term benefits, more soundly based and more extensive but less tangible. It is necessary therefore to adapt ones tactics to the result desired from the negotiations. The position New Zealand has adopted is that we have far more to gain from a long term comprehensive reform of the world agricultural trading system than from short term concessions which would go only part of the way to meeting our immediate needs, let alone our longer term needs.

However this position poses some difficulty in terms of sustaining political commitment. Obviously the anticipated goodies I mentioned earlier will take many years to arrive. The temptation is very strong to settle for half a loaf on the grounds that the offer may not be there much longer.

I believe that we must avoid this trap at all costs. The struggle for agricultural trade reform has been going on for so many years already that it would be a terrible waste of investment to abandon the long terms objectives now. Genuinely radical change is needed. Politicians recognised this in their focus on agriculture at Punta del Este, and it is essential that the momentum be sustained.

In addition to political imperatives, another factor bringing its own dynamic to bear on trade negotiations is the climate. Agricultural production and hence trade move in cycles determined largely by climatic conditions. Frost in Brazil causes a rise in international coffee prices, while a drought in the US brings a temporary glut of beef onto the market and then leads to a shortage, causing prices to rise.

When commodity markets are perceived to be on the rise, governments feel much less pressure to confront the underlying problems. This is one of the immediate dangers facing the negotiations. The current rise in world grain prices, for example, will appear to bring to producers many of the benefits which governments have been predicting would accrue from trade liberalisation. Obviously though, the root cause of the problems which have racked the grain market over the last few years,

principally surplus production and subsidised exports, has not yet been eliminated.

These tensions are very much in evidence during the negotiations. For example, at the meeting of Cairns Group ministers in Bariloche, Argentina, in February, the Australians expressed some fear that if we didn't go for some short term gain now, we might gain nothing at all. There was also a widespread feeling that the period until the American elections in November presents a window of opportunity which should be exploited while it is still there.

These factors reinforce the importance of developing a longer term strategy which is based, not on short term gains, but on tackling the fundamental problems affecting agricultural trade. The current Cairns Group proposal is structured along the lines New Zealand wants from this point of view. We will be pushing hard to maintain this line against the considerable pressure in favour of settling for immediate but lesser gains.

An important part of the Cairns Group's proposal is the use of an aggregate measure to gauge the level of protection and budgetary support in different countries' agricultural sectors. The device advocated is the PSE (producer subsidy equivalent), which represents the payment that would have to be made to compensate farmers for the loss of income resulting from the removal of a given set of agricultural policy measures. It thus goes to the heart of the domestic policies which are responsible for the agricultural crisis.

The PSE concept has recently been picked up by the OECD which has calculated PSEs for a number of products in a number of countries over the last 15 years. However the origin of the PSE goes back to the "Standard Method" developed by a GATT committee in 1960, following a call for a study on methods for measuring levels of protection. The aim way back then was to effect a gradual moderation of the level of agricultural protection.

The intrusion of a useful technical device such as the PSE into the world of trade negotiations does however pose some difficulties. Negotiations become much more complicated when countries have to decide exactly what percentage reduction in PSE there should be in any one year, and for what products. There is certainly some truth in the KISS (Keep IT Simple Stupid) principle. When the agreement of 96 countries is required, there are definite advantages in keeping the proposal simple.

These difficulties have led some countries such as Canada to suggest that the PSE should be used to measure current support levels, and then thrown away. Indeed, Japan has not accepted the use of the PSE at all, claiming that it does not export agricultural products (but ignoring the fact that its domestic market is a significant component of the global market). New Zealand's position is that once PSEs have been used to calculate the aggregate measure of support, countries should commit themselves to cutting the aggregate measure support levels by certain percentages, by means of adjustments to domestic policies.

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It is the _policy changes_ that countries would be bound to implement, not the exact PSE reduction.

The principal dynamic at play in the negotiations over the next six months will be the imminence of the Mid-term Review of the Uruguay Round to be held in Montreal in December. The issue is how to maximise the advantages of this occasion, when the participants will clearly want to show some results for the last two years of negotiations, without succumbing to the temptation to announce premature short term gains. The location of the MTR is particularly significant for the agriculture negotiations, as Canada has been perhaps the Cairns Group member to experience the most political difficulty in accepting mandatory cuts in agricultural support.

However, it is important to remember that the Group Negotiating on Agriculture is not the only sphere of activity for New Zealand in the Uruguay Round. There are in fact 15 different negotiating groups, and New Zealand is putting considerable effort into the negotiations on subsidies and tariffs. It is possible that these groups may achieve as much for agricultural trade as will the specific agriculture negotiations.

Trade negotiations, as you will have seen, take place on constantly shifting sands, swept along by currents of different kinds. It is essential to have the compass fixed on the direction you want to head in, but at the same time to stay attuned to wind shifts which may or may not play to your advantage. So far New Zealand has kept on a steady course towards comprehensive long term agricultural trade reform. It is too early to predict the final outcome, but I hope you will have a better appreciation now of the environment in which the negotiations are taking place.

ON THE MEANING AND MEASUREMENT OF AGRICULTURAL TRADE DISTORTIONS

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SUMMARY

The proposals for agricultural policy reform which were submitted to the GATT as part of the Uruguay Round are reviewed as is Producer Subsidy Equivalent which was suggested as a measuring and monitoring device. The paper argues that this measure is wrongly focussed since it is directed towards the income transfers of agricultural policies rather than their trade effects. The meaning of the term trade distortion is explored in a variety of models and it is concluded that more attention should be paid in the negotiations to the trade impact of specific policies.

Key Words: trade, agricultural, GATT, distortions

INTRODUCTION

The general objectives for the agricultural negotiations which are part of the Uruguay Round in the General Agreement on Tariffs and Trade (GATT) were set out in the Ministerial Statement of September 1986. In essence the Contracting Parties agreed, for the first time in a multilateral trade negotiation, that more discipline and predictability were required in agricultural trade in order to reduce uncertainties, imbalances and instabilities in world markets. These aims were to be achieved by bringing under more effective GATT rules, measures which affect import market access and export competitiveness , specifically, "...improving the competitive environment by increasing discipline on the use of all direct and indirect subsidies and other measures affecting directly or indirectly agricultural trade..." (Miller, 1986, p 113). As part of the initial phase of the negotiations proposals were submitted to GATT from six countries or country groupings, namely, the Cairns Group, the United States, the European Community (EC), Japan, the Nordic countries and Canada (ABARE, 1988).

The aims of this paper are: first, to review the main themes of these proposals for reform (Section 1); second, to describe the quantitative measures which have been proposed to analyse and to monitor government

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* With the usual caveat I am grateful to Alan Lloyd and Bill Malcolm for helpful comments.

support to agriculture (Section 2); and third, to
determine what the trade negotiations for agriculture
should be about in addition to those aims outlined
above, eg the interpretation of term "trade distortions"
and importance of identifying the trade impact of
specific policy instruments (Section 3). The final
Section contains some conclusions.

1.   REVIEW OF PROPOSALS FOR REFORM

        Four common themes run through the six sets of
proposals submitted to GATT. First, there should be a
reduction in the use of traditional price policy
instruments; this reduction being directed both at
improving import market access and at eliminating the
use of export subsidies, although on this latter aspect,
the EC may object. Second, there is acceptance of the
need to "de-couple" farm income support from production
levels: a proposal which acknowledges the political
desire for governments to continue to influence the
levels and distribution of farm incomes. In Hathaway's
view "welfare issues and public expenditure issues are a
proper subject for domestic politics, but bringing them
into trade discussions would overload the system" (p
125). Third, a time horizon of around ten years is
required to make the necessary longer term adjustment.
And fourth, there is general recognition of the need to
enforce existing GATT rules. However, there the fragile
commonality of interest seems to end.

        There are at least four important matters on which
there is no unanimity. First, whether or not there is a
need to implement any policy changes in stages: the US
is anxious to reach agreement on commitments to begin
the long-run process immediately, whereas the other sets
of proposals contain the idea of an immediate freeze or
standstill and then a reduction in support. Second,
there is disagreement on whether or not there should be
some quantitative indicator used to reflect the existing
values of income support for farmers, and which could
thereafter be used to monitor progress in reductions of
that support: The US strongly favours this approach,
whereas Japan believes that such a measure is not
necessary. This proposal is similar in some respects to
the *montant de soutien* concept put forward by the EC
during the Kennedy Round negotiations of 1964-67 and
which was to have been used as a measure of internal
market support and for monitoring adherence to any
agreed levels of support. Third, whilst the Cairns
Group and the United States have a stated liberal
agricultural trade regime as the long-run goal, the EC
probably does not. For the latter, international market
sharing arrangements and the retention of export
subsidies as an integral part of the Common Agricultural
Policy (CAP) are deemed to be important. And fourth,
the Nordic countries and Japan regard the onus of

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short-run adjustments in policy to lie with those
countries currently using export subsidies, e.g. the US
and the EC, rather than with the countries using import
impediments to trade.

The implicit economic model underpinning these sets
of proposals seems to differ, ranging from an acceptance
of free trade as the proper goal to one of managed
agricultural trade. "The simplest and most
intellectually satisfying approach would be to get an
agreement whereby all countries would agree to phase out
all forms of import controls and all subsidies -
domestic and export - which affect international trade"
(Hathaway, p 140). This is, of course, essentially the
position taken by the US proposal. However, it will be
suggested below (Section 3) that this view is not
without its theoretical shortcomings as a basis for
addressing current concerns about protectionism.

2. PROPOSED QUANTITATIVE MEASURES

The United States has proposed that Producer
Subsidy Equivalents (PSEs) should be the quantitative
indicator used to monitor progress towards the phasing
out of all assistance to agriculture with few
exceptions, e.g. de-coupled income support. PSEs were
used by the OECD (1987) to measure support levels during
the period 1979-81, work which was updated by the USDA
(1987) using data for 1982-84. According to Tangermann
et al "The concept of producer subsidy equivalent is
straightforward. It is the subsidy that would be
necessary to replace the array of actual farm policies
employed in a particular country in order to leave farm
income unchanged ... The main purpose of the measurement
is to aggregate, in a manageable way, a wide range of
price and non-price policies whose effects are not
otherwise comparable" (p 266). With the emphasis on
farm income, the implication is that both revenue and
cost effects should be considered. The authors
acknowledge that in the context of trade negotiations
some policy instruments would be ignored, ie those
instruments with only negligible effects on trade.

With such flexibility possible in the definition of
PSEs, it is necessary to know what definitions were used
in published values in order to interpret them properly.
It appears that the OECD used the following definition
(OECD, pp 104-105).

Total PSE = $Q(P_D - P_w) + D - L + B$,

where   Q: level of production,
        P_D: domestic producer price,
        P_w: reference price,
        D: direct payments,
        L: producer levies and fees, and
        B: other budget payments, direct or implicit.

From such a definition of PSE it is clear that the
measure is static, that it refers only to the revenue
side of the farm income calculation and therefore
ignores the conceptual and empirical issue of costs of
production, that it does not distinguish between direct
trade instruments and others, nor does it distinguish
instruments that induce supply response from others.

Moreover, inherent in this definition are the
following conceptual and empirical issues which generate
problems for measurement and for interpretation of the
numbers: exchange rate variations over time, extent of
the policies included, stage in the marketing chain at
which prices are identified, quantitative restrictions,
stock holding policies, concessional trade, fluctuations
in world prices, supply control policies, and the large
country case. All of these are discussed in some detail
in OECD (1987, Annex II, pp 99-124) while the last is
analysed below (Section 3).

It has been argued by Rausser and Wright (1987)
that the OECD and USDA calculations should have
separated those policies which induce supply effects
from others that do not (p 38). To remedy this
perceived deficiency they proposed a modified measure
that they called Producer Incentive Equivalent (PIE), a
measure which would include only output-inducing
policies. To some extent this new measure is not
required, given the flexibility in definition suggested
by Tangermann et al. However, it does serve the useful
purposes of focussing on the subset of policies which
provide output-increasing incentives to farmers, and
alerting the user to check on which policies belong to
this subset.

However, a more important criticism must be
levelled at the focus on PSE or PIE as a quantitative
indicator for the trade negotiations. They are intended
as a measure of income support or income transfer and
they do not measure comprehensively the trade distorting
effects of the included policy instruments. "The
negotiations are not addressing how much income is
transferred to the farm sector in individual countries
... [they] will attempt to devise rules that will remove
or reduce adverse effects on trade of government
measures designed to transfer income to farmers"
(Hathaway 1987, p 138). The trade distorting effects,
which should be the subject of the negotiations, depend
upon the supply, demand and trade effects. It is to
these aspects that the paper now turns.

3. ADDITIONAL CONSIDERATIONS

The aim of this section is to consider various
theoretical interpretations of the term "trade
distortion". First, the deterministic, partial

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equilibrium model for a single, small country is used.
Second, within this same framework price uncertainty is
introduced in order to explore the implications for
trade distortions of a de-coupled income support
measure. And third, the outcome for the
gains-from-trade theorem are summarised in order to
indicate how difficult it is to place any precise
meaning on the term "trade distortion" once one of the
principal assumptions of the model is relaxed.

Clearly, to describe the present state of
agricultural trade as distorted, suggests a norm or base
set of trade flows which would differ from those
currently observed and which would be in accord with
some theoretical ideal, eg free trade. Corden (1984)
has defined "free trade" in such a way that it can be
separated from domestic "laissez-faire". "Free trade
is defined here as the absence of all *trade* taxes,
subsidies and regulations, but still allowing non-trade
interventions - e.g. taxes and subsidies on particular
forms of domestic production or consumption which may
still *incidentally* affect trade. Thus the case for free
trade and the case for laissez-faire are divorced"
(p 87, original italics). Thus governments can support
farm incomes but only through direct domestic
instruments if they are to follow a free trade policy.
Hence there appears to be theoretical support for the
position adopted by the US and the Cairns Group.
However, this distinction between free trade and
laissez-faire begs two questions as far as agricultural
trade policy is concerned: first, will de-coupled income
supports still affect trade through domestic supply
response; and second, is free trade the optimal global
economic policy against which to measure trade
distortions?

3.1   Trade Distortions

Before addressing these questions it is necessary
to establish meanings for the term "trade distortion"
and to assess the extent to which the PSE measure is an
appropriate conceptual indicator. In a deterministic,
partial equilibrium model, which is the one in which PSE
was developed, the meaning of the term "trade
distortion" can be shown easily. Such an analysis also
makes clear the importance of the particular policy
instrument used for farm income support. It is not the
intention to present a typology of such instruments but
only to illustrate, perhaps, the rather obvious point
that PSEs do not address the essential issue of the
trade negotiations, namely, the trade impact of farm
support measures.

Single Product
Assume that the free trade equilibrium price is p_w
with production at q_w, consumption at c_w and imports at
m_w , where D is the domestic demand function, S the
domestic supply function and ED the import demand

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function (Figure 1). The import impediment is assumed
to be one which affects both producer and consumer
prices, e.g. a tariff, threshold price or import quota
but not a guaranteed price/deficiency payment. Then the
rate of protection is $(p_t - p_w)/p_w$, the protective
effect is $(q_t - q_w)/q_w$ (Corden (1971), p 21), the income
transfer is the area s, and the trade distortion is the
reduction of imports, namely,

Figure 1
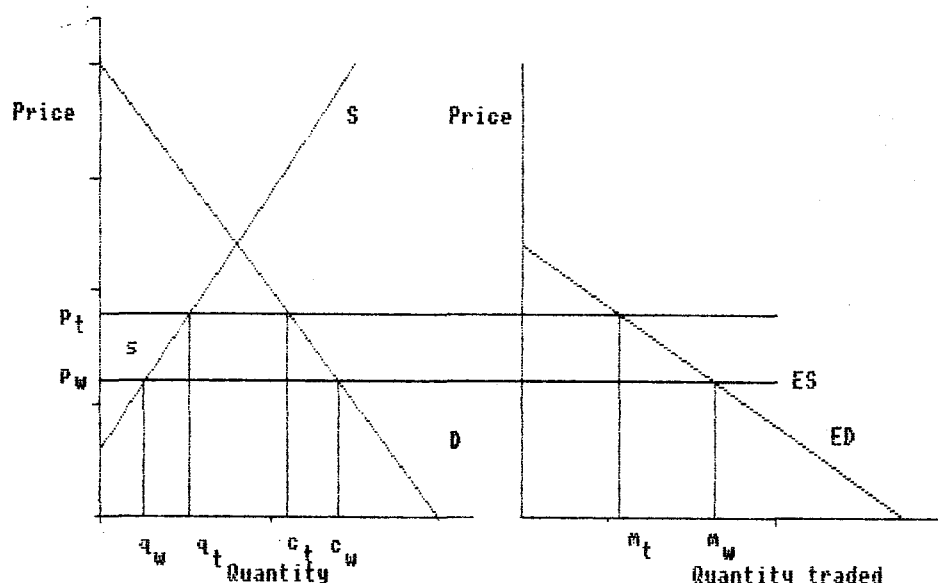
$[(q_t - q_w) + (c_t - c_w)]/(c_w - q_w)$ or $(m_w - m_t)/m_w$.
Hence, the size of the trade distortion clearly depends
upon both the domestic supply and demand responses, the
given policy instrument, and the given difference
between domestic and world prices measured in domestic
currency. In other words the rate of protection does not
translate uniquely into a particular size of trade
distortion. Moreover, the PSE measures only the income
transfer and there is no way to relate that area to the
trade distortion without specifying the type of policies
included in the measure and the parameters of the
domestic demand and supply functions.

The large country case is even more indeterminate
in the sense of trying to relate PSEs to the trade
distortion (Figure 2). Assume that the free trade price
is p_w with domestic production at q_w, imports at m_w and
domestic consumption at c_w, where D is the domestic
demand function, S is the domestic supply function, ES
is the import supply function and ED is the import
demand function. If a tariff is levied, how are the
various protection effects to be defined? The rate of
protection can now be defined in two different ways
(Corden (1971) p 22): as the divergence between the
foreign and domestic supply prices, i.e. $(p_t -$
$p_w^i)/p_w^i$; or as the proportional increase in the final

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domestic price, i.e. $(p_t - p_w)/p_w$. The trade effect is
the same under either definition since imports fall from
m_w to m_t. However, there are two values of the income
transfer effects corresponding to the two different
definitions of rate of protection, namely, $(s + s')$
for the first definition and s for the second. The OECD
(1987) study used the actual prices observed for the
base period and, therefore, employed the first
definition for the good reason that data did not exist
for the second. Hence, the income transfer effected by
the policy can be measured as a PSE calculation with, in
principle, two different values but neither translates
uniquely into a trade distortion because the trade
effect depends now not only on the domestic elasticities
but also on the elasticity of the import supply
function.

Figure 2
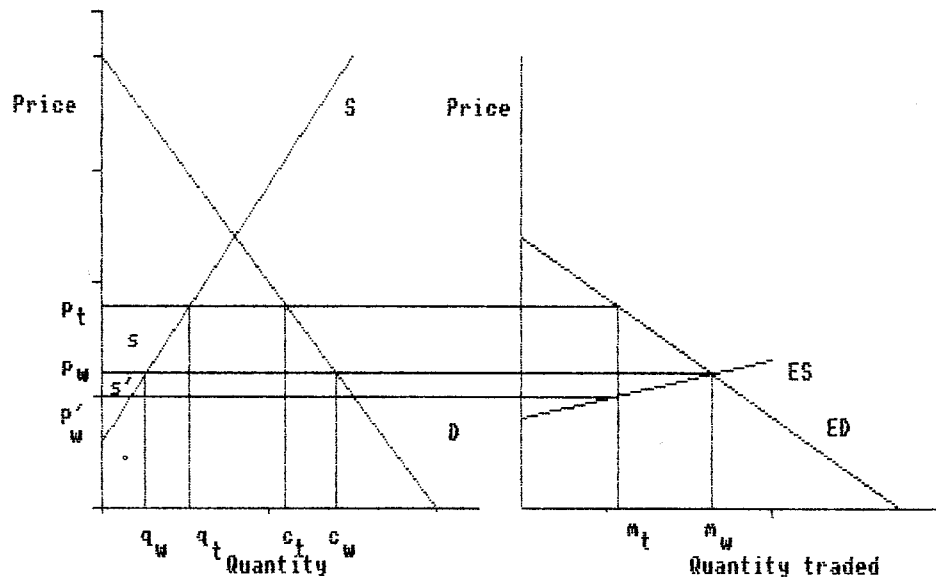
Multi-product
    In the single-product, partial equilibrium model
the direction of change in the import impediment and the
direction of change in import volume are unambiguously
opposite. However, in a multi-product environment this
need not be true. Paarlberg and Thompson (1980) showed
that in a two-country, two-product, partial equilibrium
model the size of the cross-price effects were crucial
in determining the direction of change in the import
volume of both goods. "When these are relatively large,
the single-product model's estimates of the magnitudes
of imports from tariff will be inaccurate at best and
may err in predicting the direction of the effects"
(p 31). Consequently, it is not possible to predict, a
priori, the direction of the trade distortion which
arises from the imposition of a single tariff in one of
the countries. How much more difficult it would be in a

multi-country, multi-product environment is obvious.
The same authors showed that in a 2x2x2 general
equilibrium model *a priori* indeterminancy also occurs.
However, it occurs now because of real income effects
rather than substitution effects.

3.2 De-coupled Income Supports and Trade Distortions

In the theory of the deterministic, single product
firm fixed costs are irrelevant to output decisions in
the short run. Therefore, an income supplement made
available to producers through a policy of de-coupled
income support would not generate any response in supply
compared with the situation of no such policy.
Starting, then, from a given policy intervention and
trade position, removal of the price policy and the
substitution of de-coupled income support would lead to
only one source of supply response, namely, a reduction
in output to the free trade position, the direct income
support having no production effect. Hence, in this
model de-coupled income support would give rise to no
trade distortions, at least on the production side,
because there is no supply response and any changes in
the level of that support would not alter the level of
imports, *ceterus paribus*. Therefore, Corden's separation
of trade policy from domestic policy appears useful in
this model.

However, the feasibility of non-trade distorting,
de-coupled income support is open to doubt once product
price uncertainty and risk aversion are introduced. It
can be shown that the supply response to a fixed income
payment may be negative, zero or positive, depending
upon the particular model used (Table 1). Only in the
second case can it be concluded that trade effects will
be zero, for only in this case does the individual
firm's short-run supply function remain unchanged.

Table 1   Direction of Change in Short-run Optimal Output

Increases in	Model					
	Certainty	Roy	Telser a	b	Kataoki	Sandmo
Income payment	O	—	O	+	O	+

Notes: The models referred to which allow for
        uncertainty are the safety-first models due to
        Roy, Telser and Kataoki, and the maximum expected
        utility model of Sandmo. References to these
        models are given in the source paper.
        a: probability constraint not binding
        b: probability constraint binding
        —: a leftward shift of the short-run supply
           function
        O: no shift
        +: a rightward shift.
Source: MacLaren, D (1983).

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Therefore, these results demonstrate that, in general, it may not be possible to introduce feasible domestic policies of the type being proposed (Section 2 above) which avoid having direct or indirect trade effects. Consequently, the meaning of "trade distortion" again becomes unclear.

3.3 General Equilibrium and Trade Distortions

The essential message of the gains-from-trade proposition is that "given certain assumptions, not only is free trade Pareto-superior to autarky but it is also Pareto-efficient, being superior to various degrees of trade restriction" (Corden, 1984, p 69). Corden went on to note the key assumptions which were made in deriving this result, namely, "... absence of increasing returns ..., no distorting domestic taxes, no externalities, the feasibility of lump-sum transfers, and flexible factor prices that ensure full employment of all factors" (p 72).

However, recent work in the pure theory of international trade has relaxed one other assumption, namely, that the model is deterministic. Uncertainty has been introduced through either endowments, prices or technology, and the outcomes can be divided into results which address the normative issues of trade, eg the gains from trade, and those which are concerned with comparative advantage and other positive issues. Superimposed on this dichotomy is the presence or absence of a complete set of risk markets. Since the reality of agricultural trade suggests that there is not such a set of markets, the following results assume incomplete risk markets. This literature contains several unfamiliar conclusions. The following are some examples which have been derived from specific assumptions: a) free trade is Pareto-dominated by autarchy; b) starting from a position of free trade, some restriction is Pareto-improving; c) starting from a position of autarchy, some trade is Pareto-improving; and d) self sufficiency is an optimal policy. Pomery (1984), having reviewed much of this literature, wrote "Where powerful results would be most welcome, e.g. on the desirability of free trade, there appears no justification for an unambiguous conclusion" (p 461).

In one sense this conclusion is a set-back because it may make irrelevant the policy prescriptions of deterministic general equilibrium analysis: in another sense it is helpful because political realities in agricultural matters are such that governments want to retain the additional degree of freedom in policy choice which a ban on trade policies would deny them. Pomery's conclusion leads to the additional conclusion that if general, *a priori* trade policy prescriptions cannot be obtained from theory, then the concept of "trade distortion" cannot be defined *a priori* and hence cannot be measured without precise specification and estimation

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of the theoretical model. However, in the presence of uncertainty and in the absence of complete risk markets, the Hecksher-Ohlin (H-O) theorem fails to hold (Grinols, 1985, p 253) and, consequently, it is not obvious what model should be estimated. Therefore, using the notion of comparative advantage in the H-O sense, as a basis for defining "trade distortion", is also rather limited.

3.5   Other Aspects of Uncertainty and Trade

There is one further aspect of international trade and uncertainty which should be discussed, albeit very briefly. It is well known that protectionism causes international markets to shrink and to become more volatile in prices. But there is an additional uncertainty present which is not easily modelled even under subjective risk, namely, the periodic and unpredictable use of export subsidies in selected markets which disrupts the normal commercial exports of third countries. Australia, for example, is not alone in having complained to GATT on a number of occasions about EC exports made possible only by export restitutions. The timing of the restitutions, the volume of exports to which they are applied, the destinations to which they apply, and the size of the unit value of the subsidy, stem from decisions made by the various management committees that are part of the CAP and these are based largely on political and financial considerations. This makes them very hard to predict. Hence, they are disruptive and, in a dynamic sense, probably lead to more damage for third country exporters than any single period loss of exports and welfare effects would suggest.

4.   CONCLUSIONS

The basic aims for the agricultural trade component of the GATT negotiations are essentially to impart order in an increasingly chaotic set of international agricultural commodity markets. Six sets of country or country-group proposals were presented to GATT by the summer of 1987 and they display certain common areas of agreement but other important areas of inconsistency and potential conflict. The main thrust is towards more effective discipline within GATT rules but there is disagreement about the appropriate strategies to help force moves towards freer, if not free, trade. The monitoring of progress is regarded as important by most of the proposals and for that purpose a measure called Producer Subsidy Equivalents (PSEs) has been put forward. It is a partial equilibrium measure of the income support provided to the agricultural sector through various government policies.

This paper has suggested that the proper focus of the negotiations should be the trade distortions induced by the wide range of policy interventions and not the

amount of income transfer *per se*. It has been stressed that the concept of trade distortion, while straightforward in a single, small country, single-product, partial equilibrium model, becomes increasingly elusive in more complicated and realistic settings. It has been argued that PSE measures income transfers from which it is not possible to deduce anything about trade distortions, even in the simplest model, in the absence of information about domestic supply and demand own- and cross-price elasticities, the particular policies used and the "size" of the country. While computable general equilibrium models may play a part in providing estimates of trade distortions, it is open to doubt whether, in a world in which uncertainty is prevalent, they are sufficiently well-founded in theory, since it is known that the H-O model of comparative advantage breaks down under uncertainty with incomplete risk markets.

Finally, the main thrust of this paper has been to suggest that the measurement of the largely irrelevant should be replaced with an increased emphasis on refocussing the trade negotiations towards the way in which both domestic and trade instruments affect international trade. This would help direct discussions away the amount of agricultural income suppport, which is an internal matter, and towards the dynamic economic effects of trade disruptions.

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GATT MULTILATERAL TRADE NEGOTIATIONS AND FOREST PRODUCTS TRADE

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SUMMARY

The major increase in New Zealand's wood supply in the late 1990s and early 2000s means larger volumes of processed and unprocessed products will need to be exported. There will need to be further development of existing markets and the development of new markets. This paper addresses the extent to which trade barriers influence trade in forest products, which are of greatest significance to New Zealand and what changes are desirable.

It concludes that the benefits of GATT to New Zealand forest products trade depend largely on the manner in which the negotiations are approached, their success in addressing non-tariff barriers. and in particular the extent to which barriers in the developing countries can be reduced.

Key Words: Forest products trade. GATT, trade negotiations.

THE GATT NEGOTIATIONS

Background:

The General Agreement on Tariffs and Trade (GATT) is the multilateral treaty that provides a global system of rights and obligations governing international trade voluntarily accepted by its members. The principal purpose of GATT is to foster fair and free trade among its members on the basis of reciprocity and non-discrimination. It provides a forum for review of trading arrangements and practices to ensure they conform to the principles of the Agreement. It also provides for arbitration and adjudication of trade disputes as well as for surveillance of international trade.

There are 96 signatories to the Agreement with a number of others adhering to the GATT rules. Most of the others also benefit from the most-favoured rule of the Agreement. China is currently in the process of becoming a member while the USSR is believed to be considering it.

The GATT came into being in 1948. Since then there have been 7 rounds of multilateral trade negotiations. The first six of these, ending with the Kennedy Round in 1967, concentrated almost exclusively on reducing tariffs. The seventh - the Tokyo Round. which lasted for six years from 1973 to 1979. was the first comprehensive attempt to deal with both tariff and non-tariff restrictions. It developed a series of codes of conduct dealing with a variety of non tariff measures such as subsidies, contervailing duties, technical barriers. import licensing. anti-dumping. government procurement and customs valuation. Graph 1 shows the global tariff reductions achieved for industrial products during recent negotiating rounds.

These achievements are significant; but a major disappointment for New Zealand was that so far agricultural protection and access had not been addressed. Among other things natural resource based products, including forest products as distinct from agricultural products. were also not dealt with adequately.

By the early 1980s it was evident that further multilateral negotiations were necessary. Thus in 1986 the Uruguay Round commenced. The coverage of this Round is wide. Three categories of negotiations cover: unfinished business (agriculture. natural resources etc). stand still and roll back. an new issues (services etc).

New Zealand is playing an active role in the negotiations. An advisory committee of sector groups affected by these trade issues is providing a channel of consultation between the industry and officials.

In the past negotiations forestry products had not been considered separately but had been handled as part of the general tariff negotiations. The first comprehensive attempt to deal with the restrictions affecting forestry was made at the 1982 GATT ministerial meeting. However, a series of negotiations that began in 1984 ended without much success largely because of the inability to agree on the coverage, eg whether processed products such as newsprint should be included.

In the Uruguay Round forest products would be covered under three negotiating groups: tariffs, non-tariff measures and natural resource based products.

TRADE BARRIERS FACING FOREST PRODUCTS

Tariffs

Like most exports forest products face protectionist pressures. Countries use a wide array of measures to provide this protection, from well-known and easily recognised barriers such as tariffs, to less obvious and more difficult to identify non-tariff barriers (NTBs). The latter include a variety of measures ranging from quantitative restrictions such as quotas or licensing systems, to health and safety regulations.

Average tariff rates facing forest products are relatively low in most developed countries. Unprocessed or partly processed wood products such as logs, squares or rough-sawn timber are usually free of duty or only have low rates. Semi-processed products such as veneer, fibreboard and dressed timber face higher rates, while more highly processed products such as plywood, some reconstituted panels, wood manufactures (joinery, carpentry, mouldings etc.) and furniture are usually subject to very high tariffs. This tendency, known as tariff escalation, is also apparent, but to a lesser degree, with paper and paper products.

An analysis of pre- and post-Tokyo Round average trade weighted tariff rates for wood and wood products carried out for selected major developed country markets showed that average rates for a number of importing markets were zero for wood in the rough: declined from 2.4% (pre-Tokyo Round) to 1.7% (post-Tokyo Round) for primary wood products; and from 7.8% to 5.7% respectively for secondary wood products (UNIDO, 1983).

As a general observation, while rates of 5-10% may seem rather low, where the dutiable value is relatively high and where highly competitive market conditions exist, the duty can have a major influence on the competitiveness of a particular exporter. Further, low average rates can mask the problem facing specific products.

Although tariff rates in developed countries are generally low for most forest products, those in developing countries are often substantial. Most developed countries are signatories to GATT and therefore bound by GATT rules, particularly in respect of providing Most Favoured Nation (MFN) tariffs to other members; but developing countries have not been obligated to cut tariffs in any programmed manner. They have however received MFN rates as a concession from the developed countries. As a result, many of the reductions that have flowed from previous GATT negotiations have not been reflected in the developing countries own barriers. (Tariff rates in a number of developed countries are shown in Table 1, and in developing countries in Table 2).

The result has been that many of the developing countries have benefited from declining tariffs on forest products in the developed countries, but not had to make similar reductions themselves. The developing countries have also benefited from additional special preferences such as the Generalised System of Preferences (GSP) scheme under which individual developed countries offer special tariff advantages to selected countries for selected products.

PREVIOUS GATT ROUNDS

Tariff reductions for industrial products : 1962-1987

Percent tariffs

1962 : Cuts prior to the Kennedy Round
1972 : Cuts following the Kennedy Round
1987 : Cuts following the Tokyo Round
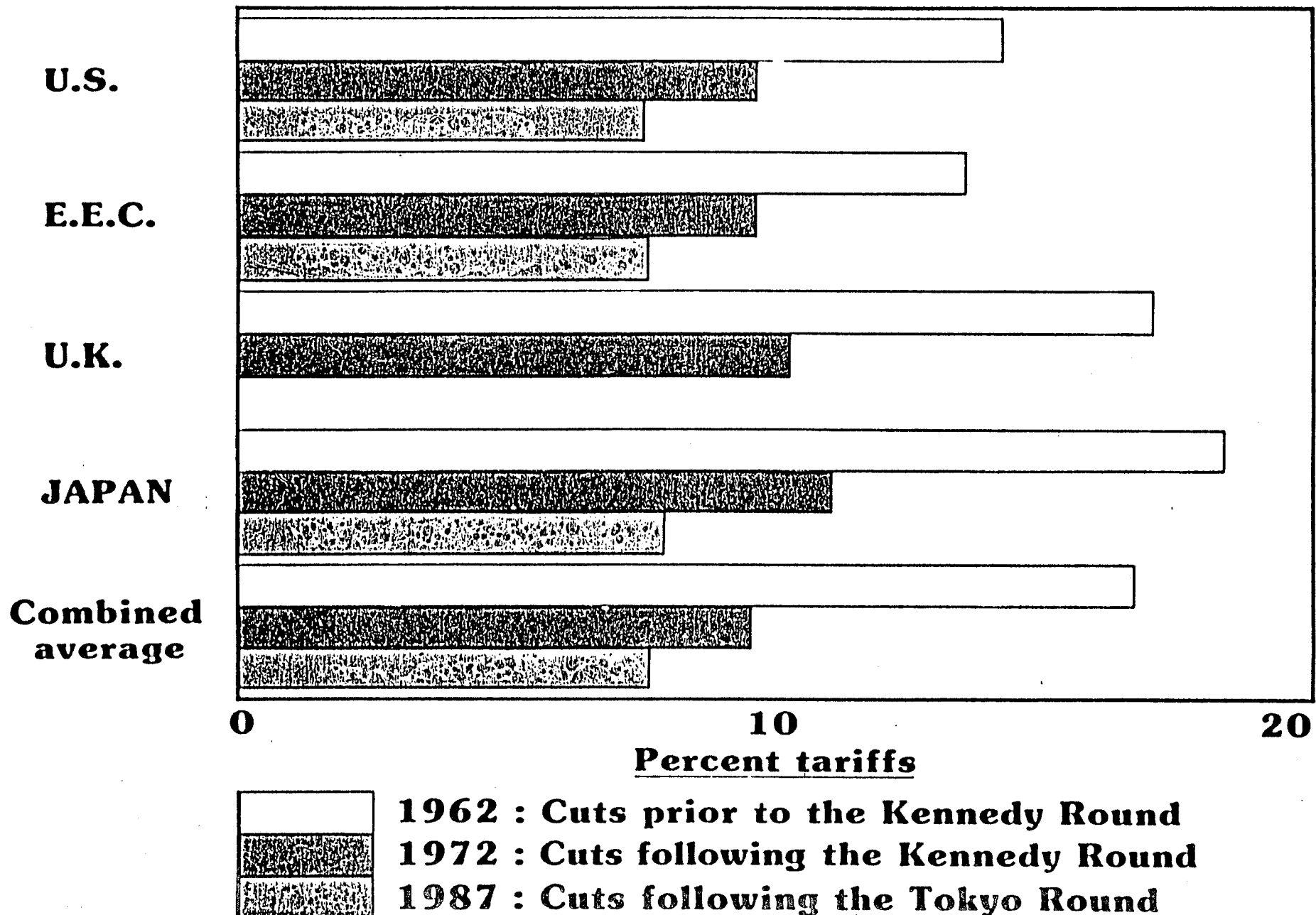
TABLE 1 : Most Favoured Nation (MFN) Tariff Levels facing Forest Products
in selected developed countries:

(as at December 1986; Japan as at April 1987)[1]

	Tariff Rate (%)			
General Product Description	Australia[2]	EEC	Japan	USA
Wood in the rough and roughly squared	0	0	0	0
Wood simply sawn	5	4.1	0-4.8	0
Wood chips	5	0	0	0
Wood planed, grooved etc.	2-15	4.3	0-8	0-2.5
Veneer	5	6.1	5	0
Plywood	28	10.4	S.W. 12.5 H.W. 13.5-17.5	20
Laminated lumber	15	11.1	15	7.34c/kg+ 3.4%[3]
Manufactured wood products	15-22	2.6-10.5	2.5-4.8	0-8
Furniture	30	5.6-6.3	4.8	2.8-5.8
Wood pulp	2-15	0	0	0
Newsprint	0	5.4	3.9	0
Other paper and paperboard	0-30	4.1-12.8	5.12	0-3.3

Notes: [1]These are MFN rates. Special preferences may be available for
certain products and supplying countries. MFN rates apply
to member states who are contracting parties to the GATT
articles unless other lower - special rates apply. These are
the rates faced by New Zealand in the EEC, Japan and the USA.

[2]Zero tariffs for NZ products.

[3]Converted from US currency at April 1986 exchange rate.

S.W. - softwoods
H.W. - hardwoods

Sources: National tariff schedules; official documents.

TABLE 2- Tariff levels for selected products in four developing countries*
(% ad valorem)

	India	Malaysia	Korea	China
Wood in rough	40	20	5	13
Wood sawn lengthwise	55	20	15	19
Fibre building boards	140 (b)	25	20	7.5
Plywood	70	40	30	15
Newsprint	0	5	40	
Kraft paper		5	40	
Furniture	90	55-60	50	150

* In most cases as at December 1986

(a) In addition product taxes are imposed which average about 10%.

(b) Basic tariff plus products tax.

Note: These rates should only be regarded as indicative.

Non-tariff measures

Non tariff measures used for protective purposes are wide ranging. They include direct quantitative controls such as quotas, tariff quotas or voluntary export restraints; less direct controls such as import authorisations (licenses, permits etc) which may be automatic or at the discretion of customs authorities; price controls such as minimum prices, price investigations, variable levies and countervailing duties; and health and technical standards which may be liberal or highly restrictive in their interpretation. In addition, customs formalities, import deposits, government trading policies and marking and packaging requirements can also act as NTBs, depending on their application. Even more difficult to categorise are internal subsidies which have the same effect as NTBs.

Forest products are less affected by NTBs than most other products. Nevertheless NTBs do create problems for some forest products. Developed countries such as Japan and the EEC use tariff quotas for newsprint and plywood. Health and technical standards and import authorisations act as NTBs, although it is sometimes difficult to determine whether they are being used for legitimate health and safety reasons or as a means of trade control. Anti-dumping investigations are becoming more common in developed countries such as the EEC, the USA and Australia. Similarly developing countries use NTBs. Global volume controls are widely used, particularly monitoring measures, quotas, discretionary licensing and foreign exchange controls.

The conclusion of a study on trade barriers affecting forest products (Bourke, 1988) was that in general trade barriers are not a major impediment to trade. Tariff levels are generally low in developed countries although they still remain a problem in some markets for plywood, some sizes and species of sawn timber, reconstituted panels and for some more processed products such as furniture. The same is not true for many of the developing countries where tariffs are a major barrier. The effects of NTBs vary, with import procedures, anti-dumping and countervailing investigations and duties, and to a lesser extent health and technical standards being of most concern. Again, the developing countries have substantially higher barriers than most developed countres.

Broadly, therefore, there is still a need for the reduction of tariff rates on some products in developed countries. The main scope is in reductions by the developing countries. NTBs provide difficulties which are in most situations greater than for tariffs. One feature of barriers is that as tariff rates decline there is a tendency for NTBs to become more prevalent as countries seek alternative ways of controlling trade. An additional problem is that although individually barriers may not be of major consequence for forest products, collectively they can create considerable difficulty, since usually more than one barrier applies.

NEW ZEALAND'S PRESENT MARKETS AND FUTURE SITUATION

Current Exports

Almost 40% (4.3 million m^3 roundwood equivalent) of New Zealand's total wood production was exported in the year to December 1987. Exports were valued at NZ$901 million with pulp and paper and paperboard products accounting for 56% of the total. Two markets, Australia and Japan, dominate New Zealand's export trade, accounting for nearly two-thirds of total exports (Table 3).

TABLE 3: Value of exported forest products by Country of Destination
(NZ$ million fob - year ended December 1987)

Country Percentage	Value	%
Australia	330	37
Japan	233	26
Taiwan	47	5
China	34	4
USA	31	3
India	27	3
All other countries	199	22
	901	100

Source: Ministry of Forestry

Exports to Australia in order of importance (by value) are paper, sawn timber, wood pulp and panel products; those to Japan are essentially unprocessed or less processed products - logs, wood pulp, wood chips and sawn timber (mainly flitches). The main volume growth in exports in the past 20 years has been in pulp (an increase of 282,000 t) and sawn timber, including flitches (an increase of 282,000 m^3); but in more recent years the fastest growth has been in the reconstituted panel products area, specifically medium density fibreboard.

Forest product exports to Australia benefit from the trade agreements between the two countries since 1965 with all products entering duty free. This provides New Zealand with an advantage over most other developed countries. For example, while NZ gains duty-free entry, tariff rates on some wood products are up to 30%. But this advantage is limited since most developing countries also receive duty-free treatment through various concession schemes

Logs, flitches, large dimension sawn timber (>160 mm), wood chips, and woodpulp are duty free in Japan, but other products face tariffs ranging from 4.8% on sawn timber to 12.5% on softwood plywood. In some cases developing countries (which includes Chile) receive duty free treatment. Of some concern to New Zealand is the fact that timber from some important North American species enter duty free while radiata pine faces a 4.8% tariff.

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Future Trends

New Zealand exports will expand dramatically towards the end of the century as the available wood supply expands. With only limited growth in domestic consumption likely, the situation will change from one where 40% of the wood supply is exported in various product forms, to that where 70% could be directed to export. This could involve export volumes expanding from the 1987 level of 4.3 million m^3 to an estimated 10 million m^3 in 2000, and 17 million m^3 by 2010 if all the available wood is used.

Australia and Japan will continue to be important markets, but any substantial growth in the volume of New Zealand exports to these markets will be difficult given their expanding domestic supplies and slow growth in demand. In addition there will be increased competition from suppliers such as Chile, North America, and the USSR, and increasing competition from other materials such as plastic, steel, and concrete.

This will mean other markets must be developed, and New Zealand exporters can be expected to turn increasingly towards the developing countries of the Asia/Pacific region: in particular, markets such as the People's Republic of China, South Korea, India, and Taiwan are seen to have considerable potential. This potential must, however, be developed, and initially at least, prospects appear greatest for logs and pulp and paper products. Outside this region Western Europe and the USA may provide markets for more processed items such as clearwood products.

This trend will therefore mean exporting to markets where tariffs are higher, even in many cases on unprocessed or semi processed products. As can be seen in Table 2, for selected developing countries in the Asian region rates can be prohibitive with even logs facing high duties. North American tariffs on most forest products are low, but Western Europe has rates which are more similar to those of Japan.

Thus New Zealand will be placing increasing emphasis on markets where tariff rates are high - in some cases prohibitive. And since New Zealand is attempting to move towards the exporting of increasing volumes of more processed and higher value products there will be greater difficulties.

In addition, much greater problems with NTBs are also likely; in the developed countries the problem areas will be meeting technical standards and possibly tariff quotas. In the developing countries import procedures, licences, exchange controls, and government controlled procurement methods will be the main problems.

Some of the concerns that will need to be addressed will therefore be high tariffs, tariff escalation, and a variety of NTBs.

POTENTIAL BENEFITS FROM GATT NEGOTIATIONS

Areas Requiring Action

The ideal objective for New Zealand is free trade in forest products. As noted earlier although trade barriers are relatively low in most developed countries there are still difficulties facing some products in specific markets and, as with most primary products, these barriers are greatest for more processed goods. Further pressure to reduce these barriers would therefore be of value.

In the case of tariffs the most benefit to NZ for trade with the developed countries would result from reductions on selected products such as panels, wood manufactures and furniture. In these countries however, probably of greater importance than the absolute level of the tariff is the need for equality in treatment with other competing exporters. For example in Japan to have the same tariff rate with North American and Chilean softwoods. In the case of the developing countries, significant drop in tariffs on most products is needed, since current rates are generally very high.

In some **developed** countries, a reduction in NTBs is likely to be of greater importance than a reduction in tariffs. Ensuring that NTBs such as health and safety standards are only used for legitimate reasons rather than as de facto protection measures is essential. Another is, reducing the risk of anti-dumping and countervailing duties. The same issues will also be of relevance in the case of **developing** countries.

Negotiating Strategies

What does this mean for the current GATT negotiations? - or more correctly, what are the GATT negotiations likely to mean for NZ's forest product exports? ·

In past GATT rounds, negotiations have resulted in worthwhile reductions in **developed** country tariffs. They have had little effect on those of the **developing** countries. Their effect on NTBs has also been minimal, in no small part due to the difficulties of identifying and "proving" that these measures are in fact being used as NTBs, and the difficulty of devising procedures which result in reductions. [1]

It also seems likely that although some improvement may be achieved in the current round, it would be unwise to expect much of value for the NTBs that are of most interest to forestry - namely standards and technical barriers, import procedures, and anti-dumping and countervailing investigations. Pressure for improvement should be kept up on these areas. but any improvement will probably be relatively minor.

Many of the strategies to be adopted in the negotiations. and the subjects to be addressed. are still in the processs of being determined. Thus the full implications to forestry are unclear at this time. One issue being addressed, and one which created some difficulty in previous rounds, is whether cuts should be made across the board, on a sector-by-sector basis, or at the individual product level. The implications to forestry will differ depending on which approach is selected.

Negotiations for tariff or non-tariff reductions could be dealt with broadly on a formula basis which would bind all contracting parties. or be individually negotiated on a request/offer basis. Negotiations within each of the GATT negotiating groups are still in progress but preliminary submissions by member countries indicate the likelihood of formidable obstacles. Major exporting nations such as Australia have proposed reductions of overall level of effective assistance to industry which covers both tariff and non tariff protection including domestic subsidies which have a trade effect. For natural resource-based products, Australia has suggested the phased elimination within 10 years of all tariff and non-tariff restrictions, subsidies as well as all protective regulations. US supports a similar approach with greater emphasis on request/offer basis for medium level tariffs and NTBs. New Zealand has proposed fixing ceilings for all tariffs to be achieved over a specific period with a combination of formula and request/offer arrangement for below ceiling rates. Japan on the other hand favours the complete abolition of tariffs on industrial sector exports but excluding mining and forest products. EEC appears to support a selective approach.

The effective rates of assistance approach is the ideal but it is doubtful whether the international community is yet ready to apply such a comprehensive approach to tariff cutting. The formula basis is the next best which can ensure worthwhile long term benefits. Request/offer approach is only useful at the margin and does not offer much to smaller nations who do not have much bargaining power. Also, countries can continue to retain restrictions on sensitive products under this system. The outcome of the Uruguay round therefore. depends on how these basic approaches are sorted out.

New Zealand Requirements

With its expanding wood resource. and the need to increase exports substantially. New Zealand will have to place increasing emphasis on the export of forest products to markets othe than our current two major trading partners Australia and Japan. In particular this means increasing emphasis on developing countries. especially in the Asian region. These markets have substantial import restrictions in most instances.

1] See World Bank, 1987 for discussion of recent trends in trade barriers. expecially NTBs.

For example South Korea, Taiwan, China and India are all of considerable interest and all have high tariffs and NTBs. As a consequence an important element in future export diversification and growth will be the extent to which barriers are reduced in developing countries.

An important question for NZ forestry is therefore how barriers in the developing countries can be reduced. Since developing countries tend to be treated somewhat differently from others the reductions of interest to New Zealand are not likely to be properly addressed in the GATT negotiations unless they are part of a trade-off package. Unless a trade-off can be achieved, wih the developing countries being willing to reduce some of their own restrictions in return for gains from the developed countries, many of the barriers of interest to forestry will have to be addressed outside the GATT negotiations on a normal bilateral basis. This places countries such as NZ at a disadvantage with larger trading countries, since we don't have the negotiating "muscle" of such countries. The willingness of the major players in the negotiations - the EEC, the USA and Japan - to offer concessions on products which are of major interest to the developing countries, such as textiles, clothing, electronic goods, footwear and various agricultural products will therefore be critical. Given that the USA has been pressing some of the Asian countries to reduce their restrictions on the entry of forest products it seems likely that barriers in the developing countries may be reduced.

In the case of NTBs it will be more difficult to obtain cuts for the very reasons that make NTBs an attractive way of providing protection - their lack of visibility and the difficulty of proving that they are being used for trade protection purposes. It therefore seems likely that reductions in NTBs of any consequence are less likely to be achieved through the GATT negotiations.

CONCLUSION

The value of the GATT negotiations to NZ forestry rests primarily on the extent to which they address the barriers in the developing countries. To a lesser extent, both tariff and NTBs in the developed countries are of interest, although most already have low tariff levels on forest products. In these countries equality with other competing countries, including developing countries such as Chile, is of greater importance than the absolute level of tariffs. The abortive 1984 negotiations on forest products point to the difficulties associated with tariff and NTB reductions.

The value to New Zealand therefore relates closely to the extent to which workable systems to address NTBs are possible, and in particular how the developing countries are involved in the negotiations and committed to the process. The gains to forest products are likely to rest to a considerable extent on the outcome from the bargaining surrounding other products which are of greater interest to the major participants in the negotiations. As in previous rounds of negotiations, resolving problems surrounding NTBs will be the most difficult problem. Bilateral negotiations are likely to remain important even after the Uruguay round.

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TECHNICAL ASPECTS OF TRADE NEGOTIATIONS

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SUMMARY

The need for multilateral liberalisation of agricultural
trade is discussed. Liberalisation of trade would
involve disciplines on domestic subsidies as well as on
trade barriers. To facilitate such a liberalisation
there is a need for an aggregate measure of support to
farmers in the producing countries. This paper
discusses the most widely canvassed of these measures:
the Producer Subsidy Equivalent [PSE]. Variants of the
PSE, and their possible role in the GATT negotiations
are discussed. The possible consequences of an
assistance-based liberalisation for New Zealand trade
are modelled. This is done by the use of a non spatial
equilibrium simulation framework, incorporating all New
Zealand's major trading partners and the important
traded commodities.

Key words: agriculture, trade, assistance measure,
Liberalisation Scenarios

BACKGROUND - THE CRISIS IN AGRICULTURAL TRADE

The symptoms of the crisis in agricultural trade are
well known: surplus stocks of all the major commodities;
massive overproduction in the developed countries
co-existing with starvation in some developing
countries; depressed and unstable international
commodity prices; limited export markets in the face of
trade barriers. Insulation of agricultural markets from
the world market - the breaking of the link between
world price movements and domestic prices - has been
under way for several decades.

The GATT has tried to address the issue of agricultural
trade but since the GATT's establishment in 1948
agriculture has been subject to major loopholes. These
loopholes, in Articles 11 and 16 have allowed
quantitative restrictions on imports and for the payment
of subsidies on exports of primary products
respectively. The conditions placed by the GATT on the
use of these trade-distorting measures have proved
ineffective: the concepts of "equitable share" and
"serious prejudice" enshrined in Article 16 and the Code

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on Subsidies have not proved workable and the use of direct and indirect export subsidies on agricultural products has burgeoned.

Since the 1970s the GATT has made attempts to address the issue of agriculture. A mandate to negotiate was agreed in the Declaration which launched the Tokyo Round of MTNs in 1973, but it was not sufficiently detailed and it stressed the 'special characteristics' of agriculture. There was also disagreement about whether the agriculture group was to be the sole body with responsibility for all agricultural negotiations or whether other groups (on tariffs, quantitative restrictions) would also discuss agriculture. The result was a dissipation of negotiating efforts and a move to a commodity-specific approach which ensured that a comprehensive solution for agriculture would not be achievable.

In the current Uruguay Round of MTNs agriculture has loomed large. The Round presents a new opportunity, and probably the best for many years, to deal with the crisis in agricultural trade. New Zealand's objective in the Negotiating Group on Agriculture is to ensure that international comparative advantage be allowed to operate in agriculture.

THE NEED FOR AN AGGREGATE MEASURE OF SUPPORT

The cause of the problems of agricultural trade can be identified quite simply as the major producing countries supporting their farmers in ways that induce supply increases.

Identification of the linkage between domestic subsidies and trade is important. Domestic policies are the root cause of the crisis in the agricultural trading system. Domestic support policies stimulate high-cost production at the expense of low-cost producers and impede the operation of international comparative advantage. **All** supply-inducing policies, not just export subsides, distort trade patterns. Research conducted by the OECD has shown that multilateral, multicommodity phaseout of assistance would be the least painful way of liberalising trade in farm products. An aggregate measure of support would be necessary to establish levels of current support and to plan and monitor such a phaseout programme.

The Punta Del Este Declaration, which launched the current GATT Round has these major objectives for agriculture:

(a)   improve market access through the lowering and removal of import barriers;

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(b) increase discipline on the use of all direct and indirect subsidies and other measures affecting agricultural trade, reduce their adverse trade effects, and deal with their causes.

Reform must take place at the level of domestic policies. It therefore falls within the domain of national governments. So, for political reasons, any attempt to reform agricultural trade is most likely to be agreed multilaterally. Such agreement is more likely to come about if there is to be multilateral implementation of the measures required to bring about reform. These measures **must** include reducing the supply-inducing support given to farmers. Studies, by the OECD in particular, have shown that a multilateral reduction of assistance is the least painful adjustment process. Multilateral liberalisation will be more politically acceptable if countries simultaneously share the burden of adjustment. This is the rationale for an aggregate measure of support.

Types of aggregate measures

There are several measures that can be used to quantify the degree of support given to agricultural sectors; these are depicted in Annex 1. Generally, the more comprehensive the measure the greater is its complexity and its need for a large data requirement. Thus the nominal rate of protection is the simplest measure: it includes only the assistance to output delivered in the form of border protection. The price adjustment gap incorporates all assistance to output, but not assistance to inputs or value adding factors. The most comprehensive assistance measure is the effective rate of assistance [ERA]; it captures all the net assistance delivered to outputs, inputs and value adding factors. The PSE differs from the ERA in that it does not take account of measures which **increase** the price of inputs used by farmers.

The PSE is therefore less comprehensive than the ERA, but it does represent a fair compromise between the enormous data requirement of the ERA, and the relatively incomplete price adjustment gap.

PSEs

The producer subsidy equivalent of a government policy is defined as the money that would be necessary to compensate producers for a removal of that policy. PSEs measure policies that result in budget outlays (for example deficiency payments and input subsidies) and policies that do not (eg import quotas and variable levies). They can be expressed in several ways:

Aggregate PSE: in monetary units, for one commodity or for a range of commodities. This is the value of the assistance given to all the producers of the commodity.

Per Unit PSE: the value of assistance per unit of production, expressed for each commodity

Percentage PSE: the OECD definition is the value of assistance divided by the value production plus direct government payments minus the producer levies paid to the government:

$$\frac{\text{value of assistance}}{\text{value of production + direct payments - levies}}$$

It is also possible to express the PSE as:

$$\frac{\text{value of assistance}}{\text{value of production - levies}}$$

This form expresses total assistance to a product as a percentage of the world price (or a reference price proxy for world price). It is in effect a tariff equivalent measure. This is the form that New Zealand favours: it has the obvious advantage of being well and widely understood, but the negative feature of varying autonomously as a consequence of world price and exchange rate changes.

It will probably be necessary, depending on how PSEs are to be employed, to have other forms used simultaneously. For example countries' aggregate PSEs could be targeted as well as commodity-specific PSEs. But the percentage PSE is the measure of the relative incentive to produce as between products and countries and this should be our principal target for reduction[1].

Calculation of PSEs

PSEs measure support or protection provided by many types of government intervention. Some of these policies result in budgetary expenditure - for example deficiency payments and input subsidies. But they also measure support provided in forms that do not result in budget outlays: for example import quotas and variable levies. The PSE is the sum of the two types of support:

1   **Budgetary expenditure:** most policies other than those that support market prices are delivered in the form of budgetary outlays. These include:

    -    Direct cash payments: as in deficiency payments, headage payments, paid set aside, and direct disaster payments

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[1]   Related to the PSE concept is the CSE: the consumer subsidy equivalent. This measures the subsidy to consumers of government policies in agriculture. For most producing countries CSEs are negative.

- Producer levies: these are treated as negative payments and deducted from budgetary expenditure

- Concessional credit: the programme interest rate is deducted from the market interest rate and multiplied by the loan volume

- Input subsidies: the subsidy rate multiplied by the volume of input used gives the outlay

- Marketing programmes: for processing, inspection marketing and transportation subsidies budgetary data can generally be used

- Long term programmes: these include research extension, structural assistance and conservation programmes. If these were to be included into the agreed PSE measure budget data could generally be used for these policies.

- Exchange rates: the treatment of fixed or pegged exchange rates has not been decided. One method would be to calculate parity exchange rates based on the relative purchasing power vis-a-vis, say, the US. The exchange rate distortion per tonne of produce could then be multiplied by total production to give the subsidy element of this form of assistance.

2   **Price differential:** most market price support policies lead to differences between the domestic and external prices for farm products. The assistance element is derived by taking the price difference and multiplying it by the volume of production. Examples of price support polices that would be captured by the price difference method are:

- Import quotas, two price systems and variable levies, tariffs.

- State trading operations, export subsidies, two price systems, intervention purchases.

The effects of all these policies would be difficult to calculate in other ways, particularly their joint effects.

This list of policies is not, of course, exhaustive.

Role of the PSE

Two broad roles for the PSE are envisaged: these correspond to the first two 'Options for the use of an aggregate measurement of support in the negotiations on

trade in agriculture' identified by the technical group of the GATT negotiating group on agriculture[2]:

Option 1:

Commitments to reduce support expressed directly as PSE reductions. Under this option agreement would be reached on final PSE levels: each participant would decide on specific policy changes that would bring about PSE reductions.

Option 2:

To negotiate reductions in assistance using the PSE as a yardstick. Under this option PSEs would be used to negotiate equivalent policy changes between countries: assistance reduction policies would be negotiated in order to reduce PSEs by, or to, a specified amount.

Either of these two options could lead to achievement of New Zealand's goal in the agriculture negotiations. Our preference has been for the first option, which provides a high degree of sovereign control over the shape of national reform packages.

Option 2 would lead to practical problems involved in describing, and agreeing on, required policy changes. These problems would also occur under option 1, but, under this option, solutions would not have to be negotiated and agreed prior to the liberalisation programme. Under option 1 their solution would be the sole responsibility of the liberalising Contracting Party. Nevertheless, New Zealand's objective in the agriculture negotiations could be achieved under option 2 as well: agreement on this option should not be resisted if it is clear that failure to agree on it would lead to less favourable options from New Zealand's point of view.

Policy coverage

The widest possible policy coverage is desirable. Almost all forms of assistance will have some effect on supply; but these effects will not always be positive, and the time profile of the different supply responses will vary. We favour the inclusion in the coverage of PSEs of all policies aimed at, or significantly affecting, the agricultural sector. Exclusions from the PSE disciplines could then be negotiated, with only those policies having no, or minimal, effects on supply escaping them. These would be 'decoupled' policies, under which support is decoupled from output. In the presentation of the case for a PSE-based liberalisation the distinction between income-based support and output-based support is of the utmost importance.

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[2]   in document MTN.GNG/NG5/TG/W/4

Possible examples of decoupled support, as listed in the Cairns Group proposal are:

- Direct income support which is decoupled from production and marketing[3]

- Adjustment or resource redeployment assistance which has a negligible impact on production and trade or which acts to reduce production levels

- Non-commodity specific aid for infrastructure development covering research, extension, education, market information, inspection, grading, pest and disease control

- Specific, natural disaster relief measures.

Product coverage

Product coverage should be as wide as possible. The ideal list of products would include all those which accounted for more than 5% of any participating country's gross agricultural production. Thus sheepmeat, which may account for less than 5% of the EC's GAP would be subject to PSE disciplines [in the EC and all other participating countries] because it accounts for more than 5% of New Zealand's [and other countries'] GAP.

Country coverage

Country coverage should be as wide as possible. All OECD countries should be included as should all exporters of any of the major commodities.

Processed Products

The boundary point for assistance measurement arises when considering assistance to processing of agricultural products. The New Zealand position is that any assistance which increases processing capacity of farm products should be counted as assistance and included in the PSE disciplines. Note that the definition of decoupled subsidies should not allow assistance that increases processing capacity to escape PSE disciplines. Any agreement on subsidies for processing industries will have to be undertaken without prejudice to agreement reached on industrial subsidies reached in the Negotiating Group on Subsidies.

Inclusion of animal feed costs in PSEs

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3   the political feasibility of direct income supports is discussed and compared to that of supply control policies in Annex 2

High prices for animal feedstuffs are a negative subsidy
- a tax - on livestock producers. Omission of the
effects of government policies which increase prices of
feed would overstate the net government subsidy given to
livestock producers. Net PSEs, as have been calculated
by the OECD, should therefore be used in the
negotiations.

EXCHANGE RATES AND WORLD PRICES

PSEs can vary independently of government assistance
policy because of autonomous changes in exchange rates
and world prices of farm products. Complications arise
because PSEs might increase not because of policy
changes in the country but because of falling world
prices or because of exchange rate changes. Governments
would be unlikely to agree to disciplines that required
binding of their PSEs over a period which was short
enough for these fluctuations significantly to affect
their PSEs. On the other hand, if a reduced PSE were to
relate only to the average over a very long period
domestic markets would not be sufficiently responsive to
international markets. It is impossible to distinguish
between short-run fluctuations and long-term changes in
trends: so protection against price and exchange rate
fluctuations should not be allowed to create added
protection of domestic markets.

One remedy is to measure PSEs annually, but, when
establishing a country's compliance record, to compare
its average PSEs over the most recent [say] 3-year
period with its commitments. In effect countries could
align their domestic policies with a 3-year moving
average of world market prices: if PSEs were above their
bindings in the past two years the current year's
assistance would have to be reduced sufficiently to
bring their average PSE for the 3-year period down to
the bound level. Exchange rates, or world prices, could
still change in the third year to such an extent that
the 3-year average PSE is too high. One solution is to
use the second year's prices for year 3.

The length of the reference periods used in assessing
PSEs and countries' fulfilment of their commitments to
reduce them has to be a compromise between the need to
smooth fluctuations in exchange rates and world prices,
and the need to ensure responsiveness of domestic
policies to price movements. An annual assessment of
PSEs, with averaging over 3 years to measure compliance,
would be an acceptable compromise.

Monitoring

The GATT must ultimately be responsible for monitoring
the fulfilment of contractual obligations as well as
servicing negotiations, maintaining and verifying a PSE
database. However the GATT would need to draw heavily on

both national resources and on data compiled by the OECD in particular.

Supply control

New Zealand's objective of restoring international comparative advantage to the operation of agricultural markets would not be fully reached if domestic production quotas came to be regarded as the only way of solving current agricultural trade problems. Quota limits are unresponsive to market prices. They would therefore entrench existing production patterns and impede structural change.

Nevertheless there are pragmatic reasons for encouraging the adoption of supply controls, in conjunction with PSE disciplines, by the major producing countries. These are summarised in Annex 2 where the political feasibility of supply controls is compared to that of direct income support. The arguments there point to the need to give some credit for effective supply control policies.

This credit could take the form of the targeting of a different variant of PSE: for those commodities under supply control the commitment could be described as a percentage reduction of the **total commodity** PSE. Thus, where there are no supply controls, the percentage PSE would be the desired form of commitment, but there would be resort to the total commodity PSE when supply controls are imposed.

Actual PSEs

PSEs have been updated to 1986. Figures show that OECD assistance of agriculture has generally increased. Average net percentage PSEs are as follows:

	Australia	Canada	EC-10	US	Japan	New Zealand
1979-81	9	24	37	16	57	18
1986	15	46	50	35	75	31[4]

Source: OECD (1988)

VIEWS OF THE OTHER COUNTRIES

The Cairns Group and the US generally support the idea of the PSE measure [as a basis for commitments and as a monitoring tool]. Canada, as we saw, although a member of the Cairns Group has proposed its own variant of the PSE, the Trade Distorting Equivalent, which treats supply control policies more favourably. Both the EC and

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[4]   this figure, as the report says, is due entirely to the once-off producer board write-offs. For 1985 the average PSE was 20%.

the Nordic countries see a lesser role for the PSE but Japan's proposal explicitly rejects the notion that an aggregate measure of support can be useful in the negotiations.

THE DE ZEEUW APPROACH

On his visit to New Zealand in August 1987 de Zeeuw, chairman of the GATT negotiating group on agriculture suggested that a compromise agreement might include two sets of disciplines:

One for competitive exporting countries where something like the US proposal would apply with support being decoupled from production and mostly confined to fixed levies (tariffs).

A second where countries (or particular sectors?) which were not exporting could maintain domestic support. If they restricted imports they should also control supply.

The reasoning behind this approach is that it would be unrealistic to say that non-competitive countries should not have any agriculture sector at all. Under this approach PSEs would still have a role: they could be used as a monitoring device for phaseout of measures and binding of support at certain levels. The approach raises many questions: how far could food security, employment and other social objectives be allowed to go? What proportion of self-sufficiency would be permitted? If a country could not compete internationally it should not be exporting. But if Finland and Sweden ceased to export but wanted to retain their domestic market would that be enough? Would we then say they must have a minimum access commitment? If countries restricted imports they should control supply.

Questions that would have to be answered to determine New Zealand's interest in the de Zeeuw approach would be:

1 . Whether the possibility of achieving any more beneficial options were worth striving for in the negotiations.

2 What degree of self-sufficiency would be the maximum acceptable for each product?

3 How speedily would the exporting sectors be expected to adjust to the new disciplines?

4 What would be the long-term implications of acceptance of the approach? How would it affect stability of the trading system?

What would be likely to happen if the de Zeeuw approach were adopted? Clearly EC and US livestock products,

which are currently in surplus, would have to be bound
by PSE-type disciplines. If supply controls on
substitute products were tight then producers of
livestock products would rely on decoupled support or
suffer a fall in their standard of living.

It is clear that if applied to livestock products, and
in the EC and the US in particular, the de Zeeuw
guidelines would, in general, benefit New Zealand. This
is provided that the permitted degree of self-
sufficiency were lower than 100%.

So if there were no feasible negotiating alternative the
de Zeeuw approach could have some merit for New Zealand.
The answer to question 2 is important: we should aim for
the lowest negotiable self-sufficiency ratios for the
importing countries. Disciplines on access should be
strict and binding. The supply controls on the non-
exported products would also be critical: assistance
based liberalisation of the exported products should not
result in a shift of resources toward the production of
non-exported products.

For the exporting countries some form of aggregate
measure would be required to ensure that reductions in
support were uniformly applied across countries and
commodities. As with the A options definitions of
decoupled support would have to be agreed.

Arguments that could be deployed against the de Zeeuw
approach are:

1   That it would lead to ossification and entrenchment
     of existing production patterns which are
     inefficient in that the operation of international
     comparative advantage is not allowed to operate
     over the entire production range of a particular
     commodity.

2   That it breathes new life into the 'special
     characteristics' argument for agricultural
     products.

3   That any self-sufficiency achieved could largely be
     illusory because of imported fuels and fertilizers.

4   That expansion of domestic production to achieve
     national self-sufficiency makes world markets
     thinner and therefore less stable.

5   That the costs of any self-sufficiency achieved
     could far outweigh the benefits.

Yet if a total liberalisation, along the lines proposed
by the US and Cairns Group, is not achievable, the de
Zeeuw approach may be New Zealand's preferred option.

APPLICATIONS

Whether or not PSEs, or any aggregate measure of
assistance, will be used in the GATT agriculture
negotiations is still a matter for debate. The role of
an aggregate measure has also to be decided. If no such
means of capturing all forms of assistance is found, it
would be difficult to see how the GATT can advance. In
any event, it would be desirable to have an overall
assessment of the value to New Zealand of different
forms of assistance-based liberalisation. The next part
of the paper looks at a modelling framework which
simulates various liberalisation scenarios.

A METHODOLOGY FOR EVALUATING THE EFFECTS OF ASSISTANCE (PSE/CSE) BASED LIBERALISATION FOR NEW ZEALAND TRADE

The Producer Subsidy Equivalent (PSE) and its variants were defined and their usefulness as aggregate measures of support to farmers was discussed in the first part of the paper. Their potential role within a multilateral trade liberalisation framework was also considered and several technical issues involved were identified. The objectives in the second part of this paper are: to demonstrate the application of these assistance (PSE/CSE) based liberalisation measures and to study their effects on world reference prices, trade, welfare etc using a Static World Policy Simulation Model (SWOPSIM).

An overview of this modelling framework covering its general scope and objectives, the model development and its adaptation by the MAF/Lincoln research team and some preliminary results, as well as their possible use in trade negotiations, are discussed in the next section. The results of two multilateral trade liberalisation scenarios are detailed in the following section and their implications evaluated.

Overview of the Trade Policy Simulation Framework

The SWOPSIM modelling framework follows the logic of a non-spatial price equilibrium model, which assumes that domestic and traded goods are perfect substitutes in consumption. It is a computer simulation model based on electronic spreadsheets available with micro computers. It is also based on the OECD (MTM) trade model, which is an economic model that runs on a mainframe computer system, used mainly to evaluate general trade policy impacts in all OECD member countries. But the OECD/MTM model is less flexible in accommodating sub sets of countries and commodities of importance in trade for, or specific policies of interest to New Zealand.

The need to measure the effects of trade barriers and domestic agricultural policies of important trading partners on agricultural commodities of importance to New Zealand necessitated the development of this in-house capability at the Policy Services Division MAFCorp. The specific objectives of this research are threefold:

(i)   the development of a quantitative framework for Agricultural trade policy analysis,

(ii)   the evaluation of a range of multilateral and bilateral trade policy adjustment in agriculture, and

(iii)   the assessment of a series of specific issues relating to trade talks in agriculture.

SWOPSIM Model Development at the USDA

The trade policy modelling framework adopted was originally developed at the USDA - Agricultural Trade Analysis Division (Roningen, 1986). The models created by the SWOPSIM framework have an economic structure and a policy structure and reside in the country model and country policy spreadsheets, respectively. The economic structure includes constant elasticity supply and demand equations and some summary policy measures. As in any standard neo-classical net trade models, trade is the difference between supply and demand.

Linkage across products occurs via cross price relationships and technological parameters, while linkage across countries and regions takes place through domestic-international price equations and world trade (Webb et al, 1987). Policies are introduced into the model by allowing world, producer and consumer prices to diverge. This is accomplished by recognising the marketing and transport margins, the exchange rate, exchange rate transmission elasticity, a world price transmission elasticity and a constant term. Two additional equations link producer and consumer prices in each domestic market to the world prices.

The policy diversity and richness of the SWOPSIM-generated models is achieved by means of the price linkage equations based on Josling's (1981) subsidy equivalent method. This approach recognises the close relationship between domestic and trade policies and quantifies the totality of the influence of governments on the market. The separation of subsidies to the producers (PSE) from those to the consumers (CSE) allows the effects on these two groups in the economy to be evaluated. PSEs attributable to trade measures such as quotas and tariffs appear as constant terms in the producer and consumer price equations, while policies affecting domestic price margins enter the terms associated with the marketing margins for producers and consumers.

The data and parameters which define the economic structure of each country's food and agricultural sector are included in the model spreadsheets and are used to generate the supply, demand and trade equations in combination with the PSEs and CSEs transferred from the policy spreadsheets. The PSEs and CSEs associated with each policy for each commodity within each country are computed by the policy spreadsheets based on original budget data. This facilitates updating or revising the policy information used in the model without disrupting the economic structure of the model.

Policy Services Version (MAFF) of the SWOPSIM Model

The particular version of the trade model developed to
evaluate the effects of assistance based liberalisation
scenarios on trade between New Zealand and its major
trading partners is known as MAFF. This is constructed
within the overall SWOPSIM framework discussed in the
previous section, and makes use of the flexibility of
this modelling approach to determine the country and
commodity coverage. The model contains seven countries
or regions. These are Australia, Canada, EEC, Japan,
United States together with New Zealand and an aggregate
rest of the world (ROW) grouping.

The commodities covered in this version are beef,
sheepmeats, pork, poultry, (fluid) milk, dairy products
(butter, cheese, wholemilk powder (WMP), skim-milk
powder (SMP), and condensed milk), forage, wool, wheat,
soybeans, and coarse grains (including barley, maize
(corn), sorghum and millets). Some of these commodities
are included because of the cross-commodity linkages
(eg, coarse grains, soybeans, forage) as well as the
joint nature of production (eg, fluid milk, wool), even
though they may not be significant in New Zealand trade.

The supply and demand parameters (eg elasticities) used
in this model are those used by the OECD-MTM model, with
corrections where necessary, and the production
disposition (ie, quantity data) is based on OECD (1985)
sources for the 1979-81 period. Prices and policies
(PSEs/CSEs) are 1985 values, except for New Zealand
which is based on updated 1986 figures (USDA, 1987),
also from OECD (1987b) sources. Producer prices are set
at the world price plus direct payment plus market
support only. Assistance to value adding factors and
input subsidies is excluded.

The model is solved using a set of Basic programs
incorporating the spread sheet program, SuperCalc. The
model spreadsheets for all the countries are used in a
procedure called WORLDMOD (or COMODMOD when only a
single commodity is under consideration), to generate
the solution using a full simultaneous multi-region
multi-product model from country/region spreadsheets.
The results are output as two spreadsheets. One
consists of supply, demand, trade flow and price changes
as a result of liberalisation scenarios introduced. The
other provides the welfare results in terms of changes
in net producer and consumer welfare and taxpayer
savings.

Model Results of Multilateral Trade Liberalisation Scenarios

The political and economic rationale for multilateral
trade liberalisation and its implications for trade
negotiations within the GATT framework was addressed in
the first part of this paper. The model (SWOPSIM)

framework outlined so far in the second part of the paper is ideally suited for evaluating the trade, price, and welfare effects of assistance (PSE/CSE) based multilateral liberalisation scenarios. It uses the subsidy equivalent approach in reducing assistance levels as opposed to a policy based liberalisation strategy. The framework can be used to study the effects on trade of a single commodity involving several countries. But it is not presently capable of effectively addressing issues of bilateral nature, such as import or production quotas, or minimum prices, directly.

Scenarios of Liberalisation Measures

Within a Multi-lateral framework, two trade liberalisation scenarios were considered to be of some significance for evaluation using the MAFF model. These examples are shown for the purpose of focusing on New Zealand trade, price and welfare effects. They are listed below, and their importance for New Zealand and in this study are for somewhat different reasons.

(i)   Tri-lateral grains liberalisation - this involves the reduction in assistance levels for wheat and coarse grains producers in the EEC, Japan and the US only.

(ii)   Overall liberalisation - this is a multi-country (6 countries explicitly treated in the case of MAFF model) multi-commodity (13 traded and 2 non-traded commodities in the MAFF version) assistance reduction measure.

The effects of Tri-lateral grains liberalisation scenario have not been widely studied nor discussed as extensively as the overall liberalisation scenario. Overall (partial) liberalisation has been reported at the 10 percent (OECD, 1985 and 1987; USDA, 1987; and Tyers and Anderson, 1986) and higher (ABARE, 1988; Tangermann, 1988) levels of assistance reduction. For this reason, it is important the grains liberalisation scenario be studied to understand the effects on both the grains trade as well as the trade in livestock products, due to the feed grain - livestock linkages particularly important in the northern hemisphere. The implications for New Zealand trade, producer and consumer prices, the welfare of both dairy and meat producers and the economy could be very important. The overall liberalisation scenario, on the other hand, can be used as a benchmark to compare the results from the MAFF model based on the SWOPSIM framework with the results from the larger models of the OECD (1988), USDA (Roningen et al; Webb et al, 1987) and ABARE (1988) with wider country and commodity coverage.

Grains policies and Assistance Levels in EC/Japan/USA

The level of assistance to grain producers in the European Community, Japan and the US is moderate to high. Percentage PSEs in 1985 ranged from 23 for coarse grains in the EEC and the US to 95 for both wheat and coarse grains in Japan (table 1; part I). The values for wheat in the EC and the US were about 38 percent. The US is a large producer and net exporter of both wheat and coarse grains, Japan is an important net importer of both commodities, and EC is a net exporter of wheat and a net importer of coarse grains (table 1; part I).

In the EC and Japan, assistance to grain producers is mainly in the form of market price support, which accounted for over 75 percent of the total PSE. Direct payments accounted for about 50 percent or more of the assistance provided to the US wheat and coarse grains producers (table 1; part II). Measures reducing input cost accounted for at least 20 percent of the PSE in the US for both wheat and coarse grains and is the second largest component. General services assistance represented over 15 percent of the PSE and is the second largest in the EC, while no assistance was provided in the form of direct payments to the EC wheat or coarse grains producers. Direct payments, measures to reduce input costs, and general services are all used to some extent to assist Japanese wheat and coarse grains producers, but individually account for less than 10 percent of the total PSE. Sub national and other forms of assistance are found in the US only, and represented less than 5 percent of the wheat and coarse grains PSEs in 1985 (table 1; part II).

Tri-lateral Grains Liberalisation Scenario and the Results

This scenario represents a partial liberalisation of assistance provided for wheat and coarse grains producers in the EC, Japan and the US. It is viewed by some as a likely second best position in the GATT trade negotiations, if the overall liberalisation scenario to be considered later in this paper does not generate adequate effective support for reasons discussed in the first part of this paper. If agriculture is again treated as a special case in the Uruguay round, a US/EC/Japan trade-off involving grains could be contemplated. The consequences of this potential development for these three countries, New Zealand and for other trading partners are studied.

For the purpose of modelling this within the SWOPSIM framework using MAFF, a 10 percent reduction in PSEs for wheat and coarse grains in the three countries was considered. In addition, for EC and Japan where most assistance (over 75 percent) is provided by means of market price support (table 1; part II), a corresponding

Table 1:   1985 Level and Composition of Assistance to Grains Producers in the EEC, Japan, and the US

		WHEAT[1]			COARSE GRAINS[2]		
I	Level of Assistance	EEC	JAPAN	USA	EEC	JAPAN	USA
a	Producer Prices[3]	178	203	149	180	192	98
b	Level of Production[4]	71,166	874	65,992	70,424	406	274,724
c	Net Trade[4]	13,634	-5,238	25,868	-2,485	-21,182	51,500
d	Percentage PSE	37.2	95.2	39.4	23.0	95.4	23.8
e	Unit PSE[3]	48.0	99.0	42.0	34.0	94.0	19.0

II	Composition of Assistance			(Percentages)			
a	Market Price Support	81	77	11	79	78	8
b	Direct Payments	–	9	61	–	9	49
c	Reduction of Input Cost	4	6	19	1	4	25
d	General Services	15	8	4	20	9	9
e	Sub National	–	–	3	–	–	5
f	Other	–	–	2	–	–	4

Sources: OECD (1987), "Updating of PSE/CSE Analysis", Country Notes on EEC, Japan and USA.
              USDA (1988), "Situation and Outlook for Wheat and Coarse grains", ERS.

1   Represents wheat for human as well as feed use; for EEC the 'Common Wheat' is included.
2   Coarse grains represent barley, Maize, sorghum, Millets etc.
3   Producer Prices and Unit PSEs per tonne are in the currency of respective Countries:EEC (ECU), Japan ('000' yen), and US ($).
4   Level of Production and Net trade are in '000' tonnes; a negative sign represents net imports.

increase of CSEs by the same proportion was necessary. This was modelled to reflect the change in market price for consumers due to the reduction in price support to the producers in EC and Japan. But in the US where market price support represented only about 10 percent or less of the PSEs for wheat and coarse grains, CSEs were left unchanged. Results can be summarised in terms of the effects on changes in trade flows, world reference as well as producer and consumer price changes in individual countries/region, and changes in total welfare levels by commodity and region. The output of this simulation are medium term results of the effects of liberalisation.

The impact on world reference prices are discussed first. Wheat and coarse grain prices per tonne rose by US$ 1-2, the meat product prices fell by US$ 2-4, wool prices rose by about US$ 3 and the dairy products prices were almost unchanged. The changes in world reference prices were not anticipated to be much higher given the small degree of this partial liberalisation scenario (ie, 10 percent reduction).

The effects of liberalisation on the trade flow of commodities are reported next. Trade in beef and sheepmeat from New Zealand is higher, but the trade flow changes following liberalisation were less than 1 percent. Estimates of New Zealand's pork imports increased by over 20 percent, coarse grains exports increased by about 10 percent, and wheat imports decreased by about 15 percent (figure 1). But with initial quantities of trade in these commodities being relatively small, actual changes were not quite as significant.

Among the other countries in the MAFF model, EC trade in wheat exports declined somewhat, but imports of coarse grains increased by almost 10 percent from a modest base. Changes in EC trade flow of other commodities (beef, poultry and sheepmeats) were very negligible. The Japanese trade in all the meat products (imports) decreased. The decrease was about 5 percent for pork, 10 percent for beef and almost 40 percent in the case of poultry meat. But both wheat and coarse grains trade (imports) in Japan increased by about 5 percent. Australian trade in pork and poultry (exports) was found to decline by over 40 percent, from initial levels which were quite small, and the EC trade in pork (exports) also reduced by over 20 percent starting from a relatively larger base.

For the US, the percentage changes in trade flow following this low level partial grains liberalisation was quite small. There was a 2-3 percent decline in pork and sheepmeats imports as well as poultry and wheat exports. Beef and coarse grains trade was almost unchanged. The effects on the Canadian trade were also quite small, where beef and pork exports were reduced,

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Figure 1: Trade Flow Changes: Grains Liberalisation
(10% Reduction in PSE for CG/WH in EEC/JP/US)
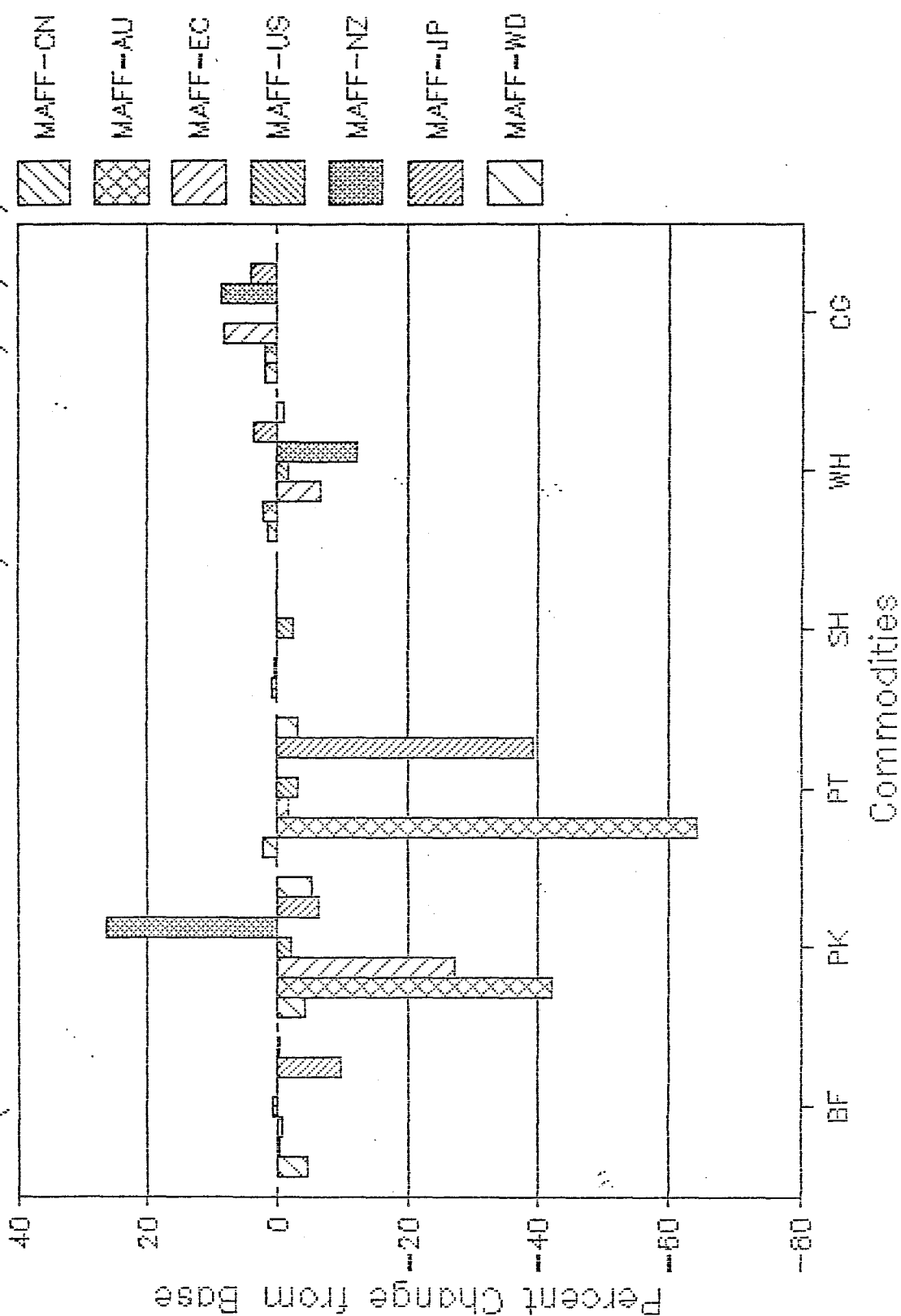
while poultry and sheepmeat imports were increased somewhat. Canadian and Australian wheat and coarse grains exports also increased by about 2-3 percent. There were hardly any changes noticeable in the rest of the world trade, except for some decline in the pork, poultry and wheat trade. These results are consistent with a-priori expectations of lower production levels and an increase in net imports or a decrease in net exports of coarse grains and wheat in EC, Japan and the US, following assistance reduction.

The effects of grains liberalisation on changes in producer prices were quite significant for the EC, Japan and the US wheat and coarse grains producers (figure 2). This was anticipated, owing to the tri-lateral nature of this liberalisation scenario. But the actual price decline in the EEC and the US was only about 2-3 percent and in Japan about 8-9 percent, even though the PSEs were reduced by 10 percent. This was partly due to the increase in world reference prices for both wheat and coarse grains by about US$ 1-2 following liberalisation, which compensated somewhat the reductions in assistance levels. Prices for New Zealand wheat and coarse grains producers also rose by about 2-3 percent, similar to the rise for the Australian and the rest of the world counterparts. The increases in Canadian wheat and coarse grains prices for domestic producers were somewhat smaller in percentage terms. The effects of this 10 percent tri-lateral grains liberalisation on prices for producers of meat products was quite negligible (under 1/2 percent) in all the countries modelled, even though the world reference prices for these products fell by $US 2-4 per tonne in absolute terms. For all the meat products included in the model, the greatest decline (still under 1/2 percent) of producer prices in relative terms was experienced by the New Zealand producers.

The final results of the effects of trilateral grains liberalisation are related to **changes in total welfare levels** by commodities in the different countries and region modelled (figure 3). This represents the sum changes in producer and consumer welfare for each commodity, and the tax payer savings in those countries undertaking liberalisation. The country to benefit the most as a result of this liberalisation scenario is Japan, with benefits of about $US 200 million in poultry and over $US 600 million in the case of coarse grains (figure 3). The US producers, consumers and tax payers, on the other hand, will lose between about $US 25 million in beef and pork activity and around $US 300 million in wheat and coarse grain activity. EC gains between $US 10 and 50 million in the beef, poultry and pork activity and loses about $US 40 million in the wheat and coarse grains activities separately. The welfare gains and/or losses in each of the different activities were quite negligible in all the other countries, including New Zealand.

Figure 2: Producer Price Changes: Grains Liberalisation
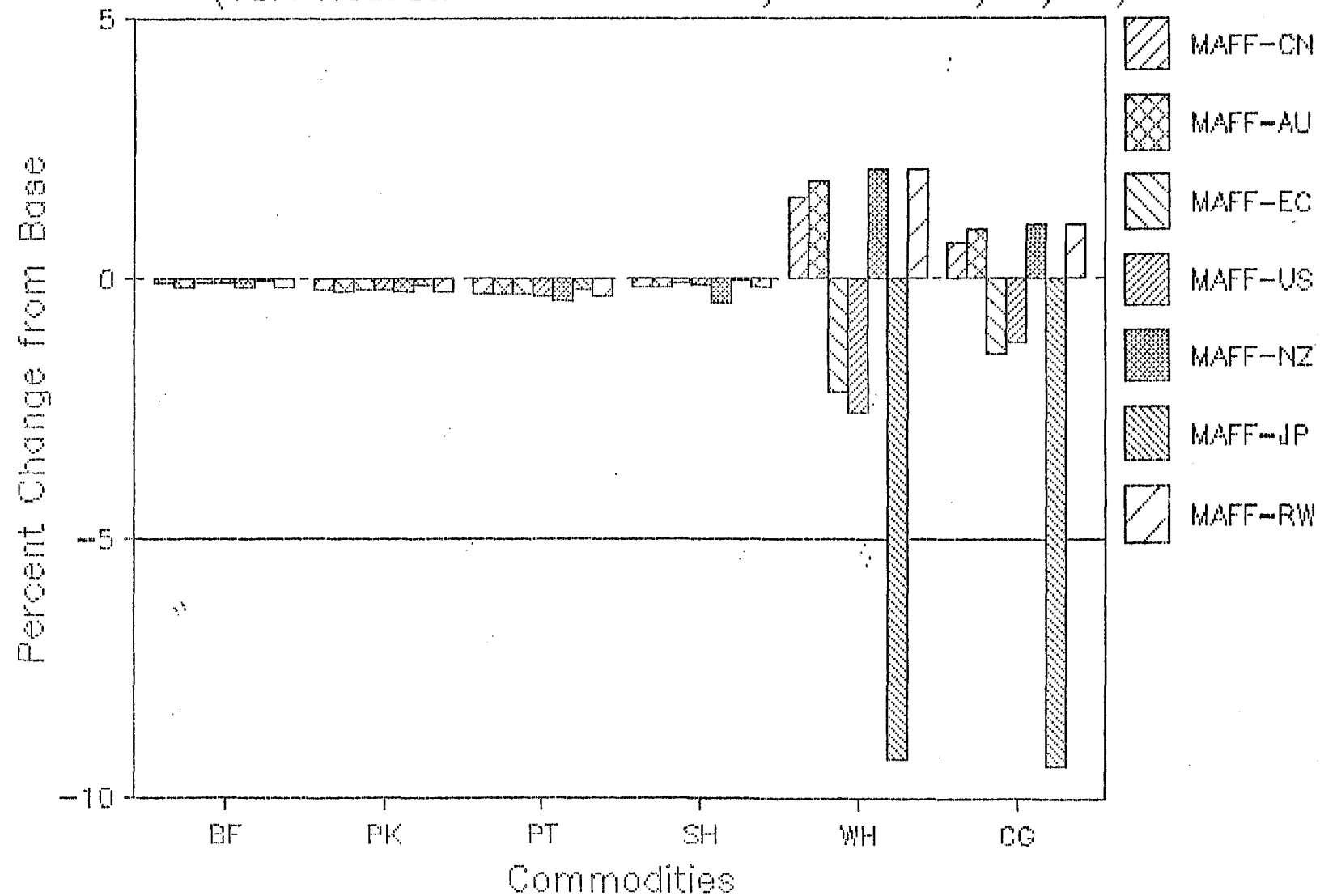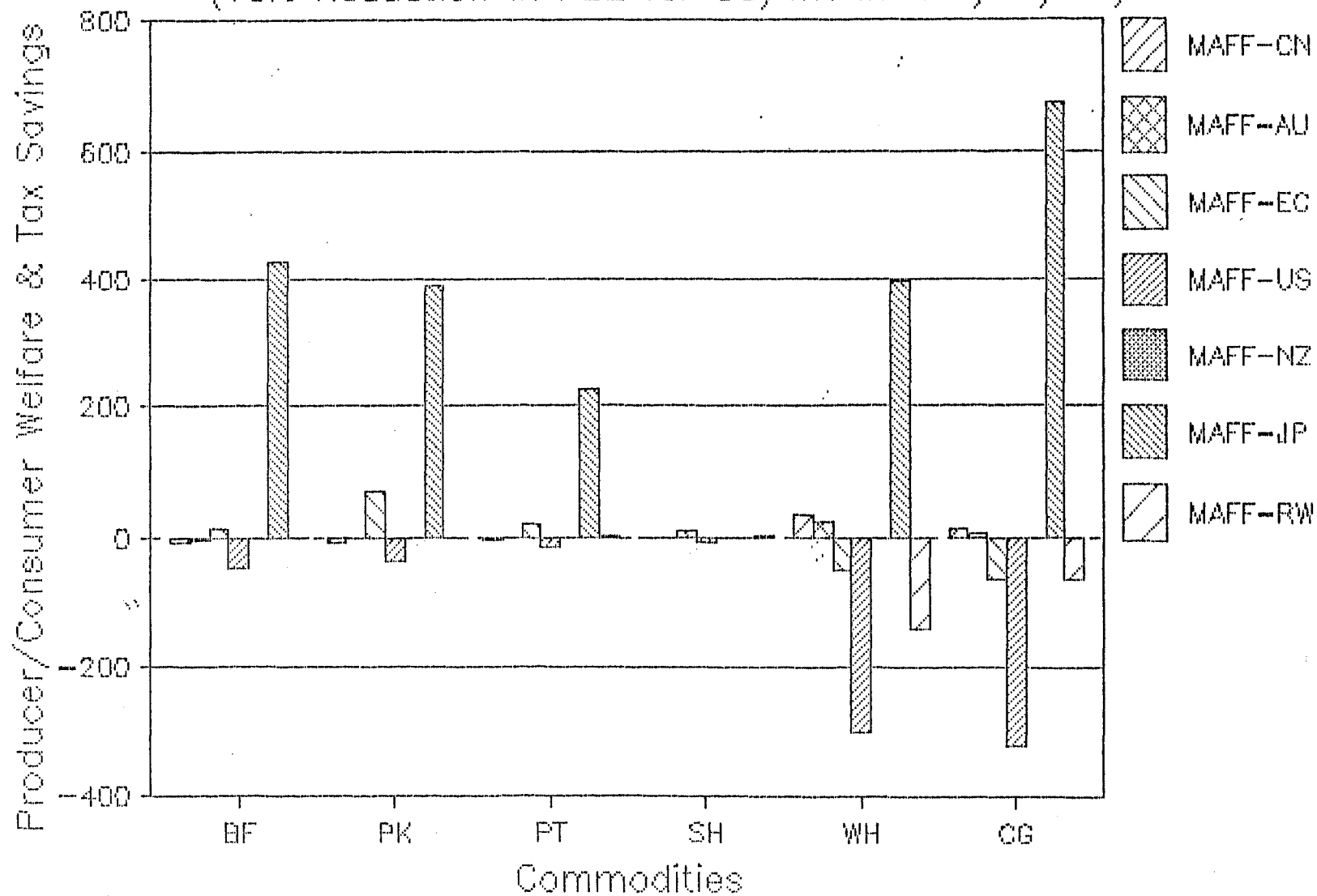(10% Reduction in PSE for CG/WH in EEC/JP/US)

Figure 3: Total Welfare Levels by Commdities and Regions
(10% Reduction in PSE for CG/WH in EEC/JP/US)

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Results of the Overall Liberalisation Scenario

This is the most preferred scenario of New Zealand and
MAFF was used to verify the results in relation to
overseas work which has studied the effects of overall
(ie, Multi-Country/Multi-Commodity) liberalisation.
These models (OECD/MTM, 1985; USDA/TLIB, 1987; ABARE,
1988) have similar economic structure, but differ in the
country/commodity coverage, due to their particular
focus of analysis, and the data and parameter values
used. They have also studied wide variations of the
overall liberalisation scenario and have used somewhat
different time periods to represent the level of
assistance (PSEs/CSEs) to agricultural producers. The
diversity of these models in relation to their specific
model structure as well as the data and parameter use is
summarised in table 2.

Table 2   Coverage and Data Comparisons of some Trade Models

Model[1]	Coverage Country Commodity		Parameters	Prodn. Disposn.	Prices	Policies	Scenarios
1 OECD/MTM	11 (NZL)	14	Original	1979-81	1985	1979-81 1982-85	5
2 USDA-TLIB - STLIB	36 8 (AU/NZ)	22 13	Revised	1984 1986	1984/85	1984/85	several
3 ABARE	12 (DX)	22	Revised	1986/87	1986	1984	10
4 MAFF	7 (NZ)	15	Original /updates	1979-81	1985	1985	2

[1]   Among these four models, the latter three are SWOPSIM generated models with differing
country/commodity coverage operating on micro computers, but are based on the economic
structure of the OECD/MTM model.

In each of these models, country coverage implies New
Zealand being represented separately (eg, OECD/MTM (NZL);
MAFF (NZ)), modelled together with Australia (USDA -
STLIB; AU/NZ) or represented as developed country
exporters (DX) among the Cairns group of countries
(ABARE). The extent of country coverage also indicate
the nature of the rest of the world (ROW) grouping. When
several countries/regions are modelled explicitly (eg
USDA - TLIB), the ROW will comprise of fewer countries;
but in the case of MAFF, the ROW represents all countries
besides the 6 modelled separately. The commodity
coverage also varies considerably across models, with the
USDA and ABARE versions representing a wider coverage in
comparison to the OECD/MTM and MAFF models (table 2).

The data used in these models also differ in relation to
the period of coverage of the production disposition (ie,
quantity data), the prices and the policies. While the
MAFF model is based on 1985 prices and policies (1986 for
New Zealand) and original 1979-81 quantity data from OECD

sources, the OECD/MTM model uses sets of policies (ie, averages) for two three year periods (ie, 1979-81 and 1982-85). The USDA models are based on 1984 quantity data recently updated to 1986 and prices and policies prevailing during the 1984/85 season. The ABARE version is also based on 1986 quantity and price data but uses the 1984 policies for assistance levels (ie PSEs/CSEs).

The OECD/MTM results are provided for five scenarios, of which the ad valorem option results are used here for comparison. The USDA-TLIB and STLIB models have been used for the evaluation of several scenarios of which, the developed country liberalisation results are considered. The ABARE model results cover 3 levels of partial liberalisation (ie, 10, 20 and 30 percent) originating from 3 different sources (ie, all countries, US/EC/Japan and Rest of the world), as well as a total liberalisation (100 percent) scenario. For purposes of comparison, the 10 percent level of liberalisation of all countries is considered here. The results of two liberalisation scenarios studied in a multi-lateral framework using the MAFF model are reported here. In modelling the liberalisation scenarios, the level of assistance in the ROW group remains unchanged in all the models.

Effects on World Reference Prices

Due to the need to validate the overall results across models, percentage changes in world reference prices for major traded commodities following a partial (ie, 10 percent) overall (or developed country) liberalisation are compared in table 3. These results relate to specific scenarios identified in the previous section for comparison and have to be viewed in relation to the differences in model structure provided in table 2.

Table 3   Effects of Partial Overall Liberalisation on World Reference Prices of Major Traded Commodities

Models	Milk	Dairy[1] Prod.	Beef	Pork	Poul -try	Sheep Meats	Wool	Wheat	Coarse Grains	Soy Beans
				(Percentage Changes)						
1 OECD/MTM[2]	2.7	-	1.5	-0.2	0.6	2.0	0.7	-0.3	-0.9	-1.5
2 USDA/STLIB	-	3.3	1.9	-	-	-	-	6	7	3
3 ABARE	6.0	2-3	0.7	0.4	0.3	1.1	-	-3.5	-	-
4 MAFF	1.0	2-6	2.8	0.2	0.7	1.4	0.6	1.8	0.9	-0.1

[1]   Dairy products in the MAFF model comprise of Butter (4.1%), cheese (4.2%), whole milk powder (1.5%), condensed milk (4.1%) and skim milk powder (6.4%) and the resulting increases in world reference prices are reported within parentheses.

[2]   The OECD/MTM results are based on the Ad valorem scenario reducing assistance from the 1982-85 levels.

As with other models, the greatest increase in world reference prices were found for the dairy products and the ruminant meat (ie, beef). Sheepmeat prices rose by about 1-2 percent, while wool prices increased very little. The changes in poultry and pork prices were very minimal (less than 1%). The results from the MAFF model suggest an increase in wheat (1.8 percent) and coarse grains (0.9 percent) prices, but by a smaller magnitude than the USDA model. Milk prices also rise in all the models; but are the highest for the ABARE model (6 percent), the lowest for the MAFF model (1 percent) and in between these two values for the OECD/MTM model at about 3 percent. Dairy products are not treated explicitly in the OECD/MTM model, while the USDA-STLIB model results reported (Webb et al, 1987) did not cover the price changes for pork, poultry, sheepmeats, wool and milk. The ABARE model did not include wool and price changes for coarse grains and soybeans were reported to be negligible. The effects on wheat and coarse grains prices was small and negative in the OECD/MTM model, while it was relatively larger and positive in the USDA-STLIB model.

Summary and Implications

This paper identified some of the important issues in the current agricultural trade negotiations and demonstrated the use of a trade modelling framework to study the effects of assistance based liberalisation to New Zealand and its major trading partners. New Zealand requires the capability to evaluate the different proposals and scenarios in a proactive as well as reactive framework, with emphasis on studying the effects of these measures on trade, prices and welfare of commodities of importance. The results of an overall (partial) liberalisation scenario studied using the Policy Services version of the trade model   MAFF compared well with findings of similar models.

The results of a tri-lateral grain liberalisation scenario studied suggest no appreciable trade or welfare gains to New Zealand's major trading interests (ie, dairy products, sheepmeats and beef) even though the trade was not adversely affected. Welfare gains for Japan and losses for the US were also observed, while in the EC there were small gains in the meat activity at the expense of minor losses in the wheat and coarse grains activities. This information is very useful and is of interest for trade negotiators from New Zealand as well as other Countries. They also suggest the need to maintain the momentum generated in the Uruguay round of GATT negotiations for a multi-lateral liberalisation of trade in all agricultural products. A PSE or some form of aggregate measure based multi-lateral liberalisation scenario can be viewed as feasible in this context. Several issues of concern however, need to be addressed to satisfy different countries that the effects of

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liberalisation will be beneficial and spread evenly across all trading nations.

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Annex 1: Classification of Aggregate Measures Assistance by Policy Change

Policy Measure	NPR	PAG	ERP	PSE	ERA
Assistance to output					
via market prices					
- tariffs, import quotas	x	x	x	x	x
- import quotas	x	x	x	x	x
via other means					
- export incentives, inspection	x			x	x
- stabilisation activity and funds	x			x	x
- production bounties	x			x	x
- set aside payments	x			x	x
- subsidised marketing costs	x			x	x
Assistance to inputs					
- fertiliser subsidies				x	x
- fuel tax exemptions				x	x
Assistance to value adding factors					
- concessional credit				x	x
- income tax concessions				x	x
- research and extension				x	x
- disaster relief				x	x
- farm adjustment				x	x
- conservation programmes				x	x
assistance to other activities					
- protection of inputs			x		x

Key: NPR = nominal rate of protection; PAG = price adjustment gap; ERP = effective rate of protection; PSE = producer subsidy equivalent; ERA = effective rate of assistance

Sources: Adapted from USDA (1987a), BAE (1987)

ANNEX 2: Supply Control and Direct Income Payments

Under the assistance reduction disciplines proposed by the US and Cairns Group worthwhile reform of the major producing countries' agricultural policies will, in the current jargon, 'decouple' farm product prices from producer incomes. Almost inevitably real product prices will be cut, or will be allowed to fall. It is unlikely that existing farmers will remain uncompensated for such reductions. The strength of their lobby, and the social pressures in favour of their remaining on the land will ensure that those currently farming do not experience a drastic reduction in government support. Rather a larger proportion of assistance will be delivered in forms which do not stimulate supply.

Domestic production quotas and direct income supports are such methods, and this annex discusses the political feasibility of these forms of assistance.

Domestic production quotas

Production quotas have certain advantages over open-ended price supports:

1   Surplus output is curbed
2   Government expenditure is reduced
3   High cost production is cut, leading to a gain in economic welfare.

However:

1   Consumer prices are raised: some of the budgetary burden is shifted from taxpayers to consumers where it is less visible and more difficult to restrain. Welfare losses arise as consumption patterns are distorted.

2   Quotas impede structural change in agriculture. Quota rights could be made transferable mitigating this disadvantage to the degree that farmers are unconstrained by liquidity limits or uncertainties about future policy.

3   Quotas are difficult to remove. If the quota effectively reduces production (as it should) withdrawal of the quota would lead to an increase in production, or would require a significant price cut - both politically awkward decisions.

4   Quotas for one product can raise the output of other products. Under a milk quota regime, for instance, beef production could expand.

5   Quotas are expensive to administer.

Of alternatives to open-ended price supports, quotas would be most likely to please farmers. But New Zealand's goal of restoring international comparative advantage to the operation of agricultural markets would not be reached if domestic production quotas were imposed on the farm sectors of developed countries.

Direct income support

There are, however, even greater difficulties associated with the use of direct income supports:

1   Would the income support be offered as compensation for reduced prices? The Cairns Group proposal excepts "direct income support which is decoupled from production and marketing" from the disciplines applying to other forms of assistance to producers[5]. It is left open whether direct payments would be correlated, to any degree, with income levels applying before the disciplines were imposed. For domestic political reasons it is difficult to imagine acceptance of direct income aids which did not restore at least some of the income lost from price reductions. Such support, proportional to **past** income - and therefore production - levels, would not breach the Cairns Group disciplines. There would be a practical problem though, of determining by how much to compensate farmers. This problem is more complicated than determining the revenue lost from price cuts. It requires assessment of the · alternative uses of farm resources. Some, mostly the bigger farms, will have more opportunities for diversification than others. [Given the commodity coverage specified in the US and Cairns Group proposals [6]diversification within agriculture may not cause a problem here, but some farmers will be more able to diversify out of agriculture.] So replacement of price support by income aids of this kind will require some judgement about the extent of the alternative income sources enjoyed by, or open to, the farm household.

If the new forms of income support were **not** intended to be compensation for price cuts [and were therefore flat-rate levels of income support] then those farmers currently producing large volumes, and so benefiting most from price supports, would be big losers under Cairns Group

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[5] The US proposal exempts "direct income or other payments decoupled form production and marketing".

[6] US: "..all agricultural commodities, food, beverages, forest products and fish and fish products". Cairns Group: "..widest possible range of agricultural products".

disciplines. Since these farmers are the most powerful, politically, it is difficult to envisage the proposals being implemented in this form.

The EC Commission in a special report[7] identifies the principal problem with its own modest income aid scheme as being to define clearly the beneficiaries of income aids. It is important, says the Commission, that direct payments be reserved for farmers in real need. However the perception of such a criterion varies greatly from one region of the Community to another, with average agricultural incomes in very productive areas as much as 17 times higher than in the least prosperous regions.

2   Direct income aids shift the basis of support from commodities to people. One reason why farmers can expect to resist this change is that it makes comparisons with non-farmers, many of whom have also suffered from structural change, inevitable. Any compensatory scheme would almost certainly treat farmers more generously than non-farmers, and would be difficult to implement for this reason.

3   There is another practical problem in that the expected budgetary gains from structural adjustment in agriculture take a long time to realize fully, while the peak demands for income support would occur from the outset.

Discussion

If targeting of PSEs or similar aggregate measures of support is not achieved in the MTN the negotiations would probably have failed from New Zealand's point of view. If it is achieved it is likely that the US, EC and Japanese governments will consider production quotas or direct income aids as important farm policy instruments. The key questions following from the above discussion are:

1   Whether direct income aids are going to be seen as feasible alternatives to existing policies by subsidising governments, and

2   If not, how to formulate supply control disciplines in such a way as to achieve New Zealand's objectives most fully.

Of the difficulties associated with domestic production quotas which are outlined above only number 5 (their administrative cost) is a problem in so far as subsidising governments are concerned. But administrative costs have not previously deterred these

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[7]   in "Agricultural Situation in the Community" for 1987.

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countries from similarly cumbersome agricultural support
arrangements. The other difficulties are either too long
term in nature or are otherwise irrelevant from the
viewpoint of current policy-makers in these countries.
This is not the case with the problems arising from
direct income support, as outlined above. With this form
of support budgetary and political difficulties arise
immediately. It therefore seems more likely that if the
US, EC and Japan significantly change their farm
policies they will move down the supply control route.

The implication of the above reasoning for New Zealand's
position on PSEs is that credit should be given for
supply control policies. Ways of doing this are
discussed in the main paper.

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THE INCIDENCE OF TRADE POLICIES ON AGRICULTURE: THE CASE OF ECUADOR

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SUMMARY

Trade policies designed to protect or assist one sector of the economy have been shown to have unintended disprotective effects on the other sectors of the economy. Trade policies designed to assist the industrial (import-competing) sector by imposing tariffs on imports affect relative domestic prices and distort incentives, with the result that the agricultural sector bears part of the costs of industrial protection as a tax.

This paper measures the effects of trade policy on relative prices, estimating the adjustments in domestic markets for non-tradable goods in response to distortions in the markets for traded goods induced by commercial policies in Ecuador from 1960 to 1986. Estimates of the incidence of protection on agriculture are made at various levels of aggregation.

Key Words: Protection, Incidence, Ecuador, Agriculture.

1. THE INTERSECTORAL EFFECTS OF TRADE POLICIES

Domestic trade policies designed to protect the import-competing sector of an economy have additional unintended effects on the exportable sector (see for example Sjaastad (1980c); Garcia (1981); Clements and Sjaastad (1984); Tshibaka (1986); Oyejide (1986) and Bautista (1987a)). The exportable and importable sectors together comprise the tradable portion of the economy, where goods are traded internationally. The prices of tradable goods are set in world markets, while their domestic prices reflect prevailing trade policies such as import tariffs, export taxes, export subsidies or import licensing, and exchange rate policies. Home goods are those which are not internationally traded. Their prices are endogenously determined by supply and demand in domestic markets. Trade and exchange rate policies affect the relative domestic prices of importables and exportables. In addition to the direct effect captured by the traditional partial trade analysis, there is a "general equilibrium effect" through the price of home goods. This latter component is central to the approach adopted in this paper. The effect of a tariff designed to protect the import-competing sector is transmitted to the markets for home and exportable goods through factor markets and the demand structure of the economy.

A tariff on imports will raise the domestic price of importable goods, causing resources to flow into the importables sector, as rational domestic producers respond to the price incentives created by the tariff and attempt to capture the rents it engenders. Users will adjust their consumption patterns to use less of the higher priced goods. Since the price of home goods is determined by domestic supply and demand, an increase in the price of importables which alters domestic supply and demand will be reflected in the relative price of home goods. The response of the relative price of home goods to

the trade intervention in the importables sector determines the extent to which the home goods or the exportables sector bear the costs of the protection afforded the importables sector.

The effect of trade policy on relative prices can be measured by estimating the adjustments in domestic markets for non-tradable goods in response to distortions in the markets for traded goods induced by trade policies. The incidence parameter ,ω measures the change in the price of home goods relative to the price of exportables as result of the change in the price of importable goods relative to the price of exportable goods, brought about by commercial policy. The substitutability in consumption and production of goods in the three sectors determines which sector will bear the costs of commercial policy.

If importable goods and home goods are close substitutes, then the price of home goods will also rise in response to the increase in the price of importables, so that there will be little change in the price of home goods relative to importables. Since home goods are mainly services, the price of home goods can be thought of as nominal wages which form an input into the exportable sector. The exportable sector is less able than the other sectors to absorb increased costs, since its prices are determined on world market. With increased domestic costs and given world prices, the real price facing exporters is likely to fall. The direct and intended effect of an import tariff is thus a reduction in imports and the growth of the import-competing sector. The indirect and unintended consequence of an import tariff is the imposition of higher costs on the exportable sector and a fall in the level of both exports and imports. In this case the value of the incidence parameter will be high. If $\omega = 1$, then the burden of protection of the importables sector is borne wholly by the exportables sector.

On the other hand, if exportable goods and home goods are close substitutes in production and consumption, an increase in the price of importables brought about by an import tariff will draw resources from both the home goods and exportables sectors as the prices of home goods and exportables will rise by approximately the same amount. The protection of the importables sector will occur at the expense of both the home goods and exportables sectors. In this case the incidence parameter will be low. If $\omega = 0$, then the burden of protection is borne equally by the consumers of home goods and producers of exportables.

The incidence parameter thus reveals the incidence of the burden of commercial policy between sectors, which in turn depends on their consumption and production substitution relationships.

2. THE INCIDENCE PARAMETER IN A THREE SECTOR ECONOMY

The effect of trade policy can be estimated at various levels of aggregation. At its most aggregated, an economy consists of three sectors, importable goods (m), exportable goods (x) and home goods (h). The allocation of goods into each sector of the Ecuadorean economy, and the determination of price indices for those sectors is described in Scobie, Jardine and Greene (1988).

Following Garcia (1981), we define the following notation:

P_m = domestic price of importables,

P_x = domestic price of exportables,

P = domestic relative price between importables and exportables,

P_h = price of home goods,

P_m^* = international price of importables,

P_x^* = international price of exportables,

P^* = international relative price between importables and exportables,

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E_n = nominal exchange rate,

E = logarithmic differential operator (eg. $EX = dlnX$),

e = real exchange rate,

t_m = import tariff,

t_x = export tax,

T = a measure of relative trade polices,

D_h = demand for home goods,

S_h = supply of home goods,

Y = real income, and

Z = vector of supply shifters.

The domestic price of importables (P_m) is a function of the nominal exchange rate (E_n), the international price ($P_m{}^*$) and trade policy, represented here by an equivalent tariff on imports (t_m).

$P_m = E_n.P_m{}^*(1+t_m)$

The domestic price of exportables (P_x) is a function of the nominal exchange rate, the international price of exportables ($P_x{}^*$) and trade policy (t_x), generally an export tax or import subsidy.

$P_x = E_n.P_x{}^*(1+t_x)$

With only three sectors, there are two relative prices, so that

P_m/P_h = $[E_n.P_m{}^*(1+t_m)]/P_h$

$= (E_n/P_h)[P_m{}^*(1+t_m)]$

$= eP_m{}^*(1+t_m)$, and

P_x/P_h = $[E_n.P_x{}^*(1+t_x)]/P_h$

$= (E_n/P_h)[P_x{}^*(1+t_x)]$

$= eP_x{}^*(1+t_x)$,

where e is the real exchange rate (E/P_h). P is the domestic relative price between importables and exportables, so that

$P = P_m/P_x$,

$= (P_m/P_h)/(P_x/P_h)$,

$= [eP_m{}^*(1+t_m)]/[eP_x{}^*(1+t_x)]$,

$= [P_m{}^*(1+t_m)]/[P_x{}^*(1+t_x)]$,

$= [P^*(1+t_m)]/(1+t_x)$, and

$= P^*T$,

where P* is the relative international price of importables and exportables P* = P_m^*/P_x^*, and T is the ratio of $(1+t_m)$ to $(1+t_x)$ so that $T = (1+t_m)/(1+t_x)$.

The domestic relative prices of importables to exportables is thus a function of their international relative prices and trade policy. Where tariffs equal subsidies, so that T = 1, the relative domestic price equals the relative international price. When the international price of exportables equals the international price of importables, then the domestic relative prices of importables and exportables are determined by trade policies.

$$P_m/P_x = P^*T$$

$$(P_m/P_h)/(P_x/P_h) = P^*T$$

$$P_m/P_x = (P_x/P_h)(P^*T)$$

Now, assuming without loss of generality that $P_m^* = P_x^* = 1$,

$$E(P_m/P_h) = E(P_x/P_h) + ET, \text{and}$$

$$(EP_m\text{-}EP_h) = (EP_x\text{-}EP_h) + ET. \tag{1}$$

The market for home goods must clear domestically, with demand equalling supply in equilibrium. The demand for home goods is a function of the relative prices of importables and exportables and real income (Y), while the supply of home goods is a function of the relative prices of importables and exportables and a vector of supply shifters (Z).

$$D_h = D_h(P_m/P_h, P_x/P_h, Y), \text{and}$$

$$S_h = S_h(P_m/P_h, P_x/P_h, Z).$$

For the derivation of the incidence parameter (ω) Y and Z are held constant, since the primary concern is the effect of trade policy on relative prices.

Taking the log differentials.

$$ED_h = \eta_{h.m}(EP_m\text{-}EP_h) + \eta_{h.x}(EP_x\text{-}EP_h), \text{and}$$

$$ES_h = \varepsilon_{h.m}(EP_m\text{-}EP_h) + \varepsilon_{h.x}(EP_x\text{-}EP_h),$$

where $\eta_{h.m}$ and $\eta_{h.x}$ are the elasticities of demand for home goods with respect to the relative prices of importables and exportables, and the corresponding supply elasticities are $\varepsilon_{n.m}$ and $\varepsilon_{n.x}$. Equilibrium in the home goods market requires that the excess demand be eliminated or

$$ED_h\text{-}ES_h = 0,$$

or $(\eta_{h.m}\text{-}\varepsilon_{h.m})(EP_m\text{-}EP_h) + (\eta_{h.x}\text{-}\varepsilon_{h.x})(EP_x\text{-}EP_h) = 0,$

$$\gamma_m(EP_m\text{-}EP_h) + \gamma_x(EP_x\text{-}EP_h) = 0, \tag{2}$$

Replacing $(EP_m\text{-}EP_h)$ in (2) with (1),

$$\gamma_m[(EP_x\text{-}EP_h) + ET] + \gamma_x(EP_x\text{-}EP_h) = 0,$$

$$(\gamma_m + \gamma_x)(EP_x\text{-}EP_h) + \gamma_mET = 0,$$

$$EP_x\text{-}EP_h = -[\gamma_m/(\gamma_m + \gamma_x)]ET, \text{ or}$$

$$EP_x\text{-}EP_h = -\omega ET, \tag{3}$$

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where

$\omega = \gamma m/(\gamma m + \gamma x)$.

The incidence of trade policy on the tradable sectors depends on the relative size of the demand and supply elasticities for importables and exportables. The incidence parameter (ω) determines how the price of home goods relative to export goods changes in response to commercial policy (T) through its effects on the relative prices of exportables and importables.

Recall that

$P = (P_m/P_x) = (P_m/P_h)/(P_x/P_h) = P*T$,

so that

$EP = E(P_m/P_h)-E(P_x/P_h) = EP* + ET$.

Now, assuming that the relative international price of importables to exportables $(P* = P_m*/P_x*)$ is constant, so that $EP* = 0$ and domestic relative prices reflect trade policies,

$E(P_m/P_h)-E(P_x/P_h) = ET$,

$E(P_m-P_h)-E(P_x-P_h) = ET$,

$EP_m-EP_x = ET$.   (4)

From (3),

$EP_x-EP_h = -\omega ET$,

and replacing ET with (4) and multiplying by -1,

$EP_h-EP_x = \omega (EP_m-EP_x)$,

$E(P_h/P_x) = \omega E(P_m/P_x)$.

Assuming that ω is constant, after integration,

$\ln(P_h/P_x) = c + \omega \ln(P_m/P_x)$

which is the equation for measuring the value of the incidence parameter (ω) in a three sector model of the economy. The incidence or 'shift' parameter describes the relationship between the price of home goods (P_h) and the price of tradable goods $(P_m$ and $P_x)$. It can be viewed as the elasticity of P_h/P_x with respect to P_m/P_x. It shows how much the price of home goods relative to exportables changes as a result of trade intervention in the importables sector which alters the price of importables relative to exportables.

If $\omega = 0$, then the price of home goods increases in the same proportion as the price of exportables. The burden of protection of the importables sector is then borne by both the home goods sector (who are largely domestic consumers) and the exportables sector (who are largely producers of exports).

If $\omega = 1$, then the prices of home goods and importables rise in the same proportions as a result of commercial policy. The burden of protection of the importables sector is therefore borne wholly by the exportables sector, as resources flow from the exportables sector into the other sectors.

The incidence equation may also be specified when more than three sectors of an economy are identified.

3. THE INCIDENCE PARAMETER IN A MULTI-SECTOR ECONOMY

In order to isolate the effects of trade policy on specific subsectors of the economy the three principal sectors of the Ecuadorean economy were disaggregated into five sectors, and further disaggregated into seven sectors. The principles underlying the determination of the incidence equations are the same for both levels of disaggregation. At the five sector level, importables and exportables are separated into agricultural (a) and non-agricultural goods (n). Since agriculture in Ecuador is a highly tradable activity, all home goods (h) are non-agricultural. The five sector breakdown comprises

P_{am} = domestic price of agricultural importables,

P_{ax} = domestic price of agricultural exportables,

P_{nm} = domestic price of non-agricultural importables,

P_{nx} = domestic price of non-agricultural exportables, and

P_h = price of home goods.

The demand for home goods is a function of the relative prices of goods in all the other sectors and real income (Y), which is assumed to be constant. The supply of home goods is also a function of the relative prices of goods in all the other sectors and a constant vector of supply shifters (Z).

$D_h = D_h(P_{ax}/P_h, P_{am}/P_h, P_{nm}/P_h, P_{nx}/P_h, Y)$, and

$S_h = S_h(P_{ax}/P_h, P_{am}/P_h, P_{nm}/P_h, P_{nx}/P_h, Z)$.

Taking the log differentials and setting $ED_h - ES_h = 0$,

$\gamma_{ax}(EP_{ax}-EP_h) + \gamma_{am}(EP_{am}-EP_h) + \gamma_{nx}(EP_{nx}-EP_h) + \gamma_{nm}(EP_{nm}-EP_h) = 0$,

where $\gamma_{ax} = (\eta_{h.ax}-\varepsilon_{h.ax})$, and so on for the other sectors.

Solving for EP_h and letting $\gamma = \Sigma_k \gamma_k$

$EP_h = (\gamma_k/\gamma)\Sigma_k EP_k$

so that

$EP_h = \Sigma_k \omega_k EP_k$

where $\omega_k = \gamma_k/\gamma$ and $\Sigma_k \omega_k = 1$.

Now, select any of the RHS variables (sectors) as the numeraire (eg, agricultural exportables, ax) so that

$E(P_h/P_{ax}) = \omega_{am}(EP_{am}/EP_{ax}) + \omega_{nx}(EP_{nx}/EP_{ax}) + \omega_{nm}(EP_{nm}/EP_{ax})$,

which after integration yields an estimating equation of the form

$\ln(P_h/P_{ax}) = c + \Sigma_k \omega_k \ln(P_k/P_{ax})$ \hfill (5)

In a like manner, am, nx and nm can be used as the numeraire to obtain four equations for the five sector model.

Six equations for the seven sector model can be obtained in the same way. The five sector model of the Ecuadorean economy was disaggregated into a seven sector model by separating agricultural

exportables (ax) into basic (axb) and processed exports (axp); and agricultural importables (am) into coastal (amc) and sierra (ams). This breakdown reflects the principal characteristics of the agricultural sector where some commodities such as coffee and cocoa are processed before export; and the geographical differences between coastal and upland agriculture. The notation for the seven sector model is as follows:

P_{axb} = domestic price of agricultural exportables (basic commodities),

P_{axp} = domestic price of agricultural exportables (processed commodities),

P_{amc} = domestic price of agricultural importables (coastal),

P_{ams} = domestic price of agricultural importables (sierra),

P_{nm} = domestic price of non-agricultural importables,

P_{nx} = domestic price of non-agricultural exportables, and

P_h = price of home goods.

Equation (5) for the seven sector model with basic food agricultural exportables (axb) as the denominator can be formulated as:

$$\ln(P_h/P_{axb}) = c + \Sigma_k \omega_k \ln(P_k/P_{axb})$$

with corresponding equations for the other sectors.

4. THE RESULTS

The long run incidence parameter for Ecuador for the period 1965 to 1986 was estimated for the three, five and seven sector levels of aggregation. The Cochrane-Orcutt method was used to correct for first order autocorrelation in all the regression equations.

The statistical results of the regression used for the three sector model are good. Ninety four percent of the variation in the relative price of home goods is explained by changes in the relative price of importable goods. The results for the equation described by the three sector model are shown in Table 1.

Table 1: Ecuador: Estimates of the Incidence of Protection in a Three-Sector Model (1965-1986)

Independent Variable	Dependent Variable $\ln(P_h/P_x)$
Constant	0.6839
	(0.5500)
$\ln(P_m/P_x)$	0.9730
	(22.2839)
R^2_{adj}	.94
SER	0.0436
D.W.	1.66

Figures in brackets are t-values.

The high incidence parameter value of .973 indicates that the burden of protection is borne by the exportables sector. A value close to 1 suggests that home goods and importables are close substitutes

in Ecuador. A tariff on imports or a tax on exports falls almost wholly on exportable goods. A rise in the price of importables is reflected in a rise in the price of home goods by almost an equivalent amount, causing resources to flow from the export sector into the home goods and importables sectors. Since home goods (services) are an input into the production of exportable goods, the rise in their prices increases the costs of production of exportables, while the price of exportable goods are set in world markets. Trade policies designed to protect domestic industry and reduce imports also reduce the incentive to produce exportable goods and hence exports.

The model assumes, for analytical convenience, that real income and international prices are constant, and that trade is balanced. Since these assumptions are not true over time, real income (Y) measured by Gross Domestic Product, the balance of trade (BT) and the terms of trade (TOT = P_m^*/P_x^*) were included as explanatory variables. The results of the equation including the additional variables are shown in Table 2.

Table 2: Ecuador: Estimates of the Incidence of Protection in a Three-Sector Model
(1965-1986)

Independent Variables	Dependent Variable $\ln(P_h/P_x)$
Constant	1.3695
	(0.4345)
$\ln(P_m/P_x)$	0.9936
	(19.4750)
TOT	0.0477
	(0.6629)
lnY	-0.0495
	(-0.2260)
BT	-0.0007
	(1.2203)
R^2_{adj}	.94
SER	0.0451
D.W.	1.68

Figures in brackets are t-values.

The inclusion of the additional independent variables increases the value of the incidence parameter to .9936.

Table 3: Ecuador: Estimates of the Incidence of Protection in a Three-Sector Model
(1976-1986)

Independent Variables	Dependent Variable $\ln(P_h/P_x)$
Constant	0.5858
	(0.5665)
$\ln(P_m/P_x)$	0.9090
	(10.6960)
R2adj	.89
SER	0.0475
D.W.	1.98

Figures in brackets are t-values.

The estimation of the parameter is sensitive to the period of the estimation, indicating that omega is, contrary to the assumptions, not constant. For the estimation of the absolute size of the transfers of income between sectors for 1986, the incidence parameter for the period of 1976-1986 was estimated.

Table 4: Ecuador: Estimates of the Incidence of Protection in a Five-Sector Model
(1965-1986

Independent Variables (P_i/P_j)	Dependent Variable (P_h/P_j)			
	Impact in Sector j			
Intervention in Sector i	$\ln(P_h/P_{ax})$	$\ln(P_h/P_{am})$	$\ln(P_h/P_{nx})$	$\ln(P_h/P_{nm})$
Constant	0.8324 (0.5364)	0.8324 (0.5364)	0.8324 (0.5364)	0.8324 (0.5364)
P_{ax}	-	0.0661 (1.1422)	0.0661 (1.1422)	0.0661 (1.1422)
P_{am}	0.1025 (1.4201)	-	0.1025 (1.4201)	0.1025 (1.4201)
P_{nx}	0.0007 (0.0213)	0.0007 (0.0212)	-	0.0007 (0.0214)
P_{nm}	0.8306 (10.7013)	0.8306 (10.7013)	0.8306 (10.7013)	-
R^2_{adj}	.96	.95	.995	.95
SER	0.0473	0.0473	0.0473	0.0473
DW	1.67	1.67	1.67	1.67

Figures in brackets are t-values.

The disaggregation of the economy into five sectors results in a series of equations, forming the matrix of results shown in Table 4. The equations for the disaggregated models take the form

$$\ln(P_h/P_j) = c + \Sigma_i \omega_{ij}.\ln(P_i/P_j),$$

measuring the impact of an intervention in sector i on the relative price in sector j. Table 5 shows the matrix of results for the seven-sector disaggregation.

Table 5: Ecuador: Estimates of the Incidence of Protection in a Seven-Sector Model (1965-1986)

Independent Variables (Pi/Pj) Intervention in Sector i	Dependent Variable (Ph/Pj) Impact in Sector j					
	$\ln(P_h/P_{axb})$	$\ln(P_h/P_{axp})$	$\ln(P_h/P_{amc})$	$\ln(P_h/P_{ams})$	$\ln(P_h/P_{nx})$	$\ln(P_h/P_{nm})$
Constant	0.9527 (0.4754)	0.9527 (0.4754)	0.9527 (0.4754)	0.9527 (0.4754)	0.9527 (0.4754)	0.9527 (0.4754)
P_{axb}	-	0.1236 (1.9281)	0.1236 (1.9283)	0.1236 (1.9281)	0.1236 (1.9280)	0.1236 (1.9281)
P_{axp}	-0.0694 (-1.2216)	-	-0.0694 (-1.2216)	-0.0694 (-1.2215)	-0.0694 (-1.2216)	-0.0694 (-1.2217)
P_{amc}	0.0065 (0.119)	0.0065 (0.1149)	-	0.0065 (0.1149)	0.0065 (0.1149)	0.0065 (0.1149)
P_{ams}	0.1742 (1.3209)	0.1742 (1.3208)	0.1742 (1.3208)	-	0.1742 (1.3208)	0.1742 (1.3209)
P_{ax}	0.0096 (0.2701)	0.0096 (0.2701)	0.0096 (0.2701)	0.0096 (0.2701)	-	0.0096 (0.2701)
P_{nm}	0.7555 (6.9253)	0.7555 (6.9253)	0.7555 (6.9253)	0.7555 (6.9253)	0.7555 (6.9253)	-
R^2_{adj}	.99	.99	.98	.96	97	.96
SER	0.0463	0.0463	0.0463	0.0463	0.0463	0.0463
D.W.	1.86	1.86	1.86	1.86	1.86	1.86

Figures in brackets are t-values.

The effect of true protection afforded any one subsector on any other can be estimated using the disaggregated "omega" parameters. True protection in sector (i) is measured by its price relative to other goods, so that

$$t_m^* = E(P_i/P_h)$$

In general it can be shown that

$$E(P_j/P_h) = -1/(\Omega_j) . i\omega ij . (EP_i - EP_h) \tag{7}$$

where $\Omega_j = 1 - \Sigma i\omega ij$ $(i \neq j)$

Equation (7) describes the relation between a change in the true protection to sector i on the real price of sector j. For example, in order to examine the effect of an increase in the true protection to manufacturing (i = nm) on basic agricultural exportables (j = axb), while holding constant the real prices in all the other sectors,

$$E(P_{axb}/P_h) = -(1/\Omega_{axb}) . \omega nm . axb E(P_{nm}/P_h). \tag{8}$$

From the results in Table 5, it can be shown that this implies that a 1% increase in the true protection to manufacturing would result in a true tax on basic agricultural exportables of 6.11 percent. This highlights the sensitivity of the agricultural sector to protection of the manufacturing sector in Ecuador.

While the impact true protection afforded each of the sectors can conceptually be estimated on any other sector, the task has proved empirically difficult. The negative value for omega for the processed agricultural exportables sector (axp) suggests that processed agricultural exportables are complements and not substitutes for protected goods from the manufacturing sector, clearly a less than intuitive result!

These results constitute preliminary estimation of the disaggregated intersectoral impact of protection. The aggregate transfers arising from trade policy in Ecuador for the period 1965 to 1986 are quantified in the next section.

5. GAINS AND LOSSES FROM PROTECTION

The aggregated model makes it possible to measure the absolute size of the transfers arising form commercial policy between sectors in a three sector economy. Clements and Sjaastad (1984) develop a matrix which can be used to estimate the size of the burden of protection to each of five groups in the economy: producers of exportable goods; producers of importable goods; consumers; taxpayers and the government. The analysis concerns only the magnitude of the transfers between groups and not the costs of making the transfers.

Clements and Sjaastad (1984) hypothesize that

$$d = t_x + \omega[t_m\text{-}t_x] \tag{9}$$

where

d = the increase in the price of home goods

t_m = the average import tariff

t_x = the average export tax

The nominal distortion, or net protection introduced by trade policy is the difference between export taxes (or subsidies) and tariffs $(t_m\text{-}t_x)$. If these two policies offset each other, so that with zero net protection $t_m = t_x$, there would be no real effects on the price of home goods, implying that $d = t_m$ $= t_x$. With positive net protection, prices of home goods will therefore rise by the amount of the export tax plus some proportion, determined by the incidence parameter , of the net protection $(t_m\text{-}t_x)$. The incidence parameter therefore indicates how the burden of net protection is distributed between sectors, since it is that fraction of the net protection of importables translated into an implicit tax on exportables through the increase in the price of home goods (nominal wages).

If ω is zero, then from (9) $d = t_x$, so that the prices of home goods and exportables have risen by equal proportions. If $\omega = 1$, then $d = t_m$, which indicates that the burden of protection is borne wholly by the exportables sector, since the price of importables and home goods will rise by the same amounts.

The true tariffs and taxes are defined as the changes in the domestic prices of importables and exportables relative to home goods brought about by commercial policy interventions, so that

$t_m{}^* = \delta\, P_m/\delta\, P_{h,}$

$= (t_m\text{-}d)/(1+d)$, and

$t_x{}^* = \delta\, P_x/\delta\, P_h,$
$= (t_x\text{-}d)/(1+d)$.

The matrix of transfers is shown in Table 6, as a fraction of GDP.

Table 6: Transfers arising from Protection (fractions of GDP)

From	Import Competing Firms	To Consumers	Taxpayers	Government	Total
Exporters	0	$\omega t_m^* c_x/(1-\omega)$	0	$\omega t_m^* X/(1-\omega)$	$\omega t_m^* q_x/(1-\omega)$
Consumers	$t_m^* q_m$	-	0	$t_m^* M$	$t_m^* c_m$
Government	0	0	$t_m^*(M + (\omega X/(1-\omega)))$	-	$t_m^*(M + (\omega X/(1-\omega)))$
TOTAL	$t_m^* q_m$	$\omega t_m^* c_x/(1-\omega)$	$t_m^*(M + (\omega X/(1-\omega)))$	$t_m^*(M + (\omega X/(1-\omega)))$	-

Source: Clements and Sjaastad (1984, p.60)

where

q_x = value of production of exportables,

q_m = value of production of importables,

X = value of exports,

M = value on imports,

$c_x = (q_x - X)$ = value of consumption of exportables, and

$c_m = (q_m + M)$ = value of consumption of importables.

The elements of the matrix are expressed in terms of the true tariff, t_m^*, since a weighted average of the true tariff and tax is zero,

$$\omega t_m^* + (1-\omega)t_x^* = 0,$$

so that the true tax can be expressed as

$$t_x^* = -t_m^*\omega/(1-\omega),$$

which is exactly analogous to equation (8).

Exporters experience a loss on the full amount of the value of exportables, q_x, at the rate of the export tax (t_x^*) so that the total transfer from exporters is

$$T_e = -t_x^* q_x$$

$$= \omega t_m^* q_x/(1-\omega).$$

Exporters will therefore lose whenever an import tariff is imposed $(t_m^* > 0)$. The implicit tax on exporters is transferred to the government. The lower domestic prices of exportable goods represent a transfer to consumers, so that

$$\omega t_m^* q_x/(1-\omega) = t_x^*(c_x + X),$$

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$$-t_x{}^*X = \omega t_m{}^*X/(1\text{-}\omega),$$

$$-t_x{}^*c_x = \omega t_m{}^*c_x/(1\text{-}\omega).$$

Although consumers gain from the lower prices paid for the domestic consumption of exportable goods, they lose due to the higher prices they pay for importable goods as the result of a tariff. The loss from consumers is transferred to import-competing firms, and to the government through import tariffs, so that

$$t_m{}^*c_m = t_m{}^*q_m + t_m{}^*M.$$

The net position of consumers is determined by their gains and losses, so that

$$T_c = \omega t_m{}^*c_x/(1\text{-}\omega) \text{ - } t_m{}^*c_m.$$

Consumers will experience a net gain when the incidence parameter exceeds the share of importables as a proportion of the total consumption of tradable goods.

Producers of import-competing goods will experience a gain whenever an import tariff is imposed ($t_m{}^*$ > 0). Importing competing firms gain from the increased production of importable goods as a result of the higher prices brought about by a tariff, so that the total transfer to producers in the importables sector is

$$T_i = t_m{}^*q_m$$

The government gains revenue from tariffs on imports and taxes on exports, which is assumed to be transferred to taxpayers through an equivalent reduction in other taxes, so that the net transfer to taxpayers is

$$T_t = t_m{}^*M\text{-}t_x{}^*X$$

$$= t_m{}^*[M + \{\omega X/(1\text{-}\omega)\}].$$

Since taxpayers are also likely to be consumers (although producers are also taxpayers) the net transfer to this group is

$$T_c + T_t = [\omega t_m{}^*c_m/(1\text{-}\omega) \text{ - } t_m{}^*c_m] + t_m{}^*[M + \{\omega X/(1\text{-}\omega)\}],$$

which will be positive if

$$\omega > q_m/(q_m + q_x).$$

That is, they will benefit from protection as long as the incidence parameter exceeds the share of importables in total production of tradables.

Following Choi and Cumming (1986), production and trade data for Ecuador for the latest available year, 1986, was used to calculate domestic consumption (Greene, Scobie and Ortiz, 1988; and Scobie and Jardine, 1988). The production, trade and consumption figures are expressed in terms of GDP in Table 7.

Table 7: Ecuador: Production, Trade and Consumption (1986)

	Sucres (millions)	GDP %
Production of exportables (qx)	531,454	39
Production of importables (qm)	732,578	54
Exports (X)	321,500	24
Imports (M)	317,300	23
Consumption of exportables (cx)	209,954	15
Consumption of importables (cm)	657,741	77
GDP	1,366,304	

For Ecuador, the 3 sector incidence parameter for the period 1976 to 1986 and the average import tariff and the average export tax for Ecuador estimated in Keeler, Scobie and Greene (1987) were applied to the GDP percentages according to the matrix formulae, where

t_m = average import tariff   = 0.4

t_x = average export tax   = -0.1

ω = incidence parameter   = 0.9090

so that

$d = t_x + \omega(t_m - t_x)$ = 0.3865,

$t_m^* = t_m - d/(1+d)$ = 0.0097, and

$t_x^* = t_x - d/(1+d)$ = 0.3509.

Table 8 shows the transfers of income arising from protection as a fraction of GDP. In Table 9 the transfers are expressed in millions of sucres.

Table 8: Ecuador: Transfers arising from Protection (1986)
(% of Gross Domestic Product)

	To				
From	Import-competing Firms	Consumers	Taxpayers	Government	Total
Exporters	0	1.5	0	2.3	3.8
Consumers	0.5	-	0	0.2	0.7
Government	0	0	2.5	-	2.5
Total	0.5	1.5	2.5	2.5	-

Table 9: Ecuador: Transfers arising from Protection (1986)
(Millions of Sucres)

From	Import-competing Firms	Consumers	Taxpayers	Government	Total
Exporters	0	20,495	0	31,425	51,920
Consumers	6,831	-	0	2,733	9,564
Government	0	0	34,158	-	34,158
Total	6,831	20,495	34,158	34,158	-

Table 10: Ecuador: Net Gains and Losses from Protection (1986)

	% GDP	Millions of Sucres
Exporters	-3.8	- 51,920
Import-Competing Firms	+0.5	+ 6,831
Consumers/ Taxpayers	+3.3	+ 45,089

Table 10 shows the net gains and losses to exporters, producers of importable goods, and consumers cum taxpayers. The benefits of protection for the importable sector and consumers/taxpayers are entirely at the expense of the exportable sector, which experiences a substantial net loss amounting to 16 percent of the revenue from exports in 1986.

6. CONCLUDING COMMENTS

The evidence for Ecuador from a three sector model is clear. The protection of the importables sector has occurred at the cost of disprotection of the exportables sector. The costs of trade policies are borne overwhelmingly by the export sector, and outweigh the benefits of protection to the import-competing sector.

Ecuador's trade policies have had a pervasive effect on agriculture. The tradability of the agricultural sector has meant that agricultural production has been sensitive to policies designed to protect the import-competing sector. The extent to which trade policies have affected the incentives to agriculture can be established by measuring the partial on disaggregated incidence parameters. This paper has endeavoured to establish a consistent theoretical framework for estimating these partial incidence parameters. While the preliminary results are encouraging, empirical challenges remain.

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OPERATING A R & D ORGANISATION IN THE USER-PAY ENVIRONMENT

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SUMMARY

The reasons for confusion in the user-pay R & D funding environment in New Zealand are explored and the recent experiences of the New Zealand Agricultural Engineering Institute (NZAEI) in adjusting to real funding reductions of 30 per cent are explained. Important issues of transactional cost, competition, public accountability and organisational structure are identified. Suggestions are made about the way in which the present situation can be improved in the interests of excellence, efficiency and accountability in R & D.

Key words: R & D, User-Pay, NZAEI

FUNDING ENVIRONMENT FOR R & D IN NEW ZEALAND

The outstanding characteristics of the current environment for Government support of R & D in New Zealand are confusion and uncertainty, which has meant that the support mechanisms for R & D in the non-government sector are equally uncertain of what their objectives should be, let alone what mechanisms are necessary to achieve them.

The main reason for this situation is the absence of a clear Government-policy on its own role, despite a good deal of (conflicting) advice from the Beattie Report that it commissioned itself; suggestions from the Science and Technology Advisory Committee (STAC), set up by Government to take the work of the Beattie Committee further; and advice given in a number of review papers written by Treasury about how it sees the role of Government in the R & D area.

Despite the lack of a clear policy, there have been, however, definite Government actions in respect of funding for R & D in the agricultural area. These actions have taken the form of funding reductions to the budgets of organisations receiving Government support. By and large, the reductions have been inconsistent, as evidenced by the way in which they have been applied to different categories of R & D organisations, such as the research associations, universities, research institutes, and to the two large governmental R & D agencies -- DSIR and MAFTech. To illustrate this point, Figure 1 shows the reductions made in the government funding to the total DSIR vote, MAFTech (which includes the combined operations of the earlier Advisory Services and Agricultural Research Divisions) and the New Zealand Agricultural Engineering Institute (NZAEI), over the period of the fiscal years 1983/84 to 1987/88, expressed in real terms as a percentage of 1983/84 dollars.

Figure 1:   Reductions in Government Funding to Several R & D Organisations in
            New Zealand.
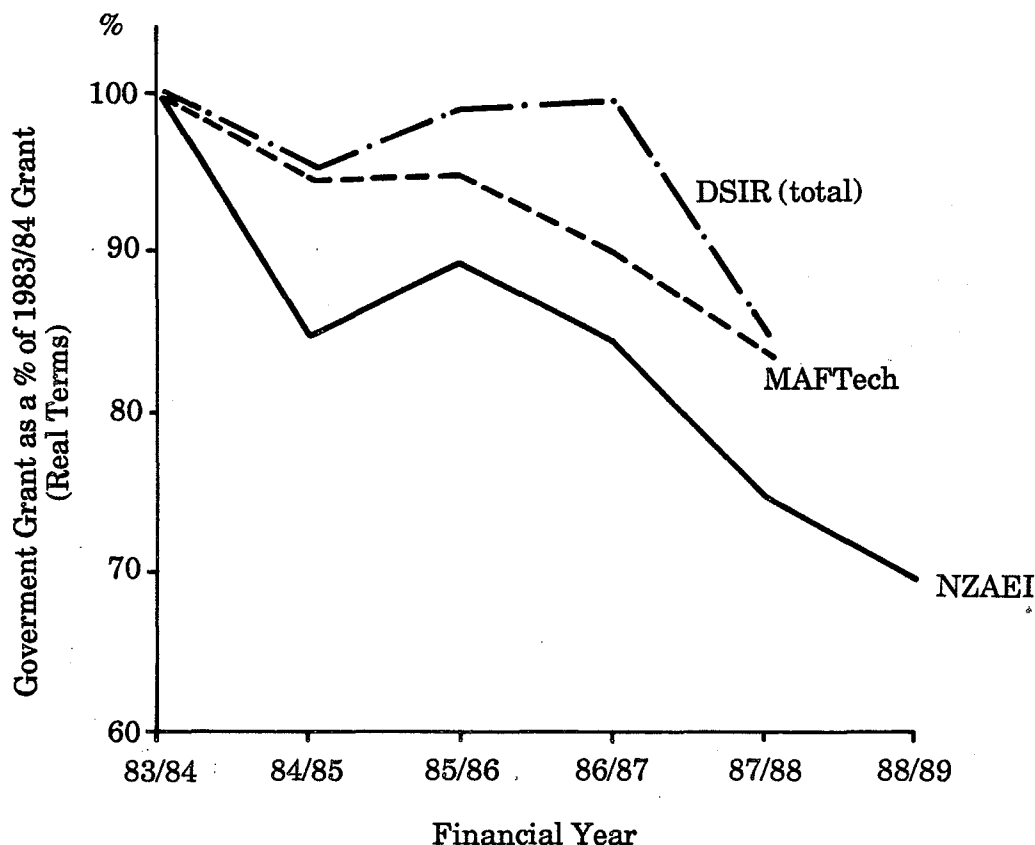
The inconsistencies evident in Figure 1, and which are typical insofar as actions affecting other R & D organisations are concerned, are disturbing for two reasons: (a) they ignore the relative payments to alternative public investments; and (b) they alter the relative abilities of different agencies to win private contracts for their services. In the absence of clear policies and implementation procedures on the part of Government, it would seem that the absolute support given to a particular agency is largely determined by its ability to influence decision-making on grounds not necessarily related to objective measures of relative performance.

The response to this situation in the non-government sectors of the economy who have traditionally been the beneficiaries of government-sponsored R & D, has been to recognise a responsibility for additional levels of industry funding support. Each industry sector has responded in a different way because of its structure and ability to generate support monies from its members. As a consequence, government R & D agencies have shown interest in cultivating industry sectors where, for whatever reason, support monies are accessible, resulting in resource allocations that do not necessarily reflect the in-house R & D priorities of the organisations themselves. As a final point it should be noted that the current level of R & D support on offer through the existing industry groups is very much less than the budget shortfalls resulting from Government funding reductions, and is likely to remain so in the immediate future. This has created a real problem of excessive transactional costs, as discussed later.

Given this general overview of the funding environment for agricultural R & D in New Zealand, it is clear why confusion and uncertainty exist within the R & D organisations affected. Each organisation has responded to this environment in its own way. The remainder of this paper describes how the NZAEI has and is operating in this situation.

NZAEI - A PROFILE

In order to relate the operational experiences of NZAEI in the user-pay R & D environment, it is useful to briefly review its institutional situation and resources. NZAEI is an institute of Lincoln College, set up under a contract between the College and the Crown in 1963. It is located in facilities on the Lincoln College campus with a North Island station at Hamilton. The establishment contract provides for the Institute to be controlled by a Management Committee, whose representation is prescribed under its Constitution, and which is a committee of Lincoln College Council. The Institute has no separate legal identity and its staff are legally staff of Lincoln College, with currently about 50% engaged and paid on a version of the academic tenure system, and 50% on short and medium term contract.

The Institute is N.Z.'s major centre of excellence in agricultural engineering. In accordance with the terms of its Constitution and 25 years experience in providing engineering expertise to solve problems in N.Z.'s agricultural and horticultural industries, the Institute provides a range of technical services associated with three interrelated activities: (a) Research and Development; (b) Specialised Consulting and Testing; and (c) Commercial Ventures. Its major client for providing approved R & D services and conducting projects is the Government, paid for by annual grant via Vote Agriculture to Lincoln College, based on a submitted annual work programme. Products of the R & D activity enhance the ability of the Institute to conduct specialised consultancy assignments on behalf of government and non-government clients. Increasingly in recent times, R & D products also form the basis of commercial ventures with a variety of joint-venture partners. It must be emphasised that NZAEI is not a "research" organisation in the accepted classical sense -- it does not allocate resources to activities where the principal outcome is "knowledge". Institute resources devoted to long-term strategic projects have as their desired outcome an acceptable return on investment, whosoever captures these returns (the public, diverse beneficiaries in an industry sector, or some as-yet-to-be identified commercial entity).

Institute staff numbers of 40 include 20 professionals (mostly engineers of all disciplines), 15 expert sub-professionals and 5 support staff. All but 5 professionals are located on the Lincoln College campus. The Institute controls specialised laboratory, workshop and computing facilities.

Unlike many product-orientated research groupings which have been developed alongside a particular industry sector, the Institute's work cover all sectors of N.Z.'s agricultural and horticultural industries. The percentage of total resources allocated to work in various activity areas is shown in Table 1 for the period 1984/85 - 1987/88, which illustrates changes in resource allocation driven by market contact and changing circumstances. By way of comparison, the percentages of resources devoted to outside earnings in the same activity areas are shown in Table 2.

Table 1:   Total Resource Allocation by NZAEI in Various Activity Areas

	84/85	85/86	86/87	87/88
	----------------%----------------			
Water Resources	4	3	6	7
Water Application	7	10	5	12
Frost Protection	13	12	10	3
Waste Management	2	1	1	1
Structures	10	8	9	16
Horticultural Mechanisation	14	21	12	4
Agricultural Mechanisation	27	18	13	19
Tractors	8	5	5	1
Tractor Safety Frames	2	3	1	3
Post Harvest Handling, Processing	11	14	29	29
General	2	5	9	5
	100%	100%	100%	100%

Table 2:   Sources of Outside Earning by NZAEI in Various Activity Areas

	84/85	85/86	86/87	87/88
	----------------%----------------			
Water Resources	7	7	8	13
Water Application	4	4	4	7
Frost Protection	29	11	11	4
Waste Management	4	3	1	3
Structures	3	4	8	21
Horticultural Mechanisation	10	23	7	5
Agricultural Mechanisation	19	10	12	4
Tractors	14	10	5	4
Tractor Safety Frames	8	17	10	9
Post Harvest Handling, Processing	-	7	24	24
General	2	4	10	6
	100%	100%	100%	100%

SOURCES OF INCOME FOR NZAEI

The details of government grant allocated and outside earnings achieved over the period 1984/85 to 1987/88 are given in dollar terms in Table 3.

Table 3:   Funding Source for NZAEI

	Government Grant	Outside Earnings	Total Earnings	(Outside Earnings) Total %
	------------------$----------------			
84/85	1,189,000	359,391	1,548,391	23.2
85/86	1,443,213	380,668	1,823,881	20.9
86/87	1,558,000	387,774	1,945,774	19.9
87/88	1,558,000	474,835	2,032,835	23.4

There are several points worth making here. The government grant for 1984/85 and 1985/86 reflects the first funding cuts imposed on the Institute -- basically 90% of the 1982/83 grant held for 2 years, but partly adjusted for inflation and an unexpected HSC increase in 1985/86. From 1986/87 the second set of funding reductions was put in place for a period of 3 years (up to and including 1988/89), setting the government grant in fixed dollars. The overall effect of these two-stage reductions has been to see a funding reduction in real terms of 30 per cent from the 1983/84 base (see Figure 1).

The outside earnings have increased steadily over the period (Table 3) in dollar terms, but not as dramatically as a percentage of total budget. The activity areas that have generated the outside earnings are shown previously in Table 2. There has been a dramatic shift in the client source for outside earnings, as shown in Table 4, with decreasing reliance on government and quasi-government sources and increased activity with private sector clients and with overseas project work. The implications of this are discussed later.

Table 4:   Analysis of NZAEI Outside Earnings by Client Source

	Outside Earnings $	Government Departments (%)	Quasi-Government (%)	Private (%)	Overseas (%)
84/85	359,391	39.7	28.3	29.1	2.9
85/86	380,668	37.6	5.9	52.3	4.2
86/87	387,774	21.2	9.2	60.4	9.2
87/88	474,835	21.3	6.2	59.1	13.4

As a matter of record, the unpreparedness of NZAEI to meet the funding shortfalls from 1984/85 onwards is illustrated by the fact that annual outside earnings over the two years previous to 1984/85 (excluding a one-off LFTB contract) averaged about $70,000, as illustrated in Figure 2.

Figure 2:· Growth in Outside Earnings
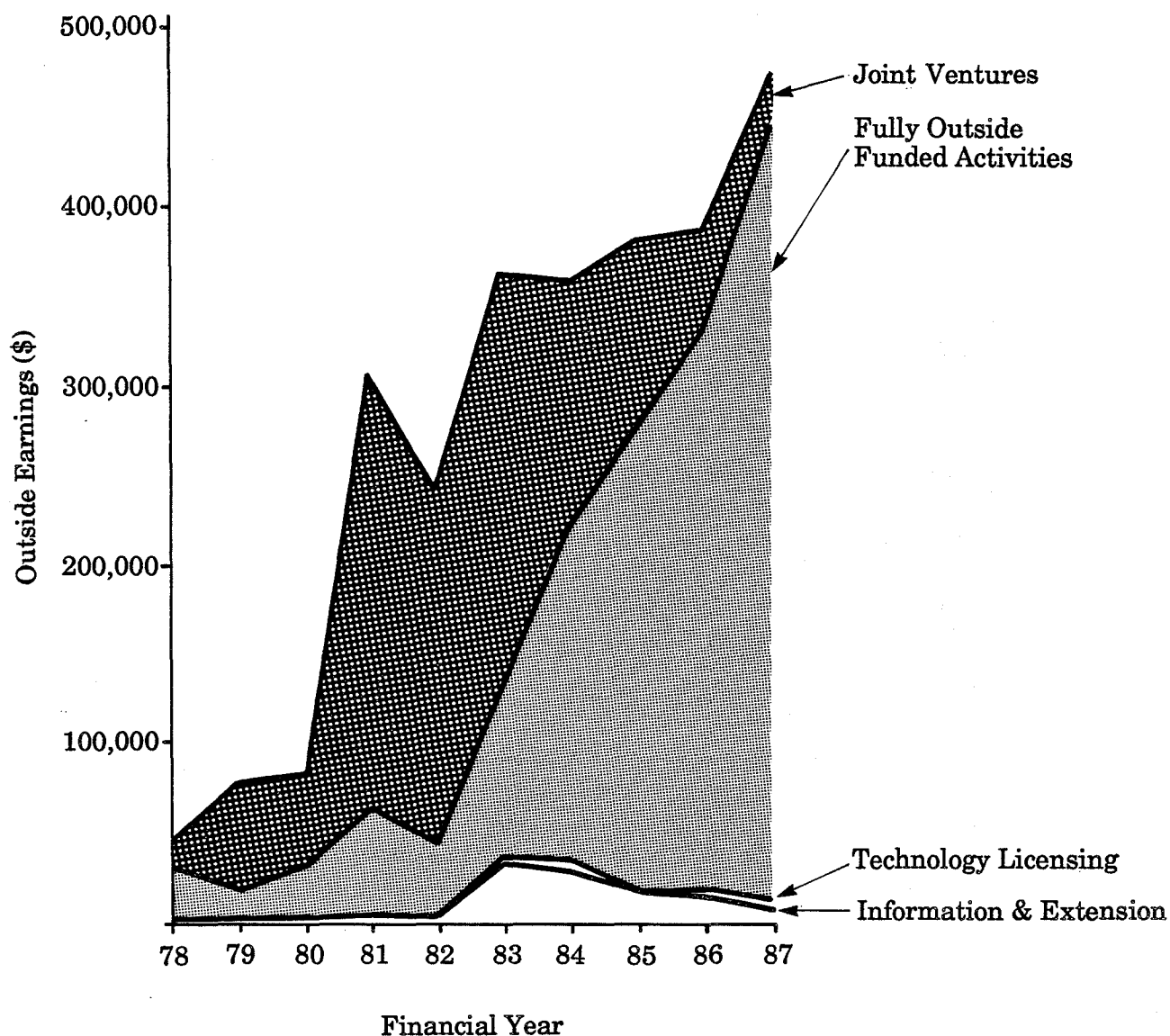
OPERATIONAL AND POLICY IMPLICATIONS OF CHANGED FUNDING
CIRCUMSTANCES

The material presented up to this point has been included so as to provide a
background to the experiences of NZAEI during the period of funding cut-backs.
For the purpose of focussing discussion on what have been found to be important
issues to be confronted by the Institute, the operational and policy implications of
the funding cut-backs will be discussed under the following headings:

* Research and Development Work Programme
* Client Portfolio and Transactional Costs
* Competition and Joint Venturing for Contracts
* Public Accountability Issues and Confidentiality
* Internal Organisational Changes

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<u>Research and Development Work Program</u>

In the period prior to the funding cuts (pre 1984/85) the research and development programme of the Institute was generated within internal sectional groupings organised as working teams on the basis of the traditional activity areas of agricultural engineering.

In 1983/84 these categories consisted of: soil and water engineering, machinery and mechanisation, environmental engineering and structures/services. Each of the 4 major sections generated project proposals within discipline areas, budgetted and justified work on the basis of importance to the problem addressed, perceived benefits without regard to beneficiaries, relationship to current knowledge in the area, and use of total resources. This programme was subsequently ratified by the Management Committee. During this period there was little real attention given to attracting outside funding, although in 1978/79 this approach still realised about $50,000 in bits and pieces of outside support.

It is clear in hindsight that the R & D projects conducted in this period were already reasonably well-targetted to "future" industry needs, despite their sub-discipline orientation, and the advances made provided the platform of knowledge and technology for a more vigorous exploitation of commercial advantage from 1984/85 onwards.

The experiences since 1984/85 have seen a marked shift of emphasis in the R & D programme. To a large extent, the problems of meeting funding shortfalls re-directed interest away from activities where the short-term prospects of income generation were not promising. During this period, a large number of NZAEI contract staff were subjected to the uncertainty of contract renewal periods of 1 (one) month in 1984/85(!) and were extended through 3, 6, 9 and finally 12 month periods from 1986/87 onward. Without significant financial reserves, longer contract period committments could not be made, and the Institute as a whole saw itself literally fighting for its survival as an organisation.

The perspective in mid-1988 is somewhat brighter. The vigorous pursuit of outside earnings have given more scope for devoting resources to R & D activity that is more speculative and is designed to rebuild the intellectual capital of the organisation so as to enhance future activities.

The R & D projects that are now being actioned are also identified and developed in a completely different way to the discipline-driven projects of earlier times. As will be described later, internal management changes have resulted in a dismantling of line-control based on discipline areas, and this has given the Institute the ability to have a multi-disciplinary approach to problems and opportunities identified by the market. A system has also been developed whereby responsibilities for knowledge of and contact with the market is given to key individuals. This system now provides a good deal of the ideas that are taken to project proposal status in the R & D area.

Client Portfolio and Transactional Costs

The clients for the Institute's services where outside funding is involved consist of government and quasi-government agencies, producer boards, service industries, private sector companies, and a small number of corporate farmer clients (see Table 4). The Institute does not usually deal directly with farmers and growers because of its geographical limitations and its relationship with MAFTech.

The size of the Institute contract is on average small. Table 5 shows the number of contracts and average size of contract for each year of the period 1984/85 to 1986/87. The average figure is distorted to some extent because of the provision of a large number of cost-effective computer-based services in testing and analysis. Nonetheless, the market segment that the Institute serves is such as to involve numbers of contracts to be negotiated and services offered disproportionately large for the size of the organisation and the amounts of money involved.

Table 5: Analysis of Numbers and Average Value of Contracts

	84/85	85/86	86/87	87/88
Number of Contracts	135	131	166	137
Average Value ($)	2,662	2,906	2,231	3,465

Table 5 shows this situation to be improving, in that average earnings per contract are higher. With more experience there is better performance also in screening project opportunities that are unlikely to result in contract earnings.

The problem of transactional costs with such a large number of contracts is a reality, and is especially difficult where there is more than one beneficiary group being approached for contributions. The nature of the Institute's work is such that this situation is quite common. By way of example, a recent project aimed at improving the economics of spreading reactive phosphate rock (RPR), involved two importers, two machinery manufacturers, the Groundspread Association, and though they could not be identified, present and future pastoral farmers who will benefit from cheaper spreading costs for RPR. Even given a clear appreciation by the Institute at the time of project formulation of the potential difficulties in getting a consensus from these sources of potential funding, it must be said that such situations invite the risk of excessive transactional costs. It is obvious from our experience that the transactional cost problem will not be reduced until there are clearer policies and procedures for funding projects of interest and benefit to the market players.

The most common denominator in multi-beneficiary funding contracts, apart from the transactional cost issue, is that of the "free rider" problem, where the beneficiaries involved have difficulties in apportioning benefits in relation to costs and use this as a basis for extended negotiations. This has a lot to do with the present number and structure of producer boards and industry associations.

The current way in which the non-government support system for R & D has responded to the user-pay policy has inefficient features for all players. Until it is changed though, the same players will attempt to adjust to their respective needs, and the danger may be that very valuable resources of R & D capability may be lost in the process.

Competition and Joint Venturing for Projects

Many groups within the R & D community have still yet to be seriously affected by the user-pay environment. This has happened because the inherent inertia in many large agencies have buffered them from the realities facing their colleagues in more exposed situations. However, "the word is out", and such groups have the perception of threat to their status quo, and compete for contracts with little or no experience of the real costs in undertaking R & D on a commercial basis. The nett result of this is seen when the R & D community puts forward proposals to producer board research committees. It is the experience of the Institute that when marginally-costed (i.e. subsidised) proposals are considered alongside fully-costed proposals, the research committees are inclined to favour those that promise more than the support requested justifies. This is an inevitable consequence of the lack of a coherent and consistent policy for arranging government and non-government support for R & D activities, and runs the danger of the more exposed, but not necessarily the least worthy, organisations being unsuccessful. Another feature of this situation is that it can be difficult to arrange a joint venture with consistent charging between partners that are exposed differently to the user-pay environment, and this creates obvious problems with the prospective client.

Public Accountability Issues and Confidentiality

No one who has operated in the real market place for R & D services believes in the simplistic and Treasury-promulgated view that there are only two recognisable extremes of a continuium between "non-appropriable" and "appropriable" R & D activities. The difficulty is that refutals are hard to find, at least in print. One wonders why -- perhaps it is because the jargon of the dogma has not got a word for that in-between activity where a beneficiary captures and pays for some of the benefits of contract R & D, but where the substantial benefits accrue in a longer time-frame to such a diverse set of beneficiaries that their input cannot be captured. Or is it that the simplistic logic involved has some appeal to the scientific mind?

This is a key dilemma of R & D groups in the current environment. On the one hand, projects can be "dressed up in dinner suits" and put into the long-term, basic or whatever category that justifies support under the current policy approaches suggested by Treasury -- this automatically means that vigorous efforts may not be made to attract part-funding from identifiable beneficiaries, in that the "non-appropriable" status of the project might be jeopardised. The nett result is that the desired "market-led" philosophical shift in R & D resource allocation may not be achieved because of a simplistic and unrealistic policy perspective of the real world. There is no doubt that government-funded research organisations are aware of and are prepared to exploit this dichotomy between philosophical direction and naive interpretations as to how it may be achieved.

Most R & D organisations, in response to the dichotomy referred to above, are in the process of re-stating their research activities, programmes and projects in such a way that they are well-positioned to secure their share of the government funding that will continue to be allocated for R & D activity in New Zealand, on the basis of being in the non-appropriable category, and it must be questioned whether this will achieve the obviously desirable objective of making public investment in R & D more market-led, transparent, accountable and efficient. How we do this with the systems we finally adopt will be of crucial importance to our ultimate place in the international community.

As R & D programmes become more dependent upon private sector funding, it is the experience of NZAEI that confidentiality issues become more important. This conflicts with the accepted international policy of free exchange of scientific information between R & D organisations via the scientific literature. Whether the public exposure of R & D activity is restricted because it is restricted by client confidentiality requirements, or simply because the time for the preparation of scientific papers cannot be supported for financial reasons, the result is the same -- potentially very dangerous because the basic test of the value of R & D is peer review. This issue is not one for conjecture insofar as NZAEI is concerned. We are very conscious of the reduction in the number of our published papers in recent years and the associated increase in Confidential Reports.

Internal Organisational Changes

Reference has been made previously to the dismantling of discipline-orientated work groupings with NZAEI in favour of multi-disciplinary work groupings. The benefits that have flowed from these changes have been that team projects are able to be organised efficiently and that rigid "demarcation" issues are avoided. The danger is that excellence is lost in the conduct of the disciplines. It is our experience that this can be maintained by informal technical linkages within the discipline groups, although it must be questioned if this is sustainable in the long-term in the absence of an adequate number of published papers and associated peer-group reviews.

The relative success of NZAEI in sustaining viability in recent years in the face of an apparently difficult situation in terms of an agricultural recession, small organisational size, limited reserves of cash or capital, and specialised skills, is due largely to organisational unity. All of the aforementioned disadvantages can be turned into opportunities if the approach and committment of staff can be achieved. This is obviously an easier task with a staff of 40 rather than 400 and it is more achievable with flexible staff employment arrangements and the absence of an excessively bureaucratic structure. Nonetheless, it can be argued that there can be distinct relative advantages in R & D groupings of modest size that may not be achievable in large science bureaucracies linked directly to the political and departmental system.

IDEAS FOR THE FUTURE

Government Support Mechanisms for Basic and Strategic Research

(a) From the NZAEI perspective, there is much to commend the general ideas promulgated by STAC to establish three funding Foundations -- Medical, Social Services and Science and Engineering -- that each control a significant proportion of research funding provided by Government; reflect Government priorities as to the support to be given to each activity area; and determine on the basis of agreed criteria the allocation of support monies to successful project proposals. Such a system must be capable of encouraging the most excellent and efficient grouping of science resources on offer, regardless of the institutional persuasion of those making up the staff resources in the proposal.

(b) Support through this mechanism should be for basic and strategic research projects only, but a realistic view must be taken about assessing the projects that do not fall neatly into the strategic research category because of their apparent interest to the market. Some commercial support for a project should not preclude make-up support from Government so long as the arrangements are satisfactory.

(c) The mechanisms must avoid, at all costs, the intervention of "croneyism", which bedevilled some previous attempts at prioritising government support research.

(d) In order to perturb the status quo, the monies administered through this system should be not less than about 20 percent of the total government support for R & D.

Industry/Government Support for Applied Research

(a) Satisfactory corporate structures should be set up to represent industry groupings for the purpose of allocating industry and government funds for R & D projects.

(b) These organisations should be responsible for setting and collecting levies from members for the purposes of supporting R & D and monies collected should be matched by additional Government funds on some basis that reflects Government priorities.

(c) A review process would be required that was able to judge both the quality and market-acceptance of particular proposals made to each industry corporate.

R & D Organisational Structures

(a) An independent study should be undertaken to determine if the current institutional structures for organising the R & D resources are adequate and to suggest change if appropriate.

(b) Consideration should be given as to whether science and R & D should be departmental affairs at all, and whether some other (perhaps geographical) organisations based on centres of excellence should not be given corporate identities for the purpose of participating in such a system.

(c) An essential feature of science organisations of whatever institutional arrangement should be the ability to capture a commercial return from its own products, operating with the necessary flexibility to compete with the private sector.

(d) There would need to be a transitional period during which Government support was continued as a base load to ensure continuity of operations, but the ultimate objective would be to link this support to success in attracting funding through the STAC arrangements and via the industry corporates. Only the best and the most efficient groups would ultimately survive under this arrangement

FUNDING AND RESOURCE ALLOCATION IN RURAL AND WOOL RESEARCH
- AN AUSTRALIAN VIEWPOINT

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SUMMARY

Recent public debate on the role of government funding of R & D in
Australia is discussed. This debate seems to have centred primarily
on the use of R & D to achieve economic growth, increased
productivity and structural adjustment in the economy, rather than on
whether public or private funds should be used to finance certain
types of research. Restructuring of the Australian CSIRO, procedures
for allocating wool research funds in Australia and efforts to
improve the objectivity and efficiency of setting R & D priorities
are briefly reviewed. Some future issues in the ranking of wool
textile and production research are also discussed.

Key Words: research priorities, productivity, funding

(Views expressed are those of the author and do not
necessarily coincide with those of the
Australian Wool Corporation)

1. INTRODUCTION

The issue of government versus private or industry funding of research and development is presently being widely debated in New Zealand. Similar developments have occurred in Australia and an Australian perspective on the issue and discussion of the Australian experience may be useful. The purpose of this paper is to outline a view of that debate using rural research and wool R & D in Australia as examples.

The transfer of political power in Australia to the Labour Party in 1983 seems in retrospect to have been something of a watershed in government attitudes to R & D. From the outset the approach developed was one of integrating R & D more in to economic development strategies. At the same time there was a general shift to seeking greater industry commitment to R & D. These developments as they relate to the Australian CSIRO, the rural sector and wool R & D are briefly reviewed in the following section of the paper.

In the wool industry about A$41 million is presently being spent on commodity specific R & D. This is supported by the government matching expenditure of grower funds and by direct government funding of some research. These arrangements for funding and the basis for the allocation of wool R & D funds are outlined in Section 3. This is followed in Section 4 with a brief overview of attempts which have been made to develop and implement quantitative procedures for setting R & D priorities. Taken together, these arrangements are one way of implementing an industry based R & D program. Some conclusions are drawn about the implications of the current arrangements in wool R & D in Australia.

2. GOVERNMENT ROLE IN R & D

Numerous reviews and reports have indicated that Australia has a relatively low level of R & D spending. Total R & D expenditure as a percentage of GDP generally falls in the bottom quartile of OECD countries. In a recent study the CSIRO (1987) indicates that Australian R & D expenditure is generally around 1.0 to 1.2 percent of GDP. For the USA and Japan the equivalent figure is around 2.8 percent.

Recent estimates by the CSIRO (1987) are that less than one-third of total R & D expenditure in Australia is by the business sector and over two-thirds is funded by government. Despite this, general government financing of R & D through appropriation funds has contracted as a share of total spending, altering the mix towards more industry funding.

Rural research in Australia has traditionally been primarily funded along commodity lines. For each individual commodity the government established research trust funds. Over the years compulsory research levies on primary producers were put in these Funds and expenditure from them was generally matched by government contributions. In the various individual commodity industries, advisory committees on how to best spend the money developed. The whole system was administered by the Commonwealth Department of Primary Industries and the Minister in that portfolio formally approved the allocation of these industry

funds. These arrangements were consolidated following the IAC (1976) review of rural research funding which concluded that there was a substantial case for continued public sector funding of rural R & D.

In addition to direct funding of rural research through mechanisms noted above, substantial further government funding of rural research has traditionally occurred. This has been through the Commonwealth Department of Science and Technology funding the CSIRO (known as appropriation funds), through government funding of universities and through research conducted by state government departments of agriculture. More recently there have been substantial changes to these funding arrangements which are described below.

In 1985 the Australian Science and Technology Council (ASTEC) reported to the Prime Minister on future directions for the CSIRO. ASTEC (1985) expressed the view that the CSIRO should change from "(being) largely science oriented to .... largely applications oriented", (p.2) and should .... "concentrate primarily on research in support of existing and emerging industry sectors and measures to facilitate the adoption of the practical results of its research", (p.3). The priority ASTEC saw for basic research at the CSIRO was lower, arguing that it should "give consideration to transferring elsewhere research groups conducting pure basic research which is not linked to major objectives of CSIRO". At the same time it was recommended that the level of appropriation (ie. government) funding for CSIRO be maintained, although efforts should be made to increase outside commercial funding (ie. industry funds).

Following from the above the CSIRO has since been restructured. This restructure involved aligning the senior management and divisional structure to conform to business systems to which R & D results and external funding related. In the case of wool this meant that a new Institute of Animal Production and Processing was established. Within this Institute the three main divisions engaged in wool related research are:

.   The Division of Wool Technology covering wool textile research, wool measurement and fibre chemistry.

.   The Division of Animal Production and the Division of Animal Health covering wool production and related research.

A significant feature of these developments is that the issue of public versus industry-specific benefits, and therefore who should pay for the R & D, seem not to have loomed large as considerations in the debate. This seems to stand in contrast to the present situation in New Zealand.

Since 1983 the present government has been attempting to alter the relatively low level of expenditure on R & D in Australia. Perhaps partly as a consequence of the ASTEC Report, attempts have been made to shift R & D expenditure more toward the "applied" end of the spectrum. This is seen as an aid to improving national productivity, export income etc. As a consequence R & D, like the Australian film industry, has received subsidies through the tax system. At present 150 percent of the investment in R & D is deductible in the year of expenditure, although this will fall to 100 percent under tax revisions recently announced. This runs the risk of being the same

public sector "kiss of death" which some people in Australia see as a problem with similar measures in the film industry. In the R & D case, the temptation is to invest in short-term and "safer" research, the scientific equivalent of Mad Max V or Crocodile Dundee III.

It is also frequently argued that altered R & D priorities can facilitate structural adjustment in the economy and prompt the growth of whole new industries. In this argument there seem to be very real dangers that it may lead to declining net future payoffs from R & D. The proposition has been advanced by politicians that scarce R & D resources should be diverted to "high-technology" and "sunrise" industries. Such suggestions seem to ignore the fundamental principles of comparative advantage in our economy. As a consequence there is a risk that resources will be diverted from R & D in agriculture, mining and perhaps some value adding activities associated with them, in which Australia is likely to have a comparative advantage, into the things that are best done in Tokyo, Osaka or perhaps Silicon Valley.

This is indeed what appears to have been happening in Australia. Within the CSIRO, senior management had, in response to the political appeals, implemented a system of "protected" versus "non-protected" categories for resource allocation. The high-technology and sunrise industries were classified as protected and much of the rural research as non-protected. When resources became available in a non-protected area (eg. establishment vacancies, buildings and physical equipment) they were diverted to protected areas. So far as I can ascertain, there appears to have been no consideration by the R & D administrators and managers of a criterion of whether Australia has, or could develop, an international comparative advantage in the industry in question.

Apparently reflecting the policy described above, the share of CSIRO expenditure devoted to rural industries has declined over the last eight years from about 41 percent in 1979/80 to 37.4 percent in 1986/87. The share of rural industries funding coming from the trust fund accounts has generally risen and direct appropriation funding has declined. Over the period 1983/84 to 1986/87, while the total number of professional staff engaged in rural production and processing research has changed very little (a 0.7 percent drop), the number funded from appropriation sources has declined by 6.3 percent. Industry funds have been called upon to make up the difference.

In the rural sector the government has moved over the last two years to alter the administrative and accountability arrangements for commodity-specific R & D. This is a form of "democratisation" of the management and detailed decision making process, while overall accountability to government is maintained and accountability to the industry group funding the research with government is strengthened. Features of the approach are as follows:

.   separate research councils or corporations have been established for each commodity;

.   these organisations, such as the Wool Research and Development Council (WRDC) and Australian Meat and Livestock Research and Development Corporation (AMLRDC) are responsible for developing

strategic plans, recommending operating plans and budgets and reporting back to government and relevant producer organisations on performance of the R & D function; and

. the trust funds previously held by government have been handed over to the relevant organisation for administration and allocation.

The objective is to remove government from overview of the detail and shift the balance of detailed accountability to the representatives of the industry in question.

As a consequence of these arrangements the Wool Corporation now has more direct control of the funding of wool related research. The wool R & D fund has a balance of about $64 million and expenditure in 1988/89 will be about $41 million. This will be financed approximately equally by compulsory taxes on woolgrowers and a government subsidy. These funding arrangements are accepted without any significant debate with government about whether the results of R & D accrue substantially to woolgrowers or to the general public. It is in the area of direct expenditure by the CSIRO of appropriation funds on wool R & D where the government is reducing the real level of spending on R & D.

3.   THE ALLOCATION OF WOOL R & D FUNDS

The Wool Corporation has the responsibility for administration and allocation of R & D funds for wool, taking advice from the WRDC under arrangements noted above. In this section the working of these arrangements and methods of allocating funds are briefly reviewed.

Membership and functioning of the WRDC was developed in 1986. The Council comprises four AWC Board Members, four independent members (chosen by a "Selection Authority" which is appointed by the Minister for Primary Industries and Energy, but includes some woolgrower representatives) and a Chairman appointed by the Minister on the recommendation of the Chairman of the AWC. The Council has been in operation for two years and has yet to become a major force in the allocation of R & D funds. So far it has largely continued the practices of its predecessor organisation within the AWC.

At the broadest level the Council must address the issue of setting priorities between broad areas of research. It is necessary to use a consistent framework so that major streams of production, textile and other research are viewed within a common overall context. R & D funds are presently allocated by a two-stage procedure:

. Budget levels are set for each of five defined major areas of research. These include production, textiles, raw wool marketing, wool harvesting and economics, in descending order of annual expenditure. These research area budgets are largely set by historical patterns with production research being about 50 percent of the budget.

. Allocation of expenditure between specific research programs and projects is done by the WRDC on the advice of five advisory committees, one for each research area.

It is the latter of these two stages where much of the detailed decision making on allocating R & D funds occurs. The research advisory committees (RAC's) enable the WRDC and the AWC to get the best possible advice as they comprise a mixture of experienced researchers and commercial/marketing members with competence in research in the area in question, along with woolgrower and AWC Board Members.

The RAC's generally meet twice annually, once to review progress in major research areas and the other an annual budget meeting. The review meetings include visits to major research sites and detailed presentations by research staff involved. In the major area of production research, all the principal sites are visited about once every three years. Budget meetings revolve around submissions by researchers and these submissions, rather than the direct contracting of research by the AWC, form the main basis for direct resource allocation. The effect of all of this is that researchers and research agencies see their strongest accountability for performance being to the RAC's.

In each of the five research areas the AWC employs professional staff with research backgrounds to support the WRDC and RAC's. In addition there are several relevant administrative staff and some staff devoted primarily to evaluating research priorities. The AWC's R & D group comprises eighteen staff of which thirteen are "professional" staff. Over the years R & D priorities and strategies have been developed in the various areas by these staff. These are now collected together in the WRDC Strategic Plan; in the production areas, for example, there are twelve sub-strategies with relative priority weightings. The staff are responsible for monitoring the performance and progress of the main areas of research and provide an executive officer role in relation to the various committees. In the future they will become more involved in evaluating priorities and reviews of the results of R & D.

The R & D function also draws heavily on advice, at a staff level, from other parts of the Corporation and the IWS; this is particularly so in marketing and textiles areas and includes technical input on textile technology, raw wool measurement, transport and distribution and economics. The IWS has developed a global research plan for wool textile R & D and provides significant inputs to textile research priority setting. In addition it serves as a mechanism for international communication and co-ordination of research in this area; in New Zealand, Wool Research Organisation of New Zealand (WRONZ) staff are involved in such co-ordination along with the Division of Wool Technology in the CSIRO in Australia. Recent higher priorities for research on mothproofing of wool, in the context of environmental concerns arising from existing mothproofing technology are a case in point. Both Australia and New Zealand are now accelerating research in this area which has its most direct effects on carpet wool which is principally produced in New Zealand.

4. SETTING RESEARCH PRIORITIES

There has been a long-standing debate in Australia about the setting of R & D priorities and the *ex poste* evaluation of research payoffs. This has gathered new impetus with the formation of the WRDC and projects have recently been funded to further review methods of R & D priority setting. In a recent unpublished report, Scobie and Jardine (1988) summarised and assessed techniques in the field while Mullen et al (1988) developed a model for assessing the relative merit of textile versus production research. This interest is by no means new; in the early 1980's a similar burst of enthusiasm led to reports by Brindle (1981) and Greig (1982) along with substantial amounts of internal work of a benefit/cost analysis type on wool harvesting research.

A broad conclusion derived from all of this work is that detailed *ex-ante* analysis can only be justified in terms of cost for very large individual projects or for groups of projects (a "program" of research) in which there is a single common goal. Less costly techniques such as ranking or scoring systems do seem to have practical appeal for *ex ante* project evaluation and Scobie (1988) suggests that they can produce essentially similar results (in terms of funding decisions) to more costly benefit/cost analyses. Further, simple and practical procedures fit in quite readily with reasonably disciplined application of subjective judgement by panels of experts such as our RAC's, which feel less threatened than they would by a more sophisticated economic analysis.

Scoring systems do, however, have some weaknesses in a practical sense. They have been used only in some areas and inconsistencies in allocations can arise if ranking systems are not applied throughout the R & D program. Periodically there has not been a binding economic constraint in the sense of project applications totalling more than the indicative budget in given research areas. In this situation ranking, or any other systems, are of little relevance. Further, there is potential for inconsistencies in scoring to develop over time and possibly far too informal a set of criteria for scoring may be used leading to inconsistency between projects. Despite these problems, the resultant tightening up of criteria for judging projects is a major benefit of scoring systems.

In Australia the wool production research committee (PRAC) uses a formalised point scoring system and has done so for many years. This was probably borne of necessity to enable committee members to digest the great volume of research proposals and because they have consistently had a rationing problem (in 1988 PRAC considered 210 new projects and funded 69 of them).

One significant development in recent years has been the holding of conferences to review major areas of research. These began with a review of sheep reproduction research leading to a review report by Lindsay and Pearce (1984) replete with recommendations. Subsequently, similar conferences occurred on pasture utilisation and sheep genetics research, (the latter with involvement of stud sheep breeders) with the use of delphi study techniques to elicit views of research priorities amongst participants. More general reviews of research in various areas have also been periodically completed.

Examples include a survey of economic research priorities by Walker and Kilminster (1978), a review of economic and modelling issues in setting production research priorities by Parton (1986) and a review of wool handling and distribution research by McLennan and Magasanik (1984). These studies have all contributed greatly to altering R & D priorities and the criteria by which individual project decisions are made.

Recent work by Mullen et al (1988) involves an econometric approach to the allocation of effort between production and textile research. The informational requirements of such an approach are substantial; it relies heavily on the reliability of estimates of the elasticities of supply and demand at various stages of the wool production and processing industry. A further complication is that it is totally reliant on externally generated estimates of the probability of achieving a given (eg. 1 percent) change in productivity in various areas of research. Those probabilities are basically unknown, but are likely to vary greatly between areas of research, over time and between levels of research in any given program area.

As Mullen et al point out, the extent of input substitution is likely to be crucial to returns to R & D. Given that such substitution parameters are likely to be higher in "off-farm" research, returns to textile research have to be substantially higher than for production research for Australian woolgrowers to get similar benefits. This is another way of saying that international "leakages" of benefits are potentially substantially higher for textile than production research. Perhaps explicit consideration of such leakages could be a basis for closer co-ordination of R & D effort between Australia and New Zealand in some areas of rural research.

My own view is that our type of system for setting R & D priorities can lead to "over-investment" in production R & D because the system is oriented toward producers. In Australia the training of people to be career researchers in agricultural science with emphasis on soils, agronomy, sheep nutrition and reproduction etc is a substantial industry in its own right. There are eight universities involved in this production research training industry compared with only one in the area of fibre and textile science (University of NSW). In these circumstances there seems to be a shortage of career scientists in textiles and a surplus in production. There is also a risk that the allocation of funds is driven more by what the scientists think will lead to successful refereed publications than by what generates net benefits to woolgrowers.

Allocation between research programs is the area in which there seems to be the greatest potential to augment existing research priority setting procedures by more analytical and objective approaches. Ways of doing this include studies to estimate potential technical productivity gains, benefit cost analyses and peer reviews and conferences on major programs of research with explicit goals of priority ranking, perhaps using delphi or other similar techniques. These are the main ways in which technical and economic analyses are utilised in wool R & D programs in Australia.

5. SOME FUTURE ISSUES

In Australia there have been significant changes in the roles of government and industry in the funding of R & D. The CSIRO is the largest single research agency and also the major rural research body. While there continues to be a large government commitment to direct appropriation funding of the CSIRO, there are increasing pressures on the organisation to be more commercially oriented, to attract industry based funding and to earn revenue from commercial patenting and licensing arrangements. To this end the CSIRO and most universities now have their own technology adoption subsidiaries.

An issue which appears to have been largely lost in the recent debate in Australia is that of private versus public funding of basic or pure research. The general thrust of debate has been about expanding applied research and diverting CSIRO resources in to applied research. In contrast to this it would seem that a stronger case can generally be made on public interest grounds for public sector funding of basic research where chance discoveries may have widely dispersed benefits. Industry-specific research which is "successful" seems likely to have industry-specific benefits. This public interest aspect of the types of research which are publicly funded is central to the present debate on the funding of R & D in New Zealand. In that sense, and for reasons enunciated in Section 2 of this paper, the quality of debate which appears to be occurring in New Zealand has a good deal more to recommend it than is the case in Australia.

A major concern for the Australian rural sector and, more specifically, the wool industry is the progressive erosion of appropriation funding in rural research. At the same time, real levels of CSIRO appropriation funding in manufacturing and other areas has expanded. This may potentially run counter to the comparative advantage of agriculture leading to lower returns to Australia on investment of appropriation funds in R & D. Perhaps government funding of R & D should be viewed more in the context of effective rates of assistance to various sectors; in this respect the distorting effects of input subsidies familiar to economists are likely to occur.

Given the size of the Australian wool industry in world terms, the small country argument generally does not hold. This means there are likely to be revenue effects from technically successful wool production R & D which has significant adoption rates. While it is necessary to continue major production research programs that enhance the competitiveness of Australia as a world wool and fibre supplier, successful research in this field may significantly raise Australian and thus world wool production with consequent reductions in prices.

It is necessary to take long-term industry revenue effects resulting from reduced prices into account in assessing returns to and priorities for production increasing R & D. Failure to do so is likely to lead to over-estimation of the potential returns to some production R & D. This means that priority in the area must be given to research, the results of which are specifically beneficial in maintaining our international competitiveness in wool production, taking into account long-term revenue effects.

In areas of textile R & D, and perhaps to a lesser extent in some production research, an important strategic issue is the leakage of benefits from R & D. Priorities for textile R & D must take into account the extent to which benefits are shared with wool producers from other countries, with other fibres and with machinery manufacturers and other input suppliers to the wool textile industry.

Regarding other wool producers, it should be recognised that Australia does confine textile R & D largely to apparel wool. However, in both that and other areas of textile research, the IWS provides a convenient vehicle for jointly sharing the cost of specific textile research projects where the benefits are likely to be shared. It also provides a framework for IWS partner countries to co-ordinate their separate research work in the textiles area, and to ensure that technical marketing priorities are developed and provide a common base of knowledge in setting textile research priorities.

Textile research funded by the wool industry is concentrated most on the earlier stages of the textile processing and manufacturing pipeline. These are the areas where wool-specific activities are involved (eg. scouring, carbonising, carding and combing) or where wool-oriented machinery or other inputs occur (long staple spinning, chemical treatments such as shrinkproofing and dyeing). In these areas R & D investment is partly funded by machinery manufacturers to improve the speed and efficiency of machinery. However, they seem likely to give a lower priority to R & D in wool specific machinery, relative to the benefits to the wool industry. This occurs because the size of general non-fibre specific machinery markets is much larger and generates larger overall returns from new machinery developments than wool specific machinery.

The woolgrowing industry in Australia has a prominent role in the allocation of R & D funds through the AWC and the WRDC. A positive aspect of this is that R & D can be more closely integrated with marketing strategies implemented by the AWC and the IWS; for example, textile research in Australia is closely integrated with international promotion strategies of the IWS. In this respect there is something of a distinction between Australia and New Zealand. WRONZ seems over the years to have worked very closely with the early stage wool processing industry (particularly scouring) in New Zealand, even though a minority of its funds come directly from the local industry. In Australia textile research of the CSIRO is primarily geared to worldwide users of apparel wool and there is no funding from the Australian wool textile industry.

Wool R & D may sometimes be consistent with national economic goals only in an indirect sense. For example, we do not see any argument for confining the transfer of new technology to the Australian textiles and clothing industries in preference to overseas users. Given the high levels of assistance received by the local textiles and clothing manufacturers, it is often the case that the best interests of woolgrowers and the Australian economy may be best served by concentrating our efforts on efficient international users of Australian wool. The purpose of textile R & D is thus to develop beneficial technologies for adoption by efficient processors of Australian wool wherever they are in the world.

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ADJUSTMENT IN AGRICULTURE: AGRIBUSINESS

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SUMMARY

This paper reviews changes in the agribusiness sector since
1984.   Evidence is based on available statistics and some
anecdotal information.   Considerable changes are identified in
factor markets, input markets and service markets. Main features
include rapid increases in factor productivity, stabilization of
service prices (except interest), a decline in investment and a
decline in balance sheet assets. Amalgamation and restructuring
has occurred in the input and service industries and surplus
capacity still exists at several points.   Outputs can only be
maintained at current high levels by disinvestment in the capital
base.   The agribusiness sector is likely to settle down at some
new lower level of output and investment with increased levels of
productivity in the medium term.

Key Words: Adjustment, Markets, Competition, Survival, Exit,
            Entry.

INTRODUCTION

    This paper is concerned with the adjustment in New Zealand
agribusiness.   This is interpreted to mean economic changes in
the micro-economy of agriculture as opposed to the more macro
matters considered in the previous paper.   By agribusiness we
mean all those industries concerned with agricultural products
from farm to final consumer although data and length
considerations restrict the coverage mainly to the production,
input and service industries of agriculture in New Zealand. The
approach taken is to review changes in the factor, input and
service markets to ascertain where changes in economic direction
have occurred or where prices of resources or services have
undertaken adjustment in response to recent policy and market
environment changes.   Unless otherwise indicated, statistical
materials are drawn from "Situation and Outlook for New Zealand
Agriculture, 1988" (MAF, 1988).

FACTOR MARKETS

The area farmed in New Zealand has not shown much change in recent years. There is a major adjustment, however in the total area farmed as land has been transferred from the Department of Lands and Survey to the Department of Conservation. The number of holdings continues to rise. This appears to be more to do with the coverage of the Statistics Department's questionnaire than changes in the number of full-time farms. Some authors have noted the emergence of a bimodal distribution of part-time small-holdings and full-time farms (Fairweather, 1986; Schroder, 1987). There are questions about the level of the real productive capacity of the land resource, which is largely unmeasurable, concerned as it is with fertilizer maintenance, weed control and other capital asset maintenance procedures.

There is little evidence of a major shift of labour from the farm sector. The number of working owners, full-time, part-time and casual employees recorded at June 30 have not changed perceptibily. There is, however, plenty of anecdotal evidence of off-farm part-time working arrangements and an increase in the number of working wives. Rewards for self-employed labour have declined markedly.

There has been a massive change in the level of farm investment (50% decline in nominal terms from 1985 to 1987). The fall in land development investment is greater than in other categories. This data therefore suggests that the capital base of farming is not even being maintained, and must be in fact declining at some as yet unmeasured rate. In the plant and vehicle area, normal replacement is being delayed, the age of the stock must be increasing, and greater maintenance costs are likely to be required.

Since 1982 there has been a large decrease in land sales values. As is well known, the large increase in land values in the period 1977-82 was not markedly associated with any changes in income earning capacity, but appears to be related to the then current tax provisions, the availability of development funds at concessional interest rates, and the floor price system then in place. Movements in aggregate sales values since 1982 appear to bear little relation to operating surplus, nominal GDP, real GDP, or net farm incomes, except that money incomes have also declined markedly since 1984-85.

In 1987 the all farm sale price index appears to have stabilized after falling successively each year from 1982. Only grazing farms were selling at less than their 1986 values. In terms of butterfat and/or stock units 1987 land sale prices were generally lower in 1987 than in calendar 1986.

These changes in land prices are reflected in the changing capital structure of pastoral farms. On average the value of land buildings on sheep farms declined by 35% between 1984 and 1986 and on dairy farms by 19%. Market values of livestock have also declined while the average level of liabilities has remained constant on dairy farms but risen slightly on sheepfarms (to 1986). The cost of debt servicing has risen sharply under the new regime and these major changes in farm balance sheets are reflected in the following MAF data:

Year	Sheep/Beef Farms		Dairy Farms	
	Debt/Equity Ratio	Debt Service %	Debt/Equity Ratio	Debt Service %
1981	0.19	10.8	0.34	12.3
1982	0.21	12.7	0.24	12.2
1983	0.26	14.0	0.24	13.1
1984	0.27	15.6	0.27	14.4
1985	0.32	13.4	0.36	13.5
1986	0.53	20.2	0.43	16.0

Source : MAF, 1988

In 1987 the cost of debt servicing has risen further (sheep/beef farms 26%) and presumably debt/equity ratios have crept up a little further. The onslaught of deregulation was felt sooner on sheep farms and the overall decline in incomes has been greater. Presumably re-structuring of liabilities has not yet been reflected in the above data.

As MAF points out, average debt/equity ratios do not reflect what is happening at the margin. They state that in 1985-86, 24% of sheep farms had less than 50% equity (ratio of one) and that 5% of all farms had zero or negative equity. These farms have correspondingly higher levels of debt servicing - 24% of farms had debt servicing levels of 41% in 1986. A level of 25% of equity in total assets (equivalent to a debt equity ratio of 2.33) is considered to be the maximum position of exposure to be aimed at. The adjustment of existing farmers to revised asset valuations is a continuing process (well described by MAF) where considerable sacrifice, off-farm working, and restructuring of debt may all play a part.

Finally in the factor market sector, the above changes have brought about a rapid increase in factor productivity since 1980. In terms of real GDP per labour unit, there has been a 5.3% per annum increase in factor productivity in total agriculture. Since the land input ("capital") has possibly declined in the last two years, total factor productivity has likely increased faster than 5.3% in this period. In terms of physical output per unit of physical current inputs, the Economic Service sheep farm sector has increased productivity by 4.7% per year in the period 1980-1988, and by 9.3% per year since 1984.

In both measures quoted the rate of increase has risen still higher in the period 1985-1988. This appears to be the normal response of productivity ratios when the sector is contracting and has been observed before by Philpott, Ross and Scobie. When investment and current inputs surge upwards the productivity ratios tend to fall.

INPUT MARKETS

Fertilizer manufacture reached 2.5m tonnes in 1973 and 1974 and, after a cyclical decline in demand in the late 1970's, reached 2.3m tonnes in 1980. There has been a steady decline since 1980 in fertilizer output except in 1984-85. In the two years following 1985, fertilizer manufacture has halved. It is said the industry was operating at 50% of capacity in 1986 and possibly down to 30% in 1987 (Hoggard, 1987). Recovery to an output of 1.6 m tonnes was then thought possible i.e. around 58% of installed capacity.

In 1970 there were 13 manufacturing plants owned by 5 companies of which 10 had survived in 1986. The above authority believes 6 plants could now service the demand. Competition from imports has been opened up and a nitrogen plant installed at the gas field in New Plymouth.

This change in demand has had massive effects on distributors, both on the ground and in the air. Latest figures on the aerial spreading industry show a halving of flights and hours flown between calendar 1985 and 1987. The number of companies now involved has only declined marginally, though staff numbers are much reduced.

		1985	1987
Flights	(000)	1074	559
Hours Flown	(000)	104	58
Fertiliser (t)	(000)	633	350
Lime (t)	(000)	121	51
Liquids (ha)	(000)	768	559
Fencing (t)	(000)	2.3	0.9
Operators (Aerial)		108	110

Source : Ministry of Transport

Changes in other input markets can be examined indirectly by breakdown of the intermediate inputs matrix of the national income accounts. Between 1985 and 1988, nominal expenditure increased by 3.8% with an actual decline in 1986 and 1987. In real terms the value of inputs has fallen by 8% between 1984-85 and 1986-87. Changes in individual items in the input matrix from 1985 to 1987 in real terms are as follows:

Category	1984-85	1986-87 at 1984-85 prices	Percent change
Purchases of			
Livestock	$876m	$806m	- 8.0
Feed & Grazing	254	236	- 7.1
Animal Health	187	175	- 6.4
Weed & Pest Control	130	137	+ 5.4
Fertilizer,Lime,Seeds	620	434	-30.0
Fuel & Power	379	427	+12.6
Repairs & Maintenance	669	535	-20.0
Freight	177	172	- 7.8
Other (Admin)	1066	905	-15.1
Sub-Total	4358	3824	-12.2
Capitalised Development	89	-	-
Total Int. Consumption	4269	3931	- 7.9

(1986-87 inputs deflated by all farming inputs price indices)

Traditionally, the downturn in receipts has always been reflected in the fertilizer and repairs and maintenance industries, but the demand for inputs has also significantly fallen in livestock purchases, feed and grazing, animal health, freight, and overheads. Weed and pest control and fuel and power demand have both risen in real terms. This lower level of inputs also shows up as a lower level of demand for seasonal credit.

SERVICE MARKETS

Processing

For the last eight years the cost of processing/handling meat, wool and dairy products has been under considerable market and political pressure. In general, increases in these charges have been well below the general rate of inflation.

Item	Index Numbers 1980	Numbers 1988	Per Cent Change
Meat Slaughter* ($/head)			
NI Lamb	6.35	10.05	58.2
NI Ewe	8.82	12.88	46.0
NI Cow	92.10	130.00	41.0
SI Lamb	6.12	10.29	68.1
SI Ewe	7.95	12.60	58.5
SI Cow	87.40	129.60 ('87)	48.2
Meat Handling ($/head)			
Works-f.o.b.			
Lamb	7.58	14.16	86.8
Beef	83.60	118.36	41.5
Wool Handling* ($/bale)			
Total**	175.7	480.2	173.3
Net	94.0	180.0	91.5
Dairy Processing			
Cheese	1750	2804	60.2
Butter	1650	3438	108.3
Dairy Handling			
Tankers	1550	3187	105.6
Freight	1664	1539	-7.5
CPI	686	1584 ('87)	130.9

    * From 1985 storage allowance excluded
  ** Includes change in Wool Board levy

Source: MAF, 1988

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In the period since 1984, there have been sharp increases in slaughter charges for NI cow and in meat handling charges for beef. Some of this charge may reflect the companies quoted by the Meat Board and not reflect the general trend. The remainder of meat processing charges have continued to be contained. Processing costs in the dairy sector have also risen steadily since 1984, and tanker charges also nearly reach the general rate of inflation. Freight costs on butter have been contained more than adequately.

This containment of costs in the marketing channel is clearly of considerable political and economic interest. Such improvements would suggest major restructuring and productivity changes in the processing sector, and this has been put forward by a recent commentator (Rufus Dawe, Straight Furrow, 18 May). Attempts to locate the real data have not been successful to date.

In the meat industry there has been a major restructuring of ownership and plant closures. Three large North Island plants have been permanently or temporarily closed in the last three years. On the other hand, the removal of licensing in the meat industry has enabled 18 new processing plants to be opened or started construction (Dominion, April 8). These changes must bring about further rationalisation in due course, especially as regards by-product and skin processing and disposal. Considerable excess capacity currently exists and is being added to.

Profitability in the meat industry is also down going by the Waitaki International results. I understand farmers in the South Island benefited from the high schedules offered there last season, if not in the current season.

The exit of companies from the dairy processing sector has been taking place over a long period, and there appears to have been no recent acceleration in this trend. It is understood that the rate of investment in dairy product processing continues at a high level and this must auger well for the future.

Stock Firms

According to MAF statistics, trading bank advances to stock firms have declined in the last 3 years. On the other hand, stock and station advances to customers have risen steadily. Customers credit balances with stock agents declined but deposits for various terms have risen. This reflects a movement towards interest earning opportunities encouraged by the stock firms. Net debits of farmers with stock firms appear to have risen appreciably in 1986, but fallen in 1987. These statistics reflect very conservative management of funds and a lack of expansion of credit in the industry as a whole due to lack of demand. They also appear to conceal the bad debt situation and the possible wide differences that exist between viable and unviable accounts. Stock firms are required to participate in re-structuring proposals.

There has, of course, been a major restructuring of the number of agencies in recent years with the demise of one of the traditional companies, but also with the entrance of a new company from Australia. Recently, this company has announced staff cuts of 150 in a total complement of 750 (Evening Post, June 14). Considerable internal rationalisation is evident among the existing companies, Knott, (1987) citing a reduction in staff from 460 to 285 in his company (Williams and Kettle). It is reported that more than 100 dealers in a farm equipment distribution network (Tulloch's) have gone out of business in the last two years (Dominion, June 9).

Finance

As with stock firms, statistics of trading bank advances to farmers do not reflect the wide disparity in individual farm debt situations. On average advances to the different types of farmers (sheep, dairy, other and services) have not increased in money terms since 1984 (MAF, Table 12). The trading banks have been the conduit whereby major cost increases have been imposed on farmers through interest rate policy.

There appears to have been a massive change in RBFC loan authorisations (MAF, Table II). Total concessional loans have dropped by two thirds from 1985 to 1987 with a major fall in loans for land development followed by land purchase. In some compensation, commercial lending by the RBFC doubled between 1985/86 and 1986/87, though total lending has sharply dropped. Accounts in arrears increased from 5 percent in 1982/83 to 11.5 percent in 1986/87, while the provision for doubtful debts increased from zero to $3.2 million. Interest rates to clients have only been slowly increased towards market rates.

Since July 1986 there has been considerable restructuring of loans by the RBFC. Some of this restructuring has involved adjustment by other lenders as well. Applicants for restructuring totalled 8099 and 4706 have been approved for discounting, 699 restructured by other means and 2724 declined. Of the 8099, 4798 were sheep farms, 2571 dairy farms and 730 other farms. Most importantly, the farmers discounted owed the bank $696m prior to discounting of which $228m (33 per cent) or $50,000 per farm was written off.

As at 31.3.87, the RBFC had not restructured its own balance sheet although the Minister of State Enterprises has stated publicly that the Bank was in no state to be privatized. More interesting perhaps, from the adjustment point of view, will be the extent of the write-down of the bank's assets when the accounts for the most recent financial year are finalized, and the consequent adjustment of liabilities.

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Landcorp has also introduced a restructuring programme for its farmer mortgagees. Discounting is used to establish new debt levels at around 70% of existing levels with an interest rate of 13%. Provision is made to "park" some of the debt interest-free until July 1989. A cash settlement offer is also available (NZ Farmer, April 27).

In the financial sector the question of entry and exit does not appear to affect the competitive position of the existing firms. The Reserve Bank (1986) argues that, apart from the RBFC, financial institutions are not seriously threatened by the farm debt problem, as rural lending represents a small proportion of their total debt portfolio. This observation appears to overlook the amalgamation and re-structuring of the major stock agency firms in New Zealand.

CONCLUSIONS

This paper was commissioned to review and analyse adjustment in New Zealand agribusiness. The review has concentrated on identifiable economic responses to recent policy and market changes. Such a review does not reflect the degree of hardship and stress that such changes involve. The OECD talks of "positive adjustment" to identify appropriate policies to manage change. New Zealand does have its share of positive adjustment policies (discounting the prime example) but one is left with the feeling that more should have been done to facilitate the change from protectionism to full market exposure of the New Zealand agricultural sector since 1984.

Without doubt the major cost of adjustment has been borne by the farmers themselves both in income and in equity terms. Some sharing of the burden of adjustment is evidenced by the financial sector arrangements and government backing for the Rural Bank.

There is evidence that pressure has been brought to bear on some of the cost excesses in the marketing channel. This has probably been achieved by increased productivity, restructuring and reduction of profits. In current circumstances, these pressures are likely to continue, with further rationalisations and exits likely.

Output of the whole agricultural industry has largely been maintained to date, but at the expense of capital stocks and maintenance expenditures. This process must come to an end soon. In the medium to longer term, the capital stock will fall, a new lower level of outputs will be established, at lower expenditure and maintenance levels, but at higher productivity levels. The search for the right balance of market returns, exchange rates and internal cost pressures will need to continue until the appropriate position of the New Zealand tradeables sector is once again clearly delineated and established.

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ADJUSTMENT IN THE WHEAT AND FLOUR INDUSTRY[1]

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SUMMARY

The regulated system which operated in the Wheat and Flour industry did not
provide participants with market signals to efficiently allocate resources
and failed to adequately distinguish between differences in the quality of
products. Since deregulation the market signals are causing production
and processing to be conducted in locations which have comparative
advantage. The conduct of milling is shifting from the South Island to the
North Island so that producers and processors in the South Island are
confronted with difficult adjustment decisions. Consumer preference and
market demand are now driving forces in all sectors and are causing
industry participants to be more customer oriented.

INTRODUCTION

The wheat and flour industry has been a heavily regulated industry that has
recently been deregulated. There has been considerable media comment about
the plight of the arable farmer and many consider deregulation to be a
major cause of the farmers' problems. Different points of view are
expressed by millers, bakers and farmers about what should or should not
happen in the industry. The increased wheat imports are seen by some to be
a failure of the deregulation policy. The purpose of this study is to
examine these issues, document the changes, the reasons for the changes and
their impact on farmers, millers, bakers and consumers. Consideration of
the historical basis for the changes adds to our understanding of the
present industry as the future and the factors that impact on its viability
continue to be debated.

POLICY ISSUES

Historical 1914-1988

During the first world war the Government controlled the prices of wheat
and flour to encourage wheat growing in New Zealand. The controlled
situation continued after the war during the commodity price boom.
In 1923 the controlled prices were abandoned because farmers believed that
they would receive a better return from the free market.

In 1928 wheat and flour duty was introduced to encourage increased plantings. The Government at that time believed that there was inherent merit in self sufficiency of the wheat industry. In 1929 wheatgrowers volunteered to pool their wheat in an attempt to influence the price of wheat. They had little success in controlling the market and growers outside the pool system received better prices. The farmers attempt to increase their market power failed.

Farmers requested statutory powers in 1932 and these powers were granted by Government in 1933 in the form of the Wheat Purchase Board operated under the Board of Trade Act. The Board had power to purchase all wheat and fix prices to the grower and the miller. The Board could not control imports which formed the basis of New Zealand pricing. In 1936 the Board became the sole importer of wheat on behalf of the Government. In 1939 price control was introduced generally and was extended to wheat, flour and bread.

The industry functioned in a totally regulated state for 40 years. The regulated condition was not harmonious and there were constant rows between interested parties about the price set for wheat, bread, and flour the level of flour quotas, the quality of product etc. These issues were decided by committees who were persuaded by the argument of one of the truculent parties.

In 1980 bread was removed from price control as part of Governments move towards de regulation of the economy. The baking industry immediately became more competitive and innovative. Different types of bread were produced and marketed, and bakers sought higher quality flour in reponse to consumer demand for quality.

In 1981 in response to pressures from growers to increase prices, the Wheat Board moved to basing the New Zealand price on a 3 year rolling average of quoted Australian Standard White Free on Board prices East Australian Ports. In any season the fall in price was limited to 90% of the previous season. After the 1983 CER agreement Cabinet decided to review the wheat and flour industry to consider what structural changes would be needed to adapt the industry for CER.

In 1984 the Board decided to purchase milling wheat on the basis of quality and defined the grades A-B. Contracting for special purpose wheats and feed wheats was introduced to allow more market freedom in the stock feed sector. A premium was paid for North Island wheat to reflect the greater value of wheat in the North Island. In 1985 following an officials report on the wheat industry the basis for pricing was shifted to weekly average pricing of wheat delivered to mills based on world market price for Australian wheat.

To protect farmers from the fall in world prices the Board in 1986 abandoned weekly average pricing and provided a floor price for wheat. At the same time an Index system was introduced to further reflect differences in quality. Wheat Board control ended from 1 February 1987 when regulatory controls were removed and the Wheat Board was dissolved on

30 April 1987. In August 1987 the Government announced a compensation grant payment of $27.50 per tonne for wheat harvested in 1987 to compensate farmers for low prices and to compensate United Wheatgrowers for withdrawing their dumping and counterveiling duty claim against imports of Australian Wheat.

Self Sufficiency

The original reason for regulation was to increase prices to growers to stimulate production and increase the level of New Zealand self sufficiency in wheat. Government at that time apparently believed that self sufficiency was more important then efficient resource use and that farmers should be protected from the competition of imports. These same arguements have been made by various farmer groups since the recent de regulation.

Problems with the Regulated Industry

The basic problem with regulations was that controls obscured price signals which needed to be observed to direct resources to maximise returns to the nation. Controls were a barrier to innovation in both the wheat growing and flour milling industry. In the flour milling industry competition was eliminated by the flour quota system.

The 1983 review of the industry identified the following specific problems in the wheat industry:

(1) Because transport costs were eliminated from market signals farmers in high freight cost areas were subsidised by farmers in low freight cost areas.

(2) The rolling average price formula and the floor price for wheat were not workable under CER where free market conditions were needed.

(3) As Quality standards were set by the Wheat Board the consumer led demand preference chain was not allowed to operate.

(4) A system of premia and discounts was needed to reward producers who responded to market signals.

In the flour milling industry the following problems were detected:

(1) A national flour pricing policy led to location of production and quality specification distortions.

(2) Flour quota allocations were based on historical output. Cost of production was ignored as was the market requirement in the location that mills were operating.

(3) Excess mill capacity and the inefficiency of some mills led to additional costs to the consumer.

(4) New milling companies could not enter the industry.

(5) Because flour prices were on a cost plus basis and quota sales were
    assured there was no incentive to minimize costs.

Stimulas for Deregulation

The removal of price control from bread in 1980 unleashed some market
forces in what was a totally regulated industry. Bakers began demanding
higher quality flour from the Board so that they could better compete for
market share. The forces for change increased over the years and the move
to market pricing of wheat in 1981 was an acknowledgement that the old self
sufficiency arguments were not as relevant as in the past.

The 1983 review of the industry was motivated by Governments policy of
changing to a more deregulated economy and by the ANCERTA agreement which
now provides for limited flour imports up to 1990 and unlimited quantities
after 1990. Deregulation was considered to be essential because
inefficiencie in the regulated system meant that the New Zealand industry
would not be able to compete with imports of flour.

The Timing of Deregulation

In the broad context deregulation commenced in 1980 and is still occuring
as the impact of deregulation in other sectors is beginning to have effect
on the wheat and flour industry. The original timetable for deregulation
was shortened at the request of the industry participants. The phasing in
of deregulation became increasingly difficult to control as successive
parts were deregulated. This is the sequence versus speed of adjustment
argument.

CHANGES IN THE WHEAT INDUSTRY

Prices for Wheat

The New Zealand wheat growers felt the effect of de regulation when the
price of wheat fell from the floor price provided by the Wheat Board to
world market prices (See table I). The 1987 harvest was large and the
quality was variable. Mills had a preference for Australian wheat which
was generally higher average quality and could now be imported free of
duty. New Zealand wheat consequently sold at a discount.

The prices paid by mills also reflected the location of production as
farmers now had to pay the cost of delivery to store door or a specified
loading point. North Island farmers in 1988 received $260.00/tonne
compared with $200.00/tonne received by South Island farmers for the same
quality of wheat.

Table I and figure I illustrate the price received by growers, the total
yield of wheat in New Zealand and the quantity of imports. With the fall
in price since 1986 the quantity of wheat produced has fallen and is
forecast to fall further. The fall in yield is matched by an increase in

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imports of wheat. The driving force determining prices of wheat in New Zealand is the cost of importing alternative sources to New Zealand.

Transport Costs

Transport costs have a major influence on the price of wheat landed in New Zealand and consequently the prices New Zealand farmers receive for wheat. In the context of CER both the Australian and New Zealand Government are committed to the achievement of competitive freight rates across the Tasman. A reduction in trans Tasman freight rates will reduce the prices New Zealand farmers receive for their wheat. There has already been a reduction in freight rates since the private sector commenced imports of wheat.

Internal transport costs influence the prices farmers can expect to receive for their crop at any location. The most important freight cost is that between North Island and South Island because a reduction in freight rates would lift South Island prices for wheat closer to those of the North Island. In the short term there are unlikely to be substantial changes in the internal costs of transport. The established trends in shifts of production are therefore likely to continue because there are real cost-price incentives for these changes to take place and production in the North Island will continue to increase.

Location of Production

Over the past decade there have been distinct shifts in wheat production between regions. The important trends presented in Table II and figure II are:

(a) reduction in the proportion of South Island production;
(b) corresponding increase in North Island production; and
(c) a decline in Southland production

Historically most of the wheat produced has been grown in Canterbury. The advent of modern machinery and crop drying facilities has widened the geographic spread of wheat production to other areas. Under the Wheat Board national pricing system the costs of producing in areas distant from the market were not reflected in the returns farmers received and this led to further regional distortions. Since deregulation transport costs have been fully reflected in the prices farmers received for their wheat at farm gate and consequently further change can be expected.

In Table III and figure III the consumption, production and milling of wheat are presented for the South Island and the North Island. While the South Island produced 81% of the wheat, it consumed only 23% and conversely, while the North Island consumed 77% of the wheat it produced only 19%. The imbalance in the areas of production and the areas of consumption is one of the major problems facing the New Zealand Wheat Industry.

Selling Options

Under the regulated environment producers had to sell milling wheat to the Board. With deregulation farmers can sell to any buyer including an export buyer. Common systems of selling are fixed price contracts, floating price contract, grower pools operated by merchants or pools through the farmers co-operative. Some farmers prefer to grow wheat free of any contact in the expectation that selling options will improve in the future. The choices now open to farmers require considerable analysis and evaluation of future market returns and the risk involved in the different alternatives. This involves an extra dimension to the farm management decision making process.

In all the selling options the price is based on the cost of importing wheat to the Auckland market. Prices offered for wheat in any New Zealand location are equal to the Auckland imported price less the cost of wheat transport to Auckland. The rationale for pricing has not been understood by farmers or their adivsers who after 40 years of national pricing were not prepared for the large regional differences in price. The Flour Millers have been irrationally blamed for causing monopolistic or oligopolistic bargaining strength to force down wheat prices. In reality the millers faced with competition from imported flour had to operate a competitive purchase policy for wheat.

The Quality of Wheat

In the 1987 harvest the average quality of wheat was 21.6 mechanical dough development (MDD) with much of the crop below 20 MDD. The 1988 harvest had an average quality of 25.2 MDD a 20% increase on the previous year. The change in quality was achieved by a change in variety of wheat grown and a reduction in total wheat produced. Many farmers who believed they were unlikely to produce milling quality decided not to produce wheat. These changes demonstrate the ability of farmers to respond rapidly to price related signals.

The introduction of the variety Otane has been a major contributor to increased wheat quality which was accelerated from 6% of the crop in 1987 to 60% in 1988. The rapid increase in quality of the New Zealand crop could not have occurred under the old system because the Wheat Board was not able to impose the hard discipline of the market. In common with most group decisions the Board decisions were a compromise which reflected the opposing interests of the industry participants. The resulting decisions were ones which tended to reinforce the status quo rather than make changes.

CHANGES IN THE MILLING INDUSTRY

Consumer Preference

Since deregulation changes in the industry have been driven by consumer preference. In competing for customers the baking industry experimented with differences in quality type and presentation of bread. Bakers found that consumers were identifying differences in MDD, colour water absorption

etc. These different qualities were given different brand names and prices and consumers consistently demanded and were prepared to pay for higher quality. Consequently the quality specifications set for 1989 will be higher then those for 1988.

Quality of Flour

The deregulation in 1987 saw intense competition among flour mills. Mills which were previously restricted by quota now competed to increase market share. Flour millers also faced competition from imports because the large increase in the global import quota in May 1987 gave bakers the choice of local or imported flour. Competition was based on both price and quality and Millers consequently demanded wheat which would produce higher quality flour.

Prior to de regulation the Wheat Board had accepted wheat as low as 14 MDD for milling. After deregulation the Millers raised the standard to 20 MDD and wheat below this was unacceptable as milling wheat and had to be sold as feed wheat with a 50% price discount. Consequently the average quality of flour produced since deregulation has increased by 3-4 MDD. Other qualities to improve are colour and water absorption (increases the length of time bread can be kept fresh.)

The Price of Flour

Table IV and figure IV show that the lowest price of flour was reached in August 1987 6 months after deregulation, and indicate competition in that industry. The Wheat Board attempted to leave the industry with a low flour price and to that end deliberately made a loss of $18.8 million is the last year of operation by maintaining a low flour price. It is significant that the industry in competition lowered the price below that of the Board.

Competitive pricing has also resulted in prices of flour and bread being lower in the South Island than the North Island. These price differences reflect the different costs experienced by flour mills in obtaining wheat. Prior to de regulation South Island consumers were subsidising North Island consumers.

Rationalisation of Mills

The process of rationalisation is likely to take some time to work through. Efficiencies will derive from:

(a) better use of capital by increasing mill output;
(b) economies of scale as small inefficient mills are closed; and
(c) modernisation of plant and equipment.

The long term result will be fewer mills working at a higher capacity and producing at a price competitive with the alternative source of flour.

The imbalance of flour production and demand in the North and South Island has been described. Present mills in the North Island have the capacity to

produce all the flour requirement for the North Island. Prior to deregulation the Wheat Board annually shipped 40,000 tonnes of flour to the North Island and by 1987 the quantity was reduced to approximately 12,000 tonnes. Many South Island mills are consequently working at 10-20% of capacity because the market in the South Island is already saturated and the mills can not compete with North Island mills. The result is that some of the South Island mills will go out of business. Already one mill has closed and we are told that another 2 mills are on the point of closing. The Ireland group of mills has been sold to Defiance Mills of Australia. There have been other sales of mills within New Zealand in response to the decision of the commerce commission following the Wattie Goodman Merger.

THE FUTURE OF THE INDUSTRIES

Government Support for Wheatgrowers

In the first year of deregulation the Government made a compensation grant to wheatgrowers of $27.50 per tonne for all wheat produced. This grant was to compensate wheatgrowers for loss of income and assist farmers adjust to deregulation, and compensate farmers for ceasing their counterveiling and dumping duty action against Australian wheat. Grant payments are unlikely to be paid in the future because Government policy is to provide a neutral environment for industries to operate. Future planned deregulation of other sectors will result in lower costs for the wheat industry for example, lower costs of fuel, machinery and transportation.

Profitability of Arable Farming

Arable farming has been the least profitable form of farming over the past three years. Figures V and VI are derrived from New Zealand Meat and Wool Boards Economic Service Sheep and Beef farm survey of income and production estimates. A comparison between South Island mixed finishing farms (arable farms) and the all classes average highlights the problems in the arable sector.

(a) Interest payments are higher on arable farms in all years indicating a higher level of indebtedness on arable farms.

(b) Over the years 1981-88 interest charges have doubled on the all class average and trebled on the mixed cropping farm. This is because of both a higher rate of interest and a higher rate of debt increase on the arable farms.

(c) Total expenditure has increased by a factor of 2.0 on the arable farm and a factor of 1.4 on the all class average between 1981 and 1988. These differences reflects the difficulty that arable farmers have had in cutting costs and the less flexible nature of arable farm costs.

(d) The all class average had a positive net income in all years under study, while the arable farm has had negative net incomes in 3 of the 7 years.

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(e) The year with the lowest net income for both classes of farm was in 1985-86. This was the year before the wheat board was disbanded, suggesting that factors other then deregulation resulted in the financial difficulty that faces arable farmers.

The present problem on arable farms is a function of the low product prices reflecting depressed international markets and the high level of debt on farms. Much of the debt on farms was accummulated during the early 80s when many farms changed hands and when there was a high level of investment in machinery and irrigation development. Arable land prices were caught up in the general land price euphoria of 1981-82. The prevailing expectation among arable farmers and many of their adivsers during the early 80s was that product prices and land prices would both continue to increase. These expectations no longer hold and many farmers are now facing the after affects of that era.

Since 1984 product prices and land values have declined while interest rates have increased. Many farms now have a high debt to equity ratio. Some farmers have no equity. On average, arable farms are forecast to make a loss in 1988-89. Most farmers are clinging tenaciously to their farms and are reluctant to sell their farms on the depressed land market. They are hoping that product prices will improve sufficiently in the future for their farm to become viable.

Those farms that are being sold are purchased by farmers with much less debt, although few farms have been sold at the time of writing and the arable crisis situation seems to be worsening. Prospects of a better harvest and higher prices in the wake of the North American drought offer arable farmers their best hope to alleviate their problems.

Much of the financial difficulty on arable farms would have been experienced with or without deregulation. Had the Wheat Board continued in existence it would probably have maintained higher prices in the short term and passed these on to the consumer in the form of higher flour prices. The result would have been surplus stocks of wheat because the wheat price would have been out of line with the price of other enterprises such as barley. There would also have been problems in defining boundaries between feed wheat and milling wheat. Eventually the Board would have been forced to lower prices.

The Board if it existed today would have accepted lower quality New Zealand wheat than the mills are currently accepting. This action would have assisted arable farmers, but The consumer would have suffered in terms of both price and quality of bread and flour.

The Profitability of Wheat Growing

The Gross Margin for selected crop and livestock activities for the year 1987/88 are compared in Table V and figure VII. These gross margins were prepared by farm advisers in late 87 early 88. Wheat is shown to be the most profitable enterprise on the farm, and recent price expectations since the gross margins were calculated would further increase wheat

profitability. These gross margins indicate that many farmers will continue to grow wheat.

Farmers who no longer grow wheat were those who are located in marginal areas because of location from market, soils or climatic factors. Farmers who because of one of these or other factors were not able to produce quality milling wheat generally ceased production and produced another product which was more profitable to them. In making these decisions farmers are maximising both their own net income and at the same time maximising national benefit from the use of national resources.

The future level of wheat production in New Zealand depends on many interrelated factors. The effect of transport costs (trans Tasman and Cook Straight) has been noted. The profitability of alternative enterprises has a strong influence on the decision to grow wheat. Technology can improve the quality and yield of the crop. The deregulation of other sectors can reduce costs to the arable sector and increase profitability. Interest rates and exchange rates are part of the complex of issues which will influence the size of the industry. Exchange rates are especially important as Australian wheat is immediately responsive to price changes resulting from currency fluctuations.

The Adjustment Process

The return to the free market system after 40 years of regulation has adversely effected many peoples incomes because market disciplines required changes in resource use. The Board attempted to phase in some of the changes prior to deregulation but met with limited success because effective transitional adjustment implied pain for industry participants.

For wheat growers the adjustment has been made more difficult by the market downturn in all arable products. However, even if prices for arable products had been higher there would have been a similar decline in the area of wheat. Mill closures in the South Island are now beginning to impact on wheat growers because they are faced with large transport costs to get their wheat to the nearest mill. Some farmers faced with these costs will decide not to grow wheat, and it is likely that in the event of a general market upturn in arable products farmers would grow increased quantities of barley for export.

With the present costs for transport there will be little transport of wheat, flour, bran or polland from the South to the North Island. The South Island wheat industry will be reduced to around 60,000 tonnes from the 273,000 tonnes produced in 1987. The extent of future wheat growing in the North Island is unknown. It is physically possible for the North Island to grow wheat and become self sufficient, and the extent of actual North island wheat production depends on comparative profitability at the farm level.

Deregulation of the wheat industry will be effecting other sectors. For example the Wheat Board annually paid around $17.0 million on freight largely between North Island and South Island. The loss of the Wheat

Board business will increase restructuring of transport systems which will in turn have some impact on the wheat industry.

The future size and health of the New Zealand wheat and flour industry is in part dependent on further deregulation of other sectors to reduce costs. Particular examples for cost reduction are fuel, transport and farm machinery, and the general reduction in cost excess caused by protection of other sectors will increase the profitablity of arable farming.

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Table I

Prices received by growers total yield of wheat in New Zealand and quantity of imports.

Harvest Year	Growers Price ($/tonne)	New Zealand Yield ('000 tonnes)	Imports ('000 tonnes)
1980	140.00	305.8	53.3
1981	183.00	325.7	43.4
1982	203.00	292.1	70.3
1983	204.00	300.8	110.2
1984	227.00	314.6	96.5
1985	274.00	309.6	71.4
1986	240.00	379.7	11.9
1987E	200.00	338.0	23.7
1988F	220.00	228.0	123.2
1989F	240.00	210.0	130.0

E = estimate
F = forecast

Table II

Trends in location of wheat production (Yield thousand tonnes and % of New Zealand total)

	North Island	%	South Island	%	Southland	%
1979-1980	25.3	(8)	280.5	(92)	92.1	(30)
1980-1981	26.3	(8)	299.4	(92)	82.7	(25)
1981-1982	26.6	(9)	265.4	(91)	80.7	(27)
1982-1983	31.6	(10)	269.2	(90)	72.7	(24)
1983-1984	38.7	(12)	275.8	(88)	39.8	(13)
1984-1985	48.7	(16)	260.8	(84)	29.3	(9)
1985-1986	48.4	(13)	331.3	(87)	37.5	(10)
1986-1987 (E)	67.0	(19)	273.0	(81)	32.0	(9)
1987-1988 (F)	51.0	(22)	173.0	(78)	25.0	(11)
1988-1989 (F)	59.0	(28)	151.2	(72)	20.0	(9)

E = Estimate
F = Forecast

Table III

Production Consumption and milling of wheat

1987

	North Island	%		South Island	%
	'000 tonnes			'000 tonnes	
Wheat Consumption (Flour)	162.7	77		50.5	23
Wheat Production	67.0	19		273.0	81
Wheat Milled	137.0	63		80.0	37

Table IV

Prices of Bread, Flour. All Food CPI and All Groups CPI

Quarter of Year	(a) Bread	(I)	(b) Flour	(I)	All Food CPI	(I)	All Groups CPI	(I)
December 86	1.22	(1.0)	1.52	(1.0)	1.46	(1.0)	1.49	(1.0)
March 87	1.22	(1.0)	1.48	(0.97)	1.47	(1.01)	1.52	(1.02)
June 87	1.22	(1.0)	1.44	(0.94)	1.50	(1.02)	1.57	(1.05)
September 87	1.27	(1.04)	1.47	(0.96)	1.51	(1.03)	1.60	(1.07)
December 87	1.29	(1.05)	1.47	(0.96)	1.52	(1.04)	1.63	(1.09)
March 88	1.31	(1.07)	1.49	(0.98)	1.56	(1.06)	1.66	(1.11)

I = Index

(a) = retail price $ of 750 kg bread sliced wrapped.
(b) = retail price of a 1.5 kg packet of white flour.

Source: Department of Statistics

Table V

Profitability of farm enterprises (Gross Margin)

$/ha

	North Island	South Island
Breeding ewes	420	280
Wheat (Milling)	540	360
Wheat (Feed)	400	200
Barley (Malting)	350	220
Barley (Feed)	340	220
Peas (Feed)	400	320
Ryegrass	450	290

Source: MAFTech

Figure I

Wheat Production Price to Growers, and Imports
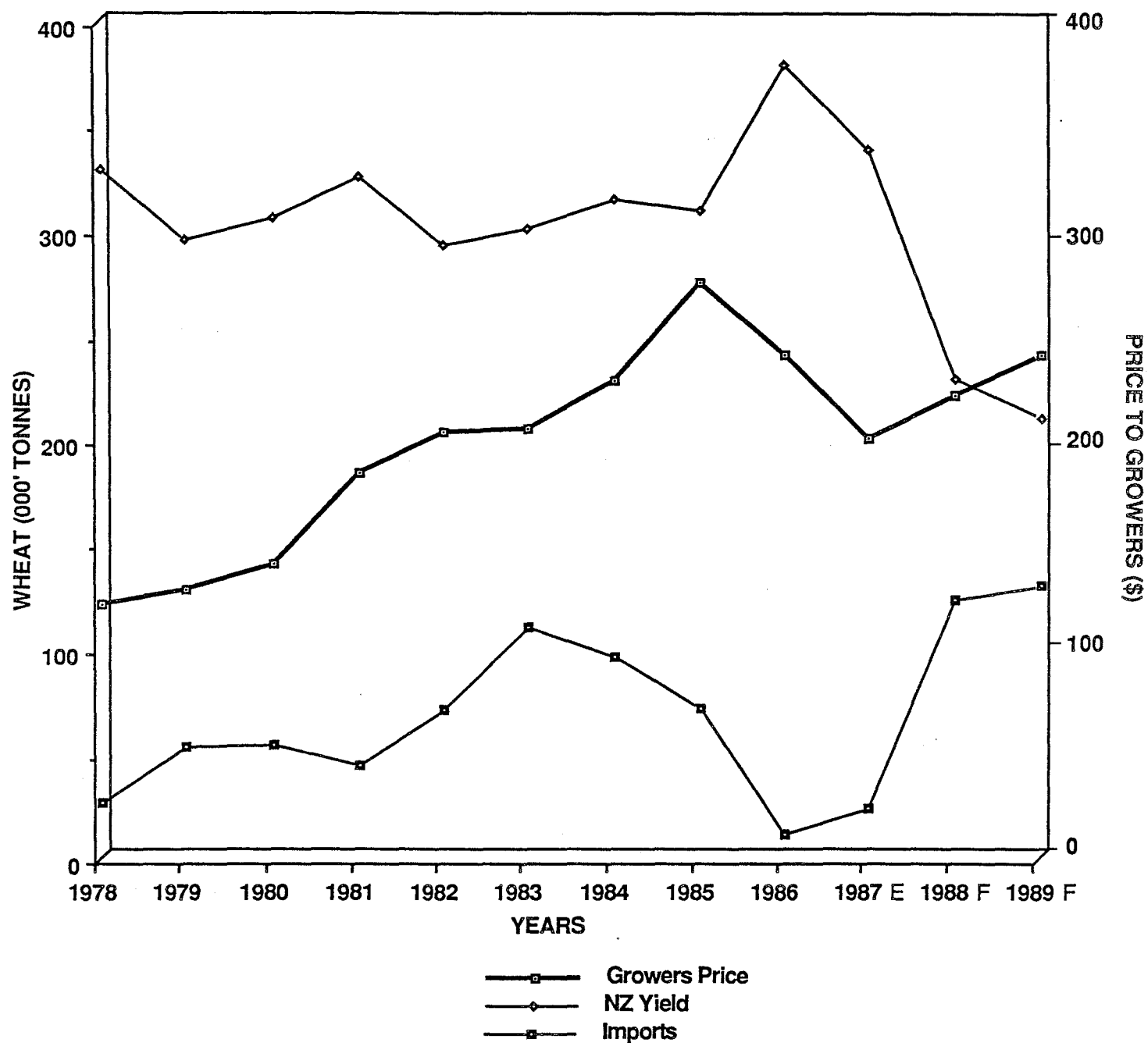
Figure II

Location of Wheat Production as % of Total
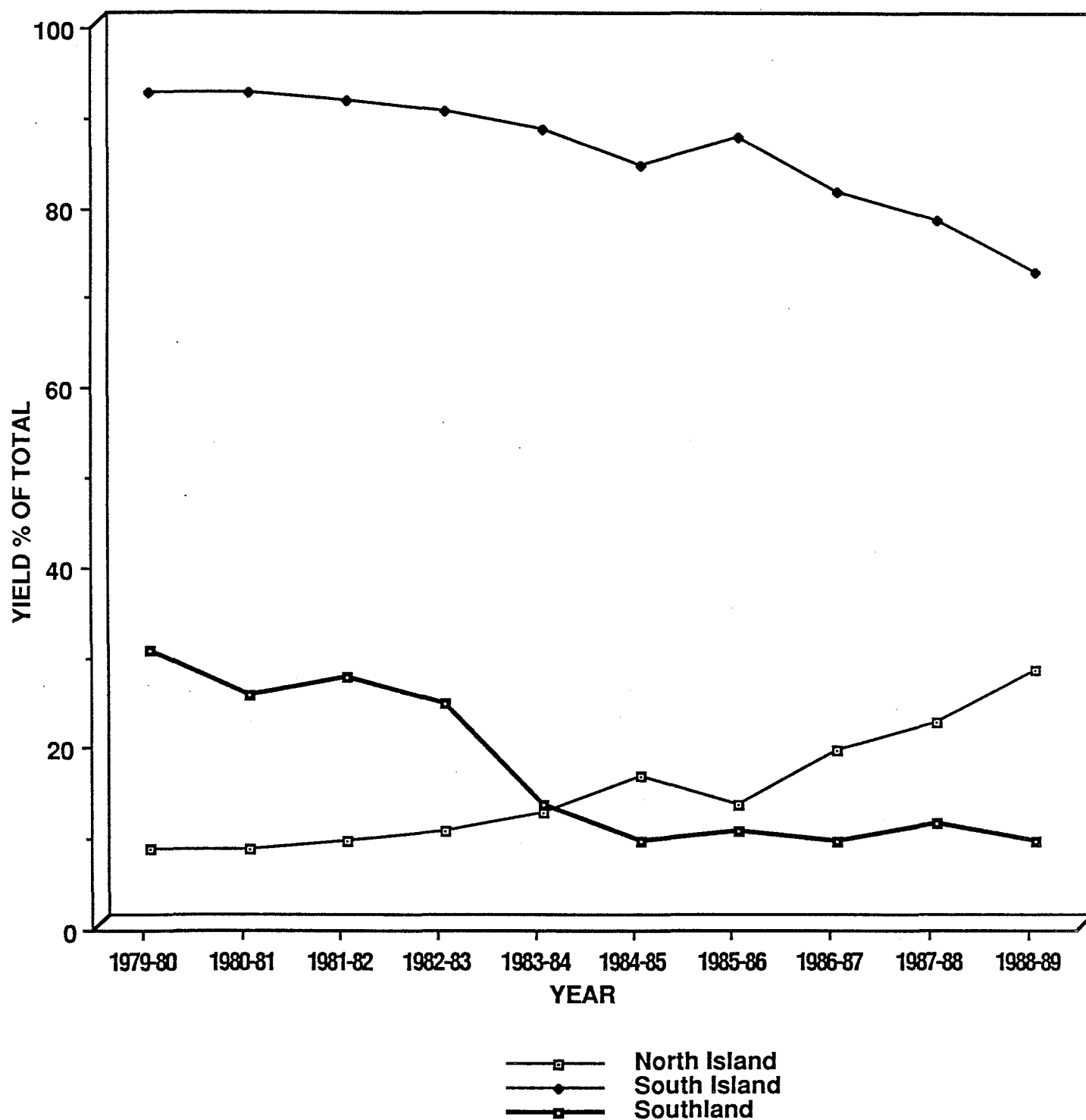
Figure III

Wheat Production, Wheat Consumption (Flour) and Wheat Milling

Wheat Production

Wheat Milling

Wheat Consumption (flour)
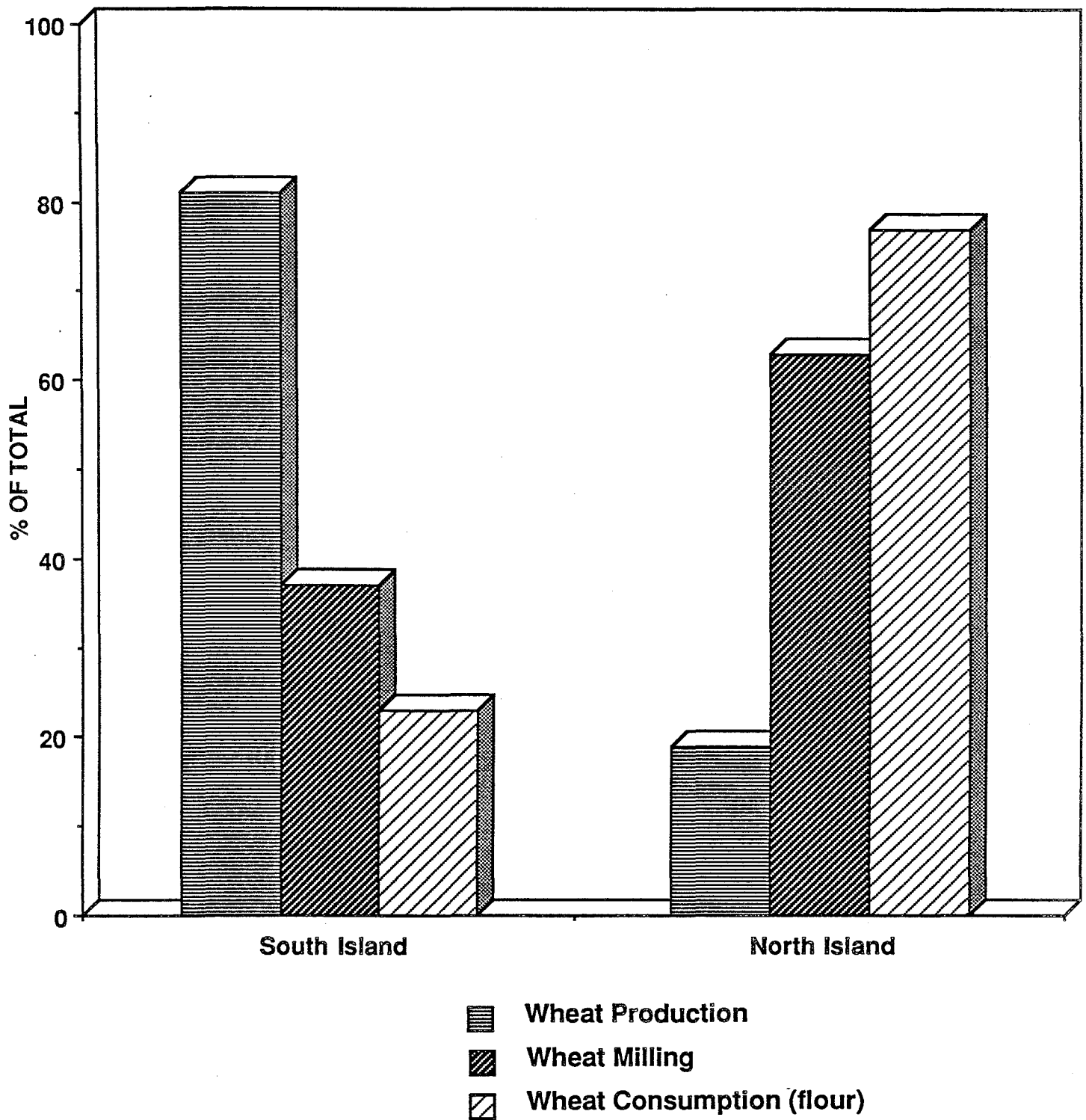
Figure IV

Bread and Flour Costs
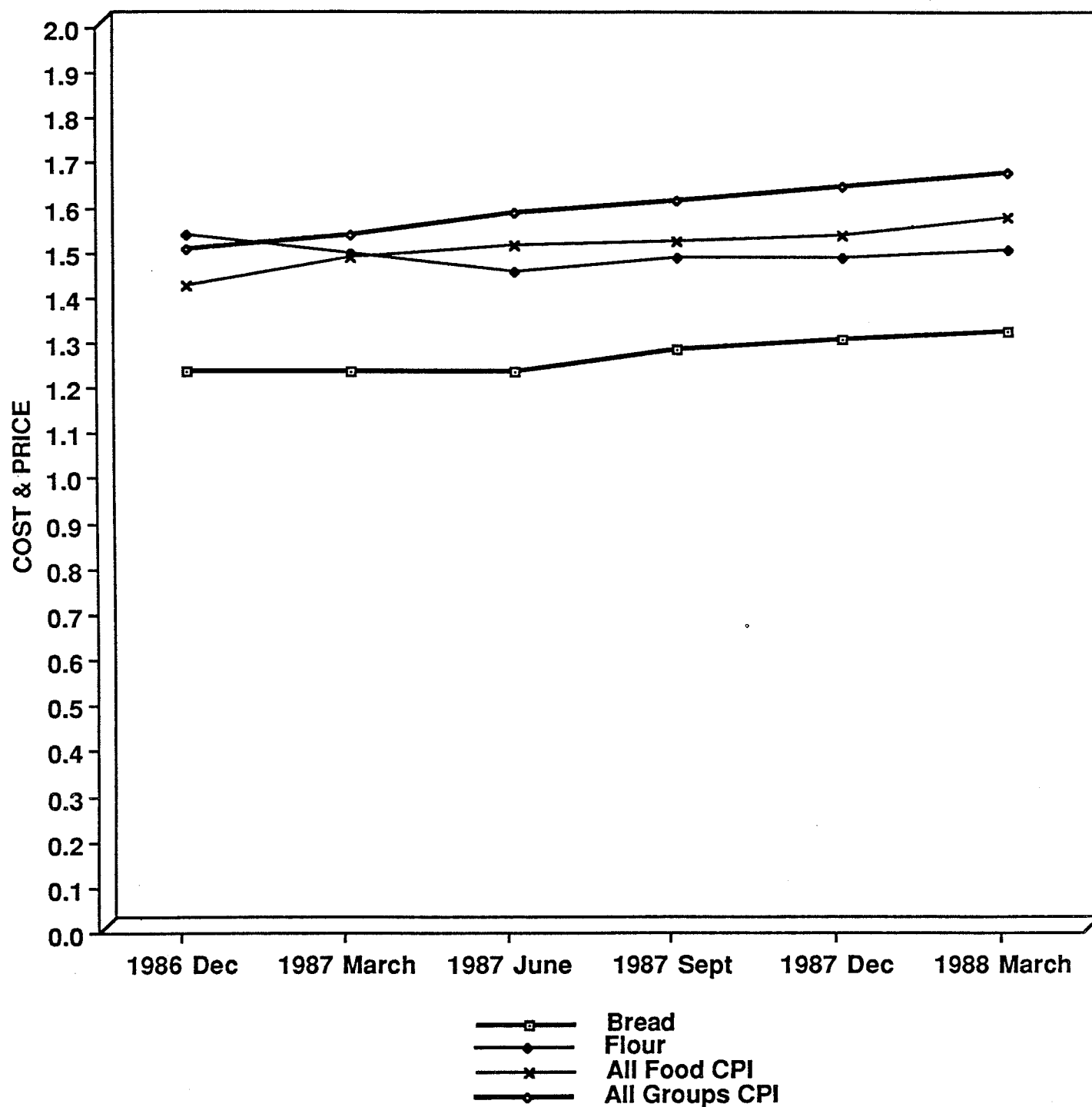
Source: Department of Statistics

Figure V

South Island Mixed Finishing
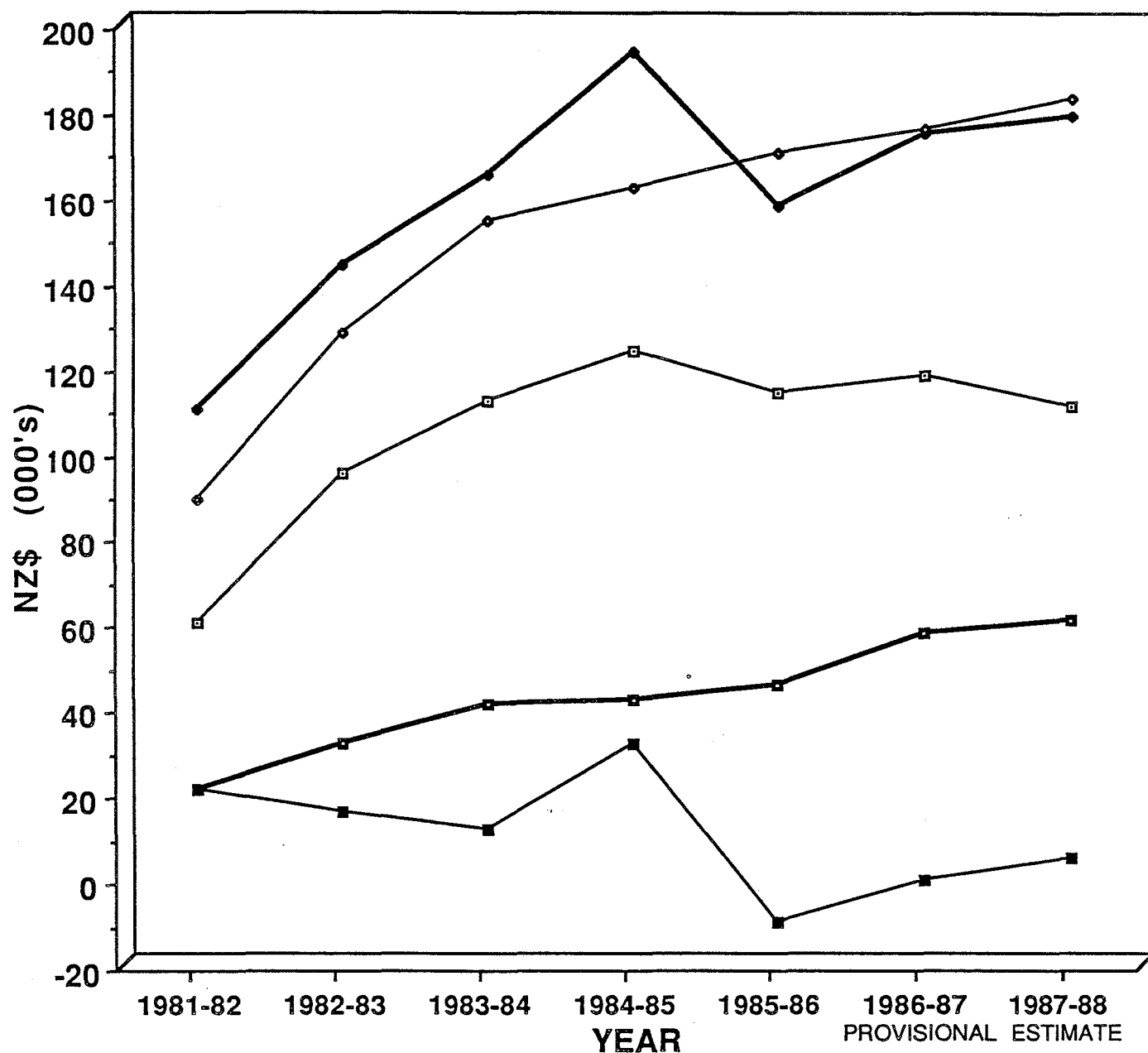
Cash Crop Account
Total Gross Income
Interest
Total Expenditure
Net Farm Income per Farm

Source: NZ Meat & Wool Boards Economic Services

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Figure VI

All Classes Average

NZ$ (000's)

YEAR

1986-87 PROVISIONAL   1987-88 ESTIMATE

—□— Total Gross Income
—◆— Interest
—■— Total Expenditure
—✕— Net Farm Income per Farm
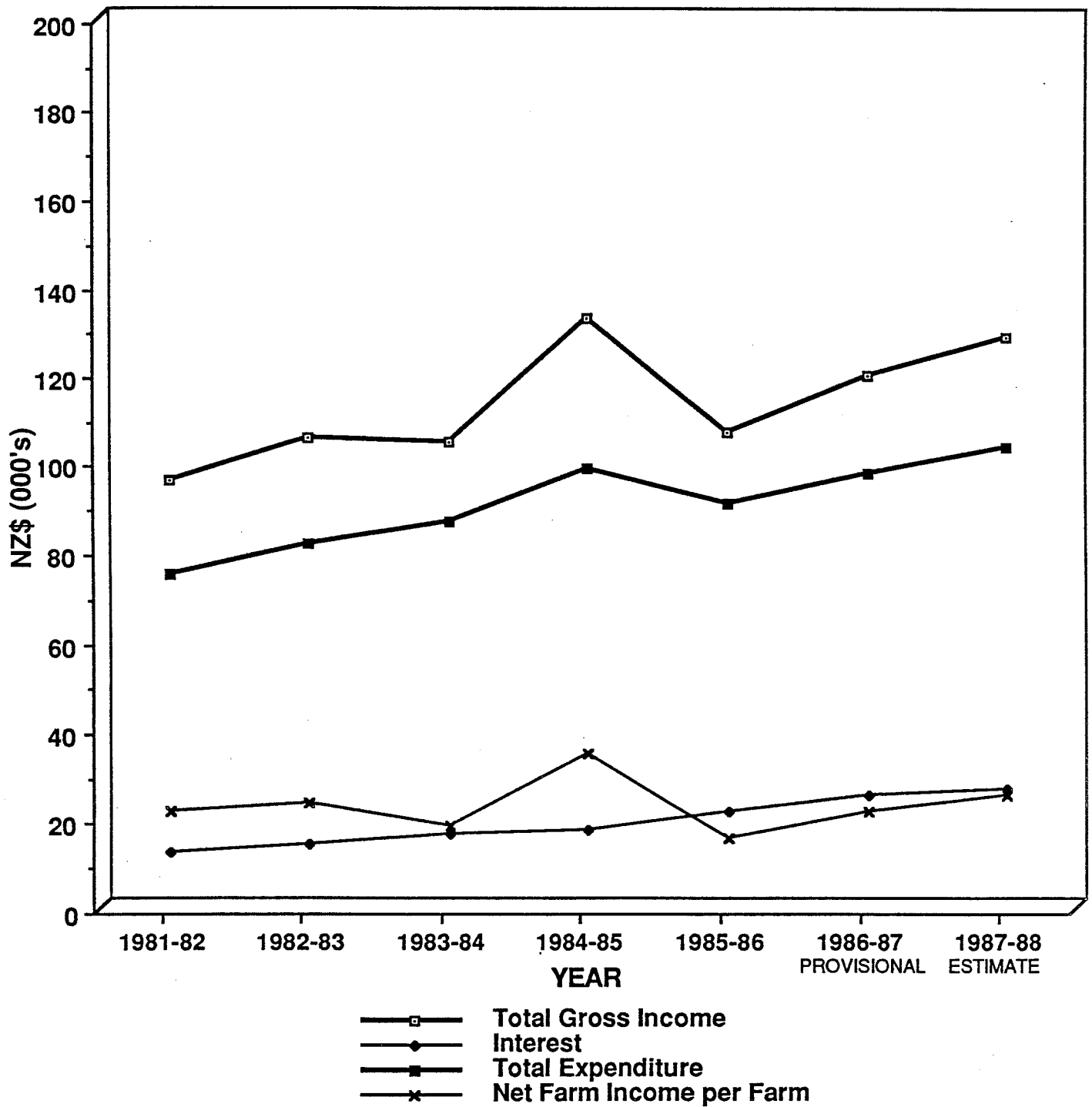
Source: NZ Meat & Wool Boards Economic Services

Figure VII

Gross Margins (North Island & South Island) 1987/1988

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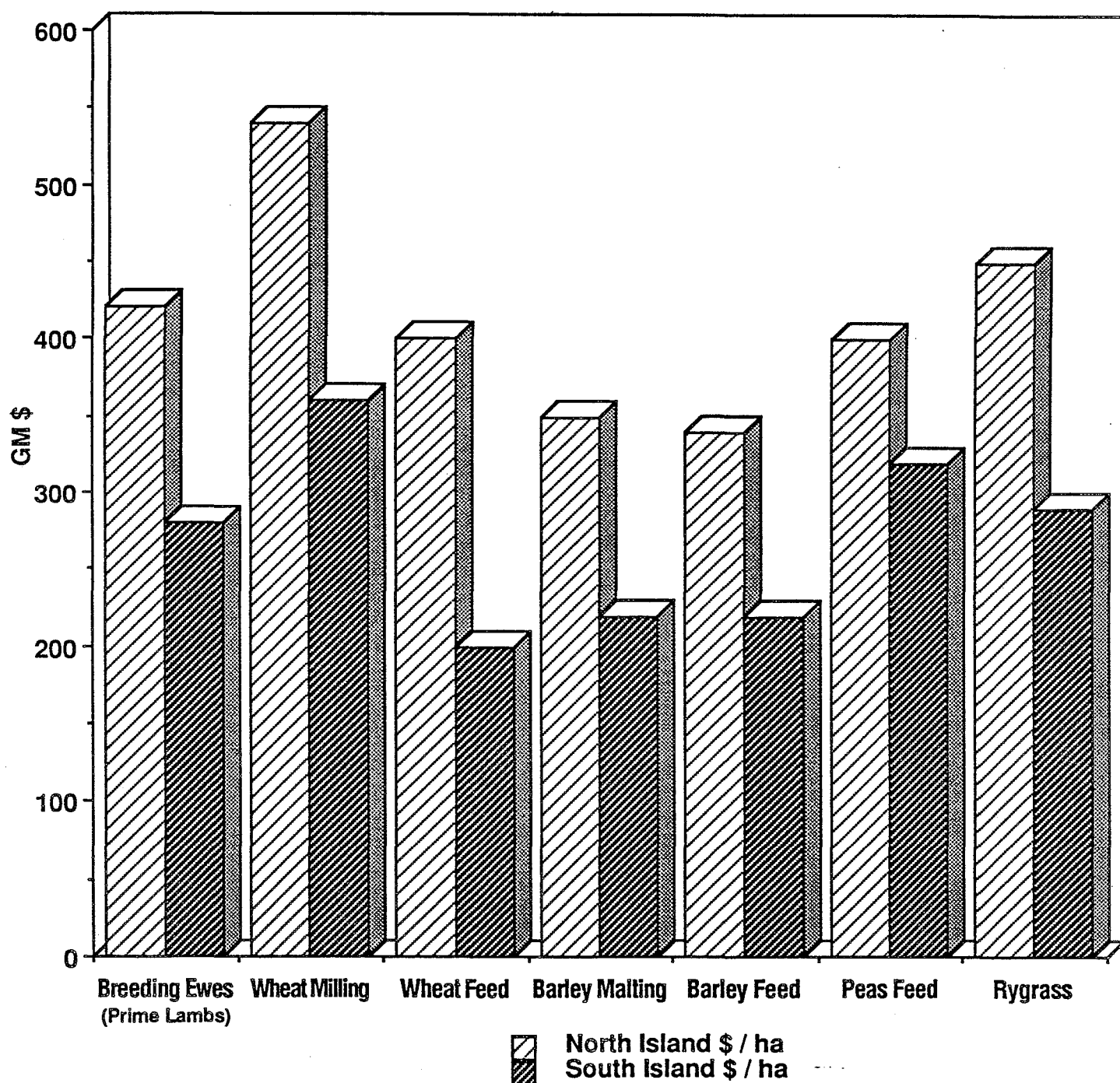
STRUCTURAL ADJUSTMENT IN EGG PRICE DETERMINATION

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SUMMARY

This paper reports on an investigation into the processes determining egg prices over the period 1982:4 to 1987:4. A model relating egg prices to lagged producer input prices was discovered using the econometric modelling methodology discussed by Gilbert (1986) and Hendry (1987). This model was used to test the hypothesis that the removal of price control on April 1, 1986 led to the breakdown of markup pricing, with it's replacement being a return to price taker status for producers. The empirical results confirmed this hypothesis of a change in the price determination process. Strategies by which producers attempted to maintain their favourable position of price makers are reported and the paper concludes with a discussion of the necessary and sufficient conditions for farmers to pass on costs.

Key Words: Egg industry; Price determination; Econometric methodology

INTRODUCTION

The hypothesis that prices are determined by a markup on average costs is normally not applicable in the agricultural sector. Models of agricultural product price behaviour tend to assume perfectly competitive market structures (Tomek and Robinson, 1981). In such a competitive setting atomistic farmers are presumed to be price takers with respect to input costs and marketing and distribution services.

This price-taker status of farmers resulted in governments, particularly in the 1930's, giving legislative blessings to agricultural marketing institutions which allowed the 'orderly marketing' of commodities to increase the level of, and reduce the variability in, rural incomes (Zwart and Martin, 1987). Farmers saw marketing boards as an institutional mechanism for gaining bargaining power to enable them to receive a similar rate of return for their labour and investment as occured in non-agricultural sectors. By the 1980's government attitudes had changed such that the redistribution of market power, in favour of producers, was no longer politically salient as criteria of efficiency came to dominate those of equity. This view was most forcefully put forward by Treasury (1984):

> "the approach which seeks to ensure 'adequate' farm incomes is one that has inhibited the adjustment process by protecting farmers from the realities of markets"

The result of this change in agricultural policy objectives

was widespread deregulation. It is hypothesised that farmers, when legislatively sanctioned, were able to price in a markup based manner. A deregulation can be expected to produce a significant shift, i.e. a structural break, in the underlying process which generates prices and it is predicted that following deregulation, farmers will once again become price takers. This hypothesis is tested by constructing a model of price determination in the New Zealand egg industry.

The econometric modelling methodology used is based upon that proposed by Hendry (1986) and follows a general-to-specific model discovery process with data-allowable restrictions being tested and imposed if accepted. Such a methodology relies upon an interaction between theory and data with the aim of producing a model exhibiting the greatest congruence with the available evidence. The credibility of our model was evaluated by testing against evidence which was independent of the discovery mechanism.

Markup Pricing Theory

The hypothesis of markup pricing was first made by Kalecki (1938) who argued that prices in the manufacturing, construction and transport sectors were determined largely by changes in the cost of production. This markup, which was considered stable in the short run, was due to the oligopolistic structure of these sectors and the constant marginal, and therefore average, costs up to the full capacity point. In Kalecki's model, the products whose price changes were considered demand-determined consisted mainly of raw materials and primary foodstuffs. The Kaleckian distinction between two pricing mechanisms was similar to that later popularised by Hicks, of fix-price and flex-price sectors, although Hicks concentrated more on the speed of adjustment whilst still accepting a competitive framework (Sawyer, 1985).

The hypothesis of markup pricing was supported by Hall and Hitch (1939) in a study of 38 oligopolistic firms. They argued that prices were determined by average total cost, with an allowance for profit. The theory was refined in the 1950's and several empirical studies of the industrial sector confirmed the hypothesis. Meanwhile, agricultural price determination was modelled using inverse demand curves, with price and quantity simultaneously determined.

INDUSTRY DESCRIPTION

The Regulated Environment

Eggs first came under price control on September 1, 1939 and remained so until April 1, 1986. The commissions of both distributors and retailers were determined by price control from 1940 onwards when marketing areas (monopoly franchises for distributors) began to be legislatively established. Farm level prices, which determined maximum retail prices,

were set on the basis of surveys of egg production costs, carried out every four years, beginning in 1946. The elements of the cost of production were: overhead expenses, variable costs, family labour and an allowance for a rate of return on assets (14% in the 1983 survey). A weighted average cost of egg production, based on the proportion of production accounted for by each farm size class, was derived from the survey. The producer price was generated by adding this to the cost of 'running the industry' in the form of Poultry Board levies and surplus disposal costs.

In the period between surveys, the producer payout price was regularly updated to reflect the effect of input cost movements. Egg marketing agents and retailers margins were altered if the Department of Trade and Industry accepted the submissions from representatives of these institutions. An example of this price setting is illustrated in Table 1.

Table 1: Components of the Grade 6 Egg Price 1984

Component	Price	% of Retail
Farm Gate Price	$1.359	74
Delivery Allowance	0.060	3
Carton Cost	0.090	5
Wholesalers Commission	0.161	9
Maximum Wholesale Price	$1.670	
Retailers Margin	0.160	9
Retail Price	$1.830	

Source: Price Order No. 281 March 1984 (quoted in IDC, 1984)

The most noteworthy point from Table 1 is the high ratio of farm gate to retail prices. Undoubtedly part of this was due to the nature of the product; there being little opportunity or need for further processing. However, the fact that marketing margins were set by regulation at levels only one third to one half of that applying on other perishables (Gibson, 1988) suggests that the high farm/retail price ratio was due more to intervention than to product characteristics.

Guaranteed producer returns were supported by supply control and a prohibition on imports of eggs and egg products. Egg production was licenced. Quotas were placed on the number of hens able to be farmed. When this regime was implemented in 1970 hen quotas were transferrable but their movements were steadily restricted to control the relocation of production, effectively disguising the true value of quota rent. From 1982 the quota price was regulated to zero and eggs, rather than hens, were transferred to deficit production areas.

The Deregulated Environment

On April 1 1986 egg pricing, marketing and grading controls were lifted. Production control remained but restrictions

on hen quota values and movements were removed. The
government was motivated by a desire to introduce more
competition into the economy and achieve lower prices
(Caygill, 1985). The removal of price control and monopoly
marketing areas resulted in an immediate decline in retail
prices due almost entirely to a battle for market share in
the lower North Island and upper South Island. Six market
centres had price declines of 10% or more: Nelson (-27%);
Wanganui (-17%); Christchurch (-17%); Palmerston North
(-16%); Wellington (-15%) and Timaru (-10%). In all of
these areas, plus Gisborne and Hastings, producer prices
were cut at the time of deregulation. This occured during a
time of rising production costs, as measured by the producer
price index for 'pig poultry and other' farm types.

Figure 1 shows movements in the egg price index[1], deflated
by the food price index and an egg producer cost index,
deflated by the producer price index for all agriculture.
This provides immmediate graphical support for the
hypothesis that deregulation caused a structural break. The
two series in Figure 1 had tracked each other from 1982:4
(the starting period for the input price index) to 1984:4.
Then the hiatus during the industry review, followed by the
announcement and implementation of deregulation, saw the
series diverge and move in opposite directions.

Figure 1: Real Retail Egg Prices and Producer Costs
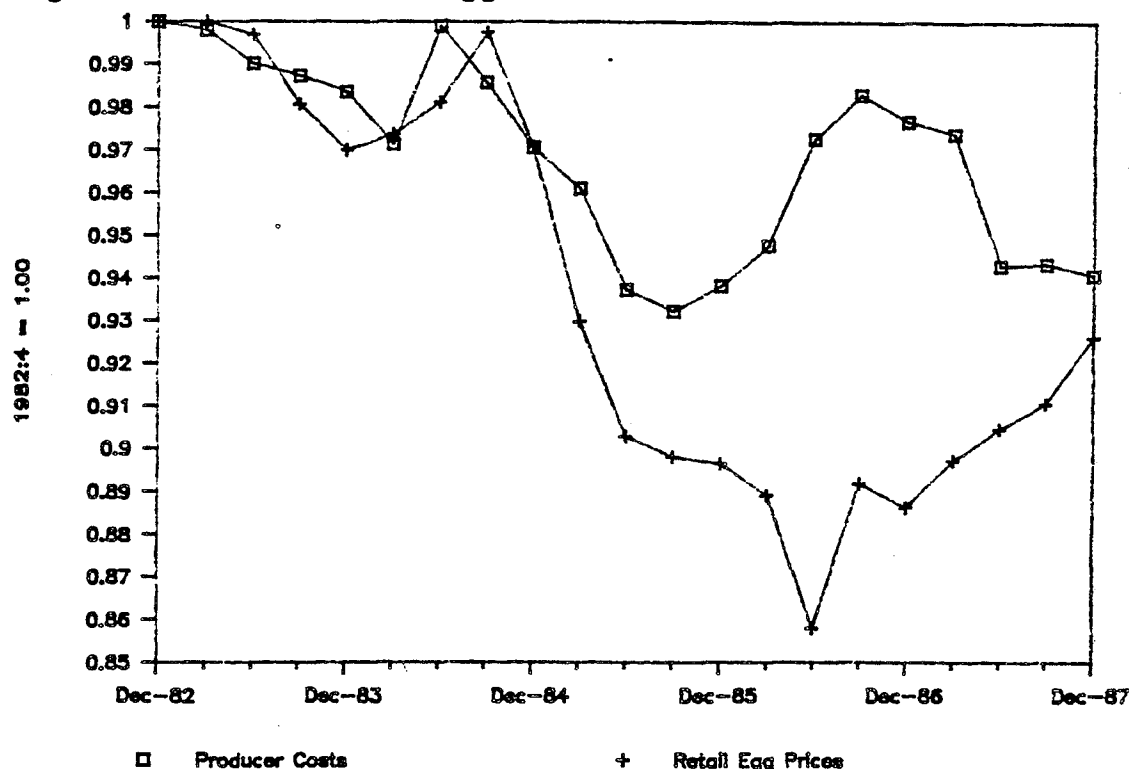
1 This index causes some measurement error as it is based
  solely on graded eggs. Mixed grade eggs, which were not
  widely available prior to deregulation, gained a moderate
  market share after deregulation, notably in Christchurch,
  and had prices up to 50% lower.

Economic time series data are generated by a process of immense generality and complexity (Hendry, 1986). Economic theory tends to operate with unrestricted ceteris paribus conditions, unobservable theoretical values, general functional forms and unspecified adjustment processes (Pesaran and Smith, 1985). As a result the econometrician must often augment theory with auxillary assumptions relating to functional form, error distribution, proxy variables, data frequency and the specification of lag structures. It is our aim in this paper to empirically test, wherever possible, the assumptions and restrictions used in deriving the final specification of the price determination model.

Model discovery by this process cannot hope to match the elegance of final specifications reported as if they were known to be correct a priori. Our approach is messy, time consuming and reveals how little we know about the data generating process. It does however allow readers to judge the plausibility of the final specification based on their own personal selection criteria. It seems safest to begin with a general specification, simplifying it only if the data legitimately allow. The reverse approach, of beginning with a simple model and 'patching it up' as problems arise has the weakness of not allowing the investigator to know whether the final specification could be encompassed by a more general model (Gilbert, 1986).

Model Discovery

We initially specified our general model as an autoregressive, distributed lag

$$Y_t = \alpha + \sum_{j=1}^{k} \beta_j Y_{t-j} + \sum_{j=0}^{k} \gamma_j C_{t-j} + V_t \qquad V_t \sim NID(0, \sigma^2) \qquad (1)$$

This was a general form of a specification reported by Gibson (1988) where Y_t was the real price of eggs and C_t was the real farm cost of egg production. The included variables were justified by Gibson on the basis of production costs being the short run determinant of prices and lagged egg prices reflecting the fact that prices in any period were some function of their previous value. The length of the lag (k) was set to two as we were dealing with quarterly data and there had been 10 increases in the maximum retail price over the five years prior to deregulation. Making allowance for the period of the price freeze it appeared that producers faced approximately six months of input price rises, before redress, in the form of a retail price rise, was granted.

The simplification procedure was based on common factor (COMFAC) restrictions popularised by Hendry and Mizon (1978). Rewriting equation (1) in lag operator notation and

subtracting the lagged endogenous terms from both sides
yields equation (2).

$$(1-\beta_1 L - \beta_2 L^2) Y_t = \alpha + (\gamma_0 + \gamma_1 L + \gamma_2 L^2) C_t + V_t \qquad (2)$$

If the COMFAC restriction $\gamma_2 = -\beta_2 \gamma_1$ holds then equation (2)
can be more parsmoniously represented as equation (3)

$$(1-\beta_1 L) Y_t = \alpha + (\gamma_0 + \gamma_1 L) C_t + U_t \qquad U_t = \beta_2 U_{t-1} + V_t \quad (3)$$

due to the common factor on Y_t and C_t $(1-\beta_2 L)$. This
restriction was tested with a Wald test, yielding a χ^2_{1df}
value of 2.09, which did not exceed the critical level at 5%
significance (3.84) so the restriction was accepted.
However, we also tested for the presence of an AR(1) error
term in equation (3) and found no evidence of serial
correlation. This indicated that our initial lag length was
too long i.e. $k \leq 1$, leaving us with equation (3) with a
white noise error term, which can be writen in more
conventional notation as equation (4).

$$Y_t = \alpha + \gamma_0 C_t + \gamma_1 C_{t-1} + \beta_1 Y_{t-1} + V_t \qquad (4)$$

Imposing restrictions, including those for an additional
common factor, on equation (4) enabled us to define a family
of nestable models, each of which represented a competing
hypothesis. These competing hypotheses were: an
autoregressive model, a distributed lag model (both with
white noise disturbances) and a static model with an AR(1)
disturbance.[2] We have already seen from Figure 1 that a
substantial shift appeared to occur in the DGP with the
removal of price control. Testing the rival hypotheses
within this family of models required that account by made
of this shift. If this were not done, the regressor with
the greatest explanatory power would have been the lagged
value of the dependent variable, whereas the hypothesis
under test concerns the exogenous variable C_t. Account of
the deregulation was made by incorporation of interactive
and intercept dummy variables.[3]

One further source of error in the comparison between rival
models was due to multicollinearity amongst the regressors.
The correlations amongst the three explanatory variables in
the unrestricted model (4) were all greater than 0.6. This
problem was mitigated with a transformation suggested by

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2 This results from the COMFAC restrictions on C_{t-1} as
$Y_t = \alpha + \gamma C_t + U_t$ where $U_t = \rho U_{t-1} + V_t$ is equivalent to
$Y_t = \alpha(1-\rho) + \gamma C_t - \rho \gamma C_{t-1} - \rho Y_{t-1} + V_t$

3 An alternative method would be to test the rival
hypotheses over the period prior to deregulation, whilst
the DGP was stable. Scarcity of observations precluded
this approach.

Gilbert (1986). Expressing C_t and C_{t-1} as a level and a change variable made them almost independent as they were highly autoregressive (DW = 0.43) in levels.

$$Y_t = \alpha + \gamma_0 \Delta C_t + \delta C_{t-1} + \beta_1 Y_{t-1} + V_t \qquad (5)$$

Equation (5) is equivalent to (4) where $\delta = \gamma_0 + \gamma_1$. The family of nestable models and the values of the test statistics on the necessary restrictions are listed below.

Table 2: Restrictions Used to Nest a Family of Models

Restriction	Model	Test Statistic	Critical Value[a]
$\gamma_1 = -\beta_1 \gamma_0$	Static with AR(1) error term	0.182	$\chi^2 = 3.81$
$\beta_1 = 0$	Distributed Lag with $U_t \sim$ 'WN'	0.204	$F_{(1,13)} = 4.67$
$\gamma_0 = \gamma_1 = 0$	Autoregressive with $U_t \sim$ 'WN'	11.62	$F_{(2,13)} = 3.80$

[a]5% significance level

The necessary restrictions for nesting a distributed lag and a static model with AR(1) error process were seen to be data acceptable. Note that the COMFAC restriction could not be applied to model (5) as it would have been of the form $\delta = (\gamma_0 + \gamma_1) = -\beta_1 \gamma_0$, so was instead applied to the equivalent model (4). Accepting the restrictions suggested that a more efficient estimation would occur with either of these models, rather than the unrestricted model. However, the nesting of the autoregressive model was not data-acceptable so that specification was disgarded. The Cox-Pesaran N-test for non-nested models was used to discriminate between our two remaining competing models (labelled H1 and H2 below).

H1: $Y_t = \alpha + \gamma_0 C_t + U_t$ where $U_t = \rho U_{t-1} + V_t$

H2: $Y_t = \alpha + \gamma_0 \Delta C_t + \delta C_{t-1} + V_t$

This test is based on comparing the observed difference in log likelihoods with the estimated expected difference when H1 is true (Pesaran, 1974) i.e. we look at the behaviour of H2 under a presumed true H1. It can be shown that the test statistic N_1 is a standard normal variable under H1.

$$N_1 = \frac{\sqrt{n}}{2} \log \left[\frac{RSS_2}{RSS_1 + RSS_{21}} \right] \left[\frac{(RSS_1 * RSS_{211})^{0.5}}{RSS_1 + RSS_{21}} \right]$$

N_1 was computed using regression residuals (e_j) from four regressions.[4]

4 RSS_j = residual sum of squares = $(e_j)^2$

(1) H1: to obtain RSS_1 and $\hat{Y}_1$

(2) H2: to obtain RSS_2 and $\hat{Y}_2$

(3) $\hat{Y}_1$ on regressors of H2 to obtain $\hat{Y}_{21}$, RSS_{21} and e_{21}

(4) e_{21} on regressors of H1 to obtain RSS_{211}

The equation nominated as H1 has a privileged position as a 'presumed true' null hypothesis so the test must be reversed and N_2 computed to test H1 under a presumed true H2. This gives four possible outcomes.

Outcome	$N_1 = 0$	$N_2 = 0$	Implication
1	reject	accept	Rejection of H1
2	accept	reject	Rejection of H2
3	reject	reject	Rejection of H1 & H2
4	accept	accept	Failure to reject either

H1 was estimated using the maximum likelihood procedure of Beach and MacKinnon (1979) with the equation being transformed with the estimated value of the autocorrelation coefficient, ρ. The resulting value of N_1 was -27.02 which exceeded the critical value for a standard normal (at 5% significance level) of 1.96, indicating that H1 should be rejected in the direction of H2. The estimation of N_2 gave a value of 0.63 indicating that H2 should not be rejected. The conclusion was that model H2 could encompass H1 so H2 was selected as our final model.

Estimation and Diagnostic Testing

Our selected specification

$$Y_t = \alpha + \gamma_0 \Delta C_t + (\gamma_0 + \gamma_1)C_{t-1} + V_t \qquad (6)$$

was estimated with maximum likelihood regression over the full sample period (1982:4 to 1987:4) with intercept and interactive dummy variables to account for the removal of price control. Quarterly dummy variables to account for seasonality were found to be insignificant. The results, after re-transforming to levels, were:

$$Y_t = -0.831 + 0.962C_t + 0.905C_{t-1} + 2.390D - 2.046D*C_t - 0.481D*C_{t-1}$$
$$\quad (3.286) \quad (3.147) \quad (6.874) \quad (4.581) \quad (1.041)$$

where: C and Y are defined above and D is a dummy variable equal to zero for observations prior to deregulation
() = t-statistics   Adjusted R^2 = 0.929
$F_{(5,14)}$ = 50.76   Durbin Watson = 2.128

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The estimated model clearly shows the significance of the structural break in the egg price DGP that occurred with the removal of price control. The negative signs on the slope dummy variables indicate that the coefficients on the input cost terms were lower in the period after the removal of price control. The results from the estimation of equation (6) were subjected to a battery of diagnostic tests to check for mis-specification. This step was an important precondition to using our estimated statistical model as incorrect specifications can give misleading policy inferences (Spanos, 1986).

These quality control tests were as follows:

1) Jarque and Bera (1980) test for normality of the disturbance term. Violation of the assumption of normality can lead to invalid inference testing and disrupts the results of other diagnostic tests.

2) Ramsey's RESET test for general misspecification of the functional form (which is a special case of excluded variable bias). The test consists of augmenting the regression with the predicted values raised to various powers (normally 2 and 3) and testing the significance of the coefficients on these augmenting variables.

3) Rao-Miller test for log-linear versus linear functional form, this being a special case of the general Box-Cox tests. This test had to be carried out on the model without dummy variables as the log of zero (for observations prior to deregulation) is undefined.

4) Breusch Pagan lagrange multiplier test for heteroscedastic disturbances, the presence of which violates the assumptions on the distribution of the error term.

5) Breusch Godfrey lagrange multiplier test for autocorrelation due to AR(p)/MA(q) processes (p=q=1,...,4). As with test 4) the presence of serial correlation in the error violates the assumptions under which the estimator was derived and is often indicative of mis-specification.

6) Tests for parameter constancy (Chow test #2). This criteria was particularly important for this model given that it's function is to test for a structural break. We did not want a specification that exhibited parameter instability across periods expected _a priori_ to be stable. We tested by reserving values for _ex post_ comparison, 4 quarters prior to deregulation and 4 quarters afterwards.

7) Test for the structural break at deregulation. This test was to confirm the findings of the dummy variable analysis. The hypothesis of non-equal parameters across

the deregulation is conditional upon equality of variances, which was tested with a modified Goldfeld-Quandt test.

Table 3: Results of Diagnostic Testing Procedure

Test	Critical Value[a]	Statistic Value	Verdict[b]
Normality	$\chi^2_{(1)}$ = 3.841	0.908	DNR
Ramsey's RESET	$F_{(2,12)}$ = 3.88	0.809	DNR
Rao-Miller	$\chi^2_{(1)}$ = 3.841	0.137	DNR
Breusch Pagan	$\chi^2_{(2)}$ = 5.991	3.805	DNR
Breusch Godfrey			
AR(1)/MA(1)	$\chi^2_{(1)}$ = 3.841	0.662	DNR
AR(2)/MA(2)	$\chi^2_{(2)}$ = 5.991	5.011	DNR
AR(3)/MA(3)	$\chi^2_{(3)}$ = 7.815	8.574	REJECT
AR(4)/MA(4)	$\chi^2_{(4)}$ = 9.488	9.476	DNR
Chow tests (ex post forecast periods)			
1985:1-1986:1	$F_{(4,6)}$ = 4.53	1.920	DNR
1987:2-1987:4	$F_{(3,11)}$ = 3.59	3.253	DNR
Chow test for structural break at deregulation			
	$F_{(3,14)}$ = 3.34	36.885	DNR
Goldfeld-Quandt	$F_{(4,10)}$ = 3.48	1.269	DNR

[a] 5% significance level
[b] DWR = do not reject the model under test

The results of the diagnostic testing procedure were generally favourable for the selected specification. There did appear to be some problem with higher order autocorrelated residuals although the test statistic exceeded the critical value by only a small degree. Current research also suggests that the χ^2 versions of the lagrange multiplier tests reject acceptable models far too often (Kiviet, 1986, quoted in Hendry, 1984). The tests of parameter constancy showed that the model did not generate structural breaks for no apparent reason, so it can be considered a useful instrument for the economic interpretation to which we now turn.

ECONOMIC INTERPRETATION OF THE RESULTS

The dummy variable analysis indicated that two distinctly different data generating processes were operating in the

period prior to and after the removal of price control. The definitions of, and coefficients on, the dummy variables allowed us to derive price determination relationships for the 'deregulation-off' period (1982:4-1986:1) and the 'deregulation-on' period (1986:2-1987:4). These are reported below.

'Deregulation-Off'
$$Y_t = -0.831 + 0.962 \ C_t + 0.905 \ C_{t-1}$$
$$(3.286) \qquad (3.147)$$

'Deregulation-On'
$$Y_t = 1.559 - 1.084 \ C_t + 0.424 \ C_{t-1}$$
$$(2.301) \qquad (0.841)$$

These derived equations support our hypothesis that egg farmers were not able to maintain markup pricing behaviour when the legislative sanctions allowing this were removed. The significance of C_t and C_{t-1} as explanatory variables for egg prices were lower, as were the coefficients on these variables. The continuation of production control prevented simultaneous determination of price and quantity in the deregulated environment, so there should be no bias in a single-equation price determination model. The coefficents for the 'deregulation-on' period indicated that farmers were no longer able to pass cost increases on into egg prices. The removal of price control relegated producers to their traditional position of being in a cost-price squeeze. This is shown by the decline in the ratio of producer prices to retail prices which was 0.74 at the time of deregulation but had fallen to to 0.63 by March 1988.[5] Some of the increased marketing margin was due to fragmentation costs, notably in cartoning but most appeared to be due to changed margins by retailers, 60% of whom reported this behaviour when surveyed in August 1987 (Gibson, 1988).

The return to price taker status appears to be due to the inability of producers to maintain a national cartel of sufficient strength to allow them to pass on cost increases. In the deregulated environment the responsiblity for surplus production was borne only by a limited subset of producers, rather than equalised across all producers by Poultry Board levies, or passed on to consumers in the disposal costs for the previously "allowable" surplus of 5 million dozen eggs. If markets were competitive the end of this cross-subsidisation would have produced retail price declines and/or producer cost increases (in the form of levies for surplus disposal) in surplus production areas. The varying regional rates of return for egg production would then have driven production relocation to more profitable (egg deficit) regions. In fact markets did not appear to be behaving competitively.

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5 Based on Canterbury figures as national ones were no longer available.

Producer Response

The removal of the institutional mechanism which had allowed price making behaviour led producers to seek other mechanisms to maintain this favourable position. These responses were: market sharing agreements; price discrimination; and increased producer control of egg distribution.

Market Sharing Agreements

After the inital battle for market share in the lower North Island and upper South Island a market sharing arrangement was reached in the Wellington market, which was the largest single egg-deficit area. The Canterbury egg floor became horizontally integrated by assuming majority shareholding in, and management of, the Wellington egg floor. This enabled Canterbury producers to maintain their 30% market share and they also reached an agreement with Oamaru producers for partioning of the Wellington market. In May, 1988 the Wellington egg floor was closed with the market requirements being met in the export regions of Canterbury, Palmerston North and Hastings.

Price Discrimination

It appears that a second type of producer response to the loss of their favoured position was price discrimination by producer-controlled egg floors in surplus production areas. Suggestive evidence of this came from the cummulative percentage retail price change in the 19 market centres surveyed by the Department of Statistics. We obtained values for 6 monthly periods after the April 1, 1986 removal of price control. Regional prices were largely equal under price control so percentage changes from that base should equate closely to price level changes. Market centres within regions which were surplus production areas are identified by an *. The measure of overproduction used was the ratio of egg receipts to sales by licenced egg floors for the 33 months prior to deregulation.

Table 4: Market Centres With Greatest % Increases in Egg
Price Index Since Removal of Price Control

Rank	October 1986	April 1987	October 1987	April 1988
1	Greymouth	Greymouth	Greymouth	Greymouth
2	Chch***	Tauranga***	Tauranga***	Gisborne***
3	Tauranga***	Chch***	P.N.**	Masterton***
4	P.N.**	Wanganui**	Masterton***	Tauranga***
5	Nelson*	P.N.**	Wellington	Chch***

P.N. = Palmerston North
Wanganui & Palmerston North are supplied by same egg floor.
  * 0 to 10% overproduction
 ** 11 to 20% overproduction
*** > 21% overproduction
Source: Department of Statistics, INFOS Series CPIM.SE+23A

It is not surprising that Greymouth was the market centre
with the greatest increase in price; indeed economic theory
would predict this. Greymouth has a large regional deficit
and is some distance from alternative supplies. What is
surprising is the presence of significant surplus production
areas amongst those market centres recording the greatest
price increases. For the first year of the policy reform
period, four out of the five markets with the highest egg
price increases were areas of significant surplus
production. For egg producers in these areas to sell eggs
in other cities, where prices were lower, price
discrimination was required. This analysis suggests that
egg producers in surplus areas prefered to use their home
market power to share the costs of surplus production with
captive consumers, rather than go out of business as
production relocated to deficit areas. Canterbury provided
the most graphic example of this with negligible movement of
hen quotas out of the area despite its chronic oversupply
and the high quota prices being paid by producers in egg
deficit areas.

Increased Producer Control

The third form of producer response to the removal of
legislative sanction was an increased control of egg
marketing floors as exploitation of distributor market power
was seen as an attractive alternative to farm-level
adjustment. Many of the egg floors were co-operatively
owned at the time of deregulation, however of these, several
were controlled by dairy farmers. Table 5, which details
ownership changes in egg floors shows the two major trends
to be the replacement of private control with co-operative
control and the replacement of dairy producer control with
egg producer control.

Table 5:   Changes in Egg Floor Control Since Deregulation

Egg Floor	Control At 1.4.86	Control At 1.6.88
Whangarei	Private	Producer co-op
Auckland	Private & Co-op Floor	Merger, 50:50 control
Hamilton	Private	Private
Tauranga	Private	Private
New Plymouth	Egg producer co-op	Egg producer co-op
Gisborne	Dairy co-op	Egg producer co-op
Hastings	Dairy dominated co-op	Dairy dominated co-op
Palmerston N	Dairy co-op	Egg producer co-op
Wanganui	Dairy co-op	Egg producer co-op
Masterton	Dairy co-op	Closed down
Wellington[a]	Dairy co-op	Egg producer co-op
Nelson	Dairy co-op	Egg producer co-op
Canterbury	Egg producer co-op	Egg producer co-op
Dunedin	Private	Private
Invercargill	Egg producer co-op	Egg producer co-op

[a] Floor due to close at time of writing
Source: Mitchell (1988)

Implications For Agricultural Incomes

Our analysis of the inability of New Zealand egg producers
to continue markup pricing once legislative sanction was
removed has several implications for the proponents of
schemes to enhance agricultural income.   Farmers in many
countries are currently faced with a decline in state-
generated income supports, with the result being
characterised as a 'farm crisis'.   Out of this has arisen
many populist schemes for maintaining rural incomes, most of
which have as their rationale, a desire "for farmers returns
on equity and labour to be on par with the rest of the
economy" (Harkin, 1987).   Our research has shown that supply
control, producer controlled marketing and exploitation of
market power by producer groups are not **sufficient**
conditions for farmers to price in a manner similar to the
industrial sector of the economy.[6]

It is difficult to control the behaviour of free-riders in
agricultural cartel-forming attempts. Piggot (1981) has
shown that for commodities with low demand elasticities,
where non co-operators are of equal, or larger size, than
co-operators, the greatest gains from voluntary supply
restriction accrued to non co-operators. The egg industry,
post-April 1, 1986 could be considered as a compulsory
cartel with regulatory legitimation of supply restriction.

6 Those conditions are of course **necessary** to minimise the
   fiscal impact of programs that aim to guarantee rural
   incomes through setting above-equilibrium prices.

However, within this overall structure there existed differential degrees of market power and supply imbalances. Market share arrangements on a national basis, comparable to the previously exclusive marketing areas, were not able to be established due to the magnitude of transaction costs, and the inability of some regions, notably Canterbury, to expel excess producers from the industry and equalise regional profit opportunities by relocating production. The result was interpenetration of markets, and a breaking away of some individuals from co-operatives, all of which acted to depress producer payouts. Whilst this was occuring retail institutions were able to exploit distributor competition and adjust the margin on eggs to a level more similar to that on other perishables (Gibson, 1988). The net result was a breakdown in the ability of producers to act as price makers.

CONCLUSIONS

This study tested the hypothesis that the removal of price control forced farmers to return to price taker status with respect to input costs and marketing services. The recent deregulation of the New Zealand egg industry was used to test the predictions of the hypothesis. We used an econometric methodology of explicitly testing implied theoretical restrictions in our model discovery process. A distributed lag model was selected as the best approximation of the data generating process and was evaluated with a series of diagnostic tests. The selected model and evaluatory test results provided strong evidence to suggest that during the period of regulation egg producers followed a markup pricing strategy.

This price determination mechanism appeared to break down after the removal of price control with input cost increases having a negative relationship to egg prices. This return to price taker status occured despite the continuation of supply control and the presence of a largely producer controlled distribution sector. Producers appeared to react to the loss of their price maker status by increasing their control of the distribution sector, discrimination pricing and market sharing agreements.

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ADJUSTMENTS IN THE KIWIFRUIT INDUSTRY [A]

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SUMMARY

Excess demand, government assistance and high returns have encouraged a large planting and production response of kiwifruit both in New Zealand and overseas. With increasing supplies the status of kiwifruit is evolving from an exotic to a normal good which has made demand increasingly elastic and lowered market returns.

With economic rents dissipating, the industry is quickly entering a mature phase with a substantial rationalisation needed to survive in a competitive market place. In addition to detailing the market dynamics the paper discusses possible areas of the industry in which adjustments may occur.

Keywords: supply and demand, kiwifruit, horticulture and marketing.

Introduction

A key feature of New Zealand's horticultural sector during the 1970's and early 1980's has been the rapid development of the kiwifruit industry. This industry expanded in response to economic stimulus from high overseas returns to the fruit, and it is only very recently that signs of financial difficulties and an end to the expansion are appearing.

Most new products are characterised by the classic "product development" cycle, with its three phases of inception, development and maturity. Initially, production was limited, and high market returns stimulated a large acreage response. Increasing overseas demand kept returns high, accentuating the planting boom and returning economic rents to early owners of the factors of production. Thus, kiwifruit showed all the features of the inception and development stages of a new industry, with rapid growth, outward shifting demand curves and disequilibrium product and factor values.

Excess demand now appears to have been eliminated in overseas markets, and grower returns have fallen. This has placed many New Zealand growers under financial pressure and caused a cessation of the acreage response. Despite this levelling of the planted area, domestic output will continue to rise because of the lags between planting and maximum production.

Additionally, rapidly expanding overseas production will accentuate problems of supply and add to New Zealand's "problem". Market competition has hastened the domestic kiwifruit industry into the maturity phase of the product development cycle.

The objective of this paper is to document and discuss the dynamics and time path of the industry from the development phase through to its emerging maturity. This is achieved by analysing the acreage response and the changing nature of the demand curves in overseas markets. Responses of growers to these changes are highlighted. Impacts of current and past government policies on the industry development are also discussed, with particular reference to the effects of policy changes upon the industry dynamics.

DYNAMICS

Supply

New Zealand

The kiwifruit crop takes 5 to 8 years to achieve maturity. Thus aggregate supply in time t will depend on the mature and immature areas planted in kiwifruit (A_t). It is likely that area planted in kiwifruit will be influenced by expected future prices (Labys, 1973). Since kiwifruit is a capital and labour intensive crop the level of inputs used (X_t) will influence output. In addition, the prevailing environmental conditions in the crop year (W_t) will also affect yields and export percentages. This supply relationship takes the form:

$$Q_t = f(A_t, X_t, W_t, E_t) \tag{1}$$

where t is time measure in years and Et is a random error term. Observations of yearly values of Wt and Xt were not available and are thus treated as endogenous variables[1]. The sheer size of the acreage increase suggests that total acreage has influenced aggregate New Zealand production more than variation in input levels. In addition producer objectives have been aimed at achieving high volumes and quality of production, so cost constraints have not heretofore been a serious problem. As a consequence, the initial development of the kiwifruit industry can be characterised by an acreage response rather than a supply (variable input) response per se. Consequently equation 1 was simplified to:

$$Q_t = f(A_t, E_t) \tag{2}$$

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[1] A biennial pattern in yields has been observed, which is in part weather dependent and partly dependent of previous years yield. This study assumes average annual yields and thus does not account for this biennial phenomenon.

New Zealand area in kiwifruit has increased substantially since the early 1970's. The annual variation (in proportionate change per annum) in planted acreage (δ_t) is assumed to be a function of expected prices (P*):

$$\delta_t = f(P*, E_t) \tag{3}$$

where $_t$ is measured as:

$$\delta_t = (A_t - A_{t-1})/A_{t-1} \tag{4}$$

Total area in kiwifruit in a given year can be estimated as:

$$A_t = (1 + \delta_t) * A_{t-1} \tag{5}$$

The relationship between A_t and Q_t will be determined by the age distribution of planted kiwifruit vines, as output per hectare (Y) increases with vine age. Total export production can be estimated by multiplying the area of vines in each age group by the average export yield for the age of vines and summed across all age groups

$$Q_t = \sum_{i=k}^{\infty} (Y_i * A_{t-i}) \tag{6}$$

where t is time measured in years:

    i is the age of vines:
    Q_t is the average exportable production in a given year:
    k is the age in which vines become productive;
    Y_i is the potential exportable yield of vine at age i;
    A_t is the hectares of vines planted of a given age;

Actual export production rose from 1,600 tonnes in 1975 to 162,000 tonnes in 1987. Mean forecasts of Q from equation 6 for the period 1973-1987 differed from observed values by an absolute average of 9.5 percent. Some of this error is caused by the biennial nature of vine production.

As hypothesized in equation 3, the yearly change in hectares planted in kiwifruit (δ) is a function of expected future prices (P*). Price expectations were found by search technique to be indicated by a weighted average of the previous three years crop prices. This expected price figure is deflated by an input price index to give a measure of real returns to the crop. Data on P* was available for 1975-1986. In addition to the price expectations variable , a variable was added to the equation to account for the sizeable effect of tax incentives on planting rates. The development tax incentives (D) were specified as a dummy variable with values of 1 for the period 1978-1982 and 0 otherwise. This modified version of equation 3 was formally estimated using ordinary least squares (standard errors of the regression coefficients are in parenthesis):

$$_t = -0.481 + 0.633 * P* + 0.180 * D \qquad R^2 = .92 \tag{7}$$
$$\quad (0.095) \ (0.085) \qquad (0.038)$$

Results from this estimation indicate that:

Expected real prices had a strong positive correlation with changes in production area (the acreage response was very elastic);

Development tax incentives had a statistically significant influence on planting rates (see figure 1);

Acreage equilibrium would occur at a grower price of approximately $7.15 per tray (1988 nominal dollars).

Changes in planted area were forecast using equation 7. Given that price forecasts are below equalibrium levels, the model predicted that there would be vine removals over the next 3-4 years. It is beyond the scope of this paper to estimate the age and regional distribution of any removals. Further, the removal of vines is not a costless excercise, and asset regidity is such that limited actual removal may take place.

World Situation

Large planting responses have been evidenced in the U.S., France, Italy, Chile and Japan (see table 1). The increase in acreage in these countries have also been in response to the favorable market returns, and in the case of EEC countries, development and marketing subsidies. The result of planting increases elsewhere is that world supplies will continue to grow at a fast rate and that New Zealand's share of world production and exports will contract. Increases of supplies in Northern hemisphere countries will serve to broaden the seasonal distribution of kiwifruit and provide some direct competition at the beginning and end of the New Zealand marketing season. Other Southern hemisphere exports will compete directly with New Zealand supplies. In 1987 world production totalled 379,000 tonnes, of which New Zealand share was roughly 50%. World production is expected to increase to 1,200,000 tonnes by 1995, with New Zealand share falling to 25%. While New Zealand production will be nearly maximised by 1991, world production is forecast to expand well beyond that given the recent nature of many overseas plantings (see figure 2) and the large lag between planting and full production.
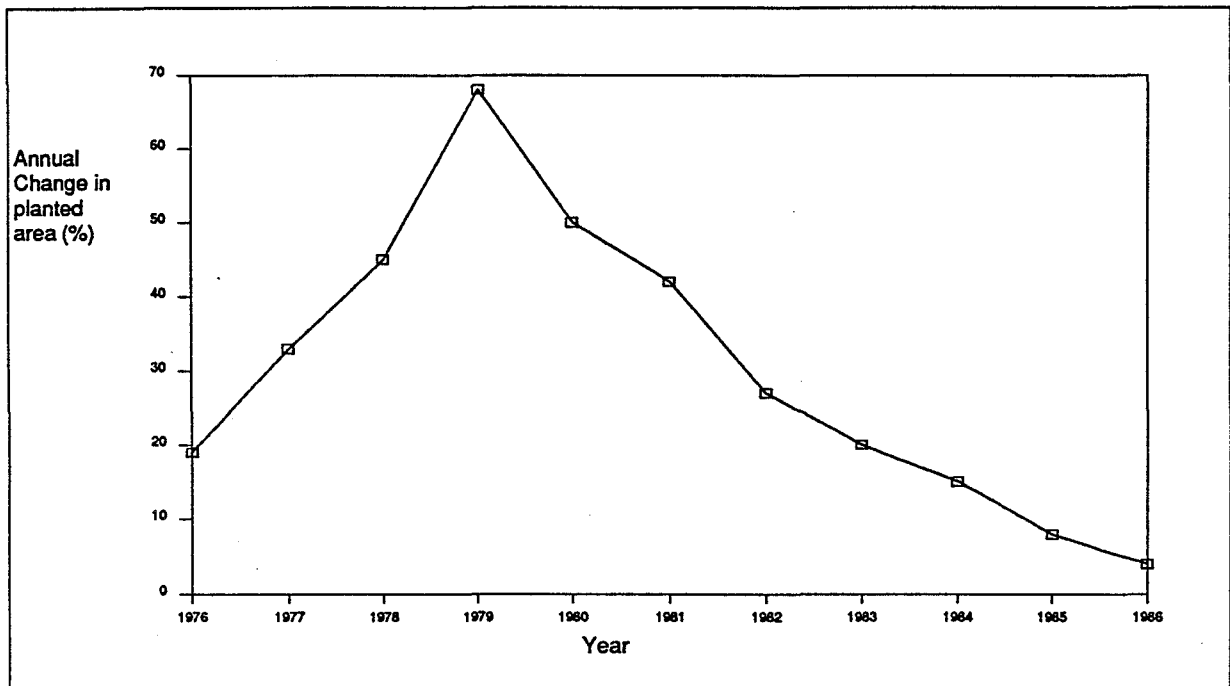
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Figure 1: Area Response in New Zealand
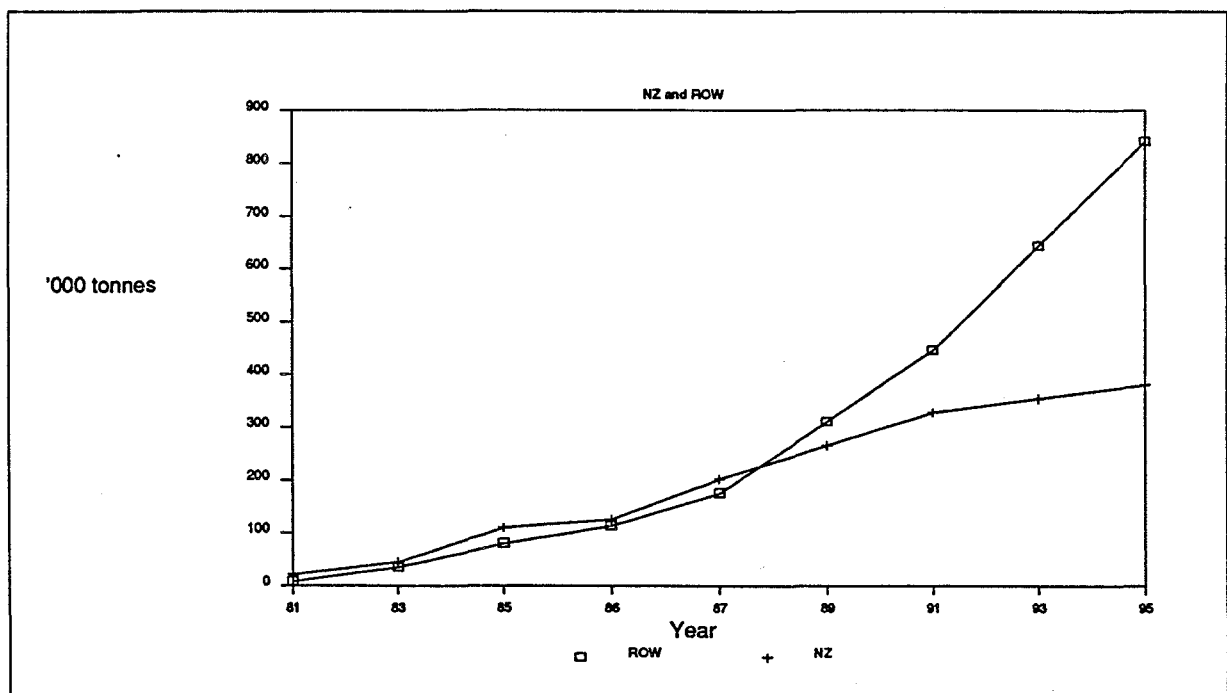

Figure 2: Production of Kiwifruit

Table 1: Area in Kiwifruit by Country (hectares)

	1980	1985	1990
New Zealand	5,500	16,000	17,000
Italy	1,200	6,000	15,000
France		3,200	6,400
United States of America		3,000	3,800
Chile		2,500	20,000
Australia		1,200	2,000
Japan		3,300	4,000
Total for above countries		35,200	68,200

Source: New Zealand Kiwifruit Authority

Demand

Consumer theory suggests that own price, personal income, price of substitute goods, and individual tastes and preferences can influence demand and thus market prices (Koutsoyiannis, 1983). The relative importance of these factors in determining kiwifruit demand is considered. Given the infancy of kiwifruit markets and the unique market position of the fruit, some of these variables may have more influence than others. Kiwifruit has been sold as an exotic fruit in most export markets, with associated high income and low price elasticities of demand and little substitution effect (uniqueness). Wider distribution and promotion of the product has increased consumer awareness, preference and demand for the fruit. Given the large increases in expected supply, consumption of kiwifruit is being pushed to greater volumes in order to clear markets from excess supply. Further, consumption in main markets is now occurring on a year round basis. These may well cause the status of kiwifruit to evolve from an exotic, occasional purchase to one of a more everyday or normal good status. These trends would suggest that:

1 Excess demand will be eliminated in foreign markets causing market prices to decline;

2 Income elasticity of kiwifruit will decrease with time;

3 The price of kiwifruit relative to other substitutes will become more important;

4 With increasing supplies and competition from foreign producers, export price elasticity will increase.

The above hypothesis suggest that the demand curve for New Zealand kiwifruit is stabilising and also changing slope.

Figure 3 contains schedules of real foreign prices (per kilogram) plotted against New Zealand export volumes (tonnes) to Japan, West Germany and a residual category (ROW) for the period 1976-1987. Early in the sample period there was a rather inconsistent relationship between price and quantity, probably due to market establishment.

However, as export volumes increased to over 10,000 tonnes in each market, this relationship does appear to be taking a more "conventional" form, that of a negative relationship between quantity and price. The small negative slope of the curves in figure 3 suggest a rather elastic relationship between price and volume.

It is probable that the plots in figure 3 are not in fact the demand curve for each market but instead a locus of equilibrium points between successive supply and demand curves. It is known that NZ (and foreign) supply is increasing rapidly, fuelled in part by past price expectations. It is likely that market demand curves are also shifting outward. This would be caused by increases in consumer preference for the fruit and increases in disposable income. However as the consumption of kiwifruit becomes more dispersed (preferences become established) the demand curve may become stabilised or subject to much smaller shifts. Movements will be more along one demand curve rather than between curves. Figure 4 depicts a hypothetical relationship of kiwifruit supply and demand over time. Large shifts between supply curves and decreasing shifts between demand curves could be a possible explanation of the concave shape of plots shown in figure 3. Growth in demand was enough to increase real prices early in the sample period, despite increases in supply. But as much larger quantities were sold on the markets, the trend in prices is downward as depicted by the locus of short run equilibrium points in figure 4.

Price Equation

Estimation of an equation to explain real foreign export price movements for New Zealand kiwifruit was constrained by three major factors. Foremost is the apparent instability of the emerging world market for kiwifruit with both demand and supply schedules changing with time, a problem of identification exists. Second, a small number of annual observations (13) on export prices were available, severely limiting the number of explanatory variables able to be employed. A third problem was the appropriate definition of an exchange rate for a given year. The annual exchange rate, as defined here, is an average over the statistical year (July through June). However, it is possible that export sales are converted into NZ currency at only a few periods thus there is a potential large measurement error in converting New Zealand price into foreign currency equivalents. With these difficulties in mind, a model of price determination was formulated. Export prices (P), are assumed to be a function of quantity exported (Q) and a trend variable (T) which is intended to capture increases in demand as well as income effects (T=1 for 1975 and T=13 for 1987). Thus, the model for a given market is expressed as:

$$P_{ti} = f(Q_{ti}, T_t, e_{ti}) \qquad (8)$$

where t is time in years and i is the export market (Japan, Germany, and ROW) and e is an random error term. It was expected that quantity will have a negative effect on price and while the trend variable will have a positive influence on price.

Estimates of equation 8 were obtained for each of the three separate markets. A log-linear functional form provided the satisfactory regression estimates. Specifically, the equation estimated was:

$$P_{ti} = b0 * Q_{ti}{}^{b1} * T_t{}^{b2} * e_{ti} \qquad (9)$$

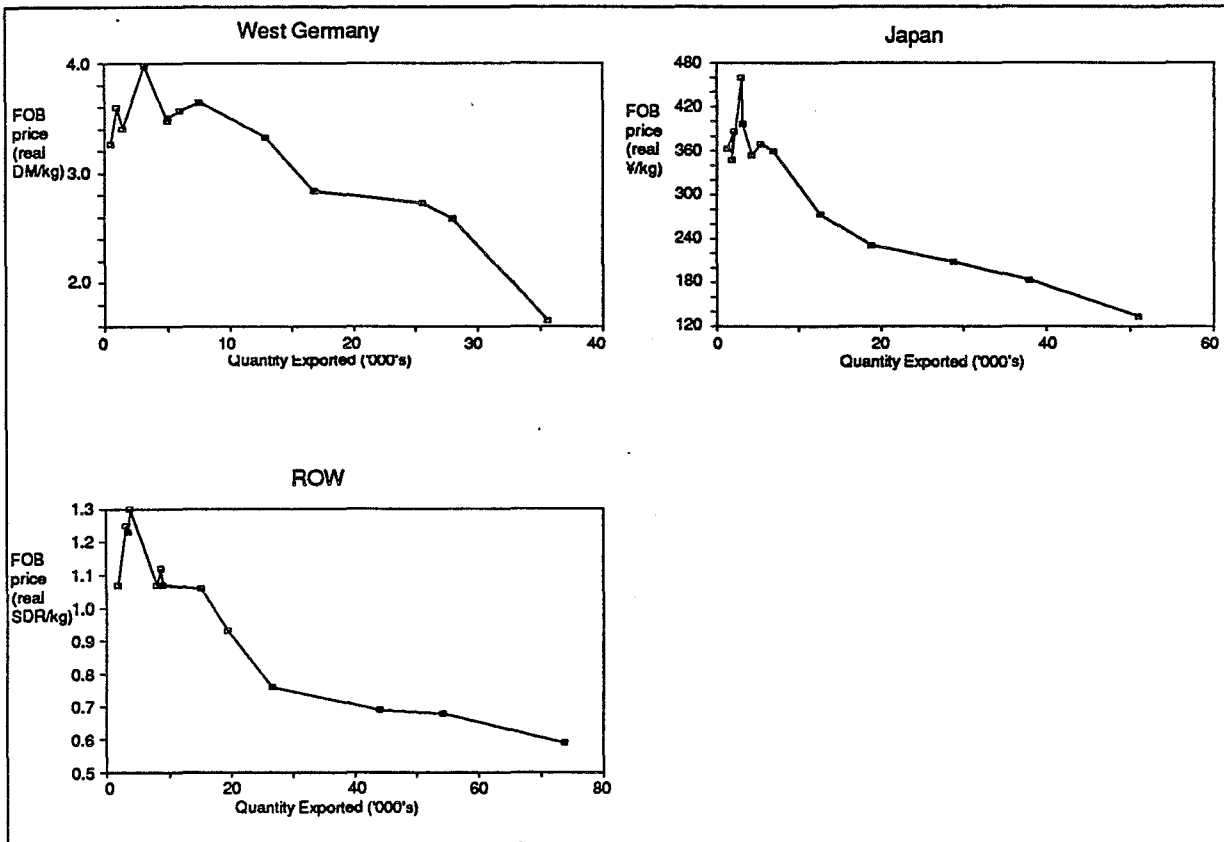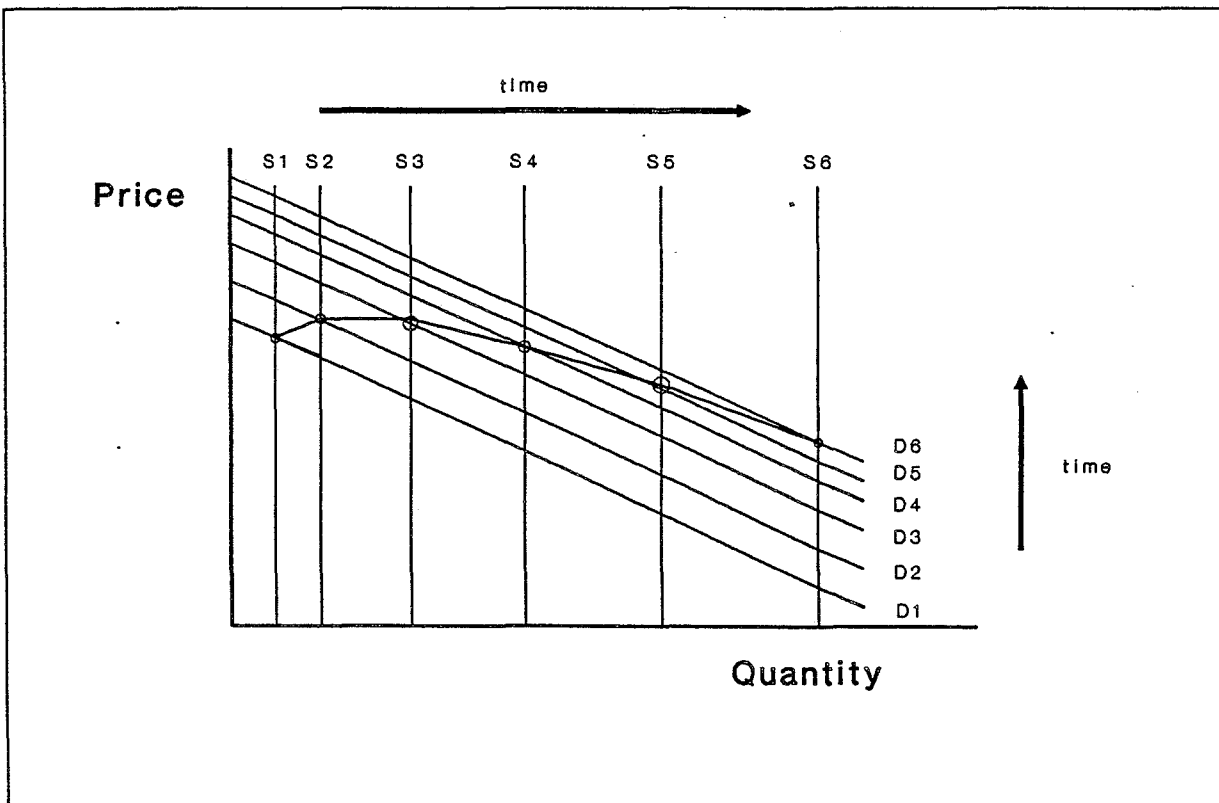## Figure 3: Price-Volume Schedule for New Zealand Export Markets

Figure 4: Hypothesized Trends in New Zealand Kiwifruit Supply and Demand Over Time

Results from the regression estimates are given in table 3. All the regression parameters were of expected sign with quantity having a negative relationship with price and trend a positive relationship. All parameters were significant from zero at a 95 percent confidence level. Estimates of price elasticity are taken from the inverse of b1 coefficients and range between -2.0 and -2.5, suggesting an elastic demand for New Zealand exports.

Table 2: Econometric Estimates of Demand Parameters by Market

(dependant variable = real foreign price)

	Constant	Quantity	Trend	R2	Own-Price Elasticity
Germany	4.180*	-0.488*	0.691*	.65	-2.05
Japan	9.170*	-0.461*	0.345*	.92	-2.17
ROW	3.104*	-0.398*	0.331*	.96	-2.51

* Statistically significant at a 95 percent confidence level

Tests were made to ascertain the changes in demand elasticity and demand shifts over time. Results indicate that demand is becoming more elastic with time. This suggests that kiwifruit is evolving towards a commodity status on world markets, and that New Zealand exporters are increasingly becoming price takers. Similarly tests on the trend variable suggest that preference/income induced shifts in demand are declining, which is consistent with the hypothesis of a stabilising demand curve. Anecdotal evidence of an increasing cross-price elasticity emerged from 1987 marketing season as the large Northern hemisphere summer fruit crop was believed to have a depressing effect on export prices received for New Zealand kiwifruit. These developments indicate that kiwifruit is losing its unique consumer status and buoyant demand in overseas markets, and as a consequence, obtaining the salient characteristics of a "normal" good in accord with microeconomic theory.

Grower Returns

Further evidence of the rapid maturation of the kiwifruit industry can be gained from a review of orchard cash budgets over time. A combination of falling returns and rising costs have served to dissipate rents quickly from the industry. Cash margins for a typical orchard fell from $5.13 per tray produced in 1982 to $2.45 in 1985 and $0.72 in 1987 (table 3). A forecast cash budget for the current 1988 crop are also given (the returns figure may be optimistic). Returns for the 1987 crop were insufficient to cover total costs for approximately 90% of the industry (MAF, 1988). At present, cash income needs to exceed $7.00 per tray if economic rents are to be gained from a typical orchard.

Table 3: Kiwifruit Orchard Budgets

(values on a per tray basis)
crop year

	1982	1985	1987	1988*	% change 1982-87
Cash Income	$9.63	$8.17	$6.76	$8.52	-29.80%
levy	0.30	0.38	0.44	0.40	46.67%
coolstore	0.61	0.70	0.90	0.82	47.54%
Net Cash Income	8.72	7.09	5.42	7.30	-37.84%
Wages	0.52	0.95	0.90	0.96	
Chemicals	0.14	0.18	0.17	0.23	
Fertiliser	0.07	0.13	0.25	0.16	
Grading & Packing	2.21	2.37	2.45	2.50	
Pollination	0.04	0.11	0.16	0.20	
Vehicles	0.16	0.25	0.19	0.25	
Repairs	0.25	0.22	0.20	0.19	
Administration	0.12	0.25	0.31	0.40	
Other	0.07	0.18	0.07	0.05	
Cash Cost	3.59	4.64	4.70	4.94	31.01%
Gross Margin	5.13	2.45	0.72	2.36	-85.97%

Source: MAF, Tauranga

* MAFTech estimates

Grower cash returns fell by over 37 percent from 1982 to 1987, mainly due to the large increase in exports for the same period. Cash expenses have risen by about 30 percent, a rate of increase that is less than the prevailing cost inflation rate of 44 percent for the same period. This indicates that real production costs have declined, probably due in part to increases in orchard productivity over the sample period. Of the costs listed in table 3, a large proportion relate to marketing activities, including coolstore, levy and grading and packing costs. Labour represents the other significant cost factor.

Land Values

Practical measurement of the relationship between income streams and asset values are complicated by a number of policy distortions and measurement difficulties. A study by Seed et al (1986) found that real New Zealand farm land prices were positively related to both expected net income and expected rates of inflation. It appears that kiwifruit orchard land values have exhibited some of the same patterns over time. Valuation Department data from Tauranga County indicate that real orchard prices, have generally followed the general downward trend in cash incomes of kiwifruit growers (table 4). From 1981 real orchard values have tracked downwards from $65,000 to $38,000 per hectare. Exceptions to this trend were 1983 and 1987. A plausible

explanation for these abberations is the lagged response to increases in kiwifruit returns in 1982 and 1986.

The sharp decline in orchard returns in 1987 appears to have had a pronounced effect on land values. Anecdotal evidence for 1988 indicates that mature orchards are selling (some are passed on at auctions) for between $20,000 and $30,000 per hectare (nominal dollars), down as much as 50 percent from 1987 values.

Table 4: Horticultural Land Prices - Tauranga

Year	Sale Numbers	Producing Units Nominal Value/ha	Real Value*	Real Gross* Margin/tray
1980	36	$44,305	$61,620	
1981	81	54,848	65,295	
1982	39	59,371	62,893	$5.43
1983	36	72,965	74,303	3.15
1984	49	63,881	61,483	3.68
1985	36	49,586	41,599	2.06
1986	42	44,099	33,207	3.57
1987	88	57,382	38,153	0.48

* Deflated by Consumer Price Index (4/83 = 100)

Source: Valuation New Zealand, MAF Tauranga

Price Forecasts

Given current orchard area and productivity levels, New Zealand's export supply is expected to rise from a current level of 160,000 tonnes to 260,000 tonnes in 1991 and 300,000 by 1995 (NZKA, 1988). These exports will be competing with 2,500, 28,000 and 215,000 tonnes from Chile for the same years. With an elastic demand curve this implies that real returns will continue to fall.

Forecasts of grower returns[2] were made using the estimated equations listed in table 2. Conversion of real foreign FOB values to domestic nominal equivalents were made using MAF macroeconomic assumptions (MAFCorp, 1988, Smith, 1987). These indicate low foreign inflation rates and a slight weakening of the dollar against foreign currencies. A market margin of 40% was used to convert FOB values to farmgate returns (New Zealand Kiwifruit Report, 15.5.87).

Nominal grower prices for 1988 are forecast at approximately $6.60/tray, due in part to a small increase in export volume from 1987 (table 5). Increasing export volumes through 1991 are forecast to depress returns to approximately $5.30. Forecasts do not explicitly include the influence of expected exports from Chile or Northern hemisphere summer fruits (substitutes) on prices, and thus may be

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[2]Forecast of grower returns are net incomes and should not be exactly compared with the returns listed in table 4, which are actual cash incomes.

optimistic.

Table 5:   Econometric Forecast of Net Orchard Income

Year	Exports (tonnes)	Return (per tray)
1988	175,000p	$6.59
1989	228,000f	$5.85
1990	245,000f	$5.60
1991	263,000f	$5.27

p = Preliminary
f = Forecast

Government Policy

Previous New Zealand Governments made a number of development schemes available which hastened the growth phase of the kiwifruit industry, particularly during the boom period from 1978-1982 (see Nickel, 1984b). Tax concessions against current incomes encouraged speculative capital and orchard development expenditures. These were eliminated after 1982. Equation 7 above showed the presence of these subsidies significantly influenced planting rates during the 1978-1982 period. Interest concessions from the Rural Bank artificially lowered capital costs, thus raising perceived rents available to kiwifruit investment. Export tax incentives encouraged (currently 7) an objective of maximising export volumes. Managed exchange rates served to reduce exporters' risks. These support mechanisms were partly offset on the cost side by the high tariffs/protection rates which affected important inputs such as packing materials, sprays, and equipment. Estimates of effective rates of assistance (ERA's) to kiwifruit by Nickel (1984a), confirmed the presence of large subsidies. ERA's were over 50% from 1978/79-1981/82 and nearly 30% for 1982/83. The assistance measures were instrumental in fostering the development boom in kiwifruit during these years.

The economic liberalisation instituted by the present Government have eliminated or reversed many of the prevailing subsidies and/or cost distortions formally present. Concessional interest rates are being phased out, and, coupled with an anti-inflationary monetary policy, have raised capital costs significantly, contributing to the current cost-price squeeze. Import duties have been lowered, but with only marginal effects on the cost side as of yet. The devaluation and then floating of the dollar appears to have been of significant benefit to the returns of the industry with the kiwi dollar depreciating against major currencies in which the fruit is traded (Yen, Deutchmarks, Francs). A kiwifruit trade weighted exchange rate is shown in table 6, along with changes in grower returns. Currency movements appear to have helped earnings in 1984, 1985 and 1986 and have had only a small negative impact in 1987.

European Community policies have promoted kiwifruit development, particularly in France and Italy. Marketing and orchard development subsidies and interest rate concessions for kiwifruit are currently available. One of these subsidies is geared towards replacing surplus commodities, such as wine grapes, with higher income crops such as

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kiwifruit. European producers also receive assistance in the form of import tariff and non-tariff barriers. A real possibility of a reference price system exists, particularly when Community production reaches sizeable volumes.

Table 6: Kiwifruit Exchange Rates and Returns

Year	Kiwifruit Trade Weighted exchange rate	Net Returns to Growers
	(% change from previous year)	
1984-85	-17.89%	21.68%
1985-86	-8.52%	-18.39%
1986-87	-15.69%	37.89%
1987-88	2.96%	-39.63%

ADJUSTMENTS

Debt/Equity

Estimates of the debt load and growers' perceptions of their financial difficulty can be seen from the following table, taken from the MAFTech/NZKA grower survey;

Table 7: Perceptions of Financial Difficulty (% of Growers)

Equity%	Severe	Moderate	Minor	None	Total
<0	4.1	2.0	0.3	2.0	8.4
0-25	3.1	2.4	1.0	2.0	8.5
25-50	3.1	8.1	1.7	5.4	18.3
50-75	2.7	9.5	3.4	10.2	25.8
>75	2.4	7.8	9.2	19.7	39.1
Total	15.4	29.8	15.6	39.3	

Source: MAFTech/NZKA Survey, 1988

Some 35 percent of kiwifruit growers have less than 50 percent equity as of November 1987. Of this total 8.4 percent have negative equity.

Fifteen point four percent of growers consider themselves in "severe" financial difficulty, while 39.3 percent consider they have no financial difficulty. We can only salute the 2 percent of growers with negative equity who consider they have no financial problems, and wonder about the 2.4 percent with greater than 75 percent equity and "severe" financial problems! A Chi square test on table 7 indicate that grower perceptions of financial status were not independant of actual situation, but only at a 90 percent confidence level.

Since this survey was conducted in November 1987, it is probable that the estimate of current market values of kiwifruit units of $30,064/ha used to base the equity levels upon would have, in fact, decreased. This is likely to accentuate the degree of financial difficulty from the above table, and effectively move many growers to a lower equity

position.

From the same MAFTech/NZKA grower survey we are able to obtain an estimate of some $732 million as the national debt exposure of kiwifruit growers[3]. Government or quasi-government agencies (the Rural Bank, DFC and the BNZ) hold some $283 million (39%) of that debt, with much of it in second and subsequent mortgages, term loans and overdraft. Private sources, at $128 million, is the next largest category.

As market prices are forecast to decline, many growers will have increased difficulty in servicing debt, swelling the number of growers in "severe" financial difficulty. Even though market interest rates are tracking downwards, the cumulative debt load of growers continues to grow. Currently lending institutions appear to be taking a "wait and see" attitude towards orchards and 1988 returns. If debt load continues to grow, lenders options will be restricted to such possibilities as foreclosing, reducing interest, equity sharing and debt write-off (parking). It is not clear at this stage how financial institutions will respond to their exposure in the kiwifruit industry.

Changes in Net Returns

Given the current outlook of falling market prices and stable/rising production costs, it is opportune to look at means of improving net returns to growers. With the industry driven by export earnings, production objectives have been to maximise quality of fruit, rather than total output. Previous excess profits from production and marketing have cushioned growers and exporters from the need to adopt a least-cost production strategy, thus it is likely that the industry is not at the lowest point of its average cost curve (optimum competitive production strategy). Gains in efficiency are imperative to survival, particularly when the Chileans are producing fruit for approximately NZ$0.75/kg (NZKA, 1988) whereas a similar figure for New Zealand would be approximately $2.30/kg (FOB value less commission). A number of options are available for increasing net returns to growers. These options include:

Increase Returns

1   the Coopers and Lybrand Study (NZKA, 1988 Section 8.5) recommended "... substantially increased demand for kiwifruit at prices that will provide economic returns for competitive growers". It can be assumed that this statement is calling for a major promotional exercise to move the "overseas" demand curve outwards and/or to create a seperate demand curve for New Zealand kiwifruit by means of a brand promotion (differentiation). Either option will involve substantial effort and cost. The differentiation approach would require New Zealand exporters to maintain a distinct quality and service image and that the market be willing to pay for the New Zealand "difference". We note from the industry marketing review (NZKA, 1988) that the Dole Corporation may manage some 30 percent of expected Chilean production. Given the international marketing expertise of this

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[3]Some of this debt pertains to non-kiwifruit operations.

company, it will be increasingly difficult for New Zealand to create and/or maintain a unique brand image as Chilean supplies enter the market in large volumes.

While past promotional activities may have helped stimulate foreign demand and maintain market returns, it behoves operators to be cognisant of the changing nature of our competitors supply. Promotion is not a costless exercise, and has an elasticity response value and faces diminishing marginal returns. Not only is the kiwifruit demand curve becoming harder to move outwards, but the potential to capture the economic benefits solely for New Zealand producers must be diminishing as competing supplies are placed on the market. There is no doubt of the desirability of establishing and promoting a New Zealand kiwifruit brand image, but a clear accounting of the methods, costs and benefits must be made;

Reduce Off-Farm Costs

2   reduce domestic marketing and packaging related costs. This could be achieved in three areas: grading and packaging, coolstore and exporter commissions. Grading and packing costs are currently at $2.40-2.80/tray (MAF) and represent at least 50% of on-orchard costs. Of these costs at least $1.50 is materials with the remainder for labour. A number of lower cost alternative are available to the domestically produced wooden trays, used almost exclusively for exporting. These include cartons, polystyrene and inexpensive imported trays. The latter option has been uneconomic due to high tariffs on imported packing materials. (Using bulk rather than highly packaged materials may lower returns however and is not necessarily compatible with the brand differentiation approach discussed above.) Coolstore costs are currently 0.85-0.90c per tray and could be reduced by increasing efficiency/scope of the storage operations. Exporter commissions are on a cost-plus (10% of FOB returns) basis. There appears to be room for considerable cost savings if export operations are rationalised. The wide differential in 1987 returns from various exporters indicates the possibility for increasing marketing/cost efficiency;

Reduce On-Farm Costs

3   labour costs are a considerable proportion of kiwifruit production costs. Casual labour involved with grading, packaging, and harvesting costs are in excess of $1.20 per tray. Additionally, other production and consulting services cost growers up to $1.00/tray. Obviously, flexibility in adjustments to both skilled and unskilled labour costs would benefit growers. However, this raises an equity issue which is beyond the scope of this paper;

4   another option to improve returns is for growers to utilise available contract services. These services can be used for orchard management and/or harvesting. The size and efficiency of these services may allow owner-operator orchards to reduce costs while at the same time freeing up labour to gain off-farm or other income;

5   the existence of a number of large size syndicated and corporate
     orchards, suggests that increasing the size/scope of orchard
     operations may be a plausible strategy to increase returns.
     Skilled labour and capital inputs can be utilised more
     efficiently over larger orchard areas, reducing average costs;

6   potential exists for boosting output per hectare, as "average"
     orchard yields are currently well below these of the highest
     yielding private and research orchards. Research by Doyle et al
     (1988) concluded that certain inputs such as artificial
     pollination, growth regulators and irrigation can boost yields
     significantly and/or reduce year-to-year yield variation. These
     inputs, if used in appropriate circumstances, also increase net
     returns to production.

All the strategic options mentioned above, would to varying degrees
boost annual returns to growers. However none of the changes would be
costless. Large new capital/investment outlays for some of these
strategies would have to be viewed critically given current costs, and
difficulties faced, in obtaining finance.

Ownership/Scale

At present, the majority of kiwifruit orchard blocks in New Zealand
can be characterised as small holdings of less than 5 hectares managed
on an owner-operator basis. Over 80 percent of the 4,300 registered
kiwifruit growers have orchard areas of under 5 hectares, with half of
these being lifestyle or sidelight blocks of 2 hectares or less (table
8). At the other extreme only 4 percent of orchards are estimates to
occupy an area greater than 12 hectares and these blocks are estimated
to produce up to 30 percent of domestic output. On the ownership side
there are 10% of orchards as registered companies, 20% in syndicated
partnerships with most of the remainder in individual/family ownership
(MAFTech, 1988). The industry can therefore be characterised by small
scale family holdings.

Table 8:   Size Distribution of Orchards

MAFTech/NZKA Survey*

		Planted Area (ha)			Totals
	2-4	4-8	8-12	>12	
Number		364	210	60	25 659
%	55	32	9	4	100

NZKA Registered Growers

Planted Area (ha)

	<2	2-5	>5		
Number	1,664	1,775	831	4,270	
%	39	42	19		100

* This survey did not include growers with less than 2 hectares of
kiwifruit.

Evidence of developments in farm size and structure from the United States and New Zealand indicate a trend towards a bi-modal distribution of small and larger farm sizes with a decline in the medium size, single-owner farmer (Fairweather, 1985). This trend was in part fostered by declining returns and the need for farms to utilise economies of scale or go part-time and utilise both off and on-farm income. These patterns may well eventuate with kiwifruit. Small holdings may be able to survive the era of diminishing returns by drawing upon off-orchard income. The orchards portion of these properties may well be a small part of total property value. Large properties can utilise scale economies to lower costs and maintain adequate returns. Budget evidence suggests that medium sized orchard (of 4-8 hectares) are rapidly becoming uneconomic and the inability to service debt may force these growers either to lease the orchard out or sell the kiwifruit portion of the property. It is not clear who will be buying the large number of freehold sales, but if other sectors are indicative, it could well be existing growers and/or business operations interested in expanding scale or throughput of their enterprises. Bi-modal distribution of orchard size and increasing separation of owners and factors of production represent plausible future scenarios for kiwifruit orchard structures.

Marketing

With large increases in exports and in competing supplies, the marketing of kiwifruit has become increasingly complex. A major review of industry marketing has been recently completed and we will eschew this type of effort.

Three areas of industry concern will be briefly discussed as they relate to other content in this paper. These are: the degree of competition between exporters, risk management and product differentiation.

Recently a number of public and private individuals, as well as the industry review (NZKA, 1988) have suggested that a single desk or monopoly seller be instituted in the interim for the industry. This would be a large departure from the multiple exporter arrangement at present. Reasons put forth for this change include duplication of efforts among exporters, and perceived inability to respond to changing market conditions.

Economic theory postulates that a monopolist can best extract rents from a market when demand is relatively inelastic. The effectiveness of a monopolist in exploiting the demand curve, ie with control of supplies, is reduced when demand is more elastic. Our analysis indicates that demand for New Zealand kiwifruit was more inelastic when the share of world production was larger and total export volumes were lower. It is apparent that foreign demand is currently becoming increasingly elastic. Working from these basic premises we suggest that a monopolist may not be more effective in extracting rents in the current marketing environment. We do recognise that a monopolist is better able to capture the benefits of promotional and research activity than a multiple desk selling arrangement. However, co-operation between exporters, with a statutory marketing body providing these activities, may achieve the same objectives.

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Further a rationalisation of exporters (currently going from 7 to 4 or possibly 2) appears to be already under way. The transaction costs of encouraging efficiency along current structural lines may be substantially less than a major overhall of the marketing operations.

A floating exchange rate and indications of protectionism abroad are two of the factors increasing the risks in marketing kiwifruit. As mentioned above, exchange rate variation means exports may have to forward contract and/or cover sales. A risk to exporters is the possibility of the European Community instituting a reference price system. While initial proposals have been rejected, a real possibility of reference prices, countervailing duties and possibly quotas being applied to imports exists in the future. The rapid emergence of EC supplies and competing Southern hemisphere supplies may instigate this system. Since 50 percent of New Zealand exports currently go into Europe, management of this situation will become increasingly critical.

Kiwifruit has been sold in a very upmarket fashion, catering to higher income consumers with tidy packaging and near flawless fruit quality. As fruit is purchased increasingly through conventional channels, the current marketing strategy may have to change to reflect differential price and income elasticities of demand in various markets. The split-market approach to marketing may be necessary to more properly align product costs with marginal returns. An example of this strategy is the "choice" grade fruit marketed to Australia this year where semi-perfect fruit are shipped in larger containers in order to capture middle market returns.

Given the product volumes and degree of competition, the choices of marketing strategy will be important to market returns and to minimise price variation over the coming years.

Policy Implications

What, if any, are the implications for public policy from developments in the kiwifruit industry? Possible areas of social and economic concern include debt loads, regional economic issues and marketing structures.

It is apparent that the kiwifruit industry is carrying a sizeable debt burden and that many growers are facing increasing difficulties in servicing this debt. However, there is no clear cut reason why anything should be done with public monies to save the kiwifruit farmer from insolvency. Many growers bought properties during a speculative boom when property values were high. How are these individuals any different than those who invested in Judge Corp shares? Nor are kiwifruit farmers a cultural institution. They have assumed the risk of the investment so why should the taxpayer help in retiring debt or vines because the investment has gone bad?

More ominous is the possible impacts of a downturn in the industry on the Bay of Plenty economy where the majority of production occurs. The region has enjoyed a boom period along with the industry, but signs of economic strain are already evident in kiwifruit centres such as Te Puke. As spending by orchardists declines regional income and employment will fall. This may have a circular impact on orchards as off-farm employment becomes harder to obtain, further worsening

orchardists' cashflows. The possible use of economic policies to offset this downturn are subject to the current free market orientation of the Labour government and the fact that there is no compelling reason why the region should be supported while others, feeling the squeeze of a depressed rural sector, are not.

Another possible industry strategy would be to restrict supply either through market withdrawals or through vine removal schemes. Neither of these options would be very effective as foreign demand is elastic. Further, any benefits of supply reductions would partly accrue to our competitors.

Conclusions

The dynamics of the New Zealand kiwifruit industry conform closely to the product development cycle. Prior to 1978 plantings and production were relatively small in magnitude, with a consequently slow growth in supply. Foreign demand increased relative to supplies, creating excess demand. This, coupled with high rates of assistance, fuelled a planting boom which drove up factor values and created a general development euphoria in the industry.

During this expansion phase in the late 1970's and early 1980's, the demand curve for New Zealand kiwifruit shifted outwards. With the relatively small volume of fruit on the market this outward shift was sufficient to maintain or increase real returns to growers. However our analysis indicates these preference/income induced shifts in demand are stabilising. This is consistent with the maturation stage of the product cycle. Kiwifruit is losing its unique consumer status and buoyant demand in overseas markets, and becoming a normal good.

As demand matures, income elasticities will decrease with time, and cross-price elasticities will increase and as a consequence export prices will become increasingly elastic with respect to volume changes. The result of these changes is that New Zealand is increasingly becoming a price taker unless it is possible to differentiate our product from other suppliers.

The increase in area of kiwifruit has only just begun to stabilise, but production lags are such that overall quantity supplied from these increased plantings will continue to rise until around 1992-1993.

Equally significant is that other countries are rapidly increasing their plantings of kiwifruit. World forecasts of kiwifruit production indicate output will increase dramatically over the next 7-8 years, even if acreage were to level, accentuating New Zealand's grower and marketing problems. Other Southern hemisphere countries will compete directly with NZ supplies, while Northern hemisphere supplies will mean that kiwifruit is available year round in our major markets, that is the fruit is becoming "commodified". This will move NZ further down the demand curve and remove any early season premiums that exporters have been able to obtain.

The maturation of the kiwifruit markets has caught many exporters and growers by surprise. Economic rents have declined or even dissipated, exposing many in the industry to financial difficulties. Growers have seen gross margins and consequently, land values decline, causing a severe debt-equity situation.

Exporters were likewise squeezed by falling returns, forcing an ongoing rationalisation of operations. These developments are a natural (but painful) part of the product development cycle. It should come as no major surprise that the maturity phase is beginning. Perhaps the only surprise is that the industry reached this stage earlier than some observers had anticipated.

A number of options do exist by which the industry can maintain or improve returns in the face of an increasingly competitive market place. Many of these options involve improving the efficiency and/or effectiveness of marketing operations (farm gate through to foreign markets). Growers are unlikely to be at a minimum average cost situation as of yet, and lowering production costs and/or increasing output could increase net returns. Furthermore, the average kiwifruit orchard of 3-5 hectares may prove uneconomic in the long term. This will force operations to consolidate with a possible dichotomy in the ownership pattern of orchards.

Given the projections for a large Chilean presence in the market place by 1991-92, New Zealand has a two to three year window of opportunity to institute necessary marketing and production changes prior to the serious competition. Chile has a cost and seasonal advantage in producing fruit. New Zealand can adjust to make its exports more competitive or differentiable, but this must be done soon before incentives are lost. It is not clear from available evidence that a move to a single desk (monopoly) seller can best achieve a rationalised system able to adapt and survive in a competitive, risky market place. A rationalisation of current export operations may be more expedient, involve fewer transactions costs and offer more industry flexibility in the near term.

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