

Farmers Conference 1985

Lincoln College
University College of Agriculture
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LINCOLN COLLEGE FARMERS' CONFERENCE 1985

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Contents

Challenges facing farming

The challenge of international trade	
<i>B. J. Ross</i>	1
The challenge to financiers	
<i>G. F. Ritchie</i>	12
How I see, and am meeting, the challenges	
<i>C. L. Freeman</i>	21
How I am meeting the challenges	
<i>W. G. Burdon</i>	24
The challenge facing government	
<i>C. J. Moyle</i>	28
The challenge of adding value	
<i>M. A. Weir</i>	33

Challenges facing cropping

Can the move to intensive arable rotations be sustained	
<i>R. L. Englebrecht</i>	39
Soil structure and plant growth under intensive cultivation	
<i>K. C. Cameron</i>	47
Intensive cereals and take-all	
<i>I. C. Harvey</i>	58
Intensive cropping	
<i>D. J. A. Kelman</i>	63

Challenges facing horticulture

The international scene and the marketing of pip fruit.	
<i>W. Haines</i>	67
New Zealand pip fruit marketing and prospects for the next ten years	
<i>K. W. Kiddle</i>	71
Investment in pip fruit development and its financing	
<i>A. Dinsdale</i>	76

Credit evaluation

The effective cost of credit and the follies of investing for
taxation relief

S. J. Natrass 83

Lincoln College Foundation Farmer of the Year Award

Introduction 90

Finalists

P. Byars 91

R. D. and B. E. Hewett 96

J. Hopcroft 103

D. Morrow 107

R. Patterson 113

Challenges facing farming

The challenge of international trade

Professor B.J. Ross, Principal, Lincoln College

The organisers of this year's farmers' conference have chosen to confront a number of the important challenges now facing New Zealand agriculture. The problems currently confronting New Zealand agriculture are very large, many and varied. I am glad that the organisers have, however, chosen to view them as challenges, because that carries with it a connotation that the problems can be confronted and overcome. I am sure the organisers are right, but the task of overcoming the problems is a formidable one, which will require strenuous efforts from all associated with the agricultural and horticultural industries.

The challenge of trade as it affects our agricultural and horticultural industries can be subdivided into a number of smaller challenges, most of which are related.

THE CHALLENGE OF COMPETITION

Many of the challenges which we face come under this general

heading. We face competition from many countries in the technology or production systems which they use for their products; in the fact that they are producing competing products which threaten the markets for the type of products which we produce; and, they are certainly competing in processing and marketing.

THE CHALLENGE OF TECHNOLOGY

For many years New Zealand has prided itself on having a very efficient and low cost agricultural industry. Our industry has had to have lower costs than most of the competing industries because of the disadvantage we have faced in terms of transport costs in getting our products to their ultimate markets. Over the years we have maintained our research efforts in New Zealand, and farmers have continued to search for the cheapest methods of production. However, I have the distinct impression that in recent years the rate of production increase in New Zealand has not been as spectacular as in some other countries. In the European Community, for example, between 1960 and 1982 the yields per hectare of all cereals increased by 82%: wheat alone was more than 100%; maize 98%; barley 48% and potatoes 56%. Beef and veal production climbed by 50%, although the total numbers of animals increased by only 1%, and the average milk yield of dairy cows has risen by 40%. Since 1968 the sheep population has risen by 20%, but has yielded a 35% production increase, and an 11% increase in the numbers of breeding sows has resulted in a 24% growth in pigmeat output.

Part of the increase in European production reflects the very favourable price environment in which they have been producing. Given high prices for cereals for example, it is worthwhile to apply large amounts of fertiliser, to spray for weeds and pests, and so on. High prices also give farmers the confidence to experiment with new techniques, and the where-with-all to buy new equipment if this is required before new techniques can be adopted. Nevertheless, regardless of whether their better performance stems from the adoption of new technology or the application of technology which was already there, it is clear that the Europeans are now much more formidable competitors than they were 20 or 30 years ago. Even if European farmers were to lose much of the protection and price support which they have enjoyed, we would find that their production would now be way above the level reached before the Common Agricultural Policy came into being.

Within the livestock industries, one of the most notable trends in the last two decades has been the dramatic improvement in productivity in the pork and poultry industries. The larger numbers of off-spring per female animal provide the possibilities of more rapid genetic advance with the animals producing white meats, and this potential has been exploited to the full. This is why we have seen the dramatic fall in the price of white meats relative to red meats in most of the worlds markets, and this has been followed by a considerable shift in consumption towards the white meats. In marketing terms there is certainly nothing wrong with being the producer of the high priced quality product, but if our meat exports are going to be relatively high in price at their

destination, then we have to make sure that they really are quality products.

Technology has intensified the competition we are facing in a number of areas, from synthetic fibres competing with our wool, improved substitutes for our dairy products, and the development of synthetic meat substitutes, but technology is working for us too. The development of the new boneless lamb roasts, of a whole range of new dairy products, and new ways of dealing with wool, such as felting, all help to improve the image of our products, and to improve our competitive position.

THE CHALLENGE OF MARKETING

Two years of living in Europe have convinced me even more strongly of the importance of high quality processing and marketing. The Europeans have decided to go all out for further processing, and some are even convinced that much larger proportions of their surplus production can be disposed of in world markets by superior processing and marketing. Whilst I think that they have rather exaggerated expectations, there is absolutely no doubt about the importance of this general area.

In my first week back in New Zealand I was amazed to see an advertisement on television for Yoplait yoghurt. My first reaction was almost one of horror. Why on earth were we allowing ourselves to be persuaded into the purchase of a French brand of yoghurt, even if it was using New Zealand raw materials? On further reflection I was pleased to think that such an advertisement indicated that the New Zealand market had opened sufficiently to allow foreign competition within our own shores, in a product for which we could be forgiven for thinking we had a strong comparative advantage. The competition from Yoplait within New Zealand is a good way of demonstrating to New Zealanders the way in which companies in other countries are going about the marketing of their primary products. It is terribly important that we take note and that we at least match them if not beat them at their own game.

The New Zealand Dairy Board appears to be in the process of turning itself into a major multi-national food company, and this is the type of development which we must applaud. Even this development is not without its problems, however, and in Britain I was approached by one group of people who complained to me about the sale in the United Kingdom of products sold under the Anchor brand and processed in the U.K. from cream imported from the continent. I tried to argue that by being innovative the Dairy Board was producing products, such as whipped cream in a spray can, which were helping to reduce the European dairy surplus at the same time as earning money for the New Zealand dairy industry to compensate in some way for the falling quota we were allocated for butter each year.

The development of really efficient marketing systems means that we have to be efficient at all levels. In other words the allocation of raw materials in New Zealand, the right to export to specific markets, and all those so called "macro" aspects of marketing with which the Meat Board has been grappling, have to be sorted out, as well as the

innovative marketing which comes from individual firms utilising their ingenuity and expertise. Properly handled, the rewards in this area are immense. I was very interested to see in the latest issue of the Meat Producer that the company which is beginning exports of processed lamb in the form of lamb burgers and so on, expects a return which is five times that for the raw material which is being used.

THE CHALLENGE OF DISTANCE

Sophisticated marketing, particularly to institutions such as hotel chains, fast food outlets and the like which are often very big buyers of, for example, meat products, demands among other things absolute reliability of supply. Our distance from many of the major markets constitutes not only a cost barrier, but also an impediment to reliability of supply. Long supply lines are more likely to become entangled. Multiple handling of products means that we are dependent on more people at a variety of places, and we are subject to changes of routes, closures of canals and the like. This is just one of the facts of life we have to take into account when planning our exports, but it means that we must always be on the lookout for cheaper, more reliable, forms of transport.

Distance from our markets also increases the challenge we face in cornering a good share of the market for the highest quality products. Things like fresh or chilled meat, fruit, and flowers, all require rapid transport, and in many cases very careful handling to ensure that the contents of containers are kept within very narrow temperature margins.

All the topics I have covered so far are generally well accepted, and have been discussed many times at earlier meetings of this Conference. The major area I have so far avoided is one which some people see as our biggest challenge, so it is time to direct our attention to the challenge of agricultural protectionism.

THE CHALLENGE OF PROTECTIONISM

Every New Zealand farmer is well aware that restrictions on the importation of agricultural products into a number of countries, notably the United States, Japan, and the European Community, have had a serious effect on the earnings of New Zealand farmers. Because sales of dairy products from New Zealand are restricted in such markets, there is a greater volume of production to be sold on the so-called free world market, and this greater volume inevitably means lower prices. In addition, artificially high prices in the protectionist countries have the effect of stimulating production to levels well above what would be produced if the produce had to be sold at world prices, and consumption is reduced because consumers reduce their purchases in the face of the high prices. When, as in the case of butter, there is a readily available substitute product which can be sold at significantly lower prices, the reduction in the consumption of the product concerned can be very substantial. The combination of higher production and lower consumption inevitably means more exports, or a smaller volume of imports, according to the country concerned, and this also has an

inevitable effect on the free world price.

Since some of the countries which restrict the importation of commodities base the price which they are prepared to pay on the free world price, the total damage done to a country dependent on primary exports, such as New Zealand, can be seen to be very considerable.

No matter how efficient one is in production, or how skillful at processing and marketing, increased sales can not be made into markets where there is a political ban or restriction on imports. The problem has its origins in politics and it is obvious that the solution must also be a political one.

It seems to me that there are two ways of responding to the challenge of politically determined protectionism, and perhaps we should be pursuing them both at once. The first response is to consider the protectionism as a fact of life, and to ensure that in a world in which our export prospects for primary products are circumscribed we should nevertheless go about maximising our income within the limits with which we are presented. We know we would be better off if there were no restraints on trade, but given those restraints we should ensure that we make the best of the opportunities we have. This means accepting the cut in real incomes which has been imposed on us from abroad, through the relatively lower returns we get from certain primary products, and then adjusting our exchange rate and general economic policies in such a way that we are able to pay our way in the world, with our resources distributed between different industries in such a way that we maximise our real incomes. Some people respond to protectionism abroad by wanting to impose higher protection for industries in New Zealand, but, except for certain special circumstances, such a course of action would mean a further reduction in our real incomes. In some cases if one country has some trade restrictions in place it can offer to remove them in return for concessions by other countries. Trade restrictions can be a useful bargaining counter in getting rid of other peoples' restrictions. Unfortunately for New Zealand, though, we are such a small market for manufactured goods, and such a potentially large supplier of agricultural products, that such a trade-off never appears very attractive to our potential partners.

The history of the last two decades suggests that we would do well to adapt ourselves to a situation in which there is permanent protectionism. One of the first steps towards this is to ensure that we do not allow ourselves to continuously pay higher than world market prices to producers, under the guise of price stabilization. Such a situation only has the effect of encouraging production of products which we find difficult to sell, from which we should be diversifying. In any case, given European productivity gains in producing some basic commodities, we should do nothing to prevent the flow of our resources into such things as the high value, out-of-season, horticultural products which may constitute our best long run prospects for sales in the northern hemisphere.

Acceptance of the idea that we should manage our economy in such a way as to cope with the worst situation in which full-scale agricultural protectionism abroad stays in being, does not mean that we should

not be agitating to have levels of protection reduced. In my two years in Paris with the Organisation for Economic Co-operation and Development, I was working on a project designed to see if it is possible to devise some way, acceptable to all OECD countries, by which agricultural protection could be reduced. The basic philosophy behind the project was that increased assistance given to farmers in countries like the United States and New Zealand has been justified on the grounds that they needed this assistance to offset the effects on world prices of the assistance given to farmers in the EEC. As world production has been encouraged or maintained, and the world prices driven lower in the way I described earlier, the costs to the Europeans of their common agricultural policy have generally been increased as well (although I will describe later ways in which this has not happened). With many countries increasing the level of assistance to their agricultural industries apparently in response to the assistance given by other governments to their farmers, it has been asked if we could not all back-track a little? If all countries could agree on a simultaneous and co-ordinated reduction in assistance to their agricultural industries, then, after a lag of two or three years, we could expect to see levels of production falling somewhat. Lower production would mean some increase in world prices, which would at least partly offset the effects of the reduction in government support on farmers' incomes. This is likely to happen only if all governments act together. If one government acts on its own, then the effects on the world price will be small, and the farmers in that particular country are likely to feel the full effects of the reduction in government support on their incomes.

Just a few years ago talk of co-ordinated action would have seemed quite foolish and pointless; an interesting academic exercise perhaps, but nothing to do with the real world. The chances of a real breakthrough are perhaps still rather remote, but for a number of reasons I believe that the chance of the OECD countries actually agreeing to start dismantling agricultural protection is much greater than it has been for a very long time.

The first reason for my mild optimism is high fiscal costs. That is, the high costs to the governments concerned of the agricultural support currently being given. For at least 15 years we have been saying that the cost of the common agricultural policy of the EEC was so great that eventually it would have to crumble under its own weight, and it certainly hasn't happened yet. On the other hand, the costs are still increasing, and the European Commission has had to ask the member governments for a higher proportion of each country's value added tax take. An increase was agreed to last year, but only after a bitter fight among the heads of government, which soured relations within the Community. It is becoming apparent that the increase granted last year was not enough, and there will be a need for further funds if present policies are left unchanged. It is probably still more likely that a request for a further increase would be granted rather than turned down, but there is no doubt that political pressures from other sectors of the economy against such an increase are mounting. With about 13 million people unemployed within the Community it is becoming increasingly difficult to justify a system of support which provides high incomes

for the wealthy grain growers north of Paris, and the big farmers of the United Kingdom, as reward for producing commodities which are already in surplus, and have to be dumped on the Russians, or on the world markets, at give-away prices. There is increasing talk within the Community of the need to target agricultural support, to ensure that assistance goes to those low income farmers who still need it, rather than to those high income farmers who do not. In a situation of surplus in almost all commodities, the old arguments of self-sufficiency, and the need for increased production, have almost lost their credibility. One sign of this is the substantial reduction, particularly in the United Kingdom, of government funding of research related to agricultural production. The fact that European governments are also concerned with reducing their internal government deficits means that they are casting around for ways to reduce government expenditure, and are therefore reluctant to accept programmes which mean spending more on agriculture.

The cost of financing agricultural assistance is also a major concern in the United States, where the government was horrified by the way in which agricultural support costs ballooned during the early years of the '80s. The 1985 Farm Bill will not pass without some amendment, but it is very definitely aimed at reducing government expenditure on agriculture.

The second reason for some optimism that there might be some general reduction in levels of support for agriculture, is linked to the concern that the United States has on the cost of its own support policies. American politicians have at last become aware of the extent to which the types of policies pursued in the United States have in fact been reducing the cost to the Europeans of the Common Agricultural Policy. For example, the United States support policies for cereals have mostly been based on reducing the supplies of grain reaching international markets. This has been done either by various schemes under which farmers have been paid to leave their land idle, or by the operation of price support schemes which in the end involve the storage of grain either on farms or in public storage facilities. The idea is that by reducing supplies reaching the market the price will rise to what is considered to be the acceptable minimum level. Traditionally these policies have been formed without much regard to the external consequences, by politicians whose eyes have been fixed very firmly on the domestic scene. But the problem is that since the United States tends to play a dominating role in the grain market, policies designed to raise grain prices within the U.S. by restricting supplies, tend to raise the world price towards the same level. One consequence of this is that all other grain exporters have been benefiting from the United States restrictions on supply, and with the U.S. minimum prices being set in U.S. dollars, the strength of the dollar has meant that, in other currencies, these minimum cereal prices have been very attractive indeed. For the EEC this has been particularly useful at a time when the Community has been moving into becoming a substantial exporter of grains. Last year the EEC was able to export about 15 million tons of grain with almost no export subsidy being required, because the world price had been pulled up so high by the American policies. In the meantime the

Americans have been acquiring large stocks and spending more than they feel they can afford, given the size of their overall government deficit. The Americans have opposed the Common Agricultural Policy for years, and they find it particularly galling to think that they have been making it easier for the Europeans to finance their existing policies. One of the ideas promoted in the Farm Bill was that regardless of the prices paid to American farmers for their production, all production surplus to American requirements should be sold on the world markets, rather than put into store. This would have the effect of pushing cereal prices down, and, the Americans hope, putting additional financial strain on the Common Agricultural Policy. Given that the finances of the Commission were very strained last year, the necessity to pay substantial export restitutions on grain exports from the Community would almost certainly precipitate another funding crisis for the Community, and the Americans are quite anxious for this to happen. This same thinking is behind the announcement we had a few weeks ago that the Americans intended to dispose of all their existing stocks on world markets. The pressures on the Europeans could therefore mount quite rapidly.

A third reason for believing that some change in levels of protection is not impossible is that the changes which have occurred within the agricultural sectors of a number of countries mean that the political importance of changes of agricultural policies has been reduced somewhat.

In Japan, for example, farm incomes now account for only 21% of the total income received by farm families. Most farm families have one or two members who are in paid employment off the farm, and the farm income has now become almost a sideline for many farm families. This means that an apparently substantial reduction in farm incomes would translate into a relatively small reduction in total farm family incomes in Japan, and since average farm family incomes are now above the average family income in Japan, such a change might well be acceptable to a majority of the Japanese population. Of course there are still very formidable political problems, with the rural areas greatly over-represented in the Japanese Parliament, but there is no doubt that the importance of agricultural incomes has been reduced in Japan.

Within the United States there have been dramatic changes too, and the situation has been reached where 5% of farmers produce about 50% of total output. On average, these farmers had average net incomes of \$US186,000, far in excess of average United States incomes, so they hardly seem to be in need of government assistance. Seventy-one percent of farmers produce about 12% of agricultural output in the United States, and on average these farmers receive more than their total farm income from a variety of non-farming sources. They are considered to be fringe or part-time farmers, and it is thought policy should not be tailored to meet their particular needs. Twenty-four percent of United States farmers produced 38% of the product. The United States Department of Agriculture sees these latter farmers as the ones on whom support should be targetted in the future. The idea that assistance and policies should be targetted almost certainly means that some overall reduction in expenditure is contemplated.

Even within the EEC the trend towards off-farm employment has reached the stage where only 35% of farmers derive their full income from farming. About 40% of the farmers derive only half their income from farming. Given the fact that farmers tend to be over-represented in parliaments of most countries, there are still formidable political problems to be overcome before we are likely to see significant cuts in assistance to agriculture. But there is no doubt that the overall significance of farm income as a political issue has been reduced.

Another encouraging sign is that there are concerted moves underway to get a new round of trade negotiations started under the auspices of the General Agreement on Tariffs and Trade. One of the particularly encouraging signs is that two of the original co-sponsors of this move for a new round of trade talks were the United States (who have made it abundantly clear they expect to get some progress on agriculture this time round) and Japan, who have apparently accepted this American insistence on agriculture, and as we all know the Japanese like things with which they are associated to succeed. Whether this really means that the Japanese have acknowledged to themselves that this time they will have to give something on the agricultural front we don't know, but at least it is an encouraging sign.

As I indicated earlier, the project with which I was associated at OECD was based on the idea that if all countries move to reduce their support for agriculture simultaneously, a rise in world prices would partly offset the effects of any reduction in government support.

It is just possible that the EEC may feel that since they are under great pressure to reduce their expenditure on agriculture, they might as well do it in a way which will involve other countries and thereby minimise the effect on their own farmers. The work at OECD is not yet finished, but it is interesting in a number of ways. For example, it was agreed from the beginning that we should be looking not just at the measures which are traditionally thought of as protectionist measures, such as border quotas or tariffs, but at all forms of support for agriculture, because it is believed that anything which affects production or consumption must ultimately have an effect on trade. Thus things like fertiliser subsidies, interest rate subsidies, government provided inspection services and the like, are all included in the estimates of the current levels of assistance in each of the member countries of the OECD. One of the significant developments is that the Agricultural Committee of GATT has accepted this philosophy on the need to include all forms of agricultural assistance in any agreement on agricultural trade, and this represents a very significant step forward. Earlier rounds of GATT negotiations such as the Kennedy Round, or the Tokyo Round, have been spectacularly successful in reducing import quotas or tariffs on manufactured goods, but a number of countries are now accusing each other of cheating by providing assistance to exporters, or protection to import competing industries, through other forms of assistance such as cheap capital. We have tried to make the definition of assistance in agriculture so wide as to prevent a similar outbreak of new forms of assistance if some agreement should be reached to reduce the effects of quotas and tariffs on primary products. The pressure for at least some movement as a result of a new round of GATT negotiations is

quite intense, because the United States has indicated that if they do not see significant progress in the areas which they regard as important, such as agriculture and trade in services, then they are likely to withdraw from GATT and negotiate on a bilateral basis with individual countries. Given the formidable bargaining strength of the United States, this is a very serious threat. The chief remaining doubt as to whether there will be a round of GATT negotiations concerns the French threat not to participate unless the Americans have first taken measures to stabilise the value of the dollar at a significantly lower level than that which it now enjoys. Such policies are so far away from what the Americans have been advocating that any movement there is quite unlikely, and we therefore must hope that the French will back down somewhat on their demands.

Given that a new round of GATT negotiations is on balance likely to take place, the challenge for us is to use every available legitimate political device to ensure that the talks have the greatest possible chance of success. This is possibly the greatest opportunity for a reversal of the drift into agricultural protectionism in the developed world. If we do not accept this challenge, then we will have to face the consequences of fundamental changes in our traditional markets for primary products, and in our traditional export industries. Facing up to the challenge may involve hard bargaining, and accepting the need to reduce the protection which we give our manufacturing industries in return for reductions in the protection given to agriculture in other countries.

CONCLUSIONS

As I indicated at the beginning, our international trade in primary products is being subjected to a number of strong challenges. On the technological side we seem to have been losing ground somewhat, and with our strong dependence on a cost advantage in the production of basic commodities, we need to respond strongly in this area and reassert our technical superiority. Imaginative processing and marketing have not been strong points for New Zealand; there are success stories to be told, but there are also horror stories. Just as some of our competitors have been catching up on the production front, we need to catch up on the marketing side and the strength of our response to this challenge will have a big influence on the positioning of our products on overseas markets, and the relative prices we are likely to receive.

As far as agricultural protectionism is concerned, we know that some measure of protectionism will remain for the foreseeable future. This implies that we must face up to the fact that we must not continue supporting some industries simply because they are the most efficient producers of their particular products in the world. If their products cannot gain entry to the markets where they could be sold, then it is not to our own long run advantage to keep producing them in quantities which are greater than justified by the current levels of international prices. On the other hand, major political opportunities for change may be at hand in the next year or two, and we must seize those opportunities. It may be that in the course of some hard bargaining we are challenged

with options we might rather not have to confront, but we must be prepared to meet those challenges.

The challenges facing our international trade are certainly large, but they are also exciting. By identifying these challenges, by confronting them head-on and overcoming them we shall ensure the future of our primary export industries and the economic well-being of our nation. A failure to accept these challenges will lead to an inevitable economic decline. I am quite confident that we have the ability to meet and overcome these challenges; I just hope we also have the will and determination.

The challenge to financiers

G.F. Ritchie, Manager, Wrightson N.M.A., Christchurch

Before contemplating the future, it is necessary to understand the past, and the events that have influenced the present. Since 1976 the Livestock Incentive Scheme (LIS) and Land Development Encouragement Loan (LDEL), programmes have contributed to increases in livestock productivity valued at \$90-\$110m. From about 1981, irrigation programmes, to counter drought and aid diversification, have made significant contributions to the near doubling of cereal production. This increase stemmed from Government policies aimed at increasing export revenue. Encouragement was provided through low interest Rural Bank loans and regulation of the New Zealand finance market.

As a result of stimulation by production incentives, the Supplementary

Minimum Price Scheme (SMPs) and high domestic inflation, land values peaked about mid 1981. Since then, values have dropped considerably, largely as a result of the measures introduced in the 1984 November budget. (Figure 1)

Productivity per labour unit has probably trebled in the last decade. It would not be uncommon for a family operation to be managing up to 5000 stock units where 1200-1500 would have been the average in the early seventies.

The disparity between our domestic inflation and that of our trading partners has been a major problem for the farming sector. Terms of trade have declined because 85 percent of farm inputs come from the domestic economy, while output prices are determined by overseas markets. With the exception of 1984/85, real farm incomes have declined since 1979/80. They are expected to fall again in 1985/86. In 1984/85 devaluation increased export returns, and hence farming income, while production costs were largely incurred at lower pre-devaluation levels. However, for 1985/86, the imported content of input costs will increase in response to the devaluation. (Table 1).

TABLE 1:
Income Per Sheep and Beef Farm — Outlook

Financial year	1979-80	1982-83	1983-84*	1984-85**	1985-86**	% Change
Gross income						
- Wool	32,620	39,434	38,300	47,700	46,100	- 3.4
- Sheep and lambs	26,658	34,521	36,300	42,500	30,100	-29.2
- Cattle	12,804	17,811	13,200	19,700	20,800	+5.6
- Other	6,586	13,608	16,500	19,000	19,000	—
- Total gross income	77,668	105,374	104,300	128,900	116,000	-10.0
Expenditure	52,896	81,978	83,800	99,300	91,600	- 7.8
- Net income ¹	24,772	23,396	20,500	29,600	24,400	-17.6
Consumers price index	1,706	2,589	2,700	2,986	3,344	
- Net income in Real Terms (\$) ²	14,521	9,037	7,593	9,913	7,295	-26.4
Index of Real Income ³		663	557	728	535	
- Fertiliser Tonnes	63	45	50	55	43	-22.0

1. Per farm, not per farmer, income. Net income must meet all drawings, tax capital repayments and development costs.

2. Deflated by the CPI June 1975-76 = 1000

3. Index of net income in real terms June 1975-76 = 1000

* Provisional

** Estimate

SOURCE: N.Z. Meat & Wool Boards Economic Service

N.B. The net income above, down almost 18 per cent over the previous year, is in real terms, the lowest since 1975-76. Of equal significance is that fertiliser applications are estimated to decline by 22 per cent over this season.

This situation does not auger well for the maintenance of properties. It emphasises the need to be selective in expenditure priority, to ensure that money spent will generate income.

Within the framework of the past and present, factors emerge that will influence the future.

In an address to the Canterbury Chamber of Commerce, Mr Walter Minger, an Agricultural Economist, pointed to four major factors influencing the future for American farmers:

- increasing production;
- declining commodity prices;
- increasing competition; and
- protectionism.

These factors must be equally applicable to the future for New Zealand farmers.

FINANCE

New Zealand will continue to depend on its farmers for the majority of its overseas exchange well past the turn of the century. No doubt strong negotiations between Governments will be required to overcome protectionism.

To generate opportunities, farmers will need to:

Achieve the correct scale of operations;

Make certain their financial structure permits the maximum utilisation of working assets; and,

Have the necessary management skills to operate profitably and achieve financial progress.

Scale

Lack of scale has developed with the family farm concept. Properties have been subdivided for sons and daughters, and with improved technology and management skills sufficient income has been generated to permit survival. Unless there is above average management ability or below average debt, many family units will now face difficulties. Even when there is a will to amalgamate or farm in partnership to achieve economies of scale, logistic factors may preclude such a move. Research should be undertaken to determine the extent of the problem as it does not only involve traditional fat lamb farms but also larger, recently developed hill country properties whose income is now insufficient to maintain development.

Structure

Where farmers have less than 75-80 percent equity, they may be experiencing difficulty in servicing debt. (Table 2).

Table 2:

Sheep & Beef Farm Equity & Debt Servicing
(All Classes Average Farm 1982-83)

	HIGH DEBT				LOW DEBT
Equity %	Less than 50	51-65	66-80	81-95	95+
% of Farms	3%	9%	25%	48%	15%
Gross Income Per Stock Unit (\$)	29.74	28.12	29.18	29.38	30.49
Interest Per Stock Unit (\$)	12.03	8.22	5.53	2.50	0.37
Principal Per Redn. Stock Unit(\$)	1.79	1.39	1.75	0.85	1.93
Increase —	8.18	6.20	3.99	1.61	0.03
Net Principal*	-6.39	-4.81	-2.24	-0.76	+1.90
Interest as % of Gross Income	40.5	29.2	19.0	8.5	1.2

* Minus indicates net borrowing, positive indicates net repayment.

SOURCE: N.Z. Meat & Wool Boards' Economic Service, Sheep & Beef Farm Survey 1982-83.

Where debt servicing costs exceed 20-25 percent of gross income, maintenance of the property and generating a surplus for the owner could be difficult. In New Zealand approximately 55-60 percent of farmers have equity in excess of 75 percent.

Purchase requires long term finance. That is the maximum term available, probably 15 to 25 years. Now, however, mortgagees are becoming more selective, and emphasis is being placed on:

- interest rates providing a market rate of return;
- ability of the mortgagor to repay on due date; and,
- security in the face of declining asset values.

Development requires medium to long term finance. The structure of the debt should take into account the time at which the development achieves a positive cash flow. In other words, the programme should generate sufficient cash to maintain development and service and repay borrowings.

Medium term finance, for three to five years, is suitable for plant, additional livestock, or restructuring hard core debt which may have developed in current accounts. This is expensive financing, and cash flows have to be carefully checked to ascertain that the loans can be serviced.

Short term finance is often referred to as seasonal finance, or working capital. It is finance required to generate the seasonal production of farm income and sustain the farmer and family until income is realised. This is covered in more detail later in this paper. (Table 3).

Table 3:**Annual cash costs of various financial structures**

	Principal	Term	Interest Rate	Interest	1st year Capital Reduction	Total
Term Finance	100,000	20 yr	17.5%	17,500	5,000	22,500
Development Finance	100,000	10 yr	19.0%	19,000	10,000	29,000
Medium Term Finance	100,000	5 yr	22.0%	22,000	20,000	42,000
Short Term Finance	100,000	1 yr	20.0%	20,000		20,000

NOTE 1: Obviously there will be variations as to rates of interest, the timing, and commencement of capital repayments, which will alter the annual cash cost.

However, the purpose of this exercise is to point out the cash cost of a constant sum under the varying structures and where they are inappropriate to the purpose, the strain that will be placed on annual cash generation.

NOTE 2: Overseas borrowing, a new development, requires careful planning. Equity loss could be substantial if a mistake is made.

NOTE 3: Financial planning should also take into account the taxation content accruing from the repayment of debt which has to be met from seasonal income.

Today, any new investments have to stand the test of a yield requirement in the vicinity of 20 percent. That is the return that Government stock and Rural Bank debentures have been providing. Therefore, it is essential that new investments are correctly planned and financed. If the financial structures are out of balance, and cannot be corrected by restructuring borrowings, it may be necessary to release underutilised assets to improve the debt equity ratio. Sources for this may be surplus vehicles and plant, or excessive expense on external assets, such as life insurance, where it is not committed to mortgages.

Most of the financial problems farmers have faced over recent months have arisen from incorrect financial structure; especially where problems have been triggered by increasing debt servicing costs as the result of ill-considered investment decisions. Purchase of a farm business is a long term investment decision and should be structured accordingly, as should funds for livestock and plant. For cropping operations, as well as the property and plant, there should be long term funding of at least six months of the production costs, to ensure that the seasonal financier's account will clear annually from crop receipts. This point is very important because of the delay in receipt of crop income which may be as much as 14-15 months.

Skill

Many farmers have a poor understanding of financial planning and cash management. A financial plan is essential, and may have a greater

importance in the immediate future than a physical production plan. Ignoring the need for such a plan may compound problems and lead to financial collapse.

In making up a financial plan make use of advisors. Firstly, your spouse, and then those within the farm servicing industries and your accountant. Test out your ideas, and place some financial parameters on what is an acceptable result. If a programme doesn't measure up, reconsider before becoming committed.

SEASONAL FINANCE

Seasonal finance may be required to generate the year's production, maintain assets, service debt (interest and rent), provide living expenses for farmer and family, pay tax, repay debt and replace assets. The allocation of priority would probably follow a similar order. In the calculation of season finance, the flow of receipts and expenditure on a monthly basis is necessary to determine surplus funds or overdraft requirements.

Seasonal financiers' requirements

The relationship between the seasonal financier and client is that of a working partnership based on good communication and trust. A financial plan should be prepared, either with the farmer or through advisory services. It is essential that the farmer monitors actual results with the plan on a monthly basis.

Before confirming any loan approval, the financier will want to study the following records and plans:

Updated asset and liability position. This should bear a close relationship to the most recent set of annual accounts, and should include comparative production and financial performance figures for at least the past three years. In addition, a cash analysis summary from the annual accounts should be prepared by the accountant. This would identify what cash was generated and where it was spent.

Forecast of receipt and expenditure. This should take into account anticipated changes in the forthcoming season, and to verify accuracy it should be related to the previous year's actual results.

Cash flow plan. The annual forecast transferred to a monthly cash flow chart. This will show expected surplus funds or overdraft levels. To reduce overdraft peaks it may be possible or necessary to manipulate expenditure or income.

This flow chart is of little value unless closely watched by the farmer to ensure that each month the balances confirmed with the financiers are achieved. At least one day per month should be put aside to review the financial plan, preferably prior to drawing the cheques. The plan will be of no value if expenditure is increased regardless. It is essential that the farmer's spouse has a complete understanding of the financial plan — school fees and capital items must be included.

Security for loans is generally taken over livestock. Where the margin

is insufficient, land security, crop liens, or guarantees may also be required. Seasonal financiers will lend only to the level that they believe can be serviced and cleared from annual surplus.

Credit contract. Where new loans are made or arrangements for advances are altered, a "Credit Contract" is required by law. This is a protection for both parties and provides time to consider the implication of the contract and the cost of funds.

Loans are a service not a right. The partnership between financier and farmer has developed over many years, based on the confidence that each party will honour their commitments. When the seasonal financier confirms availability of finance for monthly overdraft levels, the implied undertaking is usually also to pay favourable interest rates on surplus funds. If excess funds, over and above the approved levels, are used a penalty rate of interest may be imposed.

DUAL FINANCING

In dual financing situation financiers require:

- Statement of financial position. This will establish the hard core debt content with other seasonal financiers and the priority order of securities.
- The same information for cash flow.
- Where there is agreement to assist, a letter of recovery will be required from the prime seasonal financier, especially where security is held on livestock or crops.

Discussions should take place between all parties so ground rules are established. Many farmers in financial difficulties can attribute their problems to inefficient control of expenditure and the need to arrange seasonal finance from two sources.

OPPORTUNITIES

Funds will always be available for enterprises that present soundly based plans supported by past performance. Diversification into alternative investments requires above average management skills, and should be contemplated only where the risk of failure will not materially affect the structure of the rest of the operation. Concentration on doing the basics well and improving the quality of the units produced may prove financially more attractive than diversification in the long term, especially if it reduces the cost of adding value and therefore attracts a higher farm gate price.

THE FUTURE

Able farmers will continue to improve their performance in spite of the readjustments that are necessary at the moment. However, there is a wide gap between the high and low performances. (Table 4).

TABLE 4:**North Island hill country performance data**

1983-84
(151 Farms)

	Low	Medium	High
Physical			
Sheep No.	3,323	3,377	3,087
Cattle No.	228	302	230
s.u./hectare	11.5	10.8	10.8
Lambing %	89.4	99.9	113.9
Calving %	81.0	81.5	85.8
Wool/Sheep kg	3.9	4.7	5.4
Fertiliser kg/s.u.	10.9	13.1	18.6
Losses — Sheep %	7.4	4.8	3.9
Financial			
	\$	\$	\$
Gross Income/s.u.	19.76	26.39	33.57
Gross Income/ha	227.99	287.07	365.57
Wool	108.22	117.01	143.84
Sheep	62.86	80.56	126.33
Cattle	57.62	85.62	91.53
Other	-0.72	3.86	3.85
Total	227.99	287.07	365.57
Expenditure/ha	197.87	209.01	237.28
Interest/ha	42.79	37.27	24.89
Net/ha	30.12	78.05	128.28

SOURCE: N.Z. Meat & Wool Boards' Economic Service.

The prospects for farmers with low performance and high debt servicing costs are bleak unless their debt equity ratios can be improved. Support measures must be removed and in the longer term the adjustments made will prove beneficial if land values and productive performance assume a closer correlation. In the past there has been an unrealistic reliance on asset growth and a desire to avoid paying tax rather than concentration on improving annual financial performance as a percentage return on owner's equity.

Nevertheless, it is important that a positive approach is taken concerning the future. Difficult situations will continue to occur as they have in the past. However, change cannot be implemented overnight, and in this respect the social implications of the adjustments confronting farming at the moment need the understanding and support of the community as a whole.

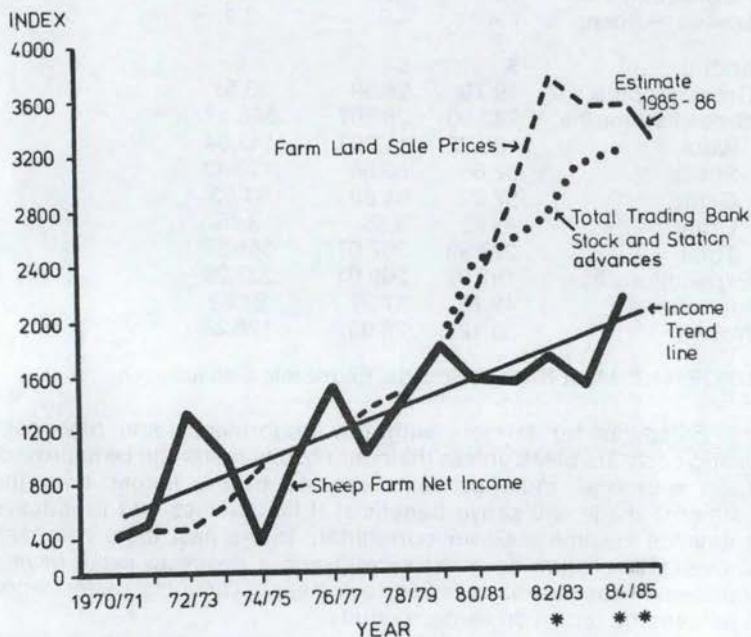
It is absolutely imperative that the agriculture industry, and those associated with servicing, remains confident about the future and has access to funds from traditional sources. Lenders must be encouraged to continue to invest in strong performers.

Irresponsible action, such as the refusal to pay interest rates will not improve the image of the industry or future availability of funds.

CONCLUSION

A definition of "financier" is "one who manages money resources". That applies to us all. If that definition is correct, the challenge to us is to make progress, and that will be achieved by those who accept advice, improve the quality of production and manage their cash efficiently.

Figure 1: Sheep and beef farm incomes and farm land sales prices.
(Money terms 1975-76 = 1000)



* Provisional Net Income

** Provisional land sale price, estimated Net Income

Source: N.Z. Meat & Wool Boards' Economic Service, Sheep & Beef Farm Survey.

Valuation Department (Combined Grazing & Fattening Land Sale Index).

How I see and am meeting the challenges

C.L. Freeman, Farmer, West Melton

I think the greatest challenge facing farming today is the Government taking advice from naive impractical Treasury advisors, with no practical experience in farming, a sector which still produces over 70% of New Zealand's export earning. I agree that farming subsidies should be cut, but subsidies to the manufacturer should also be cut, that is export incentives and import restrictions. Farming should not have to meet the tough restrictions imposed by government when it is tied to buying locally made plant and implements which are often inferior to imported counterparts in construction and quality.

Current government and treasury attitudes towards farming make me wonder whether I was wise to transfer the farm into intensive cropping

under irrigation, thereby creating large employment opportunities on and off the farm. Perhaps I should have adopted a selfish attitude of farming very low key; with no labour, greatly reduced costs, producing one fifth of the income we are today, and still living quite well. If that is the attitude the government engenders in farmers, I wonder where our overseas earning will come from.

The largest, most alarming problem I have as a farmer developing land is the level of interest rates imposed since the removal of interest rate regulations. Our first mortgage interest rate has doubled to 28% in the last nine months. We have been told by the Minister of Finance that interest rates will drop in the not too distant future. Yet the many banking officials I have spoken to do not expect any significant drop for at least 18 months. I consider I have no alternative but to borrow offshore at much lower rates, and bear the risk of the fluctuating currency market.

I am fortunate in the respect that I have not paid too high a price for land. Since development into irrigation the land has increased in value. Farmers in this situation who have sufficient equity in their land should borrow as much as they can to invest in off-farm ventures.

I am looking at every possible angle to cut spiralling farm costs. As an example, all farm crop spraying used to be done under contract. Now we have our own spray rig, which makes a substantial saving. But the contractor, who got 30% of his work from us, has had to sell out. This is not a healthy economic environment for creating employment.

We have cut costs in fuel useage, too. Our fuel bill has been reduced by 15% simply through using higher gears in the tractors, and reducing the revs.

Another very large cost on a cropping farm is seed. We now dress a large portion of our own seed under contract on the farm. This gives large savings over buying seed from city merchants and freighting it back to the farm.

The low margins I have been making out of store sheep after harvest over the past years make it uneconomic to irrigate for this venture. As a result, there will be a reduction in the number of sheep fattened on the properties by at least 5,000 each season.

The largest farm cost would be freight. Two years ago we purchased a truck for \$98,000. At the time, the venture looked a little over capitalised. Today the truck would be one of our best investments. The gross charge to us for outside freight, based on current rates, would be in excess of \$57,000. With the investment in the truck we save that large bill. We average 20,000 km in the truck a year, so it will not have to be replaced for many years. As a bonus, the current secondhand value of the truck is \$125,000.

Under the current difficult economic climate, we will not replace vehicles or machinery. We will repair rather than replace, and make gear last as long as possible. As a result, it could become quite difficult to replace machinery later because of significant increases in prices of new farm machinery. I would not like to be involved in any machinery companies or businesses directly associated with farming in these difficult times. It is inevitable that if the economic policies of the

government continue there will soon be redundancies in some of these companies.

Arable farmers are yet to feel the full produce price benefit of the last devaluation. Yet we have had the full effect of the devaluation in the increase of farm running costs and machinery prices. In response, I have stopped developing into irrigation for increasing production, as I can see no reason for further indebtedness at high interest rates. The unacceptable increases in farm running costs may create more employment in the cities, but in the end, my family ends up with less. For the same reason, I have cancelled the trees for our stone fruit venture, which were to be planted this month. In the short term, I have no intention to venture into horticulture. We will persist with the same intensive cropping procedures that have been carried out over past years. Instead of diversifying further, we will try to increase the yields of our existing crops by introducing new cultivars and more management expertise.

One of the largest concerns of arable farmers today is the delay in payments for produce after harvest. It is becoming increasingly difficult to run our farms under the present cost structure for twelve months, then wait five to eight months for payment for produce. I think farmers have to put more pressure in seed cleaning companies to dress seed earlier, and keep it coming through each month immediately after harvest, for cash flow purposes. This is a very important aspect of farming where a large percentage of the income is derived from herbage seeds. I would like to see expansion of existing seed cleaning companies, and more competition through new companies entering the business.

The introduction of the early payment scheme for wheat has been a forward step and has improved cash flow. But it is disappointing to see companies contracting certain varieties of peas on a split delayed payment basis, and not offering very encouraging contract prices. I find it far more economic to accept a slightly lower price for a crop at harvest time, and get the money in the bank to reduce interest payments. We make every endeavour to use crop varieties in our rotation that are in early demand, thereby reducing the risk of holding large stocks of produce too long.

In summary, then, we are responding to the financial pressures on farming today in four main ways.

Firstly, we are restructuring our borrowing to off-shore in order to alleviate our interest burden. Secondly, we are cutting on-farm costs in a variety of ways including operating our own services, which we would previously have bought. Thirdly, we have ceased capital intensive development and are concentrating on improved strains and management for increased productivity. Lastly, we have rearranged our crops and growing contracts to improve cash flow.

How I am coping with the challenges

W.G. Burdon, Farmer, Geraldine

I have always considered the challenges of farming to be ultimate efficiency and the ability to adapt very quickly to the economic climate.

In 1959, when 18 years old, I bought 326 acres of land near Geraldine. To do this I borrowed 100%. The vendor left in 66% on first mortgage, the remainder was family finance, all at 6% interest. My father owned the adjoining property of 585 acres, and I went into partnership with him. The land was flat, mainly undeveloped, lismore type soil with some medium soils. The partnership was designed in such a way that I paid for all capital improvements, and at my fathers death I would pay the 1962 Government Valuation for his property. I was able to pay for improvement and machinery from my income because interest rates and inflation were low. It is these two items which are the main concerns for farmers now and in the future.

The main source of my income was sheep and I was able to return a net profit of £1900 in the first year. With my share I purchased our first tractor and drill. Previously, all work had been done by contractors.

Using my own machinery I started to grow oats and barley. By 1964, the fertility had increased so I moved from fine wool sheep to Romneys. It was then I realised you must adapt quickly to changes in the farming scene.

The 1960s were good years, but by the end of the decade sheep and wool prices were becoming depressed, so in 1967 I increased cropping, with high fertiliser use. By 1969-70 my wool clip reduced from 110 bales in 1967 to 23 bales in 1970. The total clip during the next five years did not exceed 60 bales a year. Crop yields were above average. The main rotation used on the medium soils was wheat, peas, wheat, peas, grass seed, and on the lighter soils barley, oats and peas or lupins. Every crop, except for barley, was autumn sown.

By 1971 my cash flow was high and I had built up a good range of machinery and plant. It is my policy to put at least what is deducted in depreciation into new plant and machinery each year. This leads to having efficient, up-to-date plant that requires little maintenance expenditure.

Racing was a hobby of mine. It was a way to meet and mix with people from all walks of life and to find out what was happening in the cities and countryside. In 1971 I bought a very well bred thoroughbred brood mare. When I purchased the mare I didn't expect it to be one of my biggest diversification projects. But the first foal she produced sold for \$20,000 at the 1974 yearling sales. I realised the immense potential of the industry, have increased my breeding stock and now sell horses in New Zealand, Australia and England. We have 40 acres set aside for broodmares and young racing stock, plus a complex of stables and yards. The original investment is probably now worth in the region of four to five times the value of my stock and plant.

In 1969 I started to grow more lucerne, mainly for hay. Just 22 miles from the farm Fletchers started a processing factory for dehydrated lucerne. This fitted in extremely well with my farming programme, and by 1972 we were growing 300 acres of lucerne for the factory.

When oil prices rose to high levels dehydrated lucerne became uneconomic. Fletchers tried sundried lucerne, but this gave poor dry matter yields.

At that time I joined a group investing in a lucerne cubing machine. This was one of my poor financial investments, but one from which I learnt much about marketing and company business. Not enough research had gone into the development of the company. Also, sales calculations had been based on excellent Californian figures. No allowance had been made for local conditions. The company finally went into receivership.

By this time, lucerne was becoming a very expensive crop to grow because of aphids and disease. I decided to go out of lucerne, develop the bloodstock enterprise, and return to sheep and cropping, for which prices were improving.

In 1971 I took barley out of my cropping programme because of disappointing prices and an unsatisfactory payment system. Later the best thing possible for the arable farmer then happened. Farmers were allowed to export grain direct. I joined the recently formed Barley Society, which did a marvellous job for the arable farmer. It brought

competition to the grain agents and increased the price of barley 85% in one year. I congratulate the society for developing a very big and well marketed industry.

Today I carry 3200 ewes plus rams, crop 290-330 acres, and have 40 acres set aside for bloodstock.

I have tried to explain how I have adapted to the changes. These types of changes are possible only on arable type farms. I see the challenges to the arable farmer being efficiency and profit per acre. Costs have to be watched very carefully because they can escalate rapidly. Make sure fuel, machinery and labour costs are low, and always sow crops on time. In my case as soon as possible, as I have no irrigation. I autumn sow as much as possible.

Arable farming has been the poor relation of livestock farming because there are fewer arable farmers. Some of the impediments to the development of the arable industry that have to be sorted out are:

- tariff protection applying to the importation of a large range of farm machinery and commodities used in arable farming. Because we cannot buy precision seed sowing equipment tariff free, we are forced to buy less efficient New Zealand made drills;
- tractor tyres are still under import tariff protection;
- base chemicals used in manufacturing of herbicides such as phenoxy resins are tariff protected; and,
- diesel fuel and lubricating oils have local body and sales tax.

Why should the arable farmer bear these costs?

To meet the future challenges, the arable farmer must have access to the latest overseas equipment on a free import basis; any chemical approved by the Agricultural Chemical Board must be available; and we must fight for removal of tax on diesel fuel used on farms. After all, the fertilizer industry has been remodelled to ensure that fertilizer is available to farmers at lowest cost, which has been of tremendous help to all farmers. The present government has a policy of user pays and subsidy free farming. This is fair only if the farmer is not forced to support New Zealand industry.

The meat and wool industries, in my opinion, still have a great future. Wool is a good fibre and New Zealand hides are number one in the world market and have never fetched better prices. The meat industry has been greatly affected by the E.E.C. I used to get 60% of wholesale price of lamb — I now get only about 20%. Industry costs soared and returns to farmers diminished when MAF meat inspectors and vets became obligatory. We have to get the Ministry of Agriculture and Fisheries out of the industry and leave private enterprise to introduce more aggressive marketing and expertise. Farmers must make sure that the meat industry does not pass on unreasonable expenses to us.

The challenges of the future are greater than ever before. We are facing enormous increases in interest, power, fuel, telephone and with high inflation all other costs will rise. We will have to watch expenditure, and expect a fall in farm income of around 20% this year. But we must fight it out, strive to be efficient and adapt our farming methods to the future.

Figures show that our Asian neighbours are increasing their

percentage of world trade at the expense of a decreasing European trade. Therefore, we must look more at developing our products to suit these markets. They will be the countries with the money to buy in the future.

Do not apologise for receiving S.M.P.'s for the last four years. The manufacturers and businesses have had 40 years of import, licencing and tariff protection plus export incentives, and they still have it.

Profit per stock unit is of number one importance to me. Stock units per acre is not a good measure. It can lead to overstocking which in turn can lead to high costs and poor production per stock unit. Given today's prices, I am convinced it is more profitable to be slightly understocked, because then unit production is high and costs drop dramatically.

In conclusion, after Roger Douglas's first budget I was expecting to see members of the treasury mentioned in the Birthday Honours List. I thought their politics were of a theorist nature, showed little understanding of the practical nature of farming and the importance of farming to the New Zealand economy.

My father said to me:

- Doctors bury their mistakes
- Lawyers charge for their mistakes
- We inherit politicians mistakes
- Farmers pay for their mistakes.

So I hope all we farmers meet our challenges, but as individuals we must make sure that the farm leaders and the politicians give us a fair deal.

The challenge facing government

Hon. Colin Moyle, Minister of Agriculture

I will start with Mr Burdon's comment that you inherit politicians' mistakes. That is very true. Look at what we have inherited. It is worth bearing in mind that the current labour government has inherited a situation, and has to make the best of it. Changes are being made, and I am sure there will be people who get hurt and are being hurt. We have had evidence of that today with Logan Freeman's comments. No-one can stand 28% interest on the major part of their indebtedness and stay in farming, or any other business. We all recognize that situation.

I don't share Mr Freeman's pessimism entirely so far as the future government policy is concerned. We wouldn't have put the policies in place if we thought that they were going to have the negative long term consequences being suggested. Could I just make the point that so far a treasury is concerned no-one expects treasury and other officials to be practical farmers. They have their own fields of expertise. They give advice. It is up to the government to accept, reject or modify their

advice. All governments have the problem of assessing advice they are given and determining what the best course is. Advice can, however, be ignored. I suggest that, so far as the politicians' mistakes we have inherited are concerned, somebody certainly ignored advice; totally in terms of monetary management and New Zealand's long term future. We just couldn't go on that way, and the reality has now caught up with us, as it ultimately does if all advice is ignored. Not that all advice should necessarily be taken. But I make no apologies whatever for the changes that have been made, and there certainly have been some very radical changes.

Professor Ross gave an excellent summary of the scene facing New Zealand, and the direction in which agricultural policy and marketing effort must move. There is fierce competition for world markets, and we need to assess where our efforts should be put. Whether it is technology, and if so what aspects of technology, or is it marketing, and what aspects of marketing. We are addressing these questions now.

1985 has been a year of radical change in economic policy. I'm sure it will be a major turning point for New Zealand. We have undergone a period of reconstruction of economic policy. The fundamental responses we are demanding from people are being demanded from all New Zealanders, not just the farming sector. I realise farmers feel they are being singled out for special treatment, but that is not so. The government has the responsibility of ensuring that dismantling of assistance to New Zealand industry is as even handed as possible. It would be impossible if all the forms of agricultural assistance were dismantled while no changes were made in the other sectors that have also enjoyed a protected environment for 30-40 years. However, while recognising that, we must move at a pace which ensures that the New Zealand economy is not totally disrupted. We also need to protect employment levels as resources are transferred from less productive to more productive areas.

Lets just take a quick look at some of the major changes that have taken place. The first thing that the new government did was devalue, then float the New Zealand dollar. That has fundamentally changed the whole attitude and the method of monetary management and policy in this country. The stable behaviour of the New Zealand dollar after the 20% devaluation, numerous other policies and ultimately the float, was a surprise to a great many people. In fact, the dollar has increased slightly in value against most currencies since the float, and I have no doubt that over the next year or so it will increase further. There will be fluctuations during this period of adjustment, but I believe that because of the changes in monetary policy, in the long term New Zealand's dollar will gradually revalue. The relative stability of the dollar is a tribute to the decision on the level of devaluation. Twenty percent was about right.

Financial markets have been liberalised, and the free movement of currency in and out of New Zealand is now permitted. People now have the option to carry the exchange risk of borrowing overseas. I agree with Mr Freeman that his best option in the short term is probably to seek overseas finance. People borrowing from private sources, with their interest rates doubling from 14% to 28% clearly have to look for

other sources of finance. They now have that additional option that wasn't previously available. Farmers should be able to borrow overseas if they are prepared to take the exchange risk, which has been quoted at something in the region of 10.5%. That is a benefit to farmers, and others, that they didn't have before the new government changed policies.

Tariff and import licencing controls are being dismantled as quickly as possible, given the constraints of employment and the need to shift resources. Firm monetary conditions are being implemented and the deficit has been reduced. In one year the internal deficit has reduced from \$3.1 b to less than \$1.3 b. I think that is a remarkable achievement, but it is academic if there aren't run-on effects. This is important and very pertinent. Clearly, the most important single thing that is bugging farmers today, and everyone in New Zealand, is interest rates. There is no doubt about that. The question of the connection between the internal deficit and interest rates is very real. When New Zealand has a massive deficit, the government's only option to fill that gap between what we earn through taxation and what we spend is to borrow. If the government is borrowing \$3 b from the available funds within New Zealand, that \$3 b is no longer available to the rest of the community. That situation obviously puts an enormous pressure on available funds and causes the cost of money to rise. The government intends to substantially remove itself from that borrowing process by reduction of the deficit. When that is added to the freeing up of financial controls, enabling people to borrow off-shore if they wish, we have a situation in which there will be a great deal less competition for available investment funds, and therefore the price of money will come down. I think it is true that some lending institutions are making hay while the sun shines, quickly putting up their interest rates, but not so quickly bringing them down. I've also had some disturbing information about lenders writing clauses into loan agreements giving them the right to increase, but not the obligation to decrease, the interest rate during the term of the mortgage. We have to take a very hard look at operations doing that. Not that we wish to control interest rates as such, but it is quite clear that the present climate is being used by some people in an unfair, opportunist way. However, we believe interest rates are now trending down. Mortgage rates may not be reducing yet, but other wholesale borrowing rates have come down two or three percent already. From now on the pressure and the trend will be downwards. Whether it takes three months or six months to start seeing it at the retail level remains to be seen. I do not believe for a moment that it will be 18 months to two years as has been suggested by Mr Freeman.

We have a major commitment to overhaul the tax system. Whatever people feel about G.S.T., next month there will be a great deal of detailed material available to explain G.S.T. and its impact on the community. Legislation will be introduced to Parliament shortly, and at that time the concept and details will become clearer to the public, and many misconceptions and fears that exist will be dispelled. But one effect of G.S.T. will be that many items will actually reduce in price because the level of G.S.T. will be lower than the sales tax that is currently imposed. That in itself will not be insignificant as far as the farming

community is concerned. There will also be a substantial reduction in direct taxation rates. The currently high marginal tax rates will be reduced substantially, as will those for lower incomes. As Mr Richie commented, there shouldn't be such a compulsion to avoid payment of taxation at any cost. That attitude and resulting practises have not always been in the best interests of sound financial management, and good financial management is of great importance to farmers and farming.

It is as important as any other single factor in farming. So the importance of having access to sound financial advice and proper financial planning is vital for all of us. It is just as vital for the farmer as it is for the government or any other business.

So, we have made some substantial changes. In the long term the change in taxation will perhaps be the most important one of all. But no one change should be seen in isolation. They are components of a major change in economic management, financial management and total policy. Those changes are permanent. No government will reverse them. The government that wins the next election will be pleased to have a much easier ride because of the changes being made now.

Devaluation brought a welcome increase in the domestic price of exports; almost windfall gains for industries that weren't under the SMP regimes. But sheep meat is the problem area. The government is addressing the meat industry question. As several other speakers have suggested, it is very important that the meat industry meets the challenges of technology and marketing. Before the end of this month I hope to introduce to Parliament legislation to set in place a permanent meat industry council which will define its role, the direction of the industry and the place of the Meat Board and the private sector in New Zealand's meat marketing. I hope the meat companies and the Meat Board will co-operate in the market place. I hope a climate will be created in which massive development of better added-value products and marketing will be encouraged. The Bernard Matthews boneless lamb roast which was launched recently is just one example of that type of development. The product is profitable enough at the current U.K. unit price to pay the farmer a better than SMP price for lamb this year. And only the forequarter, not the best cuts, of the lamb is used. That Waipukurau plant will produce about 22 thousand tonnes of boneless roasts. Much more than that is needed to satisfy demand in the United Kingdom. I understand that the U.K. market has responded so remarkably well to the boneless lamb roast that it is far more promising a product than the turkey roast that the Bernard Matthews organisation first developed. It is so much more attractive that the company believes it will outstrip its competitors. That indicates what can be done with product development, modern technology, good marketing and promotion. We need four plants producing 22 tonnes of saleable added-value product as quickly as we can get them. But we're not going to turn every lamb in New Zealand into a boneless roast, heaven forbid. However, it is an example of the possibilities for product development and the promotability of that type of product — something that has eye appeal, a stable, acceptable unit price and is easy to cook and present. These aspects are very important. Consumer tastes and habits

change over time. A tragedy for New Zealand has been, as Duncan MacIntyre said, "It seems the market has changed and we haven't noticed it". We have noticed it now, and we have to quickly do something about it. My target is for half of New Zealand's lamb to be processed into consumer goods by 1987/88. That's an enormous challenge but we are moving rapidly in that direction, and it is vital that the companies which have to put up the investment funds for this type of work have the confidence and ability to do so. For this to happen, there needs to be a partnership between the Meat Board and meat companies. This would entail development of long term global marketing plans and annual marketing schemes agreed between the Meat Board and the companies. Everyone should know their role and have room to manoeuvre and the opportunity and security to invest in product development.

So, the policy changes we are talking about are changes in both the area of monetary management, the stripping away of subsidies and protection from all sectors, and at the same time, moving as quickly as possible towards creating a climate for investment in downstream processing and added-value industries. We have to remember that we are further away from our markets than any other country in the world. The cost of transporting and marketing means New Zealand cannot be a disposer of low value commodities. We have to ensure that every tonne we ship out of the country can sustain the freight and marketing costs while still returning a profit for everyone in the industry. Until this happens farmers will not be paid a profitable price for lamb, which needs to happen for farming to be carried out not for capital gain, but for annual profit. To get to that position we have to have competition, that is, end users of lamb vying for the product. We have to have more Bernard-Matthews-type enterprises seeking more of the raw material. That is the only way farmers will get more out of the market place. There is no monolithic structure that will achieve that for farmers, and I think such a monopolistic arrangement would not suit New Zealand. The Government is doing what it can to encourage meat marketing and stimulate action by restructuring monetary and financial policy.

Lastly, it was very true what Professor Ross said about the international scene becoming very concerned about all forms of assistance to agriculture. New Zealand, as a significant exporter of agricultural commodities, lamb, wool, dairy products, etc, has to make sure that everything that can be is being done to encourage and move towards the trend of lesser protection in manufacturing and agriculture. That is part of the wider thrust, and the wider scene.

We are not getting many accolades from farmers at the moment for what we are doing in New Zealand. We know that we are not getting accolades from many New Zealanders, except perhaps Bob Jones! However, we are persevering with what we are doing. There are no U-turns, there is no alternative for New Zealand. And I assure you that although over the next few weeks we will be announcing some further forms of assistance to help farmers through this difficult period, there will be no U-turns or modifications that will fundamentally alter the journey on which we are now embarked.

The challenge of adding value

M.A. Weir, Marketing Consultant, New Zealand Apple and Pear Board

The Hon. Mr Moyle, Minister for Agriculture, has spoken a lot about change. As a marketer I believe that change is inevitable. In the past agricultural policies, in respect to marketing, have been far from what was required — the recognition of change and the redistribution wealth for profitability throughout the whole agricultural industry.

In fairness, it could be said that the marketing aspect of agriculture has been disregarded for many years. New Zealand farmers are superb producers, and our farming produce manufacturers are very good too. But we know very little about the consumer end of marketing. And it is in this understanding that the future of New Zealand agriculture lies. To succeed commercially today it is essential to understand the consumers' needs, aspirations, and requirements. As a result of understanding those things a business structure can be framed to

produce profit that can be distributed from the farm gate through the manufacturer to the retailer.

Today's consumer is dramatically different from the consumer just ten years ago. In the last ten years there has been a migration from rural areas to cities. As people have moved to cities, more pressure has gone on their time and discretionary money. Significant changes in population demographics have taken, and are still taking, place. The trends emerging are significant from the marketing point of view, and include there being fewer families, consumers having less money to spend, and aging of the population. These trends are occurring in all nations with which we are currently trading. One way or another we have to take advantage of the opportunities presented by these trends, in order to improve our own profitability. A lot has been said this morning about flagging returns from farms. I would like to say that I think the structure of farming and agriculture hasn't changed much over the years, but the consumer has changed.

Because people now have more pressure on their time, they require more convenience. More and more people shop in supermarkets. They are not interested in shopping in half a dozen different stores. Supermarkets have developed in New Zealand and now, overseas, hypermarkets have emerged — one-stop shops. All these changes have been made in food marketing and yet in essence we are providing the same product as was provided a hundred years ago.

Let us briefly consider the recent development of convenience food. In New Zealand we see MacDonalds, and Kentucky Fried Chicken getting a dollar for a piece of chicken. There has been a general growth in restaurant turnover and people eating out, as more and more pressure goes on their time. I believe by considering all these significant changes we can find some major opportunities for New Zealand. As marketers of food products to the world we should, for instance, take advantage of the development of supermarket business.

This afternoon I intend to talk about packaged goods. This area is one in which I have skills and it is an area I understand. Very simply, in the developed Western world, the housekeeper does the shopping in a supermarket environment. An average household spends around eight thousand dollars a year on household goods. That money is spent in short shopping periods, typically of about 30 minutes duration, during which time the shopper is exposed to 5500-6000 grocery or food items. Food and grocery businesses operate within that framework. The marketplace is fiercely competitive. Costs are high and risks are great. But if the opportunities are measured effectively and carefully success is possible.

In 1980 the New Zealand Apple and Pear Marketing Board decided to revamp their processed food division, for which I am the market development manager. At that time, the division was cruising along not doing very much in their market — the beverage market. The New Zealand beverage market is large and very competitive. But, at that time it was also a declining market in almost every category. Between 1977 and 1980 the beer market dropped by about 7%. That cost a few jobs. Over the same period milk also lost about 7%. For every two percentage points in local milk consumption, about 30 farm supplies

are lost. Carbonated beverage like Coke, Fanta, etc., were in a similar situation, down five percentage points. With the development of the wine industry in New Zealand wine had increased 25%. While powder drinks and cordials were on the decline, fruit juices, in which the Board was interested, had doubled in four years to more than two and a quarter times the milk volume.

1980 was not an easy time to make significant changes in the retail food environment. The total market was turning down, and a difficult economic environment was persisting. At that time too there was a redistribution of food expenditure taking place. There was a swapping of stores in the highly competitive food market, worth some \$2b. Retail outlets in New Zealand fell by something like six and a half thousand, and were dropping at a rate of about 1000 stores a year.

In summary, consumer attention and spending was being diverted away from the traditional outlets, such as corner stores, into supermarkets. As marketers we had all these considerations to take into account. Complicating these effects was the domination of the retail food market by a small number of major chains. In Auckland, Foodtown and 3 Guys, both owned by Progressive Enterprises, account for 70% of the total retail supermarket turnover. So, from a manufacturing and marketing point of view, if your product is not in that chain it is effectively not in the Auckland market. As the manufacturers of the declining beverage categories attempted to maintain their position and share of the market, they spent large amounts on consumer advertising. So the New Zealand beverage market segment of interest to the Board, fruit drinks, was a growth segment. In just four years the market size multiplied nearly sevenfold. But to maintain our position in what was a difficult market place we had to do something about fruit drink development. Legally, fruit drinks are required to contain only 5% fruit juice. The rest may be chemical taste, water, sugars, etc. This is not in the Board's or the growers' interests. From the Board's point of view a massive apple crop was coming on stream. It certainly couldn't all be exported. Neither could it all be sold on the local market. But, given proper handling, it could almost certainly be sold on the external and internal fruit juice market.

The apple crop was expanding rapidly with a predicted increase from 180,000 tonne in 1980, to 361,000 tonne in 1988. The Board had a potential problem. In 1980 crop utilisation was 50% export, 16% local market and the rest into processing. The Board's only brief was to return the grower a profit on the whole crop. At that stage the New Zealand Apple and Pear Board had *Fresh-up* in the market place. *Fresh-up* had been around since the development of the fruit juice industry in New Zealand. We could very easily have gone out there with another brand of fruit juice and rationalised and cannibalised what we already had. But the real skill in adding value to a product is to add on the top of the share you already have. At the same time as protecting the existing brand we saw an opportunity in the market. We saw the downturn in consumer consumption as reflecting a lack of excitement, and there was a major opportunity for us.

In looking at consumer profiles it became obvious to us that the consumer had about as much apple juice as was wanted. *Fresh-up*

consumption had reached 4.6 litres per capita, which is as high as in anywhere in the world. It was certainly about as high as it could go in New Zealand. Our first step to protect the \$9 m *Fresh-up* turnover was to revamp the product. We developed *Fresh-up* with Californian Orange and brought out a concentrate which gave us a buying profile right across the price and volume market. That dropped the price of the brand by about 40%. This increased sales to the price sensitive family market. It is important to get the product positioned right, then everything that goes with it right, and then the sales opportunity is in your hands.

So it was obvious that people no longer wanted apple juice in the form that we were providing. They wanted more exotic tasting products. They wanted products that had an orange form or exotic formulations. We began developing another product. The Board was fortunate in having technical staff who were able to develop a product unique in New Zealand. They took an apple base, processed it a step further than had ever been done before in this country, in effect stripping from the juice those constituent parts that give its distinctive colour, taste and smell. A pure fruit juice base was all that was left. To that colour, taste and smell of other fruit juice constituents such as orange, orange mango, passionfruit etc., were added. Any flavour at all can be added to the base. The product was put on the market and called *Just Juice*. It is 100% pure fruit juice, using a 65% apple juice base and 35% tropical fruit juice blends. Frozen concentrates of various forms which gave the product its unique taste were imported, and four basic flavours emerged. At that point the profit criteria became very important. A significant level of expenditure had been committed to the research and the product had to start returning money very quickly. By slightly altering container size profitability increased significantly.

There are sophisticated market research techniques available that give virtually guaranteed consumer results based on the goods and services within the market place. So by the time *Just Juice* was released onto the market, we knew from all the research and development work that had been done that we had a winner. Consumers responded particularly to the taste, and secondarily to goodness because it was fruit juice. Response to taste was critical because we already had a product on the market that was being sold for its goodness — '*Fresh-up*, it's got to be good for you'.

It was important that the consumer perceived this other product to be different from *Fresh-up*. To reinforce that we introduced to New Zealand a new packaging system — the tetra pack. It is an extremely efficient package for fruit juice. I believe that this packaging system is as important a development as refrigeration was 100 years ago. A pure fruit juice packed in one of these bricks, 95% juice 5% packaging, can be stored at room temperature for 6-8 months. The product and the packaging system together gave us the ability to be generally competitive in the market. The price of fruit juice used to be more than twice that of aerated waters, which have the biggest volume in the beverage market. Now, the differential is half what it was, which has given us the opportunity to compete very effectively and to improve the volume significantly.

Prior to the introduction of *Just Juice* the Board had little control over where and how the product was being sold. That aspect is a critical element in packaged goods marketing. The manufacturer must have control right down to where the consumer buys the product. So a separate sales force and distributor system was introduced to handle *Just Juice*. The Fresh-up sales force was already selling to approximately 1500 outlets. The competing organisation which was set up in tandem for *Just Juice* was to cover 9500 outlets. Inventory and accounting control is fully computerised and all the deliveries are handled by the Board. We have taken control of the market place.

Having set up the basic business framework, communication became the next important part of the game. We have used John Walker and various other sports personalities and activities to communicate 'Fresh-up — it's got to be good for you'. *Just Juice* had to be different. *Just Juice* advertising had to sell taste. We used Kenny Everett in a mixed media campaign. The message was that *Just Juice* was a new product, that it had the orange taste, the orange and mango taste and that its taste was excellent.

Following that through we further developed the *Fresh-up* packaging to conform to *Just Juice*. This continued the development programme we commenced back in 1980, and is being further continued with the recent release of another product — *Appletise*. This is an aerated pure fruit juice, apple juice in a bottle.

The whole exercise had involved adding value and trading up a market, through understanding the consumer. At the end of 1984 retail fruit juice dollar sales have increased by 319%. Not only has the Board dramatically increased its own sales volume, but also the market has increased and now the grower gets a payout from processed foods. In the same time, fruit drinks which were a major threat in 1980, moved by only 15%, liquid extracts which were a major consideration have declined by 12%, powder extracts have dropped by 34%. The chemical drink pre-sweetened powders have followed our lead in flavours but the closest they have ever been to fruit juice or an orchard is in the back of a truck on the way to the supermarket. In a matter of four years New Zealand's per capita fruit juice consumption has increased by 85%. That has happened by trading up and adding value to apples that would have been dumped.

A number of factors are key to the added value philosophy. Firstly, research is the critical key. The New Zealand farming industry has spent millions of dollars on production and management orientated research. This is excellent, but very little has been spent on understanding what is going to be done with the increased production and how it is to be moved through to the consumer in the form that they want at a price that they want. We need to establish development techniques, we need food technologists who understand the basics of foods and can work innovatively within a framework to meet changing consumer requirements. As consumer populations change their tastes, quantity and input of required food change also. We need to understand what those changes are, and to have the ability to formulate products that meet those requirements and can be sold for a profit.

We need to consider packaging and presentation, and gear the

marketing thrust towards the supermarket where changes are occurring at a more significant rate than ever before. In New Zealand today just over 60% of total grocery turnover is through the supermarket chains. Overseas the percentage is even higher, up to 70%. Yet in New Zealand we are still operating basically out of corner stores. We need to establish distributive networks geared towards efficiency. Networks that will develop on-shore value added processing to enhance New Zealand earnings on New Zealand produced raw materials. We should for instance be able to remove the 30% bone content from our meat exports to more cost-efficiently transport loads. From a sales point of view New Zealand industries need to establish a single desk selling operation. There is no benefit in a dozen different people trying to sell the same carcass beef, or a dozen different people trying to sell the same case of apples, because in the end all that will happen with that kind of competition is the price will go down. Concurrently, profitability will reduce. Marketers also need to understand communication and advertising. We need to understand what positioning of products is all about, and what positioning trigger point will guarantee sales in a supermarket.

The dairy industry is a primary producing industry that interests me greatly. A lot of hysteria is being generated about packaged milk. The New Zealand milk market has been declining for the last ten years. I believe that if the milk industry is not deregulated and if no consideration is given to what the consumer wants then the industry will be forced to introduce cartoning for purely financial reasons. As the market place continues to decline, eventually, a financial threshold will be reached and then rationalisation will take place to financial rather than market criteria. And that is undesirable. I believe the whole dairy industry can, by proper management, improve. The introduction of flexible packaging for milk and cream is absolutely essential. so far as the wool industry in this country is concerned, I am surprised that New Zealand wool is not used for manufacturing a wider range of goods. On the other hand, the horticultural industry is in a situation where care must be taken to ensure current levels of investment and development are not more than the market can sustain. It is unrealistic to expect good export prices for everything we grow. Industries have to be structured so that crops can be utilised for processing, for the export and domestic markets. We should be developing products to suit those segments.

Basically, "added value" is about understanding what the market and consumers are all about. It is understanding what the billions of people in the world want, then presenting it to them in an acceptable packaged form, in the environment they prefer at a price they can afford.

Challenges facing cropping

Can the move to intensive arable rotation be sustained?

R.L. Engelbrecht, Farm Management Consultant, Ashburton

My approach to this subject is practical and intuitive. I have purposely avoided the scientific research on the subject, and leave that aspect to those more qualified to deal with it.

In presenting this paper I am reminded of a client who has a small plaque on his office wall, with the words "this is a non-profit organization — we didn't intend it to be, but it just turned out that way". I believe the public at large, and in particular the urban population, have little idea how extreme the financial pressures on the farming community are at present, and how vulnerable is the viability of many farming enterprises. At least arable farmers have some production and cost saving options to help them weather the current economic storm. Larger equipment, bigger paddocks and the newly bred higher-yield-potential of many of the more common crops provide the means for most

properties to sustain an adequate income.

The general move to intensive arable farming has been intensified by:

- inadequate returns from sheep (and other livestock) farming on the deeper, better quality soils; and,
- the lack of crop options available compared with some years ago.

When I first began farm consulting work, there were six main cash crops; wheat, barley, peas, linseed, ryegrass seed and white clover seed. These and sheep were alternatives for the main cropping soils of Canterbury. For a time, dehydrated lucerne was another alternative. Over the last 20 years, some 30 or so cash crop alternatives have come and gone — oilseed rape, lupins, tick beans, peppermint and so on. But on the whole, the income from the alternatives hasn't been more than equal to the crop which they replaced.

SOIL TYPES

Most of this paper will refer more to the free-draining medium depth soils (e.g. Templeton, Hatfield, Lyndhurst) and the shallower or lighter types (e.g. Lismore, Paparua, Chertsey) on which intensive cropping is a recent development.

Cash cropping in Canterbury is regularly practised on a vast variety of soil types. In referring to soil types, described as 'heavier', 'medium' and 'lighter', I regard the distinctions mainly as a function of depth, texture (clay, silt, sand) and structure, as they reflect moisture-holding capacity. The heavier soils I refer to are the deeper clay-type soils at one end of the moisture-holding scale, and the lighter to shallow and sandy soils are at the other end.

CROP ROTATIONS

In 1965 the rotation on an average 120 hectare cropping farm was probably:

old grass — wheat — winter fallow — barley — autumn sown peas — new grass — ryegrass seed — white clover seed — three years pasture grazing.

Of the total farm area 25% would have been in cereals, and just 62.5% would have been harvested.

In 1985 the rotation would be more like:

wheat — wheat (cereal greenfeed) — spring peas (Greenfeed brassica) — barley undersown — white clover seed.

With 60% of the area in cereals and 100% harvested. Or, perhaps, wheat — wheat — ryegrass seed — peas — barley — white clover seed.

With 50% in cereals and 100% harvested.

Nowadays, we refer to crop sequence rather than rotation, as the order of crops is much less rigid. Ten years ago, for example, I would have said that wheat should not be grown after ryegrass seed, or that cereals should not be grown three times in a row. These rules no longer apply, and perhaps by 1995 the crop sequence will be

wheat — wheat —; or, wheat — wheat — barley — barley;
or, wheat — barley — peas.

These cropping sequences are, in fact, already being applied on some properties.

The success or failure of such intensive farming programmes is based, I believe, on a few main principles.

TECHNICAL FARM MANAGEMENT SKILLS

As in any other farming enterprise, we must now be technically much more proficient and correct to be successful.

The more intensive the rotation, the more important it is that every operation is carried out thoroughly. Ten years ago, if take-all disease occurred, the remedy was to avoid growing wheat in that paddock for a few years. Similarly with *Aphanomyces* pea disease. With a compressed intensive cropping sequence, however, there is no room for failures or problems that compromise the cropping sequence or reduce flexibility.

Fertilizer and lime

Lime and fertilizer levels and inputs become much more important with intensive cropping for maintaining the balance of elements in the soil.

On an intensive arable farm soil testing should be carried out at least every three years on each paddock or block. The results should help identify crop requirements. We still have a lot to learn about this science, though. I am concerned, for example, at the build-up of calcium levels in the soil while pH levels are only being maintained or even declining (mainly, I consider, as a consequence of high rates of application of ammonium sulphate fertilizer).

The tested declining potash levels on some properties confirm that this fertilizer requirement must be more closely monitored in the future.

Weed control

Thorough control of annual weeds is extremely important. For perennial weeds, elimination should be the objective.

Most herbicides are dependent on a competitive crop to assist weed suppression and achieve control. A weed spray on a poor crop is not only less economic but weeds can still be a problem at or subsequent to harvest.

Under reasonable soil fertility conditions, perennial weed control by cultivation is now almost impossible. Glyphosate (Roundup) and some other chemicals can be a more economic means of perennial weed eradication (if used correctly) at a lesser cost and often with less damage to the soil than cultivation.

Pest control

Pest control must also be complete. For example, grass grub damage in a cereal crop may allow weed problems to develop and spread, and also does little for soil organic activity or development of affected areas.

Disease control

Crop diseases reduce the ability of plants to compete with weeds and pests. Incidence of crop diseases increases the susceptibility of future similar crops.

Crop hygiene

Post-harvest elimination of crop stubbles and residues can be very important in the reduction or elimination of weeds, pests and diseases. A complete, thorough stubble burn is the most reliable means of reducing risks in future crops and maintaining soil fertility. It is important to be very thorough in regard to these disease aspects.

Crop diseases which must be monitored carefully and build-up avoided if at all possible include take-all disease in wheat and *Aphanomyces* or common root rot disease in peas. Both these diseases can severely limit cropping options.

Happily, barley seems to fit into any part of the cropping sequence and perform well without any serious long term disease risk.

Maintaining a good cropping sequence

You will be aware of 'good' and 'bad' paddocks on your farm. The good paddocks are those that consistently grow top yielding crops with little management difficulty. This is not coincidence. In a strong, high yield potential crop of wheat, there is no opportunity for weeds to develop. Harvest time is not delayed. There is plenty of straw for a complete and thorough burn, and there is no litter remaining to encourage weeds, pests or diseases. There is, however, the opportunity for early establishment of a quality break-feed crop which has excellent conditions for establishment and development.

Conversely, it can be difficult to break out of poor crop sequences. For the poor weedy crop of wheat, harvest is delayed while weeds are reduced. Grazing of the stubble to reduce green matter delays the burn-off, which is often only partially successful. This leaves a lot of trash on the paddock, which takes a significant time and cost to remove, and increases the likelihood of problems in the subsequent crop. And so it goes on.

Thus, there are more reasons for a top crop this year apart from immediate revenue from the crop. Higher yields from future crops depend on management right now.

One of my top cropping clients suggests, accurately I believe, that any crop grown well, via its root development, will improve the soil. A strong crop of wheat, for example, will leave the soil in better condition than a poor crop of ryegrass seed. While this is a generalization, there is a lot of sense and logic in the concept. Growing several consecutive cereal crops is now much less of a problem than previously thought.

Frequently, the safest and surest way out of a bad crop sequence is to grow a depletive cereal crop well. Whereas, a restorative crop may compound existing problems.

I believe that with above average management soil fertility and production potential can actually be built up under an intensive cash cropping programme.

WINTER BREAK CROPS V. WINTER FALLOWING

There are many views on the suitability of growing off-season feed crops as an alternative to fallowing soils through autumn and winter. Generally, I favour the concept of keeping the land occupied, rather than fallowing, subject to certain conditions. This concept is more suited to the lighter and medium soils (for a number of reasons) but the same management principles apply.

There are three main categories of break crops:

- brassicas,
- cereals and,
- legumes.

Obviously, there are also many combinations of those listed. Break crops must:

- be in early and out early;
- not interfere with the performance of the subsequent cash crop;
- aid weed, pest and disease control, rather than compound potential or existing problems. (There is some evidence that brassicas can reduce the incidence of *Aphanomyces* pea disease).

These crops can be very profitable and aid soil fertility maintenance on freer draining and lower organic matter soils.

Selling grazing of breakcrops is the only cash crop that I know of that can be sold yet never leave the farm!

Good timing is essential for sowing break crops. As soon as the header has finished, the paddock should be fired, then the surface lightly worked before drilling or broadcasting. Nitrogen is the main fertilizer requirement for these crops.

In the future, lighter and medium cropping soils may provide winter grazing for hoggets from foothill farms. They may also be used for growing the leaner larger lambs now required by the market.

For an investment of around \$80-\$100 per hectare in seed, cultivation, fertilizer and irrigation, a return of \$400 per hectare is achievable. In the autumn of 1985 returns as high as \$800 per hectare were achieved on some properties.

The aim is to not leave the land idle. But, equally, something positive — cash return or benefit to the soil — must be achieved by breakcropping.

In late summer nature normally provides some indication of the opportunity for sale of breakcrops.

If a dry season has given an early harvest, the opportunity for early sown greenfeed crops is better. Also, dry autumn conditions usually allow for very high feed utilization after a rapidly maturing crop. Conversely, in a damp season with a late harvest there is usually adequate feed, and therefore less opportunity for financial gain from breakcrops. When there is no demand for breakcrops, or if soil conditions are too wet to suitably utilise these crops, ploughing in may be an alternative, depending on the type of crop following.

Fallows should be avoided on light and medium soils as mineralised nitrogen readily leaches with winter rainfall. Winter fallowing should be avoided even on heavier soils. Keeping the rotation compressed is

one way to avoid leaving land idle — for example, leave crop or small seed stubbles as late as possible before preparing for the next cash crop.

Leaving heavier soils in a cultivated condition during winter encourages loss of nitrogen, development of perennial weeds and, in some cases, a degree of waterlogging. However, winter breakcrops may not be suitable for many heavier soils because stock can be more damaging to the soils in the wetter underfoot conditions; or, later harvest on these soils means less time for the breakcrop to establish, so production is often much lower. In such situations, it would normally be more appropriate to establish an autumn/winter wheat crop, rather than delay a spring wheat crop with a breakcrop in between.

There is a belief that occasional deep ripping (subsoiling) of heavier soils avoids a cultivation pan and improves drainage and moisture-holding capacity. However, I consider the concept of a cultivation pan to be more imaginary than real. One of my clients with heavy Temuka and Wakanui soils has been intensively cropping for many years and is now achieving higher yields on a very intensive cereal rotation. At the same time, he claims the soil is now much easier to cultivate.

IRRIGATION

The development of irrigation on cash cropping farms (mainly sprinkler irrigation systems) has allowed most of the foregoing principles to be applied effectively. Through irrigation many farms have developed well beyond what would previously have been considered their potential. Most farmers are surprised at the results achieved from and the development of lighter and medium soils under irrigation. Irrigation undoubtedly allows the potential of shallow and medium soils to be realized, and I believe that the best is yet to come.

Under natural conditions progress in soil development during above average rainfall conditions, is frequently offset by the decline in soil development that occurs in the below average rainfall years. To a considerable degree, the more intensive the farming system the more vulnerable the farm will become under drought conditions.

With intensive cash cropping on dryland light and medium soils there is a major difficulty in forecasting yields of crops, given highly variable seasonal rainfall. A high yield target plan means high input costs with the risk that low rainfall will result in low yield and quality. Conversely, a low yield plan will reduce input costs, but it will also reduce yield given optimal rainfall. These problems are avoided on irrigated properties. With irrigation, production becomes predictable, and therefore efficient.

Spring/summer droughts can occur even in normally reliable rainfall areas. Many growers have experienced a dry spring/early summer period with a poor crop yield, followed by wet difficult harvest conditions. The 1974-75 season was a good example. It was that year that many dryland farm paddocks changed from a good crop sequence to a poor crop sequence. Irrigation provides an alternative for the control of soil fertility by keeping the soil organic cycle moving.

Through effective, thorough application of the above technical

requirements, top yield and quality crops can be consistently grown.

From a crop management point of view I would prefer to intensively arable farm medium soils with irrigation, rather than heavy dryland soils, even though the latter may be in a medium or high rainfall area. With irrigation on medium soils, soil moisture levels can be effectively controlled. The 'rain' can be turned off for the harvest period, giving earlier access to land for winter greenfeed while lower winter soil moisture levels give improved winter feed utilization.

MINIMUM TILLAGE — CONSERVATION TILLAGE — DIRECT DRILLING

Depending on one's concept of the technique, most arable farmers I know would practise minimum or conservation tillage. They aim for minimum cultivation effort in terms of time and cost to achieve a suitable seedbed for each crop.

In my observation, most farmers avoid direct drilling because too often the conditions for top yields are not well provided for by direct drilling. I would be delighted if direct drilling gave top performances, because the consequent cost and time saving would be beneficial. However, most farmers cannot afford to operate trials to assess whether the savings claimed by proponents of direct drilling can be achieved.

There aren't many failures now on cropping farms under average or better management. As one farmer I know says, "There is a place for direct drilling — someone else's place."

STUBBLE PLOUGHING

In my view the incorporation of cereal straws does little for the maintenance of soil fertility or structure. It can, however, increase weed, pest and disease risks, at least a temporary nitrogen loss and remove breakfeed crop opportunities. Evidence of wheat straw ploughed to the surface in a very similar condition to when it was buried seven or eight years previously, has convinced me there is little to be gained from this exercise.

Crop residues are, I believe, of much better value if they are semi-processed by animals before being incorporated into the soil. Pea straw is different and can be of benefit to the soil. But it can be of equal benefit and a valuable stock feed supplement by going back to the soil via the sheep flock.

CONCLUSION

Intensive arable farming is such a dynamic enterprise, so that only guidelines can be provided for the success of a system. Changes in the past 20 years have shown that today's practice may be tomorrow's nonsense, so one must apply proven management practices thoroughly and effectively, while observing and learning from the results and experiences on one's own and others' properties.

I expect that, given the opportunity to discuss the same subject in

another 10 or 20 years time, I could well be contradicting much of what I have said today. However, I believe that the move to intensive arable rotations can be sustained on Canterbury soils, with the following provisos:

- thorough management of the technical requirements of crops, particularly lime and fertilizer requirements and weed, pest and disease control (crop hygiene). That is, thorough farm management;
- timing is extremely important. The more intensive the cropping sequence, the more important is timing and technical expertise;
- breakfeed crops are usually more appropriate than a winter fallow. They keep the soil organic cycle moving, subject to the conditions mentioned;
- cultivation should be minimised while achieving a suitable seedbed for each crop;
- irrigation allows all of the foregoing objectives to be consistently and effectively achieved. It provides almost total control and predictability.

Intensive arable farming is a cost intensive industry. Farmers who reduce inputs to save costs should ensure that the savings made are greater than the short to long term reductions in crop yield and quality. Too often, they are not.

The average and above average cash cropping farmer will survive the difficult economic conditions which we will face over the next two or three years. Below average performance farmers may not survive.

Soil structure and plant growth under intensive cultivation

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INTRODUCTION

Soil structure is the term used to describe the arrangement of particles in the soil. It is a complex factor which can have a pronounced effect on plant growth. The size, shape and packing of the soil units (aggregates) determines the amount of useful air spaces (pores) in the soil. Movement of air and water as well as penetration of crop roots are all controlled by the effectiveness of the system of soil pores. Whether the pore system remains open or closed depends on the stability of the soil aggregates. Soil erosion by wind or water is also controlled by the size and stability of the soil aggregates. Cultivation can cause structure breakdown but the extent is dependent on the soil type and the intensity of cultivation.

IMPORTANCE OF GOOD SOIL STRUCTURE

The physical condition of the soil can have an over-riding influence on crop growth. "Good soil structure" is difficult to define but means "soil aggregates which are stable and of a size, shape and packing which maintains the necessary balance of air and water in the soil and allow ease of root growth".

The ability of a plant to get water and nutrients from the soil is largely controlled by the effectiveness of its roots. Any restriction in the rate of root growth or pattern of rooting can limit crop yield. Roots grow at a rate of between 1 and 50 mm/day, depending on such things as soil aeration, temperature and resistance to penetration (soil strength). Roots prefer to grow through existing cracks and pore spaces in the soil. They actually grow between soil aggregates rather than through the aggregates themselves. Roots can exert some pressure on the soil to help them grow but if the aggregates are packed too tightly and the pores are smaller than a certain size (less than 0.2 mm) then root growth will stop (Figure 1). A 'plough pan' can occur on soils which have been intensively cultivated, particularly if the soil has been too moist at the time of ploughing. Such pans can severely restrict root growth and drainage (Figure 1).

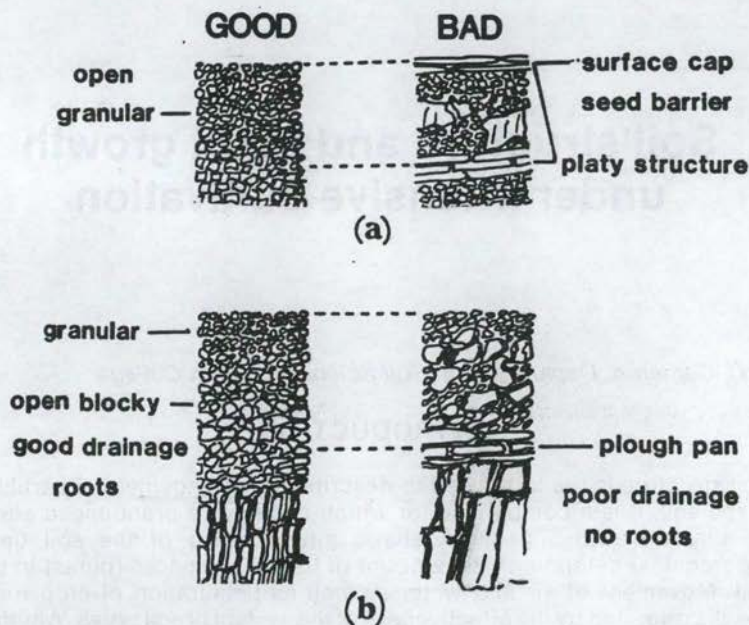


Figure 1: Good and poor structured soil profiles (Adapted from Davies *et al.*, 1972)

- (a) silt soil
- (b) clay soil

If the soil has too low a strength (i.e. too fine a tilth) the plant has poor anchorage and may also suffer from drought. Very fine seedbeds are likely to 'blow' in high winds and they can also form 'surface caps' with even light rainfall. Wind erosion of soil is a particularly serious problem with the potential loss of tonnes of fertile topsoil. Even when soil is not seen to be moving as a spectacular dust cloud, erosion may occur by soil being lifted and rolled along the surface.

Table 1. Assessment of soil structure of cultivated land
Peerlkamp scale

Clay and loam soils	
ST 1-2	Plough layer consists entirely of big clods, smooth dense crack faces, reducing conditions, roots only in cracks.
ST 3-4	Plough layer big dense aggregates, smooth crack faces, roots between aggregates.
	or
	Top 6 cm angular dense aggregates, very dense below 6 cm.
ST 5-6	Plough layer big but porous aggregates, rather smooth crack faces.
	or
	Top 7-8 cm small porous aggregates with denser layer below.
ST 7-8	Plough layer mostly porous crumbs partly combined as porous aggregates. Occasional denser clods.
ST 9-10	Plough layer all porous crumbs, very few dense aggregates.
Sandy soils	
ST 1-2	Single grain structure, no cohesion of particles if low in humus.
ST 3-4	A few aggregates of low stability. Low cohesion.
	or
	Loose top layer on collapsed and compacted lower layer.
ST 5-6	Slight cohesion of particles, entire topsoil of big rather dense aggregates.
	or
	Top layer (7-8 cm) moderate aggregation over collapsed lower layer.
ST 7-8	Plough layer almost entirely porous rather stable crumbs, occasional dense aggregates.
ST 9-10	Entire plough layer consists of stable porous crumbs and few dense aggregates.

When a surface crust forms on the soil, yields are affected. Not only does the crust prevent the emergence of seedlings (Figure 1), but it can also act as a restrictive 'collar' on the plants which have emerged. A surface crust acts as a barrier to water infiltration so the plant may not receive the full benefit of rainfall or irrigation. More serious however, is the likelihood of surface runoff. This can lead to soil erosion and loss of crop and topsoil. The problem of water erosion is worst on steep slopes, but can also occur on the plains where there are ridges and gullies within paddocks.

Roots and essential soil micro-organisms need air (oxygen) to grow. When the soil is wet or waterlogged, oxygen cannot move around so easily or exchange readily with the atmosphere. The rate at which a soil drains is controlled by the number of large pores (greater than 0.05 mm) in the soil and if these are lost, or blocked, drainage is restricted. A correct balance of large and small pores are required to allow drainage and water storage. This is controlled by the form and stability of the soil aggregates.

The temperature of the soil also affects the activity of soil micro-organisms and plant growth. Spring temperatures are particularly important, and when these are below about 5°C growth and activity are very slow. The rate at which a soil warms in the spring is dependent, amongst other things, on the amount of water in the soil. Well drained soils with open porous structures will warm the fastest. Again, good soil structure is advantageous.

SOIL AGGREGATES

Soil aggregates are a mixture of sand and silt bound together by clay, organic matter and other soil components. Within the aggregates there are many small air spaces because the clay and organic matter act as bridges holding the other particles apart, yet binding the aggregate together (Figure 2). The other soil components shown are iron and aluminium oxides and these, along with calcium, also help to cement the aggregate together. Roots and fungal hyphae help by growing around the aggregates, keeping them intact and holding individual units apart.

Plant roots help produce certain glues (polysaccharides) which bind sands and silts together. As roots grow they exert a pressure on the aggregates which moulds them into shape and this, as well as removing water from them, again helps form the individual units of structure. Other forces such as wetting and drying, freezing and thawing also help to form the aggregates.

The activity of earthworms and bacteria have a big influence on structure formation and stability. Earthworms create channels through the soil but in doing so they also 'process' large amounts of soil, binding it together. The entire topsoil of a paddock may be processed by earthworms in one year. Earthworm activity therefore has a large affect on soil conditions.

Research work has shown that soil organic matter has a very strong influence on aggregate stability (Tisdale and Oades, 1982; Chaney and Swift, 1984). The type of organic substances present are important but

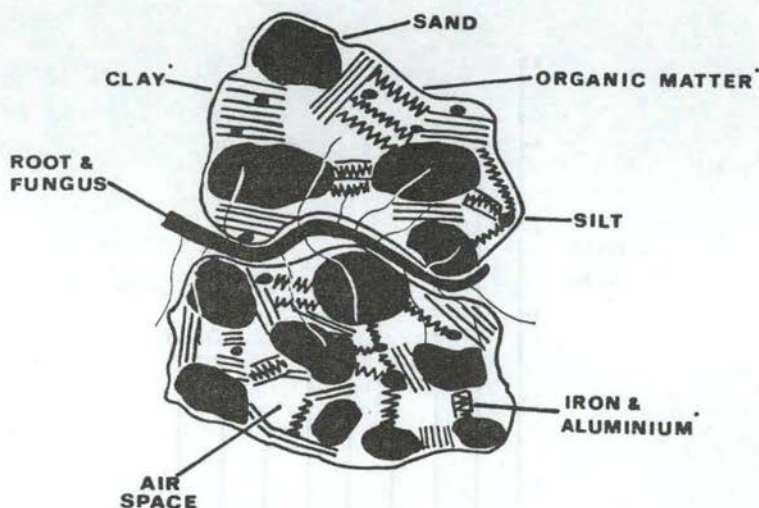


Figure 2: A view inside soil aggregates. Sands and silts held together by (i) Clay, (ii) Organic matter, (iii) Iron and aluminium oxides, and (iv) Calcium (not shown). Roots and fungal hyphae grow between small aggregates and help bind them together. Air space within aggregates is important for storing water and the air space between aggregates is important for root growth and drainage.

often it is only the amount which is possible to measure. It is commonly stated that soils are likely to be unstable when levels fall below about 2½% organic matter (Davis et al., 1975). However, this depends very much on the presence or absence of the other soil cementing agents (i.e. clay, iron and aluminium oxides, and calcium). If these other agents are dominant then the organic matter levels are less critical.

Fine sandy soils and silty soils can become unstable if they lose their organic matter, whilst heavier soils are often less prone to instability. Clay soils, however, present other problems of smearing and compaction if worked when too wet.

Many of the soils on the Canterbury Plains are young soils and because of this have low levels of iron and aluminium oxides. So organic matter levels are particularly important for maintaining aggregate stability on many of these soils.

EFFECTS OF THE MANAGEMENT SYSTEM

Obvious soil structure problems, such as wheelings and pugging, are easy to identify, and their effect on plant growth can be readily appreciated. Harvesting root crops on wet soil can cause considerable damage and the effects may persist for a number of years. Drilling in the spring can also be risky on some soils because of the likelihood of structure damage due to wet conditions.

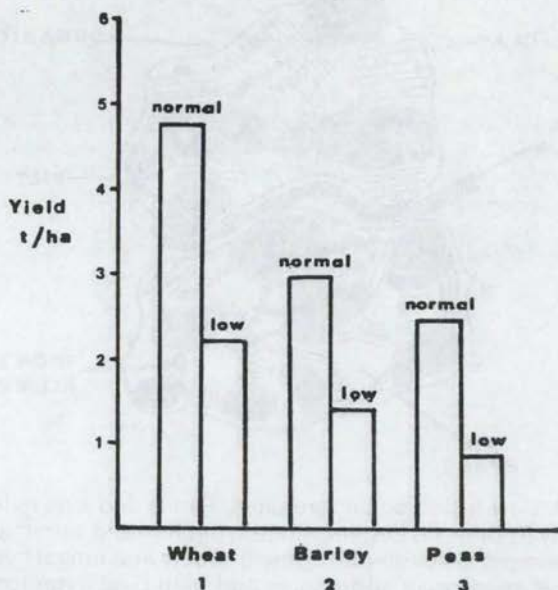


Figure 3: Examples of the effect of poor soil structure on plant yield (Batey and Davies, 1971)

- Example 1. Winter wheat lower yield on land cultivated when too wet. Pan restricted rooting.
- Example 2. Spring barley drilled into wet soil causing compaction and lower yield.
- Example 3. Peas after sugar beet. Lower yield on area showing poor soil structure.

However, it is more difficult to appreciate the yield reductions and dangers associated with the more subtle changes in soil structure conditions which can occur over a number of years.

A general rundown of the soil structure and the presence of pans or surface crusts may have more effect on plant growth one year than another. The weather conditions have a considerable influence on the likelihood of the plant suffering due to poor soil conditions. In effect, there is a higher risk factor associated with poor soil physical conditions.

Some typical examples of the problems which can occur and their effects on crop yield are given in Figure 3. In Example 1, the poor growth of the wheat occurred on a low lying part of the paddock where the seedbed cultivation was done under wet soil conditions. A distinct pan had formed and the plant roots were unable to penetrate this to obtain the water and nutrients below. In Example 2, the poor yield of

the spring barley resulted from drilling into wet soil which caused severe compaction. The rest of the paddock was drilled when the soil was drier and the yield was correspondingly higher. In Example 3, the peas were grown after a crop of beet. The poorer yield was on an area which showed poor aeration and compaction, with little or no cracking or obvious good soil structure.

Soil structure conditions and aggregate stability are greatly affected by the level of organic matter in the soil. This is influenced to a large extent by the management system. Figure 4 clearly shows that with continuous cultivation the level of organic matter is low compared with long term grass. Figure 4 also shows that where grass is ploughed and cultivation continued for a number of years the level of organic matter drops considerably.

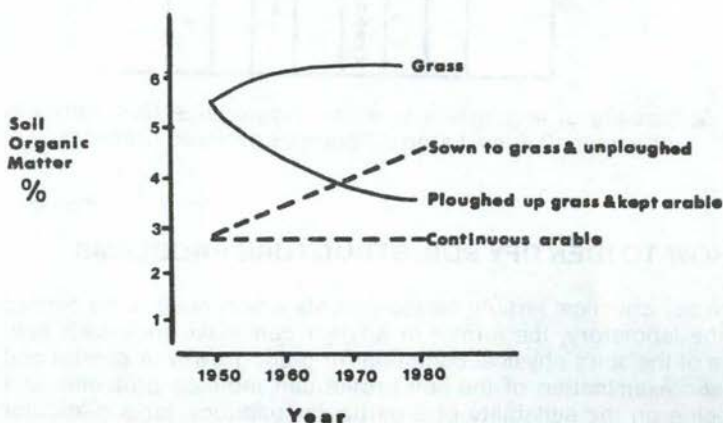


Figure 4: Influence of the management system on the organic matter content of the soil (Johnston, 1980).

Cultivation breaks up the soil and aerates it. This increases the rate of organic matter loss and reduces the stability of the aggregates. Some limited results on a Templeton Silt Loam in Canterbury have shown that with heavy cultivation over half of the soil aggregates are unstable and disintegrate in water (Figure 5). By comparison only 10% of the aggregates from a long term grass on the same soil are unstable. Light cultivation and direct drilling have more stable aggregates than the heavy cultivation but less than the grass (Figure 5).

It is possible to restore the level of organic matter by returning to grass (Figure 4). The levels of organic matter provided by different crops are given in Table 2 and shows why they build up under grass but fall under cropping. The distribution of the roots are different in cereals and grass pasture and the effectiveness of these inputs of organic matter are also quite different. Root crops in particular take a lot out of the soil.

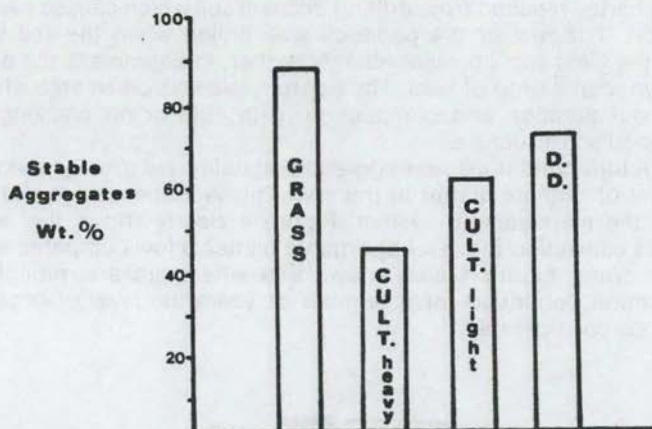


Figure 5: Stability of aggregates in water. Aggregates (2-4 mm) wet sieved for 10 mins. Large differences between practices.

HOW TO IDENTIFY SOIL STRUCTURE PROBLEMS

Unlike soil chemical fertility measurements which need to be carried out in the laboratory, the farmer or advisor can make their own field estimate of the soil's physical condition for plant growth. A careful and systematic examination of the soil profile can indicate problems and help decide on the suitability of a particular paddock for a particular crop.

Detailed procedures have been given by Batey (1975). The first step is to select an area of the paddock which is uniform and similar to the rest (i.e. avoid gateways, tracks, etc). Next, dig a good sized pit (50 x 100 cm) to a depth of about 50 or 60 cm, noting the ease of spade work at each depth. Then carefully prepare the face of the pit

Table 2. Quantities of organic matter returned by roots of various crops (from Davies et al., 1972)

Crop	Added organic matter in top 15 cm soil (kg/ha)
1 year grass	4000-5000
3 year grass	6000-8500
winter cereals	2200
spring cereals	1300
sugar beet	500
potatoes	250
red clover	2000
10 tonnes farmyard manure	4000

so that the physical features of the profile can be seen. This is best done by gently picking at the pit face with a knife to remove the smoothed edge created by the spade. Start at the top and work down the face.

Examine the full pattern of roots in the profile and decide on whether there is an even reduction with depth or if there is a sudden decrease, or increase at any depth. Examine the soil texture changes within the profile (e.g. sandy soil on clay subsoil). Examine the presence or absence of soil aggregates and their individual shapes. Test the density of the soil by probing at various depths with a pocket knife.

Divide the soil profile into four layers: (1) the soil surface, (ii) the layer disturbed by normal cultivations, (iii) the soil just below the cultivated layer, and (iv) the subsoil (Figure 6).

- (i) Surface. Examine the soil for the presence of a surface crust. This may be obvious, or may be detected by gently probing under the surface with a knife and lifting up the surface. The extent, thickness and hardness of the crust should be noted.
- (ii) Cultivated layer. Examine the soil for the presence of any dense layers or pans. These may be picked up by probing the pit face with a knife. Crop roots may show up the presence of a pan, being clustered or matted above it with none below. Where a pan is present the soil may have mottles (rust-coloured spots) which indicate poor drainage. Some of the visual effects of a pan depend on the time of year. For instance, in winter the soil above the pan is wetter, and water may even flow out of the soil profile at this point. In summer the soil below the pan is noticeably wetter. Shiny surfaces on soil aggregates may indicate blocked soil pores and an effective pan. The depth of the pan is very important as this will define the maximum easy rooting depth.

FEATURES TO LOOK FOR IN SOIL PROFILES

<u>SURFACE SOIL</u>	CRUST (extent/thickness/hardness)	E X A M I N E R O O T P A T T E R N	E X A M I N E S O I L T E X T U R E	T E S T S O I L D E N S I T Y Probe with knife
<u>CULTIVATED LAYER</u>	STRUCTURE FORM PANS (thickness / depth) COLOURS AND MOTTLES WET OR ANAEROBIC ZONES SMEARED SOIL (shiny surfaces)			
<u>SUB-CULTIVATED LAYER</u>	STRUCTURE FORM PAN (thickness/depth) (as above)			
<u>SUBSOIL</u>	STRUCTURE FORM DRAINAGE STATUS (colour/mottles/roots/ etc.)			

Figure 6: Examination of the soil profile — features to look for.

- (iii) Sub-cultivated layer. Often the most critical for crops, this is usually the layer which has the greatest structure problems. Pans created by ploughing at the same depth can be picked up by examining the crop roots and soil as outlined above.
- (iv) Sub-soil. Drainage conditions are usually most important here and these may be obvious by the presence of water or grey/blue colours of the soil. Mottles will also indicate periodic waterlogging.

Structure index

In many situations it is useful to be able to put a relative value on the structure condition of a soil. A number of visual scales have been developed for cropping situations overseas and some could readily be adopted in New Zealand. In the method of Peerlkamp (1967) the cultivated layer is examined by carefully taking a spadeful of soil and, after loosening by hand a value between 1 and 10 is given on the basis of:

- (a) the size and shape of the aggregates;
- (b) the cohesion of the soil particles;
- (c) the porosity of the aggregates and of the entire plough layer;
- (d) root development;
- (e) dispersion at the soil surface.

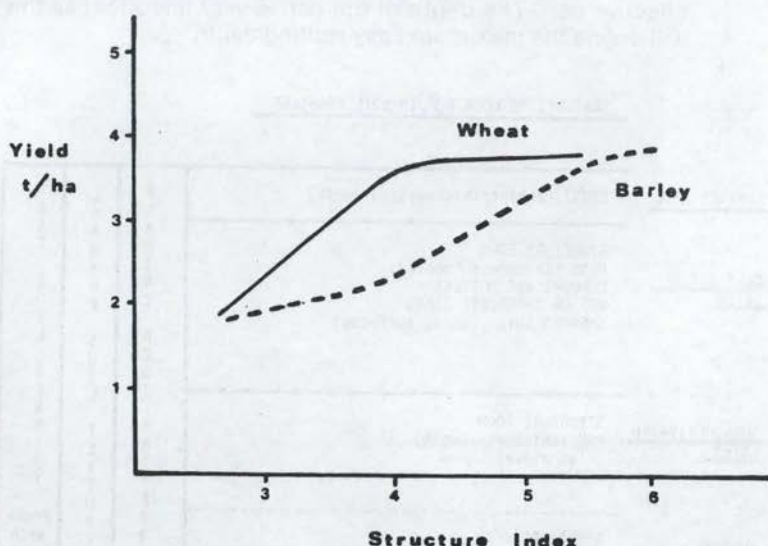


Figure 7: Relationship between a visual estimate of soil structure conditions (Peerlkamp Scale) and crop yield (Boekel, 1963).

The scale is given in Table 2 and is different for sandy soils than for clay or loam soils. The test is best conducted on moist soil in the spring or autumn and it is best to make about 10 estimates per paddock.

The Peerkamp Test has been used by the Institute of Soil Fertility in the Netherlands and by the Agricultural Development and Advisory Service in the U.K. (Eagle, 1972). Although it is a subjective test the differences between operators are not usually significant and the test is sufficiently sensitive to distinguish even small differences in soil structure. An example of the use of the test and its relationship to crop yield is given in Figure 7. The lowest crop yields were on the soils with the lowest structure index, and a value of at least 5 was required to ensure high yields.

CONCLUSIONS

On some soils intensive cultivation can cause significant deterioration of the soil structure and can increase the risk of crop failure or reduced yields. The effect on many New Zealand soils is still unknown. It may be that on soils with inherently weak structure continuous cropping is not possible and some form of pasture/crop rotation is necessary. Careful monitoring of the soil's structure condition can aid the farmer in making management decisions.

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Intensive cereals and take-all

Ian C. Harvey, M.A.F. Lincoln

The life cycle of the take-all disease of cereals is almost completely restricted to the soil, yet it is distributed throughout all the temperate cereal growing areas of the world. Take-all is caused by the fungus *Gaeumannomyces graminis* var. *tritici*; often abbreviated in the literature to Ggt.

If take-all could be economically controlled with fungicides or by the use of resistant cultivars, then plant pathology would be very much the poorer. The lack of ways of controlling this disease by conventional means has led to Ggt attracting an enormous research input. Scientists have long striven to understand the relationship between the pathogen, its environment and its hosts. The search has been to identify any chink in its armour that may be used for economic control. Much space could be taken up with discussion of various relationships between environmental factors and cultural practices and their effects on take-all. Instead, a summary is given here of some of the important

relationships that can be utilized to design a practical overall control strategy.

Listed below are factors that can affect incidence or severity of take-all (TA) in cereal crops. This information is largely condensed from "Biology and control of take-all" edited by M. Asher and P. Shipton, Academic Press, 1981.

SOIL FACTORS	AFFECT ON T.A.
High moisture	Increases T.A.
Aeration ($O_2:CO_2$)	Lack of aeration causes excess CO_2 and limits O_2 . This increases T.A.
Temperature	$5^\circ-15^\circ C$ increases T.A. Once infected, T.A. can develop up to $30^\circ C$.
pH	pH 4-6 (acid) reduces T.A. pH 6-8 (alkaline) increases T.A. This effect occurs because pH influences the rate of nitrification.
Soil type	Light, alkaline soils increase T.A. High organic, clay soils increase T.A.
Nutrients:	
Nitrogen	High NO_3-N increases T.A. High NH_4^+-N reduces T.A. $NH_4:NO_3$ ratio greater than 3:1 reduces T.A. $NH_4:NO_3$ ratio less than 3:1 increases T.A.
Chloride (Cl^-)	NH_4Cl reduces T.A. (because it increases the $NH_4:NO_3$ ratio).*
Phosphorus (P)	reduces T.A.
Potassium (K)	Increases T.A., especially if N and/or P deficient.

* Christensen and Brett, 1985. Chloride and liming effects on soil nitrogen form and take-all of wheat. *Agronomy Journal* 77: 157-163.

MANAGEMENT PRACTICES	AFFECT ON T.A.
Drainage	Good drainage reduces T.A.
Weed control	Good control reduces T.A. because it (a) reduces competition for nutrients, and (b) reduces T.A. carry-over. Couch (twitch) controlled with glyphosate can increase incidence if T.A. infection on the rhizomes is moderate to heavy. (Harvey and Braithwaite, 1986)
Seeding rate	High plant density increases T.A.
Time of sowing	Early sowing increases T.A.
Choice of crop	Wheat is most susceptible to T.A. Barley is less susceptible to T.A. Oats are resistant to Ggt, but get T.A. caused by Gga, a different variety. Rye is resistant Triticale is variable.

Fungicides

Some reduce T.A. (e.g. Benlate (benomyl 1) at 35 kg/ha (Bateman, 1981).

PREDICTING TAKE-ALL IN CEREAL CROPS

Forecasting T.A. epidemics is difficult. The only measurable factor of T.A. is soil inoculum, and calculating this on a broad acre basis is impractical. In small plots and in glass house pot experiments it can be done, but it is extremely costly on a paddock basis. Also, sampling techniques mean 'lenses' of infection are easily missed.

However, a fairly accurate prediction of T.A. risk can be made by considering the previous cropping sequence, previously recorded levels of T.A., soil type, likely disease carry-over and prevailing and predicted weather.

CROSS PROTECTION vs TAKE-ALL DECLINE

Wong (1981) suggests cross protection of wheat plants with avirulent take-all fungi (known as Ggg and *Phialophora* sp.) as a way of controlling T.A. in light to moderately infected fields. Alternatively, take all decline (TAD) can be encouraged where antagonistic fungi and bacteria are fostered through continuous wheat or barley culture. The use of a break crop destroys the TAD effect, and the entire build-up cycle (see Table 1) must be recommenced.

TABLE 1: Cross protection cycle

Year	Crop	Condition	Comments
1	Wheat	Severe T.A.	
2	Break crop (brassicacae, etc.)	No problems	Reduces T.A. inoculum.
3	Grass ley	No problems	Increases resident population of aviru- lent fungi.

Two options for combatting T.A. in subsequent cereal crops

A Years 4-8	B Year 4 Wheat. Some T.A. occurs.
Continuous cereals (wheat or barley), using avirulent Ggg/Phialophora innoculated seed.	Year 5 Wheat. Moderate T.A. occurs.
Gradual build-up of T.A.	Year 6 Barley. Years 7 & 8 Barley. Moderate T.A. occurs. A grass ley may be put in here.

Tillage	Very open soil decreases $\text{NH}_4\text{:NO}_3$ ratio and increases T.A. Compact soil increase T.A. Conservation tillage has variable affect on T.A.
Choice of wheat cultivar	Has no good recognized effect on T.A., though less T.A. in Kopara compared with Oroua has been reported in Southland and Maris Huntsman tolerant in U.K.
Cropping sequence	
sub-clover)	
lucerne)	Increase in T.A., because of the decrease in
soya beans)	the $\text{NH}_4\text{:NO}_3$ ratio, or an increase in T.A.
grass pasture)	innoculum.
barley)	
red clover	no effect on T.A.
lupins)	
oats)	
beans)	reduce T.A.
peas)	
fallow)	
sugar beet)	
potatoes)	some reduction in T.A.
Time of N application	Early $\text{NH}_4\text{-N}$ application in Autumn sown crops reduces T.A.
Use of other fertilizers	Adequate nutrients ensure ability to 'escape' T.A. The plants are no less susceptible, but have more roots to maintain growth.
Straw burning	has no effect. However, top working immediately after burning reduces subsequent T.A.
Agro chemicals	
Seed dressing	Baytan at high rates (2 — 4 x New Zealand recommended rate) reduces T.A. (Bockus, 1983).
Soil fumigants	Increase the $\text{NH}_4\text{:NO}_3$ ratio and reduces TA.
Nitrification inhibitors	as for soil fumigants.
Herbicides	No direct effect, but see weed control.
Back to Year 1	Year 9 Wheat. Light to moderate T.A. TAD is now operating. Thereafter, continuous wheat and barley.

THE FUTURE

Peter Scott (1981) "... biological control may be more effective in reducing the agricultural impact of T.A. than attempts to select for improved host resistance". The same could be said for the attempts to find economically useful chemicals.

CHECKLIST FOR REDUCING LOSSES FROM T.A.

1. Maintain good drainage and/or don't over-irrigate. 2. Don't lime paddocks with known high levels of T.A. 3. Maintain PK nutrient status and balance. 4. Apply N in the form of ammonium sulphate or ammonium chloride if applied early to early sown crops. Ensure crops are never N deficient. 5. Control weeds. Check T.A. infection on twitch rhizomes before spraying with glyphosate. Calculate risk. 6. Don't use excessively high seeding rates. 7. Maintain good tilth, but not too light. 8. Use crop sequences that decrease inoculum. 9. Top-work paddocks soon after stubble burning. 10. Try encouraging Take-all decline (TAD).

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Intensive Cropping

D.J.A. Kelman, Farmer, Geraldine

To many people intensive arable farming is a new concept, and perhaps it is in New Zealand. In England, though, large areas of land have been continually cropped for more than one hundred years. At Rothamstead Research Centre in England an experiment is running in which wheat has been grown continually for 143 years, and the yield continues to increase as new technology is applied. To my mind, there is no doubt that intensive arable farming can be sustained, and I would like to illustrate this with my experiences over the past seven years.

My wife and I farm 199 hectares of Templeton and Wakanui silt loam, four miles south of Geraldine. When we bought the farm six years ago it was a typical mixed farm running 1,200 sheep and cropping one third of the area. At that time half the farm was irrigated and half a labour unit was employed.

We moved to intensive cropping after purchasing the farm, to cover the mortgage interest, increase our income, provide a challenge and to justify irrigating the entire farm. Since then many changes have taken

place on our farm:

- dollar profits are up by 290%;
- cereal yields have increased by 40%;
- two and a quarter labour units are now employed;
- we own only six sheep;
- nitrogen fertilizer usage has increased from eight to 40 tonne; and,
- outlay on chemicals, especially fungicides, has increased dramatically.

However, outlay on stock and plant is no larger than for mixed farming.

Many people imagined that our biggest problem with intensive cropping would be breakdown of soil structure, but this has not occurred. One paddock has been continually cropped for 15 years, and it continues to yield as well as any other paddock on the farm. Our biggest problem has in fact been to acquire the necessary new skills. Basically we were pastoralists and stock farmers. We had to be retrained in new skills such as monitoring crops, recognizing and diagnosing cereal diseases and pests and so on. We had to develop an awareness of plant physiological changes, an understanding of the Feekes growth stage scaler, the important stages of plant growth and recognition of factors attributing to the yield of different crops. Thus, with the change to intensive cropping our management input has increased and we have employed more labour. Along with this has come the challenge to employ more labour and motivate good workers.

NITROGEN

This fertilizer has made a dramatic impact on our yields and our ability to continually crop. We are no longer reliant on break crops of clover or a spell of three to four years to build up nitrogen reserves. Instead, we use a rotation of three to four years in cereals, then a break crop of either peas, clover, potatoes or ryegrass seed.

The legume break crops cannot fix enough nitrogen to sustain high yields of cereals, so we buy fertility by the bag in the form of nitrogen. Nitrogen is currently \$1.03 per kilogram, so a response of approximately 4 kg wheat or 5 kg barley is necessary to recoup the cost and break even. With average responses up to 15 kg of grain per kilogram of nitrogen the outlay is definitely worthwhile.

As nitrogen has become such an important fertilizer it is essential that it be spread accurately. To do this, we have bought a pneumatic fertilizer spreader, in partnership with two other farmers. All our crops are now tramlined, so that nitrogen and chemicals can be accurately spread.

The big question is how much nitrogen should be applied. My answer is to look at the yield potential, crop history and winter rainfall. I think experience gives the skills to judge a crop's likely needs, though I feel a lot more research must be done on this aspect.

DISEASES AND PEST CONTROL

Along with nitrogen, control of diseases and pests has contributed greatly to our increased yields and profitability. One of the main aims of our crop rotation is to reduce the incidence of some of the soil borne diseases such as take-all. All the same, break crop returns must be at least equal to those from cereals.

A lot of money is invested in a crop in the way of seed, cultivation and fertilizer. That investment can be wasted through lax disease and pest control.

Timing is critical for effective spraying. A delay can prove very costly. To maintain total control over timing we do all our own spraying, including fungicides, with a trailed sprayer.

Often crop potential is not realised through negligent crop husbandry. Through the spring I like to visually check each paddock at least three times a week, rather as a sheep farmer checks a mob of sheep.

Crops are sprayed according to disease pressure and the plants' growth stage. This may involve spraying wheat and barley at $2\frac{1}{2}$ times the normal concentration/rate.

LABOUR

Contrary to the trend, we employ more labour now than seven years ago. At $2\frac{1}{4}$ employed labour units, as much labour is employed on the farm as was employed in the 1950s. Another intensive cropping farm in our area has increased employed labour units similarly.

The challenge in this is to use skilled labour effectively. This increases future options for the farm, such as moving into intensive vegetables or fruit according to market requirements.

PLANT

The less capital tied up in plant and stock the more profitable a farm can be. I believe we have no more money in stock and plant now than before the farm was intensively cropped.

One of the challenges of the move to intensive cropping has been to better utilize existing equipment. For instance, our main tractor is 74 hp. Rather than buy larger tractors, we utilize our labour to have existing tractors work longer hours. The two most important pieces of equipment on our farm are the trailed sprayer and pneumatic fertilizer spreader.

One of the great advantages New Zealand has over other arable countries is the long sowing period. In England there is just four to six weeks between harvest and planting for the next season. Here, though, we plant clover in mid February, ryegrass in March, wheat in April, May, June, July and August, peas in September and potatoes in October.

Spreading harvest over a longer period by growing winter barley and ryegrass also means that with the aid of a grain drier we are able to utilize a smaller combine.

LIVESTOCK

I believe it is a fallacy that sheep complement intensive cropping. Sheep aggravate or complicate good crop management. They delay perennial weed control, cultivation and sowing to the detriment of crop yields. In wet winters they also damage soil structure. Finally, sheep husbandry demands often clash with those of crop husbandry.

We are the proud owners of just six sheep. If sheep are required to clean up crop residue we get grazers in to do the job. If we want livestock to complement the cropping we will look at pigs or poultry, both of which would add value to our produce.

PLANT VARIETIES

An abundance of new plant varieties, giving big yield increases, have become available over the last few years. The future looks just as exciting, with the possibility of the hybridization of wheat in the next five years.

Now the wheat market has been deregulated, I expect new higher quality wheat varieties will become available. The growers' challenge will be to make them yield well.

Marketing will play a big role in expanding the small seed market. I expect our white clover production to move from Huia to specialist varieties better suited to the end user.

IRRIGATION

Irrigation is one of the keys to intensification. It provides greater flexibility to increase production. The cropper's challenge is to make better use of the water resource. Ideally, water demand should be spread through the year. This year we grew potatoes to spread water demand away from busy October and November into December, January and February.

The exciting possibility of growing two barley crops a year exists. An April sowing of barley should be ready for harvest in December, when another planting could be made. The end result could be 12 tonne of barley per hectare per year. An added advantage would be spread water demand created by the December sown barley crop.

CONCLUSION

Intensive arable farming will become more important with the continuing switch from livestock to arable farming.

I believe that intensive arable farming can be sustained, and that the challenges to arable farming are to adapt to market requirements and new technology and to produce a product that will sell profitably on the world market.

Challenges facing horticulture

The international scene and the marketing of pip fruit

Westbrook Haines, Executive Director, Export Development, New South Wales Department of Agriculture, Sydney.

We can all take some degree of satisfaction from the progress horticulture has made in New Zealand in the past 10 years. It might be said that for a country of our size we have made more progress than any other, particularly in the late 1970s and early 1980s. This occurred not because of the brilliance of 'private enterprise' and the export companies. But, rather, because of the very strong relationship between industries and government, and the requirement for both to develop plans and strategies. At the same time, innovative producers and exporters recognised an opportunity. International consumer purchase habits were changing and there was an opportunity to satisfy that change, particularly in the out-of-season. Coincidentally, it was recognised that a 'new' market, Japan, was a potential major outlet,

and increasing effort and emphasis was given to that by industry and government.

Until recently I have been closely involved with the horticulture development in New Zealand. My perspective is therefore a little different from the other speakers. I would like to focus on the current position and prospects for the future in what is necessarily a general manner.

In the last six months I have had the interesting experience of discussing New Zealand's position with the trade and governments in Europe and Japan. Like the curate's egg, the feedback was good in part and not so good in others.

The world fruit and vegetable market is changing in a way that will impact on New Zealand. At the same time, circumstances are altering in New Zealand. The pip fruit industry now faces two major enemies: one external and one internal.

The external enemy is competition, which is becoming increasingly fierce. In my view the dominant threats come from Chile and the United States of America, both of whom are increasing their exports at an alarming rate. Chile in particular is extending its sphere of influence far beyond the U.S.A., which was its original market. At the same time, Central America and South Africa are making efforts to expand their horticultural exports.

To date, the politics of European agriculture have not been of significance to our horticulture exports. That may change in the next five years.

Australia has to date been conspicuously absent in the international trade. It has lacked the infrastructure and the motivation to compete. But that will change quite rapidly. There is a new mood, determination and, most importantly, a new investment pattern occurring in Australia. I have seen developments there which are larger than anything undertaken in New Zealand, and every bit as professional.

The New Zealand industry is capable and able to meet the competition, as it has in the past. But I believe a new order is required to meet the challenges. It seems to me, however, the industry might be going in the wrong direction, which leads me into the second concern, the enemy within. The greatest danger to the horticultural industry is inside New Zealand; the government and treasury. I sense there is not the same government commitment to horticulture and its expansion, that there has previously been, despite the benefits that have accrued from the rapid growth in the past. I specifically exclude from these observations the Ministry of Agriculture, D.S.I.R., and the Minister of Overseas Trade and his department. The increasing influence of treasury officials and the so called 'free enterprise' economists is of major concern.

There is no commercial confidentiality in markets for horticultural products, and all transactions immediately become common knowledge. Gains are made at the expense of competitors. That economists applying yesterday's theories to tomorrow's problems can advocate a laissez-faire marketing system on the basis of opportunity cost analysis is a demonstration of their rank naivety. That politicians can accept that theory at face value is incomprehensible. That is your greatest danger. You no longer have free and unencumbered access to the politician.

Each and every submission you make is scrutinised by the treasury gnomes who know your business better than you. A masters degree in economics is essential now to decision making. Common sense and experience is no longer required.

Those who are organised will gain the business. I have said many times New Zealand has no logical right to succeed in the international marketing of apples. Yet we have the (rightful) reputation of being consistently the best and most effective marketers of apples in the world. This success is entirely due to the organisation and efficiency of the Apple and Pear Marketing Board. The pipfruit industry has bright prospects as long as the Board has control. At the first sign of government attempting to diminish the Board's power and authority, I would strongly recommend that apple producers get their money out fast. The industry would not survive.

As for the kiwifruit industry, my comment is that any moves to increase the number of licenses is a blueprint for disaster. The trade in all markets now is sufficiently concerned about the infighting among the present exporters and distributors to express real nervousness. A situation where importers in Germany can purchase stock surplus to other European countries immediate requirements at a price less than arrivals from New Zealand is not an illustration of sound marketing.

The returns to growers should be going up. The position is being held due (unnecessarily in my view) to the continuing depreciation of the New Zealand dollar.

And for goodness sake, would someone please do something to organise the marketing of processed kiwifruit. It is a nonsense when Watties with less than 10 percent of the volume can undercut and virtually destroy the canned market in Europe just because they want to 'nickle and dime' their way in. This despite the pleas of both the other New Zealand processing companies and the importers not to do so. A demonstration of private enterprise at its best.

Finally by way of example, let me comment on the onion and squash industries. New Zealand exporters have disrupted the trade in Japan to a point where Japanese trade and government officials are considering restricting imports from New Zealand. Who can blame them? There was no need or indeed no reason for the fiasco that occurred this year and the stocks that have remained in New Zealand. To consign onions of the wrong size to Europe without consultation with importers then claim the market was oversupplied is the height of both lunacy and dishonesty.

The major problem for horticulture in New Zealand continues to be the need for cohesion and organisation. Only the apple industry has to date achieved it. The markets are not the problem. The markets are there but New Zealand will achieve and retain them only against increasing competition.

I suggest there are three fundamental requirements for continued success. Each is dependent on growers' decisions and commitments, not the decision of buyers or consumers.

The first is the need for even tighter organisational control of the products and industries.

The second is to continue new product development. Major progress

has been made in this field, and that must be maintained.

The third is perhaps a new direction. Horticulturalists should seriously consider increasing their involvement and investment in the international arena. The dairy industry has demonstrated the advantage of off-shore investment, in both production and marketing of foreign product. It is my contention that sections of the horticultural industry could well follow their example to strengthen their long-term market position and secure their future. The industry has the knowledge, capability and experienced personnel to do so.

I believe that there are foreign investment opportunities which the New Zealand apple and other fruit industries should be considering. The recent joint company established by the Board and the Federation may well be the ideal vehicle from which to launch these new initiatives.

I hope that you take up the challenge and the opportunities and ensure the continuation of the growth achieved in the horticultural industry over the past 10 years.

New Zealand pip fruit marketing and prospects for the next ten years

K.W. Kiddle, Chairman, New Zealand Apple and Pear Board

The New Zealand Apple and Pear Marketing Board is a growers co-operative. It is not government controlled, but is a commercial business in a highly competitive market. The profits over the last ten years have totalled \$89 million, of which \$43 million has been reinvested, and \$46 million has been returned to the growers.

The Board does, however, differ from a normal distributing business in that it is obliged to accept from growers all pip fruit that reaches grade standard. So, each year's crop is unknown until it is received by the Board.

TABLE 1: Crop growth in million t/cartons (40lb)

	Total	Export	Local and processing	
1974	6.72	3.67	3.05	1.00
1981	11.26	5.44	5.82	3.80
1985	14.75	7.70	7.00	5.00
1988*	20.00	11.00	9.00	6.75

*1988 figures based on trees already in the ground, and planting trends are continuing.

Ten years ago many people would have written off the pip fruit industry. In spite of this, steady growth has been achieved because of:

- The Board's success, and its ability to secure a return for growers;
- the growth of horticulture in general, as promoted by successive governments;
- investor interest in pip fruit, rather than other horticultural crops;
- a degree of diversification by pastoral farmers; and,
- the fact that the industry offers financial security to growers, and has a very efficient marketing operation.

The pattern of growth in the pip fruit industry has not only been in the traditional regions of Hawkes Bay and Nelson. A lot of interest has been generated in Waikato, Gisborne, Wanganui and Canterbury. For example, Canterbury's current apple production is around 300,000 boxes. Already, planting exists for a tenfold increase in Canterbury production by the early 1990s.

Growth, however, must be market orientated. At present, Europe is our major market, and it will remain so in the immediate future. Our competition is from the southern hemisphere, Europe and U.S.A. (stored apples).

TABLE 2: Export projections to all markets (millions of cartons)

	1985	1990	Growth
South Africa	11.7	15.6	+33%
Chile	10.8	15.7	+45%
Argentina	11.6	19.0	+64%
New Zealand	8.0	13.2	+65%

There are five major requisites important to the development of the New Zealand pip fruit industry.

Firstly, we must sell at the top end of the market. That means producing top quality fruit.

Secondly, we must try to control prices. A degree of control is achieved by selling as much as possible out of auction, and by retaining ownership of the fruit at the wholesale level.

Thirdly, we must continue to anticipate market requirements. There is a predominance of good Red and Golden Delicious on the market at the moment. We must, therefore, look to providing other less well supplied varieties.

Fourthly, we should try to find market slots. New Zealand is small, so has the flexibility to satisfy small specialist markets better than larger producers.

Finally, we need to gear production to meet specific market slots.

In 1966 we needed to develop markets out of the EEC. We did so in Scandinavia, North America and South East Asia.

The mid 1970s showed a high return in Europe for early May and June sales. Also, the strength of the late market for the red apple, and the rising strength of supermarkets as a retail force.

In the early 1980s, variety and range was important. Supermarkets

now run up to five varieties of apples. Also, there is now a greater accent on health and storage qualities and the taste of the fruit.

Now, in 1985, the major apple varieties are Cox Orange, Braeburn and the Gala strains. The next generation of varieties we expect to dominate in 1990 are Red Fiji, Asian Pears and the D.S.I.R. Splendor-Dougherty cross. Then, by 1995, Gala-Fiji crosses, Red Jonagold and Fiesta could be important.

Hand in hand with exporting fresh fruit is the other arm of Board activities — processing.

PROCESSING

When the local fresh fruit market is saturated, non-export fruit must be processed. When the Board was first established, New Zealanders did not drink much fruit juice. We successfully developed the Fresh Up product to expand this market and to utilise surplus fruit.

Subsequently, market research showed the need for citrus and exotic flavoured juices. We had apples to sell, so developed the de-ionised apple juice base to which fruit juices are added. This product, sold in the Tetra pack, conformed to the growing health trend, and provided an alcohol substitute required by the market.

There are difficulties in innovating products, particularly in the food field. Available technology is far ahead of New Zealand's restrictive food legislation, making development doubly difficult.

However, the New Zealand fruit juice market, at 45 million litres per year (13 litres per head per annum), is close to saturation. The Board has 70% of that local market, and is now looking to export for future growth.

CHANGES

As you can see the New Zealand pipfruit industry has coped with significant changes in the last ten years. The next ten years will also bring major changes. Production world wide is increasing and the market is already oversupplied.

Producing quality and producing what the buyer wants will be paramount in the future. We are placing a lot of faith in alternative varieties. At the moment return from alternative varieties is high as they are relatively scarce. But volume and greater supply will reduce this return.

Recent changes in Government policy mean we will significantly change our methods of financing the crop and providing the facilities necessary to handle crop growth.

The 1984/85 years record intake stretched the Board's handling methods almost to the limit in the major fruit growing areas. There will have to be changes in order to cope with crop expansion.

The length of the picking season is fixed — nature sees to that. To harvest the larger crops, human and physical resources will have to be more efficiently used — greater use of electronics in packhouses and shift work are just two examples of the kind of developments necessary.

Specific packaging for specific markets will soon be part of producing what the buyer wants.

In 1995 our industry will be a strong viable one, but it will be considerably different from that we know today.

Appendix 1: Changing pattern of exports (pipfruit) in 1000 cartons

	1960	1970	1980	1984
EEC (9 countries)	1,672(87%)	2,621(18%)	2,860(55%)	3,028(44%)
UK	1,073(56%)	1,913(50%)	651(12%)	1,067(15%)
Eire	16	77	82	45
Belgium	142	201	547(10%)	546
Denmark	—	17	77	32
France	111	3	275	310
Germany	233(12%)	299	859(16%)	1,458
Holland	97	113	370(7%)	518
Italy	—	—	—	37
SCANDINAVIA (3 countries)	116(6%)	251(7%)	494(9%)	552(8%)
OTHER EUROPE (2 countries)	14	45	68	134
MIDDLE EAST (2 countries)	—	—	12	311(4½%)
NORTH AMERICA (2 countries)	46(2%)	267(7%)	786(15%)	1,085(15½%)
WEST INDIES AND CENTRAL AMERICA (8 countries)	45(2%)	82(2%)	211(4%)	36
SE ASIA (7 countries)	22(1%)	138(3¼%)	665(13%)	622(9%)
PACIFIC ISLANDS (12 countries)	11(0.25%)	78(2%)	135(2¼%)	185(2½%)
TOTAL	1,927	3,847	5,223	6,952

APPENDIX 2: Southern hemisphere apple exports to EEC in 1000 metric tonnes

	1979	1981	1983	1984
South Africa	125	122	98	153
Chile	40	93	80	97
Argentina	75	63	56	49
Australia	36	29	6	3
New Zealand	46	54	47	71
TOTAL	322	360	287	373
EEC Production	7,718	5,212	6,100	7,063

APPENDIX 3: Major apple variety pattern (in 1000 T/C equivalents)

	1980	1984	1985 (Prov)	1988 (Est)
Braeburn	17	158	235	910
Cox Orange	678	918	1,185	1,818
Dougherty Red	401	480	490	593
Gala	284	557	658)	
				1,573
Gala — Red Strains		112	255)	
Golden Delicious	915	1,077	880	863
Granny Smith	3,224	4,590	5,100	6,441
Jonathan (inc strains)	182	168	140	176
Red Delicious				
(inc delicious)	1,901	3,010	795	998
Splendour	75	109	130	156
Sturmer	960	827	795	998
<u>TOTAL APPLES</u>	<u>9,251</u>	<u>12,600</u>	<u>14,000</u>	<u>19,272</u>

Investment in pipfruit development and its financing

Alison Dinsdale, Member, New Zealand Apple and Pear Board

The reasons for diversification into pip fruit are obvious. Pastoral farming is facing a less certain future. Because it is no longer possible to expand a pastoral business without high equity, landowners must achieve higher returns from existing holdings. They must, therefore investigate diversification options.

Pipfruit is an appealing diversification option for a number of reasons:

- The New Zealand Apple and Pear Marketing Board is obliged to accept all production which is up to standard. So there is a guaranteed market for growers, as well as the option of gate sales;
- There is a guaranteed average price per tray/carton. Under existing legislation the guaranteed average price may not decrease by more than 5% annually;

- The Board makes advances to growers regularly through the season, and profit payments shortly after the end of the season. A price smoothing scheme operates, which seeks to return a high proportion of market realisations to growers. Profits have also been returned to growers in seven of the last eight years;
- The Board provides growers with packing materials and reimburses growers for packing. This payment, known as the through shed cost allowance (TSC), is a calculated average, including interest, depreciation and maintenance costs as well as labour;
- A hail insurance scheme provides 50 percent cover against hail, which is the only uncontrollable climatic disaster for pipfruit production; and,
- A substantial volume of the crop is sold on the export market, so a devaluing New Zealand dollar has increased returns to growers, and therefore the value of modern orchards has increased.

On the other hand, there are problems facing the industry in respect of its physical ability to handle the crop, financial costs and constraints, and, finally, pressures on traditional markets. Also, intending and existing growers must accept that in the future consistently high quality fruit in specific varieties will be demanded, and careful financial control will be necessary.

For new growers, constraints include the following:

- An inadequate supply of new trees.
- Planting only by reference to the price of stock will lead to logistic problems in the packing shed;
- It is the financial responsibility of the grower to deliver the fruit to the Board depot or designated export port;
- For supply to the Board to be economic, it is necessary to establish orchards within the traditional orcharding areas; and,
- Establishment on less expensive orcharding land is likely to mean increased transport costs, and later in the establishment period, increased cost of construction for packing facilities.

To give an idea of financial costs a recent costing for a pack-house packing 200 000 — 250 000 cartons per annum was \$1m. At a Rural Banking Corporation interest rate of 21% that would cost \$210,000 per annum, or \$1 a tray/carton. The present average T.S.C. rate is \$1.600c a tray/carton.

The two main lenders to horticulture, the Rural Banking Corporation (RBC) and Development Finance Corporation (DFC), emphasise that in reaching a decision to finance a horticultural development they are primarily concerned with the commercial viability of the proposal and the expertise of the applicants in managing the particular crop.

My strong recommendation is that intending orchardists have recourse to at least management advice of an established and proven orchardist.

OPTIONS FOR INVESTING IN PIPFRUIT DEVELOPMENT

1. In the main pipfruit districts there are established proven orchardists who will, for a fee, plan and supervise orchard development for new orchardists.
2. A partnership between an investor investing in land and funding development, and a young person with expertise but limited capital resources.
3. Large developments involving the issue of a prospectus seeking investors to fund development in a special partnership arrangement, perhaps subsequently within a company structure. Development and management functions would normally be undertaken by independent specialists.

Considerations influencing investment

Apart from the diminishing returns of pastoral farming, an attraction to diversification has been the tax deductibility of a substantial portion of the development costs. A note of warning is appropriate here:

Section 127* of the Land and Income Tax Act, permitting the deduction of certain development expenditure without limit has a terminating date of 31.3.86.

Unless that date is extended, development expenditure claims from 1.4.86. will be limited to a maximum of \$800 p.a. This applies to expenditure other than for clearing and preparation of land and the destruction of weeds or animal pests detrimental to the land.

Because taxation exemption laws are changeable, it is essential that any assessment of a pipfruit development considers the effective return, disregarding taxation considerations. Loss of the development claim provisions would otherwise influence off-farm investors for whom the following have been considerations:

1. Ability to offset losses during the development and establishment years against other income even though the Income Tax Amendment Act (No 2) 1982 restricts to \$10,000 a year the offset of losses from that activity or subject to the \$10,000 a year limitation, be offset against future income from other sources.
2. The ability of pay period taxpayers to arrange that the taxation saving following investment is taken during the year by reducing PAYE deductions. Provisional taxpayers may of course reduce instalments paid within the income year in anticipation of the taxation claim.

These provisions of course reduce the actual cost of investment.

A consideration which would remain of potential benefit to both existing orchardists and off-farm investors, is the use of provisions of the Matrimonial Property Act allowing ultimate transfer of the asset into the spouse's hands. Any future income would accrue to the spouse and the presumption is that income would be taxed at a lower rate. At the present time many arrange a transfer once all taxation losses have been taken by the higher income earner.

Bear in mind that development and interest expenditure claims are "clawed back"*** when the land is sold less than 10 years after purchase.

Purchase in the name of a Company and subsequent sale of shares in that Company, escapes that provision. A transfer under the Matrimonial Property Act does not invoke the provisions.

A particular advantage of association in pipfruit production with an off-farm investor is access to "other" income to cover debt servicing in the development and establishment years. I remind you that to both R.B.C. and D.F.C. security is not so much a consideration, as ability to service and competency of management.

COSTS

Nick Dalgety (Economist, MAF, Hastings) has updated MAF costings for development of 8 hectares in pipfruit, a summary of which is shown in Tables 1 and 1a.

TABLE 1: Capital costs of machinery

Item	Cost	Year Purchased
Implement shed	9,000	1
Staff amenity area	2,200	1
New tractor (60 hp)	21,000	3
Second hand tractor	7,000	1
Air blast sprayer	10,800	1
Mower	4,500	3
Rototiller	4,500	1
Weed Sprayer	1,500	1
Fertiliser Spreader	1,500	1
3 pt. linkage forklift	3,750	3
Hydralada	7,500	6
Miscellaneous tools & equipment	1,600	1 + 3
TOTAL CAPITAL ITEMS	\$74,850	(\$9,360 /ha)

The cost of frost protection is not included in this analysis.

TABLE 1a: Development Costs

Item	Cost/8 ha	Year
Plants (7061)	24,714	1
Replacement Plants (212 - 3%)	741	2
Planting Labour	2,909	1 + 2
Shelter trees (800 cuttings)	80	1
Shelter planting	80	1
Marking out	1,200	1
Posts	3,913	1
Putting in posts	280	1
Wire/staples and nails	1,879	1
Fence building	2,064	1
Ground preparation	1,104	1
Permanent grassing down	1,120	3
Tracks & Staff Amenity Area	3,870	2
Drainage	16,000	1
Irrigation	28,000	1
TOTAL DEVELOPMENT COSTS	\$87,954	(\$10,994/ha)

Land value was deleted when calculating an internal rate of return on investment of 39.9% over 15 years including debt servicing, because MAF have presumed diversification/expansion by an existing land owner/orchardist. Otherwise land is costed in Hawkes Bay for say \$20,000 — \$30,000 a hectare in prime position. There is a move to cheaper land but MAF suggests that future transport costs will offset the initial gains. In an area where frost protection is necessary, MAF's estimate of cost of protection is \$34,400 for a wind machine covering 5 hectares i.e. \$7,000 a hectare. Capital costs are \$9,000 per hectare (includes shed, tractor, sprayer, mower, forklift — all the necessary equipment). Many growers have substantially reduced investment in this category by making do with second hand machinery.

Development costs including plants and planting, shelter, including artificial shelter, and drainage and/or irrigation are approximately \$11,000 hectare.

Capital cost expenditure would of course be staged with final expenditure upon packing facilities as the crop is to be harvested. Total estimated capital costs are as high as \$57,000 a hectare.

The cash flow (which is of course dependent upon particular varieties and mix grown) shows the trend for 8 hectares (Table 2).

The model has assumed that fruit is packed elsewhere at T.S.C. This is an option well worth consideration since in many instances there are existing growers with spare packing capacity (the decision is subject of course to normal business prudence regarding vulnerability).

Sources of finance. Different sources are appropriate for the various establishment costs e.g. hire purchase for plant, machinery and equipment.

Major lenders are:

Rural Banking Corporation — last year RBC invested \$50m — \$60m in horticulture including pipfruit, of which \$10m was for pack houses and coolstores. For existing orchardist applicants, they are interested in their proven competence. For new entrants, viability of the proposed operation, and competency of management are their prime considerations. When funds are available the Corporation has assisted syndicates.

With the establishment of the RBC's commercial arm, funds at current commercial rates are easier to obtain.

I believe that the Corporation would give preference to development in the traditional pipfruit areas.

Development Finance Corporation. Over the last five years, DFC has become a major financier of horticultural development and processing. During that period the Corporation has advanced more than \$80m to the horticultural industry including pipfruit, but mainly to Kiwifruit.

They lend for three basic purposes:

Crop finance: Up to 100% of the development and maintenance costs. In most cases secured by mortgage over the land, supported by guarantees of the proprietors. Terms are commonly 6 — 8 years with principal holidays in the early years.

Grading, Packing and Processing loans: For on-farm developments or stand-alone commercial enterprises. Loans are generally secured over the assets, supported by guarantee of the proprietors. The term matches the economic life of the asset but typically 8 — 12 years with 1 — 2 years principal repayment deferred.

Equipment finance: Hire purchase finance to fund mobile equipment generally with a 25% deposit, and is for a 3 — 5 year period. Security is over equipment.

Other major sources of finance are family, solicitors' trust accounts, banks and insurance companies. Loan monies are available from such sources because high interest rates have discouraged borrowers.

Consider financing packages carefully. Principal holidays in the early years can assist materially. It is now common that there is provision for the mortgagor to increase interest rates in line with a moving market. Ensure that interest rates will also decrease to follow a downward trend in market interest rates. There should be provision for early repayment of the principal sum, and take note of the penalties for early repayment.

Consider too, the record of the lending institution — conservative institutions will not seek maximum interest rates.

Collateral security by way of life policies, where borrowing is from a Life Insurance Company, can be a considerable added cost.

Finally, consider the lender's record. The Rural Banking Corporation for example, has in the past had a reputation for supporting farmers in adverse times.

Present high internal interest rates have made many projects non-viable, and increasingly attention has been directed at off-shore borrowing. This option should be viewed with caution. The risk of off-shore borrowing is that adverse exchange movements will result in an increase in capital sum to be repaid at the end of the term, commonly 3 — 5 years. The weakened NZ dollar and July 1984 devaluation, has put many borrowers in difficulty.

Lenders today wish to see:

1. Establishment at the outset of a sinking fund so that the borrowing can be managed, or alternatively, an ability to service at a rate greater than that asked so that a margin exists within the annual budget to have the loan managed.

2. Greater equity, so that an adverse currency move still leaves the lender with sufficient security margin.

However, I believe that the off-shore borrowing is better for pipfruit development than pastoral farming for two reasons. Firstly, at the end of planting and establishment, the asset will have increased in value, regardless of any other growth in land values. And secondly, if borrowing can be funded from the offset, then the contribution of the block as income comes on stream will provide sufficient margin to relocate to more expensive on-shore borrowing — and anyway we are promised that interest rates will reduce. Finally, if you are making a loan application — make it a winner. Details should include:

- The proposition including details of capital costs, including support facilities.
- Sources of funds and capital contribution.

- The people involved. Detail responsibility for management and relevant past experience.
- Cash forecast until income begins to flow, demonstrating ability to service in the meantime the basis of calculation for the income and production, debt servicing and operating costs should also be detailed.
- Security offered. A consideration is to include in the amount borrowed not only a margin to cover the costs of borrowing but also some margin for initial debt servicing and other charges e.g. (2 tier levy) for a portion of the time until income begins to flow.

Today, land owners must concentrate not so much upon expansion but upon earning more from existing property.

TABLE 2: Cash flow

Year	Income	Farm Working Costs	Surplus (Deficit) Annually	Accumulated Surplus (Deficit) before Management costs & Debt Servicing
1		12700	(12700)	(12700)
2		15060	(15060)	(27760)
3	19348	24900	(5552)	(33312)
4	65558	44150	21408	(11904)
5	116100	61190	54910	43006
6	159777	73150	86627	129633
7	166157	71348	94809	224442
8	169345	71984	97361	321803
9	169345	71826	97519	419322
10	169345	72014	97331	516653

NOTE:

1. There is no allowance for inflation.
2. Farm working costs include ground cultivation, mowing, weed control, fertiliser, pruning, pest and disease spraying, harvesting, freight to Board, vehicle expenses, repairs and maintenance, accounting, rates, other administration and 2 tier levy.

Figures should be adjusted for the district/yields and from that base, bearing in mind the particular financial structure, debt servicing and management cost allocated.

* Section 127 of the Land and Income Tax Act, permitting deduction of certain development expenditure without limit is repealed from 31 March 1987. Phase out provisions allow deduction of certain portions of expenditure over some subsequent years.

** Where land is sold less than 10 years after purchase, claw back provisions are not applicable in respect of sale and purchase agreements which become unconditional after 12 December 1985.

Credit evaluation

The effective cost of credit and the follies of investing for taxation relief

S.J. Nattrass, South Pacific Merchant Finance, Wellington

INTRODUCTION

There is typically a lot of confusion amongst people as to what the "effective cost of credit" means. Further, many people allow taxation benefits to cloud their vision as to what represents a good investment. It is my belief that many of the present financial difficulties being experienced by farmers are due to investing in low yielding projects (such as machinery) to avoid paying tax. Often such investments are made using credit that is more expensive than is readily apparent in the advertising pamphlets.

It is my purpose to outline the follies of investing for taxation benefits using a simple machinery example, and more importantly, I will also

outline how to appreciate the effective cost of credit. This argument centres around the Cost of Credit Contracts Act (1981); an Act put in place so that investors and borrowers alike could compare investment opportunities and credit sources on a relative basis. As we compare gross margins, profit performances, and our seasonal golfing successes on an annual basis, so too should we compare credit sources. Figures such as 12.5% per annum or 22.35% p.a. mean very little unless we consider the following two points:

- (i) the number of interest payments made per year, and
- (ii) whether interest is being paid on principal outstanding or on the original principal sum borrowed.

TAXATION ADVANTAGES IN MACHINERY INVESTMENT

Whilst this argument will largely be lost as machinery investment allowance is no longer a part of our taxation legislation, it will serve to illustrate a point often overlooked by many farmers in the past. That is, for any investment designed to reduce tax there is a portion of equity required.

Consider the following example:

A tractor was purchased in 1983. It has a current market value of \$27,500. It has been decided to replace this machine to take advantage of machinery allowance. Replacement price is \$38,000. Machinery allowance is 20% of purchase price. This farmer's taxation rate is 33%.

Let us consider the equity outlay required for this investment and see if its return will be equivalent to other investment opportunities.

The initial outlay is \$38,000 less the resale value of \$27,500 equals \$10,500.

Benefits are as follows:

Machinery allowance deductible from taxable income is:

$$\$38,000 \times 0.20 = \$7,600$$

On a tax bracket of 33% this represents a cash saving of:

$$\$7,600 \times 0.33 = \$2,508$$

Therefore the net cash outlay is:

Replacement Cost: \$10,500

less Taxation Benefit: 2,508

Equity outlay \$7,992 say \$8,000

The bottom line is that this machine must save you \$2,000 per year over and above the replaced machine to compete against an investment of \$8,000 in a bank deposit earning 20%. I doubt that many people had considered the equity required to replace their machinery, or indeed whether the investment made would have a satisfactory rate of return.

CATEGORIES OF INTEREST

Interest strictly defined is a reward for foregoing consumption. People who have a higher desire for consumption than current interest rates will borrow. Alternatively savers are people who's desire to consume is lower than market interest rates.

There are five categories of interest that we are commonly subject to:

- (i) True rate of interest.

This is the rate of interest charged per interest payment period.

A loan with 12 repayments, costing 18.00% p.a. has a true rate of 1.50% per month.

(ii) Nominal rate of interest.

This is the true rate of interest expressed on an annual basis. In the above example the nominal rate is 18.00% p.a. This rate is often the rate that is published.

(iii) Effective rate of interest.

Sometimes referred to as the finance rate. This is a rate of interest used to compare credit options on a relative basis — commonly as a rate per annum.

(iv) Discount rate of interest.

Such interest is charged in front end loaded loans. Commonly there are only two points of cash flow. The first being receipt of funds and the second being repayment. Discount interest is the rate charged on the repayment amount. Note that the effective cost of finance is higher in these agreements than the advertised discount rate.

(v) Flat rate of interest.

Such a rate is used in hire purchase agreements. It is a rate quoted on an annual basis, and charged on the original principal borrowed, over the life of the loan.

ILLUSTRATIVE CREDIT OPTIONS

Table 1 below outlines five common loan types. The important things to follow are the number of cash payments made over the life of the loans. All loans are spread over one year to allow for simple comparisons. Remember that the effective cost (finance cost) is a relative cost over one year, and is the basis for comparison.

Table 1: Representation of five common loan types

Loan Option	Time (repayment schedule)				Interest rate types				
	0	$\frac{1}{2}$	$\frac{1}{4}$	1 year	True	Nominal	Flat	Discount	Effective
a (1000)				1200	20.00%	20.00%			20.00%
b (1000)		100		1100	10.00%	20.00%			21.00%
c (1000)	50	50	50	1050	5.00%	20.00%			21.55%
d (960)				1200				20.00%	25.00%
e (1000)	300	300	300	300	7.71%	30.86%	20.00%		34/65%

Loan options a, b and c are standard loans, in so far as there is an initial sum of \$1000 borrowed, with repayments made over the year. The only variation is the number of interest repayments made. For all three options the nominal rate is 20.00%, this is the rate that appears on Blackboards around New Zealand. The effective rate increases from 20.00% to 21.55%. As the number of interest repayments made per year increases the cost of your finance increases.

Logically this is so. If an interest repayment is made three months after the initial loan is taken out then there is an added cost. The cost is either foregone income from being unable to invest the fifty dollars, or the cost of your overdraft that the fifty dollar cheque has been drawn against. Naturally it is difficult to define what the cost of foregone investment income is, or for that matter the cost of the overdraft. To

calculate the effective cost we use the true rate of the loan finance as your implied cost of an early interest repayment.

Perhaps this argument is best represented by a schematic diagram. The diagram below is an illustration of loan option b.

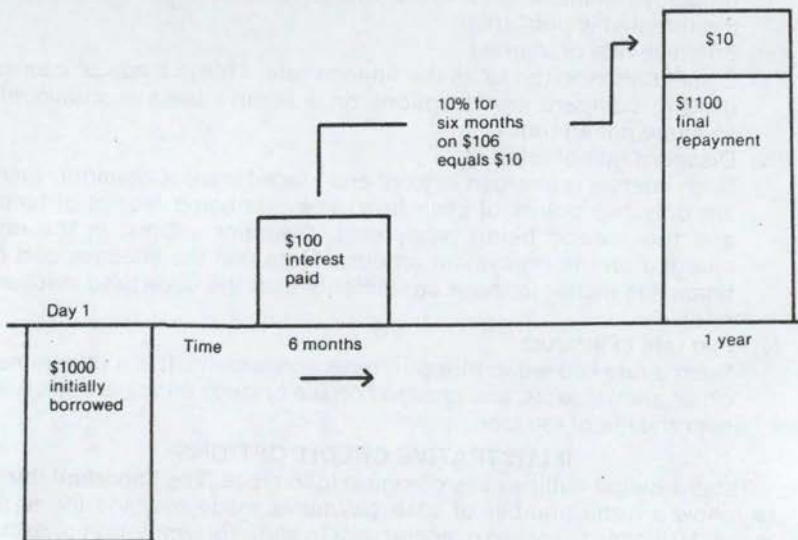


Figure 1: Schematic representation of the compounding effect of a semi-annual interest payment.

At the end of the day \$1200 has been repaid, plus, an implied cost of \$10 on the early interest repayment, making the effective cost of this finance source 21.00% (i.e. \$210 repaid on the initial \$1000 borrowed). Note that the effective cost is calculated using 10% true rate for the six months as the opportunity cost of an early interest repayment. Loan option C is the most expensive of the first three as it has the largest number of interest payments made on an annual basis.

The general formula for calculating the effective cost of finance when the number of interest repayments made in a year varies is as follows:

$$\text{Effective rate} = \left(1 + \frac{r}{n}\right)^n - 1$$

where: r = Nominal rate always expressed on an annual basis

n = Number of interest payments made per year

[Note: $\frac{r}{n}$ = True rate of interest which as previously mentioned is the opportunity cost of an early repayment]

Loan option d represents a discount loan. Once again the advertised rate is 20.00% p.a. in this case it is a discount rate. The 20.00% p.a.

rate is a rate actually charged on the final repayment amount. The initial principal sum borrowed is therefore something less:

$$\text{Principal borrowed} = \frac{\text{Final repayment}}{1 - \text{discount rate}}$$

In loan d we have a final repayment of \$1200 and a discount rate of 20.00%. The initial principal borrowed is \$960.

$$\begin{aligned}\text{Principal borrowed} &= \frac{\$1200}{1 - 0.2000} \\ &= \frac{1200}{0.8} \\ &= \$960.00\end{aligned}$$

The effective cost of this finance is obviously higher than 20.00% p.a. As only \$960.00 was borrowed and \$1200 repaid at the end of the year, the interest repaid was \$240.00 which is 25.00% p.a. on a principal sum of \$960.00.

The general formula for calculating the effective cost is:

$$\text{Effective rate} = \frac{1}{(1-d)}$$

where d = discount rate.

Loan option e (Table 1) is in reality a Hire Purchase agreement. In this case the advertised rate of 20.00% is known as a flat rate. The effective cost of this credit is somewhat higher, at 34.61%. In hire purchase agreements interest is paid on the original principal borrowed even though principal repayments are paid throughout the term of the agreement.

In option e we once again have an initial borrowing of \$1,000. The flat rate of 20% has been charged, with repayments made quarterly (i.e. four instalments). Giving a total repayment of \$1200 for the year period. This is the same total repayment as for all options discussed.

To calculate the size of instalments under a hire purchase agreement we use:

$$\text{Instalment} = \frac{P + (P \times f \times m)}{(m \times n)}$$

where P = Principal sum borrowed

f = flat rate of interest

m = number of years of the loan

n = payments made per year

Such that in option e our instalment was calculated as:

$$\begin{aligned}\text{Instalment} &= \frac{1000 + (1000 \times 0.2000 \times 1)}{(1 \times 4)} \\ &= \frac{1000 + 200}{4} \\ &= \$300.00\end{aligned}$$

As there are four instalments in this agreement, and \$1000 of borrowed principal we conclude that each instalment consists of \$250.00 principal. The first instalment is paid 3 months after the initiation of the loan

this consists of \$50.00 interest and \$250.00 principal. Therefore for the next 3 months only \$750.00 principal is outstanding. However at the end of this period a further \$300.00 instalment is paid. So in the final instalment only \$250.00 principal will be outstanding at termination. This will be repaid along with a further \$50.00 interest. Therefore over the final period \$250.00 has been borrowed for 3 months and \$50.00 interest has been charged giving a true rate of 20.00% per 3 months or a nominal rate of 80.00% p.a. Note that principal has been progressively repaid but for the entire term of the loan interest is charged on the original principal borrowed. It is for this reason hire purchase agreements can be very expensive.

A formula used to approximate the effective cost of a hire purchase agreement can be used.

$$\text{effective cost} = \frac{2 \times f \times t}{(f+1)}$$

where: f = flat rate

t = number of repayments (instalments) made

CONCLUSIONS

Whilst the effective cost of credit for loan option a is 20.00% and for c, 21.55%, it is easy to say that 1.55% is hardly worth arguing over. But you should never lose sight of the fact that option c is 7.75% more expensive. If the local stock and station agent has a drench discount of 7.75% it is often sufficient enough enticement to encourage farmers to buy their year's supply.

A hire purchase agreement involves interest repayments equivalent to the principal sum borrowed multiplied by the flat rate charged. This is of course tax deductible. However, the additional cost of paying interest on principal no longer outstanding, being an implied cost rather than realised, of course is not tax deductible. This makes a hire purchase agreement even less attractive on a post tax basis than the other four options discussed.

In the past some of the more expensive credit options have been acceptable because they have been viewed to have repayment schedules that are more "affordable". People have been encouraged to enter contracts because the monthly or quarterly repayments look small enough for the budget to handle. Never enter an agreement until you know the effective cost. This can be established by asking you financial advisor to develop a cashflow that represents the loan uptake and subsequent repayments. Then to run it through a calculation known as Internal Rate of Return (I.R.R.). Such an analysis of the cashflow should include any initial up-front costs that some finance houses charge. These can add substantially to the cost of credit.

In any investment decision always be conscious of the level of your equity that has been used. Further to this always be sensitive to the level of taxation relief you are seeking in order to make the investment worthwhile. If a taxation incentive is in place, you can bet your bottom dollar it is there because investment without it would otherwise be unprofitable, or, if the investment is sound that any taxation benefit has been reduced by way of inflating the capital required to invest in

the project. This has been evident in deer investment. Taxation legislation has a nasty habit of changing with the whim of a political pen.

If you are comparing credit sources try to minimise the number of interest repayments made over a year. Be satisfied that the terms of the loan do not involve paying interest on principal that has been repaid. Scrutinise and minimise up-front costs which have a substantial effect on the cost of credit.

**Lincoln
College
Foundation
Farmer
of the Year
Award**

Introduction

The Lincoln College Foundation was established in 1978 and since then it has encouraged farmers to apply for grants funded by the Federation's trust.

One of these grants is the annual Farmer Award — a joint venture with the Lincoln College Farmers' Conference. The Award consists of a travel grant because the Foundation sees travel as an important means of extending contacts in New Zealand agriculture.

Each year a particular class of farming is nominated and farmers working a property in this class are invited to apply for the award. Applicants submit their performance and property for scrutiny. Farms are visited and assessed according to the following criteria:

- * technical performance
- * innovativeness
- * financial performance
- * farm appearance

Finalists present a review of their property and farming experience to the annual Lincoln College Farmers' Conference and the award is made at that time. The finalists' presentations are published annually.

The annual Farmer Award is intended to encourage interest among farmers and to make them aware of the support of the Foundation Trustees. The award is made in recognition of farmers who show leadership in their class of farming and who would benefit from further study overseas.

Award Recipients

1983 C. Logan Freeman, 'Montrose', Kirwee

1984 B. J. Scott, Killinchy, Leeston

1985 P. Byars, 'Preston Fields', Merino Downs.

P. Byars

Merino Downs, West Otago

I left school at age 15 to work on my father's farm. Farming has been the main ambition of my life. In the six years I worked for my father I progressed to managing 600 ewes, which belonged to the family trust. I am now 37 years old. My wife Karen and I farm Preston Fields at Merino Downs in West Otago.

In 1969 I was given the opportunity to purchase a 100 hectare block of my father's property plus 1200 ewes. The land and stock was on mortgage to my father. During the following three years I renewed fences, subdivided paddocks and put in stock water reticulation schemes and haybarns.

In 1972, when Karen and I married, I purchased the remaining 76 hectares from the family trust and my father.

I consider subdivision the most essential element in developing a high intensive stocking system.

During the 1970s a new shearing shed was built for \$30,000, two

thirds of which was borrowed from the Rural Bank. The shed was a c-shaped raised board and side filling catching pens. Two new tractors were purchased. A truck and trailer unit, half shared with my brother, was bought for carting fertilizer and lime to the property, and stock from the property. I also had a new shed, costing \$20,000, built to house the machinery because I believe expensive machinery should be well looked after.

Farm fencing, drainage, water reticulation, shelter and buildings were all up to standard. I did all the carting and tractor work with farm machines purchased from my father.

However, you don't stand still in farming. I want to tell you about things that have happened over the past five years. The two main principles I have worked on over the last five years is that the grass grown on the farm is used for something and that the property produces a traditional Southland pasture. It's either eaten by livestock or stored to be eaten by livestock later. The second principle is that I am flexible to market forces. I see myself in a position to produce what the market requires and to be able to change quickly to follow the market forces. With this in mind I have recently diversified into deer.

Preston Fields is 177 hectares and is 25 km north east of Gore, on the boundary of Eastern Southland and West Otago. Our soil type is traditional Southland soil with heavy clay which responds well to drainage. Annual rainfall is around 900mm spread evenly throughout the year.

Wintering of stock had been in the traditional Southland way with hay and swedes. I have slowly changed to a system of rotating all stock on grass only.

I purchased a Romney flock from my father. They give good production and I consider that I'm better off with the devil I know. Romneys seem to be able to stand up to the heavy mud we get in winter. The main mob is comprised of 2100 breeding ewes. The numbers fluctuate according to stock prices in autumn. If prices are high, I sell extra two tooth; if prices are low, I keep extra sheep. This year 2,350 ewes were put to the ram because of poor autumn prices.

SHEEP MANAGEMENT

Tup crutching is done the hard way. All sheep are put across the board, turned up and udders and feet checked. Any ewes of poor constitution are culled. Twenty percent of the poorer ewes go to the black face ram. After the first cycle all rams are brought in and black face chaser rams with harness are put out at one ram to 500 ewes. Then ewes are put into two mobs and slowly brought down to a very tight rotational grazing system of 2,500 ewes per hectare per day.

Hoggets are crutched in May and go on rotational grazing. I normally have two mobs of hoggets because I consider over-stocking is detrimental. Each mob of 400 hoggets goes on 0.2 hectares per day. Usually the grass is 100mm long.

Ewes are crutched and then given more grass until they are set stocked about a week before lambing. Set stocking is usually at 17-20 per hectare,

depending on shelter and available feed. Late lambers continue on a tight grazing system until a week before they are due to lamb.

During lambing hoggets are mobbed together and rotated at 500 per hectare per day in a 14 day cycle on the more exposed paddocks. Cattle are self fed with fine chopped silage during late winter and early spring. They are electric fenced on a small area to keep pasture damage to a minimum.

I do all my shepherding at lambing time and my wife and family help feed motherless lambs. Very little stock handling is done at lambing, and only one or two ewes are assisted per day, then mainly because of malpresentation. Our average lambing percentage is 120-125% lambs weaned to ewes mated. Last year it was 114% due to a snow storm and a rain killing all newly born and some lambs up to three days old. A quarter of the total lamb drop didn't make the tailing pen. Tailing is done with the assistance of my wife and another farming couple.

Ewes and lambs are either set stocked or rotated, depending on feed. If feed is short they are rotated. This gives good lamb growth after weaning, as a feed bank is created. I find it also helps ewe fleece growth.

Last year set stocking commenced a month before weaning. Later the ewes and lambs were drenched then rotated until weaning. At weaning, lambs are immediately taken back to their respective rotation. By putting the lambs back to their original rotation they have very little weaning stress. They are used to the shift and know their own system, so they don't miss their mother. Ewes are held back and mouthed. All sheep with failing mouths are taken out and shorn ready for the works before Christmas. A week after weaning all lambs are brought in, drenched and drafted into different lines — Romney ewe, Romney ram, black face ewe, black face ram and 150 smaller lambs are collected out of the mob. No lambs were castrated last year. The lamb drenching programme is three three weekly drenches and then monthly until all works and cull ewe lambs are killed for export. The Down ewe lambs are drafted first, followed by the Down ram lambs, small ewe lambs, and then finally, 90% of the Romney ram lambs. My idea is that if the lamb has potential to grow and still grade then get rid of something else. Last year, multiples of 300 were drafted every three weeks from before Christmas. This number of lambs suits my truck and trailer unit for cost efficiency. The small cull ewe lambs (10% of total) are slaughtered in February in the YL grade. Lambes averaged 11.2 kg for Down ewe lambs, 18.4 kg for Romney ram lambs with an overall average of 14.4 kg.

From weaning the ewes are rotated in one mob, cleaning up pastures spending 2-3 days in each four hectare paddock. The paddock is topped on the second day, and the ewes eat the wilting seedhead quite well. Each mob of lambs have access to three or four paddocks with cattle running with them. The lambs get the cream of the farm with the small lamb mob getting the best feed possible. Lambs are usually back into ewe eaten pastures after about 3-4 weeks. Generally, I open the gates so the lambs can please themselves whether they want the pasture or not. If, because of seasonal conditions, the lambs don't like a paddock the ewes are brought back or the rising two-tooths are shifted onto it.

SHEARING

Hoggets are shorn in early November giving an average 5.5 kg fleece and oddments for ten months growth. I shear the 250-300 freezer ewes myself in December, to keep my hand in. All Romney ram lambs are shorn mid January and last year averaged 1.35 kg. Ewes are shorn at the end of January and average 5 kg. Two toothed are second shorn in early March and given an average of 3 kg.

CATTLE

My cattle buying policy has been to buy any breed or sex as long as there is a twist in them. Usually small to medium calves are bought, as they generate less mud in winter. Last autumn, 1984, cattle were too expensive so I bought 20 weaner stags at \$170 each (cheaper than calves). These were slaughtered at an average of 57 kg, giving \$370 per head. I would normally expect to double my money on cattle. From mid January some fat heifers are sold at each local weekly fat sale until supplies are exhausted. Steers are grazed until late April, then slaughtered at the export works.

FERTILIZER

Fertilizer is spread over the farm February to March, using a 2 tonne trailer bulk spreader pulled by one of my tractors. A bay of one haybarn serves as a 45 tonne storage shed. Some 300 kg per hectare of 15% potassic super is applied along with 450 kg per hectare of 33% potassic super spread on hay and silage paddocks.

During October to December as much drainage work is done as possible. High concentrations of stock on wet soils tends to have a sealing effect on the ground surface so I try to mole plough 20% of the farm each year. Last year I purchased a pasture aerator to try to remedy this problem.

The summer months are busy ones. For the last four years I have employed an overseas agricultural trainee from November to March. Half of her time is spent helping in the house and the other half is spent helping with the farm work.

DEER

Our move into deer farming was prompted partly by my interest in deer as an animal and partly by the indication that they would afford a good alternative source of income. In 1980 I purchased eight in-fawn hinds and in March 1981 I purchased 12 captured adult hinds, all for \$500 each. Four hectares have been fenced into three paddocks for the deer. An existing shed was modified into deer handling facilities which although very ordinary to look at, worked extremely well. Natural increase has been my aim, except when prices encourage me to purchase.

MEAT AND WOOL PRODUCTION

Wool per hectare has shown a continuing increase, though return per hectare for meat varies. In 1983/84 meat returns per hectare dropped. That year I conserved 200 tonne of silage and 3000 bales of hay. Store stock prices were too high for buying so the surplus grass has been stored and it is being utilized this year. Store stock prices were low in 1984/85. YL grade seemed to be the premium grade for price per head so I purchased a lot of store lambs. 1250 lambs were purchased, 650 ewes and 50 head of cattle were grazed to eat the surplus spring summer growth. I have no real fixed policy. I try to feed the farm well so the grazing animals eat well so in turn I also eat well.

SUMMARY

Working for my father for six years taught me how to cut expenditure to suit income. My father started farming during the depression and his pessimistic view has been instilled in me. Knowing how to work hard had to be learnt to satisfy my father. Everything was done by hand. There were no front end loaders on the farm then to make work easier. I have always tried to make best use of my earnings. Three years ago a family trust was set up. My four children purchased a 55 hectare block and my wife and I rent it back from them. My father has always treated my brother, three sisters and myself equally so far as financial help has been concerned, and this has been my objective with my own family. Today my debt servicing per stock unit is \$2. Through having a bit of my father in me, I have paid back all my family mortgages so that if times get tough the equity in the farm assets will not weaken. Perhaps I'm one of those guys who like a challenge, and my challenges have been:

- getting the farm debt free;
- investing some of my children's funds from the property in a holiday home in Arrowtown which they can enjoy; and,
- diversifying into deer and seeing the numbers grow.

I have just bought another 80 hectare farmlet. My idea is to have it as a full deer unit. At the moment there are an extra 800 ewes grazing Preston Fields, which will go to the new property in August.

R.D. and B.E. Hewett

Kalkadoon, North Canterbury

The farm Kalkadoon is in North Canterbury, 8km south of Cheviot and about 5km from the coast. It is small, 116 ha (105 ha effective). Elevation varies from 50-220 m, and rainfall averages around 700 mm a year with large variations between seasons and from year to year.

Eighty percent of the farm is on a high terrace above the River with undulating flats and minor gullies. The balance runs back onto easy hill. Soils on the flatter country are medium fertility Domett silt loam 200-250 mm thick, directly underlain by 6-8 metres of a particularly impervious loessic clay. The hill block has Cheviot hill soils over clay, papa and limey sandstone.

The main features of the farm which influence farming practice and policy are:

- its small size for a North Canterbury pastoral farm;
- the extremes of the wet and dry conditions brought about by the clay base and variable rainfall;

- neither irrigation nor drainage are viable; and,
- when moisture levels are suitable there is very high grass production.

THE INITIAL YEARS

Our farm was purchased in 1975 with funds from 18 years work in the Australian mining industry. After providing for stock and plant we were able to contribute 35% of the purchase price as equity. The balance was financed from a solicitor's mortgage and short term vendor finance. Rural Bank finance was not available as we could not show a history in farming. The property is owned and operated under a 50:50 partnership with my wife, Betty.

Our initial objects were to begin with a conservative conventional programme, regain a feel for farms and farming and to use Kalkadoon as a stepping stone to an operation with more scope. Accordingly we purchased 1,200 Corriedale ewes and blackface rams, and established a rotation of sheep with supporting wheat and barley cropping.

The conventional approach led us to conventional disaster in the first couple of years. Despite great care in purchasing "footrot free" stock, and establishing them on a "footrot free" farm, a wet autumn in the first year gave 93% infection at weaning. Ryegrass staggers also had a major financial impact. Even so, we managed to obtain average North Canterbury meat and wool production levels, but it was quite obvious that average levels were not adequate for our scale of operation. Our cropping experiences were even worse, due to extremes of wet and dry soil conditions affecting winter and spring crops. Results for these years clearly illustrate the problems we faced.

	76/77	77/78	78/79	82/83	83/84	84/85*	85/86**
Lambing percentage	93.3	98.1	96.6	129	129	139	125
Wool weights (kg)							
per stock unit	4.92	4.64	5.13	5.91	5.75	5.75	5.5
per hectare	65.4	63.8	60.5	72.6	73.6	76.6	74.3
Sheep and Wool Account							
G.P. per S.U.	14.89	18.68	20.19	34.76	42.13	47.11	38.70
Farm Working Expenses							
per stock unit	13.85	15.45	14.73	19.51	18.04	24.58	19.00
Net Farm Profit							
per stock unit	4.76	3.23	10.31	14.13	20.02	23.81	19.72
per hectare	63.00	41.00	121.00	173.00	256.00	340.00	267.00

* Reconciled budget

** Forecast

This situation left us with four options:

- Return to mining, which did not appeal;
- Diversify. Lack of irrigation potential rules out most cropping and horticulture on this farm. Deer and goats require a high capital outlay. Timber is the most attractive form of diversification to us, because it nicely complements pastoral farming in so many ways;
- Buy a larger property. Over the years we have inspected and

budgeted out several farms. We still look around, but at the prices asked we have not been able to write an acceptable budget. Purchase would have left us vulnerable to the farming shakeout which to us seemed inevitable. This shake-out now seems to be occurring, we are only surprised it took so long.

- Raise performance. We elected to try this because of the challenge offered, and because of the opportunities which seemed so apparent even after only a short time in the industry.

THE DRIVE FOR PERFORMANCE

There are many opportunities and methods to improve performance, and a wide range in the potential of each, depending on the nature of the farm. Management factors which we found particularly important in terms of performance are:

- Budgetary control. It is absolutely essential to know where you are, why you are there and where you are going.

- Financial strategy. We try to minimise capital debt because it leads to vulnerability when the political, economic or financial environments change. A low capital commitment also frees up borrowing power for real opportunities when they come along. We have managed to pay off nearly all of our initial capital debt, and over ten years have increased equity to 92%, in spite of recent new loans for house rebuilding, covered yards, and freeholding.

- Equipment syndicate. This is an important part of financial control and a major cost saver. In 1976 we formed a four-farm syndicate to increase equipment utilisation and reduce capital and operating charges. Betty and I personally own only a 70 hp tractor and two or three minor implements, yet have the advantage of using the full range of agricultural equipment, including hay gear, header, dump truck and heavy flat-deck truck with sheep crate.

- Stock nutrition. We believe it vital that feed intake be controlled to the optimum so that stock have every opportunity to perform, pasture production is maximised, and every blade of grass used. Lax grazing is very costly indeed.

- Feed demand and supply. This is very important in our situation because of exaggerated peaks and troughs in supply. Transfer of feed from surplus to deficit parts of the year costs money and some feed loss, so efficiency of the transfer method used is important. We use meadow hay for general feed, rape for lambs in summer, tamo for hoggets in winter/early spring and barley as a reserve. In planning stocking rate and feed supply we assume a three to four month drought, and provide for one spring hay failure.

Even more important is the extent to which feed demand and supply may be altered to minimise the need for transfer. The most obvious

methods of raising feed supply — irrigation and drainage — are not available to us. Our biggest transfer cost savings arise from a 35% increase in lambing percentage and higher mothering ability. Together these have the effect of raising demand in spring, with the option of reducing demand in summer and winter.

— General farming practice. I don't propose to discuss general farm operation but there are one or two unusual practices that bear mention.

We shear every 9-10 months so that shearing date for each age group moves back with the years from October for hoggets to November for works ewes. This spreads income over several wool sales, eliminates storm hazards, and means the wool is in the premium 100-150mm range and brighter than full length.

Our wintering system has moved from a "piggy squares" approach to a rolling on-off 80-day rotation, which requires no subdivision yet ensures a regulated feed intake and good preparation of pastures for spring growth. We consider it handles wet conditions better, saves time erecting electric fences and results in much less stress on stock.

We do not manipulate ewe liveweights to any great extent. This does not mean lack of monitoring and nutrition control. We believe large bodyweight changes lead to stress and lower production. Ewes usually average 60-65 kg at tupping, with the low point usually being around 58-60 kg at weaning, but this varies with the season.

— Genetic merit of stock. In our opinion the breeding program we followed has contributed over 90% directly or indirectly, to the performance improvements we have made. The program has been simple and virtually cost-free, yet the impact on financial results has been so large that this has to be our main message.

BREEDING FOR PERFORMANCE

The situation

In 1975 our outstanding impression of North Canterbury farming was the enormous extent to which the easier country had been changed by 20 years of development, aerial topdressing, new pasture species and increased stocking rates.

Sheep no longer have a free open environment with a wide selection of forage, but have to produce meat and wool under a whole new set of conditions. Among other things they are required to produce on a diet which is quite monotonous at any one time, yet has violent seasonal changes from trampled muddy ryegrass in winter, through the spring flush of ryegrass and clover, to dry seed-stalk and dust in summer. No longer can they pick and choose from a wide variety. Furthermore, sheep face both stress from mob stocking, and enormous new challenges to health (and hence their ability to perform), which include:

Footrot, from seasonally lush conditions and close sheep to sheep contact.

Internal parasites, for the same reasons.

Ryegrass staggers, due to a predominance of ryegrass in

modern pastures, and the selection processes by which new ryegrass strains are developed.

All three are increasing challenges to stock health as development continues, and economics force higher stocking rates.

Our second major impression was that whilst this dramatic change has been happening, sheep breeders in most cases have failed to keep pace in adapting the animal to the new environment. Even in 1985 there is still pre-occupation with open classes at shows as being the main means of identifying superior sheep. These are placed at the top of the breeding pyramid for large numbers of flock sheep. Show, and even ordinary stud animals, are rarely, if ever, challenged with real world conditions out in the paddock and in fact are usually very carefully protected from it. In our opinion the champion's ribbon reflects only the basic elegance of the sheep and the grooming expertise of the exhibitor. It has little to do with production merit and physical wellbeing under the conditions our farming practices impose.

Flock sheep farmers often farm by remedy, rather than culling. Activities such as footrot paring and treatment, heavy drenching programmes, and close shepherding for lambing troubles are expensive, time-consuming, and have an adverse long-term effect because they resist natural selection. For many problems of this type inherited susceptibility is high and the only real long-term progress is genetic.

PRINCIPLES AND PROGRAMME

Our whole breeding programme was established with the firm objective of developing a strain of sheep capable of maximum net returns (in \$/ha) under Canterbury conditions. After considering several options we decided, rightly or wrongly, on using Borderdale sheep. Our reasons were:

- An impression that Romneys might not handle our summer-dry conditions; we had a similar view about Coopworths, plus some reservations on wool weights.
- There is no large flock base for open nucleus breeding in English Leicester or Lincoln.
- A healthy respect for performance of some Corriedales in North Canterbury and a belief that many of the traits we wanted were there, particularly in flock sheep. We felt the right sort of natural selection had taken place in the female line due to exposure to real conditions over many years.
- Border Leicesters were unattractive as purebreds, but had the important attributes of fecundity and easy lambing, high milking ability, high growth rate, non-selective eating habits, large carcase and leanness at heavy weights in some strains.
- Demand and price for 32-35 micron wool showed good growth rates.
- We already had a challenged Corriedale ewe flock.
- The Borderdale Society appeared to have progressive aims.

Hence the Borderdales — I must emphasise that the selection was for our conditions only, i.e. summer-dry, winter-wet, improved North Canterbury easy country with high stocking rates. Other base stock

would be preferable for other conditions. Improved performance through selection can be applied to any breed choice.

Having made our breed decision, we selected a Border Leicester breeder on sheeplan who had paid close attention to production data and purchased two rams in 1976. Both were superior on records and were notably lean on ribs and rump. They were mated with Corriedale ewes selected from footrot-free animals from our original stock and other clean ewes bought from flocks with a history of footrot. Since then on it has simply been a matter of rigorous recording and selection and following our breeding principles. The main breeding principles are:

- 1) Stay on the overall objective; net \$/ha. In our experience the really elegant sheep rarely measure up in performance.
- 2) Measure production performance on sheeplan, and select using priorities suited to our particular conditions.
- 3) Challenge all stock with the real environment. We believe sheeplan and similar systems lose their value if such animals are pampered. Virtually any animal can perform under ideal protected conditions. Apart from tupping and a month at lambing our elite ewes and hoggets are all mob-stocked with the flock sheep. Elite sheep, including ram hoggets, do not receive concentrates, grain or other special treatment. We do, however, test them for susceptibility to disease.
- 4) High selection pressure is essential to rigorous selection. We have 350 elite ewes producing more than 520 lambs each year. Culling rates are 85% for ram progeny and 75% for ewe progeny. About one in 500 rams bred is considered.
- 5) Maintain an open nucleus system if possible. For the first five years screening took place on bought-in Corriedale ewes. When benefits started to flow we were approached to sell a few flock rams. The next step was to devise a nucleus flock system for screening from ram-buyers' Borderdale flocks, and so maintain an open nucleus system with very high selection pressure. This is the second year of operation as an adjunct to the elite flock, and the first ram hoggets are coming through. Performance results and contributors' interest and support will dictate the future of this system.
- 6) Resistance to disease is a specific objective. Susceptibility to footrot, ryegrass staggers and internal parasite effects are all inherited, and development of resistant stock has greatly assisted in lowering costs and increasing production. Footrot was eliminated by 1980 through breeding alone; ryegrass staggers, once a major difficulty, is now a minor manageable problem; and, the amount of drench we use has been reduced by half.

Culling is ruthless for any problems requiring attention. With high stocking rates the norm, stock just have to be easy-care, and offenders must be culled from the elite flock, regardless of other attributes.

These are the main principles we follow. We attribute 90% of our improved performance to the breeding policy. Progress is exciting, and the type of stock emerging are a pleasure to work with.

THE FUTURE

I believe we've only scratched the surface, and that a large potential remains to genetically and otherwise improve performance. Breeding objectives will change with time according to both progress made and new demands which arise. For instance, we feel that 125-130% is an optimum lambing percentage for our situation. Having achieved this on a regular basis, our attention has turned more to liveweight gain and carcase quality to meet market demands. Animal health remains a major target.

On the wool side we've settled to around 32-34 microns, and believe we can get to +6.5kg per s.u. within two or three years depending on the seasons. In essence we'll continue the breeding programme in its present form and fine-tune the emphasis according to emerging demands. We find the work challenging and the results exciting. We're also confident that improvements in performance will continue to keep us ahead of the bank manager, even on 105 ha and with under 1,500 s.u.

Within the farm gate generally, I believe public and private comment is unduly pessimistic about the years ahead. This negative mood inhibits progress, and I do not believe it is justified anyway. We pastoral farmers pride ourselves on our efficiency, yet we are efficient relative only to overseas producers in less fortunate environments. We are not very efficient at all in relation to the potential of our own environment and its advantages for pastoral production. Our conditions are the best in the world in so many ways, and offer a wide scope for improvement, provided a positive attitude prevails. I hold this view quite strongly and with the advantage of hindsight in that the problems which face many farmers in the 1985-86 budgets are precisely those we faced at Kalkadoon 10 years ago.

Outside the farm gate there has to be even more potential, because the industry presently does things so badly. Perhaps we can be reasonably confident current economic pressures will hurry the necessary changes along. If not, we are in trouble and so is New Zealand.

Overall, I think that economic pressure for change will make the next few years both challenging and rewarding for meat and wool farmers. It's a great business to be in, and an exciting time to be in it.

J. Hopcroft

Gummies Bush, Western Southland

Our farm of 212 hectares is at Gummies Bush in Western Southland, eight kilometres from the south coast near Riverton. Invercargill, the freezing works, saleyards and the phosphate works are within 50 km to the east.

It is rolling country which has all been cultivated. Some steeper paddocks face directly into the cold south-west. All paddocks have been in grass for four years, with the oldest pasture being about 25 years old.

Annual rainfall averages about 1100 mm, or 44 inches. There are 20-30 frosts per winter, and maybe one fall of snow that usually thaws by lunch time the following day. In the spring we are troubled with southerly storms that may last a few days. They slow grass growth and play havoc with the stock.

In 1976 we bought the home block for \$180,000, of which \$130,000 was borrowed. We also purchased a 30 hectare hogget block with a

mortgage of \$90,000. Prior to purchasing the farm I had been a farm drainage contractor and shearer. Now, my wife Joan and I farm in partnership. Joan is in charge of most things inside the garden gate and does a share of the lambing and general stock work. We jointly own the home farm, stock and plant and our family trust owns the rest.

The farm has a Waikiki soil. Its heavy clay subsoil requires a lot of draining, for which over 50,000 feet of clay tiles have been laid. Water is supplied in troughs to all paddocks from a windmill and bore. The annual fertilizer application has averaged 375 kg of straight superphosphate and 625 kg of lime per hectare

Most paddocks lead onto a central lane, which in conjunction with the covered sheepyards simplifies management and saves time. We employ labour only at lambing time for two weeks, but appreciate help from an enthusiastic family.

We have three school age children and an older son who is currently gaining experience on another property. We do all our own carting, haymaking, fencing and ditching, and I have been able to make good use of hobbies such as sawmilling and building.

STOCK

All sheep on the farm are Coopworth and all ewes are mated to the Coopworth ram. We take extra care in selecting rams on performance records and physical appearance, and we have bought from the same breeder for eleven years. We pay attention to progress in such things as lambing percentages, fleece weights, growth rates, lean meat and dagginess. Stock numbers are shown in Table 1.

Table 1. Stock numbers — June 1984

212 hectares — (525 acres)

	S.U.
Ewes 2800	2800
Hoggets $650 \times .7$	455
Killers-pets $50 \times .8$	40
Rams 10×1	10
Cattle 1 year 4×3	12
Total	<u>3317</u>

= 15.65 S.U. per hectare

6.31 S.U. per acre.

We feed the ewes to maintain their live weight over the summer. With this and three weeks flushing our ewes average 63 kg at mating. Summer wool production is good, too.

The rams go out about 10 April with harnesses right from the start. The colours are changed and mated ewes are drafted off every week. They have a cover ram with them and are kept in their lambing mobs through the winter until lambing. To avoid undue competition from older ewes the two-tooths are wintered in a separate mob. Each of the four mobs is put on average feed for about ten days before going onto the winter rotation, so their weight is held.

Paddocks are grazed only once during the winter, so I take extra care to budget the grass and use as little hay as possible. About mid May I measure the length of the grass in each paddock. This, multiplied by the hectares gives the cubic metres of grass available. To this figure I add one-third of the feed which I expect will grow over the winter. The balance of winter growth is used to boost either prelambling or lambing feed. I plan for a 110 day rotation, but allow for shifting twice a day if it is wet, giving a total of approximately 135 shifts.

The total cubic metres of grass is divided by 135, giving daily available cubic metres of grass. This figure divided by the 2,800 ewes gives daily feed per ewe. This year each ewe is getting .29m³ per shift (Table 2). I observe the ewes through the winter to note if they become restless before the planned shift day, and how severe the grazing has been. If I am not sure if the ration is adequate, I do a dry matter calculation, and when necessary feed hay.

Table 2. Grass budget

M ³ grass mid May		74.450
Plus 1/3 of 60mm		<u>34.400</u>
		108.850
Days May — September	110	
Extra shifts	<u>25</u>	
	135	Shifts
∴ Cubic metres/shift	<u>806</u>	
Allowance/ewe/shift	<u>806</u>	
	2800	
	= 0.29 m ³ /ewe/shift	

The hoggets are wintered in a similar fashion on a 30 hectare block, and are shifted daily. They do not receive any hay, and expect on their mid winter 54 day rotation are never forced to completely utilize all pasture on offer. We aim for them to average at least 40 kg at the end of winter.

The hogget block requires other grazing from October to control the extra feed available. This is done by rotating ewes with single lambs around directly behind the hoggets.

Normally, we crutch all sheep in June before they get too dirty.

About 16 days prior to each mob lambing, the ewes are inoculated with a four-in-one vaccine. When the first lamb is born, the ewes are spread out 15 to the hectare, using the back of the farm first. We hold the lambing ewes on breaks in less favoured lambing areas, and when they are due spread them out and put ewes with single lambs in those paddocks.

During lambing we aim to get around the lambing sheep at least four times per day. We number all twins on the rump. Any ewes that have problems are identified with coloured tags for future culling. Although we have some portable shelter sheds, all mothering up is done at the covered sheep yards. If time permits, ewes with single lambs

are run off into the lane and set stocked at 22 per hectare. This may be done anytime prior to tailing. Ewes with twins are left at 12.5 per hectare. This takes very little effort and time and has the following advantages:

- It saves feed for the twin mob which needs more;
- Later on it is simple to identify the ewes that have reared only one lamb;
- The single mob is easily identifiable, making culling on constitution more relevant; and,
- It is easy to select ewe lambs from the twin mob, which have proven production potential.

Generally, we tail as soon as time permits after lambing. All rams are left entire and we scratch for scabby mouth.

We organise our summer stock programme around the following aims:

- to have our family holiday at Christmas. This enables us to be away together when the children are young;
- to optimise worm control by using a 21 day lamb drenching schedule;
- to avoid unnecessary mustering by carrying out as many operations as possible while each mob is in the yards;
- we plan our drafting dates and numbers to fit truckloads in multiples of 250 and remove work stock as early as they grade profitable, thereby avoiding costly mid-season delays;
- to treat ewe lambs and ram lambs separately, for best grading results; and,
- to have all lambs away before the ram goes out. This ensures adequate flushing and winter grass supply, keeping hay costs to a minimum.

FINANCIAL SURVEY

For efficient farm management work priorities must be established, not only from day to day, but more importantly from month to month or even year to year. Feeding and management of stock must take priority, because this has the most direct bearing on stock performance and farm profitability.

As for the future, we have sold the hogget block and purchased another 107 hectares, this gives us a total of 290 hectares. We aim to carry 4000 ewes and 1000 hoggets, and we hope to wean 6000 lambs. The production target is 350 kgs of meat and 120 kgs of wool from the farm.

We may be forced to diversify into something other than sheep later, but I am cautious about diversification. I have found that it is best to more efficiently do what you like doing, than to try to do something totally different. That is our challenge in farming.

D. Morrow

Okawa, Mt Somers, Canterbury

I consider that with the application of progressive management and sound financial decision making, it is still possible to derive an adequate income and satisfactory life style from traditional sheep and beef farming.

I attribute the success of our farming operation to good stockmanship coupled with the adoption of progressive and innovative techniques. Our farming system contains no radical policies. Rather, we recognise the importance of concentrating on doing the basics well. This means recognising the limitations of the property and climate, as well as maximising the property's natural advantages and our personal strengths.

Achieving high production provides us with the three most important occupational attributes: a satisfactory income; a satisfactory family lifestyle; and, the satisfaction and motivation for further improvement.

Okawa, which my wife Rosemary and I farm in partnership, is 458 hectares of rolling downs in the Mt Somers district of mid-Canterbury.

At 500 metres above sea level the length and severity of the winter, frequency of snowfalls, and the prevailing strong North-west winds are limitations of the farm. The strengths are abundant summer and autumn growth, provided by a 1000mm rainfall, and proximity to markets and services. Our preference for livestock farming means this is an ideal property for us.

In 1971 I started farming by leasing half of our current property, running 2350 stock units at 11.3 s.u. per effective hectare. In 1979 I bought two-thirds of the farm, and in 1983 I purchased the remaining third, and the partnership was formed. Stock numbers now total 6,150 at 13.8 per effective hectare. The sheep to cattle stock unit ratio is 4.6:1.

The property is well planted, with a 12 hectare Oregon woodlot, and a substantial number of northwest and southwest shelter belts, a legacy from my father. We attach great importance to shelter, and plant 1,000 trees each year.

We employ one man full time, usually a pre-Lincoln student, and a local man for casual work, whom we use approximately 30 days per year. My partnership with Rosemary is more than a convenient agreement — she has substantial involvement in all facts of the farming operation, particularly policy decisions and financial planning.

Our accountant plays a vital role in the enterprise. Our debt servicing load of \$8 per stock unit requires careful financial monitoring. Our cash book is now kept on our accountant's computer, and a regular check is kept on cashflow and performance to budget.

We make extensive use of the Ashburton M.A.F. advisory service, and derive great benefit from a farm discussion group that operates in our area.

FARMING POLICY

Our farming policy is based on an all-grass system using rotational grazing except between lambing and weaning. The 120 day winter rotation is based on daily shifts.

At purchase the property consisted of 49 paddocks, all less than six hectares. To facilitate sheep handling two extra sets of sheep yards have been built in strategic places, and a lane is planned. Once this is finished the fencing will be complete.

A solid clay subsoil under Kakahu Silt Loam creates a drainage problem. We have laid five to six kilometres of tile drains over the last eight years, which has allowed us to mole drain 120 hectares. This drainage has been a breakthrough, allowing us to rotationally graze areas of the farm which were previously not used during the winter. It has also improved the pastures. Further drainage will be carried out as necessary, and as funds allow.

The farm has generated an adequate income to cover this development, although we borrowed \$20,000 from the Rural Bank for extending and renovating the woolshed.

FERTILIZER

Based on soil test results, a maintenance dressing of 250kg of superphosphate per hectare is applied annually. Sulphur is added to the super every five to six years, with molybdcic and potassic supers being used from time to time. Cobalt deficiency is suspected in our

area, but until a deficiency is confirmed by liver tests being carried out on this seasons stock killed at the works, no decision on application will be made.

One hundred tonnes of lime is spread on 40 hectares of the farm each year. Soil tests show this is enough to maintain a pH of 5.8-6.0.

STOCK

The basic principle of our management is to breed good stock and feed them well. Although you cannot make poor stock good by feeding them, we believe stock can be spoiled by not being adequately fed.

Sheep

We run Romneys because we believe they are capable of making as much money per head and per hectare as any other breed on our property. This is supported in our discussion group by the fact that out of 17 farms, the two top performing units, on a \$ per hectare basis, carry Romney flocks.

Table 1. — Physical performance

	82/83	83/84	84/85
Effective area	295	446	446
Sheep stock units	3000	4930	4980
Cattle stock units	990	1000	1070
Stock rate/ha	13.5	13.3	13.5
Meat kg/ha	207	188	251
Wool kg/ha	70	70	85
Lambing %	122	105	135
Calving %	87	90	94

This winter we are running 4,100 ewes, and we aim to keep them between 55 kg and 65 kg average all year. Between these weights, sheep should be capable of expressing their full genetic potential. Weights in excess suggest to us that stock numbers should be increased.

Rams go out in late April to start lambing on the 20 September. Border Leicester rams are mated to the 300-400 ewes not considered suitable for breeding replacements. The rest go to Romney rams. Lambing percentages are usually 120%-135% of ewes mated and lamb survival to sale or retention. Last year, a severe snow storm at lambing time resulted in a 105% lambing.

In the past, the poorest 50% of the wether lambs were sold as store lambs, and the rest were fattened. With pasture improvement and better pasture control, we have, for the past four years, fattened all our lambs, leaving the bulk of them entire. Over those years carcase weights have averaged 11.6 kg in 1982, 12.7 kg in 1983, 14.6 kg in 1984 and 12.8 kg in 1985. This year, with the high price being paid for YLs, we decided to kill our lambs at lighter weights, and we took on 240 grazing cattle for six weeks. We felt this would be better for our pastures and just as profitable.

Our weaning and lamb fattening policies are totally flexible according to the season, schedule, lambing percentage etc. Because of good summer growth, early weaning of lambs is not usually necessary in our area. To avoid the problem of providing suitable feed for 5,000 lambs at one time, we wean in two separate lots some time apart.

We have tried shearing ram lambs, but found no advantage in growth, and there was a significant increase in the incidence of pleurisy, so the cost is not justified by the return.

Shearing

The ewes are pre-lamb blade shorn during the second half of August. We pre-lamb shear for three main reasons. Firstly, it gives us earlier cashflow. Secondly, it results in better use of labour at shearing time, and later when ewes are set stocked less time is required for checking cast sheep. Lastly, we get better quality wool, for which we are paid more.

Blade shearing gives the sheep added protection necessary in our unpredictable climate. Also, the significant increase in feed requirement associated with normal shearing at this time is avoided. From shearing onwards, the ewes' condition is slowly lifted to lambing. We expect our mixed-age ewes to produce 5kg of wool for 12 months. This year we took 6.4 kg of wool per sheep stock unit wintered. Yields are never less than 80% and sometimes reach 90%.

Replacements

Replacement stock is selected from over 2,000 Romney ewe lambs present at weaning. To be eligible, a lamb must be born in the first 20 days of lambing, have been totally unassisted at lambing time, and from a ewe which has never been assisted in her lifetime. We used to have the lambing problems associated with Romneys, but have made a lot of progress in this area. In fact, last year for three days in the middle of lambing not one two-tooth had to be assisted. Ewe lambs meeting these criteria are culled on eye appraisal for everything except size, so as not to select against multiple births. The 1,280 wintered are then culled mainly on wool weight, to the 1,000 required for replacements.

Every effort is made to get hoggets to 40kg or better by their first winter. We believe the weight at this age is more critical than any other subsequent time.

Scales are used widely in our sheep management, both to meet target weights and make management decisions. Our commitment to weighing is to maintain body weight at the level we consider appropriate. To enable us to maintain this bodyweight, adequate quantities of quality supplementary feeds are kept. This is in contrast to some of the estimate dry matter systems, where the emphasis tends to be on adjusting body weight to accommodate available feed supply.

Time spent looking around the farm, checking stock and pasture growth is an essential part of our system, as is forward planning of stock movements.

Our aim is to breed large, easy care ewes with improving wool weights and lambing performance. We are members of a Group Breeding Scheme recently formed, so expect to use more rams from that source in the future, as well as from the progressive breeder from whom we currently buy.

Cattle

Cattle play a vital part in the management of our farm. Running through the middle of the property is a gully with a creek prone to flooding, and swampy areas unsuitable for sheep grazing. This 36 hectare area

is where our cows live. They are brought onto the paddocks when they are required for pasture control.

We originally started by fattening bought in calves. In 1977, because of cow beef prices and some rougher areas of the property not being grazed properly, we decided to buy breeding cows. These cows were sold in 1979, when we had the opportunity to buy 76 stud polled Hereford cows from my father. The sound breeding policies he used have provided a base for subsequent improvement in the performance of these cattle. Calving has now been condensed into a 10 week period. Last year 80% of the cows calved in the first cycle. Over the last five years the calving percentage has lifted 7 percent to 94%. These cattle are registered, but are managed as a good commercial herd.

The cows are wintered on grass seed straw obtained from cropping farms, and the young stock on grass and silage or hay. We believe that because the beef industry in New Zealand is based on grass fed steers, the bulls should be raised in the same manner.

Twenty rising two year old bulls are sold on the property in June each year. This year these bulls averaged \$1,860. We aim to produce sound, active commercial bulls to sire steer calves capable of growing quickly to the high meat, low fat type carcass required today, and heifer calves that will grow into high performing, easy care cows requiring a minimum of supplementary feed. We use our records and eye appraisal to cull towards these goals.

As our grass growth and management has improved, this year we mated the yearling heifers and only those conceiving in a six week mating were retained.

Weaning weights have improved by an average of 10kg per year, and carcass weights from cull cows have improved 30kg to 295kg, cull heifers 50kg to 246kg and bulls 40kg to 337kg.

The extra costs associated with registered cattle have meant that until this year this enterprise has paid only marginally better than commercial cattle. But we find it more interesting and challenging. Although beef prices have been low until recently, we feel most sheep farms in areas of reasonable rainfall should be able to run some cattle without affecting their sheep numbers, and possibly even improving sheep health and performance. Over the years our gross income per stock unit from sheep and cattle has always been within \$2 (sheep incomes have been considerably bolstered by SMPs).

THE FUTURE

We have three main goals for the future. Firstly, to lift our stocking rate slightly to 15 stock units per hectare. Secondly, we will concentrate on producing quality performing sheep and cattle which shift well. Our surplus stock is in good demand, and we aim to make this a feature of the property. Our third goal is to lift our lambing percentage to 150% while at least retaining wool weight if meeting the market preference for leaner heavier lambs proves less profitable.

A further option for the future may be to supply cropping farmers with well grown store lambs to fatten over the winter on specialist crops.

We think it is necessary to hold two winters' supply of supplementary feed. Last year we changed from hay to silage for our main supply,

Table 2. Farm revenue and expenses — dollars per hectare

	82/83	83/84	84/85
Sheep	337	372	508
Cattle	88	111	131
Other	7	2	13
Total	432	485	652
Farm expenses	220	185	245
Surplus*	212	300	407
Per stock unit			
Revenue	32	36	48
Farm expenses	16	14	18
Surplus*	16	22	30

*Cash available for debt servicing, drawings, tax and capital items.

because we seemed to be experts at turning good grass into straw. In our climate hay usually is either spoiled by rain or blown away. Silage provides a more easily made, better quality supplement for stock. Last year we built a 300 tonne concrete bunker, and a second bunker is planned for this year. These will enable us to meet our storage requirements.

CONCLUSION

In conclusion, the success of our farming programme has been achieved through high stock performance within a low cost structure by utilising a system suited to the property.

R. G. Patterson

Longslip Station, Omarama.

INTRODUCTION

I shall outline the development of Longslip in terms of resources, management, finance and the future.

We started with 6,500 stock units (just meeting our commitments) seven years ago, and now have 17,500 stock units, and hopes for the future. In order to be in direct control and keep the pulse on stock and pasture, Helen, my wife, and I run the property with casual peak-time labour which totals half a labour unit a year.

PHYSICAL RESOURCES

Longslip, a 15,150 hectare pastoral leasehold property, is located to the north of Lindis Pass and south of the Ahuriri River. The run ranges

in altitude from 600 to 1924 metres. Rainfall averages 700 mm at the homestead, 900 mm on the bulk of the oversown and topdressed country and more than 1200 mm on the summer wether country. Our soil resources, high country yellow-brown earths on schist and loess parent materials, are moderately fertile in the native state, but lack sulphur.

BACKGROUND TO DEVELOPMENT

My masterate study of pasture growth on soils of the various landscape units of a 500 hectare catchment on Longslip formed the basis of our development programme. The study gave us confidence by clearly demonstrating the pasture production response to seed and fertilizer and the ability of this feed to carry over into the winter. The experiments also served to convince the Rural Bank of the potential of a development programme on Longslip. The study taught me three things. Firstly, to estimate the amount of pasture on offer; secondly, to have the confidence to extrapolate within soil resource limits and lastly, to use the rigours of a degree course as a basis for objectivity in decision making and, later, reflections on those decisions.

LIMITATIONS TO DEVELOPMENT

The terrain consists of 900 hectares of river terraces, the remainder is steep land, 77% of which has slopes greater than 25 degrees. The property is in three sectors, with upper limits at 1 200, 1 600 and 1 900 metres respectively. The upper limits of each sector determine its use. Deep scrubby gullies limit access, subdivision and mob size.

Limitations of land are summed up in the tabulated land capability classes:

	%	ha
Class IV	2	339
V	—	20
VI	25	2823
VII	42	6263
VIII	31	4713
Totals	<u>100</u>	<u>15 148</u>

Prior to improvement even good clean tussock country is sub-maintenance feed. It produces 0.4 to 1 tonne of dry matter/ha/year.

The developed pasture improved with clovers annually varies in yield from 2.5 to 7.5 tonne/ha. As well as total production, two other features dependent on temperatures as well as moisture levels, are highly variable: date of commencement of significant spring growth and amount of late autumn growth. These two features have considerable implications for grazing management.

GRAZING MANAGEMENT

Grazing management is simply a matter of developing a system which works, in your own situation, in good and bad years. It must minimize

the impact that managerial constraints and physical limitations have on output. It must have maximum simplicity, flexibility and ease of operation, so as to successfully negotiate the extremes of seasonal pasture production in terms of timing and amount, reducing the snow risk, with little or no supplementary feeding.

To obtain a sustainable return on investment, it is necessary to achieve a high overall utilization of the feed grown, whilst promoting maximum regrowth.

The traditional seasonal set-stocked all-grass grazing system on Longslip formed a sound basis for future development. Wethers were on one 4 400 ha block for winter and a 5 000 ha block for summer. Ewes were tupped, wintered and lambed on the sunny Ahuriri faces, and put on to the back after weaning. Hoggets were weaned onto flats, wintered on driest sunny hill country (lowest snow risk) and placed on winter wether block for summer.

As we introduced development of the pastoral resource with oversowing of clovers and topdressing, we improved the best features of the traditional grazing system by growing more and better feed, gradually increasing grazing pressure with more subdivision and stock.

Table 1: Development resources 1978-1985

Oversowing and topdressing		
	Oversown	3900 ha
	Direct-drilled	500 ha
Fertilizer		
	Initial	2500 T
	Maintenance	440 T/year
Fencing		180 Km
Tracking		250 Km
Livestock		
	Initial	6500 s.u.
	Additional	11300 s.u.

Our development resources are shown in Table 1. Initially, 300 kg per hectare "Sulphur-Super-400" was sown with seed (3 kg/ha white, 3 kg/ha alsike plus some cocksfoot and ryegrass), with 200 kg/ha follow-up the next year. After a further two years without fertiliser, an annual maintenance regime of 100 kg/ha "Sulphur-Super-200" was established. Subdivision provides more control over where and what the stock graze, leading to better utilization and appropriate feeding of priority stock. Careful siting of fences on ridges greatly assists mustering, especially at lamb marking. We started with eight blocks and now have 49, most of which are oversown topdressed blocks of 100-250 ha.

Strategic ridge tracking proved essential; for fencing, mobility (to monitor stock and pastures) and for quick, reliable stock movement. We try to join up all tracks to promote fire control and ensure bulldozer access for extreme snowfalls.

The whole approach to the grazing management system on Longslip revolves around providing sufficient nutrition to winter enough stock

to take advantage of the spring-summer flush. We use Merinos whose foraging ability and natural resilience buffer their feed demand against its availability. In times of plenty, with high residual dry matter after grazing, the sheep improve in condition. In winter they use this condition to forage for sufficient to get by. Ewes receive sufficient pre-lamb feed to avoid pregnancy toxemia.

Apart from neglecting maintenance fertilizer requirements, failure to control roughage is the best recipe for losing clover from swards. To achieve roughage control we use a mob size of up to 5 000 at a grazing density of 20 to 30/ha for up to six weeks. Because there is little regrowth in most winters this clean up management prepares the block for the spring flush by keeping the fertility cycle moving.

To increase winter and pre-weaning feed levels the sunny ewe country facing the Ahuriri was improved in our first phase of development. It soon became obvious that to carry over more reliable winter feed and to achieve more consistent pre-mating bodyweight for easy wintering, it was necessary to spell the Ahuriri faces from weaning until the end of May. This strategy avoids overgrazing during and after drought — the third highly effective way of removing clover from the sward. Accordingly, traditional post-weaning areas and the best wether winter country were topdressed, beginning the second phase of development.

The spring-summer surplus is not cleaned off after weaning because when there is little rain before mid-April, when frosts begin, significant regrowth does not follow grazing. This freeze-dried ungrazed herbage on the sunny faces is an important grazing management resource. Spring-summer residues in a dry autumn or fresh autumn regrowth in a wet autumn are carried forward into winter. Any fresh growth is buffered against frost damage by the carried over dry herbage mass.

Through subdivision we have the ewes and hoggets in the sunniest, lowest snow-risk blocks from mid-June until August. If we get snow, the stock are already mobbed up, they pack down a platform to stand on, and can forage under scrub and tussocks or where their trampling has broken the snow cover.

From August until pre-lamb shearing in early October the darker and high blocks are grazed. This allows feed to build up on the spelled sunny blocks for pre-lamb shorn ewes. It also avoids overgrazing of new growth and stolon damage to clover — the fourth best way of eliminating clover from the sward.

We begin lambing on October 20, when the spring flush is getting underway. We could lamb earlier most years, but in a cold spring, the ewes get down in condition and produce less milk. So lambs born earlier are not necessarily bigger at weaning in mid-February.

Hoggets are grazed on the flats from weaning, with a preventative drenching programme until June, when they winter on the driest sunniest hill, in a pattern similar to the ewes. In October, their winter blocks are required for lambing so they return to the flats until shearing then go out to the back blocks in January-February.

Wethers winter on the feed residual from the summer-autumn two-tooth and ewe grazing and then spend the summer on their traditional block. This better winter and spring nutrition has improved their performance.

Cattle are used to clean up roughage in gullies in order to make them more attractive to sheep.

FINANCE AND THE FUTURE

The development resources used and how they were financed are summarized in Table 2.

TABLE 2: Cost and finance for increased stock units. (11258 stock units for \$1.1m)

COSTS		FINANCE	
oversowing and topdressing	\$37	income	\$33
fencing	\$40	L.I.S.	\$12
tracking	\$22	run plan	\$8
		rural bank development	\$20
		LANDEL	\$26
	\$99		\$99
	total cost/additional s.u.	\$99	
	less subsidy or write-off	\$33	
	net cost/stock unit	<u>\$66</u>	

The major external development factors, seed and fertilizer, fencing and tracking have together cost \$1.1 m for the addition of 11 258 stock units. These costs have been financed, as shown, by loans, grants and income. The cost of additional stock, not shown in the table, has also been financed out of income. Of the \$99 total external cost per additional stock unit, one third has been as subsidy or written off, two thirds remains as net cost per additional stock unit.

After this seven year development programme expenses of working the farm, fertilizer maintenance plus loan servicing equals half the gross income. The remainder is surplus for development and tax.

Our immediate prospects are for gradual increase in stock numbers, reduction in age of flock, and progressive improvement in productive qualities by vigorous culling. By successfully intensifying the traditional pastoral resource use pattern, we have created a platform for further development or diversification in the longer term.

SUMMARY

Development has not been an end in itself. It has dramatically improved the physical and financial performance of Longslip while making the working of this high country run easier, more flexible and an enjoyable challenge.

