

Proceedings of the

# 1983 HILL AND HIGH COUNTRY SEMINAR



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# Farming without SMPs

J. B. Dent\* & J. D. Stewart\*\*



*J. B. Dent*

## The extent of S.M.P. payment

The Supplementary Minimum Price (S.M.P.) was created in 1979 as a measure to reinforce the stabilisation accounts in the pastoral sector. Table 1 indicates that during the first three years of operation, with S.M.P.s set relatively low compared with market realisations, small payments were made. The policy was to inject confidence into the industry by guaranteeing gross farm returns at levels thought to be compatible with maintaining production and investment (Muldoon, 1982). Un-

doubtedly encouragement was given to farmers planning new development during this early period. In 1982, however, S.M.P.s were set at an optimistic level in relation to markets and as a result the policy impact radically changed. That year was not good for trading meat and wool. While it is not necessary in this paper to retrace the history that led to this situation it should be noted that world depression, the Middle East crisis and European protectionism combined to force a total S.M.P. payment of \$340.1m. Although there are signs that the world recession may have bottomed out we are still faced with a continuing market problem for lamb in Iraq and Iran (and let us not forget that 35 percent of New Zealand export lamb tonnage went to that area in 1981), a determination to limit our market share for lamb and dairy products in E.E.C. and ominous surpluses of dairy products in U.S.A. and Europe.

Initial, pre-devaluation forecasts were for a total S.M.P. payment for 1983 of \$382m in spite of the fact that S.M.P.s for wool, sheepmeats and beef have been maintained at 1982 levels or only slightly increased. More recent forecasts suggest a total pay-out of \$357m for the present

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**Table 1: Payment to farmers under Supplementary Minimum Price Scheme (\$ million)**

Product	1979	1980	1981	1982	1983 <sup>a</sup>
Wool	1.4	0	0	184.2	210
Lamb	0	0	0	93.9	135
Mutton	0	0	0	8.7	12
Beef	0	0	1.9	53.3	25
Milkfat	17.4	0	0	0	0
Total	18.8	0	1.9	340.1	382

Source: M.A.F. (1983) N.Z. Agricultural Statistics 1983, Table 65.

<sup>a</sup> Agricultural Review Committee Estimate.

season. Continuing inflation has unquestionably eroded the real value of S.M.P.s for the present year.

Even with the recent 6 percent devaluation S.M.P.s will continue to make up a substantial component of farm income for the present year. It is important to be aware of the contribution made by S.M.P.s to farm income. We know from industry statistics collated by Laing and Zwart (1983) that S.M.P.s added to the market price a further 19 percent for wool, 13 percent for both lamb and mutton and 8 percent for beef in 1982. Figures are also available for the 1981/82 season for South Island High Country and South Island Hill Country farms from the Meat and Wool Board's Economic Service. These show proportions of commodity incomes made up from S.M.P.s similar to the national figures. Overall, S.M.P.s accounted for 17 percent of gross farm income for high country farms and 15 percent for hill country farms. Expressed as a proportion of Net Farm Income S.M.P.s were 83 percent on

high country and 71 percent on hill country farms, but this statistic needs further interpretation in terms of farmers' reaction to lower gross revenue by reducing expenditure. Table 2 summarises these figures. It should be noted that the S.M.P.s are those directly paid and the figures in Table 2 do not include those elements of S.M.P. support that filter down into store stock prices.

#### **Effects of removal of S.M.P.s**

It would be incorrect, however, to assume from these figures that without S.M.P.s farmers on high country and hill country farms would hardly be making a surplus. The Meat and Wool Boards' Economic Service estimates that without S.M.P.s, farm expenditure would have been substantially reduced (Taylor 1983a); by 13 percent on hill farms and by almost 17 percent on high country farms. The result would have been a reduction in Net Farm income of 23 percent on hill farms and 17 percent on high country farms. Table 3 presents these figures.

**Table 2: 1981/82 hill and high country farms  
Average financial data**

	Hill Country Farms	High Country Farms
Gross Farm Income (\$)	132,100	201,800
Expenditure (\$)	104,400	161,400
SMP Supplement (\$)	19,700	33,500
SMP/GFI (%)	15	17
SMP/NFI (%)	71	83

Source: After N.Z. Meat & Wool Boards' Economic Service data.

**Table 3: 1981/82 hill and high country farms average data  
estimated percent reductions without S.M.P.s**

	Hill Country Farms	High Country Farms
Gross Income	15	17
Expenditure	13	17
Net Income	23	17

Source: After N.Z. Meat & Wool Boards' Economic Service Data.

These figures are supported by two other sources: firstly, case study material from our own Farm Advisory Service which shows that on average, farmers can, in the short term, maintain incomes and control overdrafts, mainly by drastically reducing fertilizer application; and secondly, analysis of a detailed econometric model of the average New Zealand pastoral farm by Laing and Zwart (1983). This model shows that should S.M.P.s be removed the immediate effect would be a 9 percent reduction in gross incomes and a 20 percent reduction in net incomes. The categories of expenditure to fall immediately are fertiliser, repairs and maintenance, development and capital investment. In the short term, output may be a little affected.

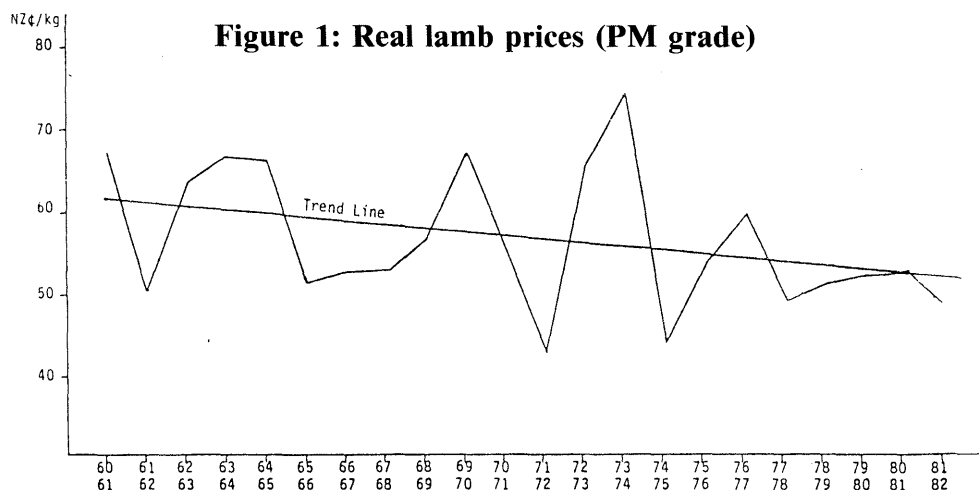
The long term impact of expenditure reductions in these categories, should no other support measures be substituted for S.M.P.s, would undoubtedly hit at the productive output from farms as farmers attempted to maintain drawings at reasonable levels by cutting costs. The way in which farm systems and farm families would or could react to such a situation remains speculative. In some areas decisions would have to be made about whether marginal land could be kept in production. Undoubtedly, this would mean hardship for some farmers, particularly those with high debt servicing commitments.

Laing and Zwart carried their analysis further by estimating the expected effect of removal of S.M.P. on export earnings. In the short run, and given even present market conditions, these could be expected to rise, because of retrenchment and disinvestment in capital stock. In the long run they estimate that export receipts from the pastoral sector would fall by \$156m per annum and they place this against a domestic cost of \$340m per annum of supplementary minimum payments.

These authors also argue that removal of S.M.P.s would set up an adjustment process in the pastoral sector that would take place over a number of years. The short run financial effects described above would lead to long run changes in production levels and enterprise choices. Included in their estimates is a net decline of over 4 million stock units with sheep numbers declining while beef and dairy cattle increase in numbers. This would be accompanied by a further decline in Net Farm Incomes if no other Government support was provided or if market prices did not lift over 1982 levels.

### Farming policy objectives

Many commentators on New Zealand Agricultural Policy suggest that it is unwise for policy to shield real market movements over an extended period of time: the



resulting unclear or inappropriate market signals would not be to the long term benefit of the nation or to farmers themselves. If the 1982 and 1983 seasons are seen as deviations from the long term trend of markets and prices, high levels of interim support may be justified; but if these levels represent the real and likely market New Zealand products will have to face in the future (and Figure 1 (Taylor, 1983b) confirms the basis of such a suggestion) then S.M.P.s may be far from appropriate. There is some opinion which has it that meat markets at least have irrevocably changed in terms of quantity required, quality acceptable as well as overall product type. Should this be the case, S.M.P.s need seriously questioning as a means of agricultural support.

A further point to consider is whether the support measures are being used to compensate for downward movements in overseas prices, or to compensate for higher rates of cost increase in New Zealand. Where the support measures are for the latter reason, their continuation reflects a recognition of a need for transfers of income from the processing-manufacturing-transportation sector to the farm sector. Such transfers would be considered necessary to compensate for the escalation of "downstream" costs in the industry induced by massive protection in the secondary sector. This protection is substantially brought about by import licensing, internal transport licensing and until recently and the effects of which are still being felt, meat processing licensing. (Recent estimates place the total cost of protection and support of the New Zealand economy at \$4b, of which the agricultural component is about \$3/4b). This opens up the whole matter of the extreme importance of improvements in the cost efficiency of the processing, manufacturing, transportation, and other areas servicing agriculture, if alternatives to the present levels and kind of support are to be put in place.

It is important to define as objectively as possible the aims of policy. In the S.M.P.

policy there has been a considerable income transfer to the agricultural sector from the rest of the economy. And in maintaining farmers' **incomes** as distinct from (but not necessarily excluding) productive capability S.M.P.s have been effective. But in meeting other important aims which may be important to our industry such as the following set, they have been largely ineffective.

- encouraging innovation and market related growth in the agricultural market,
- Keeping the industry sensitive to changes in market trends,
- Ensuring that land values bear a relationship to earning capacity based on true market prices,
- promoting efficiency and innovation in the processing section,
- promoting technological innovation and cost efficiency in the transportation section,
- facilitating productive shifts in resource use in farming, including land, investment, and loan capital,
- boosting real export earnings.

In our view these are desirable aims for policy at this time, not all can be achieved by a single policy line; hardly any are related directly to S.M.P.s being maintained.

### Alternative policy options

Desirable or necessary responses to market changes will be impeded by S.M.P.s in their present form if continued indefinitely. On the other hand, lower overall prices under reduced S.M.P.s or following their removal without other measures would result in serious disinvestment, significant declines in family income, and in the long run, disruption of production capacity. While some may argue that the reversion of marginal country, and the abandonment of marginal farms is a natural outcome of a shift emphasis in trade, our problem is that the cost of reversing such movements has been characteristically high (e.g. L.D.E.L.s) in previous cycles.

History shows emphatically that we are best to maintain the productivity of our scarce land resource. But current market phenomena, with little confidence in a cyclical upswing being round-the-corner, clearly persuade us to find policies which will encourage and facilitate adjustment and innovation which are a response to these market conditions. In addition, such policies must give some breathing space, because of the technical lags that are an unavoidable feature of farming adjustments on our hill and high country.

Of real concern is the fact that farmers who cannot afford to make changes will be caught in a downward spiral should S.M.P.s be withdrawn. Such farmers are most likely to be new entrants with high debt . . . and ambition. Laying farms open to market forces that result in such effects possibly could be a pawning of our future and should not occur by default or neglect of appropriate policy. If change is thought to be desirable, positive policies should encourage that change.

The need to encourage and support the agricultural sector at specific times is indisputable: distorting of long term market signals by policy is unforgivable. Farming groups do not appear to have developed alternative strategies related to desirable aims — apart from the continuing twin push for devaluation and reduced inflation as if these two matters were not negatively correlated or at best independent. Further, pressure has been maintained for recognition of the high levels of support in the secondary and tertiary sectors, and the need to dismantle this, because of its effect on internal costs and inefficiencies.

There are options for farming support that might better meet the needs of the future. For example:

- to the extent that direct commodity price support remains necessary, it must be market related, and therefore would best be of an “ad valorem” nature, with a price smoothing component.
- an expanded role for the Rural Bank, operating independently of the Housing

Corporation, free of political interference, with wide discretion in the identification of projects, and in selective assistance through concessionary interest, and appropriate terms.

- While input subsidies in general can cause distortion of resource use, fertiliser, fencing and irrigation have such crucial roles in New Zealand agriculture, that there is a strong case for keeping their cost within reach of farmers.
- directing assistance (research, development, subsidy) to encourage innovation and cost economies “downstream” of farms, in processing, transportation and distribution.

But whether any or some combination of these or indeed other policy should be applied should depend on the government strategy for agriculture and market outlook. For example, all the evidence points to a downturn in the real market for traditional frozen lamb. This does not need elucidation. Our international comparative advantage in converting pasture to this class of product has been eroded by cheap grain converted to pork and poultry, by changes in consumer preferences, and by policies in the E.E.C. and U.S.A. Any agricultural policy which does not focus on the possibilities of diversifying from the current primary product mix, its processing and its market, is ostrich-like.

We are of the opinion for example that we must develop the production, processing and transport technology to produce larger, leaner, chilled lamb in semi processed or fully processed cuts as an entirely separate and distinct product type for the U.S.A. and European market. To the extent that this move would hit high value markets and take frozen products off traditional markets much could be gained.

This sort of adjustment can be encouraged by policy, and should be: a different product, at a different time, at a different price, and transported differently; the latter requiring a major research and development effort in container technology. This is

the kind of **market related** thinking which must direct policy formation.

Hill and high country farmers have less flexibility for change than others on more versatile land. Some opportunities do exist, though they will not be for all, and they may not need to be for all, if the concept of the need for marginal shifts in overall production systems is realistic. Some of these opportunities will be discussed at length later in this seminar, but include:

- deer farming as part of the farm system.
- goat farming as part of the farm system.
- extending forestry (though farmers are then dependent on markets not five but twenty five years hence).
- a move towards more fine wools for the apparel trade.
- a different mix of beef and sheep stock units. (For example, Davison (1983) has recently demonstrated the possible technical and financial feasibility of the inclusion of hogget production in some farming systems.
- some thought towards amalgamation of marginal holdings.

Policies may be designed to specifically promote such diversification.

We recognise that too much can be expected from this type of diversification. We have a meat industry worth over \$1.5 billion in overseas earnings and the well-being of the main components of this, lamb and beef need to be central to any policy, not only on hill and high country but throughout the nation. Policies fostering diversification must be accompanied by those encouraging marketing changes for our traditional commodities and market related support for traditional farming systems while change takes place. Changes at the margins, can lead to benefits far exceeding the immediate extent of those changes.

## Conclusions

Farming without S.M.P.s would not lead to an immediate or short-run reduction in overseas earnings, because of technical

lags, and slow farmer adjustments, but farming incomes, and therefore maintenance and re-investment allocations could be curtailed in the short run, and the productive base of our agriculture could be eroded, if some other support policy was not put in place. Such policy should aim to:

- (a) encourage change particularly in the meat industry; at farm level, in processing, in a move away from freezing all lamb, and specifically in matching transport technology with new product lines.
- (b) to maintain market relativities between various commodities, and
- (c) to stimulate innovation, diversification, and change at the margins, to relieve existing product markets and to ensure effective use of farming resources and skills.

As a result we urge, as many have already done but perhaps with different emphasis, a phasing out of S.M.P.s and the introduction of a range of new policy measures to assist efficient farmers through a difficult period of consolidation for most, change for some, and diversification for an increasing number. And importantly we would like to see this alongside a similar revolution in support policy in other sectors of the economy, the level of which is a major factor in agriculture's weakened competitive position.

## Acknowledgement

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# Farming without SMPs

## A commentary

John G. Bayley\*



*John G. Bayley*

At the outset I would say that the previous paper provides a significant contribution to public comment on SMPs. It summarises the current situation and arrives at definite conclusions on the future of SMPs — something which a lot of commentators on that issue are reluctant to do.

Before embarking on any discussion on SMPs, we must be prepared to make the basic assumption that a strong and viable pastoral sector will be fundamental to New Zealand's economic welfare in the foreseeable future. As a nation we have to maintain a level of investment in agriculture that yields adequate return consistent with the nation's requirement for growth in export receipts.

### **Background**

The fact that this essential level of investment has not been achieved under current farm profit trends, is now history. So too is the fact that the Producer Boards' market related stabilisation schemes, although

effective in their exclusive stabilisation aims, have not induced sufficient farm confidence and capital expenditure to sustain a satisfactory upward trend in overall real farm investment.

Thus, in order to maintain investment in our nation's agriculture, the SMP scheme was implemented. The importance of this assistance was magnified by last year's cyclical downturn in market prices. Any notions that within a reasonable period the SMP scheme could become market related, and married to the existing industry stabilisation schemes, were rapidly dispelled.

### **Economic environment**

To ascertain why the SMP concept has become such a large economic part of the agricultural sector (and it has become that large part very much by default) it is necessary to look back in time. Looking back is not a process that I relish as I am not by nature a pessimist — nevertheless it is necessary in this instance to understand how the current situation has arisen.

If we review the overall New Zealand economic environment in which agriculture has operated during the last decade, the outstanding characteristic must be that of inflation. Both "off" and "on-farm" costs have risen at a rate in excess of corresponding rises in the Consumer's Price Index while the internal economy inflated far beyond the earning capacity of the agricultural export sector. Inflation has contributed to the dissipation of earnings from real productivity gains (which have been achieved by the agricultural sector over the last decade), to other less efficient areas of the economy.

*\*Fernside Rangiora*

While the cause of this inflation obviously remains conjectural, I think there is no dispute that it has been accompanied by large budget deficits, insufficient competition within the economy, high levels of protection, and a national inability to save and invest.

Secondly, since the mid '70s N.Z. has suffered from an overvalued exchange rate. This has been a major impediment to both production and profitability in the export sector. The adverse repercussions of a significant devaluation at this time appear, to some, to be unsustainable. Nevertheless, I remain adamant, that the rectification of the external imbalance some years ago, with the appropriate concomitant domestic policies, would have seen a more competitive economic environment today. Rather, we have seen an expansion of Government subsidies to secondary export industries and farming to compensate for the overvalued exchange rate.

The unfavourable operating environment of the last decade has culminated in a halving of agriculture's share of national income. The farming income operating surplus, which in the 1972/73 March year stood at 10% of total private income, is now estimated at 5% in 1982/83. A high rate of inflation, and distorted cost and profit horizons, make it difficult to conceive more damaging circumstances under which to maintain investment and innovative response to changing market demands overseas.

### **The on-farm situation**

Given these outside economic influences, the on-farm situation of the sector today is understandably not particularly rosy. In order to state this predicament objectively I highlight some of the statistics contained in the Agricultural Review Committee's Report to the Minister of Agriculture, February 1983, especially as they pertain to the average sheep and beef farmer for the 1982/83 year:

1. A level of gross farm income similar in \$ terms to 1981/82.
2. Net farm income reduced by 8% on

previous year — in real terms net farm income at its lowest point for 10 years.

3. A further annual decline in "farm gate terms of trade" of 11% — excluding SMPs this index has declined by 30% over the last four years.

4. Real Expenditure on farm inputs down 9%

— includes a 5-10% reduction in fertiliser application in volume terms (a decline for the third successive year).

— includes a 12% reduction in repairs and maintenance in real terms.

5. The meagre real growth in capital expenditure (i.e. investment expenditure) of 1% in 1981/82 will obviously become negative in 1982/83.

It is no consolation that these adverse trends are present in spite of the 17% SMP component of gross income. While I do not wish to be misconstrued as an advocate of an increase in SMPs, I submit to you that even under the current high levels of SMP supplementation, we have failed to retain our productive agriculture base over this last year.

As with any figures, there are dangers in taking averages at face value. So, I will speak of the individual farmer, on a more intuitive basis. I readily acknowledge there are some farmers performing considerably better than this average. However, one must also concede there are some farmers well below the line, and under adverse climatic conditions, I suggest, this number is increasing.

As a practical farmer I cannot ignore the already widespread disinvestment that is currently discernable; disinvestment that in many instances is not necessarily directly related to drought conditions.

Specifically:

1. The lowering of capital stock numbers.
2. The relinquishment of vital stock live-weight reserves in preference to high cost supplementary feeding.
3. The dissipation of the soil fertility bank through sub-maintenance fertiliser application.

4. The relinquishment of established grass base to pasture pests because of the relatively high eradication cost.

5. In the hill and high country, increased population and incidence of noxious plants and pests must also be regarded as real disinvestment.

Thus, I assert that due cognisance must be taken of some of these more sobering trends, if farming without SMPs is to be contemplated.

### **Removal of SMPs**

I welcome the objective analysis depicted in the paper (Table 3) and the subsequent results of the econometric model. But as the paper carefully points out, any analysis must be careful in translating the reduction in gross farm income directly to the reduction in net farm income because of the influence SMPs exert on the pattern and volume of farm inputs. I am not in a position to dispute the assertion that without SMPs high and hill country farmers would not still be making a surplus. However, I fail to accept the simplistic analysis in Table 3, that with such a massive reduction in expenditure (17%) there would not be a commensurate reduction in gross farm income to a level greater than that of the mere abolition of SMPs — especially as disinvestment through expenditure reduction has already taken place. Therefore, I conclude that Table 3 tends to underestimate the reduction of the net farm income.

Also, although it has been achieved in the past, I cannot accept that the individual farmer can assimilate a further 23 plus percent annual decline in net farm income. This may have been acceptable had income been on a rising trend in recent years. But considering that, in real terms, net farm income is currently 58% of its 1975/76 level, I think this aspect remains a forlorn assumption of the paper.

These reservations obviously extend to the econometric model, the longer term analysis and the assumptions regarding the capacity to further cut expenditure on fertiliser, repairs and maintenance, and

capital items without a resultant deleterious effect on gross farm income. I suggest that some of the ensuing questions raised by the paper regarding the individual farm systems and families and how they would react under these circumstances, and the decisions regarding marginal land being kept in production, are in some cases already being addressed in spite of the current SMP regime.

Therefore, under static market returns the abolition of the SMP regime without any other form of assistance would, I conclude, result in major short-term retrenchment in the meat and wool sector. If in the long run this retrenchment resulted in a mere \$156 million annual reduction in pastoral export earnings (5% of current meat and wool export receipts) I would be pleasantly surprised.

I would certainly have to be more familiar with the model before I would be prepared to accept that these results are much more than an indication. Moreover, the repercussions of this inevitable contraction in primary output on the downstream processing industries remains a grey area.

### **Farming policy objectives**

I identify strongly with the author's thoughts that support measures must not shield the industry from real market movements over an extended period of time. There is no doubt that since 1982 SMPs have created a massive blanket completely smothering any concept of market responsive production.

Being quite realistic, up until present drought conditions and given a satisfactorily rising plane of output per stock unit, there has been absolutely no incentive under the SMP scheme for me to envisage any change in my pattern of meat and wool production from that which I've undertaken over the last two decades. As the paper correctly asserts, I have remained insulated from the ominous trend line for real lamb price illustrated in Figure 1. I understand that a similar trend line can also be drawn for real beef realisations. However, while not wishing to detract

from the importance of these downward trend lines the question does immediately arise: — do these long-term trend lines specifically relate to the product or do they more realistically reflect the decline in consumer preference for the form in which that product is presented?

I agree very strongly with the concept expounded in the paper, of redistribution of national income as compensation for the unrestrained escalation of down-stream costs in industry, brought about by inefficiencies in the secondary sector. For there is no doubt that in the case of at least one product, current levels of SMP supplementation supercede any concept of market relativity. Thus they have proved to be a particularly convenient means of compensating farmers for the political inability to come to grips with the economic distortions outside the immediate confines of the farm sector. Nevertheless, we must concede that prior to 1982, SMPs were successful in maintaining the productivity base of the nation's pastoral sector. But the associated importance of the ad hoc schemes, LDEL and LIS, should in this respect not be underestimated.

However, as with any economic policy there must be a trade-off aspect. With SMPs, this has been the attraction of high levels of both domestic and international visibility, in addition to the aforementioned obscuring of the producers' sensitivity to the market. I would concur with the authors that the latter is intolerable even in the short term.

The other important policy criteria (listed in the paper) that assistance to agriculture must desirably satisfy, have also undoubtedly become submerged in the SMP scheme's protective blanket. But interestingly enough, when one endeavours to summarize these points, the connotations that exist within them can just as aptly be applied elsewhere in the economy. I refer to the connotations of market sensitive production, especially in the export sector, innovativeness, technical efficiency, cost efficiency, non-protectionism and the

facilitation of shifts in production to better utilise resources. All these criteria generally remain unsatisfied by large areas of the N.Z. economy outside the agricultural sector and therein must lie some indication as to where remedial action must be directed.

### **The alternatives — Long-term profitability**

As stated, historically there has been relatively high cost involved in reversing serious disinvestment trends and long run disruption of productive capacity in the agricultural sector. Thus, at times, there is an undeniable necessity when maintenance of productive capacity is paramount — that time is now! Accordingly, I reluctantly come to the same conclusion as the paper that some form of redistribution must in the short-term sustain farm viability, while eliminating the prime existing negative factor — namely insulation from market demand.

At this point I become a somewhat reluctant commentator, because, in suggesting alternatives to SMP type supplementation, we venture into the field of ad hoc policies. As the authors no doubt fully realise, these policies inevitably create further distortions which proliferate into the future. Regrettably, this ad hoc approach has been characteristic of the nation's agricultural policy for too long. While such schemes may be implemented in good political faith, there are inevitable hardships when it comes to removal, if indeed removal is ever effected. Moreover, these fragmented policies conveniently disguise the severe erosion of basic long-term profitability, the restoration of which must remain the ultimate aim of any policy.

While I fully accept the criticism that farming groups have not developed alternative specific strategies related to longer term desirable aims, I make no apology for being a small pawn in the simplistic push to reduce inflation. Regardless of what is done in the immediate future in the agricultural sector, it will in the long-term be ineffective unless the broader economic issues are also rectified. With respect to

farming, those broader issues revolve around the restoration of agriculture's operating surplus to a more realistic percentage share of our gross domestic product. Even assuming that a political resolve to that policy objective is forthcoming, restoration will not be achieved overnight. It most certainly will not be achieved under the current price/wage freeze which merely serves to suppress that share at its present depressed level.

Thus in terms of overall economic policy, I see the handling of the post freeze income distribution and the assimilation of the impending external market upturn as critical to the long-term basic viability of agriculture.

### **Fragmented options**

Accepting the long-term nature of such overall remedial action I concede that we currently have to address ourselves to the more fragmented options. From the four policy options listed by the authors it is unfortunately all too easy to identify the distortions that will arise from the implementation of such suggestions viz:

1. The increasing role of the Rural Bank relative to private rural finance institutions and the associated long-term impairment of the agricultural sector to compete for financial resources *vis a vis* the non-farm sector.

2. The proliferation of input subsidies and associated distortions in demand for those inputs.

3. The application of subsidy to the downstream processing industries where festering cost inefficiencies already abound.

However, on a more positive note, the authors' options should be commended as realistic suggestions and a genuine attempt to proffer alternatives that aim to minimise the inevitable distortions. They certainly seek to actively promote the market responsiveness, diversification, technical efficiency and increased component of the "value added" concept the sector so

desperately needs. Besides, these alternatives should be achievable well in advance of long-term sectoral profitability.

The long-term misgivings the authors have about frozen lamb are indisputable and thus diversification must extend right back to the primary product. However, while accepting the imperative nature of this diversification within various forms of product, given New Zealand's relatively small share of the total world meat market, I am yet to be convinced that policy should demand an overall reduction in lamb production.

Indeed, as the theme of this seminar predicts, diversification must remain one of, if not the key factor in our future agricultural policy. In a positive sense, I trust that later speakers in this seminar will testify to the practical success of diversified enterprises such as those listed towards the end of this paper.

### **Conclusion**

Given the present low levels of pastoral farm profitability, and in some cases existing trends in disinvestment, overall abolition of SMP payments without some form of compensation, would further erode the productive base of meat and wool farming, with inevitable adverse long-term repercussions in the nation's export earning capacity.

Accordingly, while recognizing that it is imperative to remove the immunizing effect from external market demand that the SMP regime exerts, I come to the hackneyed conclusion that some form of redistribution of national income back to the farm sector must be retained so that the latter very legitimate aims of this paper can be initiated. However, for these aims to be sustained by the sector long term, a more favourable economic environment must be promoted and thus the last statement of the paper, which advocates support policy in other sectors of the economy, becomes, in my view, a pre-condition to agriculture's long-term viability.





# Production, performance and prospects in the high country

I. G. C. Kerr\*



*I. G. C. Kerr*

The fourth series of the T.G.M.L.I. high country production surveys was conducted in 1982. The first survey in 1966 was followed by others, at approximately five-year intervals.

The most recent was largely a postal survey, with personal interviews of approximately 10 per cent of the 308 runholders involved.

The survey questionnaire comprised many pages and covered a multitude of topics such as livestock production, land use and development, sources of finance, potential production, subdivision, research

needs and labour. To attempt to gather such information by means of a complicated questionnaire was preposterous! The 85 per cent response greatly exceeded my highest expectations.

The following is a summary of some of the results. More detailed results will be published separately.

## Stock units

The changes in livestock production in the high country and in New Zealand as a whole are compared in Table 1.

**Table 1. Total livestock units**

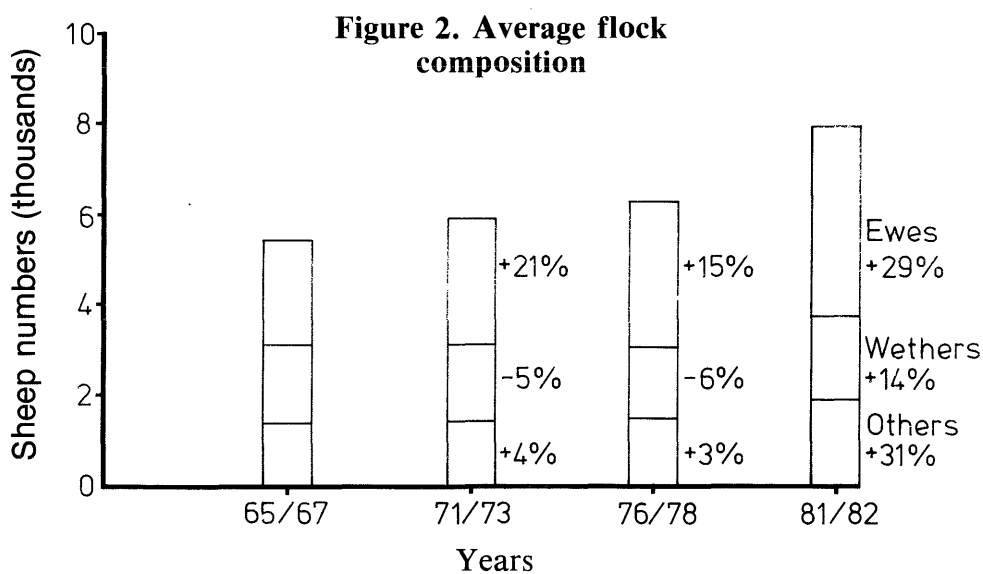
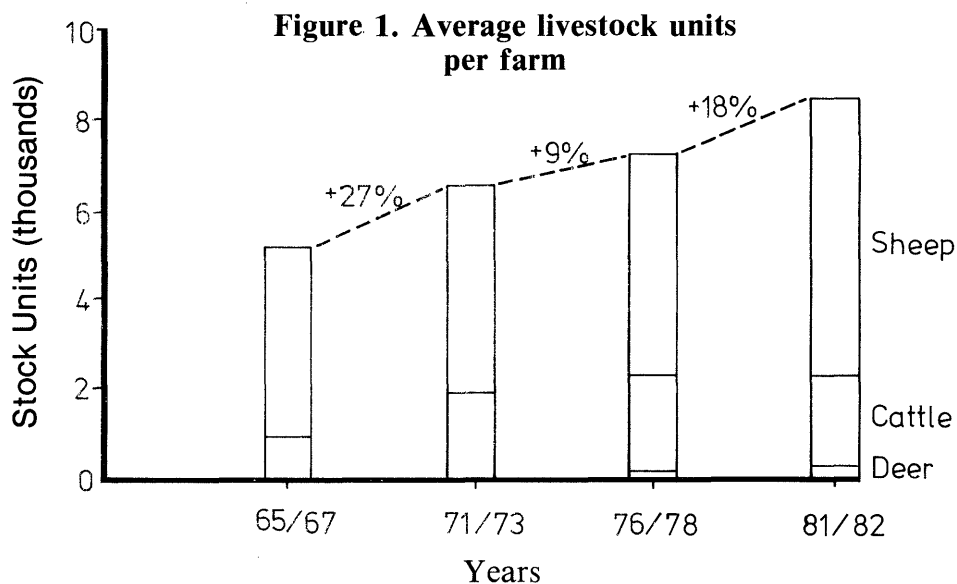
	New Zealand • High country	
1965/67	88.8	1.6
1971/73	98.6	2.0
	+ 19%	+ 62%
1976/78	99.3	2.2
	+ 6%	+ 20%
1981/82	105.5	2.6

While the high country comprises only a small percentage of the national flock and herd its propensity to grow in production is amply illustrated. Further, there have been more subdivisions of runs than amalgamations over the last five years. There are now 308 runs in the survey compared with 300 in 1976/78.

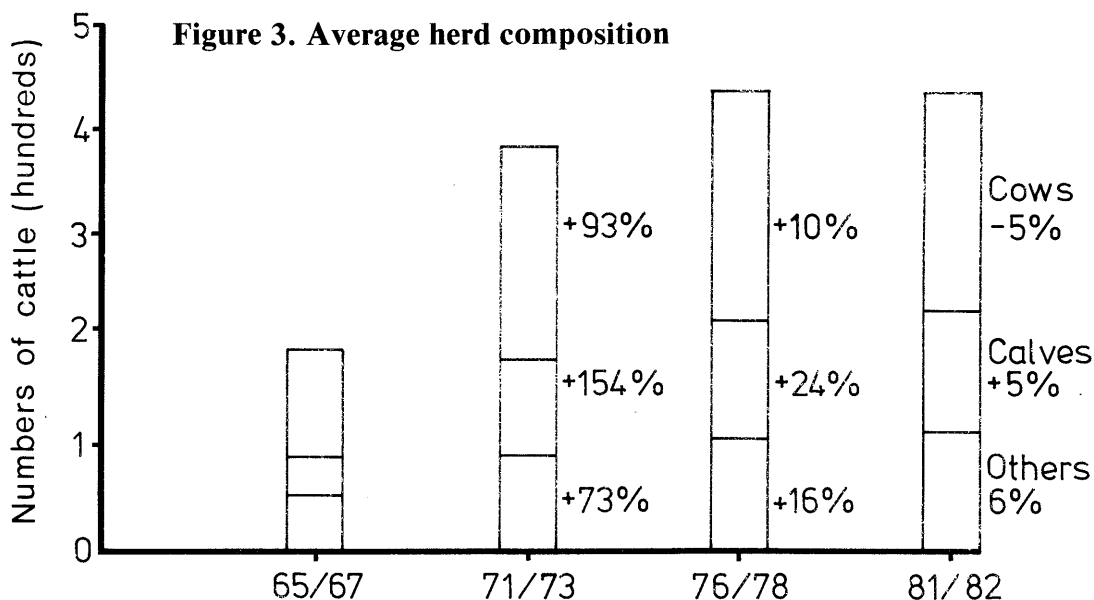
\* *Centre for Resource Management, Lincoln College.*

The earlier boom in beef cattle has been replaced by fairly rapid increases in sheep numbers. (Figure 1)

Most of the growth was in breeding ewes and their replacements and not, as some pundits predicted in wethers. (Figure 2)



The survey shows that the high country beef cattle herd has stabilised at about 135,000, with more runholders growing-on young stock. (Figure 3)



Merinos are still the dominant sheep breed. There has been little fluctuation between breeds over the years. (Table 2)

**Table 2. Sheep breeds (per cent)**

	65/67	71/73	76/78	81/82
Merino	44	50	48	46
Halfbred	41	36	35	36
Others	15	14	17	18

Among the beef cattle breeds, Hereford is by far the dominant. An earlier fashion of crossbred herds is waning. (Table 3.)

**Table 3. Beef cattle breeds (per cent)**

	65/67	71/73	76/78	80/81
Hereford	43	48	59	63
Angus	12	12	16	16
H & A	34	31	20	17
Other	11	9	5	4

### Wool production

Wool production in the high country has increased dramatically. (Table 4.)

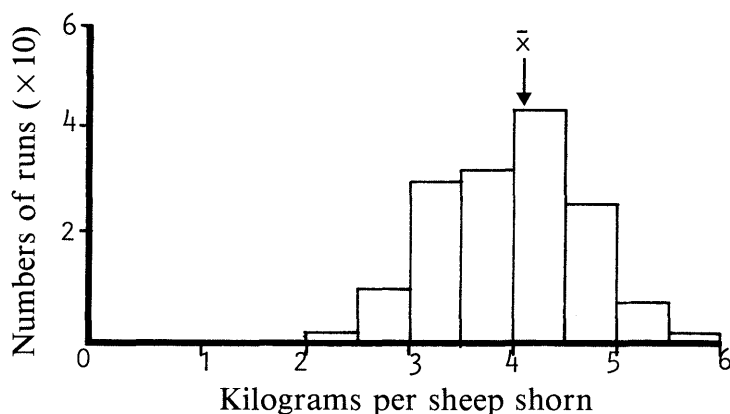
**Table 4. Greasy wool sold per run**

	kg	
1965/67	21,479	
1971/73	22,776	+ 6%
1976/78	23,795	+ 4%
1981/82	29,102	+ 22%

I believe these recent phenomena are due to a combination of extra sheep and improved levels of nutrition, topped off by a helpful season in 1981/82. As wool is such an important ingredient in the high country farmer's welfare this development is surely good news.

**Figure 4. Wool per sheep shorn (105 runs)**

S.I. High Country  
1981/82



The regional average wool production figures per sheep wintered confirm the advantages of the dry areas. (Table 5.)

**Table 5. Wool per sheep wintered 1981/82**

	kg
Marlborough (moist) MM	4.2
Canterbury (moist) CM	3.6
Canterbury (wet) CW	3.4
Otago (dry) OD	4.2
Otago (moist) OM	3.7
Otago (wet) OW	3.5
Southland (moist) SM	3.2
ALL RUNS	3.7

However, these results must be interpreted with caution because they take no account of probable yield differences nor

the increased production in areas where rapid increases in sheep numbers have occurred resulting in a high proportion of lower producing young stock.

For instance in this survey the average weight of wool per sheep shorn (from 105 runs) in 1981/82 was 3.97 kilograms. The difference between the highest and the lowest is shown in Figure 4.

Few runholders keep records of the classes of sheep shorn, together with the amount of wool produced from them. I regard this information as vital for sound management decisions.

### Performance

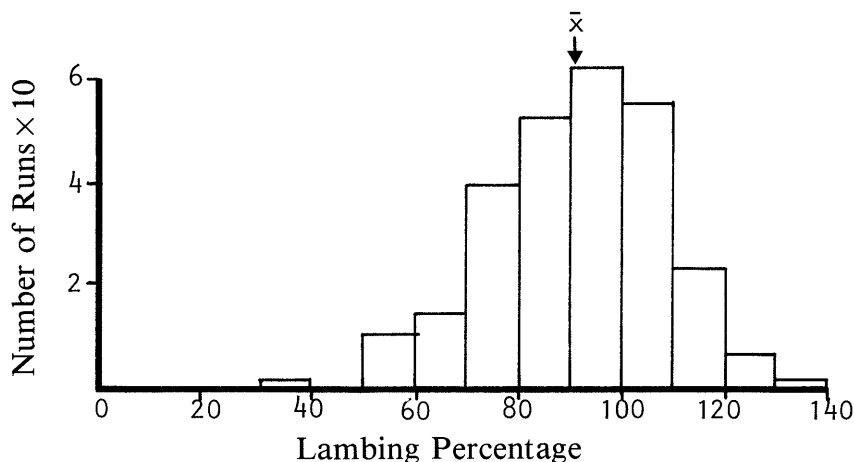
The pattern of livestock performance is shown in Table 6.

**Table 6. Livestock performance**

	1965/67	1971/73	1976/78	1981/82
Lambing (%)	79	84	85	92
Calving (%)	83	81	82	85
Fawning (%)	—	—	—	84
Wool/sheep (wintered) (kg)	3.9	3.8	3.7	3.7
Wool/sheep (shorn) (kg)	—	—	—	4.0

**Figure 5. Lambing percentage per run (238 runs)**

S.I. High Country  
1981/82



The trend in lambing percentage is clearly upwards, helped in 1981/82 by an excellent result in Otago dry and moist areas.

There is a wide range in lambing percentage per run — from below 60% to over 120%. A wide range in lambing percentage is normal for the high country, but in 1981/82 the average moved up sharply.

The advance in reproductive performance over the years, together with improvements in animal health and animal nutrition, have turned what was a barely self sustaining high country sheep industry fifteen years ago to one where today, many runs are established breeding-fattening enterprises.

#### Land use

There is an enormous range in land use (and useable land) between properties so Table 7. is only a guide for those who want an “average” figure to which to relate.

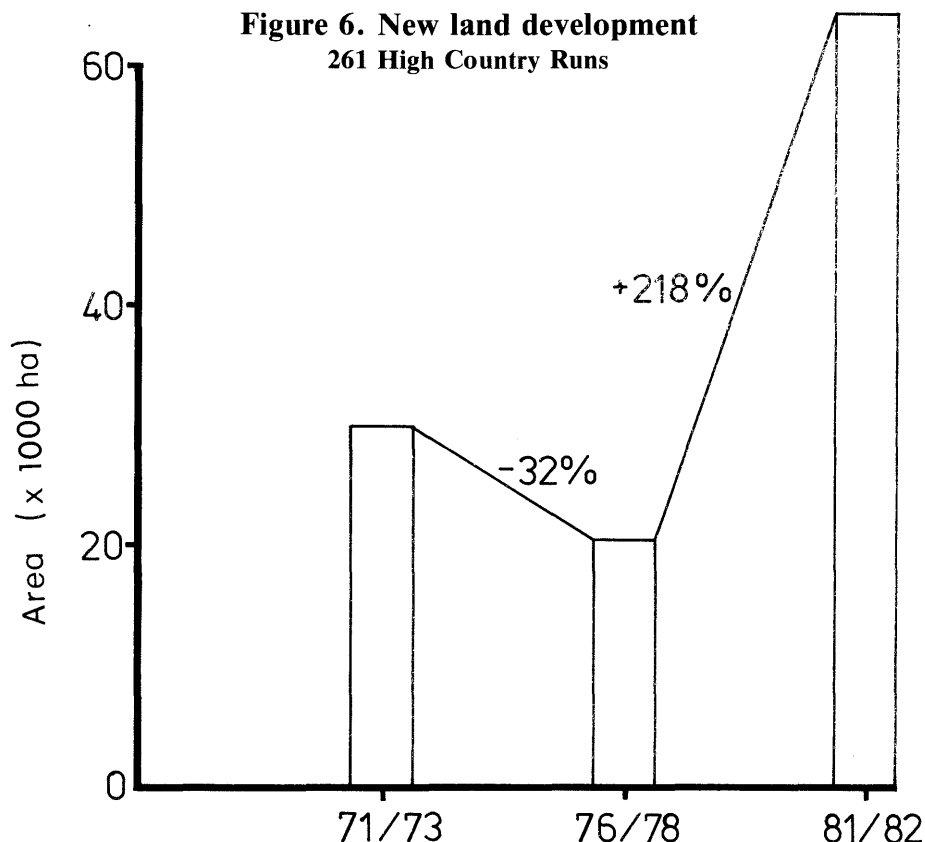
**Table 7. Average pattern of land use (hectares)**

Dryland grass	208
Irrigated grass	33
Dryland lucerne	34
Irrigated lucerne	4
Overdrilled native	22
OSTD native	1512
Crop	22
Fallow	11
Unimproved native	7179
Trees	106
Scrub	815
Rock, scree etc	1010
<b>Total</b>	<b>10956</b>

#### Productive potential

Over recent years the area of new land development has fluctuated wildly. The pattern for 261 runs is shown in Figure 6.

**Figure 6. New land development**  
261 High Country Runs



The large drop in the rate of development up to 1976/78 has been more than offset by a resurgence of investment in fencing, fertiliser, seed and stock. By far the major part of this development is in the form of fencing, oversowing and topdressing, with a marked increase in the rate of development south of the Waitaki.

In answer to a question: "how much land on your run, in your view, can best be further developed by . . ." the response was, on average as follows:

By oversowing and topdressing — 2279 ha, by cultivation — 148 ha, by irrigation — 102 ha, by planting in forest — 67 ha.

Two other questions asked for an estimate of:

- the realisable potential of each run, and
- the number of stock units in five years time.

The answers to these questions, are summarised in Table 8.

**Table 8. Average livestock units**

Five years ago	7164	
		+ 18%
Now (1981/82)	8429	
		+ 31%
In five years	11023	
		+ 20%
Potential	13247	



The high country is obviously in a phase of rapid increases in stock numbers, and many farmers see major developments ahead of them. Do some farmers lack the resources or inclination to develop or are they maximising their return at current levels of production?

Perhaps a clue can be gained from a list of factors which were regarded as limitations to production. The nature of the resources being farmed was regarded as a limitation by 65 per cent of runholders, 61 per cent considered economic and financial constraints to apply and technical factors such as diseases and fertilisers were seen to be limiting factors on 36 per cent of the runs surveyed.

#### Development

Farm development expenditure within the high country in 1981/82 averaged \$90,212.

**Table 9. Land development**

Land	\$49 349
Buildings	\$ 9 493
Stock (@ \$25.45/s.u.)	916 s.u.
Plant	\$ 8 051
Total	\$90 212

The range in expenditure showed wide variation. Fifteen per cent of farms were apparently "maintaining the status quo", yet another 15 per cent spent more than \$125,000 on development.

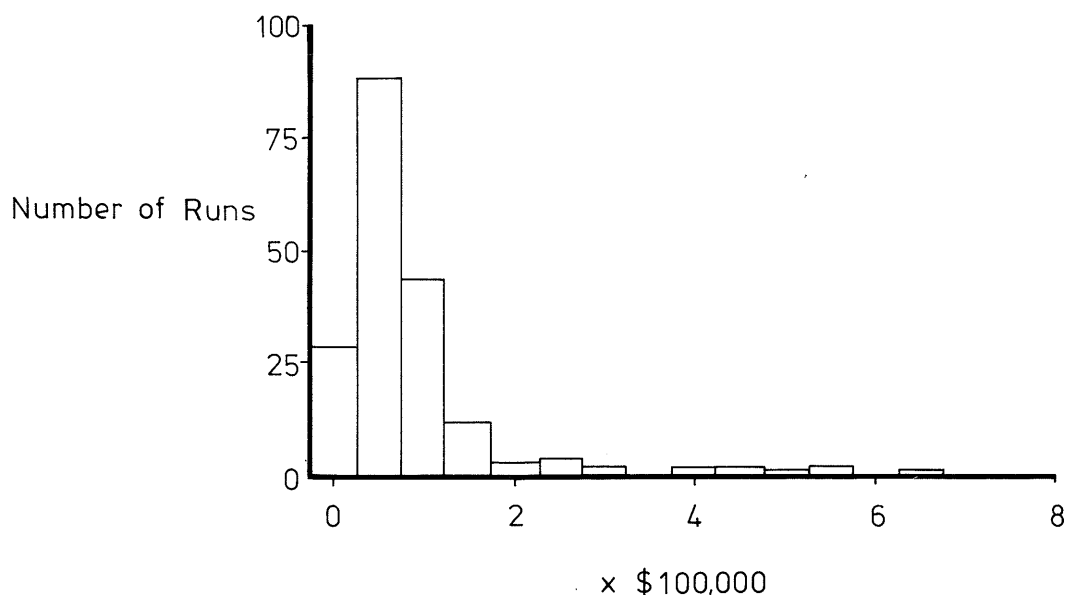
The stated sources of finance for farm development are shown in Table 10.

**Table 10. Sources of finance for development**

Revenue	49%
Firm, bank or finance company	7%
Rural Bank	42%
Catchment Board	2%

**Figure 8. Farm development expenditure**

S.I. High Country 1981/82



Reinvestment of income is still the major form of development expenditure but recently the State, in the form of the RBFC, has made a significant contribution. Catchment Boards' run plans do not seem to be as popular as they used to be.

The recent government incentives, although much vaunted and sometimes pilloried, have been used by many high country farmers. Average farm involvement in these schemes is shown in Table 11.

**Table 11. High country use of recent government incentives**

Livestock incentive scheme (LIS)	1961 s.u.
Land development encouragement loan (LDEL)	\$85 461
Land development loan (RBFC)	\$52 281

There is a wide range between runs in all schemes. But it is obvious from the rate of development taking place in the high country that these incentives are achieving their purposes.

In the 1981/82 season the average fertiliser input (as superphosphate) was 21.25 kilograms a stock unit. The trend in fertiliser use is shown in Table 12.

**Table 12. Fertiliser use (kg/s.u.)**

	71/73	76/78	81/82
Development	4.38	3.19	8.68
Maintenance	10.41	11.26	12.57
Total	14.79	14.45	21.25

The large increase in development fertiliser should be noted.

The regional pattern of fertiliser use for 1981/82 shows those areas where most of development has taken place. (Table 13.)

Some runs apply very high rates of development fertiliser.

In summary the high country appears to be on the move because it seems many runholders were able to foresee the need to intensify, diversify, economise or perish!

**Table 13. Regional fertiliser use (kg/s.u.)**

	1981/82						
Region	MM	CM	CW	OD	OM	OW	SM
Development	6.3	5.3	5.1	11.2	10.4	10.2	10.0
Maintenance	10.7	11.1	8.9	16.4	16.4	8.5	21.3
Total	17.0	16.4	14.0	27.6	27.6	18.7	31.3

### Acknowledgements

I wish to thank all the runholders who participated in this study. Each has received a summary analysis of the results for their run for the surveys that have been car-

ried out. This is but a small return for the effort made on our behalf. I also acknowledge the significant contribution of Ken Lefever and Robert Schikker of our staff towards the preparation of survey results.

# Soils and fertilisers for pasture production in the South Island hill and high country

A. G. Sinclair\* and P. D. McIntosh\*\*



*A. G. Sinclair*

## **The sequence of soils**

Most of the soils of the South Island hill and high country are derived from similar parent materials (greywacke and schist) and their differences are due mainly to the climates to which they have been subjected. The main climatic influences are rainfall and temperature, the latter as it affects potential evapotranspiration. These factors together produce a moisture sequence of soils. The distribution of the major groups in this sequence is shown in Figure 1.

At the dry end of the sequence are the brown-grey earths. These have a very limited distribution, occurring in the semi-arid basins in Central Otago and in the driest parts of the Waitaki Valley. They receive less than 500 mm rainfall and normally the soil moisture falls to wilting point by December and does not rise again until April.

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\*\* *Soil Bureau, DSIR, Gore*

The next main group of soils is the yellow-grey earths which form under a rainfall range of 500–900 mm. The drier of these may have a moisture deficit for 5 months of the year while the wetter are only occasionally below wilting point. They are a very important group of soils agriculturally, making up much of the flat and rolling downlands of the South Island; in the hill and high country, yellow-grey earths cover the older terraces and the lower hills (up to about 800 metres altitude) of the inland basins of Central Otago and the Mackenzie Country and Waitaki Valley.

The final major soil group we are concerned with is the yellow-brown earths (upland and high country sub-group). These soils only rarely have a moisture deficit and many have a moisture content above field capacity for several months each year. In the hill and high country they cover virtually all the farmable land above the limit of the yellow-grey earths so they are a very important but largely undeveloped resource. It is on these upland and high country soils that much of the recent agricultural development (with Land Development Encouragement Loans) has been initiated. With increasing rainfall these soils grade into podzolised yellow-brown earths and podzols which are generally close to or over field capacity for most of the year.

## **Fertiliser requirements**

Most hill and high country soils suffer from severe nutrient deficiencies. To exploit their agricultural potential fertilisers are generally essential.

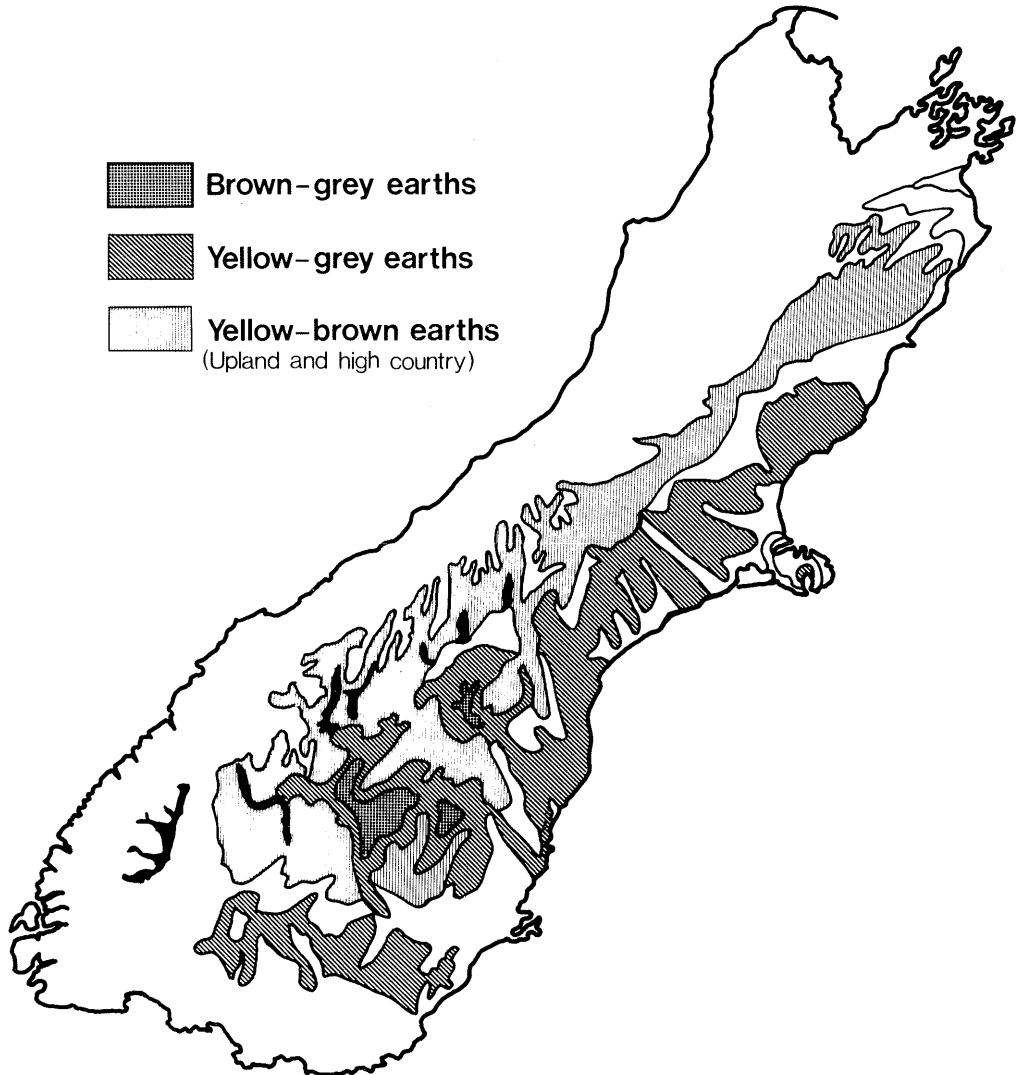
The fertiliser requirement of any soil depends on (a) the levels of nutrients already present in the soil and (b) the type and quantity of forage required.

#### Natural patterns of nutrient status

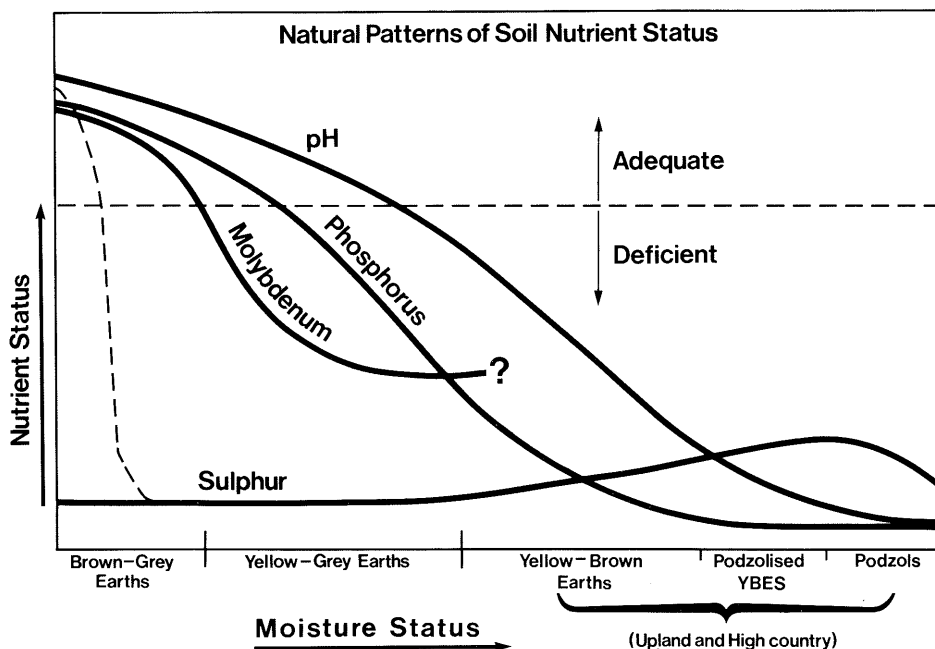
Much of the hill and high country has received little or no fertiliser so its current nutrient status arises largely from the com-

position of the parent materials from which the soils are derived and the natural processes to which they have been subjected. An understanding of these natural factors can therefore be put to use in estimating the nutrient status of land without actually having to make direct measurements through laboratory tests or field trials. When one considers the work involved in

**Figure 1. Distributions of major soil groups in the moisture sequence.**



**Figure 2. Generalised pattern of soil nutrient status relative to the growth of oversown clovers on hill and high country soils in the South Island. The broken line for sulphur relates to the accumulations of sulphate at depth in dry brown-grey earth soils which are accessible to deep-rooting plants like lucerne.**



collecting soil samples to represent adequately a large dissected block of high country there is obviously much to be gained from a predictive system of estimating soil nutrient status.

The nutrient status of hill and high country soils is closely related to the moisture status — indeed it is principally the moisture regime which has determined the present chemical composition of these soils.

The general pattern of nutrient status is shown in Figure 2. The explanation of this pattern follows:

### Sulphur

Sulphur present in the parent rock as sulphide is very quickly oxidised to the water-soluble form, sulphate, which is very susceptible to leaching. In most of our soils this “primary” sulphur has been lost but in

the very driest soils it has accumulated at depth in the soil profile in the form of gypsum, and deep-rooting plants e.g. lucerne can use it but clovers become severely sulphur deficient.

There is a small input of sulphur from rain. As soils weather they develop some ability to retain sulphur so there is a slight increase in sulphur status with increasing moisture regime. Near the coast where the sulphur inputs are greatest the natural accumulations of sulphur can be sufficient for good pasture growth, but moist inland soils will still remain sulphur deficient.

With further weathering soils podzolise and lose their ability to retain sulphur in the topsoil, so sulphur deficiency becomes more severe again.

The overall result is that almost all inland hill and high country soils are severely deficient in sulphur.

## Phosphorus

The release of phosphorus from parent material is much slower than the release of sulphur, and traces of the original phosphate mineral, apatite, can still be found in the fine soil particles of brown-grey and yellow-grey earth soils. Moreover, soils develop a much greater ability to retain phosphate against leaching than for sulphate. However some leaching of phosphate does occur as evidenced by the net loss of phosphorus from topsoils. Two processes reduce the effectiveness of phosphorus remaining in the moister soils. Firstly, considerable amounts are incorporated into chemical forms unavailable to plants. Secondly, the phosphate retaining abilities which develop make it more difficult for the plant to withdraw phosphate from the available pool. The overall effect is that the driest soils, including brown-grey and drier yellow-grey earths, usually have sufficient phosphorus for legume

growth, but distinct phosphorus deficiency occurs in moister yellow-grey earths, while the moister yellow-brown earths and podzols are often so deficient that virtually no growth occurs without phosphorus and relatively large amounts of phosphate fertiliser are required to achieve near-maximum growth.

## Molybdenum

The pattern of molybdenum deficiency is intermediate between sulphur and phosphorus. Brown-grey earths are generally not deficient in molybdenum, but severe deficiency occurs with yellow-grey earths and some yellow-brown earths. The pattern is not very clear or consistent for the moister soils.

## pH

Soils have an ability to hold cations such as potassium, calcium, magnesium, aluminium, etc. in an exchangeable form



**Sulphur response. Nil P (in foreground), P alone (behind dog), P & S (being cut).**

readily available to plants. The total quantity a soil can hold is called its cation exchange capacity.

The pH test indirectly measures the proportion of the cation exchange capacity that is occupied by basic cations (principally calcium, with small amounts of magnesium, potassium and sodium). When these cations are removed by leaching they are replaced by aluminium which dissolves out from the clay minerals in the soil. Aluminium is harmful to plant growth: it is antagonistic to rhizobia and so suppresses nodulation of legumes, it inhibits root growth, and it interferes with phosphate uptake. It is an acidic cation so as it replaces the basic cations along the moisture sequence there is a progressive decline in the pH value of the soil.

The moister yellow-brown earths and podzols have strongly acid (pH 4.2–4.8) topsoils, and legume growth is seriously inhibited if these soils are not limed. Lime requirements decrease progressively with increase in topsoil pH (4.8–5.5) in the drier yellow-brown and moister yellow-grey earths. Soils with topsoil pH above 5.5 contain only very small amounts of exchangeable aluminium so benefits from raising the pH by adding lime are slight and arise from effects other than the inactivation of aluminium and its replacement with calcium. Brown-grey earths with pH usually above 6 and drier yellow-grey earths generally do not benefit from liming.

### **Deviations from the nutrient status pattern**

The main factors disturbing the pattern described above are:

1. Soil rejuvenation.
2. Higher inputs of sulphur near the coast.
3. Variations in parent material.
4. Previous fertiliser application.

Because these deviations from the general pattern can occur it is always advisable when assessing fertiliser needs for land development, to soil sample some of

the area to be fertilised to see if there is any significant departure from the expected pattern. Soil tests used as specified in the Ministry of Agriculture and Fisheries' new Fertiliser Recommendation Scheme can give a fairly accurate indication of nutrient requirements.

### **Size of responses to fertilisers**

Since plant growth is primarily controlled by the nutrient in least supply, Figure 2 indicates that the growth of pastures will be very poor on practically all soils if fertilisers are not applied. On dried soils growth will be limited by severe sulphur deficiency and on wetter soils by severe phosphorus deficiency followed by a need for sulphur and lime. Yellow-grey earths, and probably most yellow-brown earths, will require molybdenum.

Results from our recent trials illustrate the patterns of nutrient deficiency and the size of responses to be expected in various situations.

#### **1. Trials on yellow-grey earths (Glancairn Station, Lake Benmore).**

There were 4 trial sites in this series, on sunny and shady faces at low (450 m) and high (800 m) altitudes. At each site a main trial investigated effects of different rates and forms of sulphur with and without added phosphorus, while a subsidiary trial assessed the need for phosphorus. Lime treatments were not included since pHs were in the range 6.2–6.5 where responses to lime do not generally occur. Data from selected treatments are given in Table 1.

Without fertiliser, growth was extremely poor at all sites. Phosphorus alone gave little response but phosphorus with sulphur gave good yields. The subsidiary experiments showed that in the presence of sulphur phosphorus was beneficial at the low altitude sites but was of no benefit at the higher altitude sites. The soil phosphate test was closely related to responsiveness to phosphate as shown by the subsidiary trials.



**Table 1. Responses to phosphorus (P) and sulphur (S) on yellow-grey earth soils on Glencairn Station.**

Dry matter yields are expressed as a percentage of the P + S treatment. Data from the main trial relate to total production over 3 years, and data in the subsidiary trial are for the second season's growth only. Actual mean annual yields (kg DM/ha) for P + S treatments in the main trial are given in brackets.

Site	A	B	C	D
Altitude (m)	450	450	800	800
Aspect	Sunny	Shady	Sunny	Shady
Topsoil pH	6.3	6.3	6.5	6.2
Topsoil P test	9	15	24	25
Topsoil S test	2	2	2	2
Principal legume	Lucerne	Clovers	Lucerne/ clovers	Clovers
Relative DM Yields				
<i>Main trial:</i>				
No fertiliser	17	10	1	6
P	20	13	2	8
P + S	100 (3800)	100 (5000)	100 (3100)	100 (3200)
<i>Subsidiary trial:</i>				
S	60	76	95	103
P + S	100	100	100	100

These soils lie at the dry end of the yellow-grey earth group, and confirm that in such soils sulphur is extremely deficient, phosphorus is moderately deficient to adequate, and pH is almost certainly adequate.

## 2. Trials on yellow-brown earths (East Otago Uplands).

There were 5 trials in this series, covering soils which ranged from the middle to the moist extremity of the yellow-brown earth group and into podzolised yellow-brown earths. At each site the effects of phosphorus, sulphur and lime on clover growth were established. Clover DM yields from selected treatments are given in Table 2.

These soils all show extreme phosphorus deficiency. Sulphur deficiency is extreme at the drier end of the sequence and only slightly less severe towards the moister end. Lime gives only a little benefit in the drier

soils, but greatly increases yields in the moister soils.

## Selecting land for development

In addition to considerations such as access and fencing, potential production and fertiliser inputs required to achieve this potential must be considered when selecting land areas for development.

The high altitude, acid soils have low potential production combined with high requirements for both phosphorus and lime with respect to the growth of clovers. Development with clovers is unlikely to be economic on these soils. Probably the most attractive soils for development are moist yellow-grey earths. Their production potential is high because of the environment in which they occur, they require no lime and only modest amounts of phosphorus (if any), and their main requirement is for

**Table 2. Responses to phosphorus (P), sulphur (S) and lime on yellow-brown earths (YBE) and podzolised yellow-brown earths on the east Otago uplands.**

DM yields are expressed as a percentage of P + S + lime treatments. Data relate to production from red and white clovers during a period of 3 years following oversowing. Fertiliser treatments were: S: 50kg/ha annually; lime 4000 kg/ha initially; P: mean of treatments receiving 20, 40 and 80 kg P/ha in 1st year and 10, 20 and 40 kg P/ha in 2nd and 3rd years. Actual total yields (kg DM/ha) for the experimental period for the P + S + lime treatments are given in brackets.

Site	1	2	3	4	5
Annual rainfall (mm)	470	630	755	1000	1100
Altitude (m)	760	855	1040	1100	1160
Soil group	YBE	YBE	YBE	Podzolised YBE	Podzolised YBE
Topsoil pH	5.2	4.8	4.6	4.6	4.4
Topsoil P test	9	10	7	3	7
Topsoil S test	3	6	6	5	10
Relative DM yields:					
No fertiliser	0	1	1	1	0
S	3	1	1	0	0
P	1	10	8	12	7
S + P	75	92	60	43	24
S + P + lime	100	100	100	100	100
	(2100)	(1400)	(4100)	(4100)	(1700)

sulphur which is a very cheap fertiliser. On the drier yellow-grey earths fertiliser requirements are still low but production is limited by moisture stress. The drier yellow-brown earths are the next most attractive option after moist yellow-grey earths; they require moderate amounts of phosphorus and little or no lime and they have a moderate production potential.

#### **Selecting fertiliser for high country development**

Transport and application costs of fertilisers are high in the high country so high analysis fertilisers appear attractive. However as sulphur deficiency is almost universal di-ammonium phosphate (DAP) and triple superphosphate should not be used on their own.

On yellow-grey earths sulphur is required in greater amounts than phosphorus, and molten-mix sulphur superphosphate containing 20% elemental sulphur is an ideal fertiliser. An application of 200 kg/ha at oversowing will maintain legume yields at about 70% of the maximum possible over the following 3 years.

On yellow-brown earths phosphorus requirements are at least as high as sulphur requirements so superphosphate is appropriate as far as phosphorus: sulphur ratio is concerned. However it has the disadvantage of low nutrient concentrations. A new product, "Super 14", has recently been introduced which contains 14% phosphorus and 13% sulphur. It is made by blending triple superphosphate with sulphur superphosphate. Where transport and application costs are high "Super 14"

can prove a slightly cheaper way of applying phosphorus and sulphur than superphosphate. The optimum quantity of phosphorus will vary among these soils but as a general rule the initial application should be about 15–20 kg phosphorus/ha followed by annual applications of 7.5–10 kg/ha for several years after oversowing. Sulphur requirements have not been determined accurately but are probably similar to phosphorus requirements so a sulphur:phosphorus ratio in the fertiliser of approximately 1:1 is recommended. While the more acid soils (pH less than 4.8) will respond to lime, application at conventional rates (e.g. 4t/ha) are unlikely to be economic. More information on effects of low rates is urgently required.

Molybdenum should be applied when developing high country soils. It can be included in a seed coating to give the equivalent of 20 g sodium molybdate/ha, or broadcast in the fertiliser at 50 g sodium molybdate/ha.

### **Fertilisers for maintaining high country pastures**

Maintenance requirements for high country pastures have not yet been accurately determined. Nutrient cycling from pasture to animal and back to the soil tends to be very inefficient under extensive grazing because of the uneven distribution of dung. Maintenance phosphorus requirements are likely to be about 1.5 to 2 kg phosphorus/stock unit/year; thus a high country pasture maintaining 3 stock units/ha will require the equivalent of 60–80 kg superphosphate/ha/year. Sulphur requirements will generally be similar to phosphate requirements once pastures have been established for several years. Soils which are initially high in phosphorus (e.g. yellow-grey earths with soil phosphate tests above 20) may require little phosphorus for several years and their phosphorus status should be monitored by soil testing in order to devise a specific fertiliser programme.

# The effect of altitude on pasture production in the South Island hill and high country

G. G. Cossens\*



G. G. Cossens\*

## Land use capability classes

The soil sequence and its fertiliser requirement for oversown or cultivated pastures has been discussed by Dr Sinclair. Within these sequences there is a much wider diversity of landscapes which give rise to the

*Invermay Agricultural Research Centre*

concept of the Land Use Capability Class mainly defined by slopes, moisture and susceptibility to erosion. The more diverse the range of crops grown the more versatile the soil and the higher the Land use Capability.

For practical purposes the hill and high country has a slope in excess of  $15^\circ$  and a Land Use Capability of IV to VIII. While hill country can range from sea level up, high country is best restricted to land over 850m. Within the so called hill and high country environment are flat and terrace lands whose soils may be Classes I, II, or III. So there are activities other than pastoral farming and a wider diversity of land uses which should be considered as part of this environment. Horticulture in Central Otago is one example. There are also other options, such as forestry, forest farming or forest grazing. Farm forestry would be a suitable alternative use to pastoral farming or production forestry in

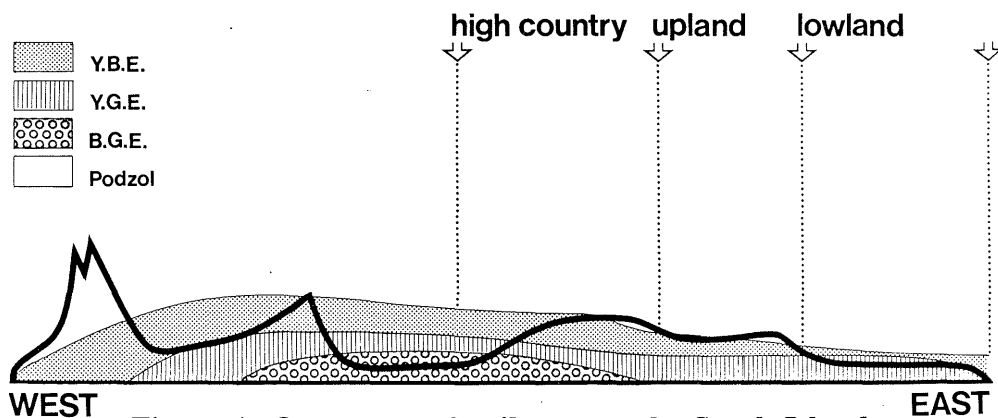


Figure 1: Occurrence of soils across the South Island

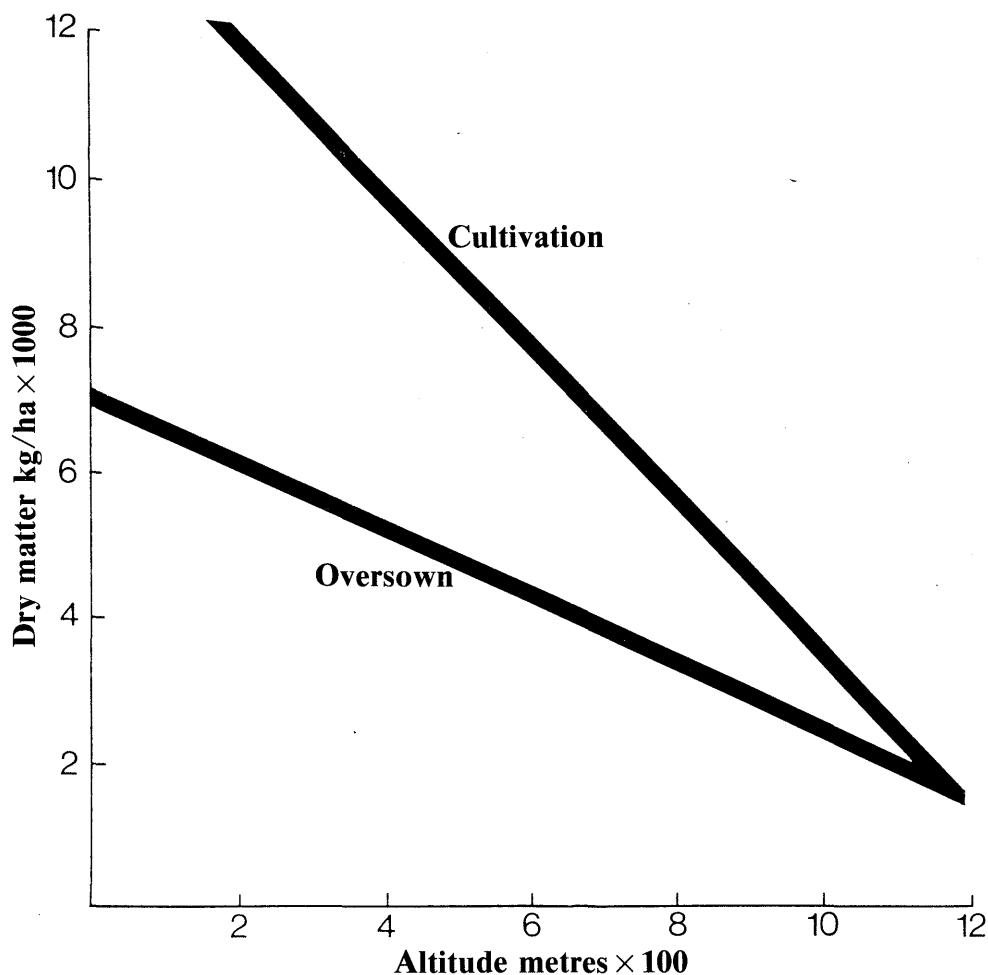
Land Use Class V. Grazing is almost all embracing whilst horticulture is largely restricted to Classes I and II.

Although these options exist within the hill and high country the discussion will be confined to pastoral farming of either over-sown or cultivated lands.

#### **Pasture Production within the Hill and High Country Soil Groups**

If the South Island is viewed in section from East to West, from Dunedin or Timaru to Haast the soil sequence appears as shown in Figure 1. The landscape varies

in height and steepness of slope. Once the soils have been cultivated, or oversown, and topdressed, the annual total or species dry matter yields can be determined. Provided the soil moisture stress is not excessive, say not more than 30 days a year below wilting point, the decrease in pasture yield with increasing altitude can be assessed. Table 1 and Figure 2 show long term data (more than 5 years) for cultivated and oversown pasture from which the yield decline was found to be directly proportional to the decrease in temperature with altitude. A cultivated ryegrass, cocksfoot,



**Figure 2: Pasture production and altitude**

white clover pasture declined by about 90kg DM/100 metres of altitude from 13000kg/ha at sea level to 2500 to 1100m. In a similar manner clover oversown pasture, with browntop-cocksfoot and sweet vernal in tussock grassland declined by about 45kg DM/100 metres of altitude from 7000kg/ha at sea level to 2000 at 1100m.

With this information the cost effectiveness of a topdressing programme for any altitude or climatic zone can be readily estimated. For example it is cheaper to oversow than plough (if such an operation was practical) at 1100m as production from cultivated and oversown pastures are so similar at that altitude.

Although Maku lotus, is higher producing for a given rate of phosphate than white clover, it does need phosphate. It should also be noted a lotus-grass sward will only be higher producing than a clover-grass sward if the former is free of clover. If clover should invade the lotus, as it will in time, the clover-lotus yield would be similar to the clover sward. Lotus should be looked upon as a pioneer legume for soils where the pH is less than 5 at altitudes from 300 to 900m. Lotus is susceptible to

desiccation but not killing after several hours of ground frost greater than  $-5^{\circ}\text{C}$ . An oversown lotus sward will generally have a yield potential similar to that of cultivated ground above 300m; in fact recent work indicates very high yields from Maku lotus at 1500m in the Awatere Valley of Marlborough. Nevertheless it is not clear yet how long these high lotus yields will persist under grazing when subjected to low temperatures or increasing grass competition as the soil nitrogen status builds up. High tannin levels, which make lotus less palatable, occur where and whenever the plant is under stress — from cold or low fertility — but, provided the grazing animal has some conditioning to the plant there is little drop in intake and weight gains of young stock are satisfactory.

It should also be noted all the cultivars of perennial ryegrass presently available in New Zealand are not particularly winter hardy in the South Island above 800m altitude and will be completely killed out of a sward 1 year in 10 at 800m and 1 year in four at 1100m. Ryegrass cultivars showing severe winter damage at higher altitudes in Otago were: Ruanui, Nui, Vigour (Melle), Norlea, Premo, Talbot, and Reveille.

**TABLE 1: Yields of Cultivated and Oversown Pasture and Lucerne for Various Soil Groups for Soils greater than 40cms Deep.**

Soil Group	Annual Rainfall mm	Crop	Total Yield DM t/ha				Total
			Winter	Spring	Summer	Autumn	
Brown-grey earth	350-450	Lucerne	0	2.7	1.9	0.5	5.1
		Pasture	0	1.8	1.0	0.4	3.2
Yellow-grey earth	500-800						
Dry	500	Lucerne	0	3.9	1.5	0.4	5.8
		Pasture			No Data		
Medium	600	Pasture	0.3	2.8	2.3	1.1	6.5
Wet	700	Pasture	0.6	3.6	3.8	1.7	9.7 (7.0)*
Yellow-brown earth	500-1100						
Lowland (50m asl)	1100	Pasture	0.7	5.5	6.1	2.9	15.2
Upland (450m asl)	650	Pasture	0.5	3.7	3.5	1.7	9.4 (6.5)*
Upland (750m asl)	1000	Pasture					4.8 (4.4)*
High Country (1100 asl)	550	Pasture	0	1.1	1.2	0.2	2.5 (2.0)*

\*Oversown pastures.

## Pasture species

### The grasses

The choice of correct pasture species is still difficult. While old varieties as tall oat grass, the wheat grasses and sheeps burnett are again being promoted, we have little reliable information about the long term grazing of these plants. Generally, a mixed legume-grass sward will give a very similar total yield no matter what the species or cultivars, so palatability and digestibility become more important than total dry matter. For instance, Dr David Scott in the

Mackenzie Basin records comparable total yields for some of the more common grass species (Table 2), as did Messrs Sheath, Greenwood and Cossens in Otago (Table 3). If the total yields of the species do not differ by more than 10 to 15% then the apparent increase or decrease in the yield could be due to chance effects, and comparisons may not be accurate.

The balance between grass and total yield was made up almost entirely by the legume component and this over a very wide range of soil groups and altitudes.

**TABLE 2: Total sward yields Mackenzie Basin, 550m altitude.**

	Cocksfoot	Ryegrass	Timothy	Tall Fescue
Total yield (t/ha DM)	5.4	5.3	5.5	5.0
% of Grass	22	12	14	9

**TABLE 3: Total yields of grass species and white cover for soil groups (t/ha DM)**

	Drier					Wetter		
	BGE 300m	Dry-YGE 150	440m*	YGE 100m	YBE Upland 450m	YBE 440m	High Country 1100m	Podzol 50m
Grass species:								
Nui ryegrass	2.7	5.7	5.6	8.2	8.6	7.5	4.1	11.4
Ruanui ryegrass	3.0	4.4	6.2	7.4	7.7	7.9	3.9	11.3
Apanui cocksfoot	3.0	4.3	4.3	8.7	7.9	6.3	3.9	11.5
Curries cocksfoot	NT	5.1	NT	8.6	8.5	7.6	NT	NT
S170 Tall Fescue	2.8	5.2	7.0	8.7	7.5	8.0	3.2	13.0
Matua Prairie Grass	2.8	NT	5.1	NT	NT	NT	3.0	12.7
Sirocco Phalaris	3.2	4.6	NT	7.9	7.3	9.8	3.0	10.8

\*Data of Dr David Scott

NT — Not Tested.

### The legumes

The same state of affairs as the grasses exists with the legumes (Table 4). However at the dry end of the scale lucerne is far superior when sown on its own, and at least in the short term red clovers are superior to white. Lack of persistence of red clovers beyond 8 years still appears to be a problem at all altitudes.

The species yields quoted are the mean of 4 to 6 weekly mowing data of three or more years or of the third year after sowing, when plants were well established; but note they give no indication of long term persistence.

Because of the short term nature of many of the trials quoted there are only limited indications of the potential of the lotus cultivars. Empire lotus (*L. corniculatus*) showed a high level of persistence at 1100m some 12 years after sowing and Maku lotus the poorest. There is obviously a need for more work on the longevity of lotus species particularly under grazing above 750m.

The red clovers, in particular Pawera, had a bad reputation for causing barrenness in ewes, however, recent work indicates the problem can be overcome by careful grazing management.

### Grazing management

The yield data given in tables 1, 2, 3, and 4 would apply to a rotational grazing system with fairly intensive but short grazing periods and long regrowth intervals. It will operate satisfactorily for oversown tussock grasslands as has been shown by some farmers and at Tara Hills High Country Research Station. Although the tables give readily attainable dry matter yields, pasture growth utilised by stock is at best about 50% in the tussock grasslands as indicated by the Tara Hills trials. Changes in the grazing management of pastures can produce total yield variations of greater magnitude than the differences in yield between cultivars. It is of little advantage in seeking higher producing species particularly for the tussock grasslands and

**TABLE 4: Total Yields of legume species and cocksfoot for soil groups (t/ha DM).**

	Drier					Wetter		
	BGE 300m	Dry-YGE 150	440m* YGE	YBE Upland 100m	450m	YBE High 400m	Country 1100m	Podzol 50m
Legumes:								
Huia white clover	4.2	5.0	3.9*	7.0	6.9	6.4	2.5	10.0
Turoa red clover	7.9	4.9		6.8	8.5	7.1	2.8	11.2
Pawera red clover	6.2	5.7	4.3	6.8	9.2	6.9	3.6	10.3
Maku lotus	4.0SE	4.6		NT	5.4	8.1	SE	9.2SE
Hybrid lotus	6.0	3.8	2.1	6.9	5.6	6.3	SE	9.6SE
Empire lotus	4.1SE	3.6		7.3	6.1	7.9	SE	9.7SE
Wairau lucerne	9.9	5.6	5.0	9.1	6.9	8.1	SE	9.7

\*Data of Dr David Scott

NT — Not Tested

SE — Slow Establishment



then subjecting them to incorrect management for as already noted the total yields of grass/legume swards were similar. Even if a cultivar were 10% higher yielding only 50% of this increase would be utilised.

#### **What to sow?**

Although much of the work quoted was short term, the following are conventional and safe.

**Semi arid climate;** that is a brown-grey earth soil.

It is very difficult to oversow in this zone because of moisture deficit, however cultivation or minimum tillage of lucerne gives the only really satisfactory higher yielding long term plant. New cultivars and careful grazing management should overcome many insect and disease problems which have put lucerne out of favour in the last few years.

Grasses for periods less than five years; Tall Fescue, Ryegrass, Cocksfoot.

Grasses for periods over five years; Cocksfoot, Ryegrass, Tall Fescue.

Legumes as a pure stand; lucerne

Legumes with grasses; White clover, red clover.

**Sub humid warm climate:** that is a dry yellow-grey earth soil

Grasses: as for brown-grey earths

Legumes: as for brown-grey earths

*Lotus corniculatus* may have a place here, but its long term use is untested. This is one

of the hawkweed (*Hieracium*) problem zones; oversowing with clover and top-dressing with superphosphate followed by careful grazing management can overcome hawkweed problems.

**Sub-humid climate:** that is a moist yellow-grey to yellow-brown earth

Grasses Oversowing: Cocksfoot only for oversowing as all other grasses are difficult to establish.

Cultivation: Ryegrass, Cocksfoot, Timothy.

Legumes Oversowing: White clover, red clover

Cultivation: White clover, red clover

**Sub humid to humid cool climate;** that is an upland yellow-brown earth over 300m. As for yellow-grey to yellow-brown earths but for oversowing use Maku lotus where pH is less than 5.0 at altitudes from 300-900m.

**Sub humid cold climate;** that is high country yellow-brown earths over 750m.

Grasses for oversowing or cultivation: Cocksfoot; do not use perennial ryegrass. Tall Fescue may be of doubtful persistence.

Legumes: White clover, red clover, alsike clover.

For oversowing use Maku lotus when pH is less than 5.0 at altitudes between 750 and 900m.

# How I manage my fertiliser programme

J. L. Daniell\*

## Introduction

Wairere is northeast of Masterton, 28 miles from saleyards and freezing works. Fertiliser is obtained from Napier and lime from Mauriceville.

Area: 1127ha 1065 effective

Altitude: 800–1750 ft a.s.l.

Contour: 20 hectares ploughable, 140 hectares discable, balance easy to medium/steep hills.

Rainfall: has averaged 1075mm over 30 years, lowest year 700mm, highest year 1500mm, lowest month 6mm, highest month 330mm.

Soils: Approximately half sandstone, half clay.

Climate: Tends to be winter wet and summer/autumn dry. N.W. wind is major influence on temperatures and evaporation rate.

Carrying capacity: 1951: 3600 stock units — 70% effective lambing

1981: 11900 stock units — 122% effective lambing.

Limiting factors in 1951 were: Low fertility soils, low carrying capacity and poor animal performance with consequent low revenue, rapid reversion to manuka and some gorse, inadequate fencing, lack of knowledge (both advisors and farmer) of capital and maintenance fertiliser requirements and of effective management systems, no really reliable worm drenches and a continuing shortage of finance.

Limiting factors in 1983 are: Moisture deficiencies are much more critical, with our higher carrying capacity and higher performance expectations, than they were prior to development. Within and between

season fluctuations in pasture growth appear to have been accentuated. There are still considerable gaps in our understanding of fertiliser needs, mineral balances and livestock thrift and growth rates. We appear to have placed undue reliance on clover to provide all the N necessary to support continuing high quality and volume pasture production. Soils now have a higher moisture retention capacity, increasing susceptibility to pugging in winter, and the likelihood of slipping on the clay hills following heavy rain. Parasite control is even more important and is necessary for older animals at times as well as young stock. Grass and clover species and strains aren't all suited to the changed environment and resulting stresses. We still don't know what is needed for pasture maintenance in terms of types and quantities of nutrients although fertiliser is our major input cost and must be affordable, effective and profitable.

Objectives: Continuing profitability is paramount so our pasture (grown at considerable cost) must be efficiently converted by animals of high profit potential, and they may not always be sheep and cattle.

All our efforts will be largely wasted if:

1. Our animals and their products aren't meeting the current and likely future demands of affluent and discerning customers.
2. They are unsuited to the conditions and stocking rate.
3. They cannot produce at high levels when well fed and managed.
4. Marketing by
  - (a) The farmer (presentation for sale or slaughter).

\*Wairere Masterton

(b) The processing/export industry is poorly organised or inefficient.

With the aim of docking 140% of lambs, weaning at between 25 and 30kgs, depending on the season, at 12 weeks of age, selling 6.5–7.0kg wool per sheep stock unit wintered and obtaining stock prices in the top 25% bracket on the day of sale, a sheep-plan performance recorded flock is run to provide rams for our own use and for sale. Selection of those which perform best in this environment has already benefitted both volume and value of output, but the gap between the best and the worst is still wide, indicating the scope for considerable further improvement.

Stock Management: Ewe hoggets (2000) are run as one mob and are all mated for approximately a month.

Ram hoggets (1100) also run as one mob. Ewes are mob stocked from weaning to pre-lambing except for the recorded ewes and flock two tooth, which are single sire mated. About 75% of the total flock is mated to ram hoggets in an endeavour to speed the rate of genetic progress.

Mobs are shifted according to feed availability and quality with priorities altering according to the time of year.

Sales of sheep are planned to suit the farm feed position and the requirements of capital stock, rather than trying to get the extra dollar for a particular line by holding them longer.

Cattle stock units are  $\frac{1}{3}$  of the total. A breeding herd of Angus  $\times$  Hereford  $\times$  Shorthorn cows provide the dry stock which have been used more as pasture controllers than as profitmakers during recent years. Flexibility is essential and cattle are used as buffer stock, when appropriate, to be sold or tightened up if the season dictates, in order to protect the sheep flock as far as is sensibly possible.

With true market return relativities between beef and sheepmeats changing markedly we are re-appraising our cattle management. We'll still be farming for the best returns over all the stock units carried and will maintain selection pressure to further improve per animal productivity.



**Romney four tooth to four year old ewes.**

### **The importance of fertiliser**

- Since the commencement of aerial topdressing, most farms have increased their stocking rates and volume of production substantially as a consequence of large and continuing expenditure on fertilisers and lime, as well as fencing, weed control, water supplies, airstrips, buildings and additional stock. In spite of these achievements there is no static position on many of our hills — we're either moving ahead or sliding backwards — because for either economic or technical reasons, or both, the farm fertility bank hasn't built up to a stage which will permit drawing on credit without a consequent squeeze on pasture production and stock performance.

Over the past two years we've seen a significant reduction in fertiliser usage, so that it is now well below the amount required for adequate maintenance of existing stock numbers. If we continue to fail to topdress regularly, with the necessary plant nutrients in the appropriate quantities, the land already developed with such effort and expense, we face the prospect of an accelerating decline in productivity and stock numbers as pastures deteriorate and the reversion cycle recommences. Further neglect of this major national asset would be an indictment of those holding positions of power and responsibility, both in Government and in the community generally.

During last spring a casual observer passing through Wairarapa hill country could see at a glance the differences in pasture and stock between those farms which had been able to continue topdressing and those which had reduced tonnages or ceased altogether. The season was a kind one but the contrasts were obvious in livestock condition and production. The effects on financial returns are now being reflected in the lack of business in our country towns, with farmers in some cases, struggling to meet their commitments.

### **Capital topdressing**

We learned the hard way in the 1950s, because we tried to develop too much land

at once, that our soil fertility must be lifted rapidly and the battle against reversion to manuka had to be won paddock by paddock if our efforts and expenditure were not to be largely wasted.

Over a period of years, using soil tests, herbage analysis and plot trials, we arrived at a mix of (2 tonnes of lime and 4 cwt molybdc super per acre) sown with 3lbs white clover and 20lbs ryegrass per acre. Seed was sown either in May or July according to circumstances, the latter giving the better results particularly on existing pasture rather than scrub burns. The following autumn 4 cwt super+1 cwt D.A.P. was added. You may ask, why did we use such a large and expensive capital topdressing?

Quite simply because, this recipe, plus grazing with sheep only in the first year gave us within 18 months a pasture capable of carrying four stock units per acre and feeding them well, so that their performance was similar to that of the rest of the flock. This was in marked contrast to the days when it was considered that a sometimes prolonged period of low per animal performance was an unavoidable cost of development. Of equal importance was the strong sward which coupled with grazing pressure enabled us to beat the weeds — making reversion to manuka a fading memory and a problem no longer.

### **Maintenance topdressing**

With the assistance of M.A.F. and private consultants we keep a close watch on stock thrift, soil nutrient status and herbage analyses to decide on our programme. The current mix is 1 cwt D.A.P. with Cu added for stock health, 2-4 cwt lime with elemental S as indicated, and Mo at 4/5 year intervals.

D.A.P.: We first used this fertiliser in 1969 to help bridge the late winter-early spring feed gap. Results were encouraging so we steadily expanded usage to provide winter and early spring feed for weaners and hoggets. We noticed that where paddocks had been topdressed for three successive years with D.A.P. and subject to other nutrients

being in adequate supply, year round pasture production, composition and drought recovery were all improved. We then built 1 cwt into the capital mixture with very considerable benefits, and finally in 1979 reached the stage where we top-dressed all the developed country annually with D.A.P. In spite of the cost, it has proved profitable and pastures are continuing to improve. One interesting sidelight is that our sandstone country, which is very attractive to porina caterpillars, now seems to withstand attacks much better once the

pasture is established. Certainly I much prefer to spend money on fertiliser than on insecticides.

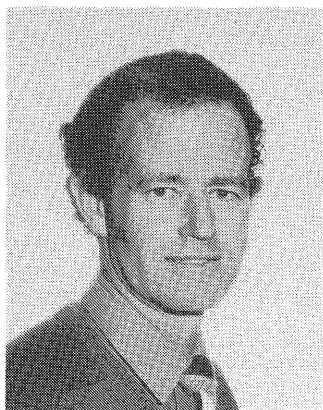
D.A.P. now provides our maintenance phosphate and application at 125kg/ha is phased from late April (or May if Autumn rains are late) to mid July.

The supplying of all necessary plant nutrients through the use of fertiliser and lime has made this possible.

The message is clear: We must continue to topdress regularly if we are to stay in business.

# How I handle my fertiliser programme

A. Kane\*



A. Kane

## Introduction

Glenfoyle is situated on the Grandview range between Tarras and Wanaka. The property consists of 3600 hectares, ranging in altitude from about 300m at the homestead to 1300m. There are 160 ha. of paddocks on the terraces, the balance is moderately steep hill country, about 2400 ha. of which are oversown and topdressed, the balance being native. About 4% is classified as Class 4 (the paddocks), 33% is Class 6 and 63% is Class 7. The property is divided into 44 paddocks and blocks with an average block size on the hill being about 120 ha. Rainfall averages 550mm per annum. Stock numbers are 4,500 half-bred ewes, 1500 hoggets, 200 other sheep and 70 breeding cows. Wool production is 4.25kg and lambing 100%.

I try to keep the management of the place simple. They start cleaning up the hogget summer country on 10th April, crutched about the 20th and flushed and

tupped on the mid-altitude dark blocks up the 8 mile and behind the woolshed. From the second week in June the ewes are wintered in one mob of 4,500 around all the sunny blocks, being shifted about once a week. They come off the hill for shearing at the end of August and are fed wilted silage in the paddocks during September before being set stocked on most of the oversown blocks for lambing during October. They come into the paddocks again in the first two weeks of November for tailing after which they are run in five mobs of about 900 ewes, with each mob being given three or four blocks and shifted every 10 days or so until weaning on January 20. The wether lambs which don't go to the works at weaning are held on the grass paddocks until the autumn rains when they are finished on lucerne. The ewe lambs are summered on some mid-altitude dark blocks, spend the autumn on the lower oversown country behind the paddocks and are shifted around all the paddocks during the winter and supplemented with wilted silage. They are shorn with the ewes at the beginning of September and summered on four blocks out the back and come in with the ewes for flushing and tupping. The cows are used to clean up any rough top on the more established oversown blocks during the summer and clean out a few gullies, mainly on the front faces, over the winter.

Fertiliser is expensive. At the present time the cost applied is over \$200/tonne — \$147/tonne for 20% Sulphur super, \$30 nett of subsidy for cartage (290km) and \$30 nett to fly it. I topdress 1800 ha. of oversowing every second year and the balance every third year. A total of 200 tonnes (at

\*Glenfoyle, Cromwell



**Back block, Camp creek**

190kg/ha). That comes to \$6.50/stock unit for fertiliser, or 45% of my annual running costs, if I exclude interest and principal payments. So, a small change in the amount or even the type of fertiliser can have a major effect on my budget. The decision as to how much, and what sort of fertiliser to use is an extremely important one.

When making that decision I keep a list of priority areas in mind. Highest on the list are the lucerne paddocks because I need the winter feed that they supply. Next would be the grass paddocks and hogget wintering country because they have a higher carrying capacity with good utilization. Then would come the mid-altitude dark blocks, because of their response to topdressing. Lower on the list comes the sunny country, which dries out too much, and the newly developed areas which receive 250kg/ha. followed by 125kg/ha. twelve months later. Because the carrying capacity of these new blocks takes many years to build up and utilization is often

poor when treating them gently, they take a lower priority for a while.

With these priorities in mind, I try to soil test as many of the blocks I think are due for topdressing as is feasible. The accuracy of soil sampling on hill country leaves a lot to be desired possibly because of the variation in soil types, fertility transfer and poor spread. This means that it may be necessary to take a lot of samples before patterns can be ascertained within each class of country. Fortunately, soil testing is cheap but if cost is a consideration, I would sooner apply a tonne less super and spend the money on testing as I feel it is going to be increasingly important to know what is happening to nutrient levels over a period of years under any given topdressing programme. Utilizing the experience of the local MAF adviser and/or fertiliser company representative for interpreting the results makes sense to me. I normally aim to keep the phosphate level in the 12-15 bracket and the sulphur levels in the 5-6 area. PH averages about 5.4 on the hill.

So the final decision on how much and what sort of fertiliser to apply is usually a balancing act between my list of priority areas, the nutrient status of each block, the amount of money available for the job and of course other priorities around the farm, such as more fencing.

When storing fertiliser, I think it's important to keep it dry. Covering it properly can be quite a big job but well worthwhile. Briefing the pilot thoroughly also merits special attention in my book. I feel that if you adopt a "she'll be right" attitude, so will he, so I give him a sketch map showing the blocks to be done, the tonnages on each strip and rates/hectare and make sure he knows I'm prepared to pay for a good job. I like to spend some time each day on the strip throwing the odd stone off it so that he knows I'm interested both in where he's putting my super and in his welfare.

I am, however, disappointed that the fixed-wing aerial topdressing industry has not yet come up with a better system of achieving a more even spread of super both across the swath width and along it. I'm sure we are all familiar with that last minute burst at the end of a run, which, to make matters worse, usually goes over the fence into the neighbour's. That's perhaps the extreme, but even if we aren't anywhere near the top of the phosphate response curve I am sure the unevenness must give rise to a great deal of wastage of an expensive resource. I know there are developments in the pipeline but they will still have to be tested and some sort of cost/benefit study done if there is an increased charge for their use.

I have doubts about the economics of applying phosphate to country over 1200m as the growing period is too short. I'm sure it doesn't pay on my 7E9 country, which is the lower altitude sunny faces where clover plants burn out during the summer, even if you do manage to get them established. But the exact amount of fertiliser to apply on oversown country is more difficult to determine. I have long looked sideways at the

MAF's broadbrush approach to fertiliser recommendations, although I have to admit they don't seem too far away in my situation at least, but I feel there is an urgent need for long term maintenance fertiliser trials under field situations in tussock country to determine more accurately the optimum rates which should be applied. Reducing application rates by 60kg/ha every second or third year has a big affect on the budget, and I feel there are too many outside factors affecting production for me to be able to assess that optimum level accurately.

Stock grazing records will play an increasingly important role in assessing the animal loss factor, in deciding on priority areas and economic benefits of more or less fertiliser. I keep mine on a chart for easy reference. This has two other advantages; one is that it's an excuse to get into the office on a cold day; the other is that if a scientist or adviser calls and wants to know what each block has been carrying for the last five years, when I'm in the middle of shearing I can throw my charts at him to take away, rather than try to sift through half completed diaries. The only thing you have to watch is that they will sometimes stop at the end of the road to have a quick look at them and if you come down, ten minutes later with the skis on top of the car, after telling them how busy you are, you can hardly say you are going snow-raking!

There are several new developments in the industry which are obviously worth keeping an eye on, but in my case don't appear to have many advantages yet. The use of big bags and a helicopter isn't going to reduce my spreading costs because of the high altitude airstrip, and fertiliser recommendations aren't specific enough yet to warrant doing small areas at different rates or types. Triple super to reduce bulk with sulphur added gives no saving in applied cost. Diammonium phosphate plus elemental sulphur works out at about the same cost as 20% sulphur super to fill my requirement but the amount of nitrogen



supplied is probably too small to do any good. Furthermore the mixture has no sulphur in its sulphate form. The use of nitrogen to help get through the September crunch period interests me, but because it seems to be a growth accelerator rather than a growth promoter, its benefit would probably come too late. But I'm sure all those options will have a place somewhere.

Can I farm without phosphate? Short term, yes. The cost saving and bank of fertiliser in the soil would keep me going for a short while but mid and long term, I doubt it. I think overheads are now too high and

margins too low to get by with the greatly reduced stock numbers it would involve. I certainly hope I never have to find out.

So, if I had to sum up how I handle my fertiliser programme, I think I would say my rule of thumb is:

- To establish priority areas.
- To take plenty of soil tests and advice, both with a grain of salt.
- To keep in mind other farm priorities.
- To keep the fertiliser dry.
- Thoroughly brief the pilot.
- Pray for rain.

# Fodder trees — an option for dry hill country

Joan E. Radcliffe\*



Joan E. Radcliffe

Trees and shrubs have been utilised in many parts of the world, from semi-arid and arid regions to the tropics, to provide fodder for livestock. In fact, the number of livestock which live on browse shrubs or small trees throughout the world is greater than the number which live on pasture (IAB 1947).

Trees and shrubs may be the sole food source for livestock, over cold or droughty periods when grasses are dormant or low-producing. They supply protein to supplement the high fibre content of senescent grasses (Stoddard *et al.* 1975). Leguminous shrubs are a source of nitrogen in the same way as are clovers. Also small trees or shrubs provide wind shelter and shade for animals and wind shelter for adjacent pasture; important factors which can increase productivity.

New Zealand farmers, and those in many other temperate countries, have generally ignored the value of browse shrubs or fodder trees. Even farmers in the

Australian State of Victoria, who have just experienced one of the worst droughts in memory, have not yet integrated browse shrubs into their farm operations.

Fodder trees have been used only on an 'ad hoc' basis (S. Margetts, pers. comm.). This management may well change in future years, as the case for browse shrubs becomes documented and proven.

Trees and shrubs eaten by stock in New Zealand were listed as early as 1919 by Cockayne (Cockayne 1919, 1920) and later by Allan (1947). More recently, suggested species (suitable for stock fodder, bees and erosion control) have been listed and discussed by Hill (1975), Davies and Macfarlane (1979) and Sheppard (1979).

In 1980, the MAF began a small scale research programme in Canterbury to evaluate the role of trees and shrubs for stock feed. We started with two genera — *Medicago* (Tree medick) and, *Chamaecytisus* (Tree lucerne), which were expected to grow well in droughty conditions and two genera — *Populus* (Poplar) and *Salix* (willow) suited for wetter situations. Although the work is still in the very early stages, these fodder trees show great promise. Our results are presented now in the hope of stimulating farmer interest, further research, and the development of fodder tree areas which can be fed to stock.

## Plant material

Plant species under current evaluation for production are:

1. Tree lucerne (*Chamaecytisus palmensis*), a leguminous small tree which grows to about 5m, and flowers in winter/early spring.

\*MAF Lincoln

2. Tree medick (*Medicago arborea*), a leguminous shrub which grows to about 1.0–1.5m. Flowering has been observed from September to May, with the main flowering in November and December.

3. Willows (*Salix spp.*), deciduous shrubs or trees generally flowering in early spring. We are testing *S. matsudana*; *S. matsudana* x *alba* clone “Tangoio”; and *S. viminalis* c.v. “Gigantea”.

4. Poplar (*Populus* x *euramericana* — clone ‘Flevo’) — a deciduous tree which flowers in spring.

Tree lucerne and tree medick were planted from container-grown nodulated seedlings, 15–20cm high. Willows and poplars were planted as non-rooted 30cm-lengths of stem.

### Management

Plants received some watering (minimal at Diamond Harbour and Waikari) during the first months of establishment — and the main shoot was nipped off to encourage branching. Thereafter they were handcut and no additional water was applied. Broad-leaved weeds, volunteer grasses and clovers were controlled by hoeing and chemical sprays.

### Trial A. Objective: To compare dry matter production from various species.

Tree lucerne, tree medick, Matsudana

willow and Flevo poplar were planted in August 1980, in rows, 6 plants per row at 50cm spacing. Rows were 2m apart. The 4 central plants per row were harvested from an effective plot area of 4m<sup>2</sup>. All plantings were repeated in August 1981, with the addition of ‘Tangoio’ and ‘Gigantea’ willows.

### Trial B. Objective: To measure the effect of plant density, cutting height and lime on production of tree lucerne.

Plants were established in rows in August 1981. Main plots consisted of a low density treatment; 5 plants per row at 1.5m spacing, trimmed to give a row width of 1.0m, a plot area of 7m<sup>2</sup>, with density of 0.7 plants/m<sup>2</sup>. A high density treatment; a double row of plants, 6 plants per row with internal spacing of 0.5m. Hedgerows are trimmed to give a row width of 1.0m, a plot area of 3.5m<sup>2</sup> with density of 3.4 plants/m<sup>2</sup>.

Any accurate estimate of plot area in a hedgerow situation is subjective.

Subplots consisted of cutting height treatments of 0.5m and 1.5m above ground.

Lime at 2.5t/ha was broadcast in October 1982, on half the main plots.

Details of sites are given in Table 1.

**Table 1: Site details**

Trial	Location	Altitude m.a.s.l.	Exposure	Rainfall (mm)			Name	Soil	
				1980	1981	1982		pH	Mineral fertility
A,B	Diamond Harbour Banks Peninsula	260	full NE.NW	na.	677	776	Takahe silt loam	A 5.3) ) B 5.6)	low-medium
A	Waikari North Canterbury	500	full NW	584	365	363	Tipapa hill	5.1	high
A	Adair South Canterbury	85	Sheltered	694	600	458	Claremont silt loam	6.2	medium-high

na. — not available

## Results

### Fodder tree comparisons (Trial A)

Tree lucerne produced substantially more leaf and total shoot dry matter than did tree medick, 'Flevo' poplar or the willows, when all species were subjected to a similar cutting regime at Waikari, Diamond Harbour and Adair (Tables 2, 3).

At Adair, however, tree lucerne did not survive the winter following severe cutting in autumn, probably because of frosting

and wet soils. Subsequent plantings of tree lucerne were trimmed to a hedgerow 1.5m high, while all other species continued to be cut at 30cm above ground. Under this management tree lucerne produced substantially more forage than either tree medick, willows or 'Flevo' poplar (Table 3). Current work at Adair suggests that willows and poplars become much more productive after 2 to 3 seasons of cutting when a good root system has developed (C.

**Table 2: Fodder species yields (t DM/ha) from Waikari and Diamond Harbour hill sites**

	Waikari			Diamond Harbour		
	leaf	stem	Total	leaf	stem	Total
Tree lucerne	5.1	6.6	11.7	12.7	24.4	37.1
Tree medick	0.8	0.8	1.6	3.7	5.3	9.0
'Flevo' poplar	0.6	0.4	1.0	3.3	6.4	9.7
'Matsudana' willow	0.1	0.2	0.3	1.9	3.9	5.8
'Gigantea' willow	0.1	0.4	0.5	1.1	2.1	3.2
'Tangoio' willow	0.3	0.7	1.0	2.9	4.3	7.2

(1) Mean of yields from (a) Plantings in August 1980 and cut in May 1981 to 15cm, May 1982 to 30cm, and February 1983 to 30cm and (b) Plantings in August 1981 and cut only in February 1983 to 30cm.

**Table 3: Fodder species yields (t DM/ha) from Adair, South Canterbury**

Planted Sept. 1980	Cut May 1981 to 30cm			Cut May 1982 to 30cm					
	leaf	stem	Total	leaf	stem	Total			
Tree lucerne	2.60	4.39	6.99			Plants dried			
Tree medick	1.34	1.47	2.81			Plants dried			
Flevo poplar	.15	.72	.57	.71	3.45	4.16			
Matsudana willow	.16	.42	.88	1.57	4.33	5.90			
Planted Aug. 1981 <sup>1</sup>	Cut Jan. 1983			Cut Feb. 1983			Cut March 1983		
	leaf	stem	Total	leaf	stem	Total	leaf	stem	Total
Tree lucerne	2.03	1.70	3.73	2.44	2.72	5.16	2.99	3.11	6.10
Tree medick	.13		.13	.66		.66	.22		.22
Flevo poplar	.58	.25	.83	.81	.64	1.45	.90	.76	1.66
Matsudana willow	.28		.28	.41	.65	1.06	.30	.40	.70
Gigantea willow	.6	.65	1.25	.76	1.84	2.60	.37	1.26	1.63
Tangoio willow	.69	.66	1.35	1.03	1.37	2.40	.70	1.62	2.32

<sup>1</sup> Uncut from Aug. 1981 to Jan., Feb. or March 1983  
Tree lucerne cut to a hedgerow 1.5m high × 1.0m wide.  
All other species cut to 30cm above ground.

**Table 3: Fodder tree yields (t DM/ha) from Adair, South Canterbury**

Species planted in Oct. 1981, cut in Oct. 1982 to 30cm for all species except tree lucerne which was cut to hedgerows, 1.0m high  $\times$  0.75m wide. Regrowth from Oct. 1982 to March 1983 presented.

	Plant Sep. 1980 cut May 1981 and May 1982			Planted Aug. 1981 cut Feb 1983		
	mean 2 years			growth 1.5 year		
	leaf	stem	Total	leaf	stem	Total
Tree lucerne	2.6	4.4	7.0 <sup>1</sup>	2.4	2.7	5.1 <sup>2</sup>
Tree medick	1.3	1.5	2.8 <sup>1</sup>	0.7	0	0.7
'Flevo' poplar	0.2	0.7	0.9	0.8	0.6	1.4
'Matsudana' willow	0.2	0.4	0.6	0.4	0.7	1.1
'Gigantea' willow				0.8	1.8	2.6
'Tangoio' willow				1.0	1.4	2.4

(1) 1 year yields only.

(2) Cut to hedgerows 1.5m high  $\times$  1.0cm wide.

Other species cut in February 1983 to 30 cm above ground.

C. McLeod, pers. comm.), so subsequent relative performances of tree lucerne, willows and poplars will be awaited with interest.

Tree medick, 'Flevo' poplar and 'Tangoio' willow gave similar quantities of forage at Diamond Harbour. Tree medick sprouted some 10–20cm of new growth over the winter/early spring period when other species were dormant, but it performed poorly at Adair (Table 3).

#### Tree lucerne

##### Forage production

Two and three-year old stands of tree lucerne have produced large quantities of

fodder (relative to other species) at all sites. The most productive site, at Diamond Harbour, has produced over 12t DM/ha of grean leafy material (Table 2). It is too soon to assess management, but the Diamond Harbour data suggest that in the first 2–3 years nothing is lost by two annual cuts to 30cm above ground, compared with uncut accumulated growth (Fig. 1). Similar results were obtained from Waikari (data not presented).

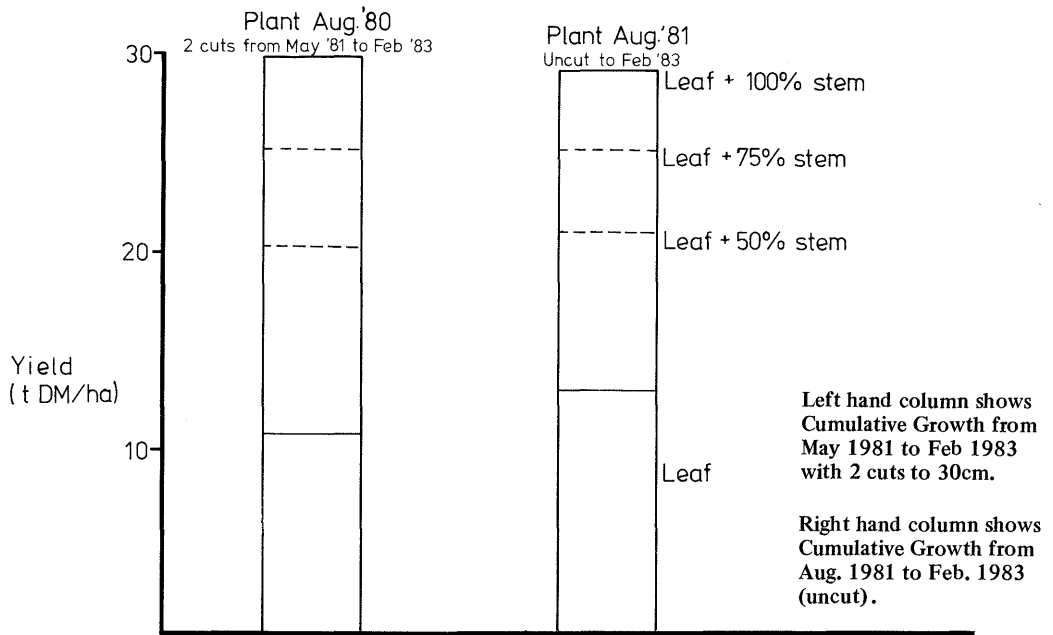
All leaf material and at least half of the stem material from the harvests at Diamond Harbour would probably have been eaten by livestock (based on observations elsewhere). Therefore production

**Table 4: Effect of plant density and cutting height on the tree lucerne at Diamond Harbour**

Planted in Aug. 1981. Cut to treatment heights on 22 Sept. 1982. Regrowth from 22 Sept. 1982 to 22 Feb. 1983 presented.

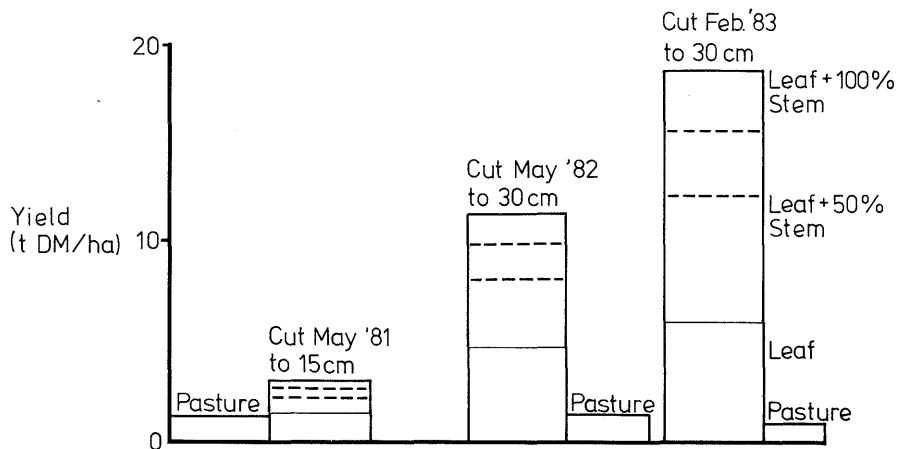
Density	Cutting height (m)	D.M. yield (t DM/ha)		
		leaf	stem	Total
low	0.5	4.65	2.57	7.22
low	1.5	2.45	1.65	4.10
high	0.5	7.47	5.33	12.80
high	1.5	4.74	4.78	9.52

**Figure 1: Tree lucerne growth at Diamond Harbour**



**Figure 2: Tree lucerne growth at Diamond Harbour**

Green leaf and stem components at three harvest dates. Plants established August 1980 and cut to 15cm at first harvest, and 30cm subsequently.



values which include 50%, 75% or even 100% of stem are considered realistic. Forage became much stemmier in regrowth from May 1982 to February 1983 as basal shoots became bigger (Fig. 2).

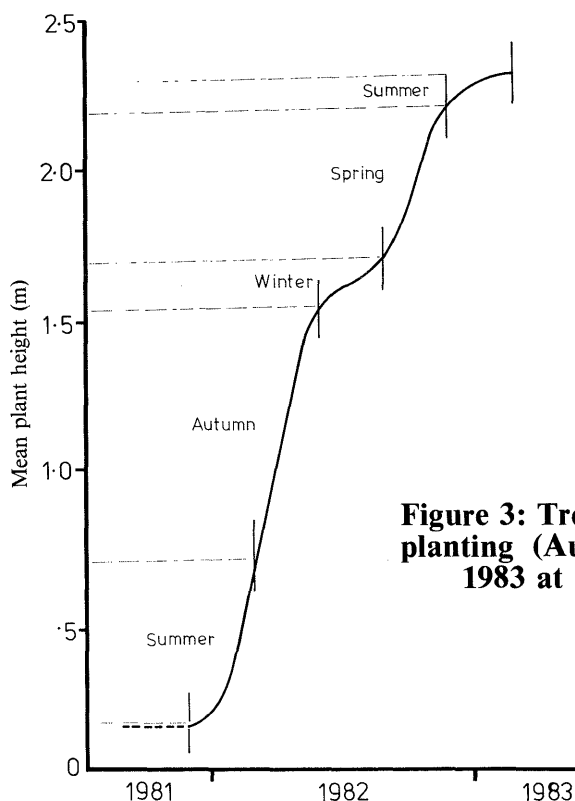
### Seasonal growth

Mean plant heights are an approximate guide to the seasonal pattern of growth. Figure 3 shows that plants left uncut from establishment for an 18-month period, have high growth rates over the first summer and autumn (about 0.9m at Waikari and 1.5m at Diamond Harbour), a slower growth rate over winter and more rapid growth again in spring. The tallest 18-month-old plants at Diamond Harbour were 3.3m. Similar height measurements of growth rates between harvests (Fig. 4) show

that summer growth at Diamond Harbour was better from severely defoliated plants than from uncut plants.

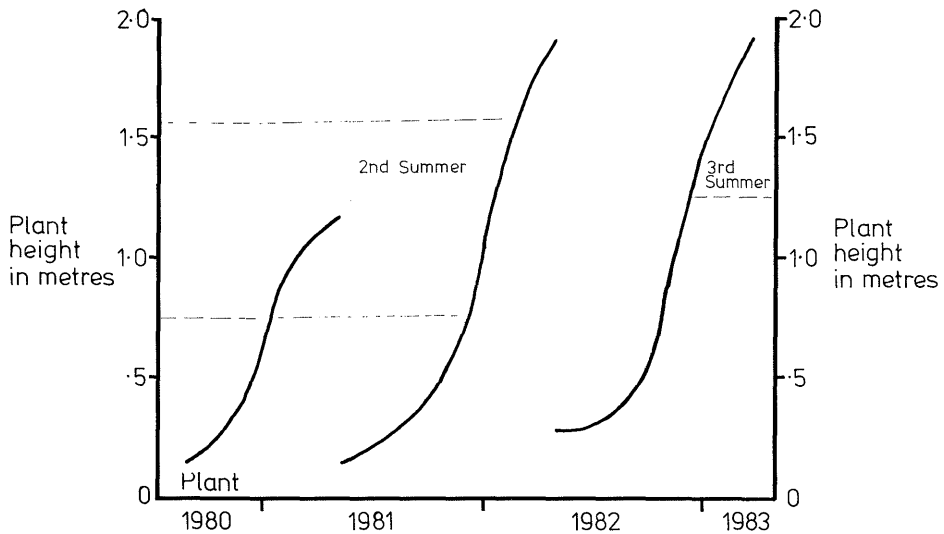
### Effect of plant density, cutting height and lime (Trial B).

The first harvest shows that a high plant density produced significantly more leaf, stem, and total DM than a lower plant density (Table 4). Also a cutting height of 0.5m produced significantly more leaf and more total DM than a taller cutting height of 1.5m. The most productive areas were the dense hedgerows cut to 0.5m although there was no significant density x cutting height interaction. There was no lime response, and no significant interactions involving lime.



**Figure 3: Tree lucerne growth from planting (August 1981) until Feb. 1983 at Diamond Harbour**

**Figure 4: Tree lucerne growth, from planting, and after defoliation in May 1981 and May 1982, at Diamond Harbour**



### Discussion

On all sites under dry conditions, tree lucerne has produced substantially more dry matter than pastures. (Compare Tables 2 and 3 with Table 1.) Other fodder species have also shown promise. All these production however, has been obtained from comparatively few harvests and it could be argued that the trials are only now becoming well established and that production patterns may change over time.

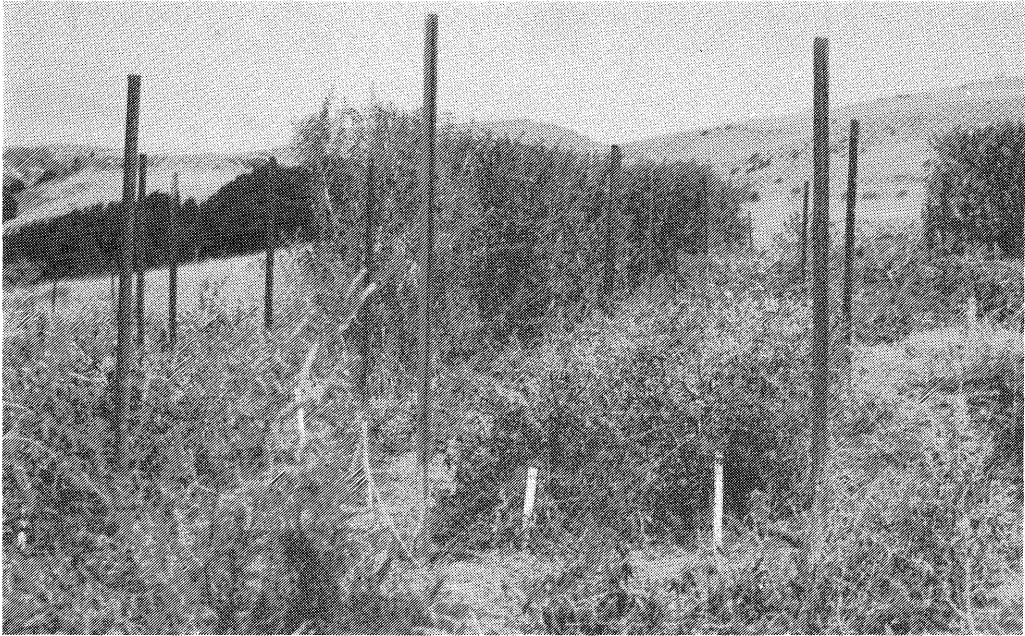
We need to know a great deal more about all aspects of fodder trees before firm recommendations can be made for their use in a farming situation. One of the most important avenues for study is the way in which they can best be utilised by livestock.

We began this programme by a simple evaluation through cutting and weighing forage. This was the easiest way to start, and 'cut-and-carry' or 'lop and leave' systems may be the most appropriate way to utilise this feed in many farm situations. If so, we need to know how plant densities, time and height of cuts etc. affect production.

In other situations, it will be most appropriate for stock to eat the trees. This is successfully done in Australia (Snook, 1952, 1961; D. J. Davies, pers. comm.), Italy (R. Clark, pers. comm.) and elsewhere. Again, the timing and the severity of the grazings need to be studied for local conditions. It is likely that different managements will suit different fodder species and ultimately, each should be evaluated under a management which optimises animal production while maintaining plant growth.

No digestibility data have been presented in this paper as they are not yet available, but there is published evidence that all the species under test are palatable and contain high protein levels. Tree lucerne is receiving increasing attention in Canterbury and digestibility studies carried out by D. P. Poppi, Lincoln College, show that the leaves of tree lucerne compare favourably to rygrass\* white clover pastures, while stems are equivalent to the lucerne and meadow hays normally used for stock maintenance (D. P. Poppi, pers. comm.).





**Tree Lucerne, Diamond Harbour, cut to 0.5m and 1.5m**

Cost effective ways of establishing fodder tree areas clearly need evaluation. Pole is planting an accepted method of establishing willows and poplars. Other species can be direct drilled, broadcast or hand-planted as seedlings, but cultural treatments, herbicide tolerances and best agronomic practices are largely unknown.

### Conclusions

1. High levels of dry matter have been grown in Canterbury under very dry conditions, using palatable, woody, perennial shrubs or trees.

2. The most promising plant tested to date is the leguminous tree lucerne. Averaged over three dryland sites it has produced nearly 7 tonnes of green leaf DM/ha and 18 tonnes total DM/ha after cutting to 30cm above ground.

3. Much more work is required to fully evaluate these productive 'fodder trees' within farm management systems.

### Acknowledgements

Mr D. J. Davies for encouragement — and DSIR and MWD for plant material, farmers P. Lamb, G. K. Faigan for trial sites, and C. C. McLeod, MAF for Adair data, and R. T. Alexander MAF for technical assistance.

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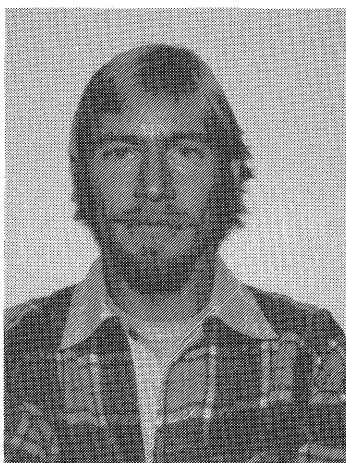
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# Forage plants for the semi-arid high country and rangelands of New Zealand

B. J. Wills\*



B. J. Wills

## Summary

The use of *Sanguisorba minor*, *Melilotus alba*, *M. officinalis*, *Dorycnium hirsutum* and *D. pentaphyllum* is discussed in relation to their use for revegetation in the high country and rangeland areas, and their potential for forage in depleted tussock grasslands.

*Sanguisorba* trials under way include the testing of accessions and sub-species of *S. minor* and methods of establishment. Autumn has been found to be the best time for sowing and the use of a suitable nurse crop helps provide a favourable micro-climate for the young plants.

Varieties of *Melilotus alba* and *M. officinalis* with low coumarin levels have been tested in high country trials. Both species are palatable and are useful as nurse

crops for *S. minor* but do not persist well except on shaded slopes.

*Dorycnium* accessions have been found to be very drought and frost tolerant. They vary in palatability and can withstand hard grazing once they are well established.

These plants have been selected primarily for soil conservation purposes in semi-arid or drought prone areas but could also provide valuable forage in the high country. Careful management is necessary to ensure good establishment and survival. All three genera also have potential as useful forage plants in higher rainfall areas and on cropping land.

## Introduction

Revegetation in the hill and high country has been researched on a broad basis since the late 1800s, as a result of which a number of plant species have been introduced into that environment. Some of the earlier work by Douglas (1974), MacPherson (1913), McGillivray (1929) and Tennent (1935) is considered, and a review of more recent revegetation policies and programmes is given by O'Connor (1980).

Until recently few of the many plant species researched found widespread use. The main cause for this would appear to have been the good productivity of a few species (clover, lucerne, cocksfoot and ryegrass) under high fertiliser regimes. Recommendations for use of these species cover a wide range from intensive lowland agriculture (where they are well suited) to extensive high country run situations where their use could be considered marginal (Dunbar, 1970; Musgrave, 1976; Nordmeyer and Davis, 1976; O'Connor,

\*Ministry of Works and Development  
Alexandra

1966; Ritchie, 1978; Scott *et al*, 1976) without due consideration for management and fertiliser applications.

Future requirements for the high country must include lower fertiliser applications and more intensive management for the rejuvenation of tussock grasslands, particularly in the semi-arid areas, together with a wider range of plant species better adapted, although not necessarily more productive, in this situation. Each of the species considered in this paper has the potential to help in this role, at least in part.

### 1. *Sanguisorba minor*

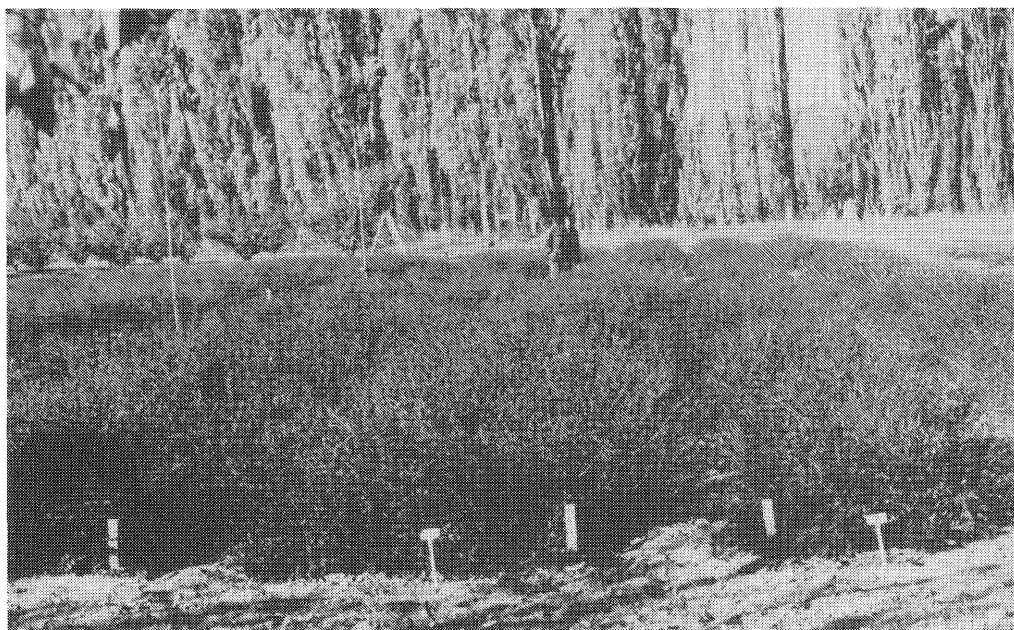
As early as 1912–20 this plant, commonly known as Sheeps burnet, was considered by Cockayne and MacPherson to have good potential for revegetation. Naturalised areas of burnet can still be found on Earnscleugh Station (Alexandra), Northburn Station (Cromwell), Jolly Road (Tarras) and the Tekapo River basin. These probably originated from the early trials of Cockayne and MacPherson.

A range of accessions and subspecies of *S. minor* have been evaluated by the National Plant Materials Centre (Ministry of Works and Development) since 1976 because the persistence of burnet shown in the early trials indicated that the species had value for revegetating depleted and eroding semi-arid soils.

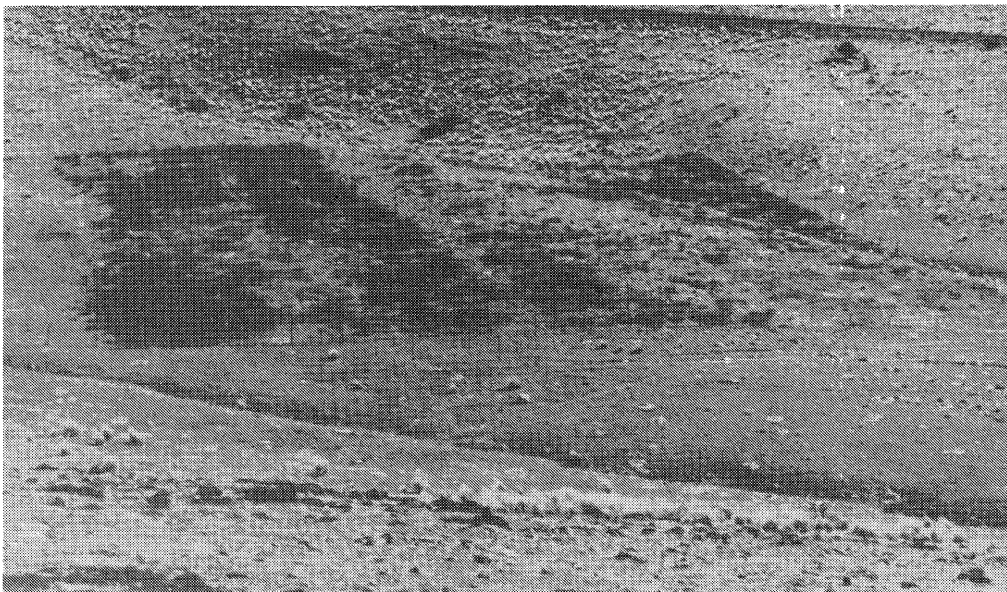
Accessions introduced from the Western Mediterranean and N.W. USA (of Spanish origin) were found to be suited to New Zealand conditions and the majority of these are *S. minor*, subspecies *muricata*. Because of commercial availability, most bulk seed introduced to New Zealand in recent years has come from Oregon (USA) and is the basis of local seed crops.

More extensive trials were set up during 1979 at Black Forest and Otematata Stations in the Mackenzie Basin. Although these trials are ongoing, some preliminary results can be discussed here.

Trial oversowing was carried out on sunny and dark aspects at both sites. The seed mix included;



**Figure 1: Variety trial, Alexandra.**



**Figure 2: Field trial, Omarama.**

*Sanguisorba minor* 10 kg/ha  
*Hedysarum coronarium* 15 kg/ha  
*Lotus pedunculatus* 'Maku' 4 kg/ha  
*Lotus tenuis* 4 kg/ha  
*Melilotus officinalis* 'Yukon' 10 kg/ha

Fertiliser: 400 sulphur superphosphate was applied at 300 kg/ha.

Each enclosure was subdivided into 0.25 ha Time of Sowing sections sown as follows — April, August, September 1979, and April, August 1980.

At Black Forest Station the seedlings failed to compete with the vigorous growth of haresfoot trefoil (*Trifolium arvense*) following oversowing with sulphur super, and the following results refer only to the trial at Otematata Station.

The establishment of the oversown species at Otematata Station for the 1979 sowings was assessed in November 1980, by counting mature plants in  $10 \times 1\text{m}^2$  plots, and the results are given in Table 1.

**Table 1: Establishment (plants/m<sup>2</sup>) of species oversown at Otematata Station on sunny and dark aspects at three times of sowing, assessed November 1980.**

Time of Sowing (1979)	Aspect:	April		August		September	
		Sunny	Dark	Sunny	Dark	Sunny	Dark
Oversown Species							
Lotus ‘Maku’		4*	4	1	6	1	15
Lotus tenuis		26	11	6	6	2	10
Melilotus ‘Yukon’		23	11	8	4	11	14
Sanguisorba minor		15	6	4	3	0	1
Hedysarum coronarium		0	0	0	0	0	0

\*Plants/m<sup>2</sup> mean of  $10 \times 1\text{m}^2$  plots/trial area

The percentage groundcover of the over-sown species, assessed in autumn 1982 using line transects, is given in Table 2.

Three species, *Lotus tenuis*, *Melilotus officinalis* 'Yukon' and *Sanguisorba minor* have contributed significantly to the vegetative cover at this site particularly on the sunny face, especially from autumn (April) sowings, 'Yukon', being biennial, provides significant early groundcover (see Table 1), with lotus and burnet increasing the groundcover in the longer term (Table 2). Difficulties in establishing plants onto depleted sunny faces such as those at Otematata have been overcome using several strategies:

1. Autumn sowing. While possibly detrimental to some of the leguminous species, this and other trials indicate that autumn is the best time of sowing for burnet, in this case late autumn. Seed must be placed in the ground either well before winter frost-heave so allowing substantial seedling development, or after soil temperatures have cooled sufficiently to prevent germination. In the latter case, frost-heave may provide a form of minimum tillage, helping to bury the large burnet seed. On dark aspects, spring over-sowing of burnet is recommended

2. Sheep trampling. Stock are used both to reduce competitive vegetation and to incorporate seed into the topsoil layer where germination is best effected. In many situations, such minimum tillage methods are

feasible over large areas of tussock grassland and burnet may be easily introduced in this manner.

3. Exclusion of stock for extended periods during plant establishment. High solar radiation inputs and high wind runs combine to produce high potential evapotranspiration rates on sunny aspects and create severe restrictions to the establishment of plants, especially in low rainfall areas (Radcliffe & Lefever, 1981). To facilitate establishment in such areas, longer than normal periods of stock exclusion are required. Present recommendations for semi-arid sunny aspects are that oversown blocks should be spelled for a minimum of 18 months after the initial trampling by stock then a gradual increase in stocking rates over the following 24 months. This may be modified to suit differing soil, aspect and climate conditions at establishment.

4. Nurse crops: 'Yukon' sweetclover was used in this seed mix as a nurse crop to encourage establishment of the slower growing plant species. While it is considered that this was successful in the above trial, two modifications are noted.

- A. Application of sweet clover seed at a lower rate (3-5kg/ha instead of 10kg/ha) to prevent excessive competition for light while retaining necessary wind protection and a good litter layer.

**Table 2: Percentage ground cover of species oversown at Otematata Station on sunny and dark aspects at five times of sowing, assessed autumn 1982.**

Time of Sowing	Apr. '79		Aug. '79		Sept. '79		Apr. '80		Aug. '80	
Aspect:	S	D	S	D	S	D	S	D	S	D
Oversown Species	% Ground Cover									
Lotus 'Maku'	0	3	2	3	0	4	0	0	0	0
Lotus tenuis	13	1	13	7	1	6	6	2	0	5
Melilotus 'Yukon'	0	1	2	1	4	5	0	0	0	1
Sanguisorba minor	27	8	3	5	1	5	6	0	0	4
Hedysarum coronarium	1	0	0	0	0	0	0	0	0	0

B. Application of sweet clover seed one season before the main oversowing is carried out, thus taking advantage of the shelter provided by the sweet clover flowering in its second season.

While there may be some competition for moisture at root level, it has been shown in similar drought prone rangelands of Utah that shading can increase plant moisture content by 78% in grasses, 89% in forbs and 28% in shrubs (Sharif, 1968). Provided shading is only minimal at ground level the provision of a nurse crop may be very beneficial, particularly where vegetation is depleted to the extent that microclimate effects are lost.

5. Rotational Grazing. Trial work by the Ministry of Agriculture and Fisheries and the Department of Scientific and Industrial Research indicates the need for a greater degree of flexibility in high country tussock grassland management and the part that rotational grazing can play. It is considered that *Sanguisorba* will also benefit from such management, with short period mob stocking followed by long recovery periods. This may be taken to the extreme with pure crop stands of burnet in which grazing would only occur in late winter (before lucerne flushes) and autumn.

Present studies with burnet include investigation of the annual growth cycle. They indicate that growth continues throughout the year, but with early spring and autumn peaks. Fertiliser requirements, apparently low, need further research, as do nutritional aspects of the plant and selection of suitable companion plants. Comparison of currently used accessions with newly released burnet varieties such as 'Delar' (USA) and selection of vigorous plants from within existing New Zealand populations is also required.

## 2. *Melilotus* Species

*Melilotus alba* and *M. officinalis*, commonly known as sweet clovers, are often found as weeds throughout Central Otago

and other dry areas. They are leguminous, biennial plants and, as a result of breeding programmes, several low coumarin varieties are now available overseas.

As mentioned in the previous section, their use for high country oversowing will be most important in a nurse crop role. Combined with slower establishing, but deeper rooting plants, little soil moisture competition should occur, but the benefits of shade and litter will be valuable.

Correct inoculation is required and spring oversowing is recommended, if possible one season before the main oversowing is completed. Extensive trials to date have utilised *M. officinalis* 'Yukon' which has proved satisfactory in terms of growth and palatability. The varieties 'Polara' (*M. alba*) and 'Norgold' (*M. officinalis*) also appear promising in nursery trials and have been especially bred for low coumarin levels (Goplen, 1981; Hall and Cook, 1974).

'Polara' in particular seems very drought tolerant but persistence of sweet clovers in the high country appears restricted to dark aspects. Recent frost trials with several legume species have indicated that, of the sweetclovers, 'Yukon' is least affected and 'Polara' most affected by early autumn frosting. 'Norgold' was moderately affected. Forage yields, indicated by Goplen (1981) are highest in 'Yukon', 6% lower in 'Norgold' and substantially lower in 'Polara'. Yield figures for 'Yukon' over a three year period in Canada exceeded 6000kg/DM/ha/year (Goplen, 1981).

## 3. *Dorycnium* Species

*Dorycnium hirsutum*, is a hairy, leguminous mediterranean sub-shrub that can grow to 0.5m and exhibits a wide phenotypic range.

More extensive trials are to be initiated with this promising Mediterranean plant which has proved to be extremely drought and frost tolerant in Otago and the Mackenzie. Two other promising species are also being investigated, in particular the prostrate and very palatable *D. pentaphyllum*.



Field trials have indicated that, while growing as perennial, *Dorycnium* often becomes over-mature and whole plants may die off after flowering if left under lax grazing management. Under grazing, *Dorycnium* accessions exhibit a wide range of palatability, the less hirsute types being most palatable. Even the least palatable accessions have been grazed under extreme summer drought conditions. Growth begins in early spring, with flowering occurring in early summer and, while seed set in the field has been low, the prolific numbers of flowers have allowed for good seedling development around parent plants.

A specific *Rhizobium* inoculum (identical to that for inoculating *Lotus corniculatus*) is available for *Dorycnium*, although field trials indicate satisfactory growth of seedlings at considerable distances from inoculum sources. Establishment from seed is slow, therefore a period of two summer seasons is recommended before grazing is commenced. *Dorycnium* will also benefit from the use of sulphur superphosphate (200 S. Super @ 200kg/ha) in most high country soils. Seed should be scarified and coated before over-sowing.

*Dorycnium* can withstand hard grazing once established and may be a good companion plant for burnet in seasonally drought prone areas. There are also possibilities for its use in the control of weedy species such as thyme or *Vittadinia*.

Like burnet, *Dorycnium* will grow all year round, rather than having seasonal peak production like lucerne, and must therefore be managed accordingly. Its place as a forage plant will probably be in autumn/spring when other feed is at a premium.

### Conclusions:

*Sanguisorba*, *Melilotus* and *Dorycnium* all help to provide protection against erosion and they may also have an important role in the production of forage for hill and high country, especially that which is

drought prone. While primarily selected for soil conservation purposes in semi-arid areas they may also be important in higher rainfall areas and cropping land because of their growth characteristics and multiple forage uses. All may be used as specialist bee crops, for instance, or for standing stock feed during early spring or mid summer when little else is available.

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# The management and profitability of a prolific flock

A. H. Ensor\*



A. H. Ensor

To fully appreciate the management decisions made in the last three years at Glenariffe, it is necessary to understand some physical aspects of the property, the carrying capacity, stock performance and management policies.

Glenariffe is situated on the south bank of the Rakaia River, inland from Mount Hutt. Rainfall is 900 mm, the altitude ranges from 450 m to 1250 m, and the majority of the property has a northerly aspect.

The original 11,000 ha run was divided into two farms in 1978. I farm 800 hectares, the remainder is either retired from sheep grazing or farmed by my brother Hamish at Glenaan. The present management system was developed while converting part of the run into a farm over the two years following the 1978 division. Most paddocks and blocks were divided two or three times, cattle and wethers sold, and the ewe flock doubled from 2000 to 4000.

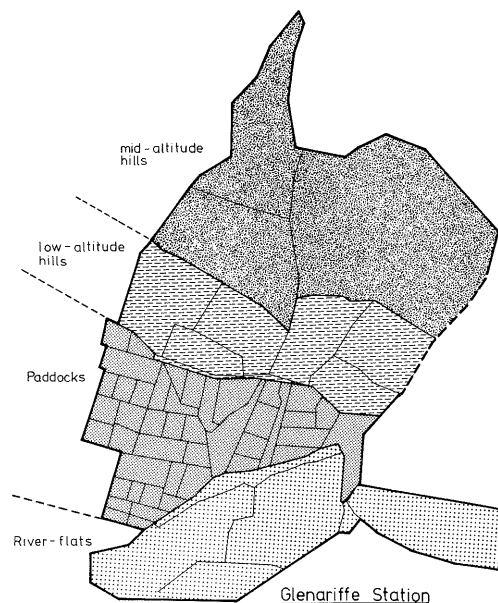
\* Glenariffe, Rakaia Gorge, Canterbury.

In 1980 this meant a simple one flock system with 5000 stock units.

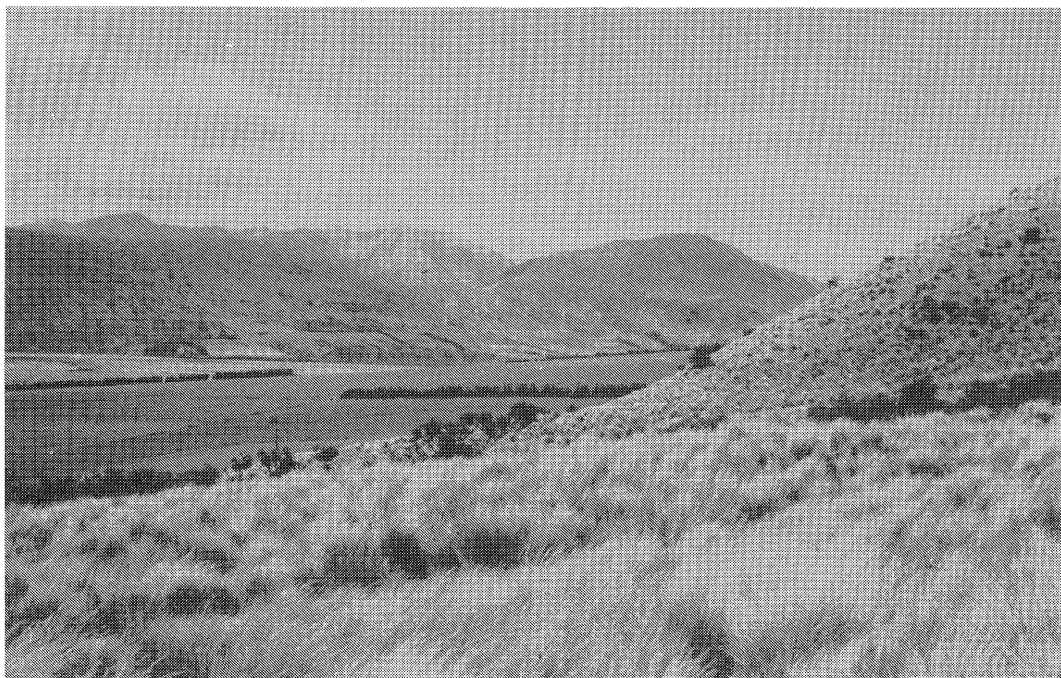
For management purposes the property divides into four land classes:

- (1) 300 ha mid-altitude hill country 800 m to 1300 m.
- (2) 150 ha low-altitude hill country 500 m to 800 m.
- (3) 150 ha cultivated paddocks 500 m to 600 m.
- (4) 200 ha river flats.

The mid-altitude country, which contains both some westerly and easterly facing country, is being developed primarily for summer feed. Low rates of high quality fertiliser, in conjunction with grazing management, are being used in an endeavour to grow high quality feed rather than bulk.



Pattern of subdivision



**River flats and low altitude country on Glenariffe**

Management of the low-altitude hill country is vital as this is the most important area of the property. The aim on this warm sunny country is to provide the maximum amount of high quality lambing feed as early as possible in the spring. The area has excellent tussock cover and following intensive grazing in June is closed for lambing in mid-September. At the end of July a mixture of D.A.P. (Di-ammonium Phosphate) and elemental sulphur is applied by air to provide phosphate equivalent to that in 185kg superphosphate. At lambing these blocks are set stocked for three weeks at 20 ewes or more per hectare.

The 150 hectares of paddocks gives the property a large degree of managerial flexibility, providing areas for:

- (1) Winter feed crops.
- (2) Hogget wintering on high quality grass, with a rotational grazing system.
- (3) Lamb fattening.

My involvement in a machinery syndicate provides efficient mechanical inputs with skilled labour where required.

The river flat which varies from stones to swamp is of limited use due to a short growing season, but the area does provide very valuable summer/autumn feed.

### **Stock increases**

In 1980 with a developed area of 500 ha, the property carried 5000 stock units producing 4.2 kg wool per head, with 95% lambing. I considered at that time that the two important factors limiting production were phosphate inputs and management. I saw several ways of increasing profitability. Had I kept the stocking rate at the 1980 figure the 1983 financial position would have been as shown in Figure 1 (column 1). The decision to increase the stocking rate (Figure 1 col. 3) rather than hope for increased performance (Figure 1 col. 2) was based on my objective of carrying the maximum stocking rate, with the highest reproductive potential, to make the

best use of the spring feed surplus. The reduction in fixed costs per unit carried and the potential profits (Figure 1) were the major incentives to increase stocking rates.

From 1980 to 1983 the only significant inputs were more ewes, a change in fertilizer policy and a general refinement of management policy and skills. I believe that the current stocking rate of 6210 stock units is approaching the point where the summer dry period will limit any major increase in the future. So from now on, stock performance will be the most important factor contributing to increased production.



**Mid-altitude country**

**Table 1: Stock carried 1983**

Ewes	5300
Ewe hoggets	1000
Ram hoggets	200
Others	100
<hr/>	
Total sheep	6600
<hr/>	
Stock Units	6210

#### **Stock performance options:**

Three options were available. Increase wool weight per head, produce heavier lambs or increase the number of lambs per ewe. The financial incentive to increase lambing percentage was obvious. This could be done in one of two ways:

- (1) Feed the ewe flock to achieve a 60 kg liveweight at tupping. I am convinced this is impractical in our environment.
- (2) Use the Booroola gene.

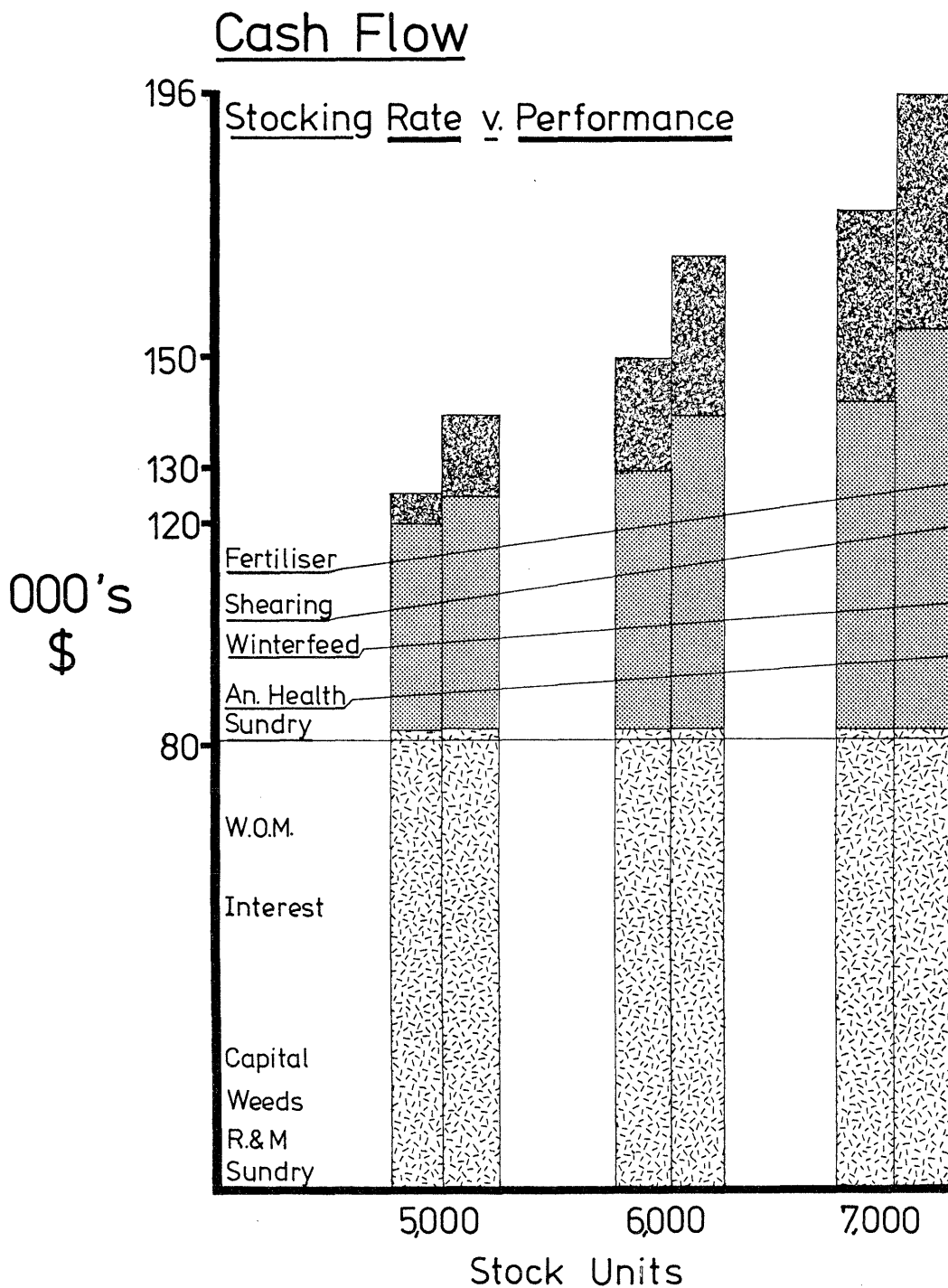
#### **Ewe performance**

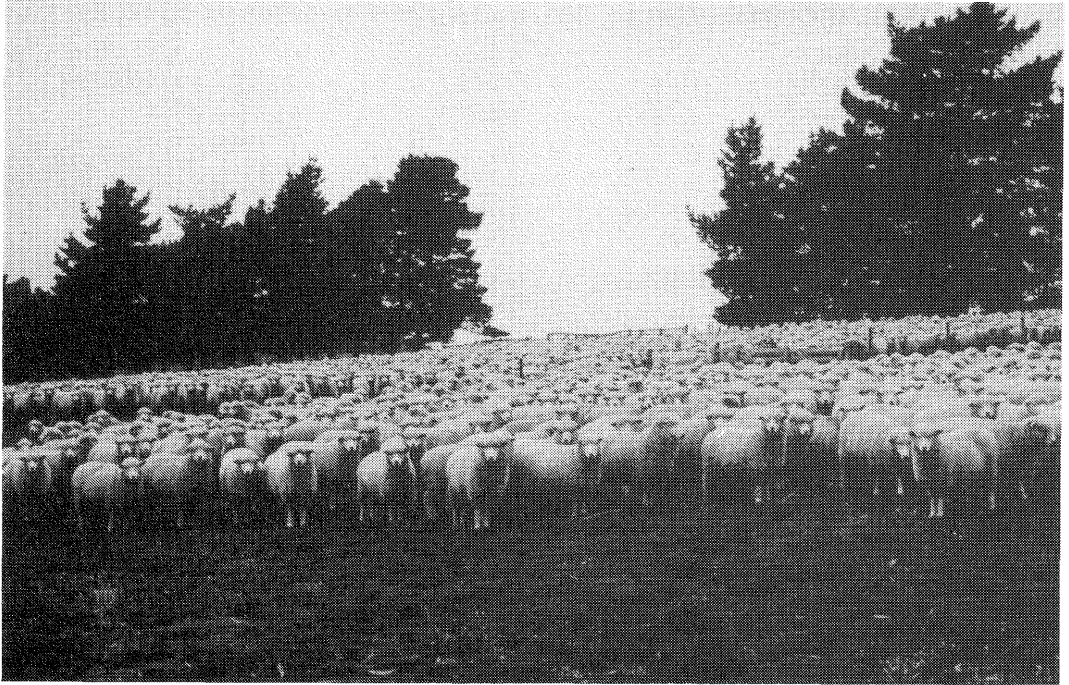
It is my belief that given adequate management a twin-rearing ewe at Glenariffe is always the most profitable sheep on the property (Table 2). With a 100 percent lambing, about 20 percent of ewes are having twins. As we have to feed **all** ewes at a similar level of nutrition in late pregnancy, we thought it desirable and efficient to have as many ewes as possible bearing twins. Some triplets are acceptable to achieve this. The additional feed requirements of lactating ewes and early lamb growth matches the surplus feed supply of October, November and December.

**Table 2: Options for Glenariffe with 6000 Stock Units**

	Income
Increase wool production (+ 0.5 kg/s.u)	\$9000
or	or
Increase lamb weights (+ 2 kg meat/head)	\$8000
or	or
Increase lambing percentage (+ 20% lambing)	\$15000

**Figure 1: Profitability levels at varying stocking rates and levels of production.**





**Three-quarter bred Corriedale ewes**

The Booroola gene has given me the means to achieve significant increases in lambing percentages. The method used to incorporate the gene into a Corriedale type sheep is shown in Figure 2. So far increases in lambing percentage of 30 percent are easily achieved with groups of ewes carrying the gene. They are managed with no extra effort and are profitable.

It must be remembered that the Booroola gene has a specific effect on what

controls the function of a ewe's ovary, and that the Merino component of the original sheep can be treated as a separate part of the desired sheep to suit a particular farm requirement. The specific nature of the Booroola gene and the resulting increases in lambing percentage allows increased selection pressure to be applied to other highly heritable traits, such as wool characteristics, wool weight and growth rates. Higher lambing percentages allow

**Figure 2: Breeding programme**

Booroola Merino	×	Corriedale	►	1/2 Corriedale
FF		++		F+
1/2 Corriedale	×	Corriedale	►	3/4 Corriedale
F+		++		50% F+
				50% ++
3/4 Corriedale	×	3/4 Corriedale	=	3/4 Corriedale
				25% FF
				50% F+
				25% ++



**Table 3: Financial return from a 50 kg ewe weaning at 10 weeks**

Ewe	Weaning weight per lamb	Lamb return 60c kg L.W.	Wool return (Kg/ewe)	Wool return @ \$3 kg	Total return per ewe
Dry	0	0	5.3	15.9	15.9
Single	24	\$14.4	4.5	13.5	27.9
Twin	20	\$24	4.2	12.6	36.6
Triplet	16	\$28.8	4.0	12.0	40.8

for the greater use of terminal fat lamb sires for increased growth rates and lamb survival in their progeny, and increased spring stocking rates.

### Management requirements

Having developed a breeding programme I found the following management considerations important:

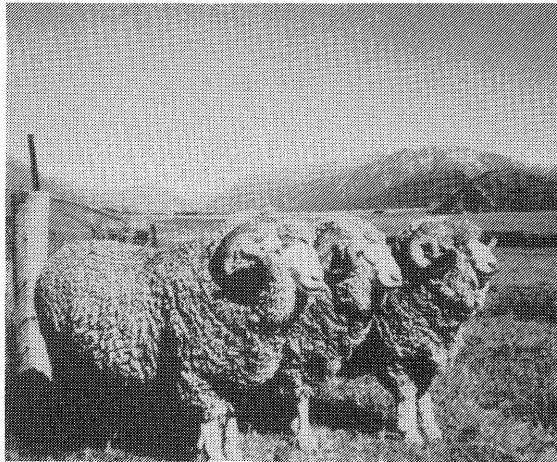
- (1) Fertiliser, the most expensive input, must be used strategically on different land classes to provide feed quality as well as quantity. Nitrogen does have a place in conjunction with phosphate for development and helping fill the gaps in feed supply. I consider the use of nitrogen in autumn a very high risk expense.
- (2) Winter crop is used to supply a large bulk of high quality feed during late pregnancy and allows the rest of the farm, apart from the hogget area, to be closed for lambing feed. The Chou crop currently supplies 200,000 grazing days for the ewe flock in August and September, and without it, it would be impossible to carry the current stocking rate.
- (3) Lambing starts in mid-September, which is very early for the district. Lambing date is important as it affects all the grazing management decisions for the following three months, and determines the condition of both stock and pastures prior to the summer dry

period. After lambing the ewes are set stocked for three weeks on the best pasture we can provide on the low-altitude sunny tussock blocks.

- (4) As the ewes' contribution to the lamb is finished at 8-10 weeks, I wean in early December instead of the more traditional late January. This move has probably had the biggest single management effect at Glenariffe and allows:
  - (a) the lambs to go on the best quality feed in the paddocks in December;
  - (b) the ewes to be rotated in one mob for pasture control;
  - (c) recovery of ewe live-weights before the dry period.
  - (d) a more flexible stock sale policy.
- (5) Sheep scales — the monitoring of live-weights has been both a shock and a spur to many changes in management.
  - (a) I consider hogget growth rates of prime importance to obtain 50 kg two-tooth ewes. Nitrogen is applied to young grass paddocks to provide the best possible feed for increased early spring growth rates and to help with pasture establishment.
  - (b) Ewes do not enter the main flock until after weaning their first lamb, and two-tooth ewes will be wintered with the hoggets after tupping to return the flock to two basic wintering mobs.

Within the constraints of the property and management, we have developed to a point where further increases in stocking rate are going to be slow and steadily more expensive. I believe that a large increase in lambing percentage is the best option available.

We have the genetic resource and are now well on the way to developing the necessary breeding and management programmes to harness this potential I have found the Booroola gene to be both technically exciting and financially rewarding.

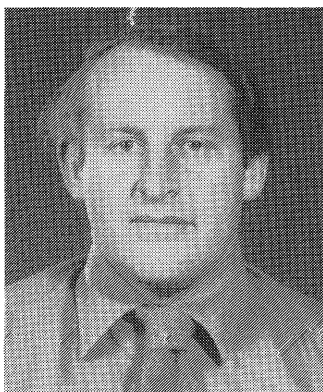


**Booroola rams**



# Is it too late to start deer farming?

T. W. Wallis\*



T. W. Wallis

The short answer to that question is, no!!

I have been involved with New Zealand's deer industry since 1958 and the early days of the feral venison industry and how it was established is very relevant to the above question.

I first realised there was something to be made out of deer when I was working in the sawmilling industry at Haupiri on the West Coast. After a day's work in the bush our major recreation was hunting deer. Deer which we could recover were gutted and driven in a Model A truck to meet the New Zealand Railways overnight goods train from Greymouth to Christchurch. Maddren Bros. paid us 9d to 10d per pound for exportable carcasses. The certification required was by a Government registered veterinarian. As all veterinarians are government registered, and with the approval of Dr Burns from Lincoln College, Graeme Thompson signed these certificates.

Deer we shot on the tops were boned out on the tussock, wrapped in stockinette, car-

ried down the mountains and sold in Fensons the butcher at Stillwater for a shilling a pound. His sausages were extremely popular. Little did the customers know that 50% of the meat was venison.

Tails and velvet were also in demand and I sold to South Seas Trading Company in Christchurch or to George Ting in Ashburton. We used to dispatch through the parcel post first salting them, wrapping with newspaper and finally in brown paper. Velvet is produced in the spring/summer and the West Coast can be quite hot and humid. Couple this with the postal delays between Haupiri to Ashburton and you end up with parcels which were almost capable of walking themselves to the Chinese buyer. I can remember a letter from George Ting with the money, in postal notes, enclosed. It read: "12 deer tails. 6 no good. Velly smelly (stink). Please more salt. George Ting."

I was conditioned in the late 1950s to see deer not only as a noxious animal, costing the country a few million pounds for forest service control, but also as a national asset.

In 1959 my brother George and I shifted to the Haast/Wanaka area, logging at Haast, milling at Luggate and marketing the timber in the Otago/Southland region. I teamed up with a school friend, Robert Wilson of R. Wilson & Company, Dunedin. He had had venison enquiries from Europe and an order for skin-on carcasses to Italy. Soon the logging trucks were stopping at meat safes positioned between Haast and Luggate. The truck driver, on a commission basis, would throw the carcasses on top of the logs and then head away in a cloud of dust towards Luggate.

Before we built the small Luggate factory we had only a chiller, situated under a

\*Alpine Helicopters Limited, Wanaka

willow tree beside the mill water race. When the carcasses arrived we brushed the dust off, trimmed and hosed them out, sewed them up in hessian sacks, then arranged for Little's Meat Transporter to backload the carcasses to cool stores in Dunedin where they were frozen, ready for export as New Zealand Venison carcasses. The majority of the deer lived safely in the mountains. Robert Wilson, Wattie Cameron and myself hired a helicopter from Nelson for a trial shoot and recovery mission in the Matukituki Valley. That was 20 years ago and 110 deer were successfully shot and recovered and delivered to Taylor's Wanaka Venison factory. A marginal profit was made but it showed the potential. Seeing a future we built a small game packing factory at the Luggate timber yard and progressed into the primal cuts — haunches, saddles, shoulders, boneless A, boneless B. We continued hiring helicopters until 1965 when we purchased our own.

Strong competition from processing companies and exporting companies in the early 1960s was coupled with a decline in the quality of deer purchased. If one company rejected carcasses the other would buy in an effort to secure that hunter's production. Large sums were being invested in the Game Industry. We could see the danger of venison, unfit for export from one processor, being sold and rejected. Buying countries, banning venison from New Zealand Consolidated Traders helped formulate the Game Packing and Export regulations which became law in 1967. The Department of Agriculture now had ultimate control of the export product through the use of Meat Inspectors used on a periodic inspection basis. We could see stability, and invested in the upgrading of factories and collection systems with chillers, helicopters, ships, fixed wing aircraft, jet boats and land rovers. Competition was keen but the product quality was under the control through the Agriculture Department by inspection and certification. West Germany was New Zealand's major market and periodic visits by

veterinarians from Germany provided a link between the importing and exporting countries.

In 1973 Germany demanded major changes to improve quality control. These changes included the setting of maximum time periods for the bringing of carcasses to chillers after killing, and from chillers to the factories for inspection by resident meat inspectors. Hearts, lungs, livers and kidneys, which until then could be left on the hill, now had to be retained with the carcass. We were given one year to implement these changes, before regulation became law in 1975.

This greatly increased the collection and processing costs which in turn lowered the price to the producer. It became more logical to think about farming deer. Our thinking in 1970 was that, if we shot a mature stag with A grade velvet, the velvet would realise the carcass value or 6 times that of D grade velvet. If we farmed these stags and could crop A grade velvet, we could expect production for at least ten years. With the number of deer being shot from helicopters and by ground hunters it seemed it would not be too long before the numbers decreased to the extent that it became uneconomic for helicopter operators and factories to rely solely on killed game. Our reasoning was that if we could develop helicopter capture techniques, and if we could prove that hinds would breed successfully in captivity, we could continue to use the helicopter skills and venison markets which we had developed over the preceding ten years.

Capture and relocation commenced in 1968 with the first feral captured deer being dispatched to Lincoln College. The project was funded by the Game Industry and Exporters Association. Dr Burns and Professor Coop authorised the trial which was managed by Roy Lamming. Cyclone produced the deer fencing which was the prototype run of what we use today. After four years Lincoln had established that feral captured deer bred in captivity, and were able to be yarded and handled albeit with some difficulty. An important finding

was that feed demand of deer at four per acre was comparable to sheep. This project terminated in 1972/73. The Deer Farming Regulations were not promulgated until 1969 and before then those buying deer were contravening the Noxious Animals Act.

There were no guidelines as to what type of land was best for deer farming or for yard designs. Experimentation showed us the way. Deer were captured by helicopter or trapped and delivered to the farms for between \$150 and \$200 per animal. Some of these deer are still producing on deer farms today, and will now be ten to fifteen years old!

Hill country and flat land farms were developed for deer all with varied ideas on how it should be done. West Domes, Glen Wye, Hindleyburn, Criffel, Dry Creek, Dunrobin, and the intensively irrigated Papamoa all in the South Island, Forest Park, Highlands Station and Tawa Park in the North Island, were among those which paved the way, facing the early problems and producing results by trial and error.

In October 1973, Invermay Research Centre commenced its move into deer with the authorisation of Nelson Cullen, then Director of the Centre, and under the leadership of Dr Ken Drew on the research side and Hamish McCallum of the Animal Health division. Research into the treatment of capture myopathy, lungworm, pulpy kidney, mineral deficiencies such as selenium and copper and, latterly, eusiniosis. On the management side, growth, fertility, antler and meat production, and behaviour were some of the early problems thrust at Invermay.

On June 26, 1975 the Deer Farmers Association was formed in Wellington. This Association brought together the early farmers and those interested in this new industry. Deer farmers were now officially represented as one voice and could tackle the many problems facing them. Relaxation of the Deer Farming Regulations came when the Noxious Animals Act changed to the Wild Animal Control Act in 1977.

In 1979 this Act relaxed the feral range

restrictions and changed the deer farm licencing system to one of notification. With the promulgation of the Deer Farming Regulations in 1969 confidence was established — deer, the noxious animal, could legally be held in captivity.

Standard values were established at local Commissioner level. Stags and weaners at \$50, breeding hinds up to \$150.

The demand for deer increased as they proved themselves a viable farm animal and as venison and velvet prices rose. The world's first live deer auction was held at Wanaka in 1977. With demand for breeding stock and velvet stags exceeding supply, live deer prices increased.

One of the biggest boosts for the deer farming industry came from the businessman farmer, more commonly known as the "Queen Street Farmer". Share farming agreements were entered into whereby the farmer owned the land, fences and buildings, the businessman owned the capital stock and they shared the progeny.

By taking advantage of the standard value provisions for livestock the businessman farmer was able to use a deferred taxation provision to assist in financing his livestock investment. Because of the availability of business finance the industry received a tremendous boost. In actual fact it got out of hand. At an elite deer sale in Hawkes Bay late in 1979 in-calf Red deer hinds from Criffel topped the sale at \$3650 each.

It was unfortunate that these unrealistically high prices, combined with political interference and falling velvet prices, put the industry into a nose dive.

The Commissioner of Taxes assessed the standard value of hinds initially at half purchase price and then at \$700.

At the same time helicopter hunting licences, which were the only prerequisite of obtaining licences to import helicopters, were made available on application. An estimated 10 million dollars worth of helicopters came into the country in under six months. Within 8 months hinds had dropped in value to less than \$500. The city in-

vestors had stopped buying and panic, or forced, selling began.

After long consultation, the Deer Farmers Association persuaded the Commissioner of Taxes to reinstate standard values at close to the original level.

It must be noted that without the trust of the city investors' capital, the capture systems of trapping, tranquilising and netting by helicopter would not have become as sophisticated as they are today.

Our company alone captured and relocated 7,000 deer onto farms in 1979. New Zealand's total capture figure today has dropped to between ten and twelve thousand deer annually.

Formal law controlling deer slaughter came into effect in 1981. This allowed farmed deer to be slaughtered, processed and exported to markets requiring ante and postmortem certification. With velvet sales stable, farmed venison an accepted product and selling overseas, the city investor returned again. Demand for stock exceeded supply. In June 1982 hinds were selling at \$1500, and continued to rise as the calving season approached.

Political interference again caused a hiccup in the form of the August 1982 Budget. A \$10,000 limit was imposed, spelling disaster to the city investor. Stability in the feral venison industry was reached when required legislation and quality control became effective. At its peak in 1973 over 3,800 tons — representing 130,000 carcasses — were processed and exported. Germany is New Zealand's major market for feral venison and consumes over 40,000 tons of game meat annually.

What then are the advantages and disadvantages of farming Red deer?

### Advantages

1. There are now nearly 2,500 deer farms in New Zealand.
2. The ewe equivalent factor for a mature hind is 2 stock units. A mature stag is 2-2½ stock units.
3. Low labour input can be compared to that for cattle.

4. Boundary fencing — 2 metre Cyclone or Hurricane netting but internal fences can be existing fences with hot wires on top.
5. Average calving percentages of 85%. Up to 95% is obtained on some properties.
6. Disease resistance. Deer are very hardy animals.
7. Efficient grazers.
8. High conversion factor or pasture to meat.
9. Produces a fat-free meat which meets a world wide trend.
10. Subsidy free.
11. Offers true diversification for the stock farmer. Can utilise the same land and pasture that hill and high country farms have to offer, and can graze alongside sheep and cattle.
12. Each breeding hind can expect up to 10 fawns over the breeding life span.
13. Each stag can produce 10 to 12 crops of velvet.
14. Winter feeding of capital stock on good quality meadow hay is quite adequate.
15. Current schedule for farm venison carcasses at the Game Packing House inclusive of tails, pistoles and skin but with Industry levy and slaughtering costs deducted is up to \$4.50 per kg. (Feral venison carcasses — \$3.00 per kg.)  
Compare this with beef and lamb carcasses.

Beef	\$1.60 to \$1.70 per kilo
Lamb with SMP	\$1.45 per kilo
Lamb without SMP but with subsidy	\$1.40 per kilo
Real value	80-90 cents per kilo
16. Current prices for velvet Super A and A grades average \$110 per kg. Higher prices for bulk lines. Criffel grossed just on \$200,000 for velvet from 560 mature stags in the 1982/83 season. On 100 hectares, of

which 60 hectares was under irrigation, there was a gross return of \$2,000 per hectare.

17. Live deer prices for good quality stock (May 1983):

Red hinds	\$1200 to \$1500
Velvet stags	50% to 70% above meat value
- As at 10 May 1983

Weaner hinds	\$800-\$1,000
Weaner stags	\$130-\$200
18. Stags have three market outlets: Live sales, velvet production, venison production.
19. Hinds have two market outlets: Live sales and venison production.

#### **Some disadvantages**

1. Hinds give birth between late November and early January. The East Coast of New Zealand, from North Otago to Northland is drought prone. Farmers without irrigation should be prepared for this factor.
2. TB can be a problem and difficult to eradicate. Buyers should see they purchase TB tested deer.
3. Fresh captured hinds mated in the wild can, in their first year, have a calving rate of between 20% and 50% lower than farm bred hinds.
4. Success or failure particularly at velvetting time, can be determined by yard and raceway design.
5. The laws of supply and demand are particularly relevant to breeding stock and velvet costings.

#### **Agricultural research centres**

About 75% of our deer research is being carried out at Invermay, with the balance at Lincoln College, Massey and Ruakura.

Some current work includes studies on:

1. Selection — improvement by breeding.
2. The potential for hybridization between Red and Wapiti.
3. Advancing the breeding season.

4. The growth of young stock through the winter.
5. Producing two crops of high quality velvet per year.
6. Improving weaning percentage.
7. Minimising disease loss.

If the deer capture rate stabilises at between ten and twelve thousand annually and the 1983 female population behind wire assessed, then it is easy to estimate the feral breeding population in any future year. Even after (say) ten years the total farmed deer population will still only be a small fraction of sheep and cattle numbers so I believe that there will be a speculative element in the industry until such time as the number of breeding hinds becomes stable and their value is based on the worth of the venison and velvet rather than the "special demand" price as at present. Game, whether it is feral or farmed, is an accepted product, and Europe can be termed our low priced base market. Over 70,000 tons of game including pigs and hares are consumed annually in Europe. Other countries, such as North America, Australia and the East must be considered our high price markets. Game meat production is true diversification as yet unhindered by political pressures or quota systems.

New Zealand must establish itself in every market it attempts to penetrate as a reliable supplier at any established seasonal price. We expect the Game Industry Board to be up and running by September or October of this year. This Board has representation of producers, processors and exporters. Its aim is to guide the venison and velvet industry through the 1980s with aggressive marketing control and sound forward-thinking judgement.

It is most interesting to see that the Meat Industry is contemplating much the same structure as we have with the Game Industry Board.

The most important factor from the deer farmer's point of view and to be determined by the Game Industry Board is a base price for the different grades of venison to be sold in each market. The



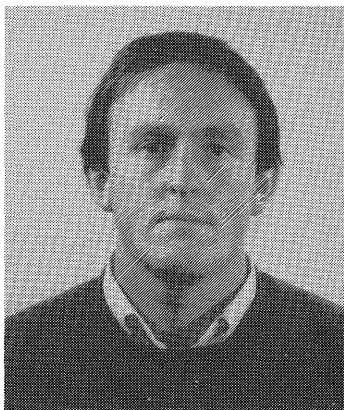
other major consideration is to ensure that the appointment of marketing people is done within a framework of policy that ensures that such people perform and are held accountable for their performance. I was pleased to be at the Summary of the International Conference on the Biology of Deer Production held in Dunedin in February this year. Professor Roger Short of Monash University, Melbourne, gave this summary: "New Zealand is leading the world in a domestication of a new species of farm animal. Today New Zealand unquestionably leads the world in the development of intensive husbandry systems for the farming of deer and as a result of your efforts you can truthfully claim to have created a new domesticated animal".

Finally — to answer the question: is it too late to start farming deer? I firmly believe the time is right. The industry has come of age. Quality breeding stock and quality velvet will be in demand for at least a decade. Venison, the backbone of this industry, will go from strength to strength. The live deer market has changed from an investor dominated market to a farmer dominated market. Current auction sales and the laws of supply and demand will determine the value of stock. The deer, with all its potential stands ahead of traditional sheep and cattle farming. Its future is seen in much clearer perspective.

New Zealand can be justly proud.

# Ewes or Wethers?

L. Saunders\*



*L. Saunders*

The question of ewes versus wethers, which in certain areas has become very topical, is a very basic management question on the product mix for any property. It is an aspect which in the past has tended to just happen — normally at culling time, with the logic of “that sheep has done well, I’ll keep it — even though I don’t really want to”.

Any business should research fully any product mix change, and see positive advantages in change before doing so.

This paper will discuss the present situation, financial analysis, feeding analysis and management considerations as each applies to high country fine wool producers and hill country halfbred-crossbred producers.

## **Present situation**

### **High country**

For the past two seasons fine wool producers have received returns for both wool

and surplus stock considerably higher than those pertaining in the late 70s. With many properties in the Mackenzie Basin working on a gross margin of \$25–\$27/total su — (before cattle prices rose), cash flows improved and LDEL and LIS programmes were expanded dramatically. Properties have generally moved into a higher cost operation due to high product returns, not higher production.

Because of static or declining ewe flock production many of these property owners have contemplated moving to dry stock systems.

### **Hill country**

Everyone knows that generally the past two seasons have been dominated by drought, causing lower pasture production, poor animal performance, marginal incomes and, presently, lower than necessary inputs such as fertiliser. Financial returns have dropped from \$20/su to \$16–\$17/su at a stage when the benefits from development, based on LDEL and LIS programmes, should have achieved the opposite.

Therefore there are two different but strangely similar situations:

The first a high country farmer contemplating a wether flock because of poor ewe production, but who should be intensifying to achieve economic returns from a higher input system.

The second a hill country farmer who was in the above situation recently but due to drought and markets is looking at wether flocks to economise — some may say to perish.

\*MAF Fairlie

### Financial analysis

The overriding question, as with any management decision, must be is it more economic to run ewes or wethers?

### 1. High Country

I have prepared Gross Margins for a typical

- (a) Merino ewe flock
- (b) Merino wether flock
- (c) Dry ewe flock.

**TABLE 1:1 High Country Gross Margins**

#### (a) The Merino ewe flock gross margin

(Wool Price \$4.95/kg Nett)

Lambing — 82%. Ewes lasting 5 years, producing 3.92kg/su (3.70kg/hd)

	<b>Total</b>	<b>%</b>	<b>Per su</b>
Stock Sales	\$10218	(30)	\$8.26
Wool Sales	\$23992	(70)	\$19.40
Total Income	\$34210		\$27.66
Total Expenses	\$4162		\$3.36
Gross Margin	\$30048		<u>\$24.29</u>
Including Capital	\$25660		\$20.74

#### (b) The Merino wether flock gross margin

(Wool Price \$4.95/kg Nett)

Wethers lasting 7 years, producing 6.0kg/su (4.25kg/hd)

	<b>Total</b>	<b>%</b>	<b>Per su</b>
Stock Sales	\$3145	(8)	\$2.54
Wool Sales	\$36815	(92)	\$29.71
Total Income	\$39960		\$32.25
Total Expenses	\$9167		\$7.40
Gross Margin	\$30793		<u>\$24.85</u>
Including Capital	\$25696		\$20.74

#### (c) The Merino dry ewe flock

Ewes lasting 5 years, producing 5.85kg/su (4.14kg/hd)

	<b>Total</b>	<b>%</b>	<b>Per su</b>
Stock Sales	\$4377	(11)	\$3.54
Wool Sales	\$35862	(89)	\$28.94
Total Income	\$40239		\$32.48
Total Expenses	\$11007		\$8.88
Gross Margin	\$29232		<u>\$23.59</u>
Including Capital	\$23001		\$18.56

The main expense for dry sheep farming is the cost of replacements,  
i.e. wether replacement cost = \$4.94 total stock units  
ewe replacement cost = \$6.36 total stock units.

**TABLE 1:2 High country gross margin/su**

	Merino ewe flock	Merino wether flock	Dry ewe flock
Stock Sales	\$8.26 (30%)	\$2.54 (8%)	\$3.54 (11%)
Wool Sales	\$19.40 (70%)	\$29.71 (92%)	\$28.94 (89%)
Total Income	\$27.66	\$32.25	\$32.48
Total Expenses	\$3.36	\$7.40	\$8.88
Gross Margin	\$24.29	\$24.85	\$23.59
Including Capital	\$20.74	\$20.74	\$18.56
\$4.00 Wool Price	\$20.57	\$19.85	\$13.03
\$3.20 Wool Price	\$17.41	\$14.35	\$8.33

The assumptions made are that one wet ewe is equivalent to one stock unit while dry ewes and wethers are equivalent to 0.7 stock units. This rate of substitution is conventional and is subject to some debate. The remaining assumption is that a dry ewe will produce 12% more wool than a wet ewe and that a wether will produce 14% more wool than a wet ewe (H. Hawker, pers comm 1983). This is based upon work done on Merinos in New Zealand and Australia.

At a wool price of \$4.95/kg nett there is an advantage to a wether flock of 56 cents/stock unit. However, the dry ewe flock returns 70 cents less on a stock unit gross margin basis.

If the capital cost is charged against the enterprises there is basically no difference in the financial returns. This is due mainly to the positive correlation between wool prices and stock prices.

The removal of SMP supplementation would yield a return of \$4/kg nett. At this wool price there is a \$0.72¢ su advantage to the wet ewe enterprise.

Since the last fine wool selling season the majority of supplementation has been removed and if we assume the floor price of fine wool has not moved, then the \$4/kg is the relevant section. Even if the floor price has moved it is unlikely to have fully accounted for the reduced supplementation, resulting in a similar gross margin for both ewes and wethers.

Using a stock unit conversion of 0.6 to 1 for dry sheep would lift the wether gross

margin from \$24.85/su to \$29/su and the dry ewe gross margin from \$22 to \$27.53/su giving both systems an advantage over the wet ewe system.

## **2. Hill Country gross margins**

I have prepared gross margins for a wet ewe flock and wether flock. (Tables 2:1, 2:2).

There is an advantage of \$4.28/su to the ewe flock before capital is included, which is increased to \$4.85 with the inclusion of capital.

A lower producing ewe flock (lambing 80%, wool 4 kg/head,) would reduce the ewe gross margin by \$1.62/su not affecting the relativity of the enterprises.

Altering the substitution rate from 1 su:0.7 su to 1 su:0.6 su — returns \$1.67/su lower than a ewe flock but only 5 c/su lower than a poor producing ewe flock.

## **Risk of income and cash flows**

With approximately 90% of income coming from wool sales the dry stock systems are significantly affected by wool price fluctuations, compared with the wet ewe system which has only 70% of income arising from wool sales.

This also creates a rather lumpy cash flow with 90% of income occurring in the spring-early summer period while the 10% of income from stock sales in the autumn being largely negated by the cost of replacements. The overall effect is that the

**TABLE 2:1 Hill Country Gross Margins**

(Wool Price \$3.10/kg)

**(a) Ewe flock**

Lambing — 95%. Ewes lasting 5 years, producing 4.2kg/hd (4.4kg/su)

	<b>Total</b>	<b>%</b>	<b>Per su</b>
Stock Sales	\$12215	(42)	\$9.86
Wool Sales	\$16851	(58)	\$13.60
Total Income	\$29066		\$23.46
Total Expenses	\$4386		\$3.54
Gross Margin	\$24680		\$19.92

**(b) Wether flock**

Buying in wether lambs. Lasting 7 years, producing 4.8kg/hd (6.74kg/su)

	<b>Total</b>	<b>%</b>	<b>Per su</b>
Stock Sales	\$3430	(10)	\$2.26
Wool Sales	\$31722	(90)	\$20.88
Total Income	\$35152		\$23.14
Total Expenses	\$11395		\$7.50
Gross Margin	\$23757		\$15.64

**TABLE 2:2 Hill Country Gross Margin/su**

	<b>Ewe flock</b>	<b>Wether flock</b>
Stock Sales	\$9.86 (42%)	\$2.26 (10%)
Wool Sales	\$13.60 (58%)	\$20.88 (90%)
Total Income	\$23.46	\$23.14
Total Expenses	\$3.54	\$7.50
Gross Margin	\$19.92	\$15.64
Including Capital	\$16.60	\$11.75

cost of working capital is increased, which should be placed as a cost against such a system. The wet ewe system, although producing a rather lumpy cash flow, still has a reasonable income spread satisfying some anxious bank managers in the autumn.

**Financial conclusion**

With the present high fine wool prices there is very little difference between wet and dry sheep enterprises, although there appears to be a great deal more risk and

seasonal income fluctuations with a dry stock systems; Income — risk fluctuations which many farmers/runholders could ill afford.

The hill country farmer has an easier decision because based on a financial analysis dry stock farming will lead to only one aspect of the seminar theme, that is — to perish. The only situation when dry stock compares equally with a ewe flock is when the ewe flock is very low producing — such as during droughts — although the analysis doesn't drop the wether production.

## Feeding analysis

Data from feed supply and demand graphs show the major problem in any stock situation is the movement of feed throughout the year. The amount that needs to be moved is a lot greater for the dry stock situation where, due to the higher numbers in the winter, feed requirements are higher than for the ewe system which has lower numbers but at the same feeding level. The wet ewe system therefore utilises much more of the spring and autumn growth peaks, at the time of growth. This with the lower feed requirement in winter, means less feed transfer, which is not only a costly exercise, but also results in inefficient utilisation of both feed and inputs such as fertiliser.

Daly (pers comm; 1982) at Tara Hills determined that autumn saved pasture in the period from late April to late August led to dry matter losses of 20–40% with quality dropping a further 10%. This is a very large cost but still significantly cheaper than the conventional haying system which loses 50% dry matter with an accompanying quality drop of 20–30%. Such losses need to be minimised.

Hill country properties do have the option of utilising feed normally used for lambs by taking in grazers as long as the feed is concentrated in a recognisable area. Extensive management systems do not allow for such feed concentration.

## Management factors

### (a) Labour

For those who employ labour there could be a saving during the lambing season. However, for the majority of properties this saving would at the most save in the vicinity of only \$0.20–\$0.40/su.

### (b) Management

Having only one class of stock does make the management of the property somewhat easier, giving an advantage to a dry stock system. However, the concept of running wethers on an extensive system and forgetting about them will only result in very poor producing wether flocks with equally poor returns.

## Summary

When I looked at the theme of the Seminar of Intensify, Diversify, Economise or Perish, I decided that the question of Ewes or Wethers really falls into all the categories except Diversify.

Firstly, one of the most common reasons for changing to wethers is a poor performing ewe flock. The replacement of such flocks with wethers will **not** increase returns; it may make it easier to achieve a return of the same level or slightly less. Production is directly related to feeding level and if hill and high country properties intensified their developed areas using their major resource of undeveloped country to complement this area, better production would result.

The question of Ewes or Wethers becomes a more individual assessment rather than a general one and I hope that the aspects in this paper have highlighted that generally the move to wethers may not be as profitable as some have claimed, and in fact with dropping economic margins in pastoral farming, the property changing to wethers lacks flexibility of product mix to adjust to market changes. This lack of flexibility associated with lower than maintenance levels of essential inputs (the so-called economising) may in fact lead to more properties perishing.

## Appendix (I) High country gross margins

### 1. Merino Ewe Gross Margin

Based on 1000 M.A. Ewes plus replacements.

#### (a) Stock reconciliation

Opening	Class	Deaths	Sold	Closing	Capital
289	Hgts	11	46	289 \$16	\$4624
232	2th	8	8	232)	(
216	4th	8	8	216)	(
<del>200</del>	6th	8	8	200) \$22	(22000
<del>184</del>	8th	8	8	184)	(
168	5yr			168)	(
50	Others	5		50 \$16	800
5	Ram Purchases				
850	Natural Increase				\$27424
	(82%)		531		
	<u>1237</u> Stock Units				

#### (b) Gross income

Sales			
Ewe Lambs	100 at \$15		\$1500
	21 at \$10		210
Wether Lambs	210 at \$17		3570
	200 at \$12		2400
Two Toothy	46 at \$19		874
Ewes	140 at \$10		1400
	44 at \$6		264
Total Sheep Sales			\$10218
Wool			
Ewes	980 at 3.7 kg	3626 kg	
Hggt/Other	330 at 3.7 kg	1221 kg	
Total		4847 kg (\$3.92 kg/su) at \$4.95	\$23992
		Total income	\$34210
			(\$27.66/su)

#### (c) Gross direct expenses

Animal Health	1237 su at 90c/su	\$1113.30
Shearing	1310 hd at \$1.20/hd	1572
Ram Purchases	5 at \$150	750
Cartage	531 lambs at \$1	531
	230 adults	138
Commissions — Fees etc at 25c/hd		58
	Total expenses (\$3.36/su)	\$4162
	Gross margin (\$24.29/su)	\$30048
Including Capital Cost at 16% — \$4388	(\$20.74/su)	\$25660

## 2. Merino wether flock gross margin

Based on 1239 su — 3% Death Rate, 3% Culling — buying in Two Tooth Wethers. Wethers last 6 years.

### (a) Stock reconciliation

Opening	Class	Deaths	Cull	Closing	Capital
340	2th	9	9	340)	
322	4th	9	9	322)	
304	6th	9	9	304)	
286	8th	9	9	286)	\$31860
268	5yr	9	9	268)	
250	6yr	5	245	250)	
1770				1770	
340	Purchases				
	2th at \$18 = \$6120				

### (b) Gross income

Sales		
Cull Wethers	45 at \$10	\$450
CFA Wethers	245 at \$11	2695
Total Sales		\$3145
Wool		
1750 head at 4.25kg/hd (6kg/su)	7437kg at \$4.95/kg	\$36815
Total income	(\$32.25/su)	\$39960

### (c) Gross direct expenses

Animal Health	1239 su at 40c/su	\$496
Shearing	1750 hd at \$1.20/hd	2100
Cartage	290 hd at 60c/hd	174
	340 hd at 60c/hd	204
Replacements	340 at \$18	6120
Commissions	at 25c/hd	73
Total expenses	(\$7.40/su)	\$9167
Gross margin	(\$24.85/su)	\$30793
Including Capital Cost — \$5097	(\$20.74/su)	\$25696



### 3. Merino Dry Ewe Flock Gross Margin

Based on 1237 su — buying in Two Toths, selling genuine 5 yr ewes. Death Rate 3%, Culling 3%.

#### (a) Stock reconcillation

Opening	Class	Deaths	Cull	Closing	Capital
394	2th	10	10	394)	
374	4th	10	10	374)	
354	6th	10	10	354) \$22	\$38940
334	8th	10	10	334)	
314	5yr	5	309	314)	
<hr/> 1770					
394	Purchases				
	2th 394 at \$25 = \$9850				
	1239 su				

#### (b) Gross income

Sales		
Cull Ewes	40 at \$9	\$360
CFA Ewes	309 at \$13	4017
Total Sales		<hr/> \$4377
Wool		
(12% more than Wet Ewes)		
1750 head at 4.14kg/hd (5.85kg/su)	7245kg at \$4.95/kg	<hr/> \$35862.75
	Total income (\$32.48/su)	<hr/> \$40239

#### (c) Gross direct expenses

Animal Health	1239 su at 40c/su	\$495.60
Shearing	1750 hd at \$1.20/hd	2100
Cartage	60c/hd sold	209
	60c/hd bought	236
Replacements	394 at \$20	7880
Commissions	25c/hd	87.25
	Total expenses (\$8.88/su)	<hr/> \$11007
	Gross margin (\$23.59/su)	<hr/> \$29232
Including Capital Cost at 16% — \$6230	(\$18.56/su)	<hr/> \$23001

## Appendix (II) Hill country gross margins

### 1. Ewe flock gross margin

Based on 1000 M.A. Ewes plus replacements running for 5 yrs — Natural Increase of 90% = 900 lambs.

#### (a) Stock reconcilliation

Opening	Class	Deaths	Cull	Closing	Capital
	Hgt	11	46	289 \$17	\$4913
232	2th	8	8	232)	(
216	4th	8	8	216)	(
200	6th	8	8	200) \$20	(20000
184	8th	8	8	184)	(
168	5yr			168)	(
50	Others	5		50 \$16	800
5	Ram Purchases at \$150 = \$750				<u>\$25713</u>
950	Natural Increase (95%)				
			661		

#### (b) Gross income

Sales			
Ewe Lambs	125 at \$15		\$1875
	61 at \$12		732
Wether Lambs	200 at \$18		3600
	200 at \$15		3000
	75 at \$10		750
Two Teeths	46 at \$15		690
Ewes	140 at \$9		1260
	44 at \$7		308
Total Sales			<u>\$12215</u>
Wool			
980 Ewes	at 4.2kg	4116kg	
330 Hgt/Other	at 4kg	1320kg	
Total		5436kg (4.39kg/su) at \$3.10	<u>\$16851</u>
		Total income (\$23.46/su)	<u>\$29066</u>

#### (c) Gross direct expenses

Animal Health	at \$1.10/su	\$1363
Shearing	1310 hd at \$1.20	1572
Ram Purchases		750
Cartage	661 lambs at 80c	528
	230 adults at 50c	115
Commissions — Fees etc at 25c/hd		58
	Total expenses (\$3.54/su)	<u>\$4386</u>
	Gross margin (\$19.92/su)	<u>\$24680</u>
Including Capital Cost at 16% — \$4114	(\$16.60/su)	<u>\$20565</u>

## 2. Wether Gross Margin

Based on 1519 su.

### (a) Stock reconcillation

Opening	Class	Deaths	Cull	Closing	Capital
	Hgt	10	50	400 \$17	
340	2th	9	9	340)	
322	4th	9	9	322)	
304	6th	9	9	304) \$17	
286	8th	9	9	286)	
268	5yr	9	9	268)	
250	6yr	5	245	250)	
<u>1770</u>					<u>\$36890</u>
400	Wether lambs purchased at \$17/hd = \$6800				

### (b) Gross income

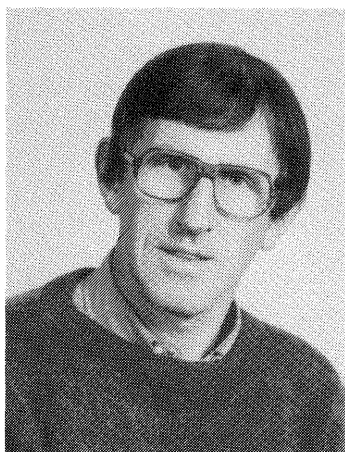
Sales					
50 Two Tooth Wethers fat pen at \$20					\$1000
90 Works Wethers at \$7					630
200 CFA Wethers at \$9					<u>\$1800</u>
Total Sales					\$3430
Wool					
1750 adults at 4.8kg/hd			8400kg		
390 hgts at 4.7kg/hd			<u>1833kg</u>		
Total			10233kg (6.74kg/su) at \$3.10		<u>\$31722</u>
			Total income (\$23.14/su)		<u>\$35152</u>

### (c) Gross direct expenses

Animal Health	at 90c/su	\$1367
Shearing	\$1.20/hd	2568
Purchases		6800
Cartage	Inward 400 at 80c	320
	Outward 340 at \$1.00	<u>340</u>
	Total expenses (\$7.50/su)	<u>\$11395</u>
	Gross margin (\$15.64/su)	<u>\$23757</u>
Including Capital Cost at 16% — \$5902	(\$11.75/su)	<u>\$17855</u>

# Going into forestry

J. W. Edmonds\*



*J. W. Edmonds*

## **Introduction**

Traditionally New Zealand's hill country has been pastorally farmed with little or no history of extensive farm tree plantings. Because of this trees are often held to be, at worst, a nuisance, that cost money to

remove, and at best, something that may provide enough cash to pay for the change in land use. However there is a slow change in attitudes and far-seeing farmers are looking towards forestry as being economically attractive and also complementary to normal farming operations in the concept of integrated land use. Indeed if the recommendations from the 1981 Forestry Development Conference (Afforestation Working Party) are to be implemented, 30 to 40% (12-16 000 ha) of the total New Zealand plantings in 1990 would be by small growers.

Anyone contemplating going into forestry, must realise that the growing of a timber crop is a long term venture, which takes an input of finance over many years — generally with little in the way of financial return for at least 25 to 30 years. Thus the investment involved plus the technical and physical requirements need to be assessed fully to justify long term commitment of land. The ability to meet subse-

*\*N.Z. Forest Service Dunedin*



**Strip sprayed areas — Balclutha district**

*Photo: N.Z.F.S.*



**Grazing under 5 year old *P. radiata*, Rotorua**

*Photo: N.Z.F.S.*

quent costs should be analysed if the maximum return is to be obtained. This return need not necessarily be for pure timber production, but by way of shelter soil conservation, weed control, aesthetics or any combination of these.

Several possibilities exist for planning any forestry development towards a particular end product — and the choice of management system will depend on this desired end use while taking account of finance (including incentives), size, location, access, altitude, species, topography, aspect, soils, climate, vegetation, labour and legal requirements.

Having taken account of these a number of management regimes can be considered.

1. Clearwood
2. Framing
3. Roundwood
4. Pulpwood
5. Firewood
6. Agro-forestry

Having grown the crop, the particularly important aspects of establishing systems of harvesting, marketing and processing suited to dispersed small growers, then has to be considered.

### Discussion

From what has been discussed above, it is clear that going into forestry is more than simply planting trees. Guidance and advice from Forest Service Extension Officers, private consultants, etc, to the small grower on how he can plan, establish and manage his forest for optimum return, is a critical component in the development of any project. With sophisticated management tools such as the computer-based simulation model called SILMOD which are becoming available for use by Extension Officers, more accurate and consistent management decisions can be made. This model has demonstrated that financially sound and intensively managed forests on fertile sites give the greatest return when pruned and thinned early to low final crop stockings (250 stems/ha or less). Such favourable sites on farms, with optimum tending regimes favouring grazing within the forest, this combination of agriculture and forestry has far-reaching implications for the hill country, which should complement and enhance rather than compete with traditional forms of land use.

# Mixing farming and forestry

G. R. Hampton\*



*G. R. Hampton*

## Introduction

Acceptance of forestry as just another form of cropping establishes a base on which direct comparisons with more traditional forms of land use can be made in the light of present knowledge and anticipated trends, yet free of historical prejudice. While certain international factors indicate future market possibilities for all products of the land (and these point favourably towards a secure market for wood, well into the next century), New Zealand's ability to predict and react to recent world market trends has not been good. Planning periods for forestry are several times greater than those for pastoral farming — good reason for treating sceptically any future predictions of values and demand in twenty years' time. It is comforting, however, that plantations on farmland may perform a most important ancillary role in addition to the eventual return in cash and that the pronounced wave of optimism for the future of our wood must have some substance.

*\*Carter Holt Ltd Napier*

## Future markets

The intuitive farmer will proceed with a farm tree planting programme seemingly in faith, paralleled with a determination to see the project through, perhaps simply to defy the critics. Farmers, whose Radiata Pine woodlots will mature during the next decade, will surely receive handsome rewards for their faith and efforts. But, in the decades beyond will our basic wood resource match the quality demanded in the market place and will the costs of growing that crop enable the then market to be economically serviced?

Intuition, faith and present costs of money suggest one or two alternative management strategies:

1. A high quality, high cost crop, geared to specific future markets.
2. A low cost forest of general use, in keeping with that currently being harvested.

Clearly the target is to achieve maximum flexibility, which implies a marriage of 1. and 2. above, i.e. a high quality crop at low cost. Industrialists share wide ranging views as to the form in which woodbased products may in future be sought in the market place, therefore the inherent qualities of logs required to meet those markets are predicted to be equally wide ranging. It is unlikely the full potential of all logs produced, as viewed by the forester now, will be realised in the future. Market demand and cost competitiveness of the product will determine the destiny of the log, and therefore the gross return to the grower. Future processing may tend toward regional specialisation, making possible optimum returns to local growers who accidentally or deliberately produce wood tailor-made for the local process.

Whatever the tending programme adopted, it must result in production of large logs to allow for harvesting economies.

### Species

In choosing species for farm planting, alternatives exist. Radiata pine seems assured of a place in most corners of the anticipated marketplace and is very clearly ahead of any other choice where security of investment is sought.

For the gambler, macrocarpa, Eucalyptus and Douglas Fir, may meet particular on-farm objectives. While Radiata pine is the commercial species of the future, and should be used in major plantations (within its climatic range), it is not intended to discourage the choice of other species for small scale plantings. Aesthetic and other particular values, which are associated with plantations of exotic hardwoods and some slower growing conifers, are admirable. However, the harsh reality of the hill country farming economy demands a

ruthless profit-oriented attitude towards any expenditure on the farm which includes forestry. This attitude is a prerequisite for successful farm forestry, which effectively limits the choice of species to Radiata Pine, and influences the manner in which the crop will be grown. The source of, and pressures on, finance employed in the farm project is of course the dominant factor in determining the tending strategy; precisely the dilemma confronting farmers at present relating to fertiliser use. That there are extreme financial pressures on fertiliser use and other farm maintenance demands, suggest that forest development will be dependant in most cases upon financing from outside sources.

### The farm tree planting programme

To achieve optimum benefits from farm forestry, location is of utmost importance from two points of view:

1. direct cash return from log sales.
2. indirect ancillary benefits arising



**Heifers grazing among 4 year old *P. radiata*, Hawkes Bay. Trees thinned to 400 stems per hectare**

from the presence of trees on the farm, and the transfer of costs from farm to forest.

### **Log sales**

The value of trees is assessed by deducting from a fixed price at the processing point or port, the costs associated with logging and cartage. Very clearly it is necessary to consider the costs of logging and transporting logs to the nearest public road (on-farm access) to ensure such costs will not destroy the viability of the project. Costs of transport to the market are a matter of crystal ball gazing as the market place may be established during the life cycle of the plantation. Such costs should, however, be considered in the light of regional justification for the future establishment of local processing, based on the resource already in place or planned. Some regions may have efficient processing, or a large forest resource that will ensure placement of processing in advance of maturity of the planned crop. This greatly facilitates decision-making. In summary, large logs should be grown at a location on the farm that enables moderate extraction and delivery costs to the public road. Delivery costs to the anticipated markets should be assessed.

### **Indirect benefit**

It is in the area of indirect benefit that hill country farmer should commence on-farm analysis of the impact of a planting programme:

Widely documented in recent years, the shelter benefits to pasture and livestock from correctly sited woodlots and shelterbelts, must receive priority consideration. The effects of drought and unseasonal snow which is accompanied by either severe drying N.W. winds, or savage southerly draughts are very fresh in our memories. Disastrous individual and regional stock losses resulting from unusual climatic occurrences recently, could in many known cases have been greatly reduced by the presence of woodlots and major shelter systems.

With intensification, hill country soil and water values demand regular reappraisal. It may be as well to voluntarily pre-empt actions which farmer inattention may attract from Catchment Authorities. Stock water is assuming ever increasing importance, a good reason to protect stream and dam catchments from siltation and evaporation.

Grazing value of plantations is a subject best left for the farmer to assess. Much has been documented on the subject setting out basic rules which require interpretation to fit particular local conditions where grazing of young plantations is undertaken. Such grazing should be used as a bonus for stock normally supported by the permanent pasture, yet the feed maintained by periodic grazing to ensure reasonable quality when the need arises.

### **Diversification and intensification**

With the thrust of this seminar directed at survival in an economic sense, two courses of action may be open to the farmer, i.e. cost reduction (which is probably already well advanced and causing socially undesirable pressures beyond the farm gate) or increased productivity. Increased productivity implies cash injection (which for farming must necessarily be State) or diversification. The effects on farm returns of diversification, if such is financed in part by the farmer, may be intolerable during the short term with gains being medium or long term. Diversification of land use, where the farmer is not required to use his already overcommitted working capital, could provide many immediate cash benefits to certain land-owners. It is this facet of farming which is seen to offer immediate benefits not only to the farmer but to the social and economic structure of the rural community and region. Radiata pine can be cropped under lease or joint venture arrangements, in the first instance providing an annual cash return, in the other, a return at harvest. The immediate benefits to the farmer are those of relief from rates and weed control costs (and some other encumbrances) for



portions of a farm which may yield uneconomic returns from continued pastoral farming. Savings in such expenditure may enable intensification of farming of the remaining better sites. Strategic location of plantings could provide the means by which stocking levels can be retained despite the loss of some land, and yet meet the criteria for economic harvesting and so provide optimum direct and indirect benefits to the farmer and investor.

In summary, the farmer selects the optimum location for the planting of shelterbelts and/or woodlots, seeks an investor to lease the land or finances all costs of afforestation on a joint venture basis, thereby achieving very rapidly and painlessly a major step towards intensification and diversification. An intelligently compiled farm plan will indicate what portions of the farm are of dubious pastoral value (or presently grossly uneconomic). A further critical appraisal of noxious weed control costs and on-going degrading effects of soil loss will complete the picture and suggest a plan of attack. Decisions made now in relation to such areas unworthy of continued farming expenditure are those which will greatly affect the short and long term farming viability of the property, and most importantly the immediate cash outlay required.

## **Conclusion**

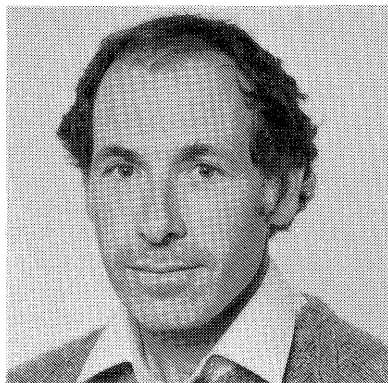
Radiata pine, in the form of farm shelter with or without woodlots, has a great deal to offer the farm, the social structure of the rural community (job opportunities) and the economy as a whole. Combining a land

resource (privately owned) with cash from industry or other private source, is a concept worthy of consideration. Those areas unattractive to such investment because of location, terrain, extent of severe erosion or climatic characteristics, may need to receive particular assistance; but farmers occupying such land will surely benefit from farm forestry development within their region which will progressively alter the local economic future for forestry. This will therefore improve the longer term viability of forestry on areas once considered uneconomic. The dual role of Radiata pine should not be discounted. In fact its soil protection values should be afforded greater priority by catchment authorities on a farm scale basis, in recognition of soil erosion as a matter of national concern, rather than an issue which a farmer or a County Council may choose to have suppressed.

The likely returns from intensive use of Radiata pine on farms should be sufficient to induce most farmers to review their attitude to forestry. It is time to look forward to the creation of a worthwhile asset by planting, rather than regarding the life of a tree as a threat to pasture and the community. Fear and ignorance should no longer prevail in local politics to the detriment of sound economic planning in general, and the economic future of many hill country farmers and communities in particular. The timber industry must present to the farming community, forestry as a sound investment option, underwritten by assurances of fair apportionment of profits, in return for soundly based local body planning provisions, and predictable central government support.

# Agroforestry research

N. S. Percival\* and R. L. Knowles\*\*



R. L. Knowles

## Introduction

Agroforestry as a land use option has expanded rapidly since the late 1960's. Now more than 20 000 ha of farmland is committed to production forestry while stock is managed on the pasture underneath. In addition, about 80 000 ha of forests is used as runoff grazing for cattle, mainly in the northern half of the North Island.

People go into agroforestry for diverse reasons, though in most instances the primary motivation is improved profitability. It is important not to discount the other reasons which include shelter for livestock, erosion control, provision of retirement income and aesthetic purposes. Our understanding of the management requirements for both the forestry and agricultural components have developed largely from experience gained from the agroforestry trials in both the North and South Islands. To date, nearly all agroforestry research has been with radiata pine. It was logical to develop management systems with this species before considering alternatives such as *Eucalyptus* spp., Tasmanian blackwood, or black walnuts.

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## Establishing trees on farmland

It is important that the young trees get as good a start as possible. The faster the tree growth, the sooner can grazing recommence. For successful establishment of radiata pine on farmland, competition from pasture must be limited and browsing damage avoided.

## Competition from pasture:

Young trees are very susceptible to competition from pasture, and unless limited either by spraying herbicides around seedlings or by physical releasing, early tree growth can be severely reduced. In some instances young trees die. Spraying herbicides prior to planting has given the best establishment. Several herbicides may be used, depending on the type of pasture. In most cases a paraquat (1.2 kg/ha) simazine (3.4 kg/ha) mixture applied to hard grazed pasture 1–4 weeks before planting is adequate. However, where perennial grasses such as paspalum and browntop are a problem, spot spraying with glyphosate (1:100 product dilution) in the December after planting may provide better control. Once the seedlings are 40–50 cm tall they are likely to grow away from pasture competition. On easier country the herbicides are applied in 0.8 m wide strips, but on broken country the spray is best applied with a knapsack to 0.9 m diameter spots.

## Browsing/debarking damage:

It is inevitable that a large proportion of the grazing opportunities are lost in the first two years after planting. Since the objective is to establish a forest it is essential that livestock do not cause excessive damage to the trees. The most common error made by farmers is to enter too many livestock too early. In some instances the damage is so severe that the tree crop is a

write-off. The level of grazing which could be sustained in the first three years without excessive tree damage was measured in trials at four sites. In the first year grazing returns ranged from 11–48% of that obtained from adjacent open pasture (with no trees), and by the third year rose to between 67 and 84% of open pasture (Gillingham *et al* 1976). With early grazing it always pays to err on the side of caution.

Certain areas in paddocks are much more susceptible to browsing damage, and it is suggested these paddocks not be planted. These include around gateways, troughs, stock camps, and along fence-lines. Fences must be secure to avoid accidental breaking in by large mobs. The smaller the tree seedlings the more susceptible they are to having their leaders browsed. Once the leaders are over 1 m they are usually safe. In general, grazing with sheep is preferable to cattle in the first two years. If young trees are browsed only once, their growth rates are little affected. However, repeated browsing reduces subsequent opportunities for grazing because of stunted and uneven growth (Table 1).

#### Weed control in agroforests

When trees are planted onto farmland the presence of weeds can severely restrict the amount of grazing subsequently obtained. In considering the costs of weed control in agroforests there are not only the immediate lost opportunities for grazing, but also the long term aspects of renovating pastures after the trees have been harvested. The economics of weed control are

related to the tree stocking, this being the factor that primarily determines the number of livestock carried.

There are three situations where weeds may cause problems in agroforests:

#### (1) Establishment:

In the two years after planting there can be problems with reversion to scrub, particularly bracken fern. This problem is reduced by planting into consolidated pastures unlikely to revert. If it appears an area will be totally lost from grazing, set stocking sheep at a low stocking rate from the first summer generally provides sufficient weed control until the trees are big enough to sustain a higher stocking rate. If bracken fern completely takes over there is little that can be done until the trees are tall enough for the paddock to be stocked with cattle.

#### (2) Debris

The presence of debris from pruning and thinning allows weed ingress. If the debris is removed this problem does not occur, but since most agroforestry is on rolling or steep country it is usually left to decay. The proportion of ground covered with debris is related to the tree stocking, and hence the weed problems in slash tend to be worse in dense forest stands. The main weeds in slash are Scotch, nodding and Californian thistles, inkweed, ragwort, blackberry and gorse. Provided only annual weeds are present there is little problem because slash decays in 3–4 years, and grazing keeps them under control. With perennial weeds, particularly blackberry, gorse and ink-

**Table 1: The effects of browsing damage on growth of young radiata pine after two years (Gillingham *et al* 1976)**

Browsing Damage	Increase in tree height from planting (cm)			
	Mamaku	Matahina	Reporoa	Whatawhata
Nil	80	138	80	104
1st spring only	76	129	64	91
1st spring + 1st autumn	44	81	39	66
1st spring + 1st autumn + 2nd spring	25	58	26	48

weed, it is important that they are controlled as in a farm situation (without trees). This is usually done with herbicides. If not controlled they provide a base from which to spread, and subsequent grazing may be severely restricted.

### (3) Grazing pressure in older stands

As trees mature the quantity of forage available gradually declines. If older stands are not grazed, some of the shade tolerant weeds, (blackberry) gradually spread, further reducing the area available for grazing. This does not occur when regular grazing pressure is maintained.

### Livestock management

The number of livestock that can be carried under radiata pine forests has been determined from forest grazing trials. These are run under conditions which as far as possible simulate an agroforest.

There are always constraints with such trials, which means the production data obtained represent the maximum possible effects. All livestock carrying capacity data are expressed relative to open pasture, to show how much agriculture is possible in an agroforest.

The effect of grazing is always related to the number of trees present and tree size. For trees of any one age, there are less livestock at 400 stems per ha than at 200 stems per ha, and less at 200 stems per ha than at 100 stems per ha (Figure 1).

As trees grow pasture yield decreases and livestock numbers fall. Thus at high tree stockings, such as a regime leading to a final crop of 400 stems per ha, livestock numbers fall off very rapidly. At lower tree stockings (100 stems per ha) about 80% of the livestock on open pasture can be carried over tree age 2-10 years, and there is only a gradual decline from there on.

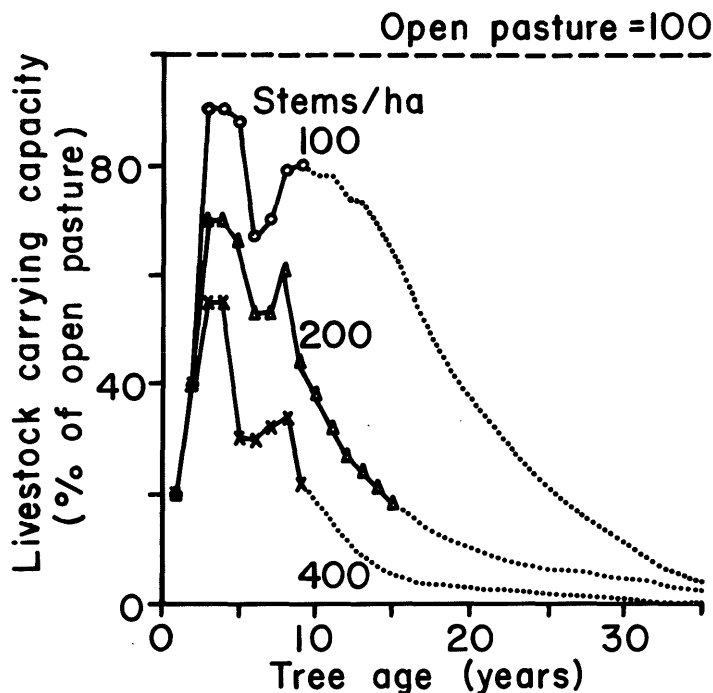


Figure 1. Predicted effects of tree age and stocking on livestock carrying capacity

It is important that the manager of an agroforest understands the interaction between the trees and the livestock. On several farms, insufficient adjustments have been made to livestock numbers as the trees mature. Where the agroforest comprises a high proportion of the total property, this inevitably leads to poor stock performance. Where the forested area is a comparatively small part of the farm any effects on either total stock numbers or performance are relatively insignificant.

Livestock performance tends to be slightly poorer at high tree stockings. The reasons for this are unclear. The effects show up as lower wool weights (Figure 2), weaning weights and ewe body condition. For ewes tupped at the same weight, the presence of trees has no effect on the numbers of lambs born or weaned. At tree stockings of 100 stems per ha or lower, the effects on performance are minor, and do not occur in all years. These effects were measured on sheep that spend their whole time under trees at a particular stocking. It

is probable they would be less significant when livestock graze under the trees occasionally. Partly because of these effects with higher tree stockings or in older stands where the canopy is largely closed over, occasional 'runoff' type grazing is more appropriate. The value of pasture that has accumulated under a forest and is utilized as 'runoff grazing' during periods of feed shortage can be considerably greater value than that from continuous grazing of the forested area.

### Tree management

In order to produce high value logs, trees in agroforests at low stockings require more intensive management than those in a conventional forest. The timing and quality of tree management is more critical in the agroforest as the trees generally have a much greater basal area growth resulting in larger butt logs (Knowles & Percival 1983), and also because the tree management has a large effect on the amount of grazing

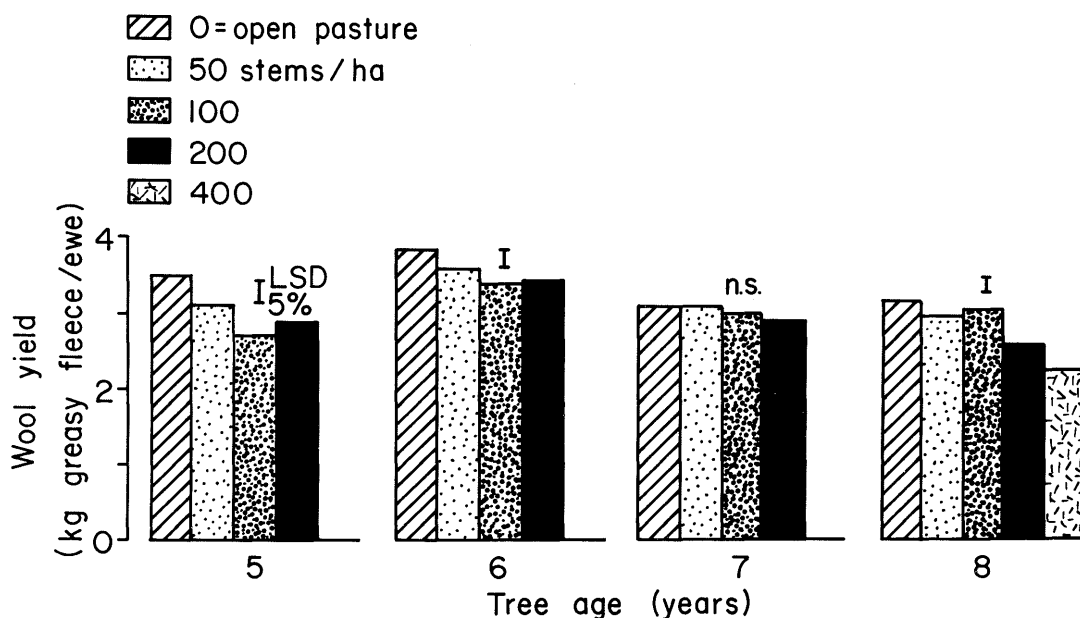


Figure 2: Effects of age and tree stocking on wool growth

available under the trees. The main objective of pruning is to produce clear timber grades from the bottom 6 m log. The amount of clearwood is strongly influenced by the diameter of the central core containing the pruned branch butts (defect core).

Management regimes have been developed for agroforestry that are aimed at high tree value and maximum agricultural returns (within the constraints of the tree crop). When the site index is over 28 (expected tree height in metres at age 20), four lift pruning starting at age four years, and successively pruning 45, 50, 55 and 60% of the height of each stem is recommended. Cull trees are felled at each pruning. The sooner the stand reaches its final tree stocking, the smaller are the effects on agriculture. If tree height growth is under 28, the first pruning is delayed until mean tree height is 4.5m.

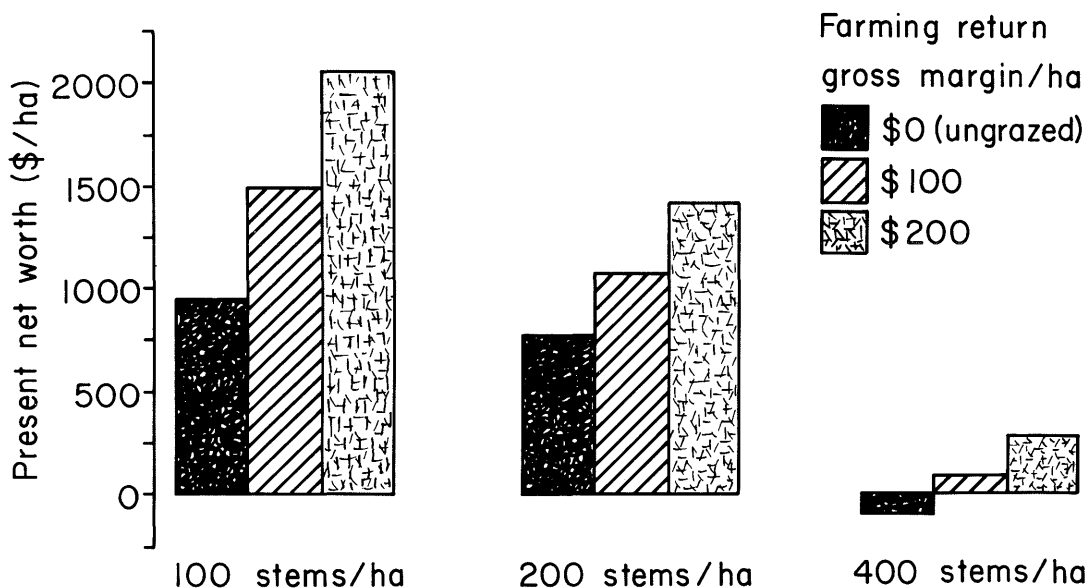
### Profitability

The forest industry is moving out of an era of untended low management systems to intensive management aimed at maxi-

mizing profit per ha. The most visible signs of this are pruned forests with relatively low tree stockings. This is occurring because the profitability of solid wood regimes producing high value products is generally much higher than the pulpwood high timber yield regimes. The initial profitability analyses of agroforestry were all based on projections of both forestry and agricultural yields. Inevitably some of the assumptions were incorrect, and hence the analyses are being updated.

Given these limitations, the profitability of agroforestry at various tree stockings has been assessed using the two levels of agricultural returns. These are based on the expected returns for King Country hill farms in 1982/83, and represent a low and high level return from sheep farming (Ritchie and Parker 1982). The outcome is expressed as present net worth (\$ per ha) for a 30 year tree rotation.

The projected returns vary greatly from around -\$100 to over \$2,000 per ha (Figure 3). Even with no farming return the profitability of a forest at 100 stems per ha



**Figure 3: Profitability of agroforestry at three levels of farming return (nil, \$100 and \$200 gross margin per hectare)**

is greater than at 200, with the 400 stems per ha regime giving a small loss. Adding in a farming component improves profitability markedly, even at the lower level of farm income. The effects of the farming component are greater at the lower tree stockings. This not only reflects the additional return from agricultural production, but also the greater tree growth (of individual trees) that occur where livestock are grazed in the forest, and reduced forest management costs for operations such as providing access and fire control.

In some circumstances maximum overall profit per hectare may not be the objective. This can arise where an individual wishes to use a forest as retirement income, producing a large cash flow at a specified time. Thus while present net worth for a 200 stem per ha regime peaks at 28 years, the consideration of \$47 per m<sup>3</sup> for the wood at 35 years compared with \$28 per m<sup>3</sup> at 25 years may influence the length of the tree rotation. It is important that people planning an agroforest have clear objectives.

### General

The long term implications of the findings on agroforestry are that large areas of hill country farmland would be more profitable if a low tree stocking were incorporated. It is of note that one of the findings of the recent Central North Island Planning Study (1983) was a similar conclusion:

"The sector (forestry) should shift from a tradition of extensive estates on

marginal back country or low fertility land to smaller scale, lower cost, clearwood regimes on better quality and more accessible sites . . . It would be both in the national and the regional interest to move towards forestry integrated with farming, based on low tree stocking rates, pastoral management which will sustain farm income, and forest management to maximise high quality clearwood production".

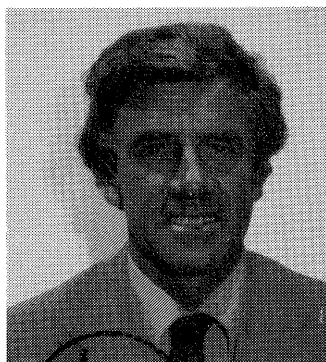
On nearly all sheep and cattle farms, part of the land area does not provide the same profit as most of the remainder. Trees at wide spacings, with a grazing input are a real option for more profitable use of these areas.

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# Farming and forestry on East Coast North Island hill country

J. M. Aitken\*



*J. M. Aitken*

## Introduction

Over the last 15 years we have planted half our farm in Radiata pine and it is our intention to maintain a sustained yield forest on 60% of our property. In most years there will be trees to be planted, trees to tend, wool to be marketed and there will be income.

To date the amount of meat and wool we produce has not fallen but the impact on our farm and family has been considerable.

The farm is in Tukituki valley East of Hastings. It is a one man farm of 400 hectares. The property winters 2000 ewes and 300 cattle. Lambing is a low 80%. Although the rainfall is 700mm, much of the land is steep and exposed to North-West winds. The limiting factor to pasture improvement is moisture deficiency.

Radiata Pine comes from Monterey where the rainfall is 300mm in a Mediterranean climate. It can be established successfully in our moisture deficient climate with the use of grass sprays at establish-

ment. As the canopy closes rainfall is trapped. In a sense we are using radiata as a means of water harvesting.

Once established radiata growth rates are well above the New Zealand average which is in stark contrast to our pasture production. In a nutshell our reason for growing radiata is higher production.

Meat and wool production has not fallen because:

- \* Land which did not produce much in the first place has been planted.(1)

- \* Paddocks which were previously used for lucerne hay production are now used for fattening.

- \* Grazing in the forest has replaced the feed provided by 7000 bales of hay.

- \* Pastures and animals are enjoying the benefits of shelter. (from north west winds on hot days and from southerly winds on cold days especially for sheep at lambing or off shears.)

- \* Over the last 15 years there have been changes in management based mainly on the recognition that the farm has production limitations.

- We changed from breeding to fat lamb.

- We lamb earlier so have a lot of stock to sell early in November.

- We have a cattle partnership with a farmer whose pasture growth pattern is almost opposite to ours. He has them in the summer, we have them in the winter. Both of us make more profit from a half share of animals going forward all the year than we did from whole ownership of cattle which went forward for half the year and not much for the rest.

*\*Hau Ora, Havelock North*



There are considerable differences between land we use for farming and land we use for forestry. These are shown in Table 1.

Physical data primarily determines best land use. From this we can apportion the likely gross margin for sheep on these two broad groups of land types. (Table 2)

To compare sheep with forestry requires a term longer than 1 year. To do this we use Nett Present Value (N.P.V.) over a period of 20 years and assume a discount rate of 10% (Table 3)

Finally we look at the cumulative effect of committing parts of our farm to particular land uses over a period of 20 years.

If farming land is devoted to sheep production the gross margin is \$201 per hectare;

under forestry the return is – \$39 per hectare.

It would be irresponsible to plant land which is profitable for farming. It would be equally irresponsible for us not to take every step possible to establish radiata on land producing a negative return from farming.

### Two-tier farming

I liken two tier farming to riding a bike and juggling eggs at the same time. It is not impossible but it helps if you have some one to prop up the bike and pay for the eggs. The problem at Hau Ora is that following planting pastures become long and rank. Cattle are required to bring that pasture back into high production. This could

**Table 1: Differences between land classes.**

	Farming land	Forestry land
Area (ha)	160	240
Topography	Arable	Non Arable
Topsoil (cms)	20–30	2.5–10
Dry matter production (kg/ha/annum)	12000	2000

**Table 2: Production data of two land classes.**

	Farming land	Forestry land
Pasture species	Ryegrass & clover	Hairgrass & Danthonia
Stock quality	Stock fattened	Store Stock
LSU/ha	15–18	2–5
Land Class	3 & 4	6 & 7

**Table 3: Nett Present Value of Returns**

	Farming Land	Forestry land
From sheep	\$1912	– \$371
From forestry		+ \$800
Two Tier (\$400 sheep & \$800 forest)	\$1200	

**Table 4: Cumulative effect of N.P.V. by land areas for four land use options.**

	Farming land 160 ha	Forestry land 240 ha
From sheep	+ \$306,000	– \$96,000
From forestry	—	+ \$192,000
Two tier (\$65,000 sheep + \$130,000 forest)	+ \$195,000	



**Land use according to land classification at Hau Ora. The hill block will be planted in trees, the balance used for pasture production.**

mean that the first 5 years are lost. There may then be 3 years of high production before the shade effect starts to diminish pasture production, pasture quality, and financial returns. By year 10 the only way that any significant pasture production can be maintained is by reducing the number of trees. Note that under two tier farming on this farm the cumulative N.P.V. from sheep falls from \$306,000 to \$65,000 and that represents a massive cash flow problem.

### **Family forest**

By 1976 25% of our farm had been planted. From a tentative start our confidence in identifying negative return land was such that we took the decision to plant all such land, that is 60% of our farm.

The sums were, 240 hectares times 20 tonnes per annum or 5000 tonnes of wood every year. Even on modest stumpages, forest income would ultimately exceed

many times the most optimistic return we could expect from farming.

It seemed to us that our forest should be a separate entity and so on the basis of land capability we surveyed 7 titles, 4 for forestry and 3 for farming. We formed a forest trust and gave all the negative return titles to our children.

The formation of a trust brought a host of benefits that we had never dreamt of and none of which could have been possible had our base remained that of a grazing unit.

\* We were able to spell out to our children at an early age what their inheritance prospects were likely to be. It brought a sense of direction.

\* We could divide our estate equally.

\* We could provide our children and their friends with work opportunities. Most

of the forest costs are labour, in our case about \$10,000 a year.

\* Our family forest could go on in perpetuity.

\* The presence of a forest could provide part time work for future owners or managers of our farm and ensure that their standard of living was as good as anyone else in the countryside. It is not uncommon for stock agents and the like to efficiently manage as many animals as I do and in their spare time. I don't think we can ignore the reverse possibility that some farmers in the future will need supplementary employment and income.

In the course of a study tour of farm forestry in Finland(2) we learned that 170,000 land owners had been taking these advantages for granted for centuries. It starts with land use. They had a rule of thumb which said that land which can sustain improved species of grass and clover is for grazing. Land which sustains unimproved species only is for forestry. The key word is sustain.

Today as farming in Finland becomes more efficient low yielding cropping land is no longer required for that purpose and is increasingly being afforested.(3)

### Finance

The Finns have it that after land use, the principle of utmost importance is the provision of 100% of costs to farmers if forestry is to realise its full potential, on farms.

This had been the case since their Forestry Act of 1917. Wood is as important to them as primary production is to New Zealand. It makes up half of their export earnings, and 80% of that wood comes from 170,000 farmers out of a total population of 2.5 million.

In round figures N.Z. forestry costs \$1000 per hectare. So if we were starting today we would need to make provision for \$250,000 to be spent over the next 20 years and before any income could be expected.

We have experienced at least 9 different forms of finance over the last 15 years and this has been a major problem. Only the first in 1968 and the last in 1983 have recognised the Finnish principle of 100% finance. The first was the Forestry Encouragement Loan which was overtaken by inflation but without which we would never have planted a tree. The last was a joint venture with Odilins Tree Farms Ltd (4). Table 5 shows the obvious attraction of 100% finance to a marginal one man farmer contemplating afforestation.

### Marketing

To invest \$250,000 long term and remain remote from the market place is close to being foolhardy. Whereas some would see marketing commitments in a joint venture as a constraint, I take the opposite view. If the timber company investor is to realise a return on investment so will I. The timber company can also influence forest management to ensure that the type of wood produced is marketable. We welcome the

**Table 5: Forms of Forestry finance.**

Year	Source	Other Contributions %		Farmer Contribution \$	
		Planting	Tending	Total	
1968	F.E.L.	100%	100%	Nil (i)	
1975	F.E.G.	50%	25%	\$168,000	
1977	Catchment Board	50%	Nil	\$216,000	
1977	Partnership	49%	49%	\$ 90,000 (ii)	
1982	F.E.G.	45%	45%	\$112,000	
1983	Joint venture	100%	100%	Nil	

(i) Until inflation reduced real value of forest loan

(ii) Lower costs accrue from tending methods

marketing commitment made by the investor in the joint venture as much as the 100% finance, knowing that we are protected by an independent valuation of the crop at the time of harvesting.

### Summary

We have found that the three cardinal points of successful farm forestry are land use, finance and marketing.

If we plant land which is profitable under grazing, then our land use is bad and our cash flow is heading for serious trouble. If our land use is good but we can't finance it, then we are heading for trouble. If our land use and finance is good but we choose to ignore marketing, then maintaining family confidence, over the long investment period required to establish a sustained yield forest, could be difficult.

The current vehicle for linking these three cardinal points into a package is a joint venture. The Finns have an equally overworked term for it — economic cooperation. You can call it the Culverden contract — the words don't matter, but I suggest that both the principles involved and the spirit with which the link is forged are very important indeed.

Figure 1 shows the interaction between the farmer, the companies and the state as described to me by Dag Kiblohm in the Swedish Forestry Boards offices in Jonkoping Sweden. As in Finland the Swedes have cooperatives for just about everything except forestry. They tried cooperatives but found them unsuitable.(5)

### The Future

This winter Odlins Tree Farms Ltd are planting 130 hectares in the Tukituki valley. We hope this will continue for 20 years or so by which time a farmer/industry owned forest resource of 3000 hectares will have been established. Given this, it is reasonable to contemplate a joint venture processing plant. The Finns would call this Metsaliitto.(6)

Our attitude is that investment money will continue to be available as long as the

opportunities for profit are as good in the Tukituki as they are anywhere else. There is a great deal that a group of local farmers can do to create this investment climate. Attracting such investment is likely to be competitive and quite different to the almost universal availability of Rural Bank incentives. The Finns would call this group of less than 10 Tukituki farmers a Forest Management Association. They will tell you that of the factors influencing growers' profit margins pruning and thinning practice is of much less importance than the ability of small groups of farmers to get alongside industry personnel to ensure that there is an appropriate range of plant to process wood and to market it. Growing pulpwood efficiently could be more profitable for a farmer than growing clearwood inefficiently.

We have found it necessary to develop methods of work appropriate for a family farm. As a result the appearance of the forest, the form of the trees and the methods of achieving this bears little relationship to normal forest practice. By thinning as soon as faults appear and by selectively removing branches before they get too big we are able to rely less on the rugby fit forest worker types and more on women, children and retired rugby players. Our approach is intensive rather than extensive.

We have found that by controlling competition from grass and leaving branches on trees, until they cease to make a photosynthetic contribution, we will probably achieve rotations of 20 years or less in the future. We are capitalising in part on the fact that, while the land has become uneconomic for grazing, it has nevertheless a better growth potential than land previously available for forestry in New Zealand. For these reasons Dr Nils Osara told F.A.O.'s Committee on Forestry, Rome, 1976 "It is therefore understandable, from the point of view of a strict cost benefit evaluation that inputs in private forestry are often likely to present opportunities which exceed those possible in state forests.(7)

## Conclusion

We confidently expect our particular mix of farming and forestry to allow our farm to stand on its own feet without being a drag on the public purse. Through joint venture the same can apply to the Tukituki Valley. There are probably other hill country districts where radiata in conjunction with farming can also overcome production limitations and bring about a return of prosperity to the countryside.

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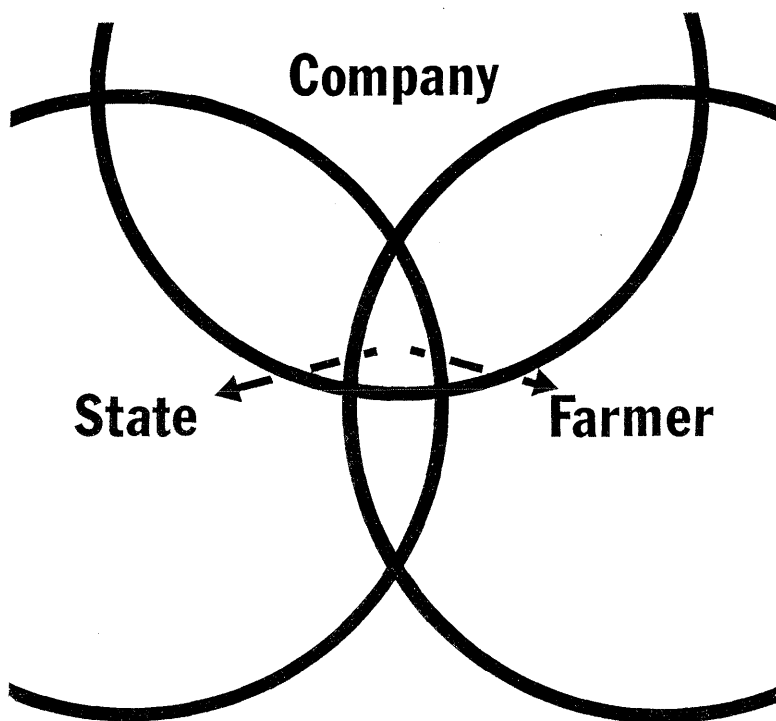
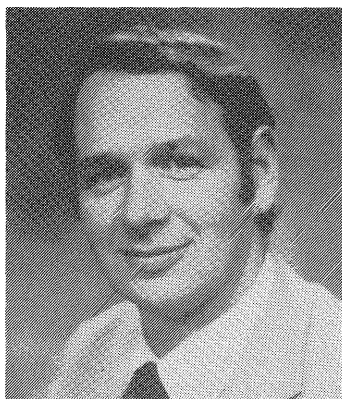


Figure 1: Economic Cooperation

# “Diversification That means farm forestry too!”

E. R. H. Garden\*



*E. R. H. Garden*

I am convinced that the majority of hill and high country farmers lack the foresight for, and understanding of farm forestry —

*\* Avenel Millers Flat*

so my comments will be directed to those who have yet to be persuaded.

When I travel through the hinterland of Otago, from Lawrence to Middelmarc, Maniototo to Palmerston, Central Otago, even my own area of Teviot, then through the Mackenzie Country and the foothills of Canterbury, I cannot help being struck by the lack of trees on the landscape — and I am aware of the consequent deprivation to both man and beast.

I farm “Avenel” in partnership with my brother, Pat. There are 5000 ha running 18600 stock units, which include: 10600 breeding ewes, 300 breeding cows and 450 deer.

The altitude ranges from 400m to 900m. Rainfall varies from 635mm to 760mm. The property has a southerly aspect and on a clear day we can almost see Mt Erebus.



**Lack of trees on the winter landscape**

The winters are cold with a fair share of snow.

We began our forestry program in 1973, and to date have planted and tended 95 ha. A further 95 ha is planned for the next 10 years, and this will bring the total area of land in trees to ten per cent of all the land under 730 metres. The following is a list of species planted to date.

Pinus 48 ha

Douglas fir 23 ha

Eucalypts 19 ha

Macrocarpa 5 ha plus minor species.

Of the species listed we have tried four varieties of Eucalypts, *E. Johnsonii*, *E. Nitens*, *E. Regnans*, with *E. Delegatensis* predominating. *Regnans* have proved to be too frost tender and will not be used until a hardier provenience is found.

We have also planted Poplars, Acacia Melononylon, Black Walnut and Leyland Cypress, and plan future plantings of Cup. Lucitannia, Oaks and some native species.

I mention these different species because I believe that the private small grower has

to concentrate on specialty timbers, or high value timbers. If Pinus is to be grown it will have to be pruned and thinned with the greatest degree of attention.

The State and large companies, I believe, will provide this country with more than sufficient bulk commodity, mediocre quality timber. I don't believe that farmers can justify growing pinus of poor quality — untended, unpruned.

Traditionally, trees, with the exception of eucalypts, are planted at 1500–2000 per ha; and are thinned in 2–3 stages down to 250–300 per ha, as they compete one with another for light. Pruning is done in three stages, so that at no time does the trunk have a diameter greater than six inches with the branches attached. Once the branches are removed, all the growth beyond that six inch knotty core is knot-free — **That is the high value timber.**

If however, farmers feel their cash-flow cannot stand the relatively high costs of pruning and thinning, two options are open to them.



**Trees and grass, Avenel.**

1. Plant a species like Eucalyptus which is self pruning but is still a good value timber.

or

2. Plant pines in a wide-spaced regime. This dramatically reduces costs, but good tree form is difficult to achieve. Given good tree stocks and good growing conditions this option could be taken. There is evidence that this is the most economical system. We have not been able to take this option because, for reasons described later, our tree form has been too poor.

Shelter is a major consideration in all our plantings. We endeavour to site all our woodlots to obtain the maximum shelter.

### **Grazing**

Further, it is our objective to graze our woodlots. This in itself is an art the potential of which we have not yet reached. We normally have a special mob (sale ewes or works ewes) which rotate round the woodlots, starting with the older trees and progressing to the one year old blocks. Grazed this way, the sheep lose their craving for tree foliage.

Douglas Fir, Eucalypts and Macrocarpa are all included in the grazing regime. There are two aspects to consider:

1. Graze lightly then return — i.e. rotational grazing.

2. Plan woodlots of a reasonable area to justify putting a mob of sheep in the block.

However, it is difficult to mix species and include ornamentals. It is also important to have the optimum initial establishment — variation in types and sizes of trees in one block results in damage.

### **Labour**

It has been our practise to use contractors for the bulk of our forestry work, but one of the most interesting developments in our enterprise is that we now employ someone specifically for forestry work. Contractors will still be used for some of the bulk work, but our employee will be used for the fine tuning — spraying, blanking, releasing, planting wide spaced

regimes, amenity planting — doing the more detailed work which we ourselves would like to do if we weren't always at conferences or speaking at seminars!

The other major advantage, is the attention we can give to pruning. We have had a major problem with poor form and gross branching in our radiata. This has been caused by: Poor tree stocks, Boron deficiency and our early practice of planting pines on the heavier soils of our darker back-lying faces. As a consequence we have had to form prune or corrective prune — something contract gangs can't cope with — too many variables. Our own employee gives us flexibility in all aspects of our work.

### **Bees**

Coupled with forestry work this employee is responsible for working with the bees — we have 100 hives of our own — as well as other farm related work.

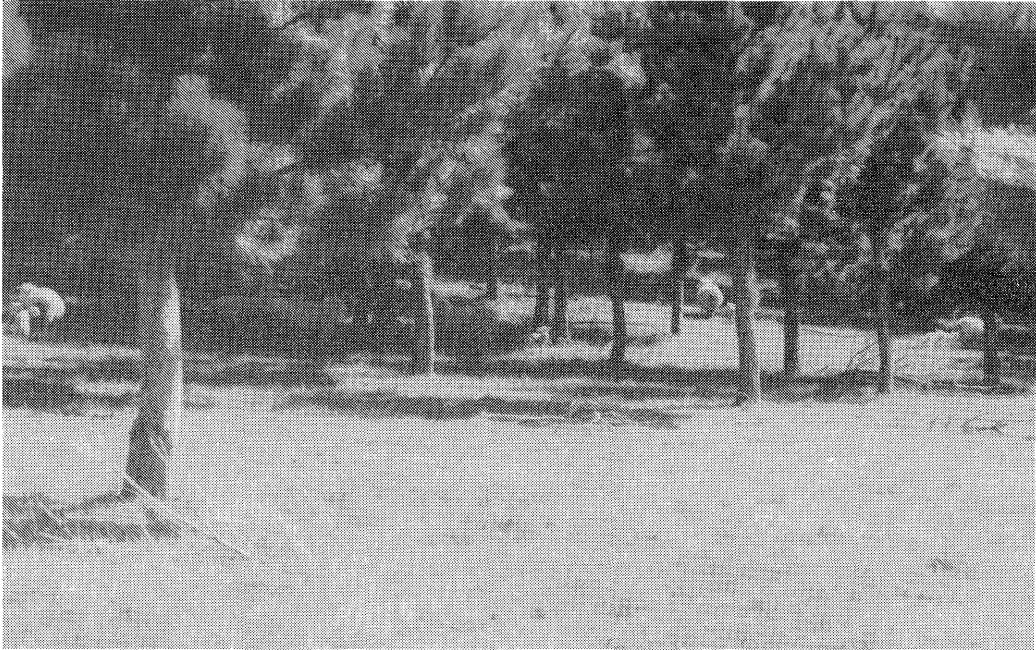
The seasonal workload of trees and bees is compatible. However, the temperament required to work both is different. Forestry work is physical but one dare not become physical with bees. A sense of humour is also required.

We diversified into bees because we had undertaken a large development program with *Maku lotus* on country with a very low phosphate level and low pH which, in our opinion, was ideal for this plant. However we are dependent on natural reseedling. Commercial beekeepers find the altitude and distances involved uneconomic, so we depend on our own bees for pollination on this high country.

### **Why trees?**

We are keen on trees, our families are and we like growing them. I am an enthusiastic propagator (vegetatively speaking) and we produce our own Cup. Leylandii and other ornamentals for the farm. I have a son who makes huts in the slash of pruned woodlots, and everytime we pass one particular lot on the bike together, he says, "Dad, when I grow up, I'm going to build





### Lambing shelter

my house from those trees.” What better reason for growing trees do I need?

Secondly, we believe that there is a great need for shelter on this class of country. With respect for the policy-makers, one of the greatest tragedies of recent times in this country, has been the development of higher harder hill country with LDEL, without shelter being an integral part of the development programmes. To utilize this development, farmers are being forced to defy climate cautiousness. I wonder how many storms like the one we had at Labour weekend 1982, are needed to bring the message home?

One of the most compelling arguments for diversification be it deer, bees or trees, is our desire to make Avenel as strong a unit as possible, with as broad a base as possible to insulate it from commodity down-turns.

Forestry though, cannot be considered in the same context as deer. I believe the marketing, processing, animal health, hygiene and political influences, will in time, say

10–15 years, relegate the deer industry to a plane closer to our traditional pastoral industries.

Forestry, on the other hand, provides a capital resource for the future. It is unlike crops of wheat, lamb or wool which all have to be harvested within a rigid time span. Trees can be left standing, growing in value until the capital is required. A very flexible crop.

A growth trial is currently being conducted at Avenel on a 10 year old block of radiata, and the computer model tells us that from the age of 17 to 40 years those trees will grow an extra 30m<sup>3</sup> per ha, per year. At current stumpages of \$30 per m<sup>3</sup> that is \$900/ha annual increment. That flexibility I referred to means that the asset can be realized at anytime to meet specific financial commitments. Such as death duties, retirement funds, the funding of an enterprise for a member of the family or for freeholding deposits! Further to this, our operation could be a specialist enterprise on its own for one of our sons. There

will be sufficient production to justify our own breaking down sawmill thus adding value to product.

Alternatively, when I am considered to be a senile old twit by my two boys, who want to get on with the job of farming and collecting their SMPs, I'll have a retirement enterprise and that is most important.

Some people invest in Broadlands, Brierleys, or Forest Products. Why not on our own farms? I've given you some of the justifications, I must say though, that the dedication and perserverence required because of the long term aspects, is greater than for any other of our enterprises.

### **Financial aspects**

Forestry requires capital and a reasonable cash flow to ensure that pruning and thinning is not restricted. Regrettably this limits the activities of farms in the early years. Currently we are spending 30c/s.u.

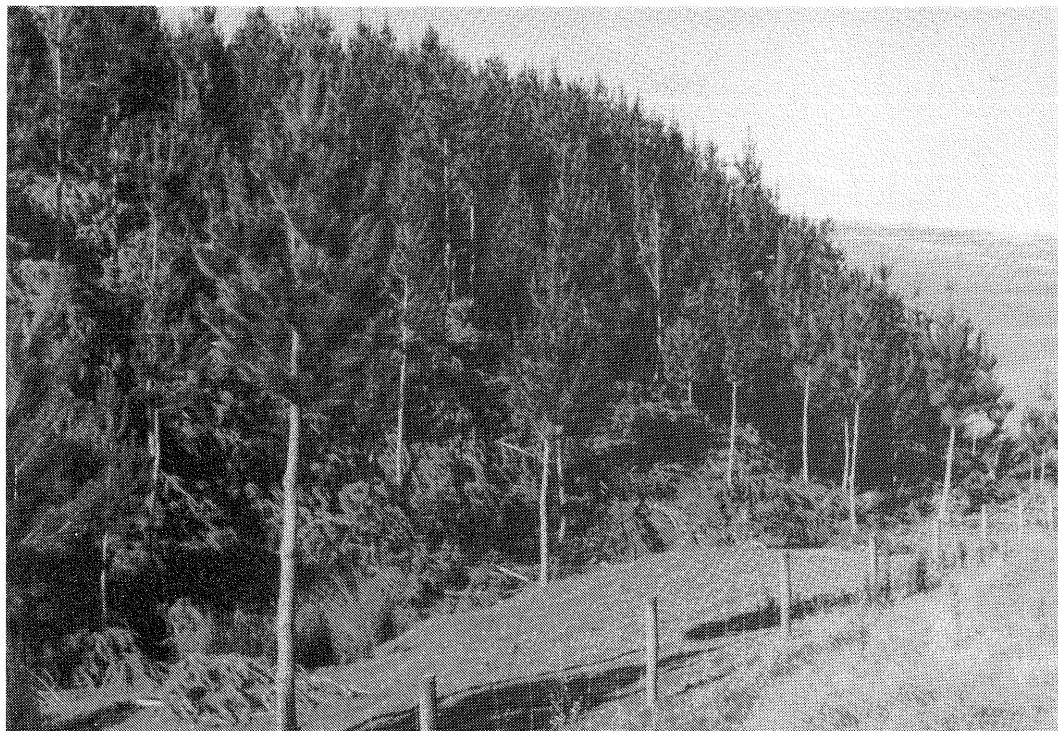
Establishment pruning and thinning costs about \$740/ha net of grant, at current costs.

I don't pretend to know what our timber will be worth in the future, but what I do know is that sawn timber from pruned logs (i.e. clearwood), is worth 2½ times more than sawn timber from untended trees.

We expect a yield of 540/m<sup>3</sup>/ha (Radiata) and this could be a return of \$22000-\$25000/ha. But I'm reluctant to be specific about financial returns because of the many other aspects which have to be considered.

1. Shelter for grass and stock.
2. The need to complete the landscape scene.
3. Creating a capital resource.

These thoughts do little for our seasonal financier, but I'll continue to try to convince him that "Avenel" has a future.



**Capital resource for the future**



# “It’s different out of town”

## A study of the cost of rural fire insurance and rural fire control

T. A. Roberts\*



*T. A. Roberts*

A management consultant will tell you that if you are hiring staff to pick apples and a male apple picker can pick six bushels an hour and a female picker five bushels an hour, both together will pick 11 bushels an hour. Any farmer will tell you that the probability is that they will pick less and there is a possibility that they will pick no apples at all. The moral of the story is that there is no substitute for practical experience, and that perceptions and ways of doing things are different in rural areas because circumstances are different in rural areas.

There is a need for many activities in rural areas to be looked at and assessed through rural eyes and there is no difference between insurance and any other activity in this respect. There is also a need for rural dwellers and rural interests to consider how insurance works for them, and what rural fire control costs them. They should make a hard-headed assessment

based on a knowledge of the special circumstances that affect those needs and not ignore the fact that it is different out of town. Both the cost and operational considerations of insurance and fire control are inextricably intertwined as a result of economic and legal factors.

In general terms there are three factors which need to be taken into account, all of which differ from the urban scene:

- (a) Economic circumstances
- (b) Physical considerations
- (c) Legal considerations

Inflation affects the rural sector differently and, in some respects, more acutely than the rest of the economy. This directly influences the writing of rural fire insurance and its cost.

Firstly, a comparatively high proportion of insured rural risks would need to be replaced by using overseas funds so that inflation and the devaluation of the New Zealand dollar markedly increase the amount of cover required to replace assets and maintain production. Most plant and machinery is imported or has a high imported content. This is true not only of farm machinery but of processing plants in rural industries.

Secondly, there has been a tendency in the rural sector to meet inflation by increasing productivity by replacing labour with plant and machinery. This means that risk accumulates as the capital increases.

Thirdly, the accumulation of risk on farming properties is accelerated directly by inflation and by the rise in farm values. Demand for farmland has for some time outstripped supply and this has reflected in

*\*Insurance Council of New Zealand*

the cost of farms. That cost is shown not simply in the value of land but in the value assigned to other insurable farming assets.

It should be expected then that the cost of rural insurance would rise. In fact the reverse has tended to be the case and, over a period of many years, cost of insurance as a percentage of on farm costs has declined as competition has benefited the rural insured.

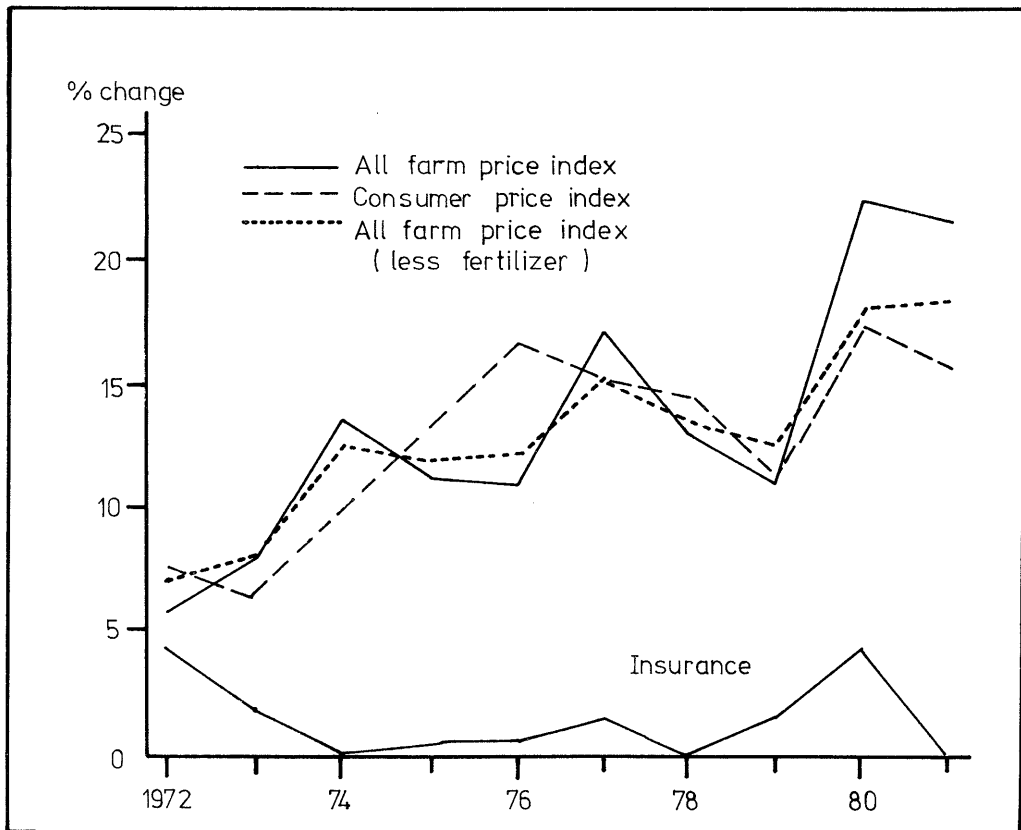
In 1971, as a percentage of total farm expenditure, farm insurance costs represented 1.07%. In 1981, insurance costs represented .35%. The decline in cost has taken place notwithstanding the problem of increasing risk accumulation. Figure 1 and Table 1 illustrate the position.

The accumulation problem is not merely a function of inflation but also of the increased sophistication of farming operations. I can do no better than to quote at length from a paper on farm insurance presented to a seminar in 1981 by Mr R. P. White of Farmers' Mutual Insurance Association:

"There is always something new to be insured, which continually tests the flexibility and the ingenuity of the insurance market and while we can always claim flexibility, unfortunately our ingenuity lets us down on occasions and we pay the penalty.

"Two such occasions were the recent deer and goat price booms with resulting

**Figure 1: Change in consumer, all farm and all farm (less fertiliser) prices indices**



**Table 1: Annual percentage changes in all farm cost price index**

Year	Weightings	1971-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81
Wages and rations	(13.7)	11.1	10.9	14.6	14.9	13.4	13.0	11.4	17.0	19.4	24.9
Sharemilkers	(5.4)	26.9	11.2	17.4	-15.1	2.9	11.3	9.4	15.5	18.8	-13.1
Animal health and breeding	(3.2)	-0.4	9.4	14.2	10.5	11.0	16.4	13.2	8.7	12.5	13.6
Electricity	(1.3)	3.4	.5	2.1	1.4	21.7	58.4	28.3	13.5	28.8	4.1
Feed	(8.5)	3.2	12.1	18.5	15.2	5.4	15.2	13.2	8.3	13.4	18.4
Freight	(2.9)	7.0	3.7	10.2	23.9	12.4	12.6	14.3	12.0	21.6	21.3
Fertiliser and lime	(11.2)	-2.2	4.5	23.7	5.9	1.4	37.1	9.0	-1.2	66.7	43.3
Seeds	(1.3)	-6.8	14.7	43.4	-11.7	2.5	33.0	18.1	6.2	21.9	8.5
Shearing expenses	(3.6)	7.4	4.3	13.3	20.6	12.0	14.5	19.3	14.1	13.0	21.5
Weed and pest control	(1.3)	3.9	2.7	23.7	26.0	16.8	12.5	7.6	6.4	19.7	19.5
Other farm working expenses	(2.8)	5.6	6.2	8.9	23.6	21.7	20.8	13.2	5.1	15.5	17.8
Repairs and maintenance	(8.7)	3.9	10.4	9.6	18.1	19.9	16.7	16.9	13.6	17.1	20.4
Vehicle expenses	(2.9)	6.3	5.6	11.9	21.8	17.3	16.3	16.1	12.5	25.0	23.2
Administrative expenses	(2.9)	8.4	7.9	7.9	12.8	16.3	12.8	18.4	13.0	20.8	33.1
Insurance	(1.1)	4.3	2.0	0.1	0.5	0.7	1.7	0.0	1.5	4.4	0.0
Rates	(3.1)	6.5	14.9	12.3	12.3	17.0	23.8	15.4	15.3	17.2	17.5
Interest	(10.0)	2.7	2.6	3.5	4.9	5.4	4.2	4.9	8.4	7.4	9.2
Rent	(1.7)	1.2	0.1	1.2	3.3	7.4	9.3	9.6	1.1	-0.6	-0.6
All groups		5.8	7.8	13.6	11.1	10.7	17.1	12.9	10.7	22.4	21.5

*Source: Monthly Abstract of Statistics*

requests for insurance on these valuable animals. It became quite commonplace to issue covers of \$12,000 a head on deer and \$7,500 a head on angora goats. Unfortunately, it also became quite commonplace to pay claims for both types of animals with almost the same regularity as the completing of proposals for them. Fortunately commonsense has prevailed. Prices are now at a more realistic level, the small print has been extended a little to help improve the mortality rate and premium levels are more commensurate with the risk undertaken.

“Wind machines, to keep frost away from fruit trees, are gaining popularity with orchardists. Standing some 35 feet high with a propeller of 18 feet in length, one wind machine can, by moving large volumes of air keep a 10 acre area free of frost. With the Clean Air Bill likely to ban the use of oil pots, there would seem to be a big future in wind machines in New Zealand. Cost is about \$18,000 per machine.

“Mobile irrigation units are gaining popularity also. These units are designed so that they operate themselves without supervision, and can be programmed to cover huge areas of land automatically, irrigating at an average rate of about 4,000 gallons an hour. Some models are quite awesome in appearance, with a boom of 225 feet in length, mounted upon a huge tractor unit. The mind boggles at the thought of one of these monsters cutting loose and heading off cross country, taking all before it. Their cost can range from \$20,000 to \$50,000. “Finally farmers are now requesting computer insurance. Insurance on mini computers that can be programmed to control stock movements within paddocks, fertilizer usage, stud records, accounting records, to name but a few uses. A sure sign that even farming is becoming part of the computer technology age in which we live today.”

Such examples could be multiplied almost endlessly.

Any variation in the cost of insurance is likely to bear heavily on the cost of production especially if insurance capacity shrinks during adverse terms of trade. Insurance is an important part of the cost of transport of New Zealand produce to market and increases in premiums or in losses, must in due course be reflected in farming costs and farming profitability. It is thus in the interest of the rural community to encourage, indeed to insist on, the best possible practices in risk management in the processing of our primary produce and in the best available controls and practices in both the production and shipping of that produce. In short, dairy factories, freezing works, packing sheds, coolstores and the like should have the best available fire protection and risk management, and the shippers and handlers of produce should be required to adopt the best available practices in respect of goods handling, fire protection and security.

### **Physical considerations**

The different circumstances which need to be taken into account are fairly obvious.

- (a) Most rural risks are a considerable distance from fire fighting services.
- (b) Few rural risks have convenient access to reticulated high pressure water supplies.
- (c) Most rural risks tend to be isolated and therefore, insecure.
- (d) In the event of loss, salvage of rural risks is often difficult, expensive and inconvenient.
- (e) High transport and building costs make replacement and reinstatement of rural losses, costly.
- (f) Some types of rural risk (hay sheds are a good example) are by their very nature especially vulnerable.
- (g) Seasonal fluctuations in insurance needs pose an additional problem. Short term storage of wool, horticultural products, hay, grain, stock feed, fertilisers, agricultural chemicals and the like, create special problems of risk

accumulation and in some cases, hazards.

All these factors need to be taken into account in assessing insurance needs and insurance costs. They also influence operational considerations, the way in which fire control is dealt with, how much it costs, and ultimately who pays or who ought to pay.

### **The legal and legislative background**

There is a widespread perception that the cost of providing fire services and protection against loss by fire falls inequitably upon the rural sector. First, it has to be recognised that in practical terms much of the rural sector does not, and in the final analysis cannot, receive effective coverage from the New Zealand Fire Service. Many rural risks simply are not within reasonable distance of a fire station. Cost factors prevent the provision of widespread coverage to rural properties on the same basis as that afforded urban properties, and it is a matter of pure logistics that will always be the case.

Furthermore, the special circumstances of the nature of rural fire and the way in which it is controlled have produced special legislation, notably the Forest and Rural Fires Act 1977, designed to deal with the special problems of fires in rural areas. The headnote to that Act describes it as an Act to consolidate and amend the law relating to the safeguarding of life and property by the prevention, detection, control, restriction, suppression and extinction of fire in forest and rural areas and other areas of vegetation.

The cost of the Fire Service is provided substantially from insurance related sources. The budget of the Service will amount to in excess of \$85 million this year (it was \$73 million last year) and of this considerable sum some 72½% is expected to be provided from insurance related sources. The first of these is the Fire Service contribution provided under Section 47 of the Fire Service Act, which in general terms provides that 22% of all fire

insurance premiums are to be paid by the insurance company to the Fire Service Commission by way of contribution. In addition there is a levy on policyholders, under Section 48 of the Act, amounting to 3.5 cents for every \$100 of the sum insured. The contribution and levy are payable in respect of all insurance written whether fire services are readily available or not. Whilst it is undeniable that in some cases rural dwellers receive direct and suitable coverage from the fire services, and all rural dwellers and enterprises may expect to derive some indirect benefit from both the fire related and non-fire related activities of the fire service, the most substantial benefit from the fire services is obtained by the urban and suburban rather than the rural insured.

Regarding the effect of the Forest and Rural Fires Act 1977 and related problems arising from the operation of the common law, I suggest that there are basically two questions to be considered:

(a) Who pays for cost of fighting a rural fire?

(b) If damage is caused by the fire, who is liable and when are they liable?

The relevant part of the Act is Part III which can be found in the Act under the ominous heading "Fire Control Finance". The relevant sections which are 41 to 54 inclusive, are intended to be a complete code designed to answer the interesting question in respect of rural fire, "who pays?" Section 41 defines what is a "cost" in relation to fire control measures and in summary the term includes just about anything. It includes all expenditure whether by wages and other remuneration, charges, expenses, losses and other outgoings, and in particular is intended to cover the cost of charges for the use of apparatus and the remuneration of employees of fire authorities. Section 42 provides statutory authority for certain charges to be met by a Fire Authority or by the Fire Service Commission on a discretionary basis.

Section 43 is the first important provision and I quote it in full.

"43. Recovery from person responsible for fire — (1) Where any property has wholly or partially been destroyed or damaged by or safeguard from an outbreak or threat of outbreak of fire, and responsibility for the outbreak is acknowledged by, or is established by action or otherwise as caused by, any person —

(a) The costs of control, restriction, suppression or extinction of the fire may be recovered from that person by the Fire Authority or the New Zealand Fire Service Commission or the eligible landholder or eligible landholders of the forest area affected, as the case may be, incurring those costs pursuant to fire control measures under this Act; and

(b) Any loss in, or diminution of, value of that property, and any consequential loss or damage not too remote in law, may be recovered from that person by the owner of the property.

(2) The amount of the costs so recoverable may be wholly or partially established by agreement, or by a Rural Fire Mediator, or by proceedings under section 48 (4) of this Act.

(3) This section shall be deemed to be supplementary to and not in substitution for any other rights of recovery that may exist in law or by enactment or otherwise howsoever.

(4) Before imposing any levy under section 46 or section of 47 of this Act, a Fire Authority shall reasonably endeavour to recover its costs pursuant to this section."

It will be seen that wide powers are provided by the Section and that to establish any liability, the Fire Authority or the Forest Service, or the Commission, as the case may be, must:

(a) Show that any property has been destroyed or damaged or safeguarded from the threat of fire.



(b) Establish that responsibility for the outbreak has either been acknowledged or established by some form of action.

Once that is shown:

(i) The cost of control, restriction, suppression or extinction can be recovered from the person responsible by the Fire Authority or the Fire Service Commission or an eligible landholder.

(ii) The owner of the property destroyed can recover the loss in or diminution of the value of his property.

The amount of costs recoverable can be established by mediation but at that point the “crunch” comes. The Fire Authority is required to reasonably endeavour to recover its costs pursuant to Section 43. If it can’t or doesn’t do so then it has authority to levy in terms of Section 46, 47 and 48 of the Act.

The Act also contains rights of appeal and perhaps what is more important, rights of recovery.

This brings us to the question of “who pays” to extinguish and control fire and this is indeed a complex matter. In urban areas the cost is borne by the New Zealand Fire Service Commission which exclusively services such areas. In rural areas it is an entirely different matter. New Zealand is split into various areas which may come under the control of either:

- (a) The New Zealand Fire Service Commission
- (b) The Local Fire Authority
- (c) The New Zealand Forest Service.

It is the second and third of these categories which fall within the scope of the Forest and Rural Fires Act 1977.

Sections 46 and 47 of that Act state that in the event of fire the cost incurred extinguishing the fire is payable by any person “who is determined” by the Director (with the approval of the Minister). In other words the Minister of Forests or any person approved by him decides who pays.

The majority of persons exposed to liability under the Act are persons who live, own property or work in rural areas. Section 48 covers the imposition of levies and their recovery. It is desirable to quote these three sections also in full.

“46. Levy for costs of fire fighting in districts other than State areas — (1) Subject to section 47 of this Act, in any case where a Fire Authority for any district other than a State area has incurred any costs of and incidental to fire fighting operations directed towards the control, restriction, suppression, or extinction of a fire in its district —

(a) The whole or any portion of those costs may be met by all or any of the persons on whom a levy could be imposed under this section, as they mutually agree:

(b) Failing any such agreement, or so far as any such agreement does not extend, the Fire Authority may, for the purpose of recovering the whole or any part of those costs, in accordance with this section impose a levy for such sum or sums as it may specify on all or any of the following persons —

(i) Any landholder in respect of any land in the district:

(ii) Any owner, lessee, licensee, processor, or occupier of any property which was in the district at the time of the fire and was menaced by the fire.

(2) Except in the case of a district in which the whole or substantially the whole of the land is occupied for farming purposes, no such levy shall be imposed under this section in respect of any land normally tilled or grazed, or any building (including a dwellinghouse) occupied for farming purposes, or any chattels thereon or therein.

(3) In no case shall land formally retired from pastoral use under a Soil and Water Conservation Plan, and not used for production forestry, be liable for any such levy.

(4) In determining whether a levy is to be imposed under this section and the amount of any such levy, the Fire Authority shall have regard to the following matters:

(a) The value of the property which has been saved and for the protection of which the fire fighting operations were to any extent directed:

(b) The extent of the assistance in connection with the fire fighting operations rendered by or on behalf of any person upon whom the Fire Authority may be entitled to impose the levy:

(c) The extent of any loss suffered by any such person as a result of the fire-fighting operations:

(d) Such other circumstances as the Fire Authority considers relevant.

(5) In assessing the amount of the costs so incurred the Fire Authority may take into account the salaries and wages of its officers and servants during any period outside their normal hours of work while they were engaged in the control and suppression of the fire and in work arising from the fire.

47. Levy for costs of fire fighting in State areas — (1) Notwithstanding anything in section 46 of this Act, in any case where there has been an outbreak of fire which has menaced any State area or anything thereon and which has been controlled, restricted, suppressed, or extinguished by any Fire Officer or other person duly authorised in that behalf, the whole or any portion of the costs incurred shall, if the Director-General (with the approval of the Minister) so determines, be payable by all or any of the following persons:

(a) Any landholder in respect of the land on which the fire occurred:

(b) Any owner, lessee, licensee, possessor, or occupier of any property which was menaced by the fire.

(2) The amount of the costs so determined by the Director-General to be payable by any person shall be paid into

the Public Account at such times and by such instalments as the Director-General determines, and that amount shall be recoverable in any Court of competent jurisdiction as a debt due to the Crown.

48. Imposition of levies, and recovery of levies and other money —

(1) Any levy imposed under section 45 or section 46 of this Act shall contain the date upon which the levy is payable.

(2) Notice of every levy made under section 45 or section 46 of this Act shall be given to each person upon whom the levy is imposed or who is liable to meet the levy.

(3) In every case where a levy has been imposed upon the Crown under section 45 or section 46 of this Act, or expenses have been or are to be incurred by the Crown under this Act, the amount shall be paid out of money appropriated by Parliament for the purpose.

(4) All money payable to or by any person or Fire Authority under this Act and all legal or other costs allowed on any appeal under this Act may be recovered as a debt in any Court of competent jurisdiction.”

Ignoring the owners of dwellings, we are left with farmers, forest owners, land owners and persons working in connection with any of these occupations. If any of these persons are legally liable to pay for fire fighting costs then their normal public liability or personal liability insurances would be available to meet any claim. However what happens when there is no negligence, legal liability or property damage and the Minister exercises his rights under the Act, is an interesting and complex question. The person concerned can have no claim under any public liability insurance and has to pay the cost involved himself.

4.12 The Act then distinguishes between three classes of people who can be held responsible for the cost of fire fighting:

(a) The person causing the fire

(b) The land owner on whose land the fire occurred

(c) Any or all land owners in the district whose land is either threatened or involved in the fire, and the Fire Authority involved can recover from any combination of these people with the important question implicit of not explicit in the Act, being no doubt the ability of the person concerned to pay. In other words, the apportionment of cost is essentially quite arbitrary.

The difficulties can be seen if we consider some practical examples. Assume the case of a farmer who owns a paddock which is struck by lightning which causes a fire. Assume also that the fire spreads into an adjoining patch of standing bush or an adjoining plantation. The New Zealand Fire Service is called but as the nearest fire station is some 40 kilometres away the service calls in the Forest Service to assist, this facility being only 15 kilometres from the seat of the fire.

The Forest Service takes control calls in helicopters and eventually extinguishes the fire. The total cost involved is \$50,000 and by virtue of Sections 46 and 47 of the Act the Minister sends an account to the farmer for the cost of extinguishing the fire. The farmer has an ordinary farmers public liability policy and he presents his insurer with a claim form and an account for \$50,000. The insurer investigates the claim, finds that there is no negligence on the part of the farmer, as the cause of the fire was an Act of God as opposed to an accident, but more important there was no damage to property. The claim is declined but the farmer still finds himself with an account for \$50,000. If the farmer can't pay then it is open to the Minister to apportion the cost between all land owners in the area. Similar circumstances could arise as a result of a tractor suddenly bursting into flames while working in the bush, as a result of building paper being blown across power lines, or as a result of a passing motorist carelessly disposing of a cigarette end. These are all actual occurrences and in each instance it has been open to the Minister of Forests, or his appointed

representative, to decide on allocation of cost.

Insurance cover for rural fire fighting costs is available from some underwriters usually as an extension to public liability cover. Policy as to the amount of cover varies from underwriter to underwriter. Many farmers feel that the available cover is inadequate. The general view of the insurance industry is that in some areas to give any more would be just about suicidal. There is also a strong element of selection against the insurance industry in the way in which the extensions are taken up. Obviously the cover will be most often sought where the risk is greatest.

The attitude of the Forest Service is that in the event of fire their first priority is to extinguish the fire, then look at the question of cost. As a rule of thumb if there is obvious negligence, then the negligent party pays but if there is no negligence and the fire is the result of pure accident or an Act of God, then the cost is normally paid by the Forest Service. However, the Forest Service have pointed out from time to time that whatever the cause it still has the statutory task to apportion costs as it sees fit. Practice varies from district to district and the powers under Sections 46 and 47 of the Act are always available if necessary or expedient.

Because of competition and other economic considerations different insurers will use different methods or practices in underwriting and marketing insurances. Some insurers tend to build up each individual policy on the basis of an individual assessment of the policyholder's potential liability and to tailor the policy to the needs of the individual policyholders. Other insurers work on the principle of packaging or consolidating their covers and offering a broadly based standard form of cover. This applies not only to rural fire fighting costs but many other contingencies also. Individual policyholders should discuss their exposure to risk and their individual needs with their insurance company or insurance adviser.

There are also some additional problems relating to liability generally. The rule in *Rylands and Fletcher* applies to the escape of fire in rural areas and farmers have very considerable, and in some cases substantially uninsurable, liabilities. A farmer farming on the edge of the Kaingaroa Forest might find himself in this category.

The principle in *Rylands and Fletcher* was originally stated as "a person who for his own purposes brings on his land and collects and keeps there anything likely to do mischief if it escapes must keep it in his peril and if he does not do so is *prima facie* answerable for all the damage which is the natural consequence of its escape."

In a legalistic way this statement expresses and establishes the position that a person is absolutely liable for the escape of things which he brings on to or does on his land. The position with respect to fire is succinctly stated in an old New Zealand Court of Appeal case, *Kelly v Hays*, in which the Court endorsed the view "that the law in New Zealand has ever been, that if a person lights a fire on his own land he must at his peril prevent it spreading to the land of his neighbours".

The effect of this rule may however be even wider than that in practical terms, and may be to make a farmer absolutely liable in respect of the escape of fire from his property whatever the cause of fire and even where there is no evidence of negligence or other misconduct on his part. The rule can be unfair in many circumstances. The wider accessibility of rural land to the public resulting from recent changes in the Law of Trespass, further compounds the problem.

Justifiable anguish arises in farming circles because rural residents consider they do not get value for money from their Fire Service levies. The perception of many farmers is that because of the undoubtedly higher risk, they pay higher insurance rates than their urban counterparts but get less benefit from the Fire Service. This is seen as unjust. It has been suggested that rural fire fighting costs be added to the budget of

the Fire Service Commission. This would be vigorously opposed by the insurance industry which sees this as further adding to the existing inequities in Fire Service funding, unless the costs were met by Government from the consolidated revenue and not from insurance related sources.

## Conclusions

A number of conclusions can be fairly drawn:

(a) We have a highly developed and sophisticated rural sector in New Zealand. Increasingly, rural enterprise is under economic pressure which will produce the need to protect risk and control cost. There is a great need for the rural sector to be insurance conscious.

(b) The need to insure increasingly complex risks will undoubtedly continue and there will be a growing need for capacity and for flexibility as new classes of risk and enterprise give rise to the need for new forms of protection.

(c) The special needs of rural enterprises should and will produce special insurance tailored to meet rural requirements and these requirements should take into account both the nature of risk and the amount of risk. There is reason to believe that much rural enterprise is underinsured.

(d) Better rural insurance programmes, a lessening of the present tendency to underinsure, greater accumulations of risk necessitating greater insurance cover and higher density of rural risks, mean that the present inequities in financing fire control will be increased as the total contribution of the rural sector to fire control costs increases without any corresponding benefit.

There is the need for a significant measure of reform in the law as it affects the rural insurer. In particular the present system of Fire Service funding is inequitable in that it imposes an unfair burden on the rural insured. Whilst it would not be practical to differentiate between urban and rural sectors in imposing

the Fire Service levy (bearing in mind the difficulty of equitably assessing just where the benefit of the activity of the Fire Service Commission lies), there is a real case for shifting more of the burden of Fire Service funding from insurance related sources into the public sector to reflect the non-fire related activities of the Fire Service. The special position of the rural interests could and should be recognised by the abolition of the right to levy under Sections 46, 47 and 48 of the Forest and Rural Fires Act, and the acceptance of all rural fire fighting costs directly by the public sector. This should not be an additional burden upon

the insurer but should be a direct charge on the consolidated revenue administered through the Fire Service Commission and funded by direct grant to the Commission from the Crown, with the Commission reimbursing the cost of the appropriate Fire Authority incurring the cost whether that be the New Zealand Forest Service, another Fire Authority or the Commission itself.

A strong case exists for statutory modification of the rule in *Rylands v Fletcher* to limit the liability for the escape or rural fire except when negligence is clear and established.

# Planning for profitable marketing of trees

J. G. Groome\*



*J. G. Groome*

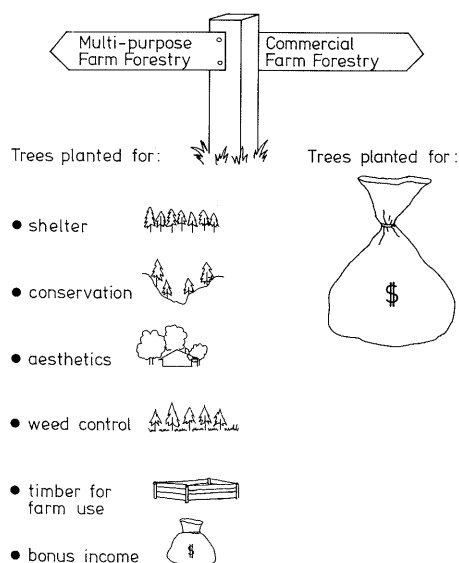
## Multi-purpose or commercial farm forestry

This paper recognises two distinct aspects of the business of tree growing, one being undertaken as an integral part of farming and the other as a commercial land use in its own right undertaken by existing landowners. The first generally involves planting primarily for purposes other than simply making a profit from the investment, while the second should logically be influenced by economic decisions. The differences between the two must be clearly identified before planning for profitable marketing takes place (Figure 1).

The planting of belts or woodlots by farm foresters is generally undertaken for one or more of the following purposes:

- To provide shelter from wind.
- For soil or water conservation reasons.

- To improve the visual appearance of the property.
- For stock shelter.
- For the production of firewood, fencing material or fodder for use on the property.
- For on-farm conversion of logs in portable sawmills to supply the owner and his neighbours' sawn timber needs.
- In the expectation of some "bonus" return from log sales.
- To provide diversification from dependence on income derived from traditional farming activities.
- For weed control which will reduce control commitments and therefore improve net annual returns.
- In situations where the landowner is himself skilled or keen on forestry and



**Figure 1: Forestry on farmland**

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can manage marginal land better under trees than grass.

Financing is generally no more difficult than for any other farming activity and arises from one or a combination of the following:

- Cash flow from farming activities.
- Soil conservation subsidies.
- Sale of previous shelterbelts or woodlots.
- Forestry Encouragement Loans.
- Forestry Encouragement Grants.

The need for the profitable marketing of the logs from these plantings is generally low as their primary purpose is to aid good farming land use, not to grow wood for commercial profit. In addition, if the financing has not been a "burden" (and this is usually the case) normal commercial returns are not necessarily expected. However, there is no reason why the trees cannot be marketed to the best advantage. Ways to improve this activity are discussed below.

Commercial farm forestry however, as the name implies, must be much more market orientated if it is to be a legitimate user of land. The planting of land for purely economic reasons is justified only when:

- Land capability studies clearly indicate that the net returns are better under forestry than farming.
- Adequate financing and management to take the crop to maturity is available or assured.
- Markets are guaranteed or the landowner is convinced that they will be available.

### **Financing constraints**

Reference to another paper (1) presented at this seminar will show that financing purely commercial tree crops, by individuals in New Zealand, has been subject to considerable variation. It is necessary to examine these in more detail in order to have a solid basis for planning marketing, because of the necessity of ensuring a return on the investment within a reasonable time. On the other hand, plan-

tings which have been made primarily for non-commercial reasons or have been financed with little or no sacrifice on the landowners part do not require assured markets. Such plantings include those closely associated with farming and areas financed under the original Forestry Loans (1962) (2). Under this most unusual scheme, until inflation took its toll, the State provided virtually all the finance, with any additional costs being deductible against assessable income. Forests financed in this manner can also be sold with income from both the crop and the land being non-taxable. The scheme was later replaced with one (3) which provided 50% of the finance required as a grant, up to certain limits per hectare for approved projects. Any expenditure over and above the grant was deductible against the assessable income of the owners. From 1 April 1983 all plantings qualify for a 45% grant with no deductibility against assessable income. This is available for any expenditure on forestry whether it is undertaken by individuals or companies.

While this situation continues, the only parties who are likely to use their land for planting (or indeed should plant on financial grounds) are:

- Farmers, as an integral part of farming (multi-purpose).
- Owners of land which shows a negative return from farming activities, who can arrange adequate financing and who are located in areas where markets will be available.
- End users and others associated with the forestry industry.
- State and Local Bodies, for social or political reasons.

To contemplate purchasing land at today's inflated prices to grow a 25 year crop, even when 45% of the cost is provided, would require assurance of, or faith in, an extremely good future market for wood. Also, if the investment is made with no links to the market place, in a country where the majority of the wood (54%) is owned by the State and a further 30% is

owned by end users, it is verging on being irresponsible. However, given that there is a considerable amount of privately owned land which should be planted, the most likely and desirable development is for the owners of that land to get together with those who can provide a guaranteed market. In this way non or low producing land can be put to use without changing hands at inflated prices, and the market risk eliminated.

The vehicle which now makes this possible is the "Joint Venture Forestry on Farmland" concept.(4) Providing the inputs of the two parties are fairly evaluated and used as a basis for revenue sharing, and that the guaranteed market is provided at a price set independently of the end user, the concept provides an admirable stepping stone to the financing of a major permanent change in the use of New Zealand's lower class hill country. It is important to realise that the involvement of the finance-providing end-user partner is only for the period necessary to bring the first crop of trees to maturity. The proceeds from harvesting will be adequate to provide good returns to both partners, a relatively small proportion of which would be needed to finance the subsequent crop. The landowner will then join that fortunate band of forest owners in a position to consider options for the sale of their wood without having to commit it in advance. This does not mean that they can ignore the dependability of markets, but it does ensure greatly enhanced market strength.

The harsh fact of private forest financing is quite simply that some source must carry the long term burden necessary to finance the first crop. Those sources which are, or have been available, include:

- The landowner for reasons other than a commercial return.
- The State through generous grants or loans.
- End users.
- Land owners practising permanent forestry with part of the returns from one crop financing the next.

The latter option does not eventuate unless it is planned and earned by outlaying capital for comparatively low returns relative to the risk involved or trading the temporary use of a piece of land for eventual forest ownership. Just as young farmers and share farmers have traditionally entered into joint ventures with parents and other landowners to eventually become farmers on their own account, it is now possible for farmers to take a similar, albeit longer, course into forestry without risky financing.(5)

Returns from investment in Radiata plantations in most parts of New Zealand can be shown, on paper, to promise a rate of return over and above inflation of 3-13%. However this is an inadequate return on investment for both individuals and institutions when compared with the alternative opportunities, involving lower risks, which continue to be available. It is unrealistic to expect investment capital to be locked up in a crop, which although insurable, faces numerous risks before being sold to a future market to which access may not be assured.

### **Planning for marketing from multi-purpose farm forests**

For logs which arise as an ancillary activity to farming or from plantings undertaken for other than economic reasons the need to market skilfully is not as important as for those crops which require a commercial return. The motivations for planting, growing and selling wood from belts and woodlots are quite different to those which influence the people or organisations who establish forests for commercial reasons. "Returns" from the former type of planting start early and can arise from weed control, shelter, appearance, soil stabilisation, firewood, posts etc. and be available over a considerable period. The profitable sale of logs from these plantings is usually a "bonus" and because of this, "marketing" is often conducted in a cavalier fashion. Offers are often accepted from ostensibly honest but



very experienced log buyers on a lump sum or take and pay basis, with the result that the market is seriously affected for those practising economic forestry. This situation is both undesirable and unnecessary (Table 1).

There are various ways in which farm foresters can improve the marketing of shelterbelts and woodlots should they wish to obtain reasonable financial returns over and above those set out earlier. During the establishment and tending phases attention should be given to:

#### 1. Choice of Species

There is a long list of species which although capable of producing excellent wood for a variety of purposes, are unlikely to command economically acceptable prices unless there is sufficient volume available regionally to warrant the development and maintenance of a market. In market terms the better known species fall into four marketing groups:

- Dependable — Radiata pine/Douglas fir.
- Dependable but uneconomic — Corsican pine, Larch.

- Discountable — Other pines (Muricata, Ponderosa, Contorta etc.)
- Difficult — Eucalypts, Macrocarpa, Poplars and other hardwoods.

2. Growing a proportion of straight trees and reducing the effects of branches by:

- Using elite or good planting stock.
- Planting the trees closer together.
- Thinning and pruning on time in the manner advocated by Barr in the N.Z. Farmer magazine.
- Pruning selectively in shelterbelts using the Smail technique.
- Resisting the temptation to “top” shelterbelts if you wish to sell sawlogs later.

3. When the time comes for marketing, the sale should preferably be made during periods of short log supply or high timber demand.

To be aware of when these periods are likely to occur it is advisable to become a member of an Association or Foundation whose business it is to research such matters.(6)

**Table 1: Factors which influence the sale of trees by multi-purpose farm foresters**

#### Frequency of 5 most Important Resistance Factors

- Price considered inadequate 84%
- Continuity of Shelter 29%
- Current Farm Income/Tax 22%
- Reputation of proposed purchaser 22%
- Other reasons 6%

#### Response by Potential Purchaser

- “We will pay \$X + 10% per tree (per ton/per tonne/per cubic foot/per cubic metre/per load) that we measure (count/weigh/guestimate) into our mill or ship”!!
- “Those trees are overmature and the wind (bugs/earthquakes) will make them fall on your house (yards/fence)”.
- “Would you like us to provide all the timber (hardware/concrete/plumbing) for your new house instead of cash”?
- “Our M/D belongs to the Christchurch (Hawkes Bay/Wellington) Club”.
- “We understand that Labour will go in next year and tax capital gains”.

4. The trees should be measured and an indicative value assessed either by the owner or an independent, experienced party.

5. Serious consideration should be given to using an agent to market competitively and supervise the sale.

A case study of a multi-purpose farm forestry enterprise is depicted in Table 2. Because of its location and the need to grow slower-growing species due to altitude, this is classified as a high marketing risk.(8)

The marketing of trees or logs grown as an economic forestry venture, on the other hand, demands much more careful planning as it is critical to the whole success of the enterprise. Experience has shown that the less difficult the financing of forestry has been, the less difficult is the resultant marketing. The most advantageous

marketing position arises where the crop has been, financed by returns from the felling of a previous plantation or from some other surplus funds. The effect of this is to relieve the owner from debt servicing or the need for ill-timed liquidation of the asset, and to leave him free to sell at the most advantageous time.

### **Planning for marketing from commercial farm forests**

#### **Market Flexibility**

Unlike other farm crops, which generally need to be harvested annually and then stored if not sold, trees can just go on putting on new wood over old wood until the time is ripe to sell them. Areas of Radiata pine are being felled in New Zealand at 25–60 years of age — a 35 year marketing period is therefore possible. Douglas fir

**Table 2: Case study 1 — High marketing risk**

• Name	Godley Peaks Station
• Location	West Side Lake Tekapo
• Elevation	300m–1500m +
• Rainfall	800–2000mm
• Commercial Forestry Suitability	Limit plantings to Pinus Nigra and Douglas Fir
• Existing plantings	61ha Corsican, Douglas fir, Ponderosa Pine and Larch in woodlots and shelterbelts. Annual planting programme generally as 4–6 row shelterbelts.
• Existing Markets	Limited to Local sawmills, posts and poles.
• Distance to nearest Market	60km (Fairlie)
• Distance to nearest Port	120km (Timaru)
• Other Forestry in the Area	Limited, planting on farms.
• Future Market Prospects	local sawlogs Moderate risk
	posts and poles Moderate risk
	log export Moderate risk
	chips for local processing
	or export High risk
• Planning for Profitable Marketing	(i) Limit planting to multi-purpose wide belts.
	(ii) Encourage local planting of similar species by neighbours to build up resource sufficient for local sawmill.
	(iii) If export log project develops through Timaru look for Joint Venture partner.

planted in 1915 has been thinned several times already and is likely to be held until it is over 75 years of age before clearfelling. These are low cost stands generally established by the State, but could just as well be under private ownership on farms providing a virtual growing bank.

However such financing to date has more often been the exception rather than being common or normal. For a brief period in the sixties plantations could be established and basic tending undertaken entirely from the Forestry Encouragement Loan. Unless a significant amount of debt has since been accumulated, the owners of these forests are also in a fortunate marketing position which requires little planning. Those who enter into a joint venture with an end user of the wood, generally trade relief from financing for marketing flexibility. In these cases, planning for or assurance of independent assessment of value is preferable to relying on market price or arbitration.

Where a landowner must find more than 50% of the finance required by borrowing or reducing alternative spending, and when such expenditure is not deductible against assessable income, very careful planning for marketing is essential. The same need applies when a landowner enters into a joint venture with a partner who is not an end user, and can give no assurance that a market will be available. The nature of the investment means that a debt must be serviced and met within a reasonable time otherwise interest charges will eliminate any profits. The marketing flexibility available to multi-purpose farm foresters who have "written off" the expenditure is replaced by a condition of market vulnerability.

This is particularly so when a surplus of wood develops on the local market as was the case during the fifties and part of the sixties when most of the forest-growing companies financed by bonds or shares fell victim to their wood-using cousins. With no or inadequate dividends being possible due to low stumpages, the shareholders

were only too ready to accept a "reasonable" cash inducement to transfer their equity to a new company. In many districts only one sawmiller operated in the market place and returns to the grower were minimal.

It is strongly recommended that growers who are not in a position to market when the most favourable conditions prevail examine more closely their likely strength in the market place, and consider some form of protective action where necessary. Apart from improving tree quality through more intensive silviculture, other steps which could be considered include entering into forward selling commitments or some form of group selling.<sup>(7)</sup> Wherever possible, however, the best protection against the vagaries of the domestic market will be planning for involvement in the log export trade.

### **The Log export trade**

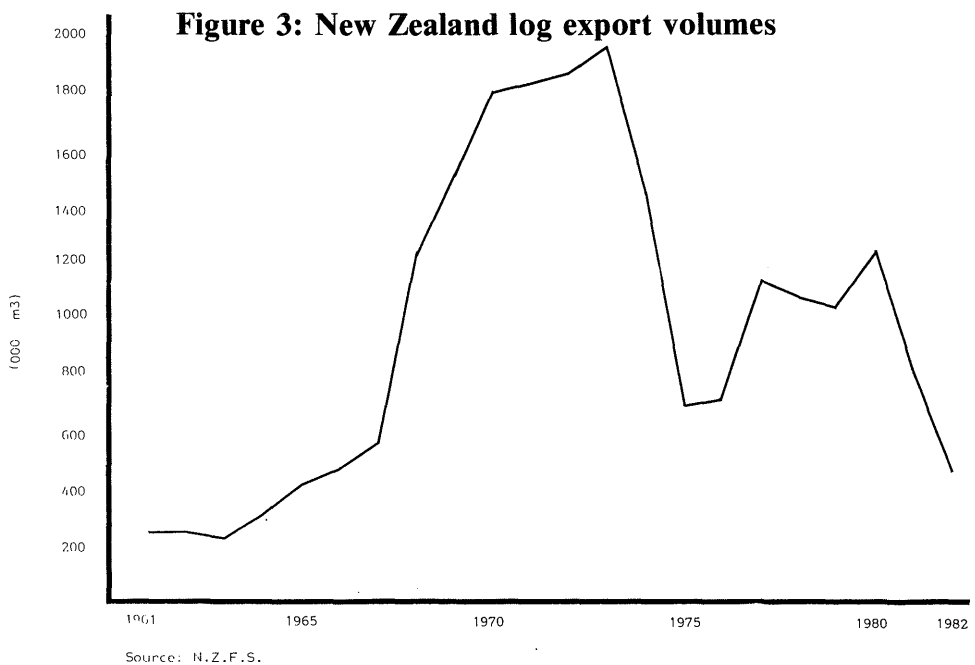
The market for the private grower has been greatly improved by the log export trade, which has now been in operation for 25 years (Figures 2 & 3), and has shown a steady upwards price trend approximately equivalent to inflation.<sup>(8)</sup> Demand has shown short term dips, generally brought about by N.Z. efforts to maintain price levels, but for the foreseeable future supplies from New Zealand will be unlikely to satisfy the market.

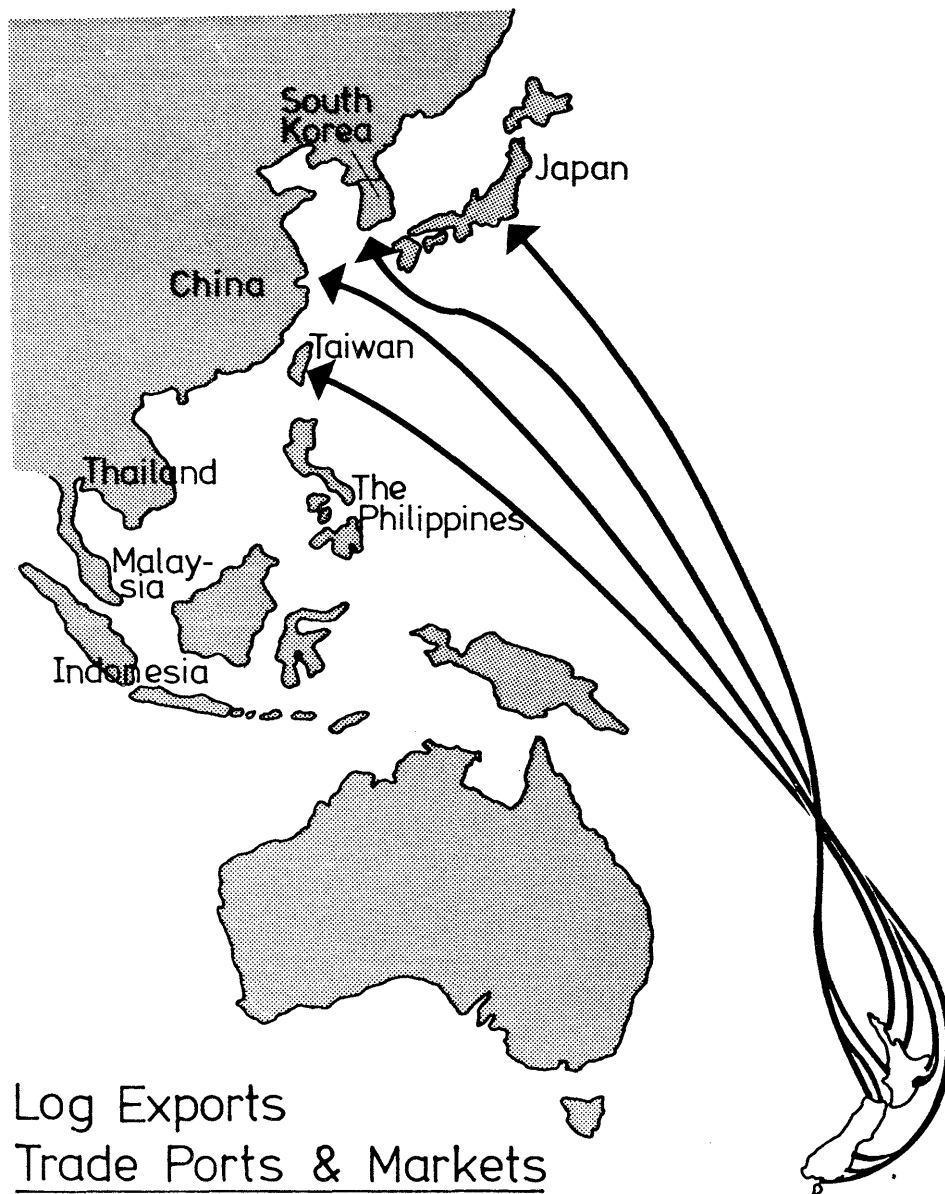
It is expected that this demand will further increase as the South East Asian countries of Thailand, the Philippines, Malaysia and Indonesia, all cease to export logs. Japan, South Korea, Taiwan and China will not easily give up their domestic sawmilling and plywood industries and will intensify their search for alternative export log supplies in New Zealand, Chile and Papua New Guinea. (Fig. 4)

Planning by a grower or group of growers for log export needs to take into account the following requirements.

#### **1. Volume**

Assuming a one port/one vessel situation, the minimum annual volume to be





**Figure 4: New Zealand log trade ports and markets**

available to initiate a log export trade is directly linked to shipping and storage. Log storage should not exceed two months. Vessels calling at New Zealand ports have capacities which range from 10 000 cubic metres to 16 000 cubic metres, and seven vessels per annum would normally be deemed necessary to sustain logging operations. If the average log vessel is 13 000 cubic metres capacity, then 91 000m<sup>3</sup>/annum is required to sustain the export operation.

Relating these volumes to hectares of forest and assuming that 400m<sup>3</sup>/ha of exportable logs are produced, one vessel requires 32½ha of forest. To export for one year requires 228ha of forest.

## 2. Shipping

Free on Board (FOB) contracts require the buyer to provide shipping, but this shipping must suit the suppliers' requirements.

## 3. Port aspects

These are complex and involve many parties:

- Marshalling: Usually under contract with suitable machines and expertise.
- Stevedoring: Undertaken by stevedoring companies which engage watersiders.
- Harbour Boards: Usually control storage areas and also levy charges for wharfage etc.

Where a port has been handling logs for some time, the terms and conditions for log loading will be well established. All negotiations regarding terms and conditions needs to be done by a well established "port employer" who is familiar with terms and conditions of work on the waterfront.

## 4. Duration of Trade

Ideally, a log export trade once established should be geared to maintain continuity at a level to suit all concerned. However ports have been made available for quite short periods to handle temporary surpluses and windblow salvage. Whangarei, Gisborne, Napier, New

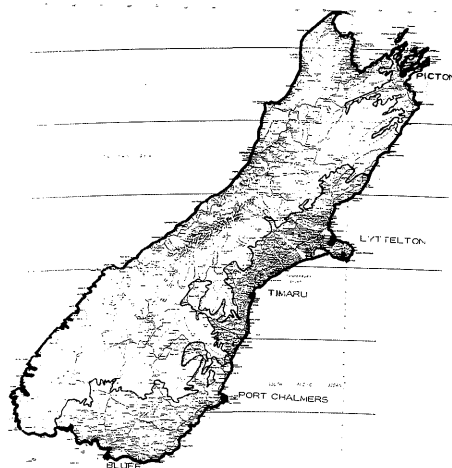
Plymouth and Timaru have all had this experience and all parties have profited, while Wellington and Lyttelton chose not to proceed when the opportunity arose.

The trade has however been more or less continuous from Mt Maunganui, Nelson, Picton, Port Chalmers and Bluff.

Ten ports have shown that they are willing and able to handle the log export trade, and there is no reason to expect that these outlets will not be available when required in the future.

In the South Island virtually all of the land east of the main divide which is suitable for growing Radiata Pine is within an economic transport distance of an export port (Figure 5).

To ensure that sufficient logs will be available to any one port to justify the preparation of storage areas, the assembly of loading equipment, engagement of stevedores, etc. it would be wise to plan for a minimum 4 year programme. A forest estate of about 900ha (2 250 acres) would therefore be needed to supply a one-vessel trade and the owners of this area (or areas) would need to commit all their exportable logs to the sale. Non-exportable logs (due to length, dimension or quality) will still require to be disposed of on the domestic market, this can be done at competitive



**Figure 5: Economic transport areas**

prices if good returns have already been received for the exported logs.

Case Study 2 (9) (Table 3) indicates the type of nucleus forest estate which could well initiate (in conjunction with one or two other owners) a viable log export programme.

### The domestic market

New Zealand is now well enough endowed with plantations to satisfy the domestic market in most areas plus a growing surplus for export. Most of these

forests are owned by the State or by wood processing companies, viz: (10)

Plantation Ownership Status (1982)		
Government	480 000ha	54%
Wood using companies	277 000ha	31%
Small forest owners	130 000ha	15%
Total	887 000ha	100%

Planning for profitable marketing by growers who have or will have financial commitments to meet must be heavily influenced by this ownership situation. The supply and demand status which has

**Table 3: Case study II — Log export forest**

• Name	Benhopai Land Co. Marlborough	
• Location	South Marlborough, West of Blenheim	
• Elevation	300m to 1100m	
• Rainfall	800–1000mm/year	
• Commercial Forestry Suitability	Radiata the predominant species on lower sites, also Muricata and Douglas fir	
• Existing plantings.		
1940's mature regen	25 P. radiata	Loan
1968–72 plantings	103 P. radiata	Loan
1980–82 plantings	161 P. radiata	Grant
1983 proposed	150 P. radiata + P. muricata	Grant
1984 proposed	94 P. radiata + P. muricata	Grant
	523 hectares	
• Existing Markets	Local sawmills, posts and poles	
	Export logs — Picton	
	Peelers — Greymouth	
	41km (Blenheim)	
	64km (Picton)	
	Extensive local body, private and state	
	Forests	
	Limited — End User owned	
	local sawlogs	Low risk
	export logs	Low risk
	peelers	Low risk
	posts and poles	Low risk
	fibreboard and other	
	local processing	Moderate risk
• Planning for Profitable Marketing	Maintain Balance between	
	(i) Pruned logs for local sawlogs and peeler logs	
	(ii) Unpruned logs for export	
	(iii) Spread remaining planting over a few years.	

developed in Canterbury due to widespread windthrow and the existence of over 25 sawmills chasing a diminishing supply, will not last for too many years and is unlikely to arise again in most districts. The methods suggested earlier to improve the marketing from farm shelterbelts and woodlots will need to be followed even more intensively. Radiata pine and Douglas Fir only should be planted, with pruning and thinning being essential, if it is intended to supply the domestic market. In addition, some regions are less desirable for private forestry investment than others as reference to Figure 6 will indicate. Those lying in the upper left hand part of the figure contain a high proportion of forests already owned by the wood-using companies. The demand for supplies from independent growers will be much lower in these regions than for those lying in the bottom right hand sector.

This situation is likely to alter from time to time and up to date information is required for market planning purposes.

#### **Financing/marketing linkages for commercial farm forestry**

It is clear that because of the sunk nature of the investment, together with the associated growing and marketing risks, that it will always be difficult to obtain finance for forestry no matter how much land is readily available, to complete the picture. If all the finance is not available from the resources of the potential forest grower or from the Government, the grower must consider trading some share in the future crop to fill the gap.

At the present time the only source of Government finance for private forestry is the 45% Forestry Grant, leaving the balance to be met from individuals' resources after paying tax. This is unlikely to result in major move towards the use of marginal land for tree growing. Three potential sources should be examined by interested landowners. These are:

- Joint ventures with established New

Zealand wood processing firms as already discussed.

- Joint ventures with off-shore parties who wish to secure logs for the future without the problems associated with seeking land ownership.

- The encouragement of community joint venture forestry schemes between local bodies and private land owners with Government providing the finance required.

#### **Community Joint Venture Schemes**

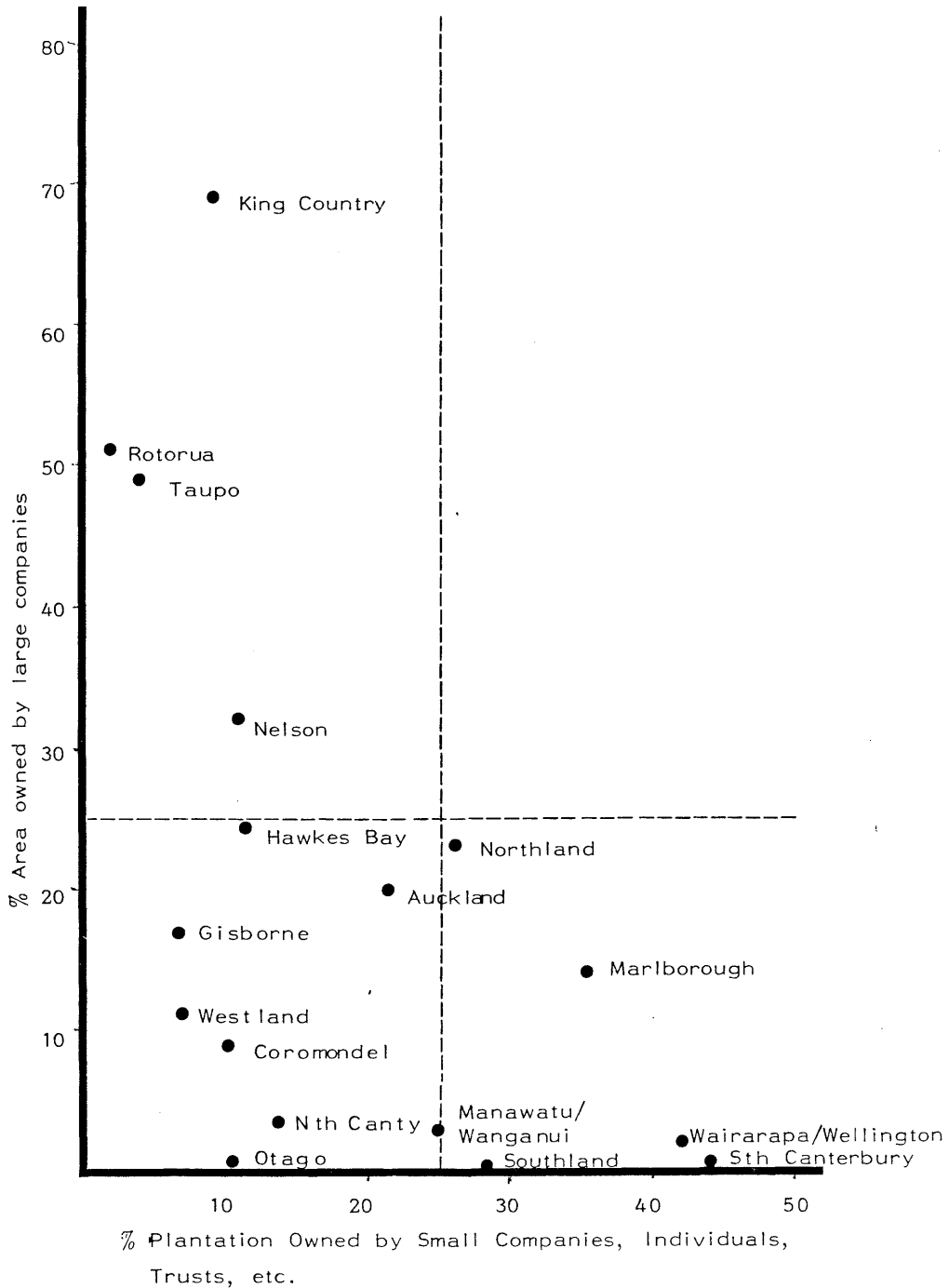
For market dependability, the last option would need to be located within economic access of an export port. Localities with suitable land available which could be considered for such schemes are the hinterlands of the following ports: Whangarei, Gisborne, Napier, Picton, Lyttelton, Timaru, Port Chalmers and Bluff.

The declared support and co-operation of the Harbour Boards concerned would be essential for qualification for special funding by Government, and because of their vested interest in creating a bulk raw material for export they could well act as catalysts for such schemes. The fuller utilisation of existing transport facilities, marginal farmland and last, but not least, the rising number of unemployed, would fully justify the employment of Government funds in this way.

In most of the areas proposed there is already a base resource of plantings by various owners for various markets either real or hoped for. A well co-ordinated drive to augment these existing resources in order to create a profitable and continuing log export trade is a justifiable planning aim. Community Forestry Joint Venture Schemes should be viewed, not as permanent quasi-Government entities, but as catalysts to create nucleus-estates to the extent required for the creation of the log export trade. The utilisation of suitable land within farms on a one-rotation basis with the landowner being the joint venture partner is envisaged, with later crops being funded and owned by individuals.



**Figure 6: Relationship between forest owners and wood processing companies (State and Local Body forests excluded)**



### A new influence in the market place

It is the Government's declared intention to encourage greatly increased use of suitable farmland for commercial forestry. For this to be attractive to land owners, something more than a 45% contribution to costs is required. The additional expenditure of 55% is unlikely to be considered by farmers unless:

- it is to produce multi-purpose farm forests which by their very nature are likely to utilise only a relatively small part of the land available.

- land owners exchange flexibility in marketing for assured financing and outlets.

- there is a move towards the creation of "log export forests" by well placed land owners taking the initiative or being encouraged to proceed by Government supported local body programmes.

It is to be hoped that at least one of these options will be available to all those farmers who wish to improve the use of their land. The consequent development of a significant area of commercial farm forests would then ultimately lead to the creation of a forest resource which, because of adequate financing would have significant market influence. More important it could be marketed in such a fashion that it would return a true and adequate profit to the land owner.

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# Financing, farming and forestry into the 1990s

I. Donald\*



*I. Donald*

Farming, like any healthy industry, needs access to capital if it is to remain dynamic and meet the continuing demands of changing ownership, development and the working capital required for progress.

## 1. Capital for farm purchase

The demand for purchase finance is obviously a function of the number of sales, and the price of land (Table 1 and Figure 1). Given that the rural real estate market is currently depressed, an extrapolation of figures from the peak of December, 1981, would give an excessive figure. Nevertheless the numbers are still large.

The real problem has been finding suitable long term finance. All long term finance is difficult to find in times of high inflation as investors take a short position due to uncertainty and the possibility that interest rates will continue to climb further. Over the past two years it has been difficult

to find people who are prepared to invest in fixed interest securities longer than two to three years. As a consequence, all borrowing, and therefore lending, has become shorter and shorter. In fact recently, with the uncertainty in Australia caused by the election of the Labour Party when call rates reached 100%, the definition of a long term investor was someone who would take a position overnight!

High inflation has therefore been one cause of the major difficulty in finding long term finance for farm purchase.

## 2. Development

There has been a very significant increase in the rate of development expenditure over the past few years, encouraged by the land development encouragement loans and livestock incentive schemes of the current Government. Regrettably this development surge which has seen the addition of 7 million sheep and beef livestock units, is waning as real farm income continues to shrink and farmers no longer have the where-with-all or the confidence to sustain continuing development programmes. This season, fertiliser applications, are down by some 33%; maintenance application levels are not being applied and some destocking will inevitably occur in the coming season if there is no prospect by then of a lift in gross revenue at the farm gate.

Currently however, the overseas exchange generated by each additional stock unit in relation to the investment capital required to provide it, gives by far the best return of any investment New Zealand can make. I am not one of those who believes that we should, because of present marketing difficulties, curtail our

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Wellington*

**Table 1: Demand for rural finance (\$M)**

	1977/78		1978/79		1979/80		1980/81		1981/82		1982/83*	1984/85*	1989/90*
ALL FARMING	—		750		990		1435*		1980*		1200*	1505*	2653*
Property Purchase (Source: Agric. Review Committee)		+ 32%		+ 44.9%		+ 37.9%		— 37%		39%			
Development (Source: Rural Bank)	100	+ 38%	138	+ 1.44%	140	+ 23.5%	173	+ 15.6%	200	— .1%	180*	226*	398*
Working Capital (Source: Reserve Bank Bulletin)	375	+ 24.5%	467	+ 25.5%	584	+ 34.9%	788	+ 10.9%	873	+ 10%	960*	1204*	2122*

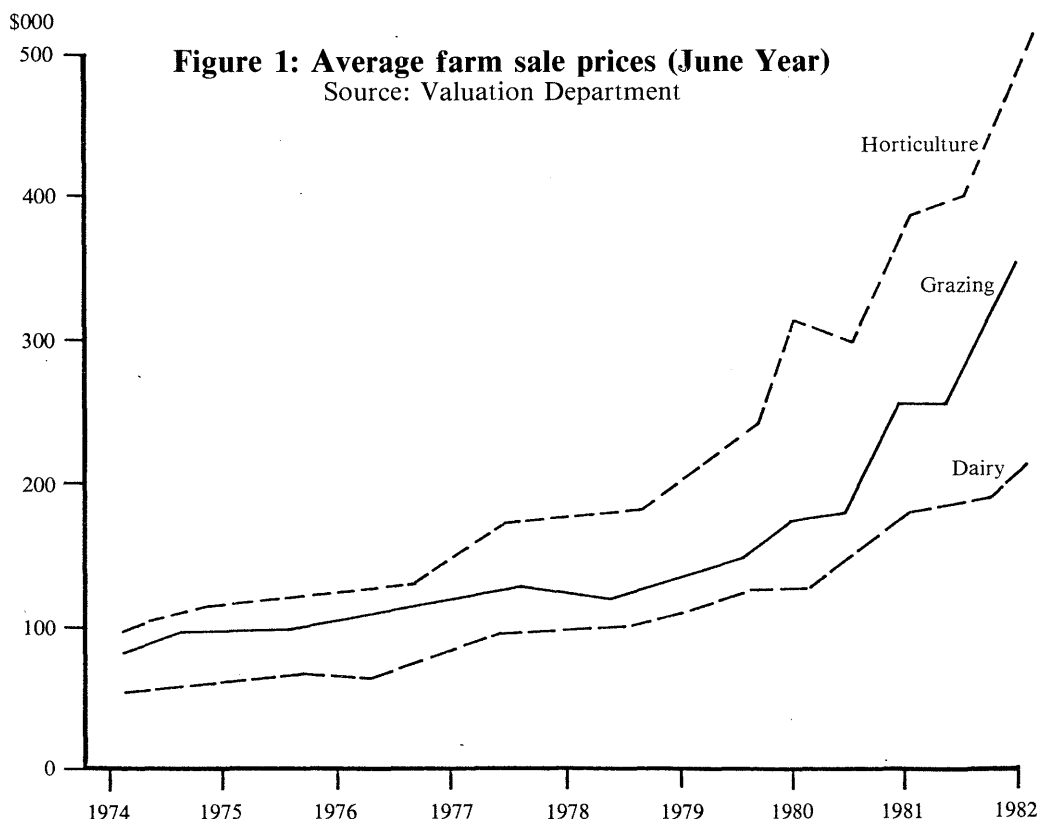
\*Estimates. 1985–1990 figures have been extrapolated at 12% from the estimated 1982/83 figures.

production of sheep meats. After all, we can all recall the dire pessimism in the late 1950's when there was talk of lamb surpluses in the world. I am a great believer in the old adage that a problem identified is a problem half solved and I am sure, given the application of the best of management talent to our meat marketing problems, we will be able to market our sheep meat production at acceptable prices. To achieve this however, we must take as much as possible of the product out of the **commodity** category where the only differentiation can be price. This can best be achieved by controlled private enterprise, which, given the prospect of reasonable reward, will be prepared to work hard at determining the nuances of the individual markets which we will have to penetrate at higher prices. Central marketing of the

product is a formula for minimising differentiation and cementing us into a commodity trade — something, from which, we desperately need to break away.

Continuing farm development coupled with a real effort at the marketing end is essential for the continuing growth and development of New Zealand. We know, given the application of existing technology (i.e. with no further technological breakthroughs) that existing production could be increased by 25–30%. This would generate substantial additional overseas earnings — the **essential** ingredient for growth in the economy — and would show an attractive rate of return for the national investment involved.

**It can be argued strongly therefore that farm development must go on and therefore the demand for development**



**finance will continue at similar levels to that experienced in the early 1980s.**

However, if inflation is allowed to go unchecked as it has in recent times, the cost of development will increase. Excessive levels of inflation will curb the farmer's enthusiasm for development as he realises that the inflationary effects on cost on his production will eat up any potential increases in income from development. Furthermore his surplus from income available for "Ploughback" will be reduced.

### **3. Working Capital**

Reference to past trends gives some idea of the likely future demand for working capital.

Increases in demand for working capital in the past have been a function of inadequate farm profitability, the preliminary financing of development programmes before they are refinanced, and more particularly the effects of inflation on farm input costs.

Assuming continued farm development (albeit on a lower scale initially) and some degree of inflation, extrapolations can be made which indicate that the funds required for this source of capital will also continue to grow from the present substantial figure.

The sum of all the above figures initially appears daunting and the question is, can these finance requirements be met?

In looking at the availability of this capital, we need to determine what attracts capital to any business or industry.

#### **A. Security**

This is the asset backing against which loans are made. This raises such questions as whether the industry is sound, has a future, and therefore whether the assets will maintain their worth and hopefully increase.

In the past this has been undoubted.

Land values have increased over the past decade at quite an alarming rate (Figure 2). There have been only two periods of concern in the past — the 1932 depression and

(despite some plateaus in the interim) the present market in which we are facing a 25% reduction from the November 1981 peak. Values nevertheless are still strong with Southland fattening country on the present depressed market selling up to \$200 per livestock unit and North Island breeding and fattening hill country at \$110 per livestock unit.

Security is therefore not a concern in borrowing money and in my view is unlikely to be so in the future.

#### **B. Debt Servicing**

The ability to service debt and pay the market rate for money will be the sole determinant of whether the required funds will be available. Unfortunately the ability of the individual farmer to pay the market rate of interest and service debt has reduced considerably. The minimum percentage equity required by the average farmer (if he is to be soundly financed and have a surplus for living expenses and debt reduction) has increased significantly from 50% which was a workable equity 10 years ago, to 70+ % today.

For example, if we assume that the gross income of a livestock unit is \$40 in Southland with a net of \$20 before living expenses, tax and capital reductions, and \$28 on breeding and fattening hill country per livestock unit in the North Island and \$14 net: then — assuming 3,000 stock units is an economic unit and \$15,000 is the minimum required for living expenses, or say \$20,000 before tax, then \$14 per livestock unit and \$8 per livestock unit are the maximum amounts for debt servicings that can be sustained on Southland fattening and North Island breeding and fattening farms respectively. Given the above purchase prices for land per stock unit and allowing for at least \$30 per stock unit investment in stock and plant, by simple arithmetic shows the minimum equity needs to be 70% even on today's depressed market.

The need for increased equity is due to the increase in farm operating costs, the increase in interest rates and the dramatic

increase in the price of land (beyond the rate of increase in its productive worth), all of which are caused by inflation.

I believe farming has made a great adjustment, over the past decade, to meet the market rate of interest which has risen from 8% in 1972, being the first mortgage rate, to 18% in the current climate (some money from finance companies is of course higher at 23-24%). This has been achieved by significant increases in productivity, something which the farming community leadership should make more of nationally. There would be few other industries that, by attention to the whole range of their management activities (sheep breeding giving easy care lambing, subdivision, advances in fencing techniques, you name them), have increased their productivity per man by 300% (1,000 to 3,000 stock units per man on average) over the past decade.

While this has not been achieved without some effort, I believe it is essential for farmers to continue to meet the market rate of interest if the funds required for the continuing health of the industry are to be marshalled. Artificially reduced interest rates for farming can only result in either:

A. An increasing proportion of all funding to farming coming from one Government source, for example, the Rural Bank. While I think the Bank does an outstanding job, there are clearly some inherent dangers in this trend, or

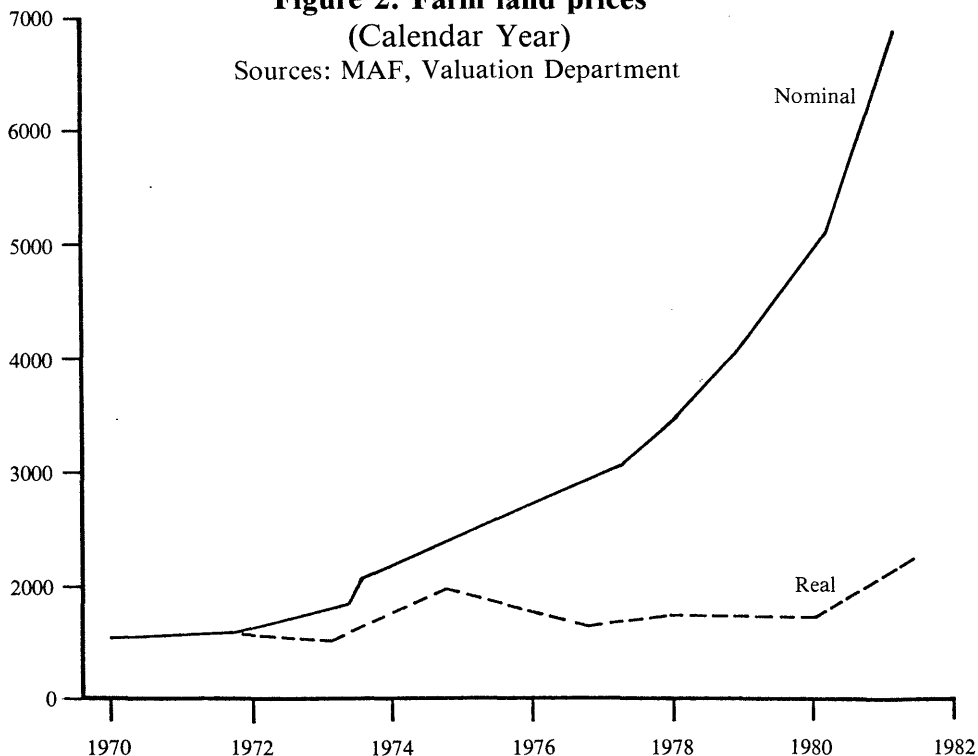
B. Farming being deprived of the capital it needs as money is channelled to industries which can afford to pay the market rate.

For the latter reason, I think it is unfortunate that the present restrictions of the financial services regulations, limit stock and station companies, to lending to farmers at 15% and some other financial

Index  
(1970 = 1000)

**Figure 2: Farm land prices  
(Calendar Year)**

Sources: MAF, Valuation Department





intermediaries, for example the insurance companies, to the amount they charge for first mortgage money. It can only result in less money being available to farming.

I believe traditional sources of finance are capable of finding the funds that are necessary provided farming is restored to a level of profitability that can pay the market rate for money and provide a surplus for development. There is perhaps one proviso to this statement and that is the lack of good second mortgage finance to: refinance development expenditures or meet seasonal overruns where accounts do not square from revenues as they should.

If I am allowed one "commercial", the latter is the reason why we have recently revitalised Wrightson farmers' finance as a medium for marshalling funds from the public to lend to farmers on second mortgage for terms up to five years.

### **Financing farm forestry**

It seems likely that farm profits from traditional pastoral agriculture will remain constrained, at least until gross farm incomes increase and interest rates decline along with the effects of inflation on farm costs.

Farmers' ability to either continue development in their traditional pastoral agricultural activities or diversify into other income-producing activities will therefore be limited unless they can find someone to finance these activities at reasonable rates, on a basis that recognises the negative cash flow of the diversification in its early years.

Because the availability of finance restricts the average farmer from moving into new agricultural pursuits, particularly those with a long payback period such as forestry, joint ventures become attractive. A number of these schemes have developed in horticulture, particularly in the asparagus and kiwifruit industries. Absentee partners, in conjunction with a farming partner, are prepared to put up money during the development phase, in return for tax deductibility (now limited to \$10,000 per annum) and capital gain (now

subject to a de facto capital gains tax if sold within 10 years).

In the deer farming industry we have seen the rapid growth of schemes in which the farmer supplies land and labour, the absentee share-farmer, capital to purchase stock, with the progeny being divided on some agreed basis — often 50:50.

Farm forestry is developing in a similar way. It is unique because the payback period is substantially longer than that of horticulture or deer.

There are several variations on the theme but one proposal with which I am familiar involves the farmer supplying the land and the forestry company the capital to establish the forest. Income from the eventual sale of the forest will be divided on a basis reflecting the capital value of the land and rolled-up interest contributed by the farmer, and the cost of establishing the forest and maintaining it, plus rolled-up interest met by the forestry company.

Because the forester carries most of the risks (the farmer retaining the land and any trees on it, whatever befalls the venture in the long term) it can be argued that the forest companies' notional contribution is the before grant costs of afforestation. This leasing of land for forestry is not new. What is new is the willingness by the farmer and the forester to enter into an agreement over relatively small areas of land. There is no doubt that the forestry costs will be higher per cubic metre of log produced than for traditional pine forest enterprises. This is because administration costs, particularly, will be higher. However, in the right locations, (near to the ultimate use of the forestry resource) forestry on farms will be a mutually beneficial exercise and our group, through tasman forests, are committed to making it work.

On typical land in the right locations, the farmer can envisage up to 25% of the wood produced for his input of land, rates and maybe some fencing maintenance. An alternative if preferred is an annual rental, in the order of 6-7% of the land value as escalated by the Government each five

years. Each case depends on the suitability of the land for afforestation and the desires of the farmer. Obviously there is a trade off between rental and crop share in the various intermediary positions between these two extremes.

For the farmer/land owner, it is of the utmost importance that the forestry partner is in the business on a long term basis and that the forest performance is of the very best standard. High crop shares do not adequately compensate for a poorly carried out forestry programme, inaccessible forestry management expertise or difficulties in marketing. As in all land use regimes, professionalism and high output per acre are critical.

There are of course other means of financing farm forestry such as cash flow from farming or sale of mature plantations of trees: soil conservation grants or from 1st April, 1983, 45% forestry grants, but of all financing approaches, the joint venture has, I believe, real advantages.

There are two aspects of this approach to farm forestry that are worthy of further elaboration.

### **1. The land use philosophy**

The afforestation of land is a highly emotive subject for the majority of New Zealand farmers. They see the loss of agricultural land to trees as a change, not just in land use for one rotation but believe that the land is perpetually soured, the cost of re-establishment to grass excessive and that once in trees, always in trees. They also fear the change in the social structure of the district as farms give way to forest and farm families to gangs of forest workers, the majority of whom travel daily to their work from central locations.

Inevitably economics will dictate land use. Just as kiwifruit has taken over from small, marginally economic dairy farms in Te Puke, forestry on land that is suited to it and well located will take over some of our less productive hill country, because it will be able to pay more for the land for that use.

While this is inevitable, it is important that it is carried out within a philosophy of best land use. That is to say, that while land may principally be purchased for afforestation, if it includes areas of better quality farm land, such better quality land should be used for farming if this is its economic use. Such better quality land could be exchanged for lower quality neighbouring land or alternatively resold as a self-contained unit if this is suitable. If neither of these options is practical or desirable, the area could be farmed in conjunction with adjacent forestry activities as a forest farm. But the point is that the joint venture approach enables the farmer to control land use both initially by deciding areas that will be dedicated to forests and, after the first harvest, by deciding whether to reafforest or regrass.

### **2. Forest farming**

The second point that needs elaboration is that it is possible with forest farming, i.e. a regime which produces less density of trees, to retain grazing on that land for a period of up to 16 years. For some farmers this is an attractive way of embarking on forestry in that the front-end commitment of land to the forestry enterprise has a minimal effect on stock carrying capacity and the period of payback (the period for which income is foregone while the forest is maturing) is minimised.

Forest farming, however, requires intensive forest management. Low initial tree stockings and earlier thinnings are necessary to minimise the loss of pasture to shade and waste thinnings. Trees are pruned as early as possible and this results in a slight loss of volume which is compensated in due course by the increase in tree size and quality.

Under this type of regime it is estimated that almost 100% of grazing is available in the forest between the second and tenth year after which it reduces progressively to 40% by age 16 to virtually nil at age 18-20 depending on topography. At that stage the farm can anticipate a considerable return

from the forest within the next seven to ten years. Obviously this variation in available grazing makes the planning and gradual development of any large scale forest farming operation critical if fluctuations in livestock numbers are to be minimised.

This approach to farm forestry on land suited to forestry (following the best land use philosophy) is, I think, an excellent way for farmers to finance their diversification into forestry. It gives them access to the capital and the management necessary to ensure success of the venture, and by negotiation they are able to tailor a package which suits their particular requirements.

I believe we will see much more of this in the future. While it is particularly suited to East Coast North Island conditions where trees give the additional advantage of stabilising the soil and preventing erosion problems on potentially good pastoral hill country, it also has its place in the South Island to a lesser degree where carrying capacities are less than three stock units per acre and where, as a consequence, attractive relative returns from trees can be obtained. While the great density of our forest activity is in the Central North Island plateau at the present moment (some 75%), only a small portion of the four-fold increase anticipated by the year 2020 will be in the Central North Island. This further growth will be in other regions currently dominated by pastoral farming, such as, Gisborne, Hawkes Bay, Otago, Northland and Marlborough. There will be an increasing amount of forestry activity, and given the need for complementary development under the best land use philosophy a partnership between companies offering the capital expertise and end use for the timber, and the individual farmer providing land (and under the forest farm regime, animal husbandry skills), will be the most advantageous to both.

Another mutual benefit is that from improvements to roading and other necessary infrastructure that forest development and harvesting will bring with

it providing it is handled with sensitivity mindful of the needs of the farmer as well as the forest.

## **Marketing**

The key to all this expansion however, is clearly our ability to market the product of our forests. Given the scale of New Zealand plantings and the small domestic market, this requires international competitiveness. While log exports have merit, we also need significant processing capacity to give us market spread and security. This will require, in the early 1990s, when the large volumes of Central Plateau capacity become available, substantial capital expenditures on world scale plants. The capital requirements are substantial and this of course is one of the rationales for Fletcher Challenge's purchase of Crown Zellerbach, Canada. If that investment proves as successful as we confidently expect it will be, it will give us the profitability and scale to have a better chance of undertaking our share of investments required in the 1990s. We also hope it will increase our influence in Pacific-Rim markets.

## **Summary**

1. For the foreseeable future New Zealand's prosperity will depend upon a dynamic agriculture which, given present known technology, has an ability to increase production by at least 25%.

Assuming that inflation is held at levels equal to or below that of our major trading partners and agriculture therefore remains profitable enabling farmers to develop with confidence, significant amounts of finance will be required to enable traditional pastoral farming to achieve this growth. A modest extrapolation of past trends indicates some three times the funds required in 1980 will be needed in 1990.

2. Marshalling these funds requires either a comprehensive Government strategy if farming is to be protected from market rates of interest, or alternatively,

that farming meets the market rate of interest and obtains the money it requires from the open market through expanded traditional sources. This latter approach is desirable, given the likely decline in interest rates and the adjustment farming has made to accommodate high interest rates in recent years.

3. Positive measures are necessary to reduce inflation, and reduced inflation is an essential prerequisite to:

A. Long term loans being available for investment in farming

B. an overall reduction in interest rates, and

C. the long term well-being of the New Zealand Agricultural Economy which has to remain internationally competitive.

4. Because

A. Constraints on net farm incomes, giving limited surpluses for diversification, are likely to continue;

B. the payback from diversification into forestry is long term;

C. the amount of capital required is significant;

D. expertise in forest management and assurances as to the marketability of the timber crop are needed;

E. farmers desire to retain control over the future use of their land, the joint venture approach to farm forestry is the most attractive means of financing diversification into forestry for the average farmer. It offers as well better control of land use and as a refinement through forest farming where appropriate, a progressive move into forestry with a minimal initial effect on stocking rates and, therefore, income.

5. As is the case with all products, the development of markets at acceptable prices will govern the ultimate levels and economics of production of both pastoral agriculture and forestry and hence the availability of finance to fund that growth. Much greater attention needs to be given to this challenge.



# Commentary

K. Whiteside\*



K. Whiteside

I continually find that attention to basics is the key to success and so it is when one looks at planning for profitable marketing of trees. Attend to the basics and normally success will follow. Trees are a long term investment. You plant trees for your children or for a future generation of commerce. Planning and proper silviculture is essential for the eventual profitable marketing of the produce. Rubbish is worth nothing. Quality produce will always obtain a premium. It is also essential that when the product does come on the market, it is handled in a co-ordinated, sensible way, not only to help the timber industry but also to maximise the returns to the producer. Unfortunately, with trees the producer is at the bottom end. He obtains only what is left after all other costs are taken into account and subtracted from the price buyers will pay.

Some examples of the differing returns (stumpage per cubic metre of timber) are:

Well tended/well marketed —  
\$28–\$30m<sup>3</sup>

\*J. E. Watson & Co Ltd  
Invercargill

Well tended/poorly marketed —  
\$16–\$20m<sup>3</sup>

Poorly tended/well marketed —  
\$10–\$16m<sup>3</sup>

Poorly tended/poorly marketed —  
Less than \$8.00m<sup>3</sup>

These are indicators and we have evidence which shows that poorly marketed trees that have been untended have, in actual fact, cost the producer money by the time he cleans up. Proper management of the investment does give good returns.

When planning and considering growing trees for profit, one must consider very carefully the likely end use and the cost of production. Key factors include site, which effects growth of the trees, access for work and distance from the market.

A cold site may give a poor growth. It could extend the production cycle 10 to 15 years and also effect the average size produced, i.e. the size and length of the trunk. Difficult access increases the cost for planting, tending, thinning and extraction. Distance from the port or end user increases cartage costs substantially, e.g., 100km cartage could cost \$10–\$12m<sup>3</sup>. This could substantially wipe out the end stumpage the producer receives (Table 1). As Mr Groome

**Table I: Indicative relative price of logs for export at various points during delivery. (N.Z. \$ per m<sup>3</sup>)**

Distance of timber from wharf	50km	150km
Price in Japan	\$100	\$100
Free on board ship in N.Z.	\$65	\$65
Free alongside in N.Z.	\$55–\$58	\$55–\$58
Stumpage to producer	\$28–\$32	\$10–\$14

has indicated, before planning and planting is considered objectives must be clearly defined. The long-term nature of forestry investment makes initial end-use objectives difficult to establish. However good trees will always command a premium provided they are well marketed.

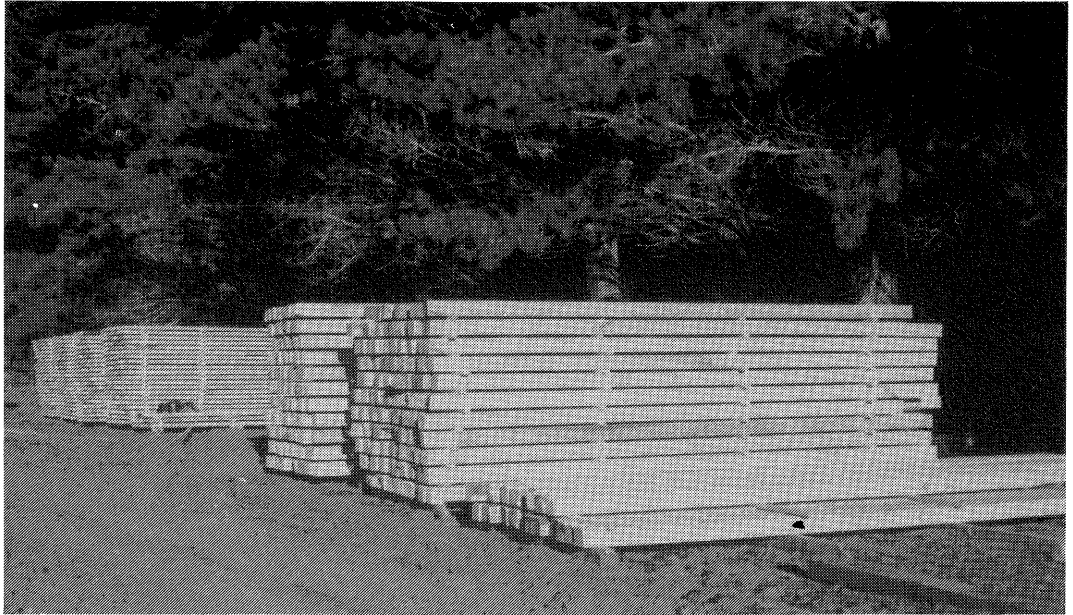
This brings me to the question of marketing and the need for professionalism and co-ordination. Too often in the past private woodlot owners have not obtained optimum returns as they have attempted to market the produce themselves, working from a base of inexperience and lack of market knowledge. Wool producers do not deal directly with the woollen mills, nor do lamb producers try to sell their product direct. For the best returns marketing must be placed in the hands of competent professionals or consultants who know the best end use for the product, who co-ordinate with big and small end users and who provide the experience necessary to assess stands of timber.

I speak from experience. Our company has substantially improved the returns to many growers, because our consultants can clearly assess timber volume and quality, and then guide this resource to the best end use. Many of the production lots with which we are involved provide wood for two or three different end users, to the benefit of the grower, e.g. some logs may go to export, some for peelers, some to the local mill and some for posts. This split of the produce for best end use means the highest value is obtained for the grower. It is also good for the end user who has confidence that what is being supplied is the quality expected.

Mr Groome also mentioned export. Many of his comments related to planning for export are valid but I would make one further comment and that is, it is not absolutely essential that full log shipments for export be considered. We have been involved in several very successful part shipments of logs using gear bulk vessels



**Figure 1: Logs — essential in the future.**



**Figure 2: Sawn timber**

out of Bluff, where a mixture of logs, sawn timber and other produce is loaded for several different end users. Log exports will supply an important market in the future. It is vital that those considering selling, consult experts to ensure they get the best advice on export markets. Although the latest rounds of negotiations in Japan, of which our divisional manager was a part, were difficult, contracts were achieved.

It is vital for those who are involved in export to co-operate and co-ordinate with each other to ensure orderly supply and good prices obtained. At present New Zealand is very fortunate in having such excellent co-operation from experts. For example, when in Japan our representative co-operated not only with the Forest Service but with companies such as Odlins and Dunedin City Council. This co-ordination and co-operation has resulted in sales which otherwise would not have been achievable.

#### **Finance**

I agree with Mr Donald that, with existing technology, New Zealand farming

has the ability to increase production substantially. Mr Donald correctly puts the figure at 25%, but to achieve this increase we require motivation and capital together with the management techniques. There is tremendous scope within the hill country sector to apply intensified management techniques. Consider what Russell Emerson has achieved in the Lindis with subdivision and controlled grazing. However, as Mr Donald rightly points out, capital is required. Lenders look at the ability of the borrower to repay. As well, a lender looks at his own returns relative to his investment in real terms. These issues should be looked at closely when considering financing in the 90's. Top management, top operators with proven track records, give the lenders confidence to become involved.

Conversely, poor operators blow the confidence of lenders. I am reminded of the days when I was an Appraiser with the State Advances Corporation — my boss telling me in no uncertain terms, as we looked at another heap of disaster type



loan applications, that disasters tend to happen to the same people. Others who are top managers do not run into the same problems.

I consider that the farming industry requires top young operators to be encouraged through to farm ownership if it is to survive and attract the capital it needs. We need innovators and leaders. However, digressing slightly, I must say I am appalled by the taxation implications of the latest Tax Amendment Act, under which young aspiring farmers can trade only once in a 'stepping stone' unit before attracting tax on interest paid on mortgage raised to finance the deal. There is no better way to 'cut the throats of good two-tooths' than to disenchant them with such a restriction.

As Mr Donald has shown, the equity requirement for the purchase of an economic unit has risen dramatically and I would not disagree with his 60-70%. To achieve ownership, those without a 'silver spoon' will probably need to trade in probably two or three 'stepping stone' units before they can achieve a full time, workable, economic farm enterprise. Those who follow this trail and succeed will surely be a positive and worthwhile addition to the farming fraternity, and they should not be bluntly discouraged by meddling with their taxation position. I hope that all those involved with agriculture will encourage the powers that be to review what I consider is a serious anomaly.

Considering now the size and source of funds necessary for farming in the future, Mr Donald's Table illustrates the extent of the dollars required. However, the real problem at the moment is simply:

1. farmers are unable to pay the interest required to give borrowers an adequate return, and
2. lenders are reluctant to lock up investments under the existing economic climate.

I have done some basic or 'mud' calculations to illustrate this point. Given an 18% interest return on a mortgage investment with a 14% inflation or devaluation factor

and 43¢ marginal tax (as exists at present on the \$17-22,000 income bracket) an investor will lose 2-3% per year in real terms on every \$1 of capital invested. That is, he lends to lose money. Crazy you say. That is the fact of today's position with the scourge of inflation the way it is. To give a 3% real return after tax, a lender on an 18% mortgage would require inflation to drop to 6% per year. Alternatively if the marginal tax was dropped to 30¢ to the lender, inflation would need to drop to 8% to give a 3% real return to the lender. Obviously the sources of finance in the future depend on the fiscal policies and economic conditions. I see no easy solution but give you a couple of thoughts as possibilities.

Firstly, for investors in farming, additional tax relief on the interest income. At present the farm vendor mortgage scheme operated by the Rural Bank provides some tax relief under strict conditions. Perhaps a widening of this scheme could be considered to improve the real return or reduce the nett loss of investors on long term mortgages.

Secondly, the possibility exists for investor participants. We have heard something of joint ventures for forestry i.e. the lender or investor and the borrower or the farmer come to an arrangement of participating in the future capital increments from either the product or the property. There is no doubt capital is attracted to this type of investment as demonstrated by interest in Inflation Bonds. An extension of the concept of joint venture forestry schemes could involve equity participation in farm mortgages. I have not looked at this matter in great depth but, as a discussion point, the possible arrangement could be the investor provides mortgage funds at (say, 8-10% interest) over a period of years and that the capital repaid after 10 years be increased by a proportion of the annual consumer price index, which hopefully may reflect inflation. This would attract funds into the industry at rates which the farmer or the borrower could afford to pay, and although the capital at term would be

higher than initially borrowed, its size relative to the whole would still be substantially smaller than that pertaining at the start. Schemes such as this are necessary to attract the capital needed within the industry. I agree with Mr Donald that it is most undesirable that the Rural Bank with its present exceptionally low concessional rates of interest be the only real source of funds under today's environment.

### **Summary**

Whether it be forestry or any other product, rewards will be greater to those who

plan carefully, use professionals effectively, and produce quality products.

Secondly, the challenges to farming in the future brought about by the scourge of inflation are massive, but given an enlightened, open approach and the will of the industry to look at joint participating arrangements, I am sure the challenges can be met. Lastly, as an industry, never forget about the young two-tooth and its importance to the flock. Younger, innovative managers and owners are an essential ingredient of a thriving industry, and must not be frustrated by illtimed, destructive, negative taxation policies.

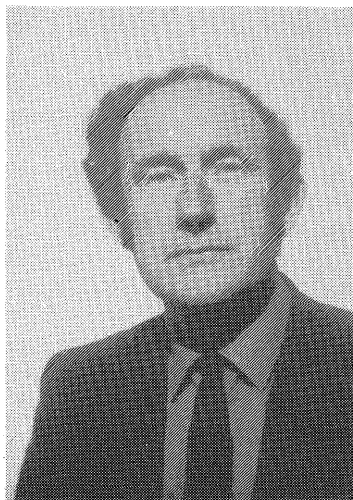


**Figure 3: Log shipment ex Bluff.**



# Where do we go from here?

D. G. Reynolds\*



*D. G. Reynolds*

In all my years of trying to see that you receive information that will lead to useful change this is the first occasion I can remember when we have got down to the nitty-gritty of how you manage you.

There have been tremendous strides in recent years in understanding how organisations work and how people in them develop. Terms like personnel counselling, career and life planning exercise, adult education concepts and so on are commonplace. It's time some of these concepts were applied to the farming community.

You have spent the last two days considering the management of physical resources. You have undoubtedly done so in the past and will do so again in the future. But what happens as a result? What does it mean to you? Is it entertainment, relaxation, an excuse to get away from the

grind — or are you here because it's vital to you to have the information being offered? How many of you have made a written list from the past two days of things to follow up?

It's often been said, and it's true, that farming can be a very lonely occupation compared with more urban pursuits. This makes it all the more important for you to understand and discipline the management of yourself.

## **Information gathering**

Do you have an information-gathering system? If so, how good is it and for what purpose do you use it?

For starters, one cannot imagine any farmer worth his salt not reading the *Journal of Agriculture*, the *N.Z. Farmer* and the weekly farming page in the "Press" or "Otago Daily Times". As well, there is a whole range of additional conference proceedings, training course material and the Ministry's AgLink system (with over 1000 titles now) available for those who wish to keep up with the play. How often do you spend time in bookshops and, over a period of time, build up a small reference library at home? How good are you at taking notes at the end of a day when you have acquired new information?

What do you do with the information at home? Is it all packed into a corner or do you have some system which makes referral easy? Do you consciously acquire information on specific subjects or does it just happen? Odds are that if you consciously acquire you will develop a system. One farmer I knew kept his own card index system of subjects with which he was concerned.

We are told that the day is not far off, if it hasn't already arrived, when all you will

\*MAF Christchurch

have to do is punch a few keys to receive what published information is available. It will certainly help, but it will mean a lot more to those who have already developed the right attitude towards information gathering.

Information can come to you in a number of ways. We've just mentioned sources of written information. There are three others. One is verbal-discussion groups, seminars such as this, and any conversation you may have anywhere with anyone. Another is what you observe as you travel or move around your district, and finally, there is what I would term experiential — what did you learn from doing during the day? Why did a job go better or worse than expected and why is a crop better or worse than anticipated? To make use of the final three, demands that you spend a few minutes at the end of each day thinking about what you have heard, seen and experienced and make a written note of points that could be important to you. All this is part of your learning process.

It's important that you understand the attitude of people who supply you with information. An adviser will try to evaluate your particular situation and give you a range of information he thinks you need to know to make a decision. The scientist will generally tell you what he knows from the work he and others have done. Other farmers will tell you what they do and have experienced in their situation. People servicing the rural sector will generally discuss with you and develop aspects which reflect their particular business interest. Your accountant can give you financial interpretations based on figures you give him. Your lawyer can give you a range of legal options. In all cases the final decision on what happens must rest with you. Whenever you are told anything you must assess:

1. The competence and bias of the speaker.
2. The relevance of the information to your situation.

3. What is still missing.

4. Whether the original decision you had made now needs amending.

### **Attitude and motivation**

Really we are talking about change and your attitude to it. One thing is sure — change is going to happen to you. There are two ways of handling it. You can either wait and have it forced on you or anticipate it and handle it on your own terms.

Consider your own experience of the people around you at home and how they have coped with the last 20 years. The more successful ones will be those who have taken the initiative in meeting opportunities. The message is clear — you must be well informed from your information-gathering system and from this set a series of goals for attainment over a realistic time period.

In industry where change is a recognised component of money making, they talk about a "climate for change" and go to some expense to create it. This means quite simply surrounding yourself with people who are stimulating, knowledgeable and challenging, and managing your resources to develop more or different production.

Recent studies have shown that members of active discussion groups have a distinct income improvement over those who are not so involved.

It can be summed up by a farmer I know who stated quite simply that "whatever I am doing now somebody somewhere is doing better and I must have that information quickly."

### **Decision making**

Having acquired information and done a lot of learning along the way and developed the right attitude towards self improvement, the next thing to look at is decision making.

Just what is your decision making process? Have you ever recognised that you have one? Why do you end up doing the things you do? It could be that this is the

crux of what makes you what you are as opposed to what you might wish to be.

Maybe it will help if we consider different levels of decision making.

Firstly, there is the daily weekly work programme in which you instinctively react to the ongoing needs of stock and the demands of maintenance. Decisions are based on clearly determined facts and you are confident of the outcome.

At the next level there are the changes from one year to the next. Changes you would make on the basis of recognised income needs, labour availability, feed supplies — more or less tangible realities; so far common ground for all farmers.

The next stage is where you begin to part company. This is the conscious recognition of where you want to be in five years' time and 20 years' time and laying plans to arrive there. It involves a large number of quite definite commitments to a sequence of activities — discussion and agreement with family and employees including accountant, adviser and banker — planning management changes — the supply and use of materials and equipment and so on. A component of this stage is the incorporation of ideas and learning which you have acquired to develop the concepts of where you want to be in five and twenty years' time.

The critical point in decision-making and success — the place which sorts the top twenty from the rest, is here. How flexible and willing are you to build in new ideas to established programmes? You must challenge every new idea to a series of questions:

1. Have I got all the information or enough.
2. Why should it interest me.
3. What is my ability.
4. Are my resources appropriate — or able to be made so.
5. Are my finances appropriate — or able to be made so.
6. What would it do to my cash flow.
7. Does it add to what I'm doing now or change it.
8. What is the risk for me.

Clear answers to these will give you a sure answer in one direction or another.

The ultimate, of course, is when you sit down and from accumulated experience and information gathering develop and apply new ideas for yourself.

What do you do with reverses, downturns, disasters and so on? Suffer it through, or look upon it as an opportunity for useful change?

### **Success, loyalties and obligations**

The previous section considered decision-making. This obviously presupposes that success is intended.

Just what is your criteria of success? Are you a success in your own eyes or in other people's eyes? Who are you aiming to please? And this inevitably calls into question your loyalties and sense of obligation. It comes down to a sequence of commitments and I would tend to put them in the following order — Firstly, to self; secondly to family; thirdly to your farm; fourthly to the industry; and fifthly to your country. But what is your order?

Dealing firstly with yourself — obviously you must be committed to on-going achievement. This requires a series of planning exercises to cover both the short and the long term, something to provide you with a stimulus and something to make full use of the resources you have at your disposal or can acquire. In large industrial concerns today there is an increasing trend to use what is termed life planning exercises where employees are encouraged to plan their careers and work towards the attainment of a series of goals designed to help them develop a satisfying career and provide optimal service to their particular industry. I think that it is a good concept to apply to yourself. A positive attitude towards change is very necessary.

Your commitment to family is obvious and needs no discussion here except that I must highlight the value of your wife — or should I say partner — as a true team you can really go places. Don't ignore her needs for the sort of stimulus you are receiving

here or at field days, challenge her to read and discuss with you and then there are the courses available for her at Telford and Flock House and much more could be said.

Presumably you are farming because you want to and enjoy it. If that is so and it should be, then you will have pride in your farming activities — which brings into focus your consideration of success. A farm must be profitable, attractive and meet the needs of the farmer and his family. But, there is another dimension and that is the example you give to neighbours, district and region, in your intensity, diversity, profitability (and maybe not just in money terms) or novelty of farming.

Your commitment to the industry should be very real and I think it can be a valid criticism of the farming community that they do not give adequate support to the Federated Farmers or spend enough time considering the developing needs of the industry and how these needs should be met. We live in a day and age of change and pressure groups — all sections of the community are in competition but there is common ground on which to build.

Your commitment to your country inevitably develops into a consideration of politics. It's important for farming to be concerned with the representation which agriculture needs and see that it is fitted into a stable society of which we can all be proud.

### **Categories of farmers**

Numerous studies have gone some way to categorising farmers. Surveys have shown that 5-7% of you are way out ahead, another 25% are not too far behind, 45% catch up eventually and 20% rarely change and probably move out of farming eventually. A little quiet reflection will tell you which group you are in and which group you really would like to be in.

For the first two groups there is not too much concern, but those of us involved with the industry must be worried about the 45 and 20%. As the industry comes under increasing pressure some answers to

vary these percentages are vital if we are to maintain or regain and develop our competitive edge on world markets. I'm not suggesting for one moment that the problems of agriculture don't contain a large measure of situations which are beyond the farm gate. Resources of land, climate, money and markets and technology are important, but the essential trigger in making it all come together is you, the farmer — and your attitude to change.

Shakespeare wrote of the seven ages of man. I think in the farming situation we can recognise four stages — up to 20, being educated and committing oneself to a farming career; up to 30, gaining experience; and then the creative years from 30 to 50 and, finally, a well-earned rest with some service to the industry and community. Front runners tend to start early and don't generally stop. Being creative is a state of mind and an enjoyable life sentence.

### **The successful farmer**

The most useful thing we can do with the time remaining is to consider what makes a successful farmer. You can then go home and measure yourself against it and feel comfortable, smug or guilty as the case may be. In developing such a thought the personal examples of the past are certainly useful but we must be conscious of what is going to be rather than of what is, or has been. That shouldn't present too much difficulty.

What is desirable? Obviously you have to be healthy and fit and stay that way. You must believe in on-going education, read widely, travel, attend courses and use others for stimulation. You are a disciplined worker, and have the ability to use and help other people, you are industry-orientated, you are tidy, neat and orderly, you use and are in turn used by the servicing organisations and finally, you have a good element of courage.

Recently, an adviser was saying that he looks upon a successful farmer as having

five components — firstly, there is his personal life; secondly, his business management — handling the day to day cash flow; thirdly, his financial management and this relates to long term capital decisions of which we all seem to make three or four in a life time; fourthly, is technical farm management ability and fifthly, day-to-day work organisation.

If he measures up well in these five criteria and as well sets challenging but realistic short and long term goals, and has a positive attitude towards new ideas, then the chances are he is going to be the sort of person who makes up that 5-7% mentioned earlier.

The final comment the adviser made was the necessity to do what you do well, as well as choosing the right thing to do. There are many farmers who are considered by some to be a success, not because of their development of new technology but because of the efficiency with which they appear to use old systems.

I have been challenging you, goading you, maybe, into a lot of self analysis and demand for action from it. Assuming you accept the challenge, where do we, as advisers, educators and scientists, fit into your scheme of things? We could do with some positive feedback.

We continually adapt, analyse, and try to be innovative to make life better for you and all of us. It would be good to know that you have identified what you need and how to make the changes you see being necessary.

### **The future**

And now, what are the pointers for the future? It would seem that the pattern for the next 20 or 30 years is shaping up very well. I suppose we are always in a state of transition but right now it seems to me to

be as stirring and challenging as any time in our history. We are considering a wide range of products, a wide spread of markets and a diversified pattern of farm production. Fortunately for us, the world continues to be peopled by an increasing number of wealthy people who are prepared to pay for the right product so our production horizons are loaded with opportunity. But, as stated earlier, the essential catalyst is you.

What is it that distinguishes us from other countries in primary production?

1. Ignorance and lack of care about marketing.

2. Low diversity in our production.

3. Small processing base.

4. Small production in relation to the market size.

5. Good resources for a wide range of production.

6. A well educated capable farming population.

It would seem therefore that the message for you as individuals is quite clear — to educate yourselves to other forms of production, intensify existing production, diversify, market your produce (you don't necessarily do the marketing, but control it and see that it's done) and lastly, involve the wider community in the total process (teamwork not polarisation).

### **Conclusion**

You have had some good leads at this seminar and you should use them. Consider them against other options and then start to build goals for yourself and your situation and pursue it with all the energy and resources you have.

I won't say good luck, because your achievement won't be luck — it will be the result of satisfying, planned work, mental and physical. You are the trigger.





