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Contents

The spread of introduced trees in New Zealand's rangelands — South Island high country experience N.J. Leggad 1

DOC — Structure and function P.T.E. Woollaston 9


Different worlds J. Morris 20

Protected Natural Areas Programme — DOC and Canterbury Farmers agree on implementation B.T. Robertson 23

The Queen Elizabeth National Trust J. Clendon 28

Reform for TGMLI B.T. Robertson 29

Sensible strategic topdressing J. Kelly and J. Bates 33

The topdressing programme on Long Acre P. Davis 39

Alternative Phosphatic fertilisers R. Harrison 43

Pest control administration in New Zealand (Compiled by Ministry for the Environment and a seminar sub-committee). 50

The rabbit menace — Terms of reference for Task Force 52

Memorandum of agreement on pastoral leases between Landcorp and DOC 54

Authors 54

Editor
B.T. Robertston

Cover design
Pat Prendergast

Cover
Outlier trees, 5km from parent source
Lake Coleridge.
Photo: N.J. Ledgard
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The spread of introduced trees in New Zealand's rangelands — South Island high country experience

N.J. Ledgard

“The success of woody revegetation cultures forces land users to choose between forests and improved pastures”. Making that choice will be one of the “principal landscape planning issues for the tussock grasslands and mountainlands for the next 20 years” (O'Connor, 1981).

Professor O'Connor, of the Tussock Grassland and Mountain Lands Institute, was referring to the South Island high country, but his comments are applicable to large areas of undeveloped rangeland elsewhere in New Zealand. The natural affinity of such land for trees has been dramatically illustrated by the ready ability of some species to regenerate naturally. The Central Plateau of the North Island contains the best known incidence of spread; in 1975 some 30 000 ha had an 'infrequent' to 'dense' covering of lodgepole pine (Pinus contorta) (Hunter and Douglas 1984). In the South Island the largest area of spread is on the Amuri Range near Hanmer where some 6000 ha have been colonised by Corsican pine (P. nigra). These, and other examples of uncontrolled natural regeneration have been the subject of numerous media articles and public meetings where emotions have sometimes run high. The issue will continue to attract attention until introduced trees are correctly managed.

The Forest Research Centre of FRI has been studying introduced trees for 30 years in the South Island high country. That work has concentrated on the important function of trees for protecting soil and water values, and more recently for growing cellulose for productive purposes (e.g., Nordmeyer, 1979; Ledgard and Baker, 1982; Ledgard and Belton, 1985). Certain forest species have been shown to grow particularly well in parts of the high country, so that forestry has “a definite role in any diversification away from traditional pastoral land use” (Ledgard and Belton, 1985). The FRC papers mentioned have highlighted the very real positive aspects of forestry in the high country. This article discusses one of the more negative issues — the potential for tree spread. It presents an overview of the extent and biology of spread and suggests guidelines to assist land managers in minimising the likelihood of future unwanted spread.

South Island high country experience

Introduced trees cover only a small portion of the high country but, in parts, they can grow well. A recent FRC survey found plantations of species such as Douglas fir, (Pseudotsuga menziesii), Corsican pine, and ponderosa pine (Pinus ponderosa) with standing volumes rarely equalled elsewhere in New Zealand or even overseas (Ledgard and Belton 1985).

In their major review of the spread of exotic trees in the South Island's rangelands, Hunter and Douglas (1984) stated that the natural spread of wild seedlings (wildings) was first recorded early in the century, but the area affected seems to have increased notably only since the late 1940s. The reasons are not certain, but probably involve declining...
Table 1. Number of sites with self-sown seedlings (frequency in brackets) and distance of spread from parent trees in the Canterbury high country (after Ledgard & Belton, 1985).

<table>
<thead>
<tr>
<th>Species</th>
<th>n</th>
<th>Number of sites with self-sown seedlings</th>
<th>Distance of spread</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 m</td>
</tr>
<tr>
<td>European larch</td>
<td>32</td>
<td>20 (62)</td>
<td>2</td>
</tr>
<tr>
<td>Corsican pine</td>
<td>57</td>
<td>24 (42)</td>
<td>2</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>59</td>
<td>22 (37)</td>
<td>1</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>42</td>
<td>15 (36)</td>
<td>1</td>
</tr>
<tr>
<td>Radiata pine</td>
<td>53</td>
<td>13 (25)</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>243</td>
<td>94 (39)</td>
<td>7</td>
</tr>
</tbody>
</table>

grazing pressure on unimproved land and the restrictions on burning introduced in the 1950s.

Species and areas

Conifers have been the most successful trees, making up over 95% of the area currently dominated by regeneration. The most common species in the South Island high country can be ranked in decreasing dominance as Corsican pine, Douglas fir, European larch (*Larix decidua*), lodgepole pine and radiata pine (*P. radiata*). Less extensive areas of natural regeneration of Scots pine (*P. sylvestris*), maritime pine (*P. pinaster*) and ponderosa pine are also found. Sycamore (*Acer pseudoplatanus*) is the most common broadleaf species involved. A more detailed study of introduced trees in the Canterbury high country showed that European larch spreads furthest and most frequently (Table 1).

In the South Island high country areas of natural regeneration containing more than 100 stems/ha amount to about 3000 ha. The total area of wilding spread is difficult to gauge but probably stands at around three times this figure.

Biology of spread

Seed production

The onset of coning and seed production in conifers is influenced by the severity of their environment. Trees produce cones earlier in drier areas than in wetter areas. For example, both Corsican and ponderosa pines cone at least 5 years earlier at Omarama (maximum annual rainfall: 700 mm) than they do in the Craigieburn Range (mean annual rainfall: 1400 mm). Observations also suggest that local progeny of introduced trees will spread earlier than their parents did.

Seed dispersal

Most dispersal is by wind; dispersal by animals and machines is rare. Because of the prevalence of north-west winds in the high country, seed dispersal and therefore wilding spread is usually south-east of the source. Autumn and winter are the main periods of seed dispersal.

Most spread is fringe spread and is encountered a few hundred metres downwind of the source (Fig. 1). However, species such as lodgepole pine and European larch have light seeds which are easily picked up and carried by wind. Such species tend to spread the longest distances. Wildings have been found 8 km downwind of the parent trees. This long distance dispersal usually originates from “take-off” sites — ridges or hilltops, or sites on or near the north and west faces of a slope exposed to the prevailing winds (Fig. 1). Seed from these sites can be blown many kilometres, eventually falling onto sheltered lee slopes. Tree managers should be aware of the dangers of planting on such take-off sites.
Production of wildings

Wildings usually do not appear until several years after the parent trees first produce cones. For example, in the Craighieburn Range, Douglas fir produces cones before age 10, but seedlings have rarely been found before the parent trees have reached age 14. Similarly, dwarf mountain pine (P. mugo) produces cones before age 8, but wildings have not been noticed until the parent trees were 15 years old.

Sequence of spread

Spread generally occurs as a mass of even-aged seedlings and does not contain representatives from all seed years. A typical example of this sequence is the spread of Scots pine around Lake Moke, west of Queenstown. The trees here can be grouped into age classes that are separated by 20- to 30-year intervals. Trees 85- to 90-years old, alongside an old stone shepherd's hut have parented the handful of 60-year-old specimens just a few hundred metres from the hut. Surrounding these trees is a zone of 25- to 30-year-old wildings, which have been the source for the most recent crop of young trees less than 5 years old.

Similar intervals and a stepwise sequence of spread are also evident for Corsican pine in the Amuri Range and east of Lake Coleridge (Langford, 1984). Most of the large areas of natural regeneration in New Zealand have resulted from periodic sequences of wilding regeneration. A number of factors contribute to this intermittent pattern of spread. The most common are variations in the quantities of seed produced and the agents disseminating seed (mainly wind), annual variations in climate which favour or inhibit the early stages of establishment, and land management practices such as fire, pasture improvement and heavy grazing. Figure 1 illustrates a typical sequence of spread and shows the points where good management can intervene and disrupt the succession.

FRC currently has a number of trials on other aspects of tree spread biology such as delayed germination, duration of seed dissemination and site requirements. Trials have also been set up to gather information on seedling palatability to stock and control methods using livestock and chemicals. All this work will assist in determining the best techniques for managing introduced trees in the high country.

The management of wilding trees

People planting and managing trees in the high country must be aware of the influence of:

- Tree species
- Tree location
- Management of the surrounding land (mainly downwind)

Tree species

Some species seed earlier and are more vigorous spreaders than others, depending on their environment. Lodgepole pine is generally regarded as the most vigorous spreading conifer but most conifers growing in the high country are capable of seeding wildings. Figure 2 lists the main species spreading in the Lake Wakatipu region. The ranking is probably typical of what can be expected elsewhere in the high country.

Tree location

Distant spread (as opposed to fringe spread) is more likely to originate from trees on takeoff sites (ridges, hilltops, or exposed hillsides) than from trees otherwise sited. Therefore spread-prone conifers should not be planted on such sites upwind of undeveloped tussock and scrub country.

Surrounding land management

On most farms tree spread is not a problem. This is not because the trees present do not produce viable seed, but because the surrounding land is managed sufficiently intensively so that seedlings get no chance to establish. Generally, trees will not spread onto land where there is: (a) a well-established dense vegetation cover, such as intact forest
prevailing N.W. wind

Year 1 - first trees (2) planted

Year 20 - seedlings from first trees

fringe spread < 500m downwind plus first outlier trees on take-off site & in lee of hill resulting from "freak" wind

Year 40
fringe spread downwind
seed spread some distance from take-off site
distant outliers establish

Year 60
fringe spread continues
fringe spread underway

Tree spread can be readily controlled by:
Pasture management and controlled grazing in fringe areas
No trees on take-off sites upwind of undeveloped areas
Removal of outlier trees before they produce seed

Figure 1. Typical sequence of conifer spread in undeveloped high country.
Figure 2. The spreading vigour and age of first seed production, of the main introduced tree species regenerating in the Lake Wakatipu region.
or improved pasture; or (b) periodic intensive grazing (mob stocking).

Mob stocking

Forest Research Institute experiments conducted in the 1960s showed that an annual stocking of less than one sheep per hectare will prevent tree spread (Benecke 1967). However, since most unimproved grasslands are not grazed uniformly, grassland improvement, subdivision, and mob stocking will usually be required to ensure that every square metre of any block is grazed. Without such management, wildings can establish on the sites less favoured by sheep (scrubby gullies and shadier faces).

Other forms of control

Fire has also been used to control seedling spread. Although fire will kill most seedlings under 2 m in height, it can create the ideal seedbed for further natural regeneration. If permitted as a control technique, fire is only useful when followed immediately by oversowing (and topdressing) of rapidly establishing herbaceous species. Even with careful tree and site selection, and good management, an occasional outlier seedling can appear downwind of a source. Outliers must be detected and removed before they in turn produce seed and greatly increase the extent of any control operation. This need not be expensive or time-consuming. With the exception of lodgepole pine, no conifer is likely to give rise to wildings before it is 10 years old. Before that age is reached, the tree will be readily visible. Therefore, a few hours of aerial reconnaissance as infrequently as every 10 years (every 5 years for lodgepole pine) is all that is required to keep a check on conifer spread.

Costs of wilding removal

The cost of removing wildings is highly variable because of the differences in terrain, stocking and age. Using a labour rate of $8/hr (including overheads and lightweight chainsaws), the costs of removing wildings in the upper Clarence catchment in 1986 were as follows:

<table>
<thead>
<tr>
<th>Stocking/ha</th>
<th>Cost/ha ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>1-4</td>
</tr>
<tr>
<td>10-100</td>
<td>4-50</td>
</tr>
<tr>
<td>100-1000</td>
<td>50-200</td>
</tr>
<tr>
<td>1000-5000</td>
<td>200-500</td>
</tr>
</tbody>
</table>

From this example it is clear that if outlier trees are allowed to grow until they give rise to their own wildings, the cost of removal can be very expensive.

The ‘do nothing’ option

Many people are unconcerned by wilding spread. This ‘do nothing’ or zero management option is difficult to support. Historically, introduced plants and animals, such as briar and broom, rabbits and deer, have got out of control as a result of similar attitudes. In addition, it is wrong to think that self-sown forests always make a good timber resource. Some have provided good timber but more often the species is not the most desirable one, does not occupy the preferred site, has an uneven age structure and is consequently hard to manage, and the yield is of inferior quality wood. If managers decide that an area susceptible to wilding invasion should be in trees, it is much more efficient to sow or plant a forest resource with the desired characteristics.

Limiting existing spread

In some regions management to control tree spread has been considered too late — large areas of land have already been invaded by wildings. In such regions any strategy to prevent further spread should recognise two areas:

- containment areas — within which natural regeneration will be tolerated because removal is too expensive, and
- control or no-further-spread zones — where no trees will be allowed to reach the age of seed production.

Inside the containment area management might be encouraged for a variety of reasons, such as recreation, timber production, or the...
restriction of tree spread beyond the containment boundaries. Outside the containment area, particularly if the boundaries are well sited, unwanted trees should only consist of outliers, and their elimination should not be expensive.

Management priorities

In 1980 a general policy for forestry on crown leasehold land was published (Land Settlement Board, 1980). The policy recognised the planting of trees as an important land-use option for both production and protection. It advocated an awareness of the influence of planting on landscape values and warned of the possibilities of tree spread, particularly in the high country. However, the objectives of this general policy will only be achieved if it is correctly ‘adapted’ to the wide range of circumstances that exist in the field. Each region must identify the particular advantages or disadvantages of forestry in their domain. For example, straight lines of shelter trees are likely to be acceptable on irrigated land but not so acceptable alongside major tourist routes offering views of neighbouring hills or mountains. Similarly, woodlots of Corsican pine or Douglas fir would be good land use of the poorer pasture-growing areas of developed properties, but would not be suitable on take-off sites or any land immediately upwind of undeveloped or lightly grazed rangelands.

Therefore, in implementing the Land Settlement Board’s policy the first priority is the identification of important local or regional attributes and values that forestry might enhance or threaten. Once these are identified priorities can be accorded to any spread control action that may be necessary. This may not necessarily involve trees which are obviously spreading. In many cases immediate attention should be focussed on younger trees, often deliberately planted, which have yet to produce seed. Currently it is the immature trees that tend to be overlooked; trees growing in situations where prompt action now can save large amounts of effort and money in the future.

Conclusion

This paper has dealt with the issue of tree spread in the high country. In a few areas natural regeneration is a problem, but it must be remembered that the majority of introduced trees in the high country are not spreading and contribute positively to the region’s use and development. This contribution is likely to increase. Tree spread can readily be avoided if plantings are properly planned and managed.

References


Tree spread — Key points

1. Characteristics:
   • very visible.
   • no viable seed until at least age 5
   • direction, and to a lesser extent, degree of spread predictable.

2. Spread of wildings depends on:
   • choice of species.
   • location relative to dispersal agents, mainly wind.
   • surrounding land management, mainly downwind.

3. Spread will not occur on land where:
   • a well-established, dense vegetation cover exists.
   • periodic intensive grazing (mob stocking) is practised.

4. Spread can be readily controlled by:
   • pasture management and controlled grazing in fringe areas.
   • not allowing trees on take-off sites upwind of undeveloped areas.
   • removal of outlier trees before they produce seed.

5. Where considerable spread has already occurred, management should involve:
   • containment areas, where wildings are tolerated, as too expensive to remove.
   • control zones, where no trees allowed to reach age of seed production.

6. Future management should concentrate on:
   • removal of existing or potential wilding sources, particularly outlier trees and trees on take-off sites.
   • regular checks on spread every 5-10 years.
   • careful siting of future plantings
If I were to discuss the structure of DOC as it is today, you might find in a few years time that the structure has changed, and in fact I hope you do. Because in the early stages of a Department there should be a degree of flexibility. As needs are foreseen and redundancies discovered it should be possible to move resources around. The structure of a Department, in my view, should be the physical on-the-ground response to its functions.

The most important thing about DOC is that it is largely decentralised. It has a small head office, which is there for the purposes of administrative servicing, and policy advice to government. It contains a number of specialist directorate’s which are not repeated throughout the country. It has also, as its major operating arm, eight regions and 34 districts which are parts of those regions. Each of those has its own administrative structure. To a degree the structure reflects the bureaucratic orthodoxy of the State Services Commission although I think the Commission would have had a far smaller number of regions and a much more “top down” management system. I believe once DOC has had a year in operation, once the policies within it and the means of implementing government policy are well established, then it will be discovered that there is room for greater decentralisation.

I can see two avenues for that happening. The first is by pruning the head office administrative resources to the minimum required for ministerial servicing, for central policy formulation and for the integration of the regions, and putting as much on-the-ground administrative resource under the regional offices and district offices as possible. The second way in which I think the “top down” effect can be reduced, is by dispersing some of the specialist units, such as the research unit, to more appropriate, and possibly less expensive locations than Wellington. But these are not the sort of thing one would try to do in the first few months of a Department’s existence.

The origin of the DOC arose from the perceived need for a nature conservancy, a major conservation division within a Ministry for Environment. After the election in 1984 it was suggested that it would be necessary to create a MfE in two stages because to take on both planning and policy aspects and nature conservancy was too much to do in one hit. It seemed appropriate to set up a policy planning and monitoring side of the Ministry first. The response from a wide range of groups was that it was inappropriate to delay the establishment of a nature conservancy. The 1985 Environmental Forum looked to establish two agencies, distinct from each other; the Ministry for the Environment, to deal with the planning and policy advice and the monitoring of the environmental effects of policies etc. and the Department of Conservation. After extensive consultation cabinet took that decision. Now the taking of that decision wrote a rather different agenda for nature conservancy in New Zealand. It expanded the horizons for the agency considerably. It was no longer to be one wing of a department with a wider and different mandate. So 1986 saw a lengthy debate, both public and within government over the proper range of functions and responsibilities for the Department of Conservation.
retrospect as a major contribution to the shape of New Zealand over the next few decades.

I want to look a little more closely at that debate. I think it is important to realise why the concept of a DOC was in fact supported so widely within government by ministers and departments with a wide range of responsibilities. It didn't indicate that there had been a sudden bright light on the road to Wellington and that all ministers and all departmental advisors had become instant greenies. It reflected the fact that underpinning the concept of the DOC was the idea of separating conservation and preservation objectives from production objectives. It involved a recognition that the concept is as important to production and productive interests as it is to conservation interests. So the debate as to what should be the functions of the DOC and what should be its range, became much more than the expected and predictable territorial debate between bureaucrats. It became, in effect, a debate over which resources and which types of resources should be regarded as predominantly productive or exploitable, and which should be regarded as resources to be preserved or conserved in the public interest. The result of that was a number of decisions taken over a period of about twelve months, which I think are historic in many cases and which will provide lasting solutions to arguments which have been going on for some time.

The most significant amongst them, perhaps, are the debates which took place over what should be the administrative future of Crown pastoral lands, particularly the pastoral lease lands, and what should be the administrative future of Molesworth. I think we will look back later and see alongside those, the debate over whether the DOC should have a significant role in the coastal zone, as manager of N.Z.'s coast line and some aspects of coastal waters and the debate over the future of public access to public lands and the future administration of marginal strips.

By far the greatest intensity of feeling surrounds the question of the administration of high country land. Frequently that debate focused attention on whether lands should be regarded as productive or as conservation lands with little or no productive value, in terms of primary production. It occurred I think, because the debate came to involve elements of our national identity. It became, to a degree a symbol of what I see as a rather wistful self image as a nation of hard bitten jokers and wide open spaces. I think we do see ourselves as a country of rugged individualists in bushshirts in a country of rugged mountain peaks. We do have a lot of rugged individualists in bushshirts, but I don't think that they are a majority of the population. So the debate from the public's perception became one that involved not just the use of or access to public lands; it also became a debate about the preservation of a valuable part of our national self image, our national identity. I don't want to suggest though, that only those that live in towns and look through their centrally heated windows at the Southern Alps have any sort of emotional attachment to that land. Those involved in production from that land identify just as strongly with it collectively and I think much more strongly as individuals. They become, in a good sense of the word, very possessive of the land. I think the symptom of this has been the increasing identification of Crown lessees as "owners" of their farms and the land they lease.

The lessee's rights in Crown leasehold land have by custom, grown from their original contractual obligation which was entered into. If you disagree with me on that I invite you to consider the price at which leasehold properties have changed hands in recent years and the escalations in those prices. At the same time there has been a corresponding erosion of the perceived public property rights in leasehold land. What, then, is this 'conservation' which has aroused so much suspicion amongst those from high country land?

Conservation, as it is defined in the Conservation Act, involves two activities, preservation and protection. They are similar
and related, but not identical. And they are carried out for four reasons: Because of the intrinsic values of that which has to be preserved; to allow for public appreciation of (and that doesn't necessarily mean walking on it); to allow for the recreational enjoyment of it, (and that frequently means walking on it) and to safeguard options for future years.

The principle functions of the DOC as contained in Section 6 of the Conservation Act are:

— to manage for conservation purposes, land and other natural historic resources;
— to advocate conservation of such resources;
— to promote the benefits of conservation generally;
— to prepare and disseminate educational material related to conservation;
— to foster recreation, (not just to allow it) where that is consistent with conservation; and
— to allow for tourism.

That is a very important list. It was not lightly arrived at; it was debated at great length in Cabinet Committees, and in Parliament, it was debated in great length in the Select Committee of Parliament which dealt with the detail of the Bill. The balance I suggest is very important — to manager, to advocate, to promote, to disseminate, to foster and to allow for certain things to happen. That list shows clearly the role of the DOC is a two-fold one.

DOC has a management role related to certain lands and other resources entrusted to it and it has advocacy, promotional and policy-generating responsibility for looking after the public interest in the public estate for the intrinsic values of that estate, to allow the appreciation of the estate, to permit recreation on it and to safeguard the future options regarding it.

In respect of most of the land which is entrusted to the DOC, there's no problem. Nobody has much argument with DOC looking after the land which has been put into one or other category of reserve. Or with it advocating increasing that estate. However, there has been some quite acrimonious debate as it relates to the ‘mixed use of public lands’, such as the pastoral lease areas such as Molesworth and some farm parks. It's been very difficult for interests which are related to production from the land to accept that the DOC, with its promotional and advocacy role, also properly has a hand in the management of Crown pastoral lands. The debate has perhaps come to a significant point over marginal strips. I have listened with interest to some individuals and groups who believe that marginal strips are to be confiscated from leases which have a freeholding right or from land which has freehold tenure or something akin to it. I can tell you that is not the case. It is true the Crown Law Office has pointed to a possible technical conflict between two parts of the Conservation Act and the State-Owned Enterprises Act. But they suggest it would be very easily fixed up by adding something like: “subject to section 64 of the Conservation Act” in section 24 of the State-Owned Enterprises Act. There is no way in which Government needs to be bound by a law draughtman’s omission to put “subject to Section so and so” in a piece of law. We have a way of fixing that, it’s known as Parliament and we can do that very easily if it proves necessary.

I want to stress that there is no way that the totality of the Conservation Act and State-Owned Enterprises Act can remove any property right which is currently held by any person. Section 64 of the Conservation Act is framed to state that in clear and unambiguous terms. What is important about that debate, is not whether or not a very minor amendment is needed to an Act of Parliament. What is important about it is the fervour with which some of those who have a personal interest or a sectional interest in productive use of land, have embraced the argument that there is something confiscatory about enshrining a successor to Section 58 of the Land Act, in the State-Owned Enterprises Act. It is unfortunate that we have allowed ourselves to get into some fairly bitter arguments on that point. It is crazy to suggest that you can’t on the one
hand, have a role of advocating an outcome and on the other hand a role of managing the process which may or may not lead to that outcome.
I have no difficulty with Landcorp and Landcorp itself has no difficulty with its combined management role assigned to it by Cabinet relating to Crown and pastoral lands and its commercial farming mandate. It could be held that those two are in conflict. It has been held by some keen environmentalists that there is a conflict there, but by and large it was accepted by the country that it is quite proper for an agency which has a mandate to promote the farming use of land to also have a hand in managing a large Crown owned estate which has a major farming use, but has some other uses also. But it is important also to ensure that the guardian of the public interest for non-farming purposes is also involved in its management. It is what has been called the Molesworth solution which I think has been widely accepted. It does make sense to have two agencies with complementary mandates involved in the management of our public estate.
If we are going to make progress, I think we have to get away from the intellectual straight jacket of looking for the dollar interest all the time, of saying this interest is dominant here, therefore all other interests must be diminished in order to protect it. We should recognise the commonality of interest in our public lands — and that includes Crown pastoral leasehold land. We should acknowledge that there is a public interest, defined in law and a private interest defined in the contracts which are held by lessees. Both of these have to be safeguarded. We do this to a degree in respect of freehold land by accepting a complicated and at times restrictive system of town and country planning which does derogate from the rights of freehold owners of land. To say that we should not accept a degree of public interest in respect of our public owned leasehold lands is to harm the future, not only of the land, but of all New Zealanders.
My message to you is that we must not look to identify the dominant interest in particular areas of public land, that we should look to define the range of interests in those lands and then to constructively seek solutions which will encompass that full range of interests rather than end up with winners and losers. Solutions, particularly relating to property rights, which produce winners and losers, ultimately result in everybody losing.

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Changes in land administration
Problems and prospects

Following the presentation of three papers covering environmental reforms, DOC, and Landcorp, those attending the 1987 Hill and High Country Seminar heard prepared statements from Mr Hamish Ensor, Mr David Henson and Professor Kevin O’Connor.

Hamish Ensor
High Country Committee
of Federated Farmers

Recently the Christchurch Press reported that the Under-Secretary for the Environment said that one of the greatest achievements of all government restructuring was the division between protection and production. I don’t want to believe this was said and I hope it was reporter’s license that made this assumption, but it worries me that this will become the public’s perception of what is happening. For the pastoral lessee and for the nation it will be a sad day when we divide conservation and production across the whole spectrum of New Zealand land.

In 1948 (which in terms for land is only yesterday) the pastoral lease was created as the line that could be drawn between that which could be alienated and that which probably never should be. This was plainly a recognition of the fact that, within that line, production and protection should go hand in hand to the benefit of the nation. The Royal New Zealand Forest and Bird Protection Society, as stated in their annual report, see this land as “predominantly conservation land” With this I would agree, if it includes conserving the production of the land which is very important to New Zealand’s overseas earning capacity. However, I suspect it does not and thus the public perception will be that there needs to be a continuing carve up of the nation’s land one way or the other which is a real tragedy for a country with land having many values. Having said that I see no reason to preclude divisions where it is practical and all parties are happy on specific situations such as the freeholding of individual pastoral leases. But any across-the-board legislation that forces this upon people is bound to have repercussions especially on the land and its various values.

Landcorp

Now that Crown Renewable Leases and Pastoral Leases are in completely different baskets they must be dealt with separately. As a high country farmer representative I will deal only with pastoral leases. However I suggest that hill and high country farmers who have renewable leases should join the recently formed association as it would be in their own interests to have a united body to represent them. Theoretically pastoral lessees need not have any fear of Landcorp. The Corporation will simply have a contract to administer pastoral leases on behalf of the Crown’s Land Department under the same law, conditions, and policy that have always applied. They have no axe to grind and we should welcome the fact that they are now a commercial entity which means that we can jointly get on with the job and decisions can be made swiftly as is usually the case under any business relationship. Pastoral lessees would do well to realize that they have every incentive to help Landcorp to carry out their contract efficiently but unlike most other sectors involving lessees there is no switching to the opposition as there is no other company doing the same job. Conversely the High Country Committee will be very distraught if Landcorp take advantage of this monopoly and I hope that
the liaison committee that has been established forestalls any problems.

Department of Conservation

From the pastoral lessees point of view DOC is the unknown player in the land administration game, mainly because it is new and its procedures and performance have not yet been tested. It is charged with the responsibility of completing the Protected Natural Areas programme and this is where they have a problem and pastoral lessees, a real headache. Once the PNA programme became a fait accompli the HCC went along with the programme provided that it was done efficiently and within a short specified timeframe and on a South Island basis. We were given the assurance that this was the objective and apart from initial hiccups it got off to a good start. But since then it has almost ground to a halt with the completion date nowhere in sight. We are on the verge of being forced to remove the last of our support to this scheme because of the impossible position it is placing lessees in, with some even having moratoria placed on activities which have been normal farming practices for years. We are told time and time again that funding is the problem. This is rubbish — PNA is a one-off programme cost and if this country has a real commitment to it the job would have been done by now. The procrastination is disgusting and if DOC, as advocates for conservation, has any backbone it will front the government for funding and if it is not available drop the scheme and return to the old system. Let's face it, the old system of judgement by the Crown's agent must have worked and still can, otherwise those special conservation values wouldn't even be there. Landcorp is charged with the job of administration and has, as I said earlier, no axe to grind in favour of any particular value or against it. With DOC available for advice, and required to give it by government, why not let Landcorp get on with the job as before? One last thought on PNAs. The High Country Committee does not accept that final designation decisions can be made on a regional or survey district basis because the political and financial realities are that when a monetary input is required priorities will have to be considered along with all other taxpayer requirement and aspirations and not solely on what conservationists may believe in. In this respect I fear for conservation in N.Z. because now its costs are clearly identified and can be weighed against the nation's other requirements.

Another major problem for DOC in the high country is going to be its ability to control weeds and pests on large areas of land especially on river beds which many interest groups believe DOC should have and control at the taxpayer's expense. By its own admission DOC is short on agricultural expertise and understanding and it could well consider the employment of such expertise to help them with their deliberations. A good example is the issuing of burning permits. It would be of immense help to DOC if they understood why farmers needed to burn a particular block of land before they made their recommendation to Landcorp. As an aside, the apparent restrictions and change of attitude to the issuing of burning permits is a sore point with high country farmers.

Prospects

These are hard to determine before any of the present administrations or systems have got their feet firmly on the ground. However the most important thing for a balanced future for the high country is the continued existence of the Lands Department even if its work requirement is reduced to a mere handful of personnel. Its most important function will be to review and write up the policy and legislative requirements of land such as pastoral leases as well as the other functions already identified for it. One prospect for high country administration that is extremely daunting to all involved is the question of marginal strips. Section 58 of the Land Act dealing with this matter has been given as one of the delays on pastoral lease administration for some time, but throw Section 64(4) of the Conservation Act and
Section 24 (2b) of the S.O.E. Bill into the ring and chaos should continue for some time. When I ponder the reasons for marginal strips two main possibilities emerge. Firstly, the protection of river banks and water quality and secondly, the assurance of public access and enjoyment of our rivers. If the protection aspects can be cared for regardless of tenure, and that it the opinion of most officials, the real reason for marginal strips is access. To actually implement this system of reservation on specific pieces of land would be an incredibly expensive exercise in futility and it is typical of trying to administer land in the high country by across-the-board law or policies to cover all aspects. The recent policy for destocking and surrender runs the risk of falling into the same trap. Surely if one looks at the rights of the land occupier and the public in any specific case and applied a little practical brain power a solution should be attainable at a reasonable cost regardless of who ends up owning the title to the land. If all else fails there is always Section 117 which is the compulsory acquisition of land for a proven public purpose. All I can say is “there must be a better way.”

While the new land administrative system has rationalized the demarcation of responsibilities on unoccupied areas of high country land the prospect is that the patchwork effect will now be shifted to within the areas encompassed by pastoral leases which will inevitably bring the runholder and the public into closer conflict which is so sad. Once again there must be a better way. In conclusion there are two future prospects I would like to leave with you. Firstly any forced reduction in the security of tenure over any grazed area of land will not be in the best interests of anyone or of the land itself. History has proved this and also proved the success of pastoral leases which are only thirty-nine years old. Secondly, while decisions are delayed, the nation continues to ignore the greatest high country problem of all, the rabbit, who waits for none and continues its devastation. As an introduced species the rabbit is totally incompatible with our environment and as such must be dealt with in the most cost effective way now or none of the other issues will really matter anyway.

David Henson
Public Lands Coalition
Christchurch

Our Coalition welcomed Government’s decision to retain Crown tenure for pastoral leasehold land.

However, the issues and conflicts have not changed. Will the new system address them any better than the old? It is too early to tell but I can discuss stumbling blocks. I will go through the various components of the new machinery.

Department of Conservation

DOC's responsibility for pastoral lands occurs at two levels. They have a reactive role. They have to advise Landcorp on environmental Implications of day-by-day management. Liaison between the two bodies has already been established for this work. Secondly, and more importantly, they have to take the initiative on environmental issues such as land surrender, the PNA programme, fostering recreation (both amateur and commercial), and facilitating access. The programme and resources for this work have not yet been put together. It is rumoured that one of DOCs regional offices did not include the PNA programme in its initial budget. Another handicap is that the functions listed are split between separate DOC divisions.

To be fair, DOC is now addressing this issue and we wish them well. They had to start from scratch and will take time.

Landcorp

The Corporation’s role may be seen as clear cut. It is in fact ambivalent. It is required to act commercially in managing Crown farms and administering Crown leases.
It has also delegated authority under the Land Act. Thus it has a regulatory function. There is inherent conflict between these roles. I know of two substantial breaches of Section 108 since April, this year. In one case Landcorp looked the other way for several weeks. The other took less time but Corporation staff subsequently sought to justify the breach. I conclude that the Land Act will continue to be honoured as much in the breach as in the observance. Underlying this is the fundamental question of whether 20 percent of New Zealand’s land can be corporatised successfully. What may work for coal mines or communications may not work for vast lands with a multiplicity of uses and values. We will not know the answer to this riddle for some time.

The Department of Lands
A nearly forgotten part of the present machinery is the residual Department of Lands. This was kept in being as an undertaker. However, there is a growing view, which we share, that a permanent and neutral Government Department is needed as a repository for the Crown title and legislation concerning Crown-owned land. However, there is a gap in the system. This gap has been created by the demise of the Land Settlement Board. Land use questions are complex and occur frequently. By their very nature they cannot be resolved by ministerial decisions. While quangocide is in fashion there is an irrefutable case for land use quangos. The decisions to retain Board policies is hollow without a body to interpret and apply them. A new body is needed which should be more representative than the old Board and with a more specific task — the pastoral high country and perhaps other lands that may remain with the present Department of Lands. We strongly believe that a new body should be established for this particular purpose. Policy making should not be tacked on to any existing body with other functions.

Landcorp management agreement
The relationship between Landcorp and the Crown, including DOC, is governed by a management agreement. There have been several drafts and I want to comment on some aspects of the latest version. It is not always consistent with the Government’s decision on pastoral lands. Cabinet decided that Landcorp would manage pastoral leases and licences. The agreement adds grazing and recreation permits, hence some of the arguments over land allocation. Grazing permits are by definition, over Unoccupied Crown Land (UCL) and therefore not part of the pastoral lease system. Recreation permits also cover large areas of UCL. Originally the Corporation was to consult DOC and have regard to its advice on conservation matters The phrase “have regard to its advice” has been dropped The implication is obvious. Landcorp will act as Crown agent for managing pastoral leases. The manner in which it is paid for this service is important. Clearly it should receive an adequate fee. However, it proposes to keep the rentals as well. This will be a further alienation of the Crown’s interest in the land. There will be a conflict between the Corporation’s financial interest and its duty as Crown agent. There are implications for both runholder and greenies in this. Those are some pitfalls in the new administration. I sincerely hope that they can be overcome.

I take issue with some of Peter Egan’s statements and offer the following comments.

Land allocation
Our Coalition had to fight hard to obtain public input. It has been suggested we waited till the ink was just dry on the agreement. In fact this was our first opportunity. When the maps and schedules were released we found a shambles. There were some genuine errors and misunderstandings. However, the Government decision was that the Corporations were only to receive lands used principally for production forestry or
commercial farming. Forestry Corporation mainly adhered to these criteria. Consequently most of its problems are questions of access rather than actual allocation. Landcorp greatly exceeded this brief hence their problems. I do not have time to give examples but we have documented the matter in great detail.

**Marginal Strips**

It is suggested that the exclusion of riparian strips of land transferred to the Corporation will greatly disadvantage Landcorp and its tenants. In fact, these strips are a traditional tenure device throughout New Zealand. They exist widely and balance public access rights with the interests of the adjacent farmer. There has been conflict about stocking pressure, particularly by cattle, on lakes and wetlands. However, to link this situation with the marginal strips question is misleading. These strips are comparable to paper roads. They are not a legal and physical barrier and may be used by the farmer and his stock on equal terms with the public.

Kevin O'Connor
Professor of Range Management
Lincoln College

The time left in this discussion is short. I will be brief. The time left for government and people of New Zealand to clarify intentions on the treatment of nature in mountain lands is similarly short. For this reason we should make haste together. For ten years or more I have pointed to the urgent need for a comprehensive mountain policy that would take account of continuing changes in mountain lands themselves and in our understanding and knowledge of them. As well, it would be open to take account of continuing changes in what different people seek from our mountain lands. It is this condition of continuing change which makes it imperative for us to recognise that, to be comprehensive, a policy should not be tight, fixed and closed.

I believe that we had the beginnings of a High Mountains Policy with the 1979 government adoption as guidelines of the policy, goals and objectives for the different use sectors, farming, forestry, nature conservation, water use, recreation, tourism and the like which emerged from the 1977 High Mountains Conference. Some governmental agencies and non-governmental organisations continued to pursue their own agenda. Others, like Land Settlement Board, adopted the principles of policy as stated, but continued to battle with issues of detail as before. Like the Hebrews of old, neither governmental organisations nor any other body behaved much differently because some Moses had just published on some mountain or other, some new comprehensive policy!

From 1979 to 1984 and beyond, we seem to have accelerated and diversified change to our use of mountain lands while our ability to engage in open, rational land allocation has decayed. Pastoral farming continued to intensify on runs steadfastly classified as land unsuited to farming of any kind. Administrative constraints on forestry were maintained while pines continued to spread into unimproved tussock grasslands. Surveys for prospective nature protection were vicariously promoted while the opportunities for effective, representative nature conservation in the lowland and montane zones were rapidly reduced by pastoral development.

It is literally in housekeeping that ecology and economics are tied together. It is as well to remember that we were not managing the housekeeping very well by 1984 when we called in a new housekeeping firm, new brooms, new acts, new corps and all. From the discussion so far, one might guess that many of us seem determined to use the new instruments of policy as some of us used the old, for the division of mountain landscapes into sectors of bureaucratic power. Let us try some other approach, lest our mountains come to resemble the sectarianised neighbourhoods of Belfast or Beirut. The division of functions according to purpose of use which is at the heart of the new resource management legislation is primarily a
division of governmental function, rather than a partition of land. In O'Connor and Swaffield (1987), the rationale in public administration for that division of functions is acknowledged. At the same time we recognise that conservation purposes and development purposes often need to be fitted together in the one landscape. Such landscape integration is a community action that requires that central government organisations should spell out the national goals and guidelines and let local communities act freely to fulfil them.

Why not allow local people to act without the constraints of planning law or any statutory pressures? Why not leave the whole of land use to market forces? Clearly the market fails when there is no voice bidding for nature or for posterity. Likewise local process fails when there is no voice for wider, national interest, or when local interests are dominated by past patterns. In the past we have allocated land with an often unspoken hierarchy of prejudice. The “best-sited” land was used for urban settlement. We have shouldered the cost of later difficulties in flood protection or communication, rather than face the prospect of urban relocation. “First-class” land has been used for any kind of farming, regardless of its significance for food production. “Third-class” land has been proffered for forestry. Open country, seen as “unsuited for farming of any kind”, we have leased for pastoral purposes Mountain forests and wilderness of little potential value for production we have dedicated as national parks and the like. Often in so doing we have been in conflict or confusion as to whether we were saving them for scenery or for science, as pleasing grounds for tourists or out of respect for some of our ancestors. Each such past decision could have been made differently. Often a different decision would have been wiser. Being wiser later suggests that we not make all decisions in the one direction, that we look to opportunities to defer choice, to keep options open, that we avoid irreversible pathways except after careful exploration, and that we leave some observable markers of the way that we have come.

This is the social and ecological context in which we should consider our land use history. The good of environment and our future human good demands that land be used within its technical limits, which vary from use to use and from one kind of land to another. This requires us to assess land in terms of its inherent characteristics, whether climate, rocks, landforms, soils or vegetation, analyse our land use experience and assess each kind of land in terms of its suitability for each use.

The good of society demands also that land be used in relation to the varied needs of society. Past neglect of the needs of society for land preserved as nature, especially where it could be used for something else, has led to surveys for representative, “observable markers of the way that we have come”. Past frustration with real or imagined difficulties of access to lands suitable for recreation has led to common cause between recreationist and preservationist. Past commitment to an antiquated pastoral lease tenure by both government and pastoral farmer has made lessees especially apprehensive about current change, even though they have been generally supportive of nature conservation and facilitative of recreational access and use.

I lament the failure of the Department of Lands and Survey and of the Land Settlement Board and the continuing reluctance of their successors to deal with the recommendations which emerged from the Protected Natural Area Programme surveys, especially that of the Mackenzie Ecological Region. An open and courageous attempt to deal with those scientific assessments would have called for similar scientific assessments of suitability of land for pastoral farming, recreational use, forestry and the like. For the Crown as lessor would have been put into a negotiating stance with its own lessees Such a negotiation would have to take account of the public interests in the land leased as well as the lessees’ interests, Just as the Clayton Committee foreshadowed, if future use of such land under new tenure is to be within the
limitations of the land and in keeping with the range of interests, private and public, in such land, then the land needs more careful interpretation and assessment for a wider range of interests than it has had. Extensive pastoral use and nature conservation may be mutually compatible on the same ground in some circumstances. Intensive pastoral farming and nature conservation may need one another but they need to be separated. Whether recreation fits with either depends on the land and the recreation. Such issues cannot be resolved anywhere but on the land itself, among people of different interests but sharing a common language assessment of individual and social needs at local and wider levels for the functions, outputs and benefits of different land uses, including keeping it as it used to be.

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"Glenthorne"
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Different Worlds
(apologies to Sam Hunt)

Riding the river
Looking for a ford
Water high and dirty
After days of rain

Floating log
Startled horse
Hits soft spot
In deep water

I slide from saddle
Grab flailing stirrup
Hooves churning
Downstream rushing
Boulders tumbling
White waves dancing
Wild eyed gelding

Through luck
Pull out on sandbar
Shaken, panting
Thankful, pale.

Looking skyward
Way above
See jumbo jet
Sydney bound

Silken businessman
Orders a gin
Monogrammed handkerchief
Wipes caviar from chin
Away it winged
Like some great silver dart
I rolled a wet smoke
We’re worlds apart.

Jim Morris
Conservation in Canterbury high country is very much a cooperative matter between the Department of Conservation and runholders.

This is the view of Mr Keith Lewis, Senior Conservation Officer for the Canterbury Region of DOC. He was speaking at a field day organised by the Selwyn Branch of Federated Farmers in February this year.

“We are all well aware that we cannot influence conservation management without the cooperation of runholders. Our philosophy for negotiation involves some form of cooperative management agreement”, he said, adding that the present values in the high country were there because of past and present management.

Two identification reports (for the Mackenzie and Heron Ecological Districts) had been completed and department staff were now talking to runholders about the management of the conservation values identified. “We don’t force negotiation, it is not part of our philosophy or policy in Canterbury”, Mr Lewis said.

The notion of surrendering the land out of leases and creating reserves was not one favoured in Canterbury, although there would be instances where the values were such that the DOC will wish to negotiate acquisition of an area on a willing basis, he said.

If identified areas were convenanted under the Conservation Act such areas did not become State areas, but under the Reserves Act they would.

Winning much sympathy from the runholders at the field day Mr Lewis said DOC staff would be listening to the views of runholders and noting the importance they placed on identified values.

“Our aim is to find ways of managing these areas that will ensure their continued protection,” he said.

“I admire the approach being taken in Canterbury where the DOC emphasis is on convenants”, said Mr Hamish Ensor, Chairman of the High Country Committee. However, what was needed was a more co-ordinated approach to the identification of values in the high country, he said.

“At the present time there seems to be no mechanism for judgements to be made on what is worth conserving from the national point of view.

“Although the Protected Areas Scientific Advisory Committee (PASAC) will follow up the work of the identification team, there is no representative on the Committee who can weigh up the production or commercial aspects of land identified for its conservation value,” he said.
“The first of the implementation phase negotiations have started in Otago on the Old Man Range. There, on three adjoining properties, DOC wishes to remove 4500 stock units to implement their proposals for a new grazing regime to protect red and snow tussock grassland.

“Although the downstream cost of this would be $250,000, this was not the only consideration. Once stock were removed it is likely that any responsibility the runholder once had for an area would also be lost.

“Such a scenario is unacceptable to runholders and it must also be unacceptable to the nation,” he said.

If landowners are too disadvantaged by the loss of grazing there must be provision for compensation, Mr Ensor concluded.
Protecting Open Space

The Queen Elizabeth National Trust

J. Clendon

The Queen Elizabeth II National Trust is of potential interest to all high country landowners and leaseholders, because it offers a unique service: protection of landscape features on private land. The Trust can protect such features by purchase, by accepting gifted or bequeathed land, and by open space covenants.

The Queen Elizabeth II National Trust is an independent organisation established by Act of Parliament in 1977 to provide, protect and enhance open space in New Zealand.

Open space is defined as:
“Any area of land or body of water that serves to preserve or to facilitate the preservation of any landscape of aesthetic, cultural, recreational, scenic or social interest or value”.

Wetlands, streams, forest remnants, caves, tussock land, archaeological and geological features, and coastline are all protected by the National Trust. The Trust is of particular interest to landholders and leaseholders because it is able to provide a legally binding means of protecting special landscape features, in perpetuity and independent of government or commercial interests. The Trust can help farmers ensure that their landscape is maintained according to their wishes.

The National Trust Board has ten members. Two are appointed by the Minister of Conservation, and six by the Minister in consultation with Federated Farmers, the Maori Council, the Counties Association, and the Municipal Association. The Federated Farmers representation reflects both the Trust’s origins and its main client group.

Most open space protected by the Trust is on privately owned, rural land. The Trust sees itself as providing a service for the farmers who want their land protected. In most cases the Trust protects land following a request from a private landowner. Its job is to respond to the landowners’ initiative.

Open Space Covenants

Landowners or leaseholders often wish to protect a landscape feature on their property because they particularly value it, or because they realise it is of national importance. In many cases the best way of doing this is through an open space covenant.

An open space covenant is a legal agreement between the Trust and a landowner or leaseholder to protect an area of open space. An open space covenant is usually in perpetuity, though sometimes it is for a specified time such as the lifetime of a stand of trees. The open space covenant is registered against the land title and is legally binding on the present and all subsequent landowners or leaseholders. The Trust Board becomes the owner’s perpetual trustee. The Trust does not take over ownership or management. The covenant is flexible to take account of farm management needs. It may be amended to improve the measures taken to care for the land, but is cannot be revoked without the consent of the Trust and the Minister of Conservation.

The National Trust as partner in the agreement usually assists with fencing or other expenses of protection and bears the legal and survey costs necessary to register the covenant agreement on the title.
The Trust believes that in a farm situation the farmer is the best guardian to manage environmentally sensitive areas and, with occasional exceptions, such places are best left in private ownership. The covenant is a way of making sure that all the efforts of the current owners in caring for the area are not wasted.

An open space covenant on Crown leasehold land requires the lessors approval. To date, the Trust has entered into several covenants over renewable leasehold land.

**Common Queries About Open Space Covenants**

**Fencing**

Fencing a covenant area is necessary where it is the only effective way of excluding stock from the very sensitive areas: eg low-land forests or threatened and rare plants. However, with larger land areas, the necessity for fencing bush may be reduced by grazing management systems based on existing fences, or new fences on the most practical lines. For wetlands, fencing of sensitive areas may be desirable to stop stock damage to vegetation and banks, especially by cattle. Also, there may be benefit in keeping the stock out of the areas which are hazardous to them. However, it may be necessary to have stock access for water or to create loafing areas for wildlife (short vegetation).

For tussock grassland areas, the fencing for normal stock management is usually adequate. Electric fencing is one way to reduce costs, but only where such fences are in widespread use on the property.

**Management Plans**

Management required for the protection of the area or feature can be detailed in a management plan. This may cover times, intensity of grazing, classes of stock, the use of fire, sprays and fertiliser etc. A well devised management system may reduce the need for fencing other than around the most sensitive areas.

**Other Organisations**

The National Trust works closely with other organisations. This cooperation may be used where a feature of the land is being protected for several reasons, eg catchment authorities may contribute to the fencing of an area for soil conservation purposes. The Trust may then assist the owner to protect the area for ecological or scenic reasons. Some county councils offer rating relief for areas protected by open space covenants. Other organisations may be involved because they can offer technical, financial or staff assistance which is beyond the abilities of the owner and the Trust, eg Acclimatisation Societies, and the Department of Conservation for wildlife management advice.

A landowner of a valuable ecological area identified by a Protected Natural Areas Programme field survey may approach the National Trust for assistance to protect the area by an open space covenant.

**Public Access**

Covenanted land still belongs to the owner who makes all decisions on access. Owners may erect signs to indicate who may have access, or what the public may or may not do on the land. If the owners prefer, the National Trust will not publicise a covenant.

**Landscape Enhancement**

Often the inevitable development of the landscape is carried out with scant regard for what the landscape looks like, or for the landscape’s character. Landscape character is the distinctive quality of a landscape, the result of various natural and man-made events. It is seen in both the shape of the land, and in its cover, eg: vegetation and buildings. At one extreme, it is largely natural (eg wilderness), and at the other, man-made (eg an urban centre). Usually is is a combination of both. It is possible and desirable to develop the landscape with regard to its character.
This 24 hectare wetland and red tussock area on Tony and Nicola Tripps Snowdon Station on the north bank of the Rakaia River is protected by an open space covenant.
The Queen Elizabeth II National Trust is involved with a demonstration farm in Southland. It is intended to show how landscape enhancement (design and planning) can be combined with sound farm production. The ultimate goal of landscape protection and enhancement is the combination of protection of natural heritage features and sympathetic development of modified landscapes.

For example, Mt Karioi in the western Waikato is extensively farmed, with coastal to mountain top features of scenic, botanical and wildlife value. The Trust supported a co-operative venture by the landowners to protect these significant features.

**Purchase and Coordination**

The Trust is able to help protect local landscapes, co-ordinating interest, finance, and effort, and sometimes contributing money towards a common objective. For example the Trust, in co-operation with other organisations, purchased the Lake Wainamu Scenic Reserve in the Waitakere Ranges. Also, the Trust’s Waipa County, Mt Karioi, and Banks Peninsula projects are aimed at co-ordinating protection and enhancement of larger areas.

Waipa County is intensively farmed, predominantly dairy land with significant horticultural potential. Forest remnants, peat lakes and hedgerows are an integral part of the landscape. The Trust has facilitated the protection of key sites and is providing all ratepayers with a series of booklets about the landscape and how to enhance it.

Similarly, the Trust initiated the Banks Peninsula Project which aims to promote awareness of the Banks Peninsula landscape. The Trust believes that the Peninsula has a distinctive landscape identity which should be protected and enhanced. As part of this project, the Trust published *The Natural and Human History of Akaroa and Wairewa Counties: Selected Essays*. These essays explore in detail the natural and cultural resources of Banks Peninsula and includes useful references for further reading, particularly on Geology, Vegetation, Wildlife and Human History. The Trust prepared a booklet based on them to be distributed to all ratepayers on the Peninsula.

**The Trust in the High Country**

The Trust has several open space covenants protecting landscape features in the South Island Hill and High Country. For example, a covenant protects both tussockland and native bush, and another protects wetland and red tussock. Other covenants are presently under negotiation.

In the 24 hectares of wetland and red tussock, managed grazing is allowed according to a regime designed to conserve the special wetland values of the site. Another covenant protects 95 hectares of predominantly silver tussock grassland. In this case, the covenant document includes a special section detailing the management of the tussock. The management principles aim at maintaining the silver tussock while giving flexibility for scrub control. They include the agreement that: the owner may not cultivate or make tracks on areas visible from the road; the owner may use sprays for noxious plant control; goats can be used for noxious weed control with approval from the National Trust Board; fire may be used only to control fern and second growth scrub; the owner shall not mob -stock or graze stock all year; a rotational management plan may be used on the southerly blocks; and cattle may not be wintered on the land. This management plan, like all Trust covenant management plans, was worked out between the Trust and the landowner or leaseholder.

The National Trust is an independent organisation uniquely responsible for protecting landscape features on private land in New Zealand. The Trust staff, particularly the regional representatives, work closely with rural landowners to save the special irreplaceable qualities and values of our natural heritage.
South Island Regional Representatives:

Nelson:
Mrs Stephanie Hole
Acacia Grove,
Q H Stud, Wai-iti Valley,
R D 1,
Wakefield, Nelson.
(054) 28123

Christchurch:
Dr Ian Blair,
65 Puriri Street,
Christchurch 4
(03) 489571

Otago:
Mr Ian Williamson
32 McKenzie Drive,
Twizel
(05620) 894

Southland:
Mr Roger Sutton
16 Vogel Street
Invercargill
(021)358 230

In the Ashley Gorge Robert and Emily Johnston’s 95 hectare silver tussock grassland is protected by covenant.
Reform for TGMLI

B.T. Robertson

The Tussock Grasslands and Mountain Lands Institute is being reformed. This move follows recent changes to the institutional arrangements for managing natural resources.

In March 1987 the Committee of TGMLI, noting the new Departmental administrative arrangements, saw a need to address or resolve conflicts and establish new operating procedures.

The committee established for itself the following goals:

- to examine and review any aspect of hill and mountain land resources or their use;
- to identify issues options for the management of hill and mountain land resources;
- to act as a forum for public debate seeking consensus on issues related to the use of hill and mountain lands;
- to formulate comprehensive policies for the use of hill and mountain land resources;
- to make information publicly available.

The Committee further resolved to establish the following operating procedures:

- the provision of forums such as the TGMLI Hill and High Country Seminar and other specialist workshops/seminars/conferences for public debate on issues affecting the use of hill and mountain lands;
- the preparation of discussion papers outlining the issues, options, and recommendations for initiatives by the Committee;
- the debate, clarification and resolution of issues arising from papers brought to the Committee;
- the provision of advice to Ministers on policies for the management of hill and mountain lands;
- making public through the TGMLI journal “Review” and by other means, information before, and recommendations from, the Committee, and any other information relevant to the use of hill and mountain lands.

In July 1987, after reviewing the role of TGMLI, Cabinet resolved that funding be made available, through Vote Environment, for the development of consistent and comprehensive policies for resource use in the mountain lands.

At its meeting on 18 September, 1987 the Executive Committee of TGMLI resolved that:

“the Executive Committee recommend to the Council of Lincoln College that the Tussock Grasslands and Mountain Lands Institute be reformed with effect from 1 April 1988 so that it might better achieve the development of consistent and comprehensive policies for resource use in mountain lands and be a forum that can address conflicts in this area”, AND “that the TGMLI be a fully representative committee from which an Executive is appointed with such powers as the Council of Lincoln College sees fit to delegate to it.”

It is intended that the new committee comprise people of high calibre and standing from all the main user groups. The committee will consult with such other people or agencies with interests in mountain lands as may be appropriate to any issue or enquiry.
Sensible strategic topdressing

J. Kelly and J. Bates

Introduction

In recent years fertiliser and debt servicing have been the two major costs in pastoral farming. As we know only too well, the debt servicing bill has increased substantially and the fertiliser bill has decreased substantially in the last two or three years. The reasons for this are well known and require no elaboration.

However, many hill and high country properties are reaching a stage where major decisions have to be made. Large areas of tussock land were developed under the LDEL scheme. In Otago for example, just under 200,000 hectares of tussock country were developed under LDEL in the early to mid 1980s. The bulk of this development was on land that had no history of topdressing.

Because of the economics of pastoral farming at present, large areas have not received follow-up fertiliser. As a consequence the following four things could happen.

— Unless the blocks received above average fertiliser applications under LDEL or in subsequent years, pasture decline will be rapid. On well-developed and high fertility areas this decline may not show for two or three years. This would by typical of downland situations. Rapid fertility decline and yield decrease is related to soil test values. In general terms the newly developed pasture is more sensitive to this decline than pasture that has been developed for many years. This is particularly so in relation to sulphur in high country areas. Therefore soil tests are vital to determine one’s position on the "slippery slope".

— The drop in pasture productivity is usually sulphur-driven because sulphur is washed and leached more quickly from soils than is phosphate.

— If fertiliser is not applied then pasture production will decline to a level approaching the original tussock cover and will reach an equilibrium at some stage at this lower level. Stocking rates will have to be adjusted accordingly.

The situation we face at present, is that many high country landowners are in a quandary as to what to do in relation to fertiliser applications. To add to this quandary we have recently seen the introduction of new fertilisers to the market.

Action required

This quandary can be overcome. There is only one way to determine where to topdress, what fertilisers to apply and the rate of application. This is to map accurately the fertility status of the property. Altitude, aspect and soil type may vary greatly within one property and these factors must be taken into account when determining a fertiliser programme. However, soil testing is only part of sensible strategic topdressing.

In order to get sufficient information on which to base confident fertiliser advice we are currently recommending that between 20 and 30 samples are necessary on most hill and high country properties. The aim is to get a complete fertility picture of the property, and make recommendations accordingly.

With this accurate background information the fertilising policies can be confidently changed or amended according to financial situations, environmental changes and for new fertiliser products that are coming onto the market. The absolute key to this advice is in the consultant’s skill in the interpretation and analysis of the soil tests results and marrying these into the whole farm operation.
There is no question in our minds that soil testing and fertility mapping have been undertaken too lightly in the past, and that in today's economic climate a whole new ball game exists. The days have gone when properties were spending $40,000 to $60,000 and more on fertiliser, based on the results of soil tests costing $50. A much more intensive and professional approach is required to really sort out the exact fertility position for each property.

**Farmer input**

MAF's Computerised Fertiliser Advisory Service (CFAS) system that reports on the analysis of soils can only give results as good as the information supplied. Part of this information is accurate past fertiliser and grazing records. Within the CFAS scheme, one of the things it can do is relate fertiliser applications to carrying capacity. Whilst this is quite straightforward on intensive flat land, it can be extremely difficult in high country areas. In fact, one of the key factors determining fertiliser requirement is block (paddock) carrying capabilities. It is somewhat surprising that many grazing management records are not good. There are also some surprising results that have emerged from grazing management records we have analysed recently. Blocks which were thought to have high carrying capacities, and have received regular applications of fertiliser have been shown on analysis to have low carrying capacities. Conversely, blocks thought to have low carrying capacity have in fact had high carrying capacities. These figures are obtained from grazing records, and because it is crucial information in helping with the fertility mapping and monitoring of the property, we would recommend that grazing management charts be kept. These can be relatively straightforward and basically involve recording the number of days and the number and class of stock in various blocks. The summary gives a "birdseye" view of overall property management. They are an excellent aid in helping develop a fertiliser strategy. We are currently developing a computerised system for Otago high country farmers which will be able to rapidly convert the notebook details into a grazing management chart. It will also have the ability to model changes in the farming operation and hence will be a valuable tool to answer many "what if" type questions. Improved stock performance can be obtained through improved grazing systems. This can be achieved with the aid of grazing management charts in matching fertiliser requirements with the real stocking rate. They are also invaluable for doing modelling exercises in terms of trying to adjust the grazing pattern particularly in relation to the critical late autumn or early spring feed supply.

Catchment Board run plan maps are a valuable aid in fertility mapping. These are extremely useful in helping to decide which areas to sample in terms of aspect, altitude, contour etc. They are also valuable when grouping areas for similar fertiliser treatments. I am sure you could all quote examples of having adjoining blocks receiving quite different and therefore impractical (in terms of application) fertiliser recommendations in the past. The maps also provide a very good record from which to start recording the monitoring programme. Many properties now have these run plan maps. Make use of them for this purpose.

**Monitoring**

A crucial part of any good fertiliser programme is an annual monitoring programme. With the initial intensive sampling of between 20 and 30 samples that we would recommend, it is a relatively simple task to set up an ongoing fertility monitoring programme. This involves selecting maybe up to five or six blocks which are tested each year to check on the fertility status of the property. This keeps the farmer right up to date as to whether or not changes to the original fertiliser programme are required. It also continues to build up information for the
fertility mapping part of the property. It also allows rapid and accurate adjustments to be made with changing financial situations. Adjustments can also be made for new fertilisers or price changes.

New fertilisers

Recently we have seen an increase in the types and forms of fertilisers available. These are in the phosphate and sulphur fertilisers in particular. Well-known ones at this stage are the reactive phosphate rocks and partially acidulated phosphate rocks. These are available through fertiliser companies and stock and station agencies. They appear to have slightly differing properties depending on their source and degree of acidulation, which affects the phosphate availability.

Because the effectiveness of rock phosphate fertilisers is so dependent on pH, temperature and moisture it is essential that expert interpretation is obtained before applying these new fertiliser types. This interpretation means relating both soil test results to the fertility levels and temperature and moisture on a particular property. The longer term effects of slower phosphate release must also be calculated. In Central Otago, consultants have identified areas where rock phosphate fertilisers can be used effectively. Because of the price advantages, savings of between $10,000 and $15,000 have been calculated. Other elements, particularly sulphur, must be borne in mind. In many high country situations sulphur is the major nutrient required. Because rock phosphates contain no sulphur, sulphur fertilisers must be applied as well as the rock phosphates. Various new types of sulphur fertiliser are also becoming available.

Example

As a very generalised example of fertiliser applications for many areas of Central Otago the requirement for phosphate is in the order of 0.8 to 1 kg phosphate per stock unit, with the sulphur requirements being in the order of 1.8 kg sulphur per stock unit.

In general, there have been good levels of phosphate application in the past and hence phosphate levels are good. In contrast to this, sulphur levels are generally low in many areas, the result of both low rates and infrequent sulphur applications (commonly every four years).

If we take a very simplified case of a carrying capacity of three SU/ha the 3-year requirement is in the order of nine kg phosphate and 16 kg sulphur. This can be supplied by applying 150 kg/ha 18 percent sulphur super. At $300 per tonne this is around $45 per hectare applied. If the interpretation and analysis of the soil test results indicate that some of the newer fertiliser materials could be applied in this situation, then these materials could be applied for between $20 and $30 per hectare; obviously a substantial saving, but only if they are applied under the correct conditions. These conditions require expert interpretation.

Future

Fertiliser will continue to be a high cost input, but with correct soil testing and good analysis of the results fertiliser will be a profitable way to spend money. The whole aim of fertiliser applications is to put it where it is going to give the best result. If you like, strategic fertiliser applications. The whole basis of testing, interpretation and analysis is changing, in that to make the most effective use of the fertiliser dollar, soil test results must be tied into grazing management records. This gives a second-to-none ability to determine accurately fertiliser requirements now and in the future. This will no doubt show some areas that have received fertiliser in the past but will probably never receive fertiliser again because the returns are too low.

The best decisions are based on the best advice. Many individuals and agencies can do soil testing for you. The question we would like to leave with you is: How many of these have the knowledge and expertise to give you a full and complete analysis and interpretation of the soil test results, and marry these in with grazing and other farm
records to enable you to fertilise with confidence to maximise profitability? We would also suggest that if your property is hill and high country and in excess of 1,000 hectares or 4,000 S.U. and someone tells you he can accurately give you the fertility status and fertiliser requirements of your property without doing a minimum of 10 to 20 tests (depending on contour, aspect, altitude, soil type and size of the property) then you should tell him to ‘go jump in the lake’ and employ someone who can give you the answers you need.

The time has arrived for all hill and high country farmers to give much closer attention to assessing and mapping the soil fertility profiles on their properties. Guesswork and luck, on a few soil samples are not good enough in today’s economic climate.

For a fraction of your annual fertiliser bill you can have your whole property tested and documented with fertiliser recommendations outlined for the next three or four years. The regular monitoring programme will check these recommendations and adjustments can be made as necessary for fertility level, new fertilisers or changed financial situations.

Acknowledgements

To Dr Mike Floate and Dr Colin Boswell, Scientists, Invermay, for assistance in the preparation of this paper. To consultants in the MAF Hill and High Country Consultancy Service for information and commitment to the programme.
The Fertiliser Programme on Long Acre

P. Davis

Long Acre, which my brother and I purchased in 1979, is situated 15 km north of Tarras on the Lindis Pass highway. The property of 3933 hectares is in two blocks two kilometres apart, and consists of 100 ha border dyked pasture, 100 ha dryland lucerne, 200 ha of flats and rolling country and 3500 ha of hill and high tussock country ranging in altitude from 500 m to 1500 m. The Home block is 2500 ha and the Blue Cliffs block, 1450 ha. Rainfall varies between 500 mm in the west to 875 mm on the higher eastern country. As both blocks run east-west, about half the run is sunny country.

In 1979 Long Acre carried 5600 sheep and 120 cattle. Now we run 12000 Merino sheep and 450 Hereford and Hereford cross cattle. At that time 400 ha of the Home block front country and 800 ha of tussock had been topdressed.

We were fortunate to take over Long Acre when the Livestock Incentive and the Land Development Encouragement schemes were in full swing. With advice and encouragement from our stock firm manager, Mr Ian Scott, we applied for a loan from the Rural Bank to topdress and oversow 1800 ha, the majority of the tussock country on the Home block. We applied 190 kg/ha of 20 percent sulphur super in the autumn of 1980 and again in the spring with 2 kg/ha of white clover, 2 kg Alsike and 2 kg Cocksfoot. After a favourable season the results were fantastic; far better than we expected. A fencing programme was quickly implemented. We had not realized the need for smaller blocks. (At that time the Home block was subdivided into six main blocks and Blue cliffs was one paddock. Now we have 19 and 10 main blocks respectively).

With the help of a LDEL for Blue Cliffs we applied 500 kg fertiliser per hectare and a seed mix similar to that applied on the Home block. This topdressing was very poorly done, some parts of the area receiving over 1 tonne per hectare and much of it none. Unfortunately poor distribution does not show up immediately and all we could do was complain and change our aerial topdressing company.

Having covered the whole run (with the exception of land over 1200 m on the dark side of Blue Cliffs) the next task was to keep fertility levels up for we realized that if fertiliser is not kept up the clovers will become depleted and more undesirable grasses will take over; browntop on the dark sides and barley grass and brome on the sunny ones; something we had noticed on other properties.

We divided the place roughly into four areas and intended to do one area each year. Soil tests were taken on the first area and showed plenty of phosphate but low sulphur, so we applied 125 kg/ha of 20 percent sulphur super (subsequent tests have shown this was not enough sulphur). Two other areas were similarly topdressed.

When we completed the third area (last year) we began to wonder if we were applying the correct fertiliser and applying it where it was most needed. High costs made us scratch our heads, as the last application cost in the vicinity of $300 per tonne.

To help solve our problem we were approached by two members of the MAF, John Bates and Dr Bruce Allen. (With the MAF now being a ‘user pays’ organisation
Key
Area 3  
95 kg/ha Filter Cake
100 kg/ha RAPR
Area 4  
125 kg/ha 33% Sulphur Super
Area 2  
90 kg/ha Filter Cake
90 kg/ha RAPR

Key
High Phosphate
Low Sulphur
High Phosphate
High Sulphur
Low Phosphate
Low Sulphur

Figure 1. Fertility levels and fertiliser programme — Home Block
Figure 2. Fertility levels and fertiliser programme — Blue Cliffs Block
some members are out looking for work. Hopefully they are just what we are looking for.)

During May, John Bates took soil tests over the whole property. We now have the results and his recommendations. He has split the place into eight fertilisable areas and again these will fit into a four year programme. It is not as simple as our plan but hopefully will produce better results.

Figure 1 shows the current fertility status of the Home block and fertiliser recommendations.

Figure 2 shows the position on Blue Cliffs block.

During the past seven years we have topdressed nearly the whole property three times by blanket coverage and introduced more productive grasses and clovers. As a result we have increased stock numbers considerably and controlled rabbits by changing their habitat. Smaller blocks have resulted in more feed and made management easier. Some weeds have increased (brier and matagouri) as has the cost of fertiliser and the tax bill. However, the drawbacks far outweigh the benefits.

In the future our strategic topdressing programme will:
— include concentrated fertilisers and thus reduce transport and flying costs
— make use of helicopters and trucks to ensure greater accuracy and better distribution
— be based on regular monitoring of fertility levels.

A more planned approach to fertiliser use is most important to achieve the best results.
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Alternative Phosphatic Fertilisers
R. Harrison.

The subject of phosphate rock and partially acidulated phosphate rock has generated considerable interest in both the farming and the scientific communities over the past few years. What are the conditions (soil, climate . . .) which control the usefulness of these alternative phosphate fertilisers? How much phosphate do they release, and over what time scale? Just how well do they compare with superphosphate?

In order to try to answer these questions, it is necessary to first understand the chemical nature of superphosphate, phosphate rock (PR) and partially acidulated phosphate rock (PAPR). Although the basic raw material of all these fertilisers is phosphate rock, there are important differences in the type of rock and in the processing of the rock which determines the argonomic usefulness of the final product.

Phosphate rocks
Phosphate rocks from commercial deposits belong to the apatite group of minerals. This group is typically represented by the mineral fluorapatite, Ca_{10} (PO_{4})_{6}F_{2}, but in fact encompasses a large range of chemical compositions. Apatite is the tenth most abundant mineral in the earth's crust, and apatites of sedimentary origin comprise most of the concentrations of economic importance. Because of the widely differing modes of occurrence of sedimentary rocks in geological periods ranging from Precambrian to Miocene, sedimentary apatites vary widely in their chemical composition (McClellan and Gremillion, 1980).

Superphosphate
Superphosphate is manufactured by the reaction of phosphate rock with sulphuric acid. The products of this reaction are monocalcium phosphate (MCP) and calcium sulphate. Because MCP is very soluble in water, superphosphate granules rapidly dissolve, releasing high concentrations of phosphate into the soil solution. Phosphate from the fertiliser granule quickly reacts with various soil components, and the result is a relatively rapid increase in the amount of plant-available phosphate (Lehr et al., 1959; Lindsay and Stephenson, 1959a, b). Over time a number of slower reactions take place in the soil which cause some of this phosphate to be converted into forms which are not plant-available (i.e. “fixation”). In contrast to superphosphate, phosphate rock fertilisers do not dissolve rapidly in the soil. Phosphate rocks, whilst retaining the basic structure of fluorapatite, differ in their chemical composition through a phenomenon known as isomorphous substitution. One of the most common of these is the substitution of a phosphate group in the apatite structure, by a carbonate group and an extra fluoride ion. It has been shown that phosphate rock solubility increases as carbonate substitution in the apatite structure increases, and consequently it is this substitution which appears to be the most important one in determining the value of the phosphate rock as a fertiliser in its own right (Chien and McClellan, 1977).

Reactive rocks
Because phosphate rocks with a high degree of carbonate substitution dissolve more rapidly in the soil than those with low carbonate substitution, they are known as “reactive” phosphate rocks (RPR) or “soft” rocks. It is important to bear in mind that even the most reactive of RPRs cannot be
considered to be water-soluble in the normal sense of the word, unlike superphosphate which is water-soluble. RPRs dissolve by releasing small concentrations of phosphate into the soil solution; as the phosphate concentration around the rock particle is reduced (by diffusion, plant uptake, reaction with soil particles), then more phosphate is released. Thus, superphosphate and RPR differ quite significantly in their phosphate release characteristics. Whereas superphosphate rapidly dissolves in the soil, phosphate rock dissolves over a much longer period of time. Superphosphate is said to provide “fast-release” phosphate, whilst RPR provides “slow-release” phosphate.

As yet no detailed picture has emerged of which New Zealand soils are suitable for reactive phosphate rocks. A number of factors appear to be important in controlling the rate of dissolution of phosphate rock in the soil. The most important of these are soil pH, degree of saturation by calcium of the cation exchange complex, and phosphate sorption capacity (P retention) (Quin, 1985; MacKay et al., 1986). In addition, the fineness of the rock is also important.

Guidelines

Because of the multiplicity of factors and rock types and the relative dearth of agronomic data for New Zealand soils, it is difficult to make hard and fast recommendations. Nevertheless, by applying basic chemical principles and supplementing this with the results of some field and glasshouse studies, a number of generally applicable guidelines can be set down.

(a) In general reactive phosphate rocks are most suitable for soils where the pH is 5.6 or less (Quin, 1985).

(b) Some recent work indicates that it is not soil pH per se which is the major factor controlling RPR dissolution, but Ca-saturation (MacKay et al., 1986). For New Zealand zonal soils, there is a close relationship between soil pH and Ca-saturation. This same relationship cannot be extended to include azonal and intrazonal soils. Therefore, for soils in these groups, it may be more appropriate to measure Ca-saturation rather than pH.

(c) Phosphate rock dissolution increases with soil sorption capacity (MacKay et al., 1986). However it is important to make a clear distinction between the dissolution of the rock in the soil, and the subsequent plant availability of the phosphate released. In a laboratory study with Sechura phosphate rock, it was shown that the dissolution of the rock increased but the amount of extractable phosphate decreased, with increasing P sorption capacity of the soil (Syers and MacKay, 1986). Thus, although soil P sorption capacity enhances the dissolution of RPR, it also increases the rate of P fixation.

(d) The rate of dissolution of RPR is quite strongly influenced by soil moisture content (MacKay and Syers, 1986). RPR dissolution would be retarded in soils which suffer periodic moisture stress. Plant nutritional problems may be compounded by the fact that under conditions of moisture stress, plants require a higher concentration of phosphate in the soil solution to maintain adequate growth.

(e) The chemical reactivity of RPR depends on particle size (Syers et al., 1986). Finer particles dissolve more quickly in the soil. However, variations in reactivity due to particle size effects are small compared to that arising from initial chemical composition. It is not possible to convert an unreactive phosphate rock into a reactive one merely by grinding it to a finer particle size.

(f) Research seems to indicate that RPR dissolves in the soil over a period of 2-3 years (Gregg, 1984). In some situations, this may lead to somewhat smaller responses to RPR in the first year when compared to superphosphate. Provided that the site is suitable for RPR, responses can be expected to improve in the second and third years.

Overall, results to date indicate that RPR is more suited for use as a maintenance fertiliser; where a development phase is planned, it is necessary to be confident that
any phosphate added will become available fairly rapidly, and superphosphate will probably be the most suitable phosphate source.

However, there is a third option as far as phosphate is concerned, and that is partially acidulated phosphate rock (PAPR). Whereas superphosphate and RPR are sources of "fast-release" and "slow-release" phosphate, respectively, PAPR is a mixture of both. Partially acidulated phosphate rock is manufactured, like superphosphate, by the reaction of a phosphate rock with a strong acid. The important difference is that instead of adding enough acid to convert all the rock to water-soluble MCP, as in superphosphate manufacture, only a portion is added. In a 30% PAPR, for example, only 30% of the rock is reacted with the acid, leaving 70% unreacted. There are two other important differences. Firstly, in PAPR manufacture, a reactive phosphate rock is used, as obviously it is important that the rock not reacted in the manufacturing process (and forming a part of the final product) should be able to dissolve in the soil. In superphosphate manufacture, unreactive rocks are used, as only a small amount of rock is left unreacted. Secondly, whereas sulphuric acid has been used in PAPR manufactured on a commercial scale. This means of course that there is no sulphate in the final product, but the PAPR does have a much higher P analysis. Thus a 30% PAPR has a typical P analysis of 17%. Of this, 30% of the rock plus the phosphoric acid used in the manufacture will be in the form of water-soluble MCP; the remainder will be the 70% of unreacted rock. Overall this gives a product which is 50% water-soluble MCP and 50% RPR.

For the purpose of assessing their usefulness, PAPRs can best be considered a simple mixture of water-soluble phosphate (like superphosphate) and reactive phosphate rock. Further research is required in this area, as there are a number of characteristics of PAPRs which indicate that this is not entirely true (Stephen and Condron, 1986).

Sulphate needs

One final and very important point needs to be considered when considering which phosphate fertiliser is most appropriate for any given situation, and that is the need for sulphate. Whereas superphosphate contains 11% S, reactive phosphate rock and PAPR contain little or no sulphate. Some manufactures produce PAPRs with added elemental sulphur. Mixtures of superphosphate and reactive phosphate rock ("Longlife" type products) are also available, and these contain S in the sulphate form. Both of these options contain significantly less S than superphosphate. Both RPR and PAPR are phosphate fertiliser. It may be that in many situations, the choice of phosphate fertiliser is dictated by sulphate requirements.

References


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JOHN C. ALLEN
A.N.Z.I.V., M.N.Z.S.F.M.
Registered Valuer, Registered Farm Management Consultant.
Specialist Area: Pastoral lease issues, farm budgeting and farm supervision in High Country
P.O. Box 455, Ph 27110
QUEENSTOWN

Wm. O. HARRINGTON
REGISTERED PUBLIC VALUER & FARMING CONSULTANT

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779-466 (Business)
770-775 (After Hours)
Pest Control Administration in New Zealand

(1) Discussion Paper.

A TGMLI discussion paper on the issues and options for pest control administration in New Zealand was published last year. What follows is a summary of that paper. Copies of the full text are available from the Institute ($6.50 posted).

The nature of pest problems

The TGMLI paper starts its analysis by examining the nature of pest problems. Two essential features are identified: first, many animal and plant pest problems have a public dimension in the sense that their effects extend beyond private interests to those of the local, regional or even national community at large. Second, the public dimension of pest problems may itself be variable over time.

To identify the public dimension of pest management problems the report breaks-up pest management into its basic components; training and licensing, quarantine, surveillance, research, and pest control. The paper suggests that the first four components are national in scope, in the sense that their benefits may not be confined to a single locality or region. The last component, pest control, can be broken down into ready reaction and routine pest management. This distinction derives from the nature of the pest itself. The control of pests with a high potential to spread directly affects pest control in many other localities or regions; the control of these pests is therefore considered to be national in scope. By contrast, the control of pests that are already widely distributed, or whose spread is confined to certain types of soil, climate or land use, is not directly relevant to other localities’ pest problems; the control of these pests is considered a routine problem of local or perhaps regional scope.

Developing principles for rationalising pest administration

Having defined and broadly outlined the public nature of pest management problems, the second step is to develop criteria and principles for rationalising administration.

The most important principle identified by the report is that of correctly matching the level or scope of administration with that of the problem to be administered. In short, to ensure that local problems are dealt with locally and national problems are dealt with nationally.

This basic principle serves not only equity, but also accountability and efficiency. By ensuring that local problems are administered and funded locally, while national problems are administered and funded nationally, administration is made responsible to those who are directly affected (financially and otherwise) by the administration. Essentially, this is the user pays’ principle applied at the collective level. It is equitable and it improves accountability and efficiency.

The second criterion identified by the report is flexibility, in recognition of the variability of the public dimension of pest problems over time. Nationally important pest problems may become of only local importance with changes in technology and land use, while new national pest problems lie waiting to erupt. If the level of administration is to continue to match that of the problems to be administered, strong incentives for critical reassessment of
expenditure and activity are needed, particularly at the national level. Flexibility, therefore, is also a function of accountability.

Rationalisation of pest administration

The third step in the report is to rationalise administration in accordance with these principles. Historical experience with quangos is drawn upon.

In its broad outline, New Zealand's pest administration consists of a number of parallel weed and pest quangos. These tend to be large, complex structures stretching from the national departmental level to the local political and operational level, with two-way flows of authority, funding and information. In principle, it appears that a quango administration could be highly flexible in matching administrative solutions to specific problems (e.g. by devolving decision-making and fund-raising to the local level when problems are of local importance). In practice, the quangos have generally failed to correctly match the level of administration with that of the problem to be administered. Drawing partly on previous reports, the TGMLI paper claims that:

— with respect to animal pests, national funds have mostly been used for control activity rather than for nationally important surveillance and research; moreover, control activity has often concentrated on pests of local importance instead of being directed selectively to pests of national importance.

— with respect to plant pests, national funds have generally been used more selectively. Even here, however, there have been problems of ensuring that national funds were not used for local benefit. Indeed, plant pests of the highest national importance such as nassella tussock and 'Class A' weeds are controlled through administrations that by-pass the standard quango structure.

The TGMLI Report's main conclusion from its study of current and past pest administration is that the identified problems are traceable to the quango structure. Quango administrations generally mix local interests with national interests, local rates with central tax-payer funding, and local representation with national representation in one single organisation. For this very reason they are unlikely to correctly match the level of administration with the level of the problem to be administered. In particular, the incentives to do so will be lacking because of inadequate accountability. Put bluntly, there is every incentive for local bodies to use central funds for local benefit, but there is no clear incentive for the national administration to prevent this misuse of funds. The national administration is largely non-governmental and may not be properly accountable to government for its use of tax-payer funds.

According to the report, therefore, the key to rationalisation of pest administration is not just to assign national pest problems to the national level and local problems to the local level. This has been tried in the past and has often failed. The extra ingredient that is needed is an incentive at the national level to ensure that national funds are used for problems of national interest. The report concludes that this could best be done by giving the national level a degree of independence from parochial interests, and by making it accountable to government. It is from this conclusion that the preference for what it calls a 'Dual Structure' arises.

A dual approach

To ensure that national resources are used selectively for pest management of national importance, the TGMLI report prefers a dual administration in which local and national levels are given a degree of formal separation. In this option, the local (or regional) administration would:

— be entirely financially self-sufficient;
— determine its own structure (local or regional), its range of activities (weeds and/or pests), and the means by which its activities are carried out (contractors and/or permanent field staff);
— be accountable to the interests it served and was funded by, i.e. the local or regional community.
A separate administration would exist at the national level, it would be:
- entirely tax-payer funded;
- entrusted exclusively with those elements of pest management that were of national importance such as research, training and licensing, surveillance and ready reaction;
- free to engage its own staff, the local pest authorities, or independent contractors for carrying out its control operations;
- accountable to government and not composed mainly of representatives of parochial interests.

To further ensure that central funds for ready reaction were not squandered on pests that can not be economically controlled or on the control of pests of only local importance, the report suggests that all central funds for control activity be subject to sunset clauses. These could be renewed only if sufficient national benefits could be demonstrated by an independent research institute.

To ensure the necessary two-way flow of information between the separate local and national administrations the report stresses the need for a network of regional field supervisors. These would be nationally trained and funded; they would feed local information up from the bottom and impart the latest scientific advice and information from the national level.

The report also examines a decentralised structure, and a centralised structure. The decentralised option is the structure that is likely to result from a progressive withdrawal of all specific national provisions and national funding for pest management, except for special rating and enabling legislation of local authorities. In this arrangement the nationally important elements of pest management would have to be administered and funded by existing government departments. Considering the financial constraints and the narrow objectives of government departments, as well as the strategic importance of some national elements of pest management, the report considers the decentralised structure to be inadequate.

The centralised option is a structure combining local and national levels in a single administration. This could be either a government department hierarchy, or a quango combining local representation and funding with departmental representation and tax-payer funding. Neither variant is considered to be adequate. A 'top-down' departmental structure would not allow for sufficient local autonomy or participation; it would be rigid and expensive to the taxpayer. The alternative quango structure would allow for rationalisation in a technical sense of combining the currently parallel plant and animal pest administrations. However, the basic structure and its associated problems would not be fundamentally different from those of the past. Consequently this option is also rejected.
Pest Control Administration in New Zealand

(2) Seminar Workshops

The Ministry for Environment convened a workshop at Lincoln College following the publication of the TGMLI discussion paper on pest control administration in New Zealand. A summary of seminar workshops and conclusions is published below.

The seminar workshops were organised broadly along the lines of the TGMLI ‘Issues and Options’ paper:

Stage I : Defining the nature of pests and pest management.

Stage II : Developing principles for rationalising administration.

Stage III : Designing pest administration.

Stage IV : A preferred option.

Stage I: Defining the nature of past problems

From an early stage most seminar participants found it useful to distinguish between local and national pest problems, and they saw this as a first step in designing a pest administration with distinct local and national levels. The problem addressed in the first workshop was how to arrive at a meaningful and consistent definition of what is a local and what is a national pest. The common threads emerging from the group reports in the workshops were:

- few groups believed that the effect of pests on output or exports was a useful or consistent basis for defining national pests;
- many groups characterised national pests by the threat they imposed on other localities, ie by their potential for spreading to uncontaminated areas;
- in characterising national pests many groups also stressed the effects of localised pest problems to ‘downstream’ areas through soil and water quality, ecology and conservation values, and through health hazards.

In summary, the first workshop agreed that in defining local and national pests:

- both types of pest have a public nature, ie their effects extend beyond private interests to the interests of the wider community;
- the distinction between local and national pests must be based on the degree of ‘spill-over’ of a pest problem to the wider community. National pests are those whose direct effects extend beyond localities and regions;
- the spill-over of a pest problem has two aspects: the potential spread of the pest and the actual ‘downstream’ effects of the pest.

National pests are pests which are of restricted distribution at present but have the potential to become significant problems nationally. It was felt that taxpayer funding is warranted to eradicate or contain these pests which should be the responsibility of Central Government.

Local pests are those which are already widely distributed in all or most regions with suitable habitats, the control of which provides benefits primarily to the occupier. Failure to control these pests in one locality does not affect other areas’ pest problems. The control of these already well-established pests could be a local decision requiring, at most, border-protection arrangements with neighbouring regions, districts or landholders. By contrast, the control of pests with a high potential spread or with wide-ranging effects is a pest problem for all
localities and requires a common approach extending beyond a given locality and its immediate neighbours.

**Stage II: Principles for rationalising pest administration**

The second seminar workshop aimed at developing principles for rationalising pest administration. Its main focus was on criteria for collective action, and particularly for determining whether public involvement should be at the local, regional or national level.

The common themes in group reports from workshop 2 were:
- local pests should be managed locally; this will improve accountability, flexibility and efficiency;
- the control of national pests requires a national involvement;
- to rationalise administration a local/national distinction is needed not only between pests, but also between pest management functions. For example, even the management of a local pest may need inputs that are best supplied nationally. Most groups identified the following national functions; their common denominator is that the benefits of these services extend beyond any particular locality or region:
  - training and licensing of field staff
  - research and education
  - surveillance and classification
  - quarantine.

In summary, the second workshop agreed that there is a common criterion for determining the national importance both of pests and of the various functions of pest management. This is the concept of 'spill-over effects' between localities or regions. With this criterion, the following principles were arrived at:
- no collective action is justified when a pest (or its management) is private in the sense that its effects are captured privately.
- local collective action is justified when the effects of a pest (or its management) extend beyond an individual's property or interest, but not beyond that of the local community.
- national collective action is justified when the effects of a pest (or its management) extend beyond local or regional interests.

These principles of collective action are clearly the same as those identified by the TGMLI report: the level of administration must match that of the problem to be administered.

In addition to the 'spill-over' or 'externality' principle, the majority of those present also called for central government involvement where:
- the complexity of pest problems called for knowledge and resources not available at the local level.
- pest management serves the protection of the resource base.
- pests are on Crown land.

**Stage III: Designing Pest Administration**

The third stage of the seminar aimed at rationalising pest administration according to the principles of collective action identified above.

**Local, and National administration**

The seminar agreed that there was a need for two levels of administration with distinct objectives and functions.

A **national administration** is required specifically for:
- quarantine
- surveillance
- research
- training and licensing
- control of national pests.

A **local (or regional) administration** is required for the routine control of pests of local importance. The seminar agreed that localities or regions must:
- be independent and financially self-sufficient;
- be free to choose their own local or regional structure for pest administration;
- have adequate legal powers to effectively administer pest control if they so desire.

47
Integration of plant and animal pest management
The seminar agreed that at the national level weed and pest management could be successfully combined in a single administration.
It also agreed that the local level should make its own choice about integrating plant and animal pest administration, and level of control that the region should maintain.
Many also believed that the local structure should be free to choose whether to have its own permanent field staff or hire independent contractors, but others felt hiring of contractors would undermine the career structure for permanent staff.

Stage IV: A Preferred Option
Overall, the seminar supported the distinction between local and national pest problems, the need for separate local and national administration with distinctly separate functions, and the basic allocation of pest management functions between the two levels of administration as described above and in the TGMLI report.
While it was agreed that it is important to distinguish between local and national problems, there is also a need to ensure that the local administration is accountable for local problems to local people. There was agreement that other criteria such as co-operation between all levels of administration of pests and pest related activities, and for informal two-way flows of information, must not be neglected. Largely as a result of these considerations most participants rejected the formal independence between local and national administrations, proposed in the TGMLI paper option (iv).
As noted, most seminar participants agreed that local administration should be autonomous and financially self-sufficient.
However, given the importance of participation, co-operation and information flows, the independence of local and national administration should not be pushed too far.
Host participants therefore preferred a single quango administration in which there was effective grass roots representation at the national level. In fact, many participants felt that even in a unified administrative structure it would still be desirable to set up a network of regional managers or field officers to encourage a better flow of information between top and bottom.
The seminar also rejected the TGMLI paper's analysis that the quango structure was to be blamed for the misallocation of central funds in the past. It did not believe that accountability for the use of national funds was either logically or historically inadequate in quango pest administrations.
Pest Control Administration in New Zealand

(2) Seminar Findings

Secretary for the Environment, Dr Roger Blakely, summarised the main findings of the seminar on pest control administration in New Zealand, as follows:

Seminar participants agreed on:

1 The need for change.

2 The need for a clear distinction between locally and nationally important areas of pest management.

3 A corresponding need for a local and national level of administration each with distinct functions. Local administration would be responsible for local pest problems; national administration would be responsible for national pest problems. More specifically:

4 A national administration which would:

Structure:
— not be a government department
— be an independent statutory authority responsible to the relevant minister(s)
— include local or industry representation.

Functions:
— be responsible exclusively for areas of animal and plant pest management that are of national importance; this includes:
  a Control of pests of national importance. These are defined as localised pests with a potential to spread over a wide area or with current 'downstream' effects over a wide area (the exact degree of spread of a 'national' pest was not defined by the seminar).
  b Other management functions for which the benefits extend beyond a given locality or region:
    — emergency response procedures
    — surveillance
    — research and information
    — training and licensing
    — co-ordination of local pest authorities, possibly through regional supervisors
    — quarantine was perceived as the responsibility of national government though not necessarily a function of national pest/weed administration.

Funding:
— receive central government funds through the Minister(s) for the functions outlined above. Most participants agreed that it is best to define these functions narrowly and have them entirely centrally funded rather than define them broadly and mix central and rate-payer funding at the national level.

5 A local administration which would:

— be autonomous and locally elected;
— determine its own structure, whether local or regional;
— be free to choose whether to combine or separate plant from animal pest management;
— be free to choose whether to employ permanent field staff or independent contractors;
— be responsible for all areas of pest management where the benefits are confined to the locality or region;
— be financially self-sufficient (ie rate-payer funded) for its specified functions.
The Parliamentary Commissioner's investigation of the proposal to introduce myxomatosis for rabbit control in New Zealand concluded that Government was faced with the following options for rabbit control:

- "Do nothing; in which case desertification will continue in the semi-arid zone, and an illegal introduction of the myxoma virus and rabbit flea is a high probability;"
- "Approve the introduction of myxomatosis which could resolve the chronic rabbit problem in the intractable area. It is an affordable option. If it is introduced it will be against the wishes of a large number of New Zealanders. It cannot be contained and will gradually spread throughout the country. It is irreversible and will mean future options to make use of the feral rabbit resources will be lost. There remains some uncertainty about the risk of other organisms being introduced with the virus and the flea. It is drastic cure for a relatively small problem."
- "Approve Government intervention, recognising that preventing the introduction of the disease could have high social benefit and result in a long term sustainable solution. Control by present poisoning methods is no longer satisfactory in the neophobic rabbit area, nor is it affordable under 'user pays' in areas of highest risk to rabbit infestation. If New Zealand prefers a myxomatosis-free country, then the Team believes taxpayer input is justified and is essential if further land degradation is to be avoided and present processes reversed. There is a case for taxpayer input to destock or retire the worst affected land and develop an integrated land management package. Myxomatosis should be left in reserve as the control of last resort."

Justification for these conclusions were as follows:

- myxomatosis is considered to be a national solution and the scale of the problem does not warrant it;
- The introduction of the flea and the virus are irreversible actions;
- Neither the flea nor the virus could be confined to the problem areas or to areas which would obtain the maximum benefit;
- There is still a biological risk involved in the importation of another foreign arthropod and disease organism;
- The introduction of myxomatosis is seen as forgoing an opportunity to utilise a potential resource (the feral rabbit);
- There is still strong public opposition to the proposal;
- At best it can only be viewed as a medium term solution;
- Alternative options do exist and have not been fully investigated or utilised yet.
- The possibility that with research new methods of acceptable rabbit control will eventuate.

Principal among the commissioner's recommendations was one to the Minister of Agriculture that he direct the APDC to allocate $100,000 to the Ministry for the Environment for the establishment of local task force groups to deal with the high to
moderate risk areas, and that $5 M be made available for implementation of an integrated land management package.

A Task Force has been appointed to work within the following Terms of Reference:

**Objective**
To develop an integrated land management strategy as a solution to the rabbit problem in areas of moderate to high risk of rabbit infestation, given that the Government has agreed that myxomatosis will not be introduced to New Zealand at this time.

**Membership**
This group should consist of five persons:
(i) an independent chairperson appointed by the Minister of Agriculture;
(ii) a representative of the Director-General of Agriculture;
(iii) two (2) representatives of local landholders, nominated by Federated Farmers Dominion Executive, in consultation with APDC; and
(iv) a person nominated by the New Zealand Catchment Authorities Association.

**Consultation**
The task force should consult with a wide group of persons to obtain expert advice. This group should include persons from the Ministry of Agriculture and Fisheries, Department of Scientific and Industrial Research, Department of Lands, Tussock Grasslands and Mountain Land Institute, Department of Conservation, LandCorp, Ministry for the Environment, local catchment boards, land holders, Ngai Tahu and APDC.

**Reporting**
The task force to report to the Ministry of Agriculture on or before 30 June 1988.

**Brief to**
(a) Define the extent of the intractable rabbit management areas.
(b) Assess options for an integrated land management programme; to include all viable options, including the resumption of Crown ownership, the use of land reclassification as a management tool, the destocking of land, and the specific land management issues raised in the Parliamentary Commissioner's report to be considered by the task force; and to consider the consequences and costs.
(c) Assess practical organisational structures to manage the rabbit problem in the intractable areas.
(d) Assess funding requirements for implementing proposed programmes above existing taxpayer input levels and practical rating limits.
(e) To provide an action plan to indicate how the integrated land management programme would be implemented.
(f) Investigate and comment upon means of integrating research and management of the neophobic rabbit, including funding options for research.
Memorandum of agreement on pastoral leases between Landcorp and DOC

B.T. Robertson

With the disestablishment of the Department of Lands and Survey the responsibility for administering pastoral leases passed to Landcorp acting as agent for the Crown who retain ownership.

However acknowledging that land covered by pastoral leases and licenses contains significant production values and areas with important conservation values, government directed that a division of administrative responsibility for this land occur between DOC and Landcorp.

A draft memorandum of agreement between these two bodies acknowledges the respective roles of the agencies and sets out procedures by which conservation values on pastoral leasehold and licence land, will be protected. This agreement has not yet been signed by the parties concerned.

Preamble

"The land covered by pastoral leases and licences contains areas with significant production values and areas of important conservation values and these areas often coincide. The Crown has an interest in this land and does not wish to divest this interest except in those specific cases where pastoral leasehold land has been re-classified as farmland. Pastoral lessees and licensees have legal rights and obligations which reflect the nature of the land. The Department and Landcorp recognise the lessees and licensees rights and obligations and the need to find appropriate techniques to reconcile the public interest in both production and conservation values in all the lands in question."

Interim protection

Roles

(a) Landcorp will manage the leases and licences under relevant provisions currently contained in the Land Act 1948 on behalf of the Crown, and in relation to conservation issues will carry out this management in accord with existing Government and Land Settlement Board policies.

(b) Landcorp will consult with the Department and have regard to its advice in relation to conservation issues (particularly non-pastoral farming aspects of existing LSB policies).

Process

1. Landcorp may request from the Department advice on conservation issues and in addition to meeting such requests, the Department may also provide advice on its own initiative.

2. The Department may advise Landcorp on specific classes of decisions within Land Settlement Board policies which it wishes to be consulted on.

3. The Department may advise Landcorp that it does not wish to be consulted under (b) above in respect of certain matters relating to specific leases or licences because the Department is satisfied that conservation values are to be protected by satisfactory alternative mechanisms.

4. Where Landcorp consults with the Department as above, Landcorp may request advice be provided within a suitable response period.
Permanent protection
Roles
The Department has the prime responsibility for the identification of conservation values, and for ensuring these are protected and for monitoring and maintaining the standard of protection. (Conservation values may *inter alia* include landscape, recreation and public access).

Process
1. Identification — The Department will identify areas with important conservation values via survey programmes, discussions with lessees and public involvement, and will provide prior advice of these actions to Landcorp.

2. Protection Options — The Department will formulate a range of options suitable for protecting the conservation values identified and will give priority to those options that do not unnecessarily affect the commercial values of the land.

3. Negotiation
   (a) Landcorp and the Department will first discuss the options for protection of the identified conservation values and agree upon general parameters for further discussions with the lessee.
   (b) The Department and the lessee will enter into negotiations on the conservation values within the lease, the means of protecting these, and forms of compensation for any rights foregone, having regard to the level of protection already afforded in terms of the relevant provisions currently contained in the Land Act 1948.
   (c) Any agreement reached with the lessee which appears to be outside the brief settled on in (a) shall be referred back to Landcorp for endorsement.

4. Implementation — Landcorp will be advised on any agreements between the Department and the lessee before implementation. Protection will be achieved by appropriate means involving legal documentation, compensation arrangements and survey as necessary. The Department will monitor and maintain the level of protection achieved.

Dispute resolution
Where a policy matter is in dispute between Landcorp and the Department, and avenues for its resolution have been exhausted, the matter will be passed for final decision to the Committee of Ministers, namely the Deputy Prime Minister, the Minister of Lands and the Minister of Conservation.

Conclusion
The Department and Landcorp recognise that their respective objectives are best served by transparent management responsibilities. The processes in this memorandum are aimed at ensuring the protection of conservation values and thereby clarifying, or removing as appropriate, constraints on commercial operations. This agreement will also form the basis for the further development of techniques to achieve these objectives. Appropriate consultative mechanisms involving interested parties will be part of this process."

Referring to those areas which might require special protection, DOC’s Director General, Mr Ken Piddington told the Association of Soil Conservators earlier this year that the only problem was one of resources. “The PNA techniques will form the basis of our approach but there are other factors such as historic resources (mine races) landscape and recreational patterns which clearly fall under the heading ‘conservation values’,” he said.

The DOC needs to be sensitive to the practical problems which runholders face. “They are in a very real sense caretakers of a very important area of Crown estate. With the help of others such as the Tussock Grasslands and Mountain Lands Institute at Lincoln College we can arrive at a much clearer definition of the values which the public should expect to see protected in the on-going management of high country,” he said.

Issuing a word of caution Mr Piddington said it will not be possible to arrive at some
perfect partition of the public estate with purely conservational values on one side of the fence and production values on the other.” This does not contradict the notion that institution’s should have clarity of objectives.

“At the heart of the conservation ethic lies the conviction that in the end we are all caretakers,” he said.

AUTHORS

Jane Clendon was until recently a resource officer with the Queen Elizabeth National Trust.

Roland Harrison is a lecturer in soil science at Lincoln College.

Nick J. Ledgard a frequent contributor to Review, is a scientist with the Forestry Research Centre of the Ministry of Forestry, Christchurch.

Brian T. Robertson is Information Officer at the Tussock Grasslands and Mountain Lands Institute, Lincoln College.

Philip T.E. Woollaston is Associate Minister for the Environment and former Under-Secretary for Conservation.

John Kelly and John Bates are Area Manager and Consultant, respectively, with MAFTech, Alexandra.

Peter Davis is a farmer in the Lindis Valley, near Tarras, Central Otago.

Jim Morris is a runholder in the Upper Rakaia.
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