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TWENTY-FIVE YEARS OF DEVELOPMENT AND PASTURE IMPROVEMENT IN SOUTH OTAGO TUSSOCK HILL COUNTRY

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Abstract

Over the past 25 years farmers in South Otago have raised the carrying capacity of native undeveloped tussock land from 0.6 su/ha to 15 su/ha through techniques of cultivation and oversowing.

The success has been achieved by a whole range of interrelated operations, which have evolved from cultivating ploughable undeveloped tussock land and sowing into pastures with white clover/ryegrass cultivars. and oversowing the rougher undeveloped hills with similar Pasture species. Soils of the region lacked molybdenum and phosphate, and topdressing with molybdic superphosphate greatly increased white clover yields.

In the 1950s, animal production was based on breeding and selling store stock, but today the emphasis IS on retaining stock and fattening for export

The results of development over the last two to three decades have put the farmers in a good position to meet the future, especially the economic problems facing the industry.

Keywords: molybdenum, oversowing. grazing management, productivity, cultivars, tussock hill country

INTRODUCTION

The South Otago tussock hill country lies to the south of and includes the Kaihiku Ranges, which dominate this region, running south east to north west from Nugget Point almost to Gore. Geologically the area is a unique series of uplifted parallel greywacke sedimentary ridges and valleys.

Altitude ranges up to 675 m a.s.l. and annual rainfall varies from 750 mm to 1350 mm, averaging 1125 mm. Droughts are seldom a problem. Mean daily summer temperature at 300 m is 12.5" C and winter 2.6" C — in other words, decidedly fresh! Prevailing weather is from the southwest and east.

The main soils are hygrous lowland yellow-brown earths. These soils have an extensive cover of greywacke loess and are generally free draining and easy to cultivate.

The coastal area was originally in dense native bush, much of which still exists. Westward inland, as the valley incline rose to about 180 m, the vegetation changed dramatically to extensive clean tussock grasslands predominantly in dense red tussock *(Chionochloa rubra* L.) and fescue tussock *(festuca novae-zelandiae* L.). The tussocks were interspersed with browntop *(Agrostis tenuis* L.) and many other low producing species, with areas of fern, scrub and bush, mostly on the southerly faces of the hills. The area covers about 80 000 ha and farm holdings today average about 800 ha (range 160 to 3500 ha).

Initial area development

It is significant that from the early settlement in about 1850 to 1950, land development was concentrated mainly in the areas of easy access adjacent to the roads and areas of easy contour, leaving most of the hills and back farm areas undeveloped, almost in their native state. This was partly due to the lack of technology, rural regional development in roads, electricity and, for Government leasehold lands, the insecurity of non-renewable leases of various types ruling at

that time. Suffice to say most of these problems were subsequently overcome.

Over the years, these undeveloped tussock areas were sparsely grazed, mainly as a run-off, carrying approximately 0.6 su/ha on the clean easy tussock and much' less on the steeper hills. Some volunteer white clover was occasionally evident but its production and potential were minimal.

DEVELOPMENT

Until the 1950s production was centred on breeding and selling store stock; pasture productivity was insufficient to sustain a total fattening programme. However, by about 1960, the spectacular effects of molybdenum on white clover establishment, selenium and thibenzole on animal health, aerial topdressing and development financing, plus a good outlook for farming prosperity, encouraged farmers to take up the challenge to develop these tussock areas. Not all farmers made the move at the same time, nor did they go about it in the same way. In fact there was quite a variation in individual methods and techniques, most of which were successful and constantly improved upon as development progressed.

Strategy was threefold: cultivate the ploughable ground; topdress and oversow the unploughable hills; and install a range of ancillary improvements to assist management efficiency as general development progressed. Soil tests taken in 1964 revealed very low soil fertility, averaging pH 5.1, Ca 1, K 6, P 2 (Truog), Mg 20, co 0.06, Mo 0.08, cu 9 — very poor conditions for high producing grasses and clovers.

Ploughable land

Best results have been achieved by ploughing in the autumn with a swamp plough, effectively burying the trash and fallowing until spring. This helps to aerate the soil and break down the buried vegetation. These soils were not difficult to cultivate and in spring soon broke down with giant discing, harrowing, levelling and rolling for consolidation before sowing. An effective development rotation was native tussock to soft turnips or swedes, to soft turnips or swedes (clubroot resistant) or kale, to new grass. All these crops were best sown in November to be well established before any likely summer dry spells.

Lime at 2.5 t/ha applied at each sowing and totalling up to 7.5 t/ha by regrassing time, brought the pH up to between 5.8 and 6.2. Brassica crops were sown mostly with 375 kg/ha of reverted superphosphate and as time and experience progressed nitrogen was also found to be beneficial. The yields of all brassica crops were generally light, but the extra large areas provided more than sufficient winter feed and helped to build up organic fertility in the soil through the return of dung and urine. During these initial stages, subsequent ploughing was not advisable as this would have brought to the surface a lot of buried trash.

Selecting high quality cultivar seed for new pastures and oversowing has played a key role in the excellent results obtained. First generation and sometimes basic seed, with a minimum of 90% germination and 99% purity test, was used. On these friable soils, sowing grass seed with a rollerdrill made an excellent job. A typical pasture seed mixture contained 11 kg 'Grasslands Ruanui' perennial ryegrass (*Lolium perenne* L.), 5.5 kg 'Grasslands Manawa' and/or 'Grasslands Ariki ryegrass (L. *perenne* x *multiflorum*), 3.5 kg 'Grassland Apanui' cocksfoot *(Dactylis glomerate* L.), 2 kg 'Grasslands Kahu' timothy (*Phleum* pratense L.), 3.5 kg 'Grasslands Huia' white clover (*Trifolium repens* L.), and 1 kg of 'Grasslands Turoa' red clover (*T. pratense* L.)

From 1966 Ariki ryegrass became popular but is not used now. In 1977 Nui ryegrass superseded Ruanui. In the 1960s and 1970s red clover was used, but is now less popular because of its estrogenic characteristics which may temporarily

affect the fertility of breeding ewes and is definitely not recommended for flushing ewes and rams before and during tupping.

It is significant that this virgin ground was free of weeds.

Early management of newly sown pasture was to graze down hard and quickly with a large mob of sheep to encourage maximum tillering and then spell. After that it became excellent lamb fattening feed.

Effective pasture management has included rotational grazing through good subdivision and regular annual topdressing with a minimum of 250 kg/ha of superphosphate. When hay or silage has been taken extra phosphate and potash have been applied to replenish these elements. Pasture damage caused by porina and grass grub has been a problem particularly in the second and third seasons.

Unploughable hills

Generally, on clean tussock areas tussock areas effective preparation before oversowing has included a good hard grazing by a big mob of sheep and cattle to open up the turf with hoof cultivation, which is repeated immediately after sowing.

Initial aerial topdressing and oversowing has been carried out in separate operations during July to September. An aircraft fitted with a swathmaster for the oversowing operation makes the best job. grass seed mixtures have been mainly 3.5 kg/ha of Huia white clover 2.5 kg/ha of Apanui cocksfoot and up to 9 kg/ha of Nui ryegrass. Inoculation of the white clover seed by the farmer just before oversowing has always been successful and though prills and coated seeds have been used extensively, they have not been superior.

The best management after sowing has been to graze the area hard during the first summer, to give maximum light for white clover development. In the following season light grazing and spelling during the white clover flowering period enables the seed to set and ripen to extend regeneration in situ and spreading by stock transference.

Over the past 25 years, finance has been available to carry out at least regular bi-annual topdressing. Soil phosphate has build up substantially and recent average soil tests are showing pH 5.3, Ca 6, K 8, P 15 to 20 (Olsen) and mg 32 to 55. It has been most important on all areas of these tussock grasslands to re-apply molybdenum every 4-5 years.

Oversowing problem areas

Some problem areas justify special treatment up to 3 years in advance of oversoing.

1. Preburning Firing results have been excellent where the cover and conditions resulted in a clean hot burn. Burning in autumn or just before oversowing and even burning in spring and oversowing the following spring have been successful with no undue regeneration of afterburn undergrowth, such as would be experienced in the North Island.

2. Fern and tutu Successive seasons of tough mob stocking with sheep and cattle particularly over winter, by feeding out hay and achieving heavy trampling, has produced excellent results in eradicating both fern and tutu. However, there is a price to pay in the loss of livestock condition and often deaths from tutu poisoning, which has to be accepted as a development cost.

3. Gorse This is also a difficult problem. Spraying with 2,4,5-T or Tordon® and also burning has opened up the gorse blocks for successful oversowing, but post-treatment maintenance is often expensive. In future goats might well play a role in controlling gorse on tussock hill country if they are managed with the necessary skills.

Introducing species by oversowing

On the tussock hills introducing white clover with the aid of molybdenum has

been an outstanding success and it has not been necessary to consider introducing other legume species, such as 'Grasslands Maku' lotus (Lotus *pendunculatus* L.). Cocksfoot and perennial ryegrass have been only partially successful in the initial oversowing and establish best with a good hoof trampling cultivation before oversowing. A few plants have successfully established along stock tracks, camping areas, dung patches, moist and more fertile areas and gradually have spread by reseeding and stock transference.

Ancillary improvements

These have been wide, varied and co-ordinated as required. Thousands of kilometres of fencing for efficient stock, pasture and crop management control have been installed in the region. Other development includes access tracks and roads, water supply, dams and reticulated schemes, air strips and fertiliser storage bins, drainage, culverts and bridges, shelter and electric power.

Building construction has included everything from homesteads to woolsheds, covered sheep yards, cattle yards, haybarns, silage silos and implement sheds. Operational equipment has over the years played a major contribution in getting the job done efficiently: tractors, multi-wheeled drive trucks and motor cycles, equipment for cultivating, weed spraying, silage and haymaking.

LIVESTOCK

The changes in livestock management and production have been dramatic and far reaching over the years of development.

The total carrying capacity on many farms has more than doubled. The carrying capacity of the undeveloped native tussock land has increased on the cultivated pastures of some farms from 0.6 to 15 su/ha and on average to 12 su/ha. On the topdressed and oversown hills it has increased to 7 su/ha.

Breeding policies have changed. Romneys were first used, then Cheviot 1st cross and finally Perendales. Numbers of breeding cows and fattening cattle have increased tremendously. The whole livestock system has changed largely from store stock production to breeding and fattening. In more recent years deer and goats have entered the arena. Many stock health problems have been encountered over the years, caused by climate, mineral deficiencies (cobalt, copper and selenium), diseases and management for example.

ECONOMICS

Initial development in the 1960s was financed largely out of farm income and some trading bank and stock firm assistance. This was followed by Rural Bank development loans and finally boosted by L.D.E.L. and other subsidised schemes universally being offered at the time in the government's call to increase agricultural production to expand our export trade.

Times have changed and product returns are presently below the cost of production. One could ask "Has it all been worthwhile and what of the future?". I definitely think it has been worthwhile and most of these farms are in a far better position to meet this temporary economic downturn than they would have been otherwise.

THE FUTURE

The main immediate problem farmers face with this large scale development not in place is maintenance and sustainable productivity in the light of lower returns and increasing costs.

Many farm costs have to be met regardless, if one is to stay in business.The

worrying costs are those that affect the maintenance of the earning assets of the enterprise and the most important of these is surely grass. The trick is to maximise its production and turn it into money. The important link in the chain is fertility and we have to face the reality that insufficient product returns mean that fertiliser may have to be applied below maintenance or most definitely applied with greater skill.

However, in my opinion, farmers do not have to return to the low levels of production before 1950, because they now have management tools, skills, technology and a level of soil fertility only dreamed about in those days.

CONCLUSION

Pasture production is sustainable without any major reduction in overall carrying capacity by adopting low cost input strategies, Maybe our grassland mentors, such as the late Sir Bruce Levy and Dr Peter Sears, would have reminded us of the concept of returning organic fertility to our soils through dung and urine and skilled rotational grazing management, which will at least maintain and even continue to raise fertility through the fixation of atmospheric nitrogen by clover. Thus more clover equates with more grass and more dry matter, which when fully utilised increases saleable products.

Take heart! Grass is our greatest crop-everything else either supplements or compliments it. Manage the stock to look after it and it will look after them, and you too. This has been an era of development which is unlikely ever to be seen again.

References

NZ Meterological Service 1976 (personal communication).

NZ Soil Bureau 1968. Soils of South Island. New Zealand. *NZ Soil* Bureau *Bulletin* 27

Pantall A.W. 1976. The development of lowland hill tussock grasslands in South East New Zealand. *Proceedings Hill Lands International Symposim* 70: 390-93. W.V. U.S.A